Iron and Manganese Homeostasis in Marine Bacteria

Robert Green

A thesis submitted to the University of East Anglia for the Degree of Doctor of Philosophy

2012

I declare that the work in this thesis has not been previously submitted for a degree at the University of East Anglia or any other university, and all research has been carried out by myself, unless otherwise stated.

Signed,

Robert Tristan Green

Acknowledgements

Firstly I have to thank Andy Johnston for everything he has taught me, for his enthusiasm for my work, and for taking me on as an orphan PhD student. You will always be a voice in my head (in a good way)!

I must also thank Arnoud van Vliet, for being my very patient secondary supervisor; without your help this project would not have been possible.

To call all the other members of my lab, past and present, 'my colleagues' would be inaccurate. You are all my friends, and cannot stress enough the importance every single one of you had on my project, both in helping with my work, and in making the lab a great place to come, every single day.

I must also thank Claire, who has been such an incredible support at home; I wouldn't have done so well without you!

And to everyone along the way, friends past and present, thank you for whatever parts you played.

Finally, to my family, who are truly my best friends in life, you gave me so much support these last few years, through some tough times, and I am very thankful for that.

I would like to dedicate this thesis to my Mum; you started my 'academic career' all those years ago in York. Look where it ended up!

Abstract

Using a mixture of bioinformatic analyses, microarrays on cells that were grown in media that were either replete or depleted for manganese or for iron, and by making targeted mutations and reporter fusions, several important observations were made on the mechanisms of Mn and Fe homeostasis in the marine α-proteobacterium *Ruegeria pomeroyi* (the main species studied here), and in other important marine bacteria.

R. pomeroyi lacks most of the known Fe uptake systems, including TonB and outer-membrane receptors, but has a predicted, but incomplete iron uptake ABC-class transporter operon, whose expression is much enhanced in Fe-depleted conditions, although a strain lacking these genes was unaffected in growth. The Fe-specific regulatory network of *R. pomeroyi* was found to involve the Irr transcriptional regulator, which controlled the expression of several genes. Microarrays revealed many other genes whose expression was enhanced or diminished in Fe-replete conditions, providing material for future work on the iron regulon of this bacterium,

Turning to manganese, here too the expression of many genes was affected (up or down) by Mn availability. These included an operon corresponding to *sitABCD,* an effective ABC-type Mn^{2+} transporter in many other bacteria. This was confirmed, directly, to be the case for *Ruegeria.* Bioinformatic analyses showed that some other Roseobacter strains lacked any previously known Mn^{2+} transporter, but instead, had a gene that likely encoded an inner membrane protein and was preceded by a motif (MRS box) that was known to be recognised by the Mn^{2+} -responsive transcriptional regulator Mur. It was confirmed that this gene, termed *mntX,* did indeed encode a manganese transporter and that MntX orthologues occurred in several other, unrelated marine bacteria, notably most strains of the pathogenic genus *Vibrio* (including *V. cholerae*) and some of the most abundant bacteria in the oceans, namely the SAR11 clade (*Pelagibacter*).

Index

Figure Index

Table Index

Chapter 1 – General Introduction

1.1 Iron

On Earth, iron is the second most common metal, and the fourth most plentiful element in the Earth's crust (Emsley 2001). It predominantly exists in two oxidised states, the extremely water-soluble ferrous iron (Fe^{2+}) and the extremely insoluble ferric iron (Fe^{3+}) (Crichton and Boelaert 2001). Fe found in seawater is nearly all in the ferric form, due to the oxic and slightly alkaline conditions.

1.1.1 Dependence of bacteria on iron

Iron (Fe) is required for growth of almost all microorganisms. It is used as a catalytic cofactor in many biological processes including photosynthesis, respiration, the citric acid cycle of central metabolism, gene regulation and DNA biosynthesis (Andrews *et al.* 2003). There are some examples of bacteria that do not require iron; these include *Lactobacillus*, which uses manganese and cobalt in place of iron (Archibald 1983; Pandey *et al.* 1994), *Borrelia burgdorferi*, a genome-reduced endosymbiotic parasite that utilises its host's metabolism to replace its own iron dependency (Posey and Gherardini 2000) and some species of Streptococci that can grow in the absence of Fe (Niven *et al.* 1999; Spatafora and Moore 1998). All bacteria that do not require Fe for growth have an absolute requirement for Mn (Jakubovics and Jenkinson 2001).

1.1.2 Iron chemistry

The coordination stereochemistry of both Fe^{2+} and Fe^{3+} means that they are often found as octahedral complexes in nature. Dependent on the associated ligand, a coordinated iron atom can exist in a high or low spin state. Weak field ligands such as F^- or OH^- increase the frequency of paired electrons in the iron-ligand interaction and are described as a low spin complex, whereas strong field ligands such as CO or CN^- maximise unpaired electrons and cause high spin complexes (Crichton and Boelaert 2001). Both the ferric and ferrous forms of iron are Lewis acids, the ferric state being stronger than the ferrous (Crichton and Boelaert 2001). The range of redox potential of both Fe^{2+} and Fe^{3+} is huge, and can be fine-tuned by various ligands. The iron site of any molecule or complex can

almost span the entire range of biologically relevant redox potentials, from -0.5 V to +0.6 V (Crichton and Boelaert 2001). Furthermore, iron complexes can catalyse electron transfer and acid-base reactions, making iron a hugely important and adaptable element for many physiological processes.

All these chemical properties make iron the ideal cofactor for many enzymes (Andrews *et al.* 2003), and the near-ubiquitous iron-dependency of all living things suggests that this has been the case since life evolved (Beinert *et al.* 1997) and may even have contributed to the emergence of life (Wachtershauser 2000).

Molecular oxygen was not present on Earth when life emerged, so all the iron present was in the reduced form. This iron was soluble, and easily accessible to all forms of emerging life. As early cyanobacteria 'breathed' oxygen into our atmosphere, the great majority of the dissolved iron became oxidised and precipitated out of the oceans, leaving huge deposits of iron hydroxides in the Precambrian fossil layer (Crichton and Boelaert 2001).

1.1.3 Iron catalyses the formation of oxygen free-radicals

Ferrous iron can participate in the heterolytic fission of the dioxygen bond in hydrogen peroxide (H_2O_2) leading to the generation of a hydroxyl radical and a hydroxide ion. This process involves both Fenton chemistry and the Haber-Weiss reaction, as shown below:

Fenton chemistry (Fenton 1894).

$$Fe^{2+} + H_2O_2 \longrightarrow Fe^{3+} + \cdot OH + OH^-$$

Iron can also catalyse the formation of a hydroxyl radical through the Haber-Weiss reaction (Haber and Weiss 1932):

$$O_2^- + H_2O_2 \longrightarrow O_2 + \cdot OH + OH^-$$

The lone unpaired electron in the hydroxyl radical makes it highly reactive, and this hydroxyl species can damage proteins, carbohydrates, lipids and nucleic acids, so it is genotoxic, and mildly mutagenic (Sies 1993). This means that this essential metal can also be lethal. It follows that Fe homoeostasis in bacteria (and, indeed, all organisms) is tightly regulated, so that cells have neither too little, nor too much Fe.

1.2 Manganese

Manganese is the twelfth most common element in the Earth's crust (Emsley 2001), and exists in a range of oxidised states (+1 - +7), the most common being Mn^{4+} in MnO_2 (pyrolusite). Manganese in sea water is found in the soluble state Mn^{2+}, although it also occurs as the insoluble oxides Mn^{3+} and Mn^{4+} (Stumm and Morgan 1981). In the oceans, soluble Mn oxides are reduced to Mn^{2+} by sunlight (Sunda *et al.* 1998), making them biologically available. Dissolved Mn levels are in the low nanomolar range in surface waters of the ocean (Landing and Bruland 1987; Middag *et al.* 2011).

1.2.1 Dependence of Bacteria on Manganese

Manganese (Mn) is also an essential metal, being critical for photosynthesis, gluconeogenesis, glycolysis, amino acid and aromatic acid metabolism, peptide cleavage, nucleic acid degradation, signal transduction and the stringency and oxidative stress responses in a variety of bacteria (Jakubovics and Jenkinson 2001). In bacteria, there is a clear biological, as well as a chemical, link between the two very similar transition metals Mn and Fe. Thus, Mn can regulate intracellular levels of Fe in *Bradyrhizobium japonicum* (Puri *et al.* 2010) and the expression of Mn uptake systems is under the control of Fe and Mn in *Escherichia coli* (Patzer and Hantke 2001), *Salmonella enterica* serovar Typhimurium (Kehres *et al.* 2002) and *Bacillus subtilis* (Que and Helmann 2000).

1.2.2 Manganese chemistry

Mn(II) has an ionic radius of 0.8Å, which is very similar to that of Fe^{2+} (0.76Å), and indeed other transition metals such as calcium and magnesium (Jakubovics and Jenkinson 2001). Because of this size similarity, Mn will often substitute for Fe in the metal-binding sites of proteins; Mn also commonly incorporates into Mg-specific ligands due to their similar binding properties (Jakubovics and Jenkinson 2001).

Mn has a major role in biological systems by catalysing redox reactions. These Mn-containing enzymes can have 1, 2 or 4 Mn atoms to facilitate redox chemistry. Mononuclear Mn containing enzymes include the Mn-containing superoxide dismutase, Mn-dependant peroxidase, and Mn-

dioxygenase. Bacterial catalase and Mn-ribonucleotide reductase enzymes utilise a binuclear Mn redox site, and the oxygenic catalytic centre of photosystem II has 4 Mn atoms (Law *et al.* 1998).

1.2.3 Manganese helps protect cells from oxidative damage

In contrast to iron, the reactions between Mn^{2+} and O_2^-, H_2O_2 or ·OH do not form hydroxyl radicals (Cheton and Archibald 1988; Stadtman *et al.* 1990). Indeed, being a co-factor in the Mn-superoxide dismutase SodA, Mn is essential in detoxifying reactive oxygen species (Keele *et al.* 1970), and several groups of lactic acid bacteria use millimolar levels of intracellular Mn^{2+} to "mop up" and detoxify superoxides (Archibald 1986).

1.3 The ocean environment

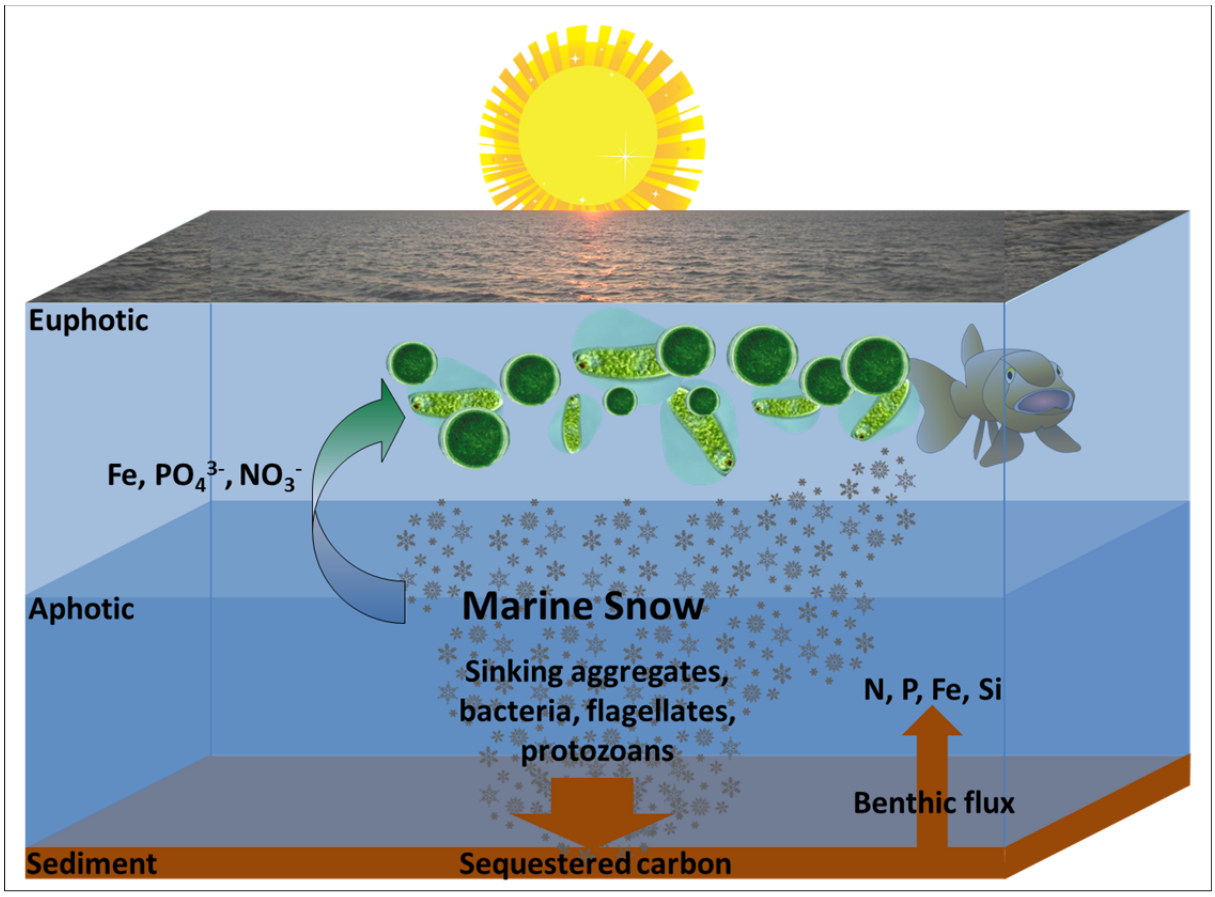
1.3.1 Ocean Geochemical Cycles

Cycling of organic molecules within the epipelagic zone (<200 m) occurs readily by mixing due to wind action, thermohaline current (Millero 2006), and through the abundant aquatic microbes (Whitman *et al.* 1998) constituting the 'biological pump' (Buesseler and Boyd 2009). Below the epipelagic, the mesopelagic (< 1000m) zone contains water that remains in place for decades, yet bacteria and archeae (Karner *et al.* 2001; Kirchman *et al.* 2007), protists (Peter *et al.* 2007) and nanoflagellates (Hideki *et al.* 2007) found here contribute extensively to ocean metabolism (Aristegui *et al.* 2009). Further down still, the bathypelagic (1000–4000-m depth) and abyssal zones (>4000 m) contain extremely high pressure water which remains *in situ* for centuries (Aristegui *et al.* 2009). In these ecosystems, very little is known about the biology, although a study by Sogin *et al.* (Sogin *et al.* 2006), revealed that 80% of mesopelagic and bathypelagic organisms were from uncharacterised genera. Movement of nutrients, metabolites and sequestered compounds down the water column is also caused by gravity – in the form of marine snow.

1.3.2 Marine Snow

Marine snow consists of organic material, excreted waste and inorganic solids falling from the densely populated euphotic zone, settling on the ocean floor in benthic sludge depositions. Phytoplankton, bacteria, flagellates and protozoans form part of clumping snow particles, which can measure many centimetres across, and are considered an important part of nutrient cycling in the water column (Alldredge and Silver 1988). Bacteria can reach densities of 10^8–10^9 per ml of marine snow (Alldredge *et al.* 1986). These break down organic material, releasing plumes of small molecules and ions from the snow particles (Azam and Malfatti 2007; Kioerboe and Jackson 2001). These plumes play a major role in recycling iron, phosphate and nitrates back to the higher water column (Kioerboe and Jackson 2001), and also lead to a net loss of carbon from the upper ocean compared to these compounds; refer to figure 1.1 (Azam and Malfatti 2007).

Figure 1.1 Diagram of marine nutrient cycling



Marine snow falling from the euphotic zone is colonised by microorganisms which contribute to the flux of nutrients. Plumes of nutrients, Fe, PO_4^{3-} and NO_3^-, are released by grazing bacteria, flagellates and protozoans from marine snow. These are recycled back into the phytoplankton rich euphotic zone; the remaining snow falls through the aphotic zone where it is sequestered into the benthic sediment. Over time, elemental nitrogen, phosphorus, iron and silicon are reabsorbed by the water column where they re-join the cycle. Also, a net loss of carbon occurs from the water as marine snow enters the sediment (Azam and Malfatti 2007).

1.3.3 Input of metals into the ocean

The influx of Fe and Mn into the oceans is mainly from erosion of sediments, which are washed into terrestrial waterways (Johnson *et al.* 1997), and the metal laced dust that is carried around in the atmosphere (Coale *et al.* 1996; Duce and Tindale 1991). Dust is considered to be the major pathway of marine iron input (Jickells *et al.* 2005), only 10 % of which is soluble in seawater (Zhuang *et al.* 1990). However, Mn concentrations in surface seawater are nearly entirely due to dust deposition

(Mendez *et al.* 2010). There are extremely low levels of Fe and Mn in the Southern Oceans due to a lack of dust input into this body of water (Martin *et al.* 1990).

Global iron deposition into the oceans is estimated to be between 131 and 487 x 10^9 mol yr^{-1} (Duce and Tindale 1991; Mahowald *et al.* 1999; Tegen and Fung 1995), fuelling blooms of life in both coastal and offshore waters (Archer and Johnson 2000). Iron availability in the oceans contributes directly to both the strength of the biological pump, and the amount of dissolved CO_2 (Archer and Johnson 2000), both of which are vital to a stable climate (Sunda 2010).

The global input of Mn into the oceans has not been determined, but some initial estimates for the flux of Mn to the Southern Ocean indicate that that ~2 µmol Mn $m^{-2}{\cdot}yr^{-1}$ of Mn is deposited by dust, which is less than the estimate of Mn flux from marine and land sediments into the same water system - 3.3 µmol Mn $m^{-2}{\cdot}yr^{-1}$ (Middag *et al.* 2011)

Iron cycling within oceans is complex. Fe(III) is almost entirely bound to organic ligands (Gledhill and van den Berg 1994; Rue and Bruland 1995; Rue and Bruland 1997; van den Berg 1995; Wu and Luther 1995). The precise makeup of these Fe-containing materials is poorly understood; thus Hopkinson (2009) states that the ligand pool '*is likely to be a mixture of siderophores, organic exudates and humic material*'. Any Fe(II) is either used by bacteria and phytoplankton, or falls to the ocean floor in marine snow, where benthic flux slowly returns metals to the water by diffusion (Azam and Malfatti 2007). The mechanical stirring of water via waves, and currents such as the Gulf Stream, and transport of iron via feeding and migrating macroscopic life leads to its movement both horizontally and vertically around the water column, so both physical and biological factors impact on the distribution of this metal (Morel and Price 2003).

The iron cycle is directly linked to the 'biological pump': 25 % of all CO_2 released into the atmosphere is absorbed into the oceans (Feely *et al.* 2009), causing a decrease in pH (Sunda 2010). By the end of the century, current trends show that the global pH of seawater will drop from 8.2 to 7.7 (Feely *et al.* 2009; Millero *et al.* 2009). Increasing acidification of surface water will decrease the bioavailable (Fe(II)) iron, less phytoplankton will grow, and less CO_2 will be fixed, with real potential for increasing global warming further – a dangerous feedback loop (Shi *et al.* 2010).

1.3.4 Iron and manganese availability in the ocean

Total dissolved iron concentrations in the oceans range from 20 pM to 1 nM in pelagic, offshore zones (Bruland *et al.* 1994; Gordon *et al.* 1982; Martin *et al.* 1991), and 100 pM to 10 nM around the coastlines (Gordon *et al.* 1982; Wu and Luther 1995). Iron availability is sensitive to pH, a particularly relevant factor, given the increasing atmospheric CO_2, and consequent acidification of the oceans (Shi *et al.* 2010). Modelled increases in irradiation or decreases in temperature were both shown to enhance levels of Fe(II) (Tagliabue *et al.* 2009), the biologically available form of iron. More than 99% of dissolved iron is in complex with unidentified ligands (Gledhill and van den Berg 1994; Rue and Bruland 1995; Rue and Bruland 1997; van den Berg 1995; Wu and Luther 1995), thereby reducing free iron concentration to low picomolar quantities (Bruland *et al.* 1994; Gordon *et al.* 1982; Martin *et al.* 1991; Wu and Luther 1995), although there is ongoing debate about iron availability in seawater (Hutchins *et al.* 1999; Wells *et al.* 1995). It is strongly suggested that the ligands responsible for most of the iron chelation are bacterial siderophore pools (Granger and Price 1999; Haygood *et al.* 1993; Hutchins *et al.* 1999; Rue and Bruland 1995; Tortell *et al.* 1999; Wilhelm *et al.* 1998).

Even though Mn is, overall, an abundant element on Earth, it only exists in low nanomolar concentrations in seawater - < 1nM in the Southern Ocean, though somewhat higher (~ 20 nM) in the Arctic Ocean (Middag *et al.* 2011a). Mn is found as both insoluble Mn oxides, and soluble Mn ions, which are rapidly lost from the upper water column by sinking, and by uptake by cells (Sunda and Huntsman 1994). Therefore, Mn concentrations fall with increasing depth (Middag *et al.* 2011).

1.3.5 Iron limitation for life in the ocean

Bacterial communities in the euphotic zone are hugely abundant (Hobbie *et al.* 1977; Whitman *et al.* 1998) and diversity is rich (Rusch *et al.* 2007; Shaw *et al.* 2008). Competition for nutrients, including iron (Measures *et al.* 2008), is therefore extremely high (Hutchins *et al.* 1999), as has been extensively modelled by Moore *et al.* (2001). Iron limits growth of bacteria in certain parts of the oceans (Martin *et al.* 1991; Moore *et al.* 2001), as graphically revealed by the iron fertilisation experiments, IRONEX I and II (Coale *et al.* 1996; Martin *et al.* 1994). In IRONEX I, Martin *et al*. (1994) increased iron concentration 2-fold (to around 4 nM) over a 64 km^2 area in the equatorial Pacific. Subsequently, IRONEX II (Coale *et al.* 1996) expanded this work by using three separate iron fertilisation events (2 nM, then two subsequent additions of 1 nM) over a 7 day period. Both studies

produced large-scale blooms of phytoplankton, with a 27-fold increase in chlorophyll concentration in the case of IRONEX II. Recent research in the eastern Pacific (Boyd *et al.* 2004; Tsuda *et al.* 2003) and the Southern Ocean (Blain *et al.* 2007; Boyd *et al.* 2000; Coale *et al.* 2004; Pollard *et al.* 2009) showed massive variation in this phenomenon: persistence of blooms lasted from 2 – 50 days, and sequestered carbon levels were inconsistent. None of the studies purported to discover the fate of sequestered carbon but are considered good early studies into the principle of iron fertilisation (Güssow *et al.* 2010). The amount of iron chelation by organic ligands increased by an average of 4-fold after iron fertilisation, suggesting that these molecules are biological in origin (Rue and Bruland 1997). This increase in organic ligand production is likely due to the increase in bacterial numbers.

Since iron is so poorly available, various physiological strategies have evolved to acquire this limited nutrient. Morphological adaption to low iron conditions is exemplified by a very small cell size in the abundant cyanobacterium, *Synechococcus* (Rueter and Unsworth 1991) and in the highly abundant SAR11 (Morris *et al.* 2002). Furthermore, a 20-50 % decrease in cell volume, in response to low Fe, was reported in both coastal (*Thalassiosira weissflogii, T. pseudonana, Prorocentrum minimum*) and offshore species (*Emiliania huxleyi, Pelagomonas calceolata, T. oceanica* (Sunda and Huntsman 1995)) of eukaryotic phytoplankton.

Bactivory by the phytoplankton *Ochromonas* was shown by (Maranger *et al.* 1998) to be a major source of this flagellate's iron requirements: 'let someone else do the hard work...'.

On a molecular level, several species of phytoplankton and bacteria show adaptations in metalloprotein use under low iron conditions, replacing the photosynthetic electron transfer chain component cytochrome c-553 with a copper-containing plastocyanin, for example (Wood 1978). In the cyanobacterium *Synechocystis* 6803, this switch is regulated by the availability of copper (Zhang *et al.* 1992).

Another Fe-S-containing protein, ferredoxin, was shown to be replaced *in vivo* with flavodoxin in cyanobacteria (Lin *et al.* 2009; Mitsui and Arnon 1971; Smillie 1965), in diatoms (Pankowski and McMinn 2009; Roche *et al.* 1995), and other phytoplankton (Doucette *et al.* 1996; Entsch *et al.* 1983; Erdner *et al.* 1999; Sandmann *et al.* 1990). This phenomenon is also found in terrestrial bacteria, demonstrating that the ability of bacteria to adapt to Fe availability is clearly well conserved and likely very important.

1.4 Bacterial Iron Uptake Systems

As introduced above, Fe is a limiting resource, and may be especially scarce in marine environments. As a result, bacteria have evolved a variety of iron acquisition strategies. Most of what we know about Fe uptake is from a number of mostly terrestrial bacteria, most notably *E. coli* and the enterics, though with others as well. These include high affinity transporters, employment of iron chelating molecules and reduction of ferric iron to the ferrous form.

1.4.1 Feo

In anaerobic conditions, iron is found in the reduced ferrous form. Obligate and facultative anaerobic species of bacteria can use Fe^{2+}-specific transporters to obtain this iron (Schroder *et al.* 2003). Bacteria such as *E. coli*, *Salmonella*, and *Shigella,* which can reside in the micro-oxic conditions of the gut, use the Feo polypeptide transporters to obtain ferrous iron. The *feo* locus consists of three genes, *feoABC*. Deletion mutants in *feoB* causes lower survival rates in a mouse colon in both *Salmonella typhimurium* (Tsolis *et al.* 1996) and *E. coli* (Stojiljkovic *et al.* 1993).

The C-terminal domain of FeoB is a helix rich transmembrane domain thought to be the permease for ferrous iron transport. The N-terminus is homologous to a GTP-binding G-protein, which is proposed to provide the active transport energy (Cartron *et al.* 2006). The functions of FeoA and FeoC are unresolved, but are not required for expression of *feoB*, but are needed for iron transport functionality. FeoA interacts directly with FeoB in *Salmonella enterica* (Kim *et al.* 2012), and is homologous to the C-terminal domain of the DtxR regulator (Braun and Killmann 1999; Kammler *et al.* 1993). The sequence of FeoA is predicted to be a GTPase activating protein, and is possibly an Fe-dependant transcriptional regulator (Cartron *et al.* 2006). FeoC is homologous to a winged-helix domain protein, only found in the γ-proteobacteria. An alignment of FeoC proteins found 4 conserved cysteine residues, which are believed to be involved in iron-sulphur cluster binding (Cartron *et al.* 2006).

1.4.2 Ferric reductases

In aerobic conditions, the availability of ferrous iron is too low to support optimal growth of bacteria (Andrews *et al.* 2003). Bacteria can use ferric reductases to convert the relatively insoluble ferric iron

into highly soluble and more easily transported ferrous iron. All bacteria (except some *Lactobacilli*) contain iron assimilatory pathways, of which ferric reductases are a component (Schroder *et al.* 2003). All bacterial assimilatory ferric reductases are flavin reductases, using either flavin mononucleotide (FMN), flavin adenine nucleotide (FAD) or riboflavin as a cofactor. They use NADH or NADPH as an electron donor to reduce ferric iron to the ferrous form (Schroder *et al.* 2003). The localisation of the ferric reductase in the bacterial cell is linked to the assimilatory function. For the reduction of ferric iron and subsequent uptake, reductases are located on the outer membrane, or even secreted, such as in *Mycobacterium paratuberculosis* (Homuth *et al.* 1998).

Thus, a wide range of bacterial species can reduce extracellular Fe^{3+} to Fe^{2+}, which they can then transport into the cytoplasm (see below). Several pathogenic bacteria (such as *E. coli*, *Salmonella typhimurium*, *Listeria* spp. and *Pseudomonas aeroginosa*), use ferric reductases to liberate Fe^{2+} from chelates such as haemoglobin and lactoferrin, enabling them to scavenge iron from their hosts during infection (Deneer *et al.* 1995; Vartivarian and Cowart 1999) and see review by (Schroder *et al.* 2003).

1.4.3 Siderophores

A commonly utilised bacterial iron acquisition strategy is *via* the secretion and uptake of siderophores. These are low molecular weight iron chelating compounds that bind strongly to Fe(III) (Braun *et al.* 1998). They were first isolated and characterised in 1952 (Neilands), and these molecules were initially called siderochromes, due to their spectroscopic properties when in complex with Fe. The exhibit significant structural diversity, but can be classified into three major groups:

The hydroxamates, these contain N-hydroxamated amide bonds and bind to iron with a hydroxamic acid functional group. This family includes desferrioxamine B, which is used as a drug to treat any iron surplus following a blood transfusion (Fernandes 2012). Hydroxamate siderophores have been shown to be produced by several marine γ-proteobacteria (Armstrong and Van Baalen 1979; Trick 1989).

The catechols which form co-ordinate bonds with iron using catecholate hydroxyl groups. These include the major siderophore of *E. coli*, enterobactin (Pollack and Neilands 1970)

Both types above have been shown to be produced in response to low iron conditions in many bacteria (Lewis *et al*., 1995; Wilhelm *et al*., 1998; Trick, 1989; Reid & Butler, 1991; Haygood *et al*., 1993).

The carboxylates, which are based on the structure of citric acid, and bind to iron with carboxy- or hydroxy-groups. Examples include Rhizobactin, produced by *Rhizobium meliloti* (Smith *et al*. 1985), Staphyloferrin, produced by Staphylococcus (Drechsel *et al.* 1993) and a fungal equivalent, Rhizoferrin (Drechsel *et al.* 1995), which is the main siderophore of the Zygomycetes.

Despite their variation in structure, all siderophores bind to Fe (III) with six co-ordinate bonds with very high stability. The biosynthesis of siderophores involves several enzyme catalysed steps, and usually begins with a non-ribosomal peptide synthetase, from a variety of different non-protein amino acids (Wandersman and Delepelaire 2004). For a review of the structure and biosynthesis of siderophores see Crosa and Walsh (Crosa and Walsh 2002).

1.3.4 Other bacterial sources of iron

ferric citrate

Citrate forms the basis of most hydroxamate-type siderophores, but can also act as an iron chelator. Bacteria secrete citrate, and then use active transport systems to recover the chelated Fe (III)-citrate complex. This transport is mediated by the products of the *fec* genes in *E. coli*. Here, FecA is an outer membrane receptor which binds and internalises citrate, and FecBCDE make an inner membrane complex responsible for the inner membrane transport of the Fe-citrate (Harle *et al.* 1995).

haeme-containing proteins

Haeme uptake is best studied in pathogenic bacteria, but can also be found in bacteria which dwell in the soil, such as *Rhizobium* (Noya *et al.* 1997) and *Bradyrhizobium* (Nienaber *et al.* 2001). Pathogenic bacteria require iron to cause infection, and have a vast amount of Fe available to them in the form of haeme, which they can obtain from host haemoglobin or haemopexin (Tong and Guo

2009). Haeme can be imported in the same way as citrate, via a cognate outer membrane receptor, such as HmbR of *Neisseria* (Stojiljkovic *et al.* 1996) or HasR of *Serratia marcescens (Letoffe et al. 1994)*. The latter produces a haeme-binding hemophore (Cescau *et al.* 2007), which is secreted out of the cell, where it scavenges haeme, and can be taken up by the bacterium using HasR. This has also been demonstrated in *Haemophilus influenza*, which produces a haemophore, HxuA, which leaves the cell, binds haemopexin, and in returned inside the bacterium using an outer membrane receptor HxuC (Cope *et al.* 1995).

transferrin, lactoferrin and ferritin

In addition to haeme, bacterial pathogens can obtain host Fe from transferrin, lactoferrin and ferritin, all host Fe-storage molecules (Cornelissen and Sparling 1994). In *Neisseria*, receptors for the uptake of transferrin and lactoferrin have been identified, and are known to remove Fe at the outer membrane, before transporting it into the cell (Legrain *et al.* 1993; Schryvers and Morris 1988).

1.3.5 Outer membrane receptors

The outer membrane of gram-negative bacteria contains various porins, which allow passive transport of small molecules (<600 Daltons). However, to transport molecules against a concentration gradient, or for molecules >600 Da in size, active transport must take place. In the case of ferric iron uptake an outer membrane receptor binds to a Fe-associated molecule, requiring physical association of the receptor and Fe. Once bound, the Fe-ligand is internalised into the periplasm, through the internal barrel structure of the receptor, using the proton motive force present on the inner membrane. This coupling of proton motive force from the inner to outer membrane requires the action of a protein called TonB (see below). These TonB dependent, outer membrane receptors (TBDR) are well conserved throughout gram negative bacteria, and are responsible for transporting a wide range of substrates – including haem, siderophores, vitamin B_{12} (Noinaj *et al.* 2010) and even some carbohydrates such as sucrose (Schauer *et al.* 2008).

The biosynthesis of TBDR is tightly regulated, to enable a fast response to varied ligand concentrations in the environment (Noinaj *et al.* 2010).

Structurally, all TBDR's are similar, they all possess a 22-stranded β-barrel transmembrane domain, which is closed by a plug domain. The N-terminus of the TBDR has a peptide sequence which has been identified as a point of TonB interaction – the Ton box (see below) (Noinaj *et al.* 2010).

1.3.6 TonB

The proton motive force of the inner membrane in gram-negative bacteria is used to power the active transport of siderophores and other iron complexes through the outer membrane. Here, a multimeric complex consisting of 1-2 copies of TonB, and many copies of two other proteins, ExbB and ExbD, assemble on the inner membrane, but with the C-terminus of TonB extending into the periplasm (see Figure 1.1). Higgs *et al*. (2002) showed that in *E. coli,* the exact proportion of TonB:ExbB:ExbD in each cell was 1:7:2, although this may not be indicative of the actual conformation of the TonB:ExbBD complex. When a TBDT is loaded with its substrate, a signal is tranduced across the membrane, where a conformational change occurs in 5 periplasmic residues of the TBDR – the Ton box. This signal induces the binding by β-sheet pairing of the C-terminus of TonB to the N-terminus of the TBDR, at the site of the Ton box (Noinaj *et al.* 2010). However, the exact mechanism of how energy is transduced into the TBDT is still unresolved.

The TonB of *E. coli* provides energy for all known TBDT expressed in this species, however, some bacteria have multiple copies of TonB, each of which is specific for a subset of their TBDT's (Gresock *et al.* 2011). We have noted, though, that TonB is also extremely poorly conserved across bacterial genera and much still needs to be done on this important protein in non-model bacteria (see Chapter 2).

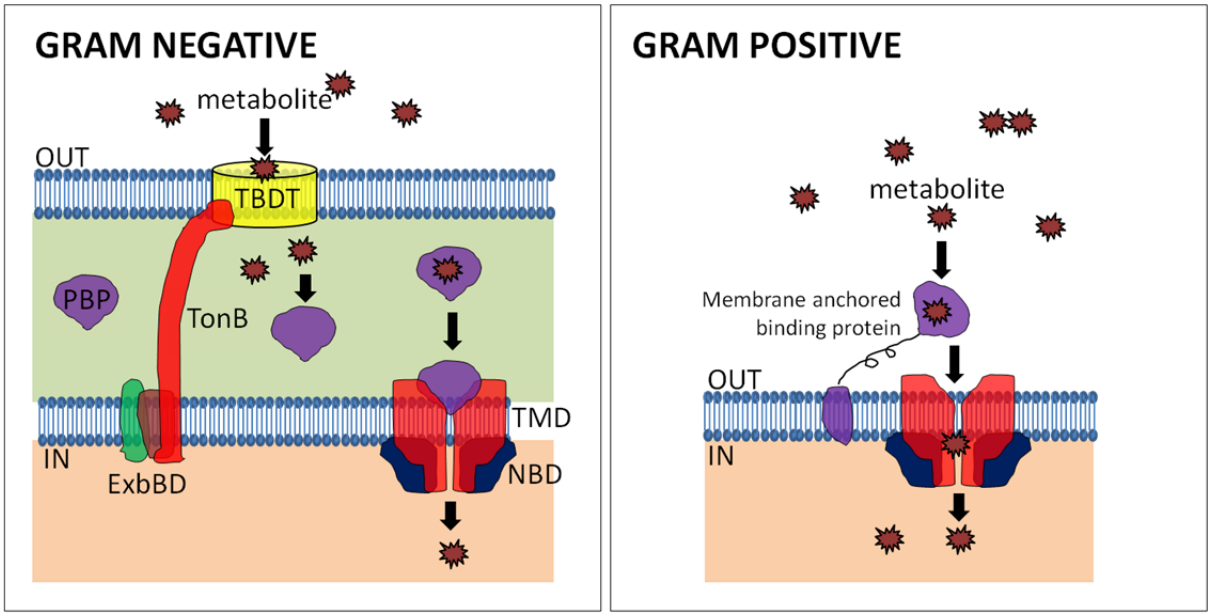
1.3.7 ABC Transporters

Once iron, or iron chelates, are in the periplasm, bacteria use cognate Fe/Fe-complex-binding protein dependent ABC-class transporters to import the iron into the cytoplasm (Köster 2001). Such systems include Fbp (*Neisseria* spp.); Hit (*Haemophilus influenza*); Yfu (*Yersinia* spp.); Afu (*Actinobacillus pleuropneumoniae*); Piu (*Streptococcus pneumoniae*); and Sit (*S. typhimurium*) (Adhikari *et al.* 1996; Adhikari *et al.* 1995; Berish *et al.* 1990; Chin *et al.* 1996; Rakin and Heesemann 1995; Tai *et al.* 2003; Zhou *et al.* 1999). The *Salmonella* iron transporter SitABCD has since been

shown to have a far higher affinity for manganese and is likely the inner membrane transporter for this metal (Kehres *et al.* 2002).

During inner membrane transport, a specific periplasmic binding protein binds to either free ferrous Fe, or to the Fe-ligand complex, and delivers them to a cognate ABC-class transporter. Here, the ligand is transported through a dimer of transmembrane permease proteins (sometimes comprising a single "intra-molecular" dimer), powered by the hydrolysis of ATP via a specific nucleotide binding protein – see figure 1.2.

Figure 1.2 Mechanism of iron transport in bacteria



Fe, (star) is transported into a Gram-negative bacterial cell via a TonB-dependent outer membrane transporter (TBDT), powered by the proton motive force of the inner membrane, which is coupled to the TBDT by TonB and ExbBD. Once in the periplasm, the method of iron import into the cytoplasm is similar in both Gram negative and Gram-positive bacteria. Here, a cognate binding protein binds to iron (PBP), and delivers it to a permease – (a transmembrane domain protein – TMD). This internalises the iron using the energy from ATP hydrolysis via a nucleotide-binding domain protein – NBD. The entire inner membrane transport complex is known as an ABC class transporter.

In *E. coli*, the transport of Fe-siderophore complexes through the cytoplasmic membrane is performed by three different ABC-class transporters, namely Fhu, Fec and Fep, with each system comprising its cognate periplasmic binding protein, trans-membrane transporter and ATPase, and

each system having specificity to the cognate class of siderophore/Fe-ligand. The genes *fhuDCB* encode an ABC-class transporter which has specificity for aerobactin and ferrichrome uptake; The Fep transporter encoded by *fepBDGC* is specific for enterobactin (there are two genes which make up the peremease domain of this transporter) and the Fec transporter, encoded by *fecBCDE* has specificity for ferric citrate uptake.

There are examples of ABC class transporters which are capable of TonB-independent iron uptake, iron deficient growth of an *E. coli* $TonB^-$ $EntF^-$ strain (ARM100) was enhanced when the cloned *Vibrio fbpABC* genes were introduced (Wyckoff *et al.* 2006). This is especially interesting given that another FbpA homologue in *Neisseria shayeganii* 871 is possibly extracellular, meaning some bacteria may have the capacity to import iron through both membranes without the need for TonB – indeed this is the case for the Feo system.

1.3.8 Marine siderophores

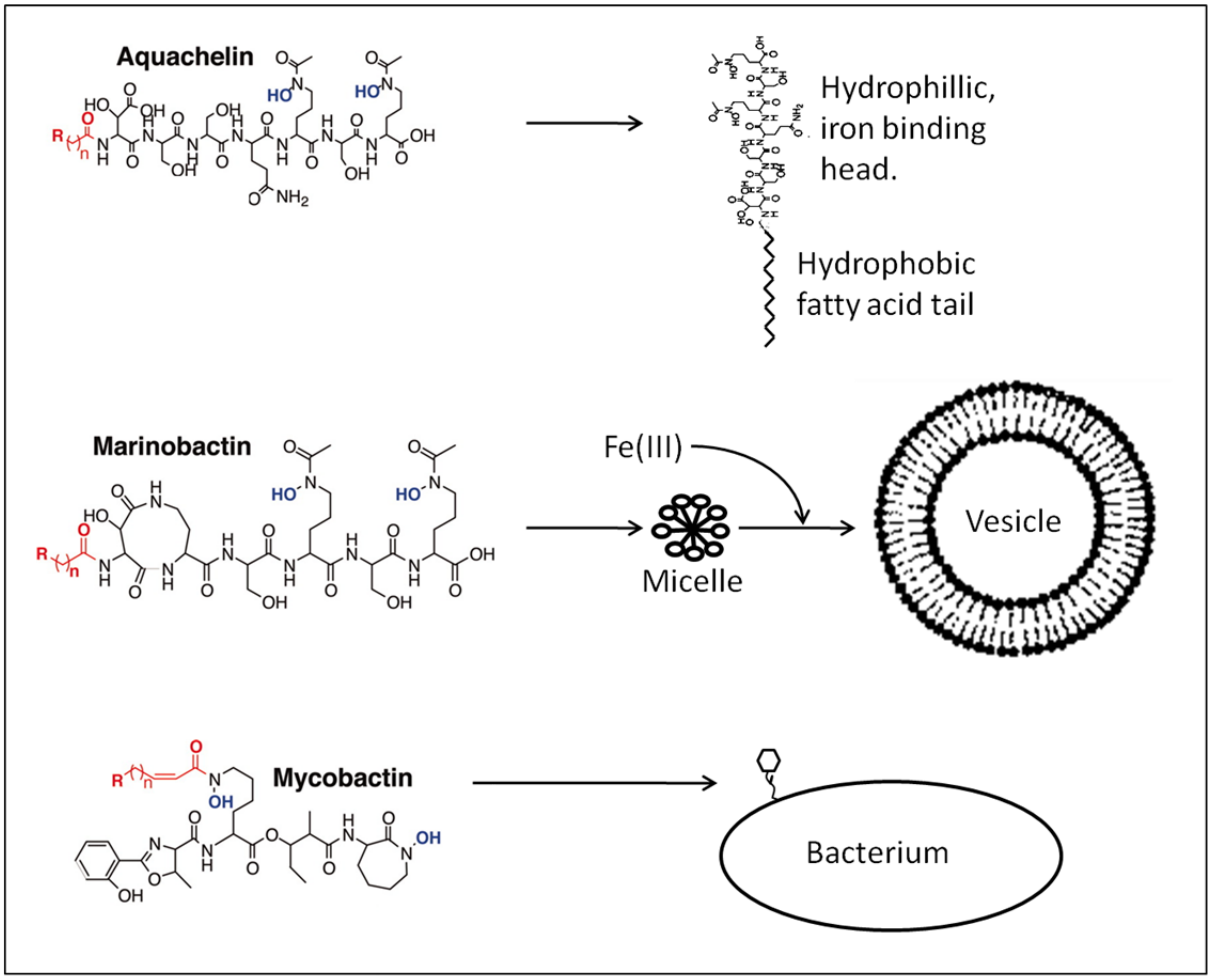
The production and uptake of siderophores has been described in some heterotrophic marine bacteria, such as *Alteromonas luteoviolacea*, *Halomonas aquamarina* and *Marinobacter* sp. strains (Granger and Price 1999; Hopkinson and Morel 2009; Martinez *et al.* 2000; Reid *et al.* 1993); the lab of Alison Butler has been instrumental in furthering our understanding of siderophore production in the marine environment.

Siderophore production in the turbulent environment of the ocean is an expensive strategy for bacteria (Hutchins *et al.* 1991) and especially for smaller cells, as modelled by Völker and Wolf-Gladrow (1999). However, siderophore production increases under iron limitation (Buck and Bruland 2007); the concentration of a specific ferroxamine siderophore was found to correlate exactly with increasing bacterial abundance (Mawji *et al.* 2008), showing that bacteria do choose to use this seemingly wasteful strategy.

Interestingly, many marine siderophores are amphiphillic (Butler and Theisen 2010), containing an Fe^{3+}-binding head group attached to a series of fatty acids. These include the aquachelins (Martinez *et al.* 2000), the loihichelins from the γ-proteobacteria *Halomonas* (Homann *et al.* 2009) and marinobactins from Marinobacter (Martinez *et al.* 2000), synechobactins from the cyanobacteria *Synechococcus* (Ito and Butler 2005) and ochrobactin from the rhizobiales species - *Ochrobactrum* (Martin *et al.* 2006). Intriguingly, Marinobactins can form micelles, which become compacted when bound to Fe (III). Both marinobactins and aquachelins are structurally similar to mycobactin and

exochelin siderophores produced by terrestrial mycobacteria; all have a fatty acid tail, although in the mycobacteria, these remain associated with the bacterial membrane, serving as an anchor (Martinez *et al.* 2000) – refer to Figure 1.3.

Figure 1.3 The structure and properties of three marine siderophores.



Aquachelin and marinobactin have long fatty acid tail moieties, which in the latter, can form micelles. These can aggregate in the presence of iron, to form vesicles containing large amounts of iron. Of similar structure, mycobactin contains a lipid membrane-bound fatty acid tail (shown in red) which anchors it to the cell surface. Adapted from (Martinez* et al. *2000).

Remarkably, multiple Fe(III)-marinobactin complexes can aggregate into multimellular vesicles, enhanced through addition of Zn(II), Cd(II), or La(III) to Fe(III) (Butler 2005). Whether these chemical properties occur in the oceanic bacterial communities is unknown, but the phenomenon of concentrating siderophores into discrete bundles of metals for passing bacteria is intriguing.

Many marine siderophores contain a photoreactive α-hydroxy-carboxylic acid when bound to Fe(III), so that near-UV light can cause the release of CO_2 and the reduction of Fe(III) to Fe(II) (Butler and Theisen 2010), thus contributing to iron cycling in the euphotic zone (Martin *et al.* 2006).

As far as is known, it is uncommon for marine cyanobacteria to produce siderophores, and there have been no reported examples of siderophores made by eukaryotic phytoplankton (Hopkinson and Morel 2009). Siderophore uptake in gram negative bacteria has evolved to require an analogue of the TonB protein (Faraldo-Gomez and Sansom 2003), but many offshore marine cyanobacteria lack this polypeptide (Palenik *et al.* 2003; Palenik *et al.* 2006; Webb *et al.* 2001), as does the subject of this work, *Ruegeria pomeroyi* (see chapter 2). Even though these bacteria are predicted to lack the ability to transport iron-siderophore complexes, they may still acquire iron from siderophores – possibly by reducing the bound Fe(III) to Fe(II) on the cell surface as is the case in *Trichodesmium erythraeum* (Hopkinson and Morel 2009) – or these species may use a TonB independent system for siderophore uptake.

1.4 Iron storage

Bacteria cannot survive with high levels of 'free' intracellular iron, and so have evolved methods of iron storage, thus preventing iron from participating in toxic reactions. These are detailed below.

1.4.1 Ferritins

One such class of storage molecule are ferritins, which are called bacterioferritins if they contain haeme *B* (Andrews 1998; Carrondo 2003). Ferritins are multimeric cage-like structures usually comprising 12 or 24 individual subunits (Arosio *et al.* 2009), which can store up to 4500 Fe ions within a central cavity (Carrondo 2003). Ferritins can supply the cell with iron when uptake is insufficient, and can also help to buffer against oxidative damage by sequestering iron (Carrondo 2003).

In *E. coli,* a strain which contains a bacterial ferritin FtnA was shown to grow better in iron limited conditions that a strain which lacked FtnA (Abdul-Tehrani *et al.* 1999). Although, it has also been reported that many ferritin deletion mutations have no growth phenotype (Arosio *et al.* 2009).

The controlled release of Fe from the cental core of ferritins is poorly understood, but is likely to involve both reduction, and chelation of the Fe (III) contained within the ferritin. In *E. coli* bacterioferritin haeme functions as a redox centre during the release of iron (Yasmin *et al.* 2011).

1.4.2 Fe-S

Iron sulphur clusters - [Fe-S] are one of the most common protein prosthetic groups in polypeptides and serve many functions (Beinert 2000). They consist of multinuclear Fe and sulphur atoms, and are variously capable of catalysing electron transfer, enzymatic activity, proton transfer, and are also used as a sulphur donor and as a regulatory sensor for iron availability (Beinert 2000). Since both free Fe and S are toxic, the biosynthesis of [Fe-S] is carefully coordinated *in vivo* (Ayala-Castro *et al.* 2008). The biosynthesis of [Fe-S] occurs via the Suf pathway, or the Isc pathway in *E. coli*.

Here, a sulphur source (cysteine) is used to generate sulphur by a desulphurase enzyme, which cleaves cysteine to form alanine. This sulphur is delivered to the scaffold proteins (either IscA and IscU, or SufA and SufB). Next, Fe is generated from an iron source, bought to the scaffold by a chaperone protein, and both Fe and S are coordinated in the scaffold complex. This generates an [Fe-S] cluster, most commonly either [2Fe-2S] or [4Fe-4S], ready to be integrated into the apo form of an enzyme (Fontecave and Ollagnier-de-Choudens 2008; Peters and Broderick 2012).

Regulation of the [Fe-S] synthesis operon *suf* and *isc* in *E. coli* is well characterised, and has been shown to be mediated by the Rrf2 family transcriptional regulator IscR, which is in the same operon as the structural [Fe-S] biosynthesis genes; IscR binds to [2Fe-2S] and can repress the *iscRSUA* operon. This causes a negative feedback loop where *iscR* is repressed by IscR, thus limiting further repression (Ayala-Castro *et al.* 2008). However, it has been shown that apo-IscR can *induce* the *suf* [Fe-S] biosynthetic genes in response to oxidative stress. Thus, *E. coli* uses both [Fe-S] operons under different conditions; *isc* is for homeostasis of a nominal level of [Fe-S], whereas the *suf* operon is used in response to oxidative stress. Furthermore, in *E. coli*, both the *isc* and *suf* operons are

controlled by the global iron regulator Fur in response to cellular iron levels. The *suf* promoter is a binding site for Fur, so the *suf* operon is repressed in high iron conditions.

1.5 Manganese uptake

Studies on Mn import in a range of different terrestrial bacteria have revealed two, widely used, but very different transporters, termed MntH and SitABCD, with some bacteria (e.g. *Salmonella*) harbouring both systems (Boyer *et al.* 2002).

1.5.1 MntH

The Nramp family (Natural resistance-associated macrophage proteins) of transporters transports metals, with particular affinity for Fe and Mn, in many eukaryotic species. MntH-like proteins exist in bacteria, where they are termed MntH (Makui *et al.* 2000). In gram-negative bacteria, MntH homologues are responsible for high affinity Mn uptake through the inner membrane, but can also transport iron with lower efficiancy (Kehres *et al.* 2000; Makui *et al.* 2000). In the α-proteobacteria *Bradyrhizobium japonicum*, a homologue of MntH was shown to be required for Mn^{2+} uptake, and is essential for growth in Mn-limited conditions (Hohle and O'Brian 2009). The gene encoding MntH was shown to be regulated by Mn via the Mur transcriptional regulator (see below). In contrast, MntH from *Bacillus subtilis* is also required for growth in Mn limited media (Que and Helmann 2002) and is regulated by Mn availability, but via a different transcriptional regulator – MntR (see below).

1.5.2 SitABCD

SitABCD is an ABC-transporter type system (see above), initially thought to be involved in iron uptake - hence its somewhat misleading acronym of *Salmonella* iron transporter (Zhou *et al.,* 1999). Expression of *sit* genes is strongly repressed by Mn in the α-proteobacteria *Sinorhizobium meliloti* (Platero *et al.* 2004), and *Rhizobium leguminosarum (*Diaz-Mireles *et al*. 2004) but by both Fe and Mn in the γ-proteobacteria *Shigella flexerii* (Runyen-Janecky *et al.* 2006) and *E. coli* (Sabri *et al.* 2006). In

the α-proteobacteria, this Mn-dependant regulation is mediated by a Fur homologue – Mur (see below).

1.5.3 MnoP

Hohle *et al.* (2011) recently described a novel outer membrane ion channel, MnoP, which facilitates Mn^{2+} transport across the outer membrane of *Bradyrhizobium japonicum*. Here, they showed that growth of an MnoP mutant strain required the addition of extra Mn^{2+} to the medium, although the mutant was not as severely compromised for growth in low levels of Mn as was an $MntH^{-}$ mutant.

1.6 Iron and manganese –responsive regulatory systems

The importance of regulating iron uptake is paramount for bacteria; too little and the cells are starved of an essential metal, too much and they run the risk of oxidative and/or free radical damage. Here I will describe several examples of transcriptional regulators which mediate this balance.

1.6.1 Fur

The paradigm system of iron-responsive regulation in many bacteria is that of the Ferric uptake regulator (Fur), which has been characterised in many bacterial phyla, including the γ- and β-proteobacteria, bacilli and cyanobacteria, actinomycetes (Alahari *et al.* 2006; Delany *et al.* 2001; Fuangthong and Helmann 2003; Grifantini *et al.* 2003; Hantke 2001; Hernandez *et al.* 2004; Parker *et al.* 2005; Quatrini *et al.* 2005; Rodionov *et al.* 2006; Wan *et al.* 2004; Zhou *et al.* 2006).

Fur exists *in vivo* as a dimer, with each monomer binding to one Zn^{2+} and one regulatory Fe^{2+} ion (Cornelis and Andrews 2010). Once bound to Fe, Fur will recognise and bind to a well conserved DNA sequence– the Fur box (Escolar *et al.* 1999). Fe(II)-Fur dimers bind to a conserved 19bp sequence consisting of 3 identical and adjacent 6 bp regions. It is thought that 2 Fe(II)-Fur dimers bind to each Fur box in a 'tandem head-to-tail fashion' (Cornelis *et al.* 2009; Oeffelen *et al.* 2008; Pohl *et al.* 2003).

Fur boxes are usually found overlapping the promoter sequences of a gene, so when Fur is present, it blocks RNA polymerase therefore repressing expression of that gene (Cornelis *et al.* 2009).

The primary role of Fur is therefore that of an iron-responsive transcriptional repressor. The list of genes found to be Fur-repressed is usually large in any given bacterial strain and so Fur is known as the global iron-uptake regulator in these species. The genes found to be Fur-repressed usually include siderophore biosynthesis and Fe-uptake systems, acid and oxidative stress responses, energy metabolism and virulence, all of which are therefore activated in low iron conditions (Bijlsma *et al.* 2002; Cornelis and Andrews 2010; Hassett *et al.* 1996; Ochsner and Vasil 1996).

Fur can also act indirectly, by repressing secondary regulators. These include sigma factors, two component sensors, AraC-type regulators and small regulatory RNA molecules (Cornelis and Andrews 2010), and so Fur can act as an indirect activator of iron-responsive genes.

In *E.coli*, several genes were found to be positively regulated by Fur, including those encoding bacteroferritin and SodB (Andrews *et al.* 2003). These genes are post-transcriptionally regulated by a small RNA called RyhB, which is Fur repressed (Cornelis and Andrews 2010; Masse and Gottesman 2002). RyhB is a 90 nucleotide RNA, which can bind to complementary sequences in mRNA targets, this binding requires Hfq. RyhB has been shown to act both positively and negatively on the regulation of target genes, either by causing RNAse E mediated degradation, or stabilisation of the transcript (Masse and Gottesman 2002).

There are other known examples of metal responsive Fur-superfamily regulators: Zinc – Zur (Patzer and Hantke 1998);Mn – Mur (see below), Nickel – Nur (Ahn *et al.* 2006), peroxidase - PerR, and Fe again by Irr (see below), showing that this protein family has a key role in metal metabolism across many genera of bacteria.

1.6.2 DtxR

Some members of the DtxR-like (Diphtheria toxin repressor) proteins have been shown to be global iron-responsive regulators, acting much like Fur in *E. coli*, but do not have any sequence similarity. These include DtxR of *Corynebacterium*, and IdeR of *Mycobacterium tuberculosis*. DtxR of *Corynebacterium diphtheria* has been shown to regulate the expression of the diphtheria toxin, but also biosynthesis and export of siderophores, iron uptake, and haem utilisation genes (Brune et al.

2006). Similarly, IdeR was found to regulate genes involved in siderophore biosynthesis and iron storage (Rodriguez *et al.* 2002).

1.7 Iron and manganese gene regulation in the α-proteobacteria

Recently, the α-proteobacteria have been shown to be dramatically different in their Fe homeostasis, compared to the canonical systems that have been described for *E. coli*, and other taxa. These differences are introduced below.

1.7.1 Fur

There are homologues of Fur found throughout the α-proteobacteria, however, it has become apparent that *Rhizobium*, *Sinorhizobium* and *Bradyrhizobium* Fur homologues are responsible for regulation of manganese uptake (Chao *et al.* 2004; Diaz-Mireles *et al.* 2004; Diaz-Mireles *et al.* 2005; Hohle and O'Brian 2009), even though these proteins are capable of binding to Fur boxes, and complimenting Fur mutants in *E. coli* (Wexler *et al.* 2003).

These so-called Mur regulators are introduced below.

In the Rhizobiales, the role of Fur is performed by two other regulators, the Fur-family protein Irr (Iron response regulator) and the Rrf2 family protein RirA (Rhizobial iron regulator).

1.7.2 Irr

Irr was originally identified as the repressor of haeme biosynthesis gene *hemB* during iron limitation in *B. japonicum* (Hamza *et al.* 1998). Since its discovery, Irr has been studied in other α-proteobacteria, firstly in Rhizobium (Singleton *et al.* 2010; Todd *et al.* 2005; Todd *et al.* 2006; White *et al.* 2011). In *Rhizobium*, Irr binds to Fe (III)-haeme at two sites. This causes an allosteric shift in the protein which prevents it binding to DNA. Irr binds to specific sequences upstream of genes, called ICE boxes - Iron Control Element (Singleton *et al.* 2010). The deduced regulon of Irr in *Rhizobium*

includes the membrane-bound ferritin gene *mbfA*, the haeme biosynthesis gene *hemA*, and the [Fe-S] biosynthesis *suf* genes (Todd *et al.* 2006).

Secondly, Irr of *Agrobacterium* has been shown to repress Fe utilisation genes in low Fe conditions, via binding to ICE boxes and repressing the upstream genes (Hibbing and Fuqua 2011). This Irr protein also binds to two haeme molecules (Yang *et al.* 2005), thus sensing the intracellular concentration of haeme to determine iron availability.

Thirdly, Irr in *Brucella abortis* has also been shown to bind to haeme, and to regulate haeme uptake (Anderson *et al.* 2011; Martinez *et al.* 2005). However, this Irr protein appears to be unstable, and degrades in the presence of haeme, therefore alleviating repression of its target genes (Martinez *et al.* 2005).

Finally, Irr *of B. japonicum* has also been shown to be degraded when interacting with haeme (Qi and O'Brian 2002; Yang *et al.* 2005). This protein recognises ICE boxes, and represses haeme biosynthesis and iron storage genes under iron sufficient conditions (Rudolph *et al.* 2006). In addition, this Irr protein has been shown to positively regulate siderophore biosynthesis in *B. japonicum*, under iron depleted conditions (Small *et al.* 2009).

Irr appears to be a signature regulator of the α-proteobacteria, with ICE box motifs found in the genomes of many different genera (Rodionov *et al.* 2006). However, another iron responsive regulator is found within the Rhizobiales – RirA.

1.7.3 RirA

In a complex complementary set-up, Rhizobium has a copy of an Rrf2 family protein – RirA (Todd *et al.* 2002). This essentially has the function of Fur, but is absolutely not related in sequence. RirA is a transcriptional repressor of iron uptake genes in *Rhizobium* and *Sinorhizobium* (Chao *et al.* 2005; Todd *et al.* 2002). The RirA protein binds to [Fe-S] clusters and so can sense the availability of iron (Johnston *et al.* 2007). The extent of the RirA regulon in these bacteria has been shown by transcriptomic (Chao *et al.* 2005) and proteomic analyses (Todd *et al.* 2005). These revealed that, in high Fe conditions, RirA represses many genes, including those involved in [Fe-S] biosynthesis (*suf*), and siderophore and haem uptake.

The DNA sequence which is recognised by RirA was termed the IRO (Iron Responsive Operator) box (Yeoman *et al.* 2004). This is very different from the Fur box described earlier, and is shown in more detail in chapter 3.

Bioinformatic analysis of potential IRO boxes found upstream of genes revealed that there are likely many RirA regulated genes found in strains of *Agrobacterium, Brucella*, *Bartonella, Mesorhizobium*, *Rhizobium* and *Sinorhizobium*. However, the range of bacteria is limited since there were no IRO box homologues found in *Bradyrhizobium* (Johnston *et al.* 2007; Rodionov *et al.* 2006) – and indeed this strain lacks a copy of RirA (Rodionov *et al.* 2006).

Together, Irr and RirA act to regulate homeostasis of Fe uptake, and usage. Irr is active under low Fe conditions, whereas RirA is active under high Fe conditions. Together, these iron-responsive repressors can respond to the level of iron in a highly controlled and sensitive fashion.

1.7.4 IscR

The regulation of [Fe-S] biosynthesis (see above) in bacteria has been shown to be mediated by IscR, an Rrf-2 family transcriptional regulator (Schwartz *et al.* 2001). IscR has been shown to be an [Fe-S] containing protein, which, when in complex with this co-factor, can bind to target sequences. Homologues of IscR are found throughout the eubacteria, and form part of the [Fe-S] biosynthetic *suf* operon in the Rhodobacterales, Rhodospirillales, Sphingomonadales, Rickettsiales, and Caulobacterales (Rodionov *et al.* 2006). However, despite there being *suf* homologues in the Rhizobiales, these genes are regulated by Irr and RirA (Rodionov *et al.* 2006; Todd *et al.* 2005) and not by IscR.

1.7.5 Mur

The regulation of iron uptake and utilisation in the α-proteobacteria is vastly different from that of *E. coli* – Fur has become a manganese responsive regulator and is termed Mur.

The Mur of *Rhizobium* and *Sinorhizobium* regulates the expression of SitABCD, a Mn^{2+} specific transporter (Chao *et al.* 2004; Diaz-Mireles *et al.* 2004; Diaz-Mireles *et al.* 2005), and is not involved

in the regulation of iron uptake. The promoter of *sitABCD* contains a binding sequence for Mur – The MRS box (Mur Recognition Sequence) (Diaz-Mireles *et al.* 2005). Homologous sequences to the MRS box are found upstream of another gene in *Rhizobium* – the manganese transporter MntH (see below). Furthermore, MRS motifs are found in the promoter regions of *sitABCD/mntH* in many other members of the Rhizobiaceae and Rhodobacterales. The prevalence of Mur, and MRS boxes has been predicted by Rodionov *et al.* (2006), and shows that Mn-responsive regulation via Mur likely extends further, to the Roseobacters, a taxonomically distinct group of marine α-proteobacteria.

Finally, *Bradyrhizobium* sp. BTAi1 has a copy of both Mur, and another class of Mn-responsive regulators – MntR (see below) (Rodionov *et al.* 2006).

1.7.6 MntR

A member of the DtxR family of transcriptional regulators, MntR was found to regulate Mn uptake in response to Mn availability. In *Bacillus subtilis*, MntR is a Mn^{2+} dependent repressor of *mntH*, and therefore Mn uptake via this transporter (Que and Helmann 2002). Furthermore, repression of both SitABCD and MntH in the enterobacteria is mediated by MntR in response to high Mn levels (Kehres *et al.* 2002; Patzer and Hantke 2001). Contrastingly, MntR can also act as a positive regulator of the expression of MntABCD under Mn limitation (Sabri *et al.* 2006).

In the α-proteobacteria, there are few homologues of MntR, but there are several interesting exceptions.

Both *Rhodobacter capsulatus* and *Mesorhizobium loti* lack Mur, and instead have a homologue of MntR, unlike the other sequences strains within those genera (Rodionov *et al.* 2006). Here, the copies of MntR are found next to a copy of MntH – and the bioinformatic searches performed in Rodionov *et al.*, (2006) have shown the presence of MntR boxes, homologous to those found in the enterobacteria, upstream of MntH in these strains.

1.8 Marine metagenomics

1.8.1 The GOS dataset

The recent metagenomic studies produced by the Venter institute's GOS (Global Ocean Sampling) expeditions and others have produced a staggering amount of data on microbial diversity, gene frequency and indeed species and gene discovery in the marine environment (Rusch *et al.* 2007; Venter *et al.* 2004; Yooseph *et al.* 2007). The Venter institute has created a compendium of sequence data, species identification and protein families called CAMERA (Community Cyberinfrastructure for Advanced Marine Microbial Ecology Research and Analysis) (available online at: http://camera.calit2.net/), which prove extremely useful in producing data about the abundance, and diversity of marine iron transport systems. These data are easily searchable using a nucleotide, or peptide query, and the resultant homologous genes/proteins returned are accompanied by data about the sampling site location, depth, temperature and other features. This really is an amazing resource to have when studying marine bacterial genetics.

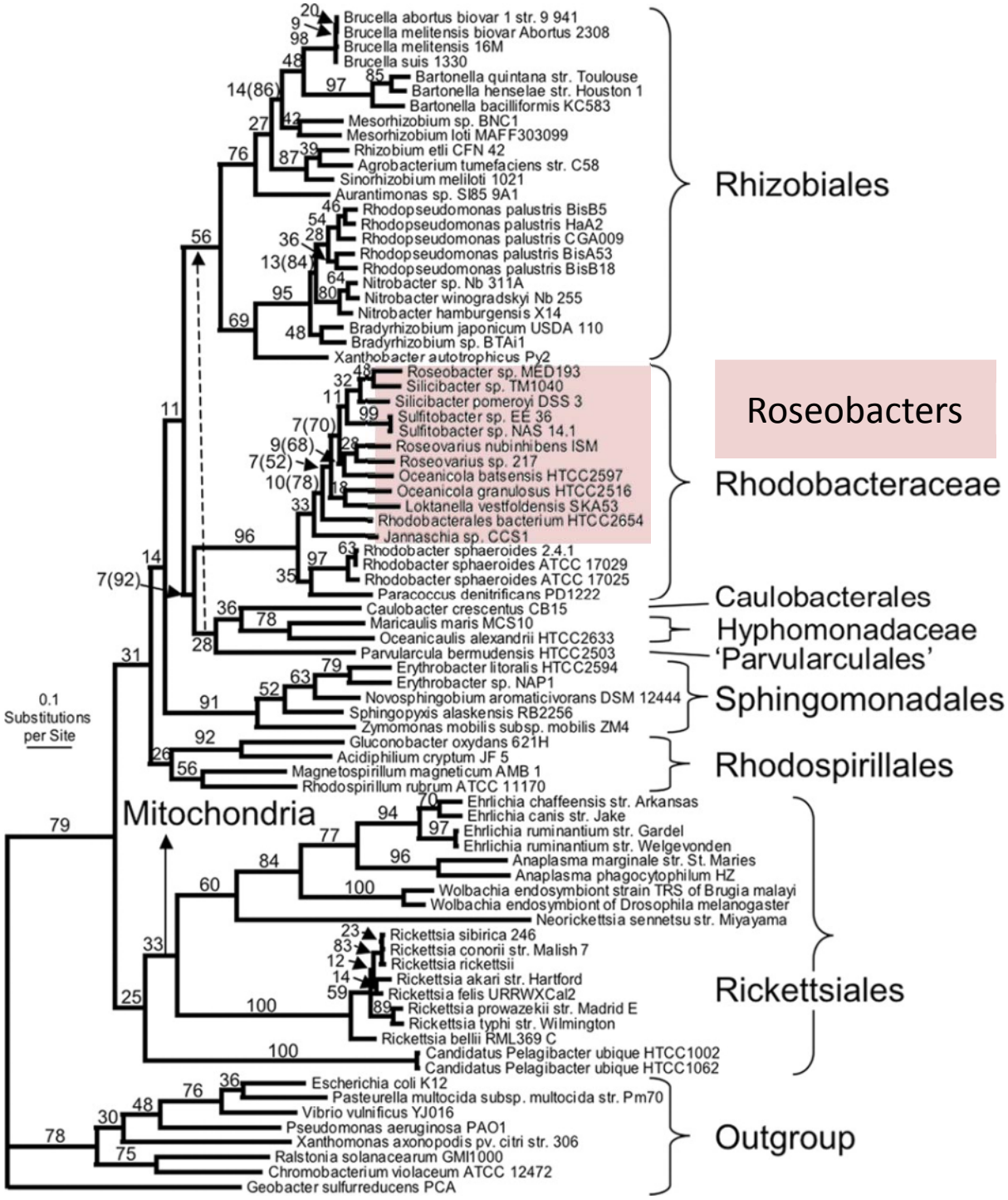
1.9 The model Roseobacters

1.9.1 The Roseobacter Clade

A subset of the α-proteobacterial Rhodobacteriaceae (refer to figure 1.4) were found to be abundant in the coastal waters of south-eastern USA (Gonzalez and Moran 1997); up to 28% of all isolated 16S ribosomal DNA sequences were identified as belonging to this group, consequently named the **Roseobacter**s (Gonzalez *et al.* 1999).

The genomes of many of the Roseobacters have been fully sequenced (available at http://www.roseobase.org/), and many are easily culturable (Gonzalez *et al.* 1999; Gonzalez *et al.* 2000), making this group amenable to *in vivo* and *in silico* research. The Roseobacters are therefore a model group of marine α-proteobacteria for the study of marine iron and manganese uptake and regulation.

Figure 1.4 Tree of selected members of the α-proteobacteria, to show the taxanomic distribution of the Roseobacters [adapted from (Williams et al. 2007)].



Phylogenetic tree adapted from Williams* et al.*, (2007) showing the taxonomic relationship of selected Rosoeobacters to a selection of the α-proteobacteria.

1.9.2 The Ruegeria and Silicibacter Genera

Members of the *Ruegeria* genus was originally classified as *Agrobacterium*, but 16S DNA sequence analysis, chemotaxonomic, morphological, and physiological studies suggested that these marine species were significantly different and were reassigned (Uchino *et al.* 1998). The phylogeny of the *Ruegeria* genus is shown below:

Bacteria→ Proteobacteria→ Alphaproteobacteria→ Rhodobacterales→ Rhodobacteraceae→*Ruegeria*

The main focus of this study, *Ruegeria pomeroyi* was isolated in 2003 (Gonzalez *et al.*) from seawater collected off the coast of Georgia. Originally termed *Silicibacter pomeroyi* it was the first member of the Roseobacters to have its genome sequenced (Moran *et al.* 2004), prior to its allocation to the genus *Ruegeria,* in 2007 (Yi *et al.*). Since then it has become something of a model for the genetic and genomic studies of the Roseobacters, with much of this work having been done in the Moran lab at the University of Georgia and here in Norwich. Indeed, several for the tools that were to be used for the planned work on the metallo-ome of this strain were already in place at UEA.

The closely related *Silicibacter* genus (refer to figure 1.4) includes *Silicibacter* sp. TM1040, 96% identity in 16S rDNA sequence to *R. pomeroyi* (Moran *et al.* 2007). Isolated from the dinoflagellate *Pfiesteria piscicida*, cultures of *P. piscicida* require *Silicibacter* sp.TM1040 to survive (Alavi *et al.* 2001; Miller and Belas 2004).

Despite their natural abundance in the oceans, the metal acquisition systems of the Roseobacters and SAR11 are yet to be investigated using functional genetic techniques. The deduced proteome of *Ruegeria pomeroyi* reveals has no identifiable iron transport systems other than *fbpAB* and there are no TonB homologues or any recognisable siderophore biosynthetic pathways (Rodionov *et al.* 2006).The following work sets out to identify how *R. pomeroyi* acquires Fe and Mn, and how the homeostasis of these metals is regulated.

1.10 Thesis aims

- To conduct a full study of potential iron and manganese uptake and regulatory genes in the Roseobacters using homology based searches.
- To study the predicted iron and manganese regulated genes in the Roseobacter *Ruegeria pomeroyi*.
- To elucidate the regulatory networks controlling iron and manganese uptake in *R. pomeroyi*.
- To analyse the transcriptional response to both iron and manganese limitation in *R. pomeroyi*.

Chapter 2 - Iron Uptake in the Roseobacters – A Bioinformatic Approach

2.0 Introduction

There has been remarkably little direct study of iron uptake genes in marine bacteria, with two, very recent, exceptions being on *Pelagibacter ubique* (Smith *et al*. 2010) and *Rhodobacter sphaeroides* (Peuser *et al.* 2011). A small scale bioinformatically-based study was performed by Hopkinson and Barbeau (2012) on the diversity of bacterial iron uptake genes in the oceans.

The work of Rodionov *et al*. (2006) provided a useful background to the work set out in this chapter, which uses bioinformatic approaches to infer some information on iron homeostasis in the Roseobacter clade of marine bacteria, Rodionov *et* al identified a range of *cis*-acting DNA regulatory motifs upstream of genes involved in iron homeostasis in the alpha-proteobacteria, including several examples of the Roseobacters. That paper also helped to expand the range of genes shown to be involved in iron homeostasis through *in silico* identification of the iron-responsive regulon of many alpha-proteobacteria.

2.1.1 Comparative genomics - bioinformatic analysis of iron uptake systems in the Roseobacters

The genes/polypeptides that were examined were in the following general classes:

Regulatory: including, Irr (iron-response regulator), Fur (Ferric uptake regulator) and RirA (Rhizobial iron regulator).

Receptors for siderophores, haem and haem-containing molecules, citrate and vitamin B_{12}.

Siderophore biosynthetic genes, including those for enterobactin (Ent), vicibactin (Vbs), aerobactin (Iuc), rhodochellin (Rhc) and vibriobactin (Vib).

TonB and ExbBD - energy-transducing proteins.

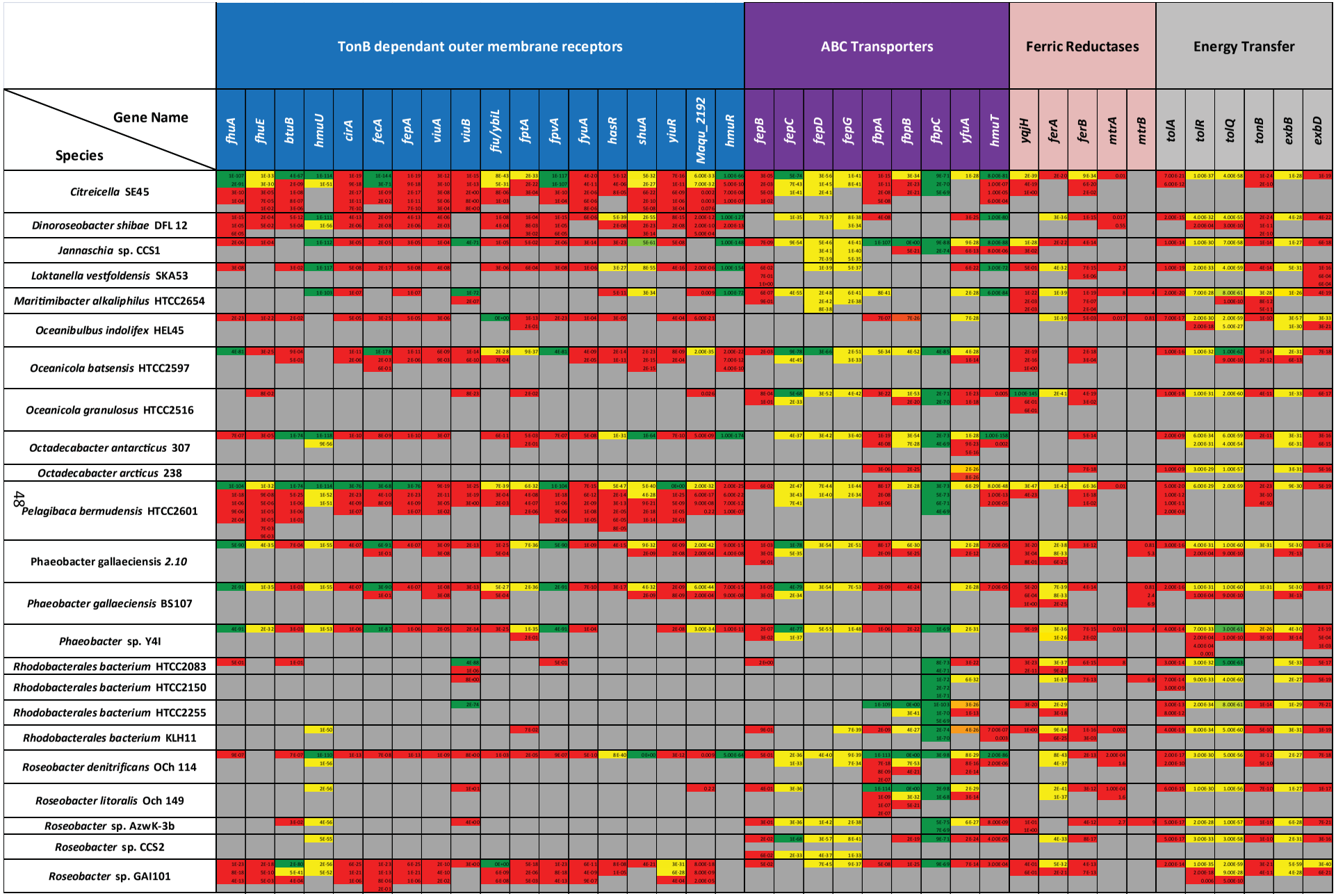
Ferrous uptake (Feo) and ferric reductase (Mtr and Fer) polypeptides.

Others, which include the ‘iron regulated protein’ IrpA.

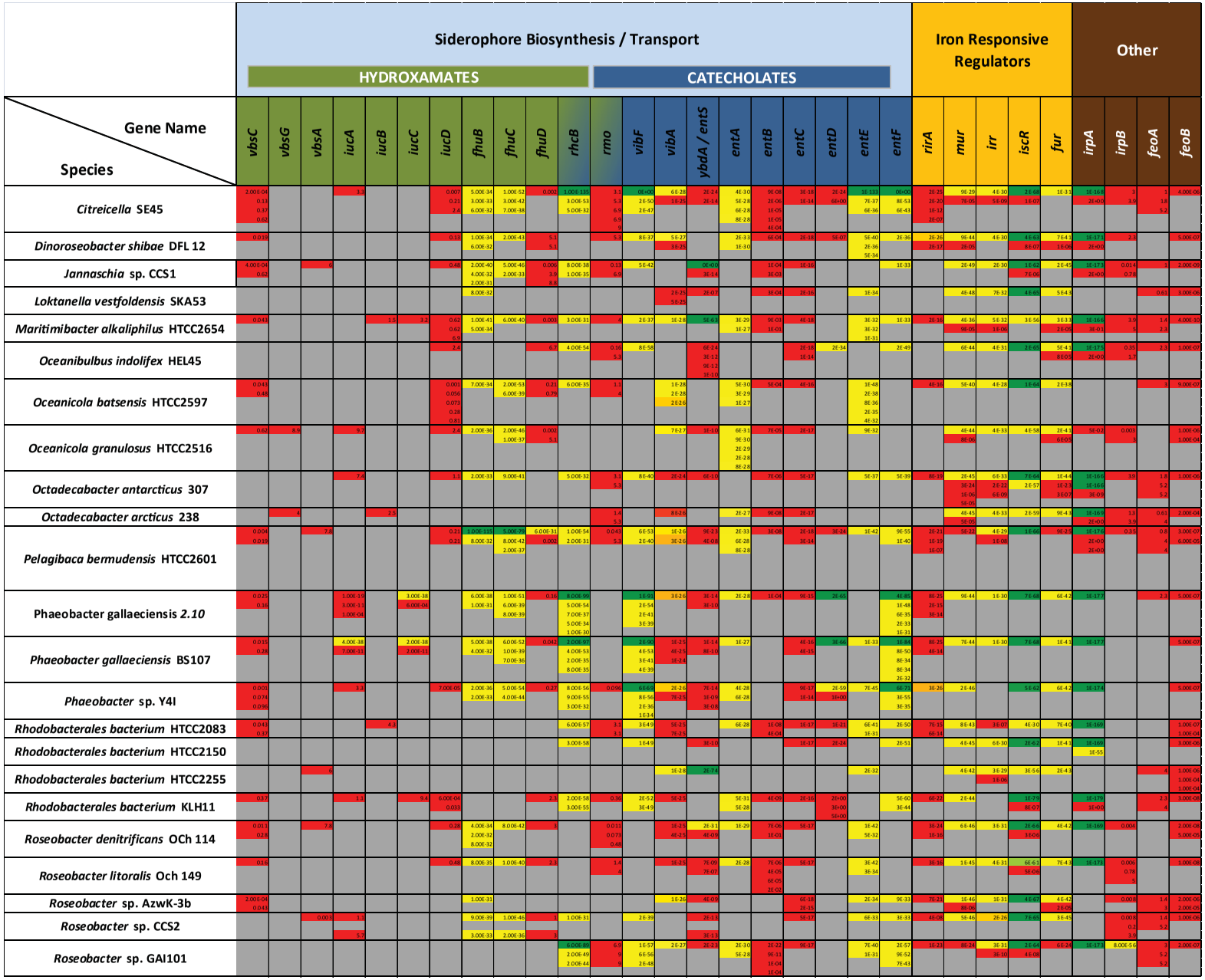
These are presented and described in more detail, below. Note that a similar survey was presented by Hopkinson and Barbeau (2012) but with much less scope and detail as far as the Roseobacters are concerned.

Table 2.1. Bioinformatic study of iron uptake genes in the Roseobacters

The protein-coding sequences of each gene listed were used to interrogate the Roseobase BLAST database for each of the organisms shown in the table. The resultant 'E-value' output was used to populate the table, and colour-coded according to the level of homology: red for "poor", yellow for "moderate", and green for "good".


TonB dependant outer membrane receptors
ABC Transporters
Ferric Reductases
Energy Transfer
Gene Name
Species
fhuA
fhuE
btuB
hmuU
cirA
fecA
fepA
viuA
viuB
fiu/ybiL
fptA
fpvA
fyuA
hasR
shuA
yiuR
Maqu_2192
hmuR
fepB
fepC
fepD
fepG
fbpA
fbpB
fbpC
yfuA
hmuT
yqjH
ferA
ferB
mtrA
mtrB
tolA
tolR
tolQ
tonB
exbB
exbD
Citreicella SE45
Dinoroseobacter shibae DFL 12
Jannaschia sp. CCS1
Loktanella vestfoldensis SKA53
Maritimibacter alkaliphilus HTCC2654
Oceanibulbus indolifex HEL45
Oceanicola batsensis HTCC2597
Oceanicola granulosus HTCC2516
Octadecabacter antarcticus 307
Octadecabacter arcticus 238
Pelagibaca bermudensis HTCC2601
Phaeobacter gallaeciensis 2.10
Phaeobacter gallaeciensis BS107
Phaeobacter sp. Y4I
Rhodobacterales bacterium HTCC2083
Rhodobacterales bacterium HTCC2150
Rhodobacterales bacterium HTCC2255
Rhodobacterales bacterium KLH11
Roseobacter denitrificans OCh 114
Roseobacter litoralis Och 149
Roseobacter sp. AzwK-3b
Roseobacter sp. CCS2
Roseobacter sp. GAI101

Species \ Gene Name	TonB dependant outer membrane receptors																		ABC Transporters									Ferric Reductases					Energy Transfer					
	fhuA	*fhuE*	*btuB*	*hmuU*	*cirA*	*fecA*	*fepA*	*viuA*	*viuB*	*fiu/ybiL*	*fptA*	*fpvA*	*fyuA*	*hasR*	*shuA*	*yiuR*	*Maqu_2192*	*hmuR*	*fepB*	*fepC*	*fepD*	*fepG*	*fbpA*	*fbpB*	*fbpC*	*yfuA*	*hmuT*	*yajH*	*ferA*	*ferB*	*mtrA*	*mtrB*	*tolA*	*tolR*	*tolQ*	*tonB*	*exbB*	*exbD*
Roseobacter sp. MED193	3E-89 1E-02	7E-35 3E-04 3E-02	3E-04 7E-01	1E-111 3E-50	2E-08	3E-86 4E-02	2E-08	4E-09 4E-05 2E-04 5E-04	2E-10 8E+00	3E-26 2E-03	3E-33 4E-02	3E-89 1E-02	6E-12 4E-05 1E-04	2E-13 6E-09 1E-05	1E-42 1E-20 3E-17	7E-08 3E-06	2.00E-40 0.13	3.00E-82 9.00E-15 3.00E-14 3.00E-13	2E-04	2E-75 1E-41 4E-37 8E-34	2E-49 3E-42	2E-48 3E-38	4E-18 3E-12	3E-29 4E-23		1E-27	2.00E-71	3E-15	2E-37 6E-28			3.1	5.00E-18	2.00E-29	2.00E-61	4E-30 4E-16	1E-30 3E-14	2E-19
Roseobacter sp. SK209-2-6	6E-91 3E-11	2E-33 1E-06 6E-02 8E-02	2E-04 7E-04 5E-01	1E-112 2E-53 4E-51	2E-08	1E-86 6E-04	2E-08	2E-08 6E-06 4E-03	8E-10 1E+00	1E-26 1E-03	1E-35 7E-02	6E-91 3E-11	8E-09 1E-07	4E-15 3E-11 4E-08	6E-41 4E-23 1E-16	3E-10 3E-05 1E-02	4.00E-42 0.002 0.49	3.00E-81 7.00E-15 2.00E-14 9.00E-13	6E-08 7E-01	7E-79 9E-43	6E-51 8E-43 9E-37	1E-47 2E-38		2E-24	3E-70 1E-68	6E-26	3.00E-76 6.00E-06 7.00E-04	5E-12	7E-36 3E-25	2E-17		9	2.00E-16	2.00E-30	1.00E-60	6E-28 4E-13	9E-30 7E-14	1E-19
Roseovarius nubinhibens ISM	1E-04	3E-06	6E-03	2E-97 6E-53	3E-06 1E-05 4E-05	6E-07	3E-06 1E-05 4E-05	3E-14 7E-11		2E-07 6E-05	6E-03	1E-04	1E-08 2E-06	2E-16 4E-14 1E-13	2E-44 4E-32 1E-25	2E-08		1.00E-71 4.00E-22 8.00E-22	2E-01	3E-39 3E-37	2E-40	1E-35	2E-07		1E-70	2E-27	5.00E-78 1.00E-08			2E-14		3.1	5.00E-15 2.00E-08	1.00E-27	7.00E-52	2E-15 7E-13	4E-27	4E-19
Roseovarius sp. 217	1E-101 6E-05	4E-37	5E-07	1E-105	2E-13	2E-73 1E-05	2E-13		1E-12 3E+00	4E-30 5E-07	2E-36	1E-101 6E-05	4E-11 2E-07	4E-20 4E-08	3E-38	5E-08	6.00E-42	1.00E-68	5E-02	5E-46	5E-43	3E-41	3E-06		1E-77 9E-74 2E-71	1E-30	3.00E-80	3E-22 7E-02		6E-12	3.6			3.00E-20 1.00E-10 1.00E-08	1.00E-33	1.00E-57	3E-15 9E-10	2E-27	2E-20 2E-09
Roseovarius sp. TM1035				1E-106 7E-56		3E-02			8E+00	1E-09 8E-05			1E-08	1E-18	2E-37			7.00E-69	9E-01	4E-34	2E-42 4E-37	1E-39 2E-39			3E-76 3E-72	1E-30	1.00E-80 3.00E-09	2E-01		1E-12	8		5.00E-18	5.00E-34	7.00E-57	8E-12	2E-26	1E-21
Ruegeria lacuscaerulensis ITI-1157	1E-100	6E-34	2E-04		1E-06	1E-78	1E-06	4E-10	2E-10	3E-24	1E-27	1E-100	6E-08			3E-08	7.00E-40 0.38		6E-10 8E-02	2E-76	4E-47	3E-48	1E-115 1E-06	0E+00 2E-26	1E-101 1E-69	6E-24 6E-13		8E-17	6E-35 4E-34	3E-13	0.017 0.15	5.3	2.00E-18	5.00E-34	2.00E-59	1E-10	3E-30	2E-19
Ruegeria pomeroyi DSS-3			2E+00								9E-02												4E-09	2E-25	2E-71 6E-70	2E-27		1E-01	2E-33 2E-22	1E-17	1.2		2.00E-26 3.00E-13	1.00E-35	1.00E-61	5E-14 1E-11	7E-30	5E-19
Ruegeria sp. R11	6E-08		1E-04 2E+00	1E-108 7E-56	7E-07	7E-02	7E-07	1E-10	7E-89	1E-08	2E-01	6E-08	8E-06	2E-14	8E-36	5E-04		5.00E-72		4E-34	2E-41	1E-38 2E-33	7E-07	9E-24		2E-29	8.00E-78	8E-30	2E-42 8E-32 1E-23	4E-15			3.00E-13	5.00E-33	2.00E-60	7E-10	6E-31	2E-17 5E-08
Ruegeria sp. TM1040				1E-108	4E-05	5E-04	4E-05		3E+00				5E-06	1E-18	2E-38	5E-08		2.00E-62	2E-01		3E-38	1E-39	5E-21 5E-10	5E-29 3E-25	4E-70 2E-69	8E-27	2.00E-85 0.024		2E-35 2E-34	3E-16			2.00E-16	1.00E-31	5.00E-60	4E-13	8E-31	1E-19
Ruegeria sp. Trich CH4B	1E-109 2E-78 3E-74 7E-07	4E-35 1E-32 4E-25 4E-06 1E-06	2E-11 1E-07 7E-06 2E-05 4E-01	1E-107 4E-57 6E-52 6E-52	1E-12 3E-09 4E-08 2E-06 1E-05 2E-06	0E+00 2E-72 2E-54 1E-10 8E-01	1E-12 3E-09 4E-08 2E-06 1E-05 2E-04	9E-13 2E-12 1E-08 8E-04 7E-03 1E-02	2E-07 4E+00	4E-33 2E-27 1E-23 5E-09	2E-31 2E-26 1E-19	1E-103 2E-78 3E-76 7E-07	4E-18 7E-18 2E-09	2E-58 3E-16 3E-12 7E-09 7E-07	5E-40 1E-35 6E-34 9E-24 7E-08	6E-12 2E-09 2E-08 3E-06 3E-04	2.00E-31 1.00E-28 1.00E-25 3.00E-04 0.02 0.076	2.00E-66 3.00E-20 6.00E-19 5.00E-13 1.00E-07 2.00E-07	3E-08 2E-02 5E-02 1E-01 4E-01 7E-01	3E-78 8E-26 1E-41 2E-40 6E-36	1E-66 2E-47 6E-40 8E-40 4E-37 9E-37	9E-53 4E-45 4E-39 1E-37	2E-21 4E-18 1E-32 1E-08	2E-56 2E-33 5E-30 5E-25 8E-20	2E-75 4E-72	8E-26	5.00E-66 4.00E-09 1.00E-06 0.001 0.011 0.069	1E-14	2E-35	4E-23 1E-16			2.00E-17	1.00E-31	5.00E-60	2E-30 5E-13	4E-31 7E-18	1E-19 5E-08
Sagittula stellata E-37	4E-20 5E-01 5E-01 5E-01	2E-24	3E-07	6E-55 1E-54	4E-07	2E-20	4E-07			0E+00	1E-16 6E-04 2E-02 2E-02	4E-20 5E-01 5E-01 5E-01	2E-07	4E-06	2E-09	1E-03	2.00E-25	2.00E-08	7E-03	7E-35	7E-42	2E-40 3E-35	1E-133	0E+00 4E-46 1E-21	1E-106 1E-71	1E-29 6E-14	1.00E-08 1.00E-05	3E-01 8E-01	3E-43 1E-21 7E-20	8E-33 7E-13 2E-06			4.00E-17	2.00E-38 2.00E-18	6.00E-62 3.00E-28		2E-57 7E-30	1E-37 5E-19
Sulfitobacter NAS-14.1	1E-106 1E-73 4E-27 2E-01	5E-40 8E-31 7E-21 3E-03	3E-08 8E-05 1E-02	1E-109 8E-57 5E-52	9E-16 4E-07 3E-06 5E-06	7E-69 5E-61 5E-29 5E-06	9E-16 4E-07 3E-06 5E-06	1E-11 6E-10	3E+00	0E+00 7E-34 1E-18 5E-05	1E-38 2E-23 8E-19	1E-106 1E-73 4E-27 2E-01	7E-10 3E-09 4E-06 1E-04	2E-11 3E-07 4E-05	2E-35 7E-10	5E-12 4E-09 5E-04	3.00E-33 1.00E-27 1.00E-21	2.00E-77 8.00E-11	4E-01	9E-38 4E-35	3E-46 1E-39	2E-37 1E-35	1E-19 3E-09	2E-29 3E-25	8E-27	5.00E-86 0.031	3E-08	2E-33	4E-02			1.00E-16 2.00E-08	1.00E-33 2.00E-19	6.00E-59 9.00E-26	4E-13	7E-56 6E-29	4E-41 7E-21
Sulfitobacter sp. EE-36	1E-108 6E-74 7E-28	5E-39 8E-31 6E-20 2E-02	3E-08 8E-05 7E-03	1E-109 6E-57 5E-52	2E-14 4E-07 2E-06 4E-05	1E-70 1E-62 9E-29	2E-14 4E-07 2E-06 4E-05	6E-10 9E-08	3E+00	0E+00 1E-32 5E-19 5E-05	1E-39 2E-23 2E-18	1E-108 6E-78 7E-28	6E-11 3E-09 4E-05 1E-04	8E-13 2E-06 4E-05	5E-36 7E-10	3E-15 3E-10 5E-04	8.00E-34 7.00E-29 9.00E-22	8.00E-75 1.00E-10	1E-01	1E-37 4E-34	6E-46 4E-39	5E-37 3E-36	4E-20 2E-09	5E-29 3E-25	2E-27	2.00E-85 0.024	2E-08 1E+00	3E-33	4E-02			2.00E-16 2.00E-08	1.00E-33 2.00E-19	6.00E-59 3.00E-27	4E-12	2E-57 6E-29	4E-41 7E-21
Thalassiobium R2A62	1E-09	8E-10	3E-04	1E-118 4E-55	1E-08	5E-06	1E-08	8E-07	3E-78 1E-52 7E-08 8E+00	2E-07	4E-02	1E-09	6E-09	3E-30	4E-69	5E-09	7.00E-08	0	3E-01	9E-38 4E-35	3E-42 2E-41 2E-40	4E-44 5E-40	2E-08			7E-30	1E-136 0.024	1E-16 1E-12	4E-34	1E-17			7.00E-16	1.00E-30	2.00E-60	8E-17	2E-30	1E-17


Siderophore Biosynthesis / Transport
HYDROXAMATES
CATECHOLATES
Iron Responsive Regulators
Other
Gene Name
Species
vbsC
vbsG
vbsA
iucA
iucB
iucC
iucD
fhuB
fhuC
fhuD
rhcB
rmo
vibF
vibA
ybdA / entS
entA
entB
entC
entD
entE
entF
rirA
mur
irr
iscR
fur
irpA
irpB
feoA
feoB
Citreicella SE45
Dinoroseobacter shibae DFL 12
Jannaschia sp. CCS1
Loktanella vestfoldensis SKA53
Maritimibacter alkaliphilus HTCC2654
Oceanibulbus indolifex HEL45
Oceanicola batsensis HTCC2597
Oceanicola granulosus HTCC2516
Octadecabacter antarcticus 307
Octadecabacter arcticus 238
Pelagibaca bermudensis HTCC2601
Phaeobacter gallaeciensis 2.10
Phaeobacter gallaeciensis BS107
Phaeobacter sp. Y4I
Rhodobacterales bacterium HTCC2083
Rhodobacterales bacterium HTCC2150
Rhodobacterales bacterium HTCC2255
Rhodobacterales bacterium KLH11
Roseobacter denitrificans OCh 114
Roseobacter litoralis Och 149
Roseobacter sp. AzwK-3b
Roseobacter sp. CCS2
Roseobacter sp. GAI101

Species \ Gene Name	Siderophore Biosynthesis and Transport																				Iron Responsive Regulators					Other			
	HYDROXAMATES												CATECHOLATES																
	vbsC	*vbsG*	*vbsA*	*iucA*	*iucB*	*iucC*	*iucD*	*fhuB*	*fhuC*	*fhuD*	*rhcB*	*rmo*	*vibF*	*vibA*	*ybdA / entS*	*entA*	*entB*	*entC*	*entD*	*entE*	*entF*	*rirA*	*mur*	*irr*	*iscR*	*fur*	*irpA*	*irpB*	*feoA*	*feoB*
***Roseobacter* sp. MED193**	0.019 0.48 0.62			7.4	9.7	9.4	1.4	3.00E-33 2.00E-32	9.00E-54 1.00E-41 8.00E-37	0.055	1.00E-82 1.00E-67 1.00E-56	3.1	2E-91 1E-79 3E-43 3E-40	4E-27 7E-27 4E-25		7E-29	3E-06 4E-04	7E-17 4E-16	6E-61	1E-40 9E-34	2E-81 3E-73 1E-45 1E-33	2E-23	8E-46 9E-05	9E-32 1E-06	4E-70	3E-41	1E-174	7.00E-85	2.3	5.00E-07
***Roseobacter* sp. SK209-2-6**	0.21 0.28 0.28						0.21 0.81	2.00E-35 2.00E-34 2.00E-33	1.00E-52 6.00E-45	6.00E-04 0.16	2.00E-54	5.3 6.9	2E-50 7E-36	2E-26	1E-14	4E-27	6E-02 8E-02	2E-18 6E-14	1E-69	7E-42	4E-51	1E-24 7E-16	3E-44 4E-05	3E-31 1E-08	5E-68	9E-43	1E-172	2.00E-86		5.00E-07
***Roseovarius nubinhibens* ISM**	0.005							2.00E-31	2.00E-42 3.00E-40 3.00E-32	5.00E-05 0.008 5.1	5.00E-49		5E-48 7E-38	1E-162 8E-28 1E-26		4E-42 2E-29 4E-29 6E-29		1E-17 3E-14	5E-43 6E+00	3E-34	7E-47 5E-32		1E-45	5E-30	3E-66	1E-42	1E-176	1.3	0.47 2.3	5.00E-05 2.00E-04
***Roseovarius* sp. 217**								1.00E-114	4.00E-75	2.00E-23 1.8	3.00E-59 9.00E-34	4	1E-55	2E-27	1E-30 1E-13 1E-12 2E-05	4E-30 5E-28 5E-28	6E-09	2E-18	3E-36	3E-34	9E-57 1E-31	1E-18 7E-18 3E-17 1E-15	3E-45	6E-31 1E-08	2E-68	9E-41	1E-161 1E+00 2E+00	6.00E-48 0.78 1	0.36 1.8	7.00E-09 2.00E-04
***Roseovarius* sp. TM1035**				9.2				4.00E-32		3	7.00E-63 3.00E-31	6.9 9	8E-59 9E-41	4E-28	1E-26	2E-29	3E-08 2E-01	3E-19 1E-13	3E-33		3E-59	8E-25 5E-19 5E-16 2E-09	2E-45 2E-05	2E-31 1E-07	2E-60 9E-06 2E-05	2E-41 1E-04	1E-160	3.00E-49 1	0.47	2.00E-10 2.00E-04
***Ruegeria lacuscaerulensis* ITI-1157**	2.00E-04		6 7.8				0.013	3.00E-32	1.00E-57	0.21 1.8 5.1		3.1 5.3		1E-25 4E-25	1E-09	1E-27	6E-05	3E-17 4E-14				1E-25 2E-15	1E-44	6E-31 2E-07	6E-74	2E-43 1E-04	1E-170		1.8 5.2	4.00E-07
***Ruegeria pomeroyi* DSS-3**	0.025		4.6 7.8				0.009 1.1 1.8			5.1 6.7 8.8	7.00E-60 5.00E-34 1.00E-33		1E-54 5E-39	5E-26	1E-16 2E-08	1E-29	6E-07 1E-04 5E-04	1E-17 5E-16	1E-45	2E-40 4E-35 2E-32	2E-50 2E-36	3E-25 6E-15 6E-07	3E-46	3E-31	1E-71 6E-07	3E-42	0E+00 2E-01 4E-01	0		1.00E-08 1.00E-04 2.00E-04
***Ruegeria* sp. R11**	0.056 0.21 0.62		7.8					2.00E-35	3.00E-40	5.1 6.7	8.00E-54		3E-50 1E-37	3E-26	3E-11 2E-08	6E-28 2E-27		1E-16 7E-15	3E-44 8E+00		2E-48	1E-18	1E-44	1E-29 2E-07	5E-62 5E-06	8E-42 2E-04	1E-177		3	2.00E-07
***Ruegeria* sp. TM1040**	1.00E-04 0.096 0.37				4.3				3.00E-34		5.00E-53 3.00E-31	5.3 6.9	2E-52 3E-35	1E-25 2E-25	2E-11 1E-08			4E-17	1E-136 2E+00	1E-35	3E-47	2E-26	1E-42	1E-31	2E-68	1E-39	1E-173	1.3 3.9	2.3 3 5.2	1.00E-08
***Ruegeria* sp. Trich CH4B**	0.002 0.011 0.37		6	7.4				3.00E-34 3.00E-33 4.00E-33	1.00E-56 3.00E-48 2.00E-42 7.00E-40 9.00E-39	0.006 0.055 0.61	7.00E-55 1.00E-30	1.4 5.3	5E-55	2E-24	1E-10 9E-09		5E-04	3E-17 1E-13	6E-91	1E-31	7E-51	8E-25	6E-43	7E-32	1E-62	1E-40	1E-175	1 2.3 2.3 5	3 4 5.2	4.00E-07
***Sagittula stellata* E-37**	0.62 0.81		4.6			5.5	0.21	2.00E-31		1.4	6.00E-54 2.00E-34	0.21	7E-54 2E-46	3E-29 5E-27 2E-26	5E-18 1E-07	2E-29 2E-28 3E-28 3E-28 4E-27	3E-07 5E-06 5E-06	5E-18	4E-20 6E+00 6E+00	6E-35	6E-50 7E-41	3E-22 2E-19 8E-17	9E-45	2E-27	2E-65	2E-41	1E-179	1.3 1.3 1.3		9.00E-07
***Sulfitobacter* NAS-14.1**	0.004	6.8						1.00E-123 3.00E-31	5.00E-63 3.00E-41	2.00E-21		4 6.9			5E-12		2E-04	7E-17		8E-41 2E-33 3E-32		1E-24	6E-25	4E-31 4E-10	1E-65	2E-22 6E-05	1E-167 2E+00	1.00E-21 2.00E-13 0.07 1	2.3 3 5.2	3.00E-08
***Sulfitobacter* sp. EE-36**	0.005	6.8						1.00E-124 3.00E-31	7.00E-64 2.00E-41	2.00E-21 5.1		3.1 6.9			4E-08		6E-10 7E-05 7E-05	7E-17		1E-39 8E-33 4E-32			3E-25	4E-31 3E-10	4E-66	1E-22 6E-05	1E-168 2E+00	2.00E-56 0.2 0.78	2.3 3 5.2	2.00E-08
***Thalassiobium* R2A62**								6.00E-41 3.00E-32 8.00E-32	1.00E-36 3.00E-36	9.00E-05		0.62 4		2E-25			1E-04	2E-17	2E+00	3E-38 4E-32	3E-31		4E-45 2E-05	2E-31	6E-65 2E-05	7E-43 5E-06	1E-168	0.16		2.00E-06 8.00E-05

Table 2.2 Functions and genbank identities of all peptides used in Table 2.1

Gene	Genbank Accession	Function	Gene	Genbank Accession	Function
fhuA	NP_414692	ferrichrome	*vbsC*	CAK12032	*Rhizobium* vicibactin
fhuE	ACI36233	ferric-rhodotorulic acid, ferric siderophores coprogen and ferrioxamine B	*vbsG*	CAC48061	
btuB	AAA23524	vitamin B12, E colicins	*vbsA*	CAC48060	
hmuU	AAC64869	heme/haemoglobin receptor	*iucA*	AAK71631.1	aerobactin synthesis - *Shigella boydii*
cirA	NP_416660	ferric iron-catecholate - colicins	*iucB*	AAK71632.1	
fecA	ACT45941	ferric citrate	*iucC*	AAK71633.1	
fepA	YP_002269216.1	Ferrienterobactin permease	*iucD*	AAK71634.1	
viuA	AET27297	vibriobactin receptor	*fhuB*	YP_406700.1	aerobactin uptake
viuB	AET27296	ferric vibriobactin utilization	*fhuC*	YP_406698.1	
fiu/ybiL	NP_415326	believed to facilitate the uptake of the siderophore dihydroxybenzoylserine	*fhuD*	YP_406699.1	
fptA	AAC43213	pyochelin receptor - *Pseudomonas aeruginosa*	*rhcB*	ABG94125.1	rhodochelin synthesis - *Rhodococcus jostii*
fpvA	AAO17439	ferric pyoverdine receptor	*rmo*	YP_704660.1	
fyuA	EGT69989	Yersiniabactin receptor	*vibF*	YP_001217726	vibriobactin synthesis
hasR	CAE46936	*Serratia marcescens* heme receptor	*vibA*	ACP08808	1st step in vibriobactin synthesis
shuA	AAC27809	heme/hemoglobin receptor - *Shigella dysenteriae*	*ybdA / entS*	YP_003076595	Enterobactin exporter
yiuR	ADV99409	catecholate siderophores - *Yersinia pestis*	*entA*	NP_415128.1	Enterobactin biosynthesis
Maqu_2192	ABM19271.1	Marinobactin receptor - *Marinobacter*	*entB*	NP_286322	Enterobactin biosynthesis
hmuR	ABX87333	TonB-dependent heme/hemoglobin uptake - *Yersinia pestis*	*entC*	ACI36818	Enterobactin biosynthesis
fepB	EGT66731	Ferrienterobactin-binding periplasmic protein	*entD*	ACI36635.1	Enterobactin biosynthesis
fepC	ACI38323	ATPase	*entE*	YP_002269228	Enterobactin biosynthesis
fepD	CAA42043	Ferrienterobactin transporter, permease	*entF*	YP_002269220	Enterobactin biosynthesis
fepG	CAA40708	Ferrienterobactin transporter, permease	*rirA*	YP_766387	Rihizobial iron regulator
fbpA	NP_286103	Ferric iron permease	*mur*	CAK05888	Manganese uptake regulator
fbpB	YP_002400786	Ferric iron periplasmic binding protein	*irr*	AAC32183	Iron responsive regulator
fbpC	YP_003076376	ATPase	*iscR*	EGT66035	Iron sulphur clusters
yfuA	NP_668846.1	iron(III)-binding periplasmic protein	*fur*	AAR12905	Ferric uptake regulator
hmuT	AAC64868	hemin periplasmic binding protein	*irpA*	SPO0086	Iron regulated protein
yqjH	NP_417541	ferric reductase	*irpB*	AAV93418.1	Iron regulated protein
ferA	YP_913877	*Paracoccus denitrificans* ferric reductase	*feoA*	CAA50386.1	ferrous iron transporter
ferB	YP_917833	*P. denitrificans* ferric reductase	*feoB*	YP_001732246.1	ferrous iron transporter
mtrA	NP_717386	*Shewanella* iron reduction			
mtrB	NP_717385	*Shewanella* iron reduction			
tolA	YP_769548	Couples proton motive force from inner to outer membrane for energising transport into periplasm			
tolR	YP_002977283				
tolQ	YP_769550				
tonB	YP_001730249				
exbB	AAA69173 -				
exbD	AAA69172				

2.1.2 The distribution of TonB-dependent outer membrane receptors in the Roseobacters

As presented in the Introduction, many iron-containing compounds are imported via an active transport process, whose initial step involves the recognition and uptake of the Fe-ligand across the outer membrane via a receptor that has a highly conserved basic structure, comprising a beta barrel. Such systems are used to import many siderophores, ferric-citrate complexes and haem, either alone, or complexed in carrier proteins, such as hemoglobin. This process also requires energy, which is transduced via the TonB/ExbBD polypeptides, so are termed, collectively "TonB-dependent outer membrane receptors" (TBDR).

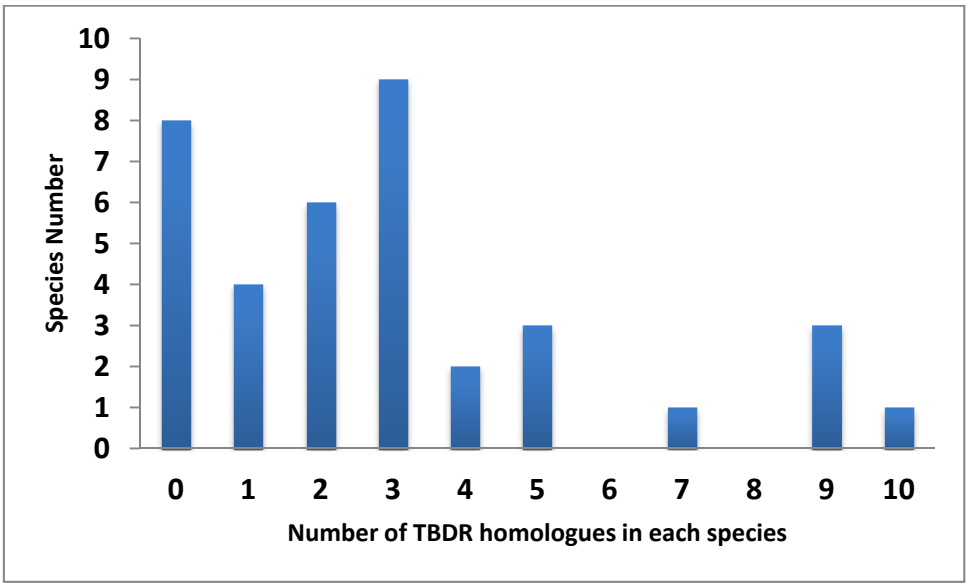
A glance at Table 2.1 shows that there are few close homologues to the various receptors.

However, it is apparent that there are significant matches to members of this super-family, but at a low level of similarity. Importantly, too, there are remarkable differences in the portfolios of different strains and even in the numbers that they have.

To infer function based on homology would be unwise given the significant diversity of the TBDR peptides; when a FhuA homologue is shown to be present in any given Roseobacter in Table 2.1, this does not mean we know the identity of the molecule which it likely imports.

As shown in Table 2.1, there is a remarkable diversity in the distribution of the types and numbers of TBDRs in the different Roseobacters. Thus, as shown in the histogram in Figure 2.1, the numbers range from zero (in eight different strains) to ten (in *Ruegeria* sp. Trich CH4B), but with only a minority of strains (10 out of 37) having four or more polypeptides in this family.

Figure 2.1 Histogram of TBDR numbers in Roseobacters species



Histogram of the numbers of TBDR gene homologues found in genome sequenced Roseobacters, as shown in Table 2.1.

The list below sets out the names of the strains with their total numbers of receptors and of the types that they most closely resemble shown in brackets: (C = citrate; H = haem; S = siderophore and B = vitamin B_{12}) are as follows: Only those with close homologues, i.e. shown as green in Table 2.1, were used for these analyses.

0 receptors: *Oceanicola granulosus* HTCC2516, *Octadecabacter arcticus* 238, *Rhodobacterales bacterium* HTCC2150, *Rhodobacterales bacterium* KLH11, *Roseobacter litoralis* Och 149, *Roseobacter* sp. AzwK-3b, *Roseobacter* sp. CCS2 and *Ruegeria pomeroyi* DSS-3.

One receptor: *Oceanibulbus indolifex* HEL45 (S), *Rhodobacterales bacterium* HTCC2083 (S), *Rhodobacterales bacterium* HTCC2255 (S), *Sagittula stellata* E-37 (S),

Two receptors *Dinoroseobacter shibae* DFL 12 (H), *Loktanella vestfoldensis* SKA53 (H), *Roseobacter* sp. GAI101 (SB), *Roseovarius nubinhibens* ISM (H), *Roseovarius* sp. TM1035 (H), *Ruegeria* sp. R11 (SH) and *Ruegeria* sp. TM1040 (H).

Three receptors : *Maritimibacter alkaliphilus* HTCC2654 (HS), *Oceanicola batsensis* HTCC2597 (S), *Phaeobacter gallaeciensis* 2.10 (S), *Phaeobacter gallaeciensis* BS107 (S), *Phaeobacter* sp. Y4I (S), *Roseobacter denitrificans* OCh 114 (H), *Ruegeria lacuscaerulensis* ITI-1157 (S)

Four receptors: *Jannaschia* sp. CCS1 (HS), *Octadecabacter antarcticus* 307 (HB) and *Thalassiobium* R2A62 (SH).

Five receptors: *Roseobacter* sp. MED193 (SH), *Roseobacter* sp. SK209-2-6 (SH) and *Roseovarius* sp. 217 (SH).

Seven receptors: *Sulfitobacter* sp. EE-36 (CHS).

Nine receptors: *Citreicella* SE45 (CHSB), *Pelagibaca bermudensis* HTCC2601 (CHSB) and *Sulfitobacter* NAS-14.1 (CHS).

Ten receptors: *Ruegeria* sp. Trich CH4B (CHS).

Indeed, some species possess a wide complement of receptors, such as *Citreicella* SE45, which has two copies of both "*fhuA"* and "*fpvA"* and single copies of *btuB*-, *hmuU*- and *hmuR*-like genes in its genome (see Table 2.1). *Ruegeria* sp. Trich CH4B also has a large complement of homologues to iron specific receptors – *fhuA*, *hmuU*, *fecA*, *fpvA* and *hmuR*, but this is surpassed by *Sulfitobacter* NAS-14.1 and *Sulfitobacter* EE36, both of which also have a homologue of *fiu*, an enterochelin breakdown-product receptor. But, the TBDR record-holder, to date, is *Pelagibaca bermudensis* HTCC2601 which has homologues of *fhuA*, *hmuU*, *fecA*, *fpvA, btuB* and two catecholate siderophore receptors – *cirA* and *yiuR*.

In contrast, several Roseobacters lack homologues to any known TBDRs; these are *R. pomeroyi* DSS-3, *Oceanicola granulosus* HTCC2516, *Octadecabacter arcticus* 238 and *Rhodobacterales* bacterium HTCC2150. Several other Roseobacters lack all TBDR genes, except a weak homologue to *hmuU*.

2.1.3 The search for TonB

The presence of TBDRs at least in some Roseobacters, points, not unreasonably to the need for a TonB polypeptide in such strains. However, using the *bone fide* TonB of *Rhizobium leguminosarum* as the BLASTP probe, none of the Roseobacter proteomes yielded a convincing homologue ($e < 10^{25}$). But, given the hyper-variability of TonBs in bacteria, I decided to search for TonB in the Roseobacters using a different approach.

I used the sequence of the TonB peptides of *E. coli*, *Rhizobium leguminosarum* and *Rhodobacter sphaeroides* as probes to interrogate all Roseobacter genomes, and discovered a homologue in

Roseovarius nubinhibens – the product of the *ISM_04245* gene (30% ID to TonB of *Rhizobium leguminosarum*). Although not a *bone fide* TonB gene, *ISM-04245* is next to putative haem uptake genes *hmuR* and a putative *exbB* gene, so I added the *ISM_04245* gene product to the *in silico* probes used for my TonB search.

I used all the TonB probes against the proteomes of all the Roseobacters. The resulting matches are shown in table 2.3. Since each putative TonB polypeptide is targeted by four probes (four different colours), any gene locus with analogous to **most** of the probes was considered to be a *bona fide* TonB. Even with this approach, none of the TonBs was >45% identical to any of the probes, except, of course for *R. nubinhibens* itself. Although this approach may have indeed identified TonBs in the Roseobacters, further direct experimentation will be needed to ratify this (for example, by examining the iron uptake abilities of strains with mutations in these genes).

However, several Roseobacters did not contain a gene homologous to more than two of the probe sequences, and therefore **may** not possess a copy of TonB. These were: *Octadecabacter antarcticus* 238, *Oceanibulbus indolifex* HEL-45, *Rhodobacterales bacterium* HTCC2255, *Roseobacter* sp. AzwK3b, *Rhodobacterales bacterium* HTCC2083, *Rhodobacterales bacterium* HTCC2150, *Roseobacter* sp. CCS2, *Roseobacter denitrificans* Och114, *Roseobacter litoralis* Och 149, *Loktanella vestfoldensis* SKA53 and *Ruegeria lacuscaerulensis* ITI-1157.

Crucially, of these **eleven** strains that lack TonB, **five** did not have not appear to have any TBDR polypeptides (underlined above and shown in Table 2.1). Two of the other strains that had no detectable TBDR polypeptides (*Ruegeria pomeroyi* DSS-3 and *Oceanicola granulosus* HTCC2516) also had very poor homologues of TonB, which were of questionable validity (E values > $5E^{-10}$). Therefore, there is some correlation between the lack of TonB and the absence of a TBDR in the same strain. This observation warrants further investigation.

The concept of bacterial species lacking TonB has received some attention - *Francisella tularensis* imports a rhizoferrin-like carboxylate siderophore via the outer membrane receptor FslE , albeit still in an energy dependent process (Ramakrishnan *et al.* 2008; 2012). *Legionella pneumophila* produces a siderophore (legiobactin) which is imported via a receptor termed LbtU, which is also supposedly TonB independent. The authors report that LbtU is a 16 stranded β-barrel, distinct from 22-stranded normal TBDRs (Chatfield *et al.* 2011).

Of course, there were also strains which do have homologues of TBDRs, and yet do not appear to have TonB. Again, without further work these questions remain unanswered, but fascinating.

Table 2.3 Presence of TonB Homologues in Genome-Sequenced Strains of the Roseobacter Clade

Gene Tag	Genome	Percentage ID	Expect value
CH4B_21510	*Ruegeria* sp. Trich CH4B	38	$4.00E^{-47}$
CH4B_21510	*Ruegeria* sp. Trich CH4B	27	$1.00E^{-20}$
CH4B_21510	*Ruegeria* sp. Trich CH4B	24	$1.00E^{-13}$
CH4B_45730	*Ruegeria* sp. Trich CH4B	36	$8.00E^{-28}$
CH4B_45730	*Ruegeria* sp. Trich CH4B	30	$5.00E^{-16}$
CH4B_45730	*Ruegeria* sp. Trich CH4B	27	$3.00E^{-13}$
CH4B_45730	*Ruegeria* sp. Trich CH4B	26	$3.00E^{-08}$
Dshi_0567	*Dinoroseobacter shibae* DFL12	38	$7.00E^{-24}$
Dshi_0567	*Dinoroseobacter shibae* DFL12	29	$3.00E^{-13}$
Dshi_0567	*Dinoroseobacter shibae* DFL12	28	$6.00E^{-12}$
Dshi_1110	*Dinoroseobacter shibae* DFL12	34	$1.00E^{-13}$
Dshi_1110	*Dinoroseobacter shibae* DFL12	37	$3.00E^{-10}$
Dshi_1110	*Dinoroseobacter shibae* DFL12	26	$3.00E^{-07}$
Dshi_2367	*Dinoroseobacter shibae* DFL12	29	$2.00E^{-06}$
Dshi_2725	*Dinoroseobacter shibae* DFL12	29	$8.00E^{-09}$
EE36_09740	*Sulfitobacter* sp. EE-36	31	$2.00E^{-09}$
EE36_09740	*Sulfitobacter* sp. EE-36	32	$3.00E^{-09}$
EE36_09740	*Sulfitobacter* sp. EE-36	26	$6.00E^{-07}$
EE36_10430	*Sulfitobacter* sp. EE-36	29	$3.00E^{-10}$
EE36_13013	*Sulfitobacter* sp. EE-36	42	$3.00E^{-53}$
EE36_13013	*Sulfitobacter* sp. EE-36	29	$5.00E^{-25}$
EE36_13013	*Sulfitobacter* sp. EE-36	28	$5.00E^{-14}$
EE36_15637	*Sulfitobacter* sp. EE-36	32	$3.00E^{-09}$
EE36_15637	*Sulfitobacter* sp. EE-36	30	$2.00E^{-07}$
ISM_03305	*Roseovarius nubinhibens* ISM	27	$4.00E^{-07}$

ISM_04245	*Roseovarius nubinhibens* ISM	100	$1.00E^{-174}$
ISM_04245	*Roseovarius nubinhibens* ISM	30	$4.00E^{-24}$
ISM_04245	*Roseovarius nubinhibens* ISM	28	$3.00E^{-16}$
ISM_06055	*Roseovarius nubinhibens* ISM	34	$1.00E^{-13}$
ISM_06055	*Roseovarius nubinhibens* ISM	29	$6.00E^{-06}$
ISM_16395	*Roseovarius nubinhibens* ISM	32	$4.00E^{-10}$
ISM_16395	*Roseovarius nubinhibens* ISM	32	$8.00E^{-07}$
Jann_0972	*Jannaschia* sp. CCS1	28	$1.00E^{-06}$
Jann_1616	*Jannaschia* sp. CCS1	32	$2.00E^{-06}$
Jann_2127	*Jannaschia* sp. CCS1	36	$2.00E^{-41}$
Jann_2127	*Jannaschia* sp. CCS1	29	$4.00E^{-20}$
Jann_2127	*Jannaschia* sp. CCS1	28	$4.00E^{-13}$
KLH11_10350	*Rhodobacterales bacterium* KLH11	27	$6.00E^{-06}$
KLH11_13530	*Rhodobacterales bacterium* KLH11	26	$2.00E^{-09}$
KLH11_14940	*Rhodobacterales bacterium* KLH11	30	$2.00E^{-22}$
KLH11_14940	*Rhodobacterales bacterium* KLH11	27	$6.00E^{-17}$
KLH11_14940	*Rhodobacterales bacterium* KLH11	24	$7.00E^{-10}$
MED193_17529	*Roseobacter* sp MED193	35	$6.00E^{-42}$
MED193_17529	*Roseobacter* sp MED193	30	$3.00E^{-23}$
MED193_17529	*Roseobacter* sp MED193	26	$3.00E^{-17}$
MED193_22036	*Roseobacter* sp MED193	38	$5.00E^{-29}$
MED193_22036	*Roseobacter* sp MED193	31	$2.00E^{-19}$
MED193_22036	*Roseobacter* sp MED193	27	$7.00E^{-16}$
MED193_22036	*Roseobacter* sp MED193	27	$3.00E^{-11}$
NAS141_05758	*Sulfitobacter* sp. NAS-14.1	31	$8.00E^{-08}$
NAS141_06398	*Sulfitobacter* sp. NAS-14.1	29	$1.00E^{-06}$
NAS141_06398	*Sulfitobacter* sp. NAS-14.1	30	$3.00E^{-06}$

NAS141_14753	*Sulfitobacter* sp. NAS-14.1	31	$8.00E^{-10}$
NAS141_14753	*Sulfitobacter* sp. NAS-14.1	25	$6.00E^{-09}$
NAS141_14753	*Sulfitobacter* sp. NAS-14.1	26	$1.00E^{-06}$
NAS141_15333	*Sulfitobacter* sp. NAS-14.1	29	$3.00E^{-10}$
NAS141_18179	*Sulfitobacter* sp. NAS-14.1	43	$9.00E^{-54}$
NAS141_18179	*Sulfitobacter* sp. NAS-14.1	31	$6.00E^{-23}$
NAS141_18179	*Sulfitobacter* sp. NAS-14.1	28	$1.00E^{-13}$
NAS141_18179	*Sulfitobacter* sp. NAS-14.1	23	$2.00E^{-07}$
OA238_811	*Octadecabacter antarcticus* 238	29	$3.00E^{-09}$
OA307_2153	*Octadecabacter antarcticus* 307	32	$9.00E^{-32}$
OA307_2153	*Octadecabacter antarcticus* 307	25	$1.00E^{-16}$
OA307_2153	*Octadecabacter antarcticus* 307	26	$2.00E^{-11}$
OB2597_05450	*Oceanicola batsensis* HTCC2597	36	$2.00E^{-50}$
OB2597_05450	*Oceanicola batsensis* HTCC2597	29	$6.00E^{-18}$
OB2597_05450	*Oceanicola batsensis* HTCC2597	28	$4.00E^{-15}$
OB2597_05450	*Oceanicola batsensis* HTCC2597	24	$3.00E^{-06}$
OB2597_15655	*Oceanicola batsensis* HTCC2597	24	$1.00E^{-06}$
OB2597_15655	*Oceanicola batsensis* HTCC2597	26	$2.00E^{-06}$
OG2516_01015	*Oceanicola granulosus* HTCC2516	30	$5.00E^{-06}$
OG2516_12444	*Oceanicola granulosus* HTCC2516	32	$5.00E^{-10}$
OG2516_12444	*Oceanicola granulosus* HTCC2516	23	$2.00E^{-07}$
OG2516_12444	*Oceanicola granulosus* HTCC2516	24	$5.00E^{-07}$
OIHEL45_09568	*Oceanibulbus indolifex* HEL-45	25	$2.00E^{-10}$
OIHEL45_09568	*Oceanibulbus indolifex* HEL-45	31	$5.00E^{-07}$
OIHEL45_15869	*Oceanibulbus indolifex* HEL-45	25	$7.00E^{-10}$
OIHEL45_15869	*Oceanibulbus indolifex* HEL-45	24	$8.00E^{-07}$
OM2255_13534	*Rhodobacterales bacterium* HTCC2255	38	$6.00E^{-12}$

OM2255_13534	*Rhodobacterales bacterium* HTCC2255	37	$7.00E^{-12}$
R2601_11699	*Pelagibaca bermudensis* HTCC2601	25	$1.00E^{-06}$
R2601_12453	*Pelagibaca bermudensis* HTCC2601	29	$4.00E^{-11}$
R2601_12453	*Pelagibaca bermudensis* HTCC2601	38	$2.00E^{-10}$
R2601_12453	*Pelagibaca bermudensis* HTCC2601	23	$2.00E^{-09}$
R2601_12453	*Pelagibaca bermudensis* HTCC2601	25	$3.00E^{-07}$
R2601_21051	*Pelagibaca bermudensis* HTCC2601	33	$8.00E^{-11}$
R2601_26191	*Pelagibaca bermudensis* HTCC2601	25	$9.00E^{-08}$
R2601_27243	*Pelagibaca bermudensis* HTCC2601	42	$1.00E^{-65}$
R2601_27243	*Pelagibaca bermudensis* HTCC2601	31	$3.00E^{-29}$
R2601_27243	*Pelagibaca bermudensis* HTCC2601	31	$6.00E^{-22}$
R2A62_18510	*Thalassiobium* sp. R2A62	26	$4.00E^{-06}$
R2A62_19050	*Thalassiobium* sp. R2A62	32	$3.00E^{-35}$
R2A62_19050	*Thalassiobium* sp. R2A62	28	$3.00E^{-19}$
R2A62_19050	*Thalassiobium* sp. R2A62	27	$3.00E^{-15}$
R2A62_29000	*Thalassiobium* sp. R2A62	21	$3.00E^{-06}$
RAZWK3B_06677	*Roseobacter* sp. AzwK3b	26	$5.00E^{-11}$
RAZWK3B_20566	*Roseobacter* sp. AzwK3b	42	$2.00E^{-09}$
RB2083_2039	*Rhodobacterales bacterium* HTCC2083	35	$7.00E^{-07}$
RB2150_04948	*Rhodobacterales bacterium* HTCC2150	26	$2.00E^{-08}$
RB2150_05338	*Rhodobacterales bacterium* HTCC2150	36	$8.00E^{-11}$
RB2654_05647	*Maritimibacter alkaliphilus* HTCC2654	31	$1.00E^{-10}$
RB2654_05647	*Maritimibacter alkaliphilus* HTCC2654	27	$1.00E^{-07}$
RB2654_05647	*Maritimibacter alkaliphilus* HTCC2654	28	$5.00E^{-07}$
RB2654_15821	*Maritimibacter alkaliphilus* HTCC2654	35	$3.00E^{-27}$
RB2654_15821	*Maritimibacter alkaliphilus* HTCC2654	29	$5.00E^{-19}$
RB2654_15821	*Maritimibacter alkaliphilus* HTCC2654	26	$4.00E^{-12}$

RB2654_18448	*Maritimibacter alkaliphilus* HTCC2654	28	$2.00E^{-06}$
RB2654_19658	*Maritimibacter alkaliphilus* HTCC2654	33	$2.00E^{-12}$
RBY4I_2464	*Phaeobacter* sp. Y4I	31	$2.00E^{-09}$
RBY4I_2464	*Phaeobacter* sp. Y4I	25	$1.00E^{-06}$
RBY4I_2464	*Phaeobacter* sp. Y4I	34	$3.00E^{-06}$
RBY4I_4149	*Phaeobacter* sp. Y4I	34	$1.00E^{-26}$
RBY4I_4149	*Phaeobacter* sp. Y4I	30	$6.00E^{-18}$
RBY4I_4149	*Phaeobacter* sp. Y4I	28	$2.00E^{-13}$
RCCS2_05544	*Roseobacter* sp. CCS2	24	$4.00E^{-07}$
RCCS2_05544	*Roseobacter* sp. CCS2	25	$2.00E^{-06}$
RD1_1932	*Roseobacter denitrificans* Och114	34	$2.00E^{-12}$
RD1_1932	*Roseobacter denitrificans* Och114	31	$2.00E^{-10}$
RD1_3158	*Roseobacter denitrificans* Och114	33	$3.00E^{-12}$
RD1_4199	*Roseobacter denitrificans* Och114	37	$2.00E^{-38}$
RD1_4199	*Roseobacter denitrificans* Och114	30	$4.00E^{-21}$
RG210_03453	*Phaeobacter gallaeciensis* 2.10	22	$2.00E^{-06}$
RG210_11773	*Phaeobacter gallaeciensis* 2.10	37	$7.00E^{-31}$
RG210_11773	*Phaeobacter gallaeciensis* 2.10	28	$3.00E^{-18}$
RG210_11773	*Phaeobacter gallaeciensis* 2.10	26	$3.00E^{-10}$
RG210_11773	*Phaeobacter gallaeciensis* 2.10	24	$8.00E^{-08}$
RGAI101_1183	*Roseobacter* sp. GAI101	31	$1.00E^{-09}$
RGAI101_1183	*Roseobacter* sp. GAI101	35	$1.00E^{-09}$
RGAI101_1183	*Roseobacter* sp. GAI101	32	$3.00E^{-07}$
RGAI101_1183	*Roseobacter* sp. GAI101	26	$2.00E^{-06}$
RGAI101_2719	*Roseobacter* sp. GAI101	30	$3.00E^{-21}$
RGAI101_2719	*Roseobacter* sp. GAI101	31	$1.00E^{-16}$
RGAI101_2719	*Roseobacter* sp. GAI101	28	$2.00E^{-13}$

RGAI101_3387	*Roseobacter* sp. GAI101	28	1.00E^{-06}
RGAI101_4137	*Roseobacter* sp. GAI101	29	2.00E^{-11}
RGBS107_01618	*Phaeobacter gallaeciensis* BS107	36	3.00E^{-30}
RGBS107_01618	*Phaeobacter gallaeciensis* BS107	28	6.00E^{-18}
RGBS107_01618	*Phaeobacter gallaeciensis* BS107	27	7.00E^{-13}
RGBS107_01618	*Phaeobacter gallaeciensis* BS107	25	3.00E^{-06}
RLO149_00770	*Roseobacter litoralis* Och 149	30	1.00E^{-06}
RLO149_16723	*Roseobacter litoralis* Och 149	36	5.00E^{-08}
RLO149_22885	*Roseobacter litoralis* Och 149	28	3.00E^{-07}
ROS217_05079	*Roseovarius* sp 217	34	1.00E^{-11}
ROS217_08174	*Roseovarius* sp 217	28	2.00E^{-07}
ROS217_17015	*Roseovarius* sp 217	30	5.00E^{-06}
ROS217_22847	*Roseovarius* sp 217	43	1.00E^{-53}
ROS217_22847	*Roseovarius* sp 217	28	9.00E^{-19}
ROS217_22847	*Roseovarius* sp 217	29	6.00E^{-17}
RR11_3124	*Ruegeria* sp. R11	27	2.00E^{-06}
RR11_420	*Ruegeria* sp. R11	28	1.00E^{-06}
RR11_420	*Ruegeria* sp. R11	24	1.00E^{-06}
RR11_420	*Ruegeria* sp. R11	27	3.00E^{-06}
RR11_89	*Ruegeria* sp. R11	38	6.00E^{-44}
RR11_89	*Ruegeria* sp. R11	34	5.00E^{-15}
RR11_89	*Ruegeria* sp. R11	26	1.00E^{-10}
RSK20926_04157	*Roseobacter* sp. SK20926	26	1.00E^{-07}
RSK20926_04157	*Roseobacter* sp. SK20926	37	5.00E^{-06}
RSK20926_10619	*Roseobacter* sp. SK20926	35	2.00E^{-37}
RSK20926_10619	*Roseobacter* sp. SK20926	26	7.00E^{-22}
RSK20926_10619	*Roseobacter* sp. SK20926	27	1.00E^{-13}

RSK20926_15376	*Roseobacter* sp. SK20926	35	$4.00E^{-29}$
RSK20926_15376	*Roseobacter* sp. SK20926	31	$2.00E^{-17}$
RSK20926_15376	*Roseobacter* sp. SK20926	26	$1.00E^{-14}$
RSK20926_15376	*Roseobacter* sp. SK20926	26	$9.00E^{-10}$
RSK20926_17927	*Roseobacter* sp. SK20926	32	$5.00E^{-07}$
RTM1035_05560	*Roseovarius* sp. TM1035	41	$4.00E^{-51}$
RTM1035_05560	*Roseovarius* sp. TM1035	26	$4.00E^{-17}$
RTM1035_05560	*Roseovarius* sp. TM1035	24	$2.00E^{-12}$
RTM1035_06468	*Roseovarius* sp. TM1035	27	$5.00E^{-06}$
RTM1035_18951	*Roseovarius* sp. TM1035	30	$1.00E^{-10}$
RTM1035_18951	*Roseovarius* sp. TM1035	26	$8.00E^{-07}$
SE45_29970	*Citreicella* sp. SE45	29	$5.00E^{-09}$
SE45_44320	*Citreicella* sp. SE45	28	$3.00E^{-07}$
SE45_44420	*Citreicella* sp. SE45	45	$1.00E^{-65}$
SE45_44420	*Citreicella* sp. SE45	34	$8.00E^{-27}$
SE45_44420	*Citreicella* sp. SE45	30	$2.00E^{-24}$
SE45_44420	*Citreicella* sp. SE45	21	$6.00E^{-06}$
SE45_53730	*Citreicella* sp. SE45	29	$2.00E^{-09}$
SE45_53730	*Citreicella* sp. SE45	22	$3.00E^{-06}$
SKA53_03031	*Loktanella vestfoldensis* SKA53	31	$7.00E^{-10}$
SKA53_05955	*Loktanella vestfoldensis* SKA53	43	$4.00E^{-07}$
SKA53_06392	*Loktanella vestfoldensis* SKA53	33	$4.00E^{-31}$
SKA53_06392	*Loktanella vestfoldensis* SKA53	31	$6.00E^{-19}$
SKA53_06392	*Loktanella vestfoldensis* SKA53	31	$9.00E^{-16}$
SKA53_08576	*Loktanella vestfoldensis* SKA53	28	$5.00E^{-08}$
SL1157_14710	*Ruegeria lacuscaerulensis* ITI-1157	33	$3.00E^{-09}$
SPO0227	*Ruegeria pomeroyi* DSS-3	38	$7.00E^{-12}$

SPO2336	*Ruegeria pomeroyi* DSS-3	28	$2.00E^{-06}$
SPO3110	*Ruegeria pomeroyi* DSS-3	32	$3.00E^{-12}$
SPO3110	*Ruegeria pomeroyi* DSS-3	32	$2.00E^{-11}$
SPO3110	*Ruegeria pomeroyi* DSS-3	28	$8.00E^{-07}$
SSE37_01135	*Sagittula stellata* E-37	25	$3.00E^{-10}$
SSE37_01135	*Sagittula stellata* E-37	27	$1.00E^{-06}$
SSE37_20382	*Sagittula stellata* E-37	34	$3.00E^{-09}$
SSE37_20382	*Sagittula stellata* E-37	29	$3.00E^{-07}$
SSE37_20382	*Sagittula stellata* E-37	23	$8.00E^{-07}$
TM1040_0352	*Ruegeria* sp. TM1040	41	$4.00E^{-52}$
TM1040_0352	*Ruegeria* sp. TM1040	27	$5.00E^{-20}$
TM1040_0352	*Ruegeria* sp. TM1040	26	$2.00E^{-13}$
TM1040_0352	*Ruegeria* sp. TM1040	22	$5.00E^{-06}$

Four probe sequences corresponding to TonB polypeptides were used to interrogate the sequenced Roseobacter genomes. The probes were from* E. coli *(Orange),* Rhizobium leguminosarum *(Green),* Roseovarius nubinhibens *(Yellow) and* Rhodobacter sphaeroides *(Blue). For each of the Roseobacter clade gene locus tags, the target with the closest similarity is colour coded and the similarity is indicated by the %age identities of the polypeptides and the Expect values.

2.1.4 Haeme and Ferrous iron ABC-class transporters are poorly conserved in the Roseobacters

Most of the known TBDRs have cognate ABC transporters that comprise the corresponding periplasmic binding protein that receive, (for example) the Fe-hydroxamate complex that has been transported through the FhuA surface-membrane receptor, which is then transported through the inner membrane via a transporter polypeptide, with the energy being delivered via the ATPase polypeptide component of the FbpABC transporter. Furthermore, there is at least one system variously known as Fbp (and there are many others in, for example, *Yersinia* and *Vibrio*) in which the ABC transporter may deliver the Fe^{3+} without the need of a corresponding OM receptor.

Table 2.1 shows that the different Roseobacters contain a variety of combinations of these types of ABC transporter, but mostly, there are no very close homologues.

The four main ABC-class transporters tested in this section of table 2.1 were Fep, the ferrienterobactin transporter from *E. coli*, Fbp and YfuA, both ferric iron specific from *E. coli* and *Yersinia pestis* respectively, and HmuT a periplasmic haemin binding-domain also of *Y. pestis*.

None of the Roseobacters has a homologue of FepB, the periplasmic binding-protein for enterobactin, but 11 species have homologues of FepC and FepD, the ATPase and permease components of this ABC-class transporter. Interestingly, *Pelagibaca bermudensis* HTCC2601 has a good homologue of FepA, the only member of the Roseobacters to possess this protein.

FbpA and FbpB were poorly conserved in the Roseobacters, with just 6 species containing a homologue of these particular proteins. However the ATPase, FbpC was well conserved with 25 of the 37 Roseobacters having at least one homologue with an E-value > $1E^{-69}$. It is likely that just the conservation of peptide sequence of FbpA and FbpB is poor, and may not be representative of the actual conservation of function throughout the Roseobacters.

None of the Roseobacter strains had a peptide in their deduced proteome homologous to YfuA, although most (29 out of the 37 sequenced strains) had a weaker homologue (shown as yellow in Table 2.1).

Finally, the most common ABC-class transporter homologue shown in this table was HmuT; there are 18 strains which possess a homologue (E-value of between $1E^{-70}$ and $1E^{-158}$).

This list is far from exhaustive in terms of potential iron specific ABC transporters found in bacteria, but an in-depth study into the full range found in the Roseobacters was outside the scope of this work.

2.2 Siderophore biosynthetic genes in the Roseobacters

There is remarkably little known about the genes encoding siderophores synthesised by marine bacteria. To our knowledge, there are no studies, of any type, on the biosynthesis of siderophores in the marine Roseobacters. This made the prediction of any possible siderophore biosynthetic genes in these bacteria tenuous at best.

Known genes from biosynthetic pathways for both catecholate- and hydroxamate-type siderophores were used to interrogate the products of the all the sequenced genomes of the Roseobacters, these are detailed in Table 2.2.

2.2.1 Homologues of vicibactin and aerobactin biosynthesis genes in the Roseobacters

Vicibactin of *Rhizobium leguminosarum* is a hydroxamate-type siderophore, and is synthesised from ornithine in a pathway of dedicated enzymatic steps (Heemstra *et al.* 2009). The translated protein products of the genes *vbsC*, *vbsG* and *vbsA* of *Rhizobium*, were each used to interrogate the Roseobacters, but no species contained even a moderate ($<E^{-25}$) homologue. Similarly, aerobactin synthetic enzymes (encoded by the genes *iucABCD*) from *Shigella boydii* yielded no homologues in the Roseobacters, with the exception of *Phaeobacter gallaeciensis* BS107, which had moderate homologues ($2e^{-48}$ and $4e^{-48}$) to IucA and IucC respectively. A single homologue ($3e^{-38}$) of *Shigella boydii* IucC was present in a different strain (*P. gallaeciensis* 2.10) of the same species.

2.2.2 Vibriobactin biosynthetic genes in the Roseobacters

Vibriobactin is produced by *Vibrio cholerae* during iron deficiency. Mutants in the biosynthetic pathway can no longer produce vibriobactin and show increased sensitivity to EDDA, as it removes any available iron from the growth medium (Wyckoff *et al.* 1997). The first dedicated step in vibriobactin biosynthesis in *V. cholerae* is the catalysis of 2,3-dihydro-2,3-dihydroxybenzoate to 2,3-dihydroxybenzoate by a vibriobactin-specific 2,3-dihydro-2,3-dihydroxybenzoate dehydrogenase, VibA. The final step in the vibriobactin biosynthetic pathway is catalysed by a non-ribosomal peptide synthetase, VibF. This step forms the complete vibriobactin from dihydroxyphenyl-5-methyloxazoline-norspermidine-2,3-dihydroxybenzoate and dihydroxyphenyl-5-methyloxazoline bound to VibF (Crosa and Walsh 2002). The protein sequences encoded by genes *vibA* and *vibF* of *V. cholerae* 0395 were used to interrogate all Roseobacter genomes as before, refer to Table 2.1.

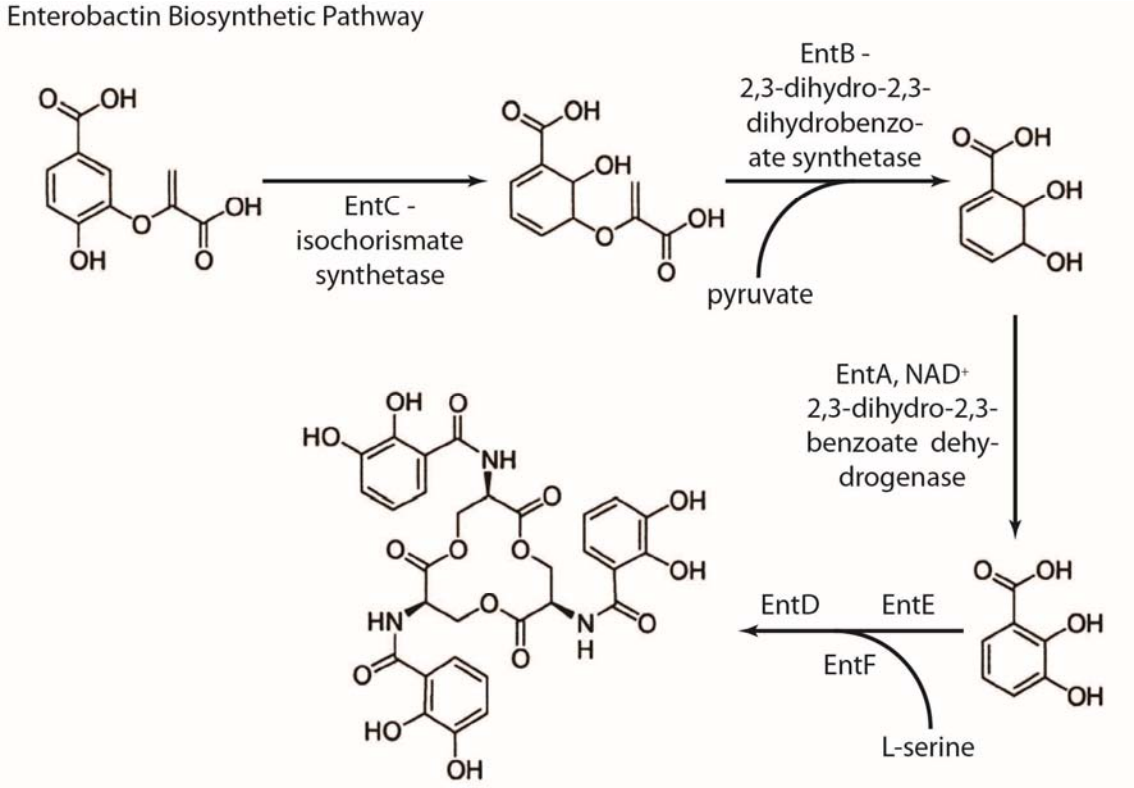
The closest homologue of *V. cholerae* 0395 VibF in the Rhodobacteraceae ($4e^{-53}$) was the Citreicella SE45 gene CSE45_4536, which is annotated as being 'enterobactin synthetase component-F'. A good homologue of this gene is found in four other Roseobacter genomes - *Phaeobacter gallaeciensis* 2.10 ($1E^{-91}$), *Phaeobacter gallaeciensis* BS107 ($2E^{-90}$), *Phaeobacter* sp. Y4I ($6E^{-69}$) and *Roseobacter* sp. MED193, which has two good homologues ($2E^{-91}$ and E^{-79}). There are 19 other Roseobacters genomes which encode moderate ($1E^{-30}$ – $1E^{-60}$) homologues of VibF of *Citreicella* SE45 (refer to Table 2.1).

Furthermore, the closest homologue of *V. cholerae* 0395 VibA in the Rhodobacteraceae was found in *Roseovarius nubinhibens* ISM ($1e^{-44}$), and is indeed predicted to be a 2,3-dihydro-2,3-dihydroxybenzoate dehydrogenase as expected. The Roseobacters were found to have 16 members which encode homologues of this gene, although not particularly well conserved – all were between $1E^{-25}$ and $1E^{-29}$. Crucially, of those 16 Roseobacters which have a homologue of VibA, 15 also had VibF, perhaps validating the presence of this, or at least a related, biosynthetic pathway in those strains.

2.2.3 Enterobactin biosynthesis genes in the Roseobacters

The iron-scavenging siderophore produced by *E. coli* and *Salmonella* is the catecholate enterobactin, also called enterochelin (O'Brien and Gibson 1970; Pollack and Neilands 1970). The biosynthesis requires several steps, beginning with the aromatic amino acid precursor chorismic acid (see Figure 2.2). This is converted to isochorismate by EntC, and then into 2,3-dihydro-2,3-dihydroxybenzoate by EntB, and finally into 2,3-dihydroxybenzoic acid (DHB) by EntA. A DHB moiety is joined with an amide linkage to a serine molecule by EntD, EntE, EntF and EntB, then three DHB-lysine molecules cyclise to form *iso*-enterobactin (Raymond *et al.* 2003).

Figure 2.2 The enterochelin biosynthetic pathway



The biosynthetic pathway of enterobactin, adapted from (Raymond et al. 2003).

The protein sequences of EntA, EntB, EntC, EntD, EntE and EntF of *E. coli* K-12 were used to interrogate the Rhodobacteriaceae, and the sequence of the most similar protein was used as a query in the Roseobacter genomes.

There is a homologue of EntA in *Paracoccus* sp. TRP ($9e^{-59}$), and when this was used, in turn, as a probe, homologues were found in 23 different strains of the Roseobacters, the most similar being in *Roseovarius nubinhibens* ISM ($1E^{-42}$). There were no homologues of EntB or EntC found in any of the Roseobacters, when searched either directly, or using *Paracoccus* species homologues as queries. In contrast, the presence of an EntD homologue was shown in several Roseobacters.

The putative translated products of both *entE* and *entF* were extremely well conserved in the Rhodobacteraceae, with the genome of *Paracoccus denitrificans* PD1222 encoding an EntE homologue (E-value of 0, gene locus: Pden_2386), and *Paracoccus* sp. TRP encoding an EntF homologue (E-value of 0, gene locus: PaTRP_010100004572). Given the conservation of these *E. coli* protein-coding genes in the Rhodobacteraceae, the resultant data from homology based searches of the Roseobacters was unparalleled when compared to the rest of this bioinformatic study. The

genome of *Citreicella* sp. SE45 has good homologues to both *entE* ($1E^{-133}$) and *entF* (E-value of 0) and also contains a homologue of *entA*, but lacks homologues to the *entB*, *entC* and *entD*.

2.3 Siderophore export and uptake in the Roseobacters

2.3.1 Enterobactin export genes in the Roseobacters

Export of enterobactin into the periplasm is facilitated by the protein EntS, which is a member of the major facilitator superfamily (MFS) of transporters. The closest homologue of this gene product in the Rhodobacteraceae is in *Jannaschia* sp. CCS1 ($3e^{-14}$), which although poorly conserved, is predicted to be a MFS-family protein. Homologues to this peptide sequence are only found in few Roseobacters - *Maritimibacter alkaliphilus* HTCC2654 ($5E^{-63}$), *Rhodobacterales bacterium* HTCC2255 ($2E^{-74}$), *Roseobacter denitrificans* OCh 114 ($2E^{-31}$), *Roseovarius* sp. 217 ($1E^{-30}$) and *Roseovarius* sp. TM1035 ($1E^{-26}$) – and it is certainly not impossible that these MFS polypeptides have function(s) other than siderophore export.

2.3.2 Aerobactin uptake genes in the Roseobacters

The uptake of iron-bound aerobactin, and indeed other hydroxamate-type siderophores by *E. coli* is mediated by a TonB dependent outer membrane receptor – FhuA, and then by the cognate ABC-type transporter FhuCDB (Forman *et al.* 2007). The translated products of the permease gene *fhuB* and ATPase gene *fhuC* have 'moderate' homologues ($1E^{-31}$ - $1E^{-60}$) in 21 of the Roseobacter strains, and indeed many of these strains (12) have multiple homologues to each of these genes (refer to Table 2.1). Four Roseobacter strains have 'good' homologues (>$1E^{-60}$) to both FhuB and FhuC, namely *Roseovarius* sp. 217, *Sulfitobacter* NAS-14.1, *Sulfitobacter* EE36 and *Pelagibaca bermudensis* HTCC2601, the latter of which is the only Roseobacter to also have a copy of the periplasmic binding protein gene *fhuD* ($6E^{-31}$).

2.3.3 Rhodochellin uptake genes in the Roseobacters

The Actinomycete *Rhodococcus jostii* RHA1 is known to synthesise a mixed catecholate-hydroxamate siderophore, rhodochellin. The biosynthetic genes for this siderophore have been described by Bosello *et al.* (2011). The first step from l-ornithine into l-δ-*N*-hydroxyornithine is catalysed by the monooxygenase, Rmo (Bosello *et al.* 2012), and a secondary structural pathway mediated by RhcB later adds the final module to complete the siderophore molecule (Bosello *et al.* 2011). The products of each of these two genes, *rmo*, and *rhcB*, were used to interrogate the Roseobacter genome sequences. Only homologues to RhcB were found in the Roseobacters, with 19 species having moderate ($1E^{-30}$ – $1E^{-60}$) homologues, and 6 species, namely, *Citreicella* SE45, *Phaeobacter gallaeciensis* 2.10, *Phaeobacter gallaeciensis* BS107, *Roseobacter* sp. GAI101, *Roseobacter* sp. MED193 and *Roseovarius* sp. TM1035, having good homologues ($7E^{-63}$ – $1E^{-135}$). *Roseobacter* sp. MED193 was found to have two well conserved homologues of RhcB ($1E^{-82}$ and $1E^{-67}$), although the best conservation was that observed for *Citreicella* SE45, with an E value of $1E^{-135}$.

2.4 Iron responsive regulators in the Roseobacters

To examine the presence of *known* iron-responsive transcriptional regulators in the Roseobacters, several, well characterised examples were used as queries.

2.4.1 Mur

Fur is the global Ferric uptake regulator originally identified in *E. coli* (Hantke 1981), and since shown to control iron homeostasis in a wide range of bacterial phyla. However, in the rhizobiales, Fur has become a “Mur”, and regulates genes in response to Mn availability (see Introduction).

Two well-studied Mur peptides are those of *Bradyrhizobium japonicum*, and of *Rhizobium leguminosarum*. These probes revealed the presence of convincing Mur homologues in the great majority of Roseobacter strains (Table 2.1). These are considered in more detail in Chapter 6, as are those (which are of more interest) that *lack* a Mur-like regulator.

2.4.2 Irr and RirA

Rhizobium does regulate ferric iron and haem uptake, and to do so, it uses the antagonistic action of two transcriptional regulators; the Fur-family Iron responsive regulator, Irr and the RRF-2 family Rhizobial iron regulator, RirA (Todd *et al.* 2002). Irr represses genes in Fe-depleted conditions and, conversely, RirA negatively regulates genes in the presence of iron (again, refer to Introduction). Consequently, the amino acid sequences of both RirA of *R. leguminosarum*, and Irr of *B. japonicum* were each used to search for homologues in the Roseobacters.

No Roseobacter genome contains a homologue of the protein coding sequence of *Rhizobium rirA* with a cut-off value < E^{-27}. In contrast, all but three of the Roseobacter genomes had a close homologue of Irr, these being *Phaeobacter* sp. Y4I, *Rhodobacterales bacterium* HTCC2083 and *Rhodobacterales bacterium* KLH11, the last of which also lacked a homologue of Fur/Mur and RirA.

2.4.3 IscR

The final Fe-responsive regulator examined in Table 2.1 was the Iron sulphur cluster Regulator, IscR, which regulates the biosynthesis of iron sulphur cluster in *E. coli* (Schwartz *et al.* 2001), and whose encoding gene is found directly 5' of the Fe-S biosynthesis *suf* genes in the α-proteobacteria - refer to the Introduction for more detail.

However, IscR has been lost in the Rhizobiales (Rodionov *et al.* 2006), and although the *suf* genes remain, these are regulated by RirA and Irr (Todd *et al.* 2005). When the translated peptide sequence of *iscR* of *E. coli* O104:H4 was used to interrogate the *Rhodobacteraceae* proteomes, the closest homologue was found in *Rhodobacteraceae bacterium* KLH11 ($9E^{-39}$). This protein was found to be well conserved in the Roseobacters, and most homologues were annotated as IscR, and were found upstream of the *suf* genes, as occurs in other bacteria. All the sequenced Roseobacters had a homologue of IscR of *Rhodobacteraceae bacterium* KLH11 at an E-value of between $1E^{-50}$ and $1E^{-75}$.

2.4.4 The Roseobacters likely do not use ferric reductases

There were no homologues found in any Roseobacter genome to any known characterised ferric reductase (the products of the *ferA, ferB / mtrA* and *mtrB* genes of *Paracoccus denitrificans*

/*Shewanella oneidensis*). However, YqjH, a possible ferric reductase from *E. coli* - see Miethke *et al.* (Miethke *et al.* 2011), was found in only one Roseobacter genome - *Oceanicola granulosus* HTCC2516 (gene locus OG2516_12819, 38% ID to YqjH). However, even using this *Oceanicola* polypeptide as a probe, no other convincing homologues were found in the Roseobacters.

2.4.5 The Roseobacters may not import ferrous iron

Table 2.1 also includes two characterised ferrous iron transporter genes, *feoA* and *feoB* from *E. coli* K-12. Ferrous iron transport in *E. coli* is switched on in response to anaerobic growth, to facilitate iron uptake during infection (Cartron *et al.* 2006). Strikingly, there were no close homologues of the FeoA and FeoB gene products in any sequenced Roseobacter genome. This may indicate that the Roseobacters always live aerobically and do not have access to ferrous iron; indeed, there are no reports of anaerobic growth of Roseobacters.

2.4.6 Other genes linked to iron

Also shown in table 2.1 are the genes *irpA* and *irpB* of *R. pomeroyi* DSS-3 (refer to Chapter 3 for a detailed discussion of these genes). Both appear to be under the control of a strongly iron repressed promoter in *R. pomeroyi* and so their distribution among the Roseobacters was of interest. As table 2.1 shows, the IrpA polypeptide exhibited a clear "present or absent" pattern, with 30 strains having very close homologues ($<1e^{-150}$) to IrpA of R. pomeroyi (SPO0086), with the remaining 7 strains lacking a polypeptide with a detectable IrpA-like polypeptide. The *irpB* (*SPO0087*) gene of *R. pomeroyi* encodes a putative membrane protein. Homologues to this peptide were found only in *Sulfitobacter* sp. EE-36 ($2E^{-56}$), *Roseovarius* sp. 217 ($6E^{-48}$), *Roseovarius* sp. TM1035 ($3E^{-49}$), *Roseobacter* sp. GAI101 ($8E^{-56}$), *Roseobacter* sp. MED193 ($7E^{-85}$) and *Roseobacter* sp. SK209-2-6 ($2E^{-86}$), and in all cases the corresponding gene was very close to the *irpA* gene.

2.7 Discussion

This bioinformatic study of the iron homeostasis genes in the Roseobacters has revealed both the diversity of genes present, and the striking differences between species.

The Roseobacters are a taxonomically distinct group of the Rhodobacteraceae, so it may be expected that they share some features in their ability to acquire and respond to iron. However, this survey has shown that different strains and species may use very distinct portfolios of genes for the import of this metal, probably as a result of repeated acquisition of genes by horizontal gene transfer and/or loss of genes, and crucially demonstrates that the Roseobacters are a collection of very different bacteria, from many different genera.

The distribution of the TBDR proteins with specificity for iron-bound molecules appears to reveal three evolutionary strategies within the Roseobacters, the generalist strategy, where some species have many TBDR homologues; the specialist strategy, where only one or two TBDR homologues are present; and the "unknown strategy" group, which appear to lack any TBDR homologues. These organisms may have iron receptors which fall into a yet uncharacterised class of TBDR proteins, or simply lack TonB-mediated transport, and therefore use an entirely new method of outer membrane translocation of iron. It would be of great interest to study the function of TonB homologues in the Roseobacters to help identify these proteins definitively. Furthermore, those strains which appear to not have TonB could use a novel TonB independent iron import system.

Synthesis of siderophores is an expensive process for bacteria, especially so if they do not recover these siderophores. However, if enough marine bacteria synthesise these molecules, and indeed enough iron-bound chelating molecules leach into the oceans from the land, then a strategy of having receptors for a wide range of these iron-chelators would be advantageous; just as having a receptor with high promiscuity for various iron-chelates would be advantageous.

However, if a bacterium were to remove iron from a chelator at the outer membrane, then transport the iron in a ferrous form, this would negate the requirement for a complex and presumably substrate limiting receptor. We see such a 'reduction linked uptake strategy' in Synechocystis sp. PCC 6803, where Fe-siderophore complexes are reduced at the outer membrane interface, allowing uptake of biologically available iron into the cell (Kranzler *et al.* 2011). Nevertheless, we do see several genes that may encode siderophore biosynthesis and indeed uptake in the Roseobacters, but the lack of functionally verified genes from marine bacteria, for either uptake or biosynthesis of siderophores demonstrates the clear gap in knowledge here which unfortunately limits this analysis.

The distribution of RirA and Irr is interesting, and may be indicative of the loss of function of RirA in particular within most Roseobacters – indeed this gene is not conserved across the α-proteobacteria. Irr was conserved in nearly all Roseobacters, and indeed the function of this peptide is examined directly in *R. pomeroyi* in Chapter 5.

IscR is highly conserved throughout the Roseobacters, and is likely the functional regulator of iron-sulfur clusters across this group –always being found upstream of the *suf* genes.

It is very clear that all bioinformatic predictions here will require direct work to validate them. The following chapters do go some way towards this, with regards to Fe and Mn uptake in *R. pomeroyi*, and indeed go further afield to the Roseobacters and beyond when looking at Mn uptake systems (see Chapter 6).

Chapter 3 - *in silico* study of putative iron regulated genes of *R. pomeroyi*

3.0 Introduction

The previous chapter described an *in silico* survey of all the genome-sequenced strains of the Roseobacter clade for their types of iron uptake systems, as deduced by the presence of genes whose products were known to be involved in Fe homeostasis in other types of bacteria.

In this chapter, and in those that follow, attention is focussed on one particular strain of the Roseobacters, namely *Ruegeria pomeroyi* DSS-3 (see Introduction). From the survey conducted above, *R. pomeroyi* DSS-3 was one of the unusual strains in that it lacked any discernible siderophore production systems and also had no genes that were predicted to encode an outer-membrane TonB-dependent receptor. Indeed, this was one of those 30 Roseobacter strains that appeared to lack a version of TonB itself. Therefore, it was of interest to determine how this strain obtained its iron.

Before embarking on direct experimental work on this topic in *R. pomeroyi* DSS-3, its genome was subjected to another round of *in silico* analyses, but this time with the focus being on *cis*-acting regulatory sequences which by comparison with known regulatory motifs, were likely to be the binding sites for iron-responsive transcriptional regulators.

As before, Rodionov *et al.* (2006) set the stage for these studies, having already predicted some of these motifs and their downstream target genes. As described in the Introduction, the mechanisms of iron homeostasis in the alpha proteobacteria are very different from those in many other bacterial phyla, including those that harbour such model bacteria as *E. coli, Bacillus, Pseudomonas* and many others, in which the Ferric uptake Regulator, Fur, is the pivotal global Fe-responsive transcriptional regulator (Stojiljkovic *et al.* 1994; Vassinova and Kozyrev 2000). Instead a limited number of lab-based studies, mainly on the Rhizobia, *Agrobactreium* and *Brucella* coupled with the *ab initio* bioinformatic predictions have shown the one of the key Fe-responsive regulators in the α-proteobacteria is Irr, which, although a member of the Fur super-family, is very different from Fur, *sensu stricto*, refer to the Introduction and (Hamza *et al.* 1998). In addition, some of the Rhizobia and their close relatives also have the transcriptional regulator RirA, which is a member of the Rrf2-

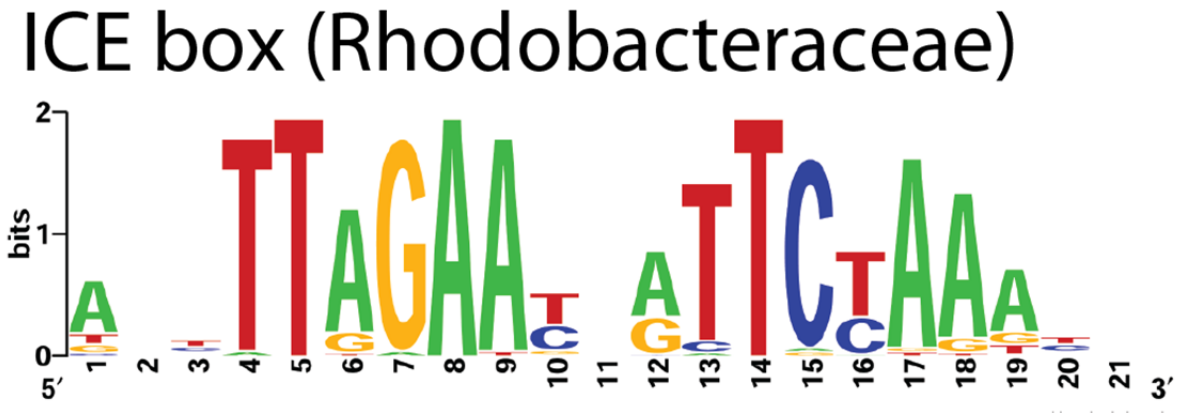
superfamily of regulators, very different in all ways from Fur, except in its overall role, which is to repress several genes involved in Fe acquisition in Fe-replete conditions (Todd *et al.* 2002).

Here we describe the distribution of two of these predicted regulatory, *cis* acting sequences in *Ruegeria pomeroyi.* These are (a) the ICE motifs, recognised by the Irr regulator and (b) the Iron-Rhodo (IR) boxes, whose corresponding transcriptional regulator has not been identified.

3.1.1 Irr and its target ICE sequences and genes in *Ruegeria pomeroyi*

Under Fe-depleted conditions (usually) the Irr polypeptide of several α-proteobacteria has been shown to bind to "iron control elements", repressing transcription of the downstream genes. These ICE boxes have a canonical sequence whose particular version in the Rhodobacteraceae is shown in Figure 3.1.

Figure 3.1 Logos of iron responsive regulator binding sites in *Ruegeria pomeroyi*



Logo of predicted iron responsive regulator binding motif, the ICE box. Reproduced from Rodoionov et al. (2006).

Inspection of the genome of *R. pomeroyi* DSS-3 revealed four convincing ICE motifs, situated near the predicted promoters of the genes that would be regulated by Irr (summarized in table 3.1). Significantly, several of these resemble those that have been shown to be Fe/Irr-regulated in other bacteria and are as follows.

Table 3.1 Genes with ICE boxes

Those genes with a predicted ICE motif are shown. Detailed are their predicted function, locus and name. The sequence and position relative to the translational start codon of each ICE motif are also shown.

Gene locus / name	Predicted function	ICE box sequence	Position
SPO3842 mbfA	membrane-bound ferritin	AtcTTgGAATCATTCTAAAtT	-33 bp
SPO0382 fssA	hypothetical Fe-S scaffold protein	tcTTTAGAAcCgTTCcAAAgT	-75 bp
SPO2025 iscR-sufSBCD	Fe-S cluster assembly	AtcTTAGAATGgTTCTAAgtc	-102 bp
SPO0330 ccpA	cytochrome c peroxidase	AtgTTAGAATGATTCTAAtCg	-73 bp

3.1.2 SPO3842, MbfA

This 324 amino acid polypeptide is ~70% identical to the corresponding gene product in the rhizobia, where it was first identified (Rudolph *et al.* 2006; Todd *et al.* 2005). The *mbfA* gene has been shown to be expressed at higher level in Fe-replete conditions, under the control of Irr in *Rhizobium, Brucellla, Bradyrhizobium* and, very recently, in *Rhodobacter sphaeroides*, the first published example in the Rhodobacterales (Peuser *et al.* 2012). MbfA has an unusual domain constitution – an N-terminal half with a ferritin-like fold within a domain that resembles a Rubrerythin electron transporter and a C-terminal half that is strongly predicted to be in the inner membrane – hence the term membrane-bound ferritin. A similar C-terminal domain is found in the CCC1 protein of yeast, where it also has a link with iron, being a trans-membrane protein that is required to accumulate manganese and iron in the vacuole of this fungus (Li *et al.* 2001).

MbfA is very much a signature polypeptide for the α-proteobacteria, being found in nearly all genome-sequenced strains of this sub-phylum, but only very rarely in other clades.

3.1.3 SPO0382 FssA

A second *Ruegeria pomeroyi* gene that has an ICE box in its promoter region is *SPO0382,* whose product is 63% identical to FssA (iron sulfur scaffold) of *Rhizobium leguminosarum.* This was first described by Todd *et al.* (Todd *et al.* 2006) who noted that is very similar (48% identical) to a eukaryotic protein, which is termed Nfu1 in yeast and HIRIP5 (HIRA-interacting protein 5, the HirA protein being a transcriptional regulator of histone gene transcription) in mammals. These two eukaryotic proteins HIRIP5 act as scaffolds to transfer FeS clusters to different acceptor proteins (Lorain *et al.* 2001). As with MbfA, predicted orthologues of FssA protein are confined to the α-proteobacteria, although there is lower-level sequence similarity to parts of the NifU protein, another scaffold protein that delivers FeS clusters to nitrogenase (Agar *et al.* 2000).

3.1.4 SPO0330; CcpA

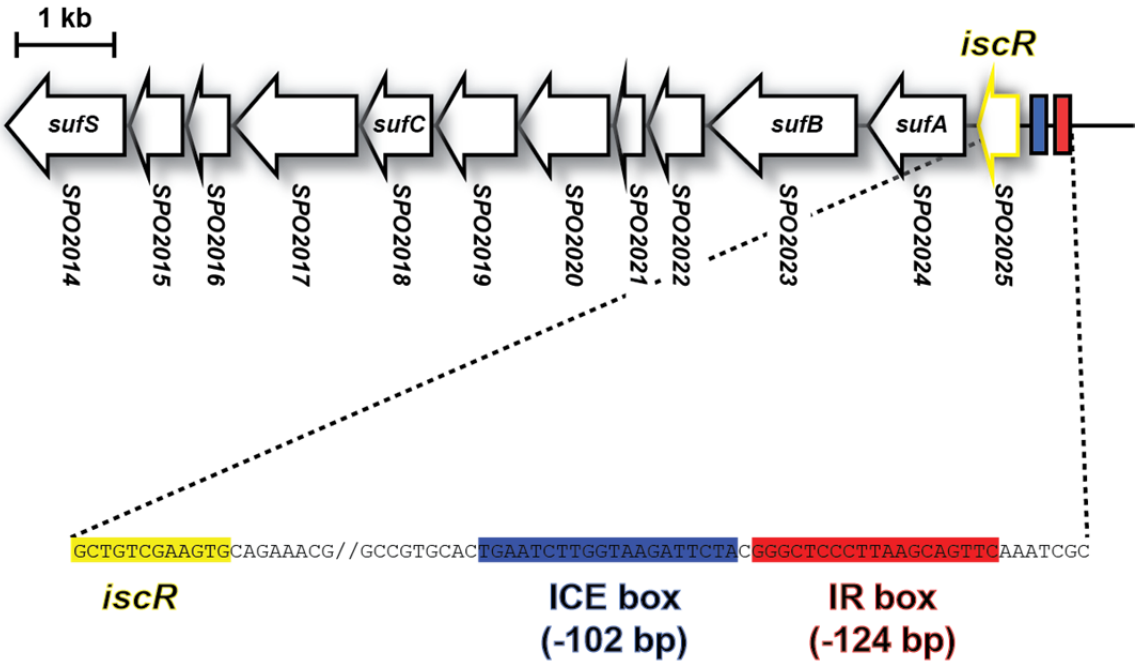
CcpA is a widely distributed cytochrome-c peroxidase enzyme (pfam03150), which contain two haem groups, using the iron centres as cofactors to reduce H_2O_2 to water (reviewed by Torres and Ayala, 2010). Predicted orthologues (at least 70% identical) occur in a wide range of Proteobacteria, and in some cases, the regulation of the corresponding gene has been studied. For example, *ccpA* of *Pseudomonas stutzerei*, it was found to be under the control of Fnr, an O_2-sensing transcriptional regulator (Vollack *et al.* 1999). Homologues of *ccpA* in the Rhizobiaceae and Rhodobacteraceae were shown to likely be under the control of Irr (Rodionov *et al.* 2006).

3.1.5 SPO2025–SPO2014*; – the* iscR-suf *operon*

As shown in Figure 3.2, the *Ruegeria pomeroyi* genome has a group of 12 contiguous genes that are preceded by an ICE motif. Based on detailed studies in several other bacteria, these are the *suf* genes, which are responsible for the synthesis of FeS clusters, plus the promoter-proximal gene, *iscR,* which encodes a transcriptional regulator of the Rrf2 family that regulates this operon in response to iron availability (Bandyopadhyay *et al.* 2008). The *suf* operon of several α-proteobacteria have ICE boxes in their *cis*-acting regulatory DNA (Rodionov *et al.* 2006) and it had been shown directly that the *suf* operon of *Rhizobium leguminosarum* is regulated by Irr, in response to Fe availability.

It was noted by Rodionov *et al.* (2006) that there was another potential regulatory motif, termed an IR box, which was predicted to be the site at which the IscR regulator bound. Interestingly the *suf* operon of *Rhizobium* is also under dual control, being repressed under Fe-depleted conditions, but, when the cells were grown with Fe sufficiency, the RirA regulator exerted a level of repression, due to its interaction with its cognate binding (IRO) motif that was immediately downstream of the ICE box (Todd *et al.,* 2006).

Figure 3.2 The *iscR-suf* operon of *R. pomeroyi*

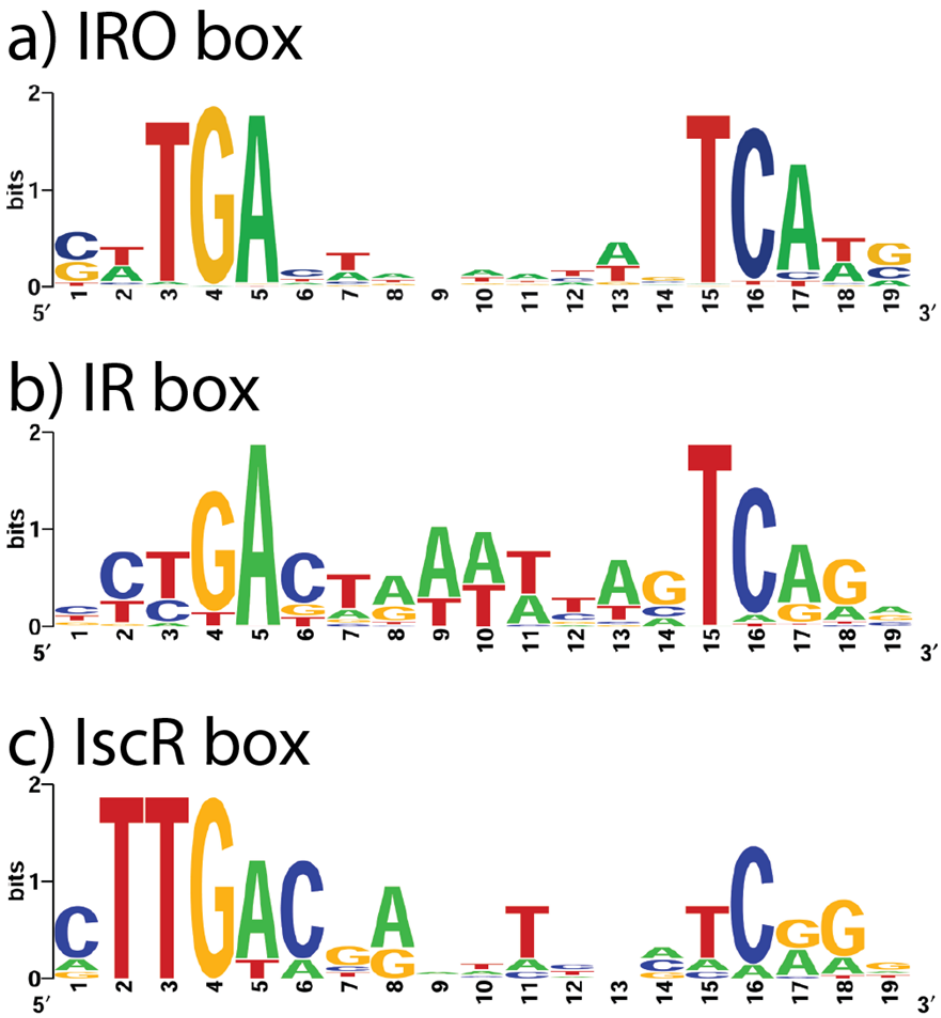


Representation of the* R. pomeroyi iscR-suf *genes (*SPO2014-SPO2025*). Zoomed region shows position of IR (red) and ICE (blue) boxes 5' of* iscR*, whose 5' coding sequence is shown in yellow.

3.2.1 Iron-Rhodo (IR) boxes

The second set of conserved, potential *cis* acting regulatory sequences that might respond to Fe availability were termed Iron-Rhodo (IR) boxes by Rodionov *et al.* (2006). The consensus IR box had some similarity to that of the IRO box recognition site of the previously identified RirA transcriptional regulator in the rhizobia and, to a lesser extent, to the motif termed IscR$^{\alpha}$-box-I, which is the predicted IscR-binding site for the IscR of the Rhodobacterales (see Figure 3.3).

Figure 3.3 Logos of iron responsive regulator binding sites in *Ruegeria pomeroyi*



Logo representations of predicted iron responsive regulator binding motifs. a) IRO box, predicted binding motif of RirA, generated from DNA loci found in four Rhizobiaceae, two Mesorhizobium species, Brucella, and Bartonella. b) Iron-Rhodo box found in the Rhodobacteraceae, and c) IscR box from the Rhodobacteraceae. Reproduced from Rodoionov et al. (2006).

A total of six transcriptional units, together with their predicted IR sequences are listed in Table 3.2, and are as follows:

Table 3.2 *Ruegeria pomeroyi* genes with predicted IR motifs

Those genes with a predicted IR motif are shown. Detailed are their predicted function, locus and name. The sequence and position relative to the translational start codon of each IR motif is also shown.

Gene locus / name	Predicted function	IR box sequence	Position
SPO0086 irpA	iron-regulated protein A	aCTGACaAATTTAGTCAGA	-89 bp
SPO3139	similar to truncated hemoglobins	TCcGACTttAacAGTCgGA	-32 bp
SPO3287 fbpA	periplasmic binding protein	I cCcGACTgAAaTAaTCAGt II atTGACTAtTTcAGTCgGA	-74 bp -25 bp
SPO0789 hemP	haemin uptake	ggcGACaAAAaTAGTCAGg	-100 bp
**SPO2025 iscR -sufSBCD*	Fe-S cluster assembly	ctTGACgAATTcccTCgGg	-141 bp
**SPO3288 fbpB*	permease	TCcGACTAAAcTgGTCgat	-39 bp

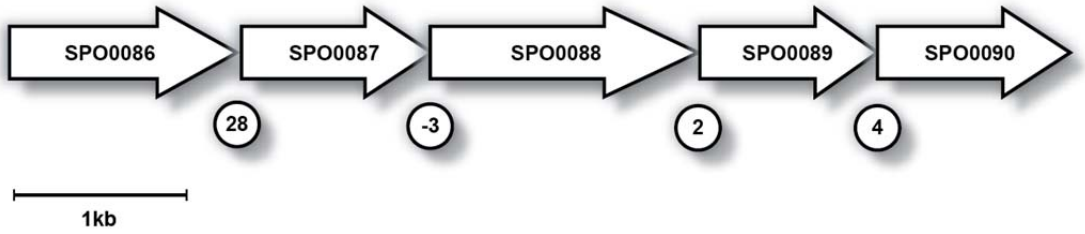
3.2.2 SPO0086 - irpA

The *SPO0086* gene is the promoter proximal gene of a strongly predicted 5 gene operon, *SPO0086 – SPO0090* shown in Figure 3.4 below. Of the polypeptides that are similar in sequence to the *SPO0086* gene product, the one that is, *a priori,* of most interest is that of *Synechococcus elongatus* PCC6301 (previously strain PCC7942) gene locus: syc0095_d (34% identical; $1e^{-53}$). This polypeptide had been termed IrpA, because it was shown to be an iron-regulated-protein, mediated by the Fur transcriptional regulator and which was involved in iron uptake in these cyanobacteria (Reddy *et al.* 1988).

More broadly, the IrpA polypeptides are membrane-bound members of the M75 family of peptidases (Pfam cl09159), as first identified in *Pseudomonas aeruginosa* (Fricke *et al.* 1999). The IrpA-like polypeptide from *P. aeruginosa* PA4370 can cleave radiolabelled insulin, and was therefore

the founding member of the M75 family of proteins - the insulin cleaving metallopeptidases (ICMP), or imelysins, which were thought to bind to zinc. A functional and structural study of two groups of imelysin-like proteins was performed by Xu *et al.* (2011) who suggested that these proteins may act as a scaffold for iron uptake complexes to form on the outer membrane. Recently, a novel iron transporter EfeUOB was identified and characterised (Cao *et al.* 2007; Rajasekaran *et al.* 2009; Rajasekaran *et al.* 2010). Interestingly the 250 C-teminal residues of the EfeO protein was shown to contain an imelysin-like domain, the other half of this protein being a putative iron binding cupredoxin domain, which might bind iron (Rajasekaran *et al.* 2010).

Figure 3.4 *SPO0086-SPO0090* Operon Map



The SPO0086-SPO0090 genes of R. pomeroyi (arrows) likely form a single transcriptional unit, with small intergenic gaps shown as circled numbers of base pairs. Scale is indicated by 1 kb bar.

Close homologues of the IrpA of *Ruegeria* pomeroyi (termed IrpA^{RP}) are found throughout all divisions of the proteobacteria, with >250 homolgues with greater than 50% identity. Perhaps significantly, the first ~25 amino acids is sometimes absent from homologues of IrpA^{RP} when aligned (not shown). Indeed, when the IrpA^{RP} sequence was used as a query with SignalP [available at: http://www.cbs.dtu.dk/services/SignalP/] (Petersen *et al.* 2011), this program strongly predicted (90% chance) an N-terminal signal peptide that would be cleaved at position 22.

Furthermore, Irp^{RP} is strongly predicted to be localised in the outer membrane when analysed with psortb [available at: http://www.psort.org/psortb/index.html] (Yu *et al.* 2010), with a score of 9.93 (a value >7.5 is the cut-off value with this tool). The predicted topology was examined, using the trans-membrane domain prediction software Pred-TMBB [http://biophysics.biol.uoa.gr/PRED-TMBB/] (Bagos *et al.* 2004), which indicated that IrpARP has an extracellular loop, flanked by two transmembrane domains. It is unclear why a usually soluble M75 protein would be present in the outer membrane, but IrpA^{RP} may represent a significant evolution away from the canonical examples

of this peptide family. Furthermore, IrpA^{RP} does contain a putative metal binding site – HxxE, at position 182 of the amino acid sequence.

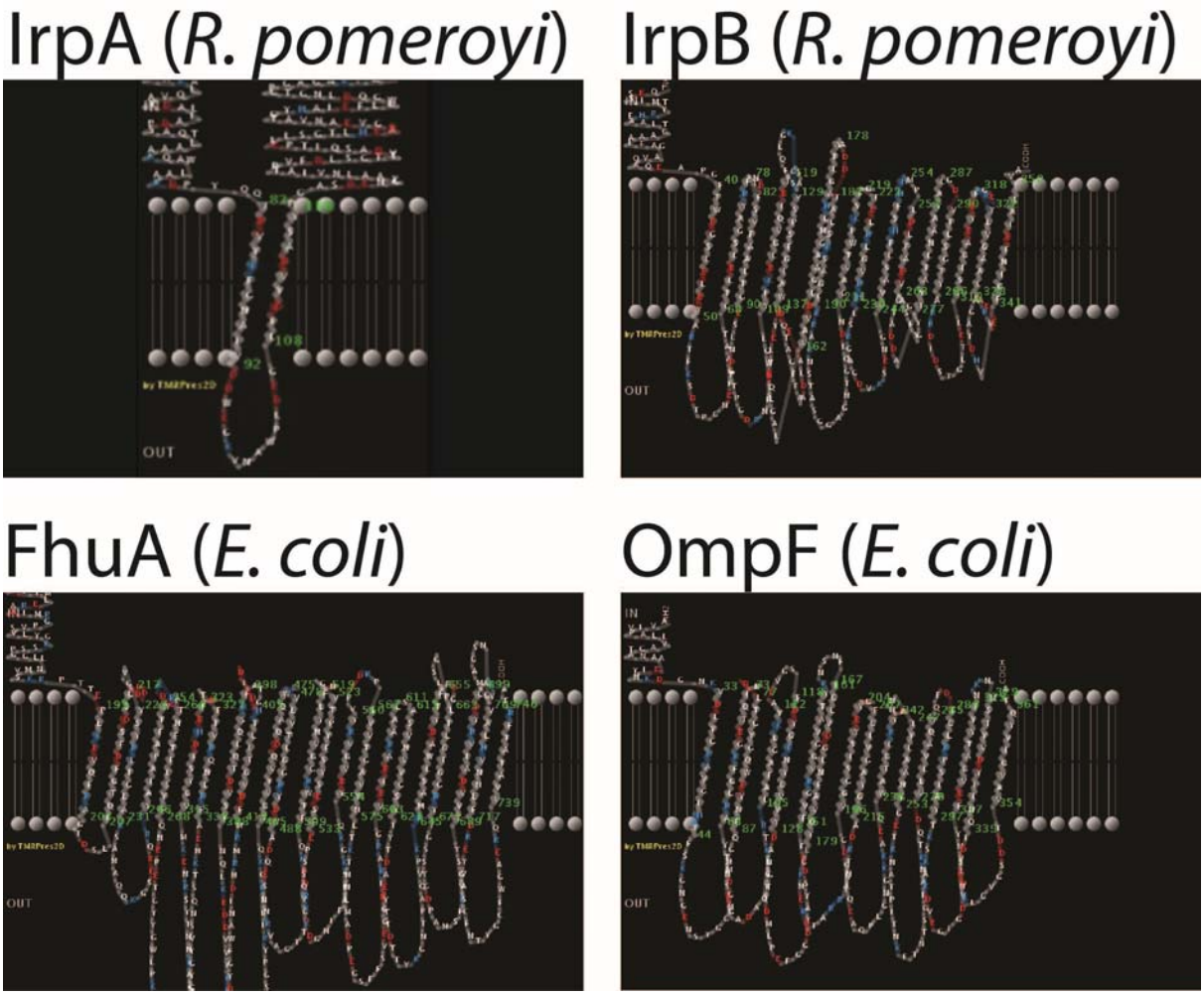
Of those imelysin-type proteins that have been functionally linked to iron uptake, the imelysin homologue in *Pseudomonas aeruginosa*, IcmP (gene locus - PA4370) was Fur-regulated (Cornelis *et al.* 2009). There is also a homologue of IrpA^{RP} in *Vibrio cholerae* VC1264, which has two Fur boxes in its promoter region, and is highly regulated by both Fur and iron (Mey *et al.* 2005). And, of course, the eponymous, original, IrpA of *Synechococcus* was identified on the basis of its response to Fe availability.

3.2.3 SPO0087 – irpB

The *SPO0087* gene product has no known domains and its function is unknown. In contrast to the very widespread range of IrpA homologues in the NCBI data base, there are very few (14) homologues of the SPO0087 gene product, even when a relaxed threshold (<4e^{-08}) was used, with seven of these being in other Roseobacter strains. (See table 2.1). It is also extremely poorly represented in the GOS marine metagenome data base, with only 5 homologues with E values < 0.01. It was noted, though, that the gene *MICA_2042* from the predatory 'vampire' bacterium *Micavibrio aeruginosavorus* ARL-13 (Wang *et al.* 2011) encodes a homologue of IrpB (30% identity, 8e^{-21}) and that this gene may encode the periplasmic protein of a suggested manganese transporter.

The IrpB of *R. pomeroyi* is predicted to be in the outer membrane (psortb, >7.5), and to have a signal peptide (SignalP). Furthermore, Pred-TMBB predicts 16 trans-membrane helices, and a cytoplasmic, n-terminal 'plug' domain as shown in Figure 3.5 below. Indeed, IrpB is not dissimilar to the classical beta-barrels of the TonB-dependent receptors (Locher *et al.* 1998) or the outer membrane porin OmpF (both shown in Figure 3.5 below). However the IrpB polypeptide has no sequence similarity to either of these types of outer membrane polypeptides, so, if this general function has any validity, IrpB would have to represent a wholly new class of porin molecules.

Figure 3.5 IrpA, IrpB, OmpF and FhuA modelled in the outer membrane



The membrane architecture of IrpA and IrpB, of Ruegeria pomeroyi and FhuA and OmpF of E. coli DH1 as predicted using Pred-TMBB (Bagos et al., 2004).

3.2.4 SPO0088

This gene encodes a hypothetical protein, with 2 cytochrome C-like domains (DUF1111 [pfam06537]), but It is predicted to localise to the cytoplasmic membrane (10.0 in psortb). There are close homologues in many alpha-Proteobacteria (including 33 of the Roseobacter strains) where for example, the *RSKD131_2939* of *Rhodobacter sphaeroides* KD131 (61% identity, E-value = 0), is adjacent to 2 bacterioferritin genes and an M75 imelysin homologue of $IrpA^{RP}$.

3.2.5 SPO0089

The *SPO0089* gene product is also a member of the imelysin group of M75 family peptidases and, indeed, is 31% identical to the *SPO0086* product (see above) and 25% identical to the experimentally characterised IrpA of *Synechoccus.* Its closest match (56%) was to a gene (*SL1157_1932*) in *Silicibacter lacuscaerulensis* ITI-1157, and most of the genome-sequenced Roseobacter strains contain homologues with ~50% identity to the *SPO0089* gene product.

3.2.6 SPO0090

Finally, in this operon, the product of *SPO0090* is also a domain of unknown function, although it is strongly predicted {by tatP: (Bendtsen *et al.* 2005)} to contain a TAT export signal (see review by Palmer and Berks 2012), with the mature protein being located in the membrane.

When the layout of the genes in other bacteria that encoded homologues of the *Ruegeria pomeroyi SPO0086 – SPO0090* was examined, it was striking how similar was their synteny, even in distantly related bacterial strains. Thus, very similar arrangements were seen in members of the Alteromonadales (28 taxa), Vibrionacaea (14 taxa), Pseudomonadales (29 taxa), Oceanospiralles (4 taxa) {all gamma-proteobacteria}, Comamonadaceae (10 taxa) {betas}. And, outside the Proteobacteria, homologues of both *SPO0086* and *SPO0088* are found as adjacent genes in several strains of the Cyanobacteria (37 taxa), the Bacteroides/Chlorobi (36 taxa, the Spirochaetales (18 taxa) and finally the Chlamydiae/Verrucamicrobia (18 taxa).

It was noted that the γ-proteobacterium *Vesicomyosocius okutanii*, an intracellular endosymbiont of the deep-sea clam, and which has a small (<1.1 Mb) genome, has a predicted operon that comprises, in order from the promoter: a homologue of *SPO0086*, then *SPO0088*, followed by two hypothetical genes, then a multicopper oxidase, and finally, an iron ABC transporter, including a homologue (36 % identical) of *SPO3288*; this points to a role in Fe transport for this operon.

Furthermore, all sequenced genomes of the Rhizobiales, and both *Rhodobacter sphaeroides*, and *Ruegeria* TM1040 contain all but one (*SPO0087*) of the members of the *SPO0086* - *SPO0090* operon. However, these all have one or more genes in the position occupied by *SPO0087 in Ruegeria pomeroyi;* in the Rhizobiales there is a single gene that encodes a multicopper oxidase, and in both

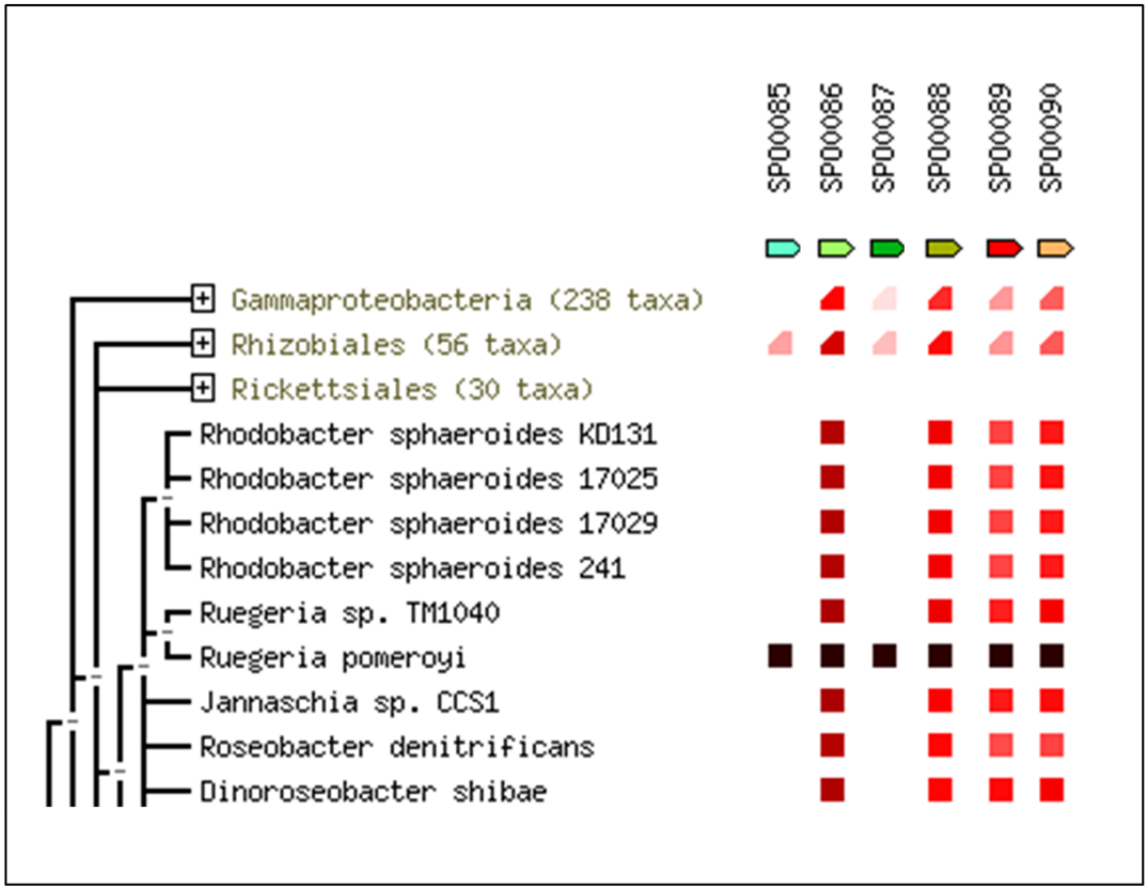
Rhodobacter and *Ruegeria* TM1040, there are two genes which encode bacterioferritin (reviewed in Andrews 1998; Carrondo 2003).

We also noted that the genome of *Roseobacter denitrificans* contains a homologue (74 % identical at the amino acid level) of *SPO0086.* Perhaps significantly, this is adjacent to a gene that encodes a predicted, FbpB-type (see below), permease of an ABC transporter for Fe uptake.

Taken together, the *SPO0086* – *SPO0090* operon of *Ruegeria* appears to have several suggested and ratified links as judged by the predicted functions of the homologues of the various gene products. It is also striking that several of the gene products are associated with the bacterial membrane(s), again pointing to a possible role in Fe transport.

The preservation of this cluster of genes in a range of bacteria suggests that their products function co-ordinately, though the role of the special case of *SPO0087* is certainly not clear.

Figure 3.6 STRING 9.0 Co-occurance analysis of *SPO0086-SPO0090*



Co-occurrence analysis of SPO0086 to SPO0090 reveals the presence of a homologue of SPO0085 in those species and taxa shown. The darkness of squares indicated the quality of similarity, black being 100%, fading from dark red to light pink as similarity diminishes. Analysis was performed using STRING 9.0 [http://www.string-db.org/].

3.2.7 SPO3139 – *A truncated haemoglobin protein*

The product of the gene *SPO3139* is a member of the family of O_2-binding homo-dimers that are widespread in bacteria and eukaryotes, but its function is unknown. Significant homologues (>30 % identity) are found in most other Roseobacters. The function of this gene is not known in any of the bacteria in which it has been found, though its general predicted function, as a polypeptide that binds O_2 is consistent with its being regulated in response to Fe availability.

3.2.8 SPO0789- hemP

This gene encodes a very small (50 amino acids) polypeptide, that resembles the HemP polypeptide of *Escherichia coli*, which had been shown to be required for the uptake of haeme in that species, and to be regulated by Fur, in response to Fe availability (Stojiljkovic and Hantke 1992). There is a motif homologous to an IR box located 100 bp upstream of the *hemP* translational start. The *hemP* gene in *R. pomeroyi* is found as part of a two gene (predicted) operon, the other member, *SPO0790*, encodes a hypothetical protein found in a few Roseobacter genomes. However, *hemP* is only present in *R. pomeroyi*, and not in any other Roseobacters. A close homologue of HemP was found in *Rhodobacter sphaeroides* (64 % identity), where a recent microarray study showed that this gene was ~5-fold induced by low iron, and deregulated (~15-fold) in a Fur^- background (Peuser *et al.* 2011). This Fur homologue is described as a Fur/Mur, regulating both Fe and Mn uptake in *Rhodobacter* (Peuser *et al*. 2011).

3.2.9 Components of an iron specific ABC-class transporter – FbpA and FbpB

There are two adjacent, convergent transcribed genes, *SPO3287* and *SPO3288,* each of which is preceded by a convincing IR sequence (Figure 3.7). These two genes are strongly predicted to encode the periplasmic binding protein and the permease of an ABC-type transporter, each of these polypeptides being particularly similar to those that are involved in iron uptake in many other bacteria – hence their names of ferrous binding proteins (Fbp). Close homologues of these two gene products not only occur in all the Roseobacters (see Table 2.1) but in a very wide range of other bacteria many different phyla (proteobacteria, Firmicutes, Cyanobacteria, for example). Not unexpectedly for Fe uptake polypeptides, the expression of the *fbp* genes has been shown to be repressed in Fe-replete bacteria (for example *Vibrio cholerae* (Mey *et al.* 2005), *Sinorhizobium meliloti* (Chao *et al.* 2005) and *Rhizobium leguminosarum* (Todd *et al.* 2005; Todd *et al.* 2002)), and this has been shown to be mediated by the Fur transcriptional regulator in *V. cholerae*, and by RirA in *Rhizobium* and *Sinorhizobium*.

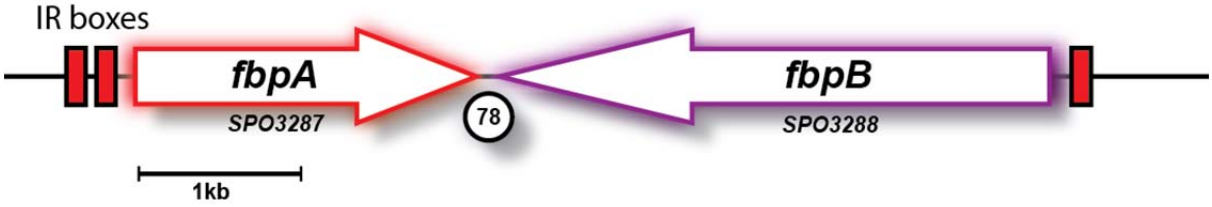
The genome of one species, *Vibrio cholerae* O1 biovar El Tor str. N16961, encodes good homologues of *fbpA* (40% identity) and fbpB (41% identity), plus *SPO2689* (40% identity). These three genes, *VC0608*, *VC0609* and *VC0610*, are all transcribed unidirectionally, and are identified as *fbpABC* in this strain. There is a sequence homologous to the canonical Fur box upstream of *fbpA*, and indeed this

gene has been shown to be negatively regulated by both iron, and Fur (Mey *et al.* 2005). The subsequent genes *fbpBC* must be transcribed from a second promoter, as their expression was unaffected by iron or Fur (Mey *et al.* 2005). The function of these genes were verified by Wyckoff *et al.* (2006), where they showed that cloned *V. cholerae fbpABC* is able to complement the growth defect of an iron uptake deficient strain *S. flexneri* (strain SM193w). Wyckoff and colleagues also showed that the uptake of ^{59}Fe into SM193w cells increased 6-fold when the cloned *fbpABC* genes were present. Intriguingly, they also show that iron deficient growth of an *E. coli* $TonB^-$ $EntF^-$ strain (ARM100) was enhanced when the cloned *Vibrio fbpABC* genes were introduced (Wyckoff *et al.* 2006). This is especially interesting given that another FbpA homologue in *Neisseria shayeganii* 871[1] (locus *HMPREF9371_0466*, 39% identity to FbpA of *R. pomeroyi*) is possibly extracellular. Homologues of FbpA are present in all pathogenic strains of *Neisseria* (Ferreiros *et al.* 1999) and have been shown to bind to iron (Zhu *et al.* 2003). Ferreiros *et al.* (1999) also show that FbpA is antigenic and subsequently that parts of the protein have an extracellular presence through the outer membrane.

Although *R. pomeroyi* FbpA and FbpB are similar in sequence to other Fbp polypeptides, they have two rather unusual features, compared to the canonical arrangement of the *fbp* genes elsewhere. In most bacteria the genes that encode all three components of the Fbp transporter are contiguous and co-transcribed. Clearly this is not the case here, where *fbpA* and *fbpB* are both in single gene transcriptional units. Furthermore, there is no nearby gene that corresponds to *fbpC,* which encodes the ATPase cassette that is a signature of ABC transporters.

[1] misannotated as an ATPase of the FbpABC transporter. The translated product of *HMPREF9371_0466* has an E-value of 0 to the characterised FbpA of *Neisseria weaveri* ATCC51223 and *Neisseria weaveri* LMG5135.

Figure 3.7 Arrangement of *fbpA* and *fbpB* genes in *R. pomeroyi*



Arrangement of the genes SPO3287 (fbpA) and SPO3288 (fbpB) in the genome of R. pomeroyi; the positions of IR boxes are shown as red squares. The intergenic gap of 78 bp is indicated, and scale is shown by the bar marked 1kb.

In an attempt to identify the cognate ATPase of this transporter in *Ruegeria pomeroyi*, the amino acid sequence of a *bona fide* FbpC was used to interrogate the deduced proteome of this strain. The closest matches were to *SPO2689*.

Furthermore, STRING 9.0 neighbourhood analysis was performed using FbpA and FbpB of *R. pomeroyi* as query proteins. This analysis confirmed the presence of FbpAB arranged as a potential transcriptional unit in many phyla of bacteria. In many species, homologues of genes encoding FbpA and FbpB had a third gene present, *fbpC*. This gene was in the same orientation as *fbpA* and *fbpB* indicating that it may be part of the same transcriptional unit. This pattern was observed throughout the proteobacteria, and even extended further from this taxonomic group, although with decreasing certainty as the similarity between proteins decreased with evolutionary distance; this gene was always predicted to be homologous to *SPO2689* of *R. pomeroyi*.

3.3.1 Concluding comments

These *in silico* searches of the *Ruegeria pomeroyi* have extended those of Rodionov et al (2006). We can conclude that many of those genes predicted to be under the control of iron responsive regulatory motifs are indeed likely to be involved in Fe uptake and/or metabolism or are at least deduced to be so. The likely iron homeostasis system of *R. pomeroyi* involves a large set of genes, including probably transporters, iron storage proteins and transcriptional regulators. However, some of the genes discussed above remain a mystery, such as the *irp* genes, and the seemingly incomplete

fbp transporter. Indeed, homologues of many of the predicted iron-regulated genes discussed above have been shown to be regulated by iron in other bacteria, either via unknown means, or by cognate iron responsive regulators such as Fur and RirA and Irr.

Although useful, bioinformatic studies need to be confirmed, or otherwise, by direct experimental work. Such is the material in the remainder of this thesis, in which the roles and regulation of some selected genes is described and, at the end, by a pan-genomic, microarray investigation of *R. pomeroyi*.

Chapter 4 - *in vivo* studies on iron uptake in *R. pomeroyi*

4.0.1 Introduction

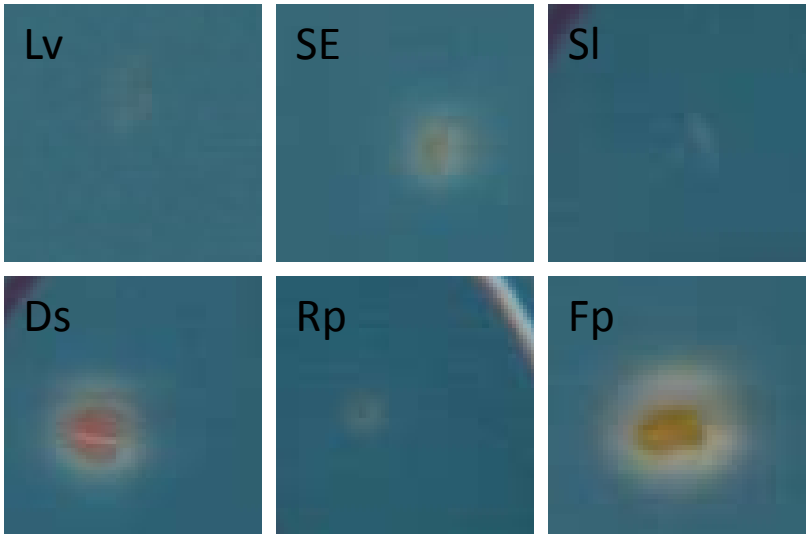
As shown previously, several potential iron homeostasis genes were identified, *in silico*, for *R. pomeroyi*. However, this strain appears to lack any known outer membrane transport system for iron, and does not appear to be able to synthesise siderophores. Also, the *fbp* genes of *R. pomeroyi* appear to be incomplete and are arranged in an unusual orientation. The following experimental work explores these facets of this marine bacterium.

4.1.1. R. pomeroyi *does not produce siderophores*

The bioinformatic interrogations in Table 2.1 predicted that *R. pomeroyi* DSS-3 does not appear to be able to synthesise siderophores, nor does it possess the necessary receptors for siderophore uptake or the energy conduit TonB. This was tested directly, using the chrome azurol sulphonate (CAS) assay for siderophore production (Schwyn and Neilands 1987). When complexed with Fe^{3+}, CAS agar is blue in colour, but this turns orange when the iron is chelated by a molecule with higher affinity than CAS, such as a siderophore. Importantly, this assay is independent of the chemical class of siderophore and can be readily adapted to microbes growing on solid media, in which case, colonies of siderophore-producing strains are surrounded by orange halos.

As seen in Figure 4.1, *Ruegeria pomeroyi* DSS-3 failed to make such an orange halo, nor did some other Roseobacter strains (Petursdottir and Kristjansson 1997; Van Trappen *et al.* 2004) that were also examined (Figure 4.1). In contrast, *Fulvimarina pelagi* strain HTCC2506, which is in the closely related Rhizobiales family of α-Proteobacteria, did make a pronounced orange halo on CAS medium. Another strain of the Rhizobiales, *Dinoroseobacter shibae* DFL-12 (Biebl *et al.* 2005) also produced a small CAS halo.

Figure 4.1 Siderophore production by different strains and species of the Roseobacter clade



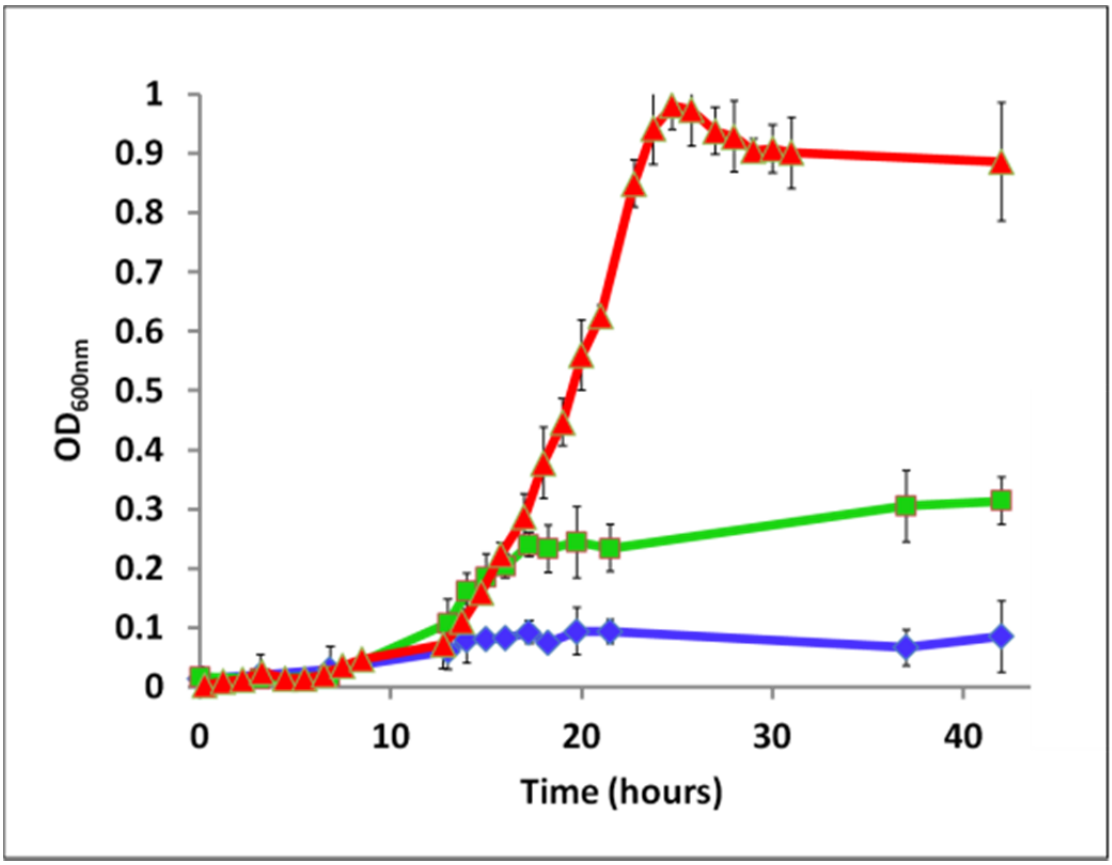
Cells from single colonies of a selection of Roseobacter strains were picked to MBM minimal medium with CAS and 5mM $FeCl_3$ and incubated at 28^0C for 4 days before scoring for the orange halo that indicates siderophore production. Lv = Loktanella vestfoldensis SKA53, SE = Sulfitobacter EE36, Sl = Silicibacter lacuscaerulensis ITI-1157, Ds = Dinoroseobacter shibae DFL-12, Rp = Ruegeria pomeroyi DSS-3, Fp = Fulvimarina pelagi.

4.1.2 Iron deficiency limits growth of R. pomeroyi

Since *R. pomeroyi* does not produce siderophores, and appears to lack an identifiable means of outer membrane iron transport, it was of interest to examine its iron requirement for growth, something that had not been previously done for *R. pomeroyi* or indeed, any strains of Roseobacters. Therefore, *R. pomeroyi* DSS-3 (a rifampicin resistant derivative of strain J470) was grown in minimal MBM media, containing 500 nM or 20 µM $FeCl_3$ respectively, and in MBM with no added iron.

As shown in Figure 4.2, *R. pomeroyi* has an absolute requirement for Fe for growth and responds to levels as high as 20 µM. Higher concentrations did not enhance growth rate or final cell density (data not shown). In comparative experiments with another bacterium, *Rhizobium leguminosarum*, whose Fe homeostasis has been studied in detail (summarised in Crosa *et al.* 2004), a similar pattern was seen. Thus, *R. pomeroyi* is not exceptional in terms of its need for a supply of Fe for its ability to grow and must therefore have an effective system for capture of this metal.

Figure 4.2 Growth of *R. pomeroyi* in MBM with iron limitation



R. pomeroyi cells were grown in MBM with no added iron (BLUE line), with 0.5 µM $FeCl_3$ (GREEN line) or 20 µM $FeCl_3$ (RED line). Triplicate cultures were incubated at 28°C, shaking at 200 rpm. OD_{600nm} values with standard errors are shown.

4.1.3 The fbp *iron transport genes of* R. pomeroyi

The only genes that were strongly predicted *in silico* in the *R. pomeroyi* genome sequence were the adjacent *SPO3287* and *SPO3288*, whose products were similar to two of the key components that form Fbp iron ABC-type transporters, found in many other bacteria (see Table 2.1 and Figure 3.7). The product of *SPO3287* and *SPO3288* gene products closely resemble the periplasmic binding protein and the trans-membrane transporter respectively. As mentioned above, the convergently transcribed arrangement of *fbpA* and *fbpB* is unusual, as is the lack of a nearby *fbpC* gene, encoding the ATPase.

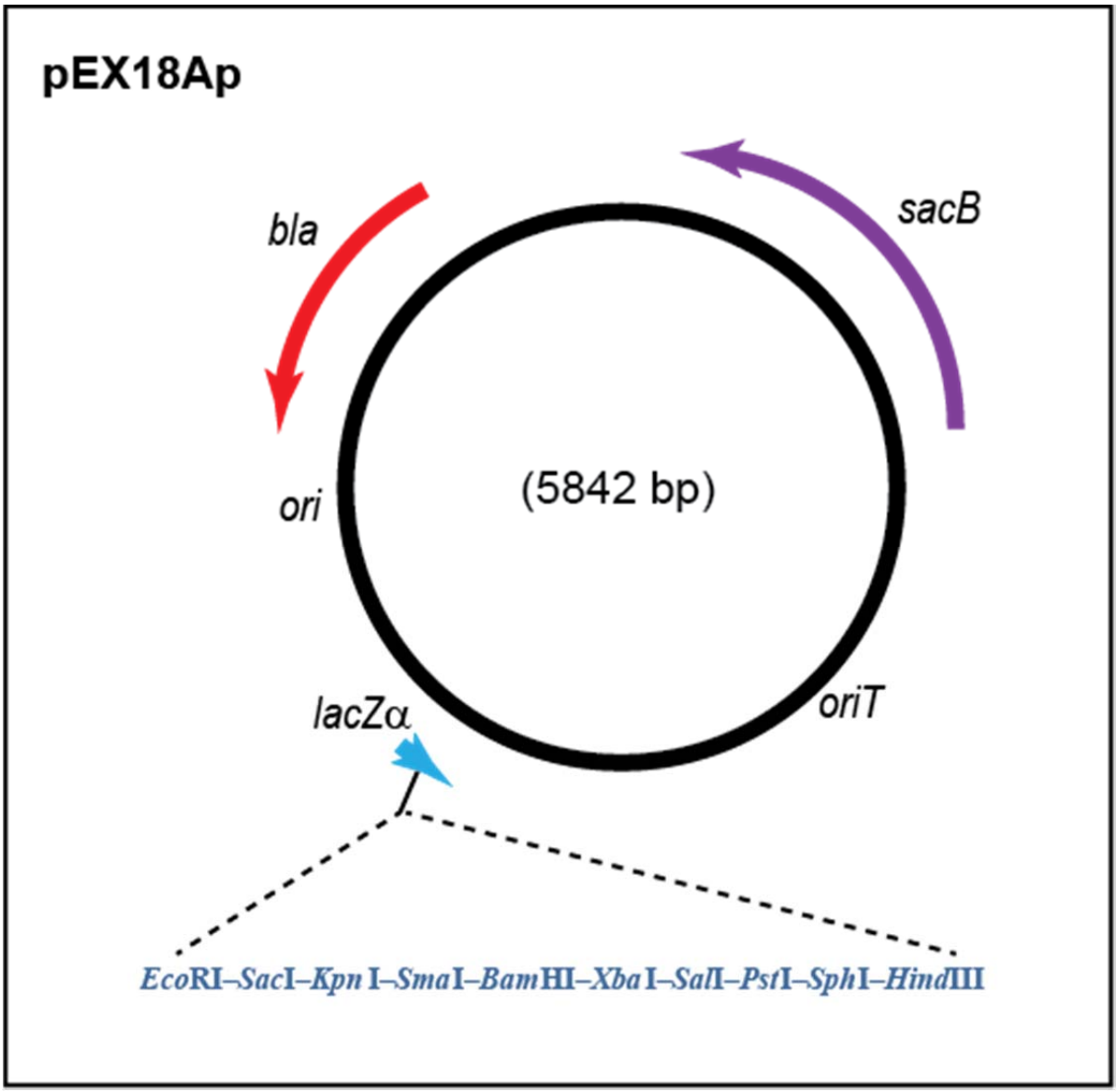
The sections below describe attempts to show if these genes do indeed, encode Fe transporters and to determine if and how they are subject to Fe-responsive regulation.

4.1.4 Disruption of the fbpAB genes does not affect growth of R. pomeroyi

To make a genomic mutation in *fbpA and fbpB* of *R. pomeroyi* DSS-3 (J470), most of the coding region of both genes was deleted and was replaced with a selectable marker. To do this, the "suicide" plasmid pEX18Ap (Hoang *et al.* 1998) was used. This is a wide host-range plasmid that encodes ampicillin resistance (via its *bla* gene) and can be mobilised from *E. coli* to many different proteobacteria, but it fails to replicate in such hosts (Figure 4.3 PLASMID MAP). It also contains a polylinker cloning region and a *sacB* gene, which encodes a levan-sucrase that cleaves sucrose into glucose plus fructose, the latter being polymerised to levan, a toxin for most bacteria (Bollen *et al.* 1979; Gay *et al.* 1985).

A 5011bp region of DNA that spans both *fbpA* and *fbpB* was amplified by PCR, using oligonucleotides **FbpABflankF** and **FbpABflankR** and *R. pomeroyi* genomic DNA as a template. This PCR product was cut using *Eco*RI and *Hind*III and ligated into pEX18Ap, cut with the same enzymes. The ligated products were used to transform competent *E. coli* JM101 cells (a *lacZα* –ω+ strain) which were spread onto LB agar plates containing ampicillin to select for transformants. The resultant colonies were screened for plasmids with the correct insert by restriction endonuclease analysis of plasmids that were isolated from a selection of these transformants (Figure 4.4). Two recombinant plasmids (pBIO2103 and pBIO2104) containing a band of the correct size - 5011bp, were confirmed by sequencing.

Figure 4.3 Map of plasmid pEX18Ap



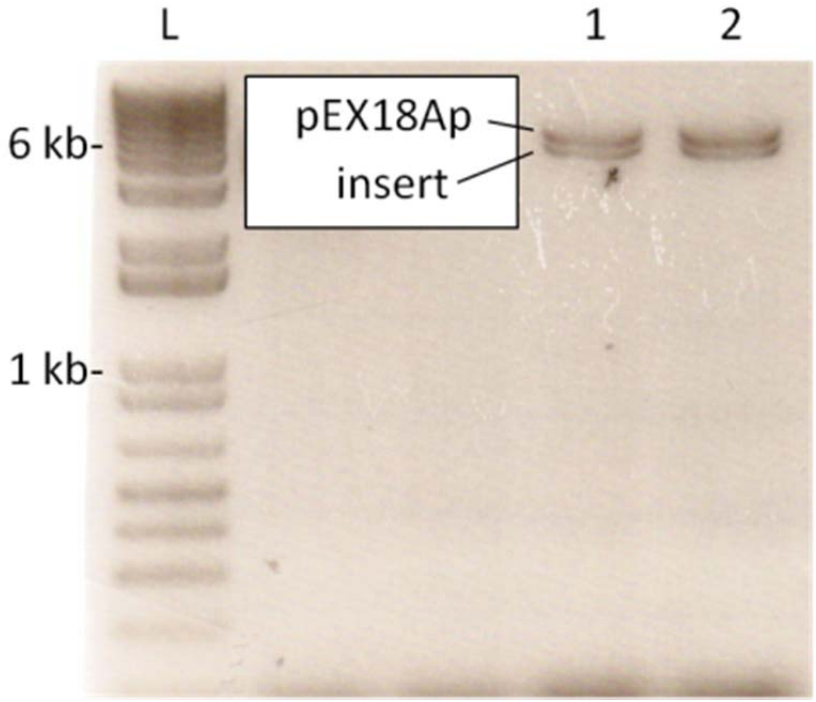
Key features of plasmid vector pEX18Ap showing positions of the origins of replication (ori), and of transfer (oriT), the sucrose inducible sacB gene, the ampicillin resistance gene (bla) and the lacZα gene, containing multiple cloning sites, indicated with dotted lines.

One of these plasmids, pBIO2103 was then used for further manipulations in which most of the *fbpA* and *fbpB* genes were removed and were replaced with a a spectinomycin resistance (Spc^R) cassette. There are two *Pst*I sites, one located within *fbpA* and one within *fbpB*, such that most of the coding sequence of the genes could be deleted by cutting with *Pst*I, and replaced with the $SPEC^R$ cassette which was obtained by PCR using oligonucleotides **Spec*Pst*IF** and **Spec*Pst*IR** on DNA of another plasmid, R100, as the template (see Figure 4.5). Both pBIO2103 and the $SPEC^R$ cassette DNA were

digested with *Pst*I, ligated together, and used to transform *E. coli* JM101 as described before, selecting ampicillin and spectinomycin resistance. This resulted in pBIO2105, shown in panel 3 of Figure 4.5.

Plasmid pBIO2104 was transferred from *E. coli* to *R. pomeroyi* cells via a tri-parental conjugation, selecting for Amp^R/Spc^R transconjugants. Since pBIO2104 is a derivative of pEX18Ap, the only surviving cells should be those that had undergone a single recombination (SCO) event between the chromosome and the incoming plasmid, in the homologous region flanking *fbpA* or *fbpB* (refer to Figure 4.5 below). Cultures from three such transconjugants were grown overnight in non-selective complete HY medium, to allow for a second, intra-molecular crossover event that would remove the majority of the plasmid DNA, including the *sacB* gene, but would retain the insertion of the Spc^R cassette in the *fbpAB* genes. These were detected by examining single colonies derived from the overnight cultures for those that were Spc^R and sucrose resistant, but had lost their resistance to ampicillin; three such derivatives were retained for further study. Approximately 30% of the colonies derived from the initial cross proved to be correct as judged by their resistance patterns.

Figure 4.4 pBIO2103, and pBIO2104

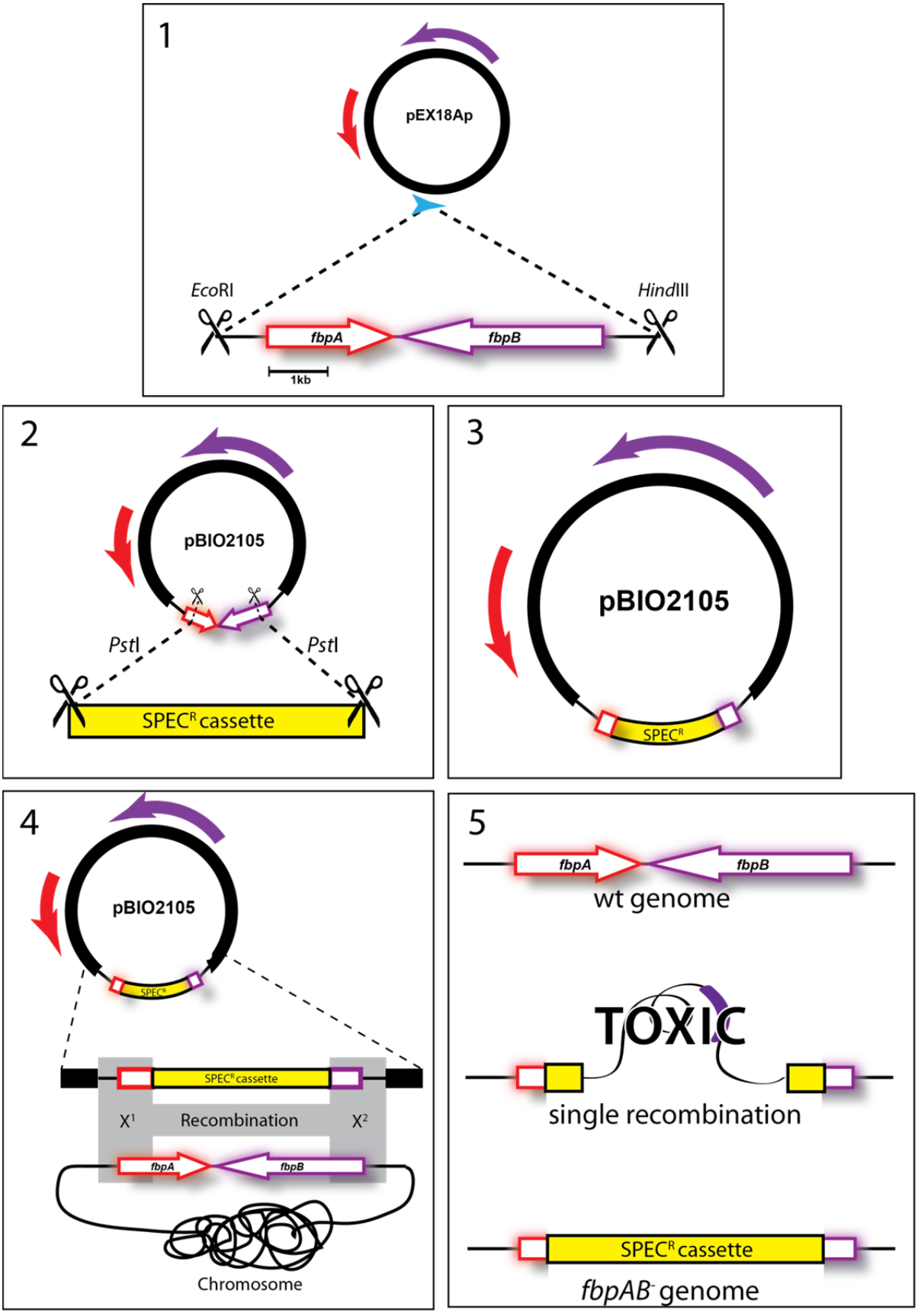


Two independent derivatives of pEX18Ap, into which a 5011bp fragment spanning fbpA and fbpB of R. pomeroyi was cloned, were digested with EcoRI and HindIII and the resultant fragments were visualised following electrophoresis on a 1% agarose gel. Lanes 1 (pBIO2103) and 2 (pBIO2104) both show two distinct bands at the appropriate size for both pEX18Ap (5842bp) and the 5011bp cloned fragment (labelled as insert). Size marker ladder (L).

To check that these were genuine replacement mutants, genomic DNA was obtained from each of these three strains and was used as template for PCR amplification using two sets of primers, whose ability to produce amplicons of particular sizes should provide diagnostic evidence for the veracity of the intended mutational events.

Thus, primers **P1** and **P2** should yield a product of 2316 bps if the $SPEC^R$ cassette has inserted as intended but should give no product if not (e.g. if the cassette had inserted elsewhere in the genome). Primers **P1** and **P3** would show that a size difference would occur for the deletion of a 1880 bp *Pst*I fragment within *fbpA* and *fbpB*, and the insertion of a 1700 bp Spc^R cassette – the wild type product was expected to be 2800 bps, and the mutant strain should yield 2620 bps. This 180 bps difference is clearly visible in the lower right panel of Figure 4.6, for samples 2 and 3 compared to the wild type. These two sample strains were renamed J531 and J532.

Figure 4.5 Creating a mutagenic pEX18Ap derivative pBIO2105



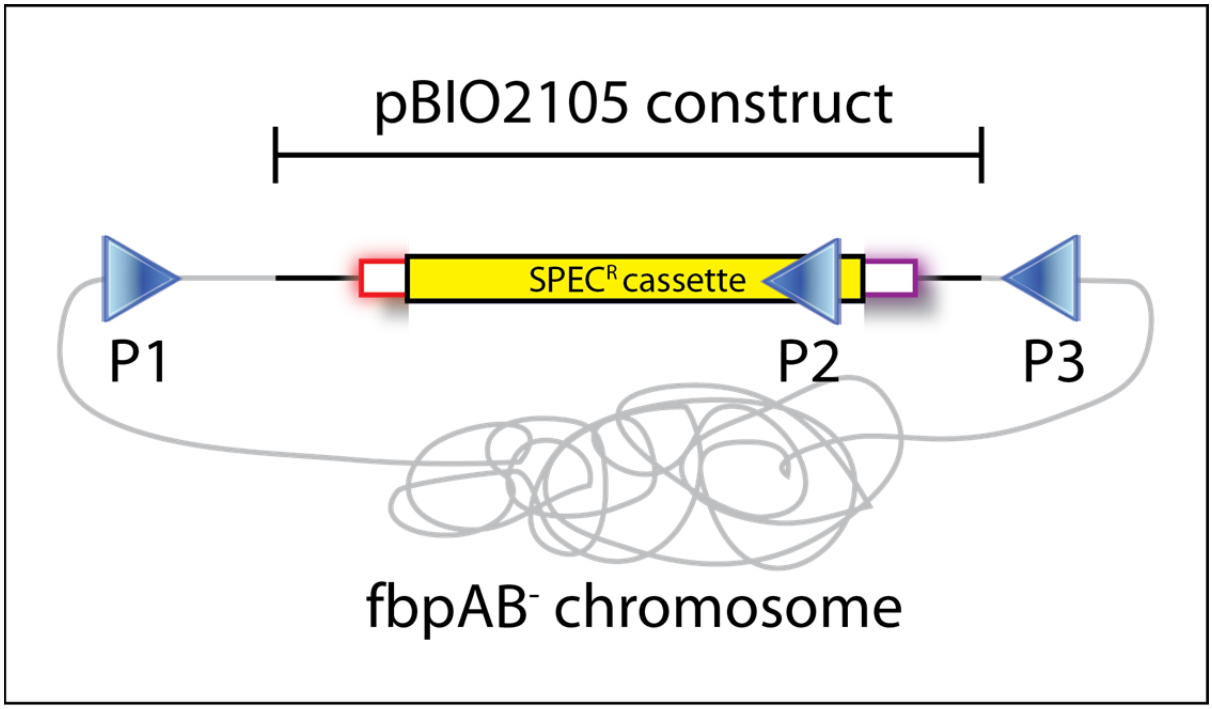
Panel 1. A 5011 bp region of R. pomeroyi genome was amplified and cloned into pEX18Ap using EcoRI and HindIII (panel 1), yielding pBIO2103

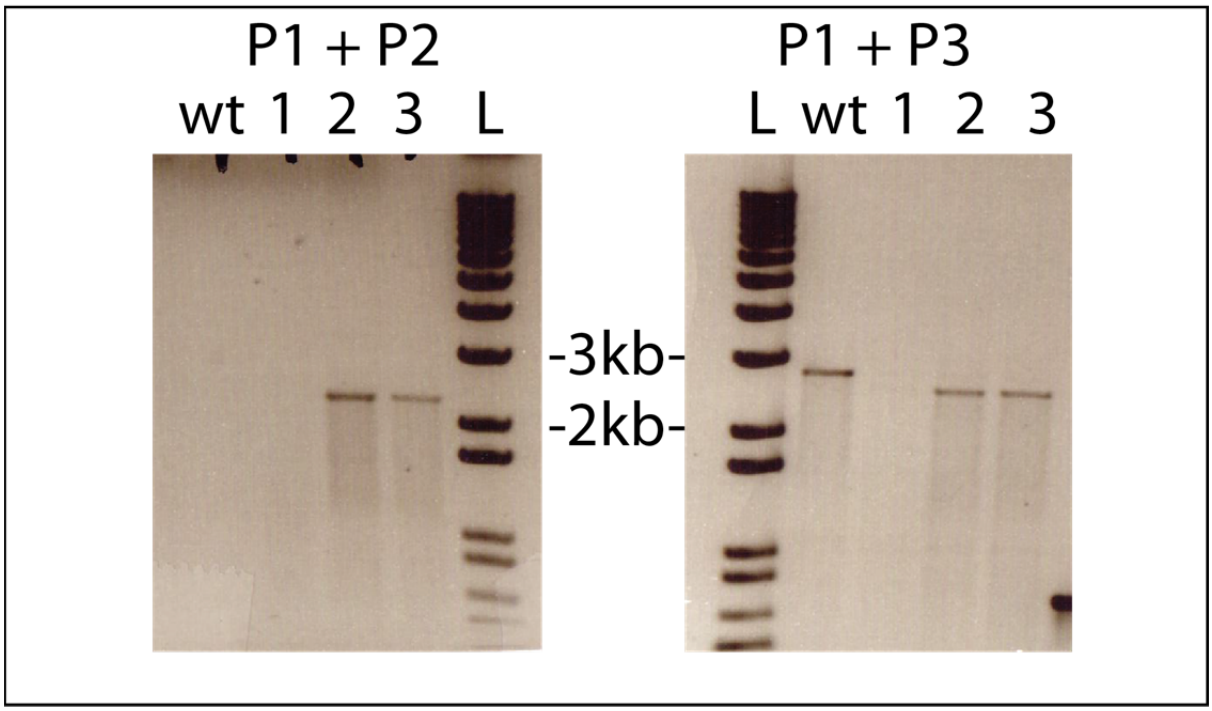
Panels 2 and 3. The DNA between the PstI sites in fbpA and fbpB was removed and was replaced with a SPEC^R fragment, also cleaved with PstI, to form plasmid pBIO2105.

Panel 4. Plasmid pBIO2105 was transferred to R. pomeroyi cells via conjugation, a host in which this plasmid cannot replicate. Homologous recombination events within the regions of homology between the genomic DNA and pBIO2105 occur at locations shown as X^1 and X^2.

Panel 5. Addition of sucrose ensures that the incoming plasmid pBIO2105 is lost, by selecting against single recombination mutants, which will express the lethal sacB gene expressed from the pEX18Ap plasmid DNA. The final product is a strain in which the cassette has replaced the majority of the fbpAB DNA.

Figure 4.6 Screening FbpAB$^-$ strains of *R. pomeroyi* using PCR



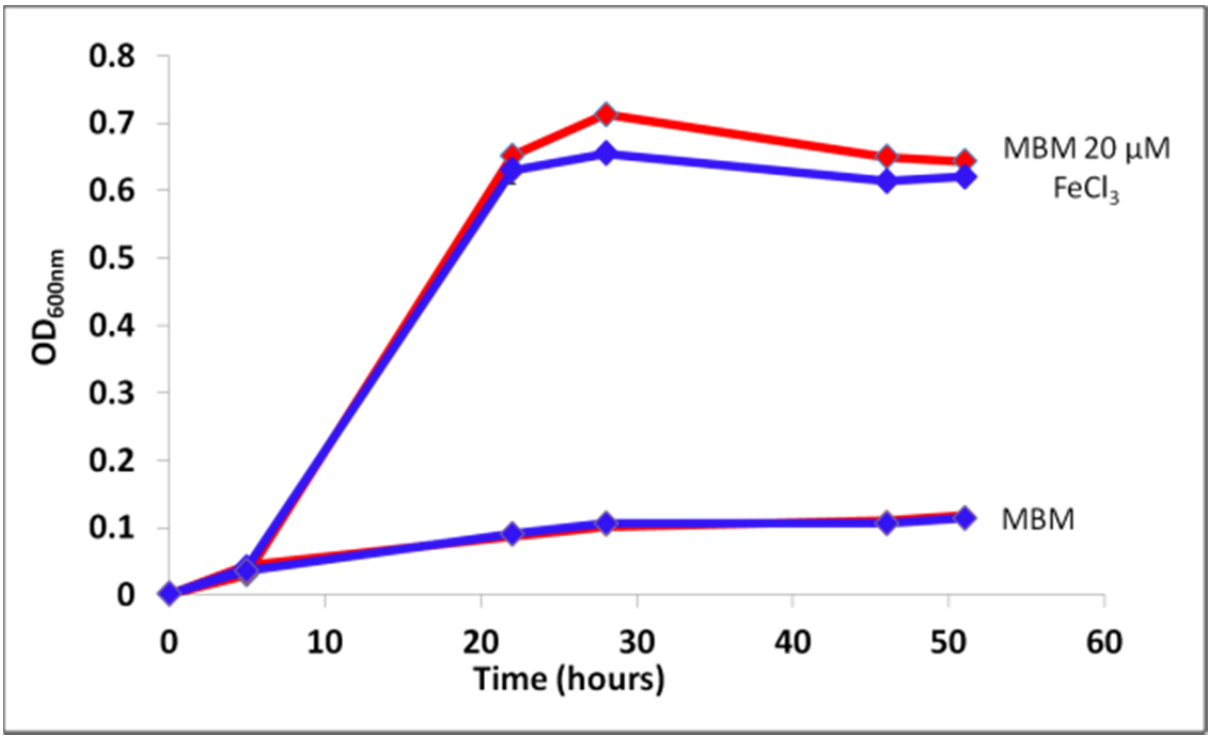


Upper panel depicts the position of oligonucleotide priming sites for screening potential fbpAB⁻ strains of R. pomeroyi. The sites are located within the SPEC^R cassette (P2), and upstream of the region 5' of fbpA used to generate pBIO2105 (P1). Used in a standard colony PCR reaction (see Materials and Methods) these oligonucleotides would fail to generate a product in the wt strain, but could amplify the region shown between P1 and P2 to generate a 2400bp PCR product. As shown in the lower panel, a band at 2400bp is visible for samples 2 and 3, but not in the wt, verifying the mutagenesis for samples 2 and 3. Furthermore, primers P1 and P3 used together allowed the visualisation of the change in size of the fbp region following the replacement of a 1880 bp PstI fragment by a 1700 bp SPEC^R cassette. Lane 1 did not produce a PCR product with either set of primers and so this strain was discarded.

4.1.5 Growth phenotype of the ΔFbpAB strain of R. pomeroyi

To test the effects of deleting the *fbpAB* genes in strains J531 and J532 the growth rates of these two mutants in Fe-replete and Fe-depleted MBM media were compared with the wild type. As shown in Figure 4.7, the Δ*fbpAB* mutation had no detectable effect on the growth either in the presence (20 µM) or absence of added $FeCl_3$. Thus, this putative FbpAB transporter was not critical for iron uptake in *Ruegeria*. In addition to the data shown in figure 4.7 below, an intermediate level of $FeCl_3$ was tested (500 nM); however, the FbpAB$^-$ strains were unchanged in growth compared to the wt at this intermediate iron concentration and so it was omitted.

Figure 4.7 The effect of iron limitation on growth of FbpAB$^-$ strains of *R. pomeroyi*



***R. pomeroyi* wt (red lines) and FbpAB$^-$ (blue lines) were grown in MBM with no added iron (- $FeCl_3$) or supplemented with 20 µM $FeCl_3$ (+ $FeCl_3$). Cultures were incubated at 28°C, shaking at 200 rpm. Data shown are the mean OD_{600nm} values of three replicate cultures of each mutant strain (J531 and J532) with the standard deviation shown as error bars.**

4.1.6 Analysis of fbpA-lacZ *and* fbpB-lacZ *transcriptional fusions*

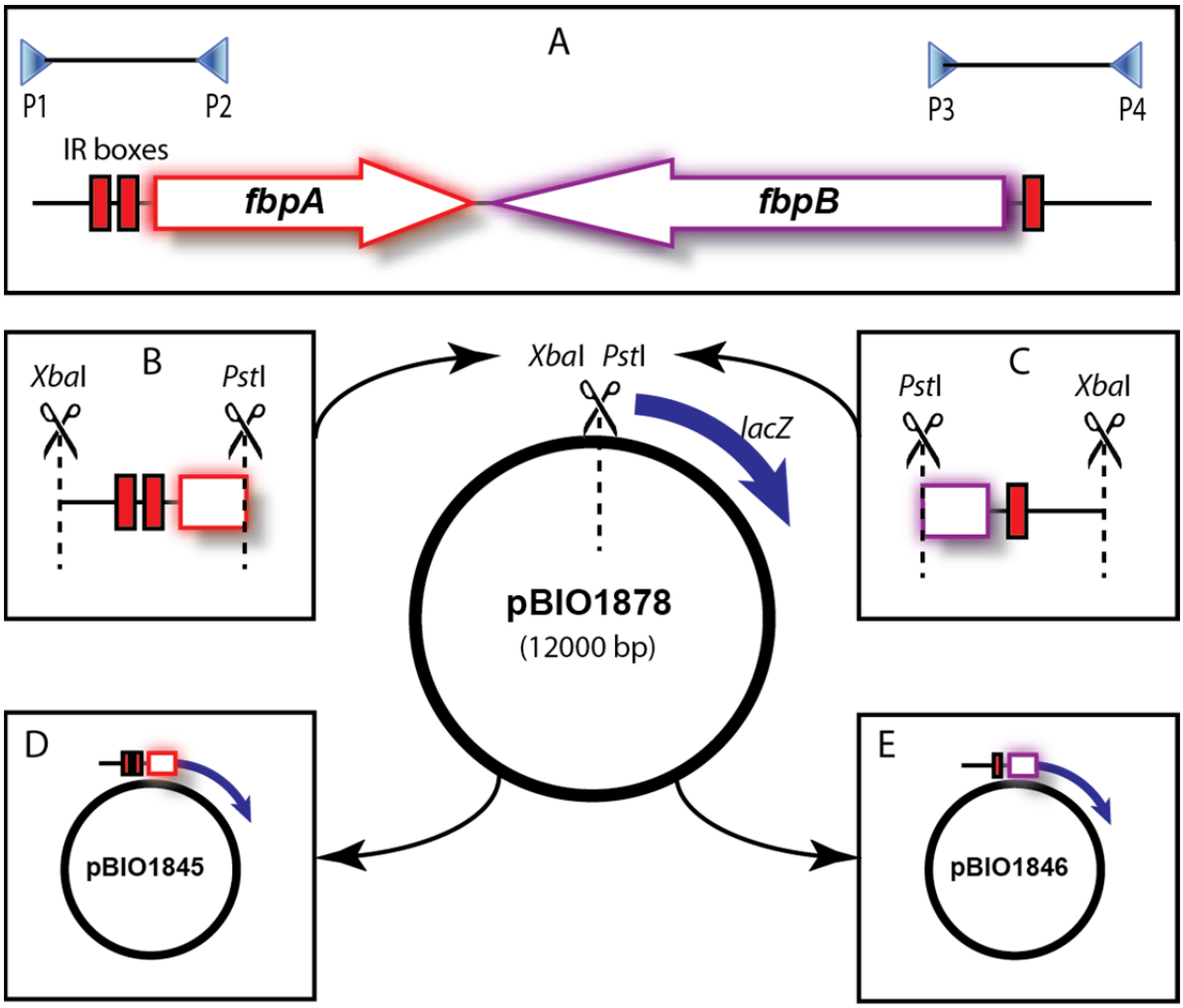
The genes *fbpA* and *fbpB* were predicted to be under the control of a putative *cis*-acting regulatory motif, the IR box (described earlier), suggesting that their transcription would vary, according to the availability of Fe in the medium, through the action of an as-yet unknown transcriptional regulator. To test directly if the expression of *fbpA* and/or *fbpB* was affected by Fe availability, transcriptional fusions to each of these genes were made, and assayed, as follows.

The transcriptional fusion vector pBIO1878 (Todd *et al.* 2011) was used as the basis for the construction of these *lac* fusions. Plasmid pBIO1878 is derived from pMP220, which has a wide host-range in gram negative bacteria, a polylinker 5' of its promoter-less *lacZ* reporter and a gene that confers tetracycline resistance (Spaink 1987). However, the Tet^R phenotype is expressed rather poorly in *Ruegeria* and other Roseobacters, so a more suitable selectable *spc* gene marker, which

confers resistance to spectinomycin, had been cloned into the *Sph*I site of its poly-cloning site (Todd *et al.* 2011).

To generate the *fbpA-lacZ* and *fbpB-lacZ* fusion plasmids, their individual promoter regions were each amplified from *R. pomeroyi* genomic DNA using primers **fbpAfwd** and **fbpArev** for the *fbpA* promoter (**P1** and **P2** in Figure 4.8) and primers **fbpBfwd** and **fbpBrev**,(**P4** and **P3** in Figure 4.8) for the *fbpB* promoter. These fragments were each purified from gels, cloned into pBIO1878 such that the *lacZ* reporter would be under the control of the *fbpA* (pBIO1845) or *fbpB* (pBIO1846) promoter. The constructs were verified by sequencing. Details of the steps involved are shown in Figure 4.8.

Figure 4.8 Generation of wide host range *fbpA*- and *fbpB-lacZ* fusion plasmids pBIO1845 and pBIO1846

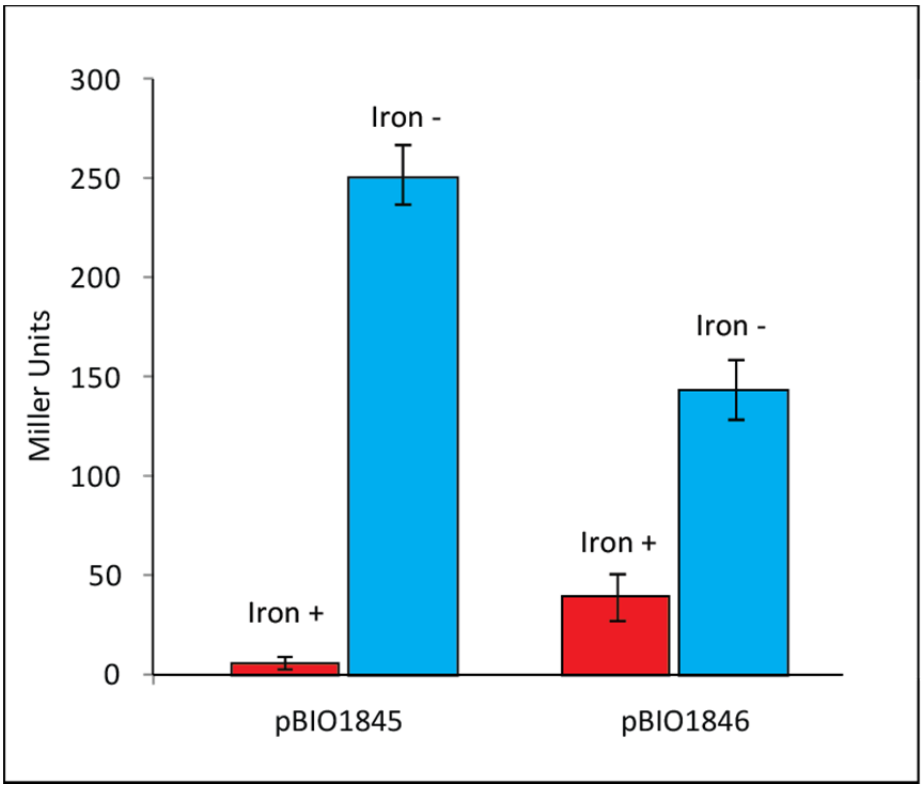


Locations of the primers used to amplify the promoter regions of fbpA (P1 and P2) and of fbpB (P3 and P4) are shown in panel A. Note that these primers contain XbaI and PstI restriction sites used for subsequent cloning steps (see Panels B and C). Each PCR fragment was cleaved with XbaI plus PstI and ligated to pBIO1878, digested with the same enzymes. These manipulations produced plasmids pBIO1845 and pBIO1846 in which the reporter lacZ would be controlled by the fbpA and fbpB promoters respectively (Panels D and E). The two IR boxes preceding fbpA gene and the one preceding fbpB are indicated.

To measure the transcription of *fbpA* and *fbpB*, plasmids pBIO1845 and pBIO1846 were each mobilised by conjugation into *R. pomeroyi* strain J470.Transconjugants were selected on HY agar plates containing 50 µg/ml rifampicin and 200 µg/ml spectinomycin. For each cross, three separate, purified transconjugants were assayed for β-galactosidase activity (detailed in Materials and

Methods) following growth in MBM minimal media that either contained (20 µM) or lacked added $FeCl_3$.

Figure 4.9 Expression of iron availability on the expression of *fbpA-lacZ* and *fbpB-lacZ* fusions.



Ruegeria pomeroyi containing either the fbpA- or fbpB-lacZ fusion plasmids (pBIO1845 and pBIO1846 respectively) were grown in minimal medium (MBM) either supplemented with 20 µM $FeCl_3$ (Iron +) or not (Iron -) and assayed for β-galactosidase activity, expressed in Miller units. Error bars represent the standard deviation of 2 biological, and three technical replicates.

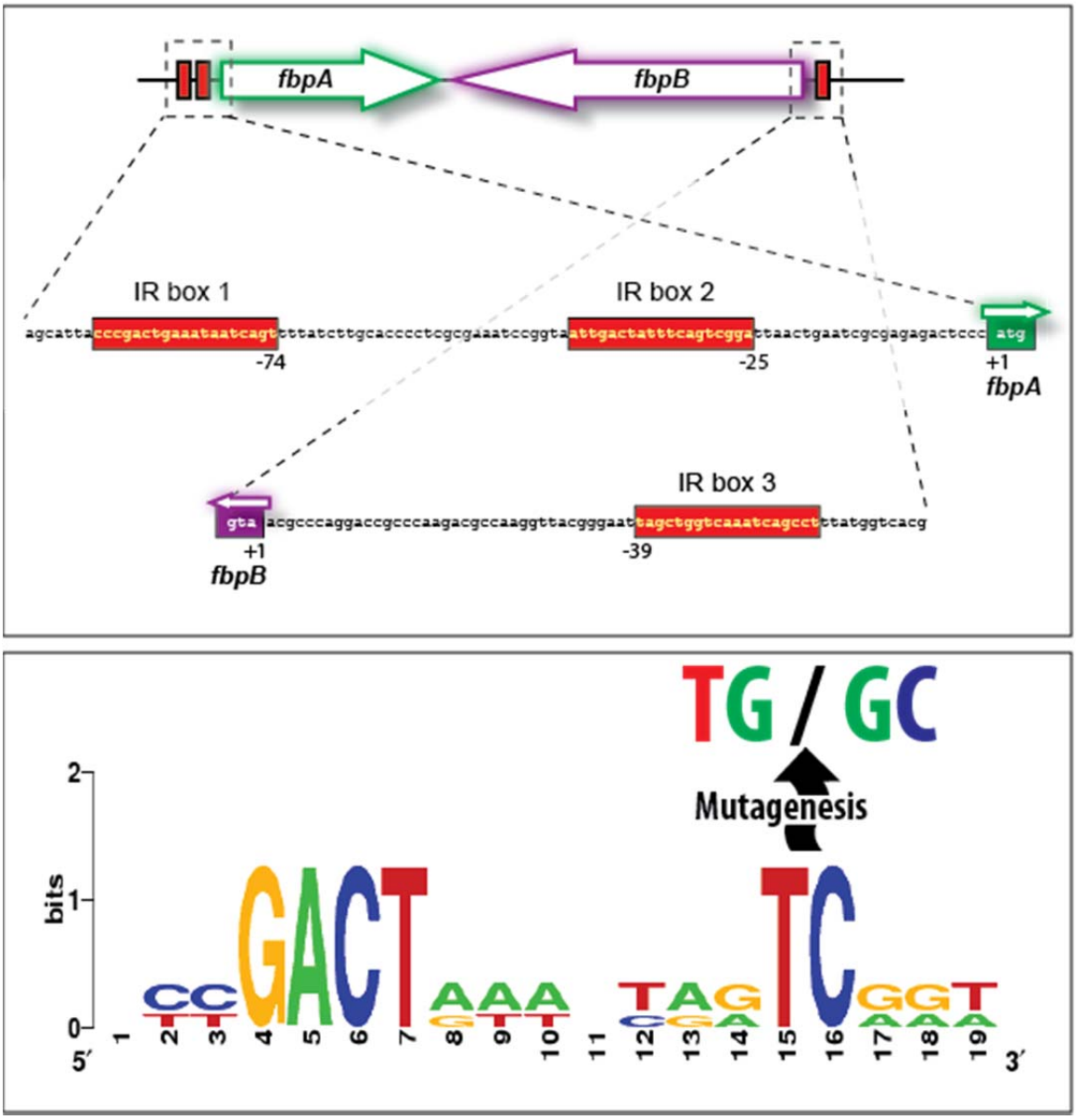
Both the *fbpA-lacZ* and *fbpB-lacZ* fusions were expressed at much higher levels in Fe-depleted than Fe-replete media, ~41-fold for *fbpA-lacZ* and rather less (3.5-fold), for *fbpB.*

4.1.7 IR motifs preceding fbpA *and* fbpB *are important for their Fe-responsive transcription*

As predicted by Rodionov and colleagues (2006), and discussed in Chapter 3, both *fbpA* and *fbpB* have regions of dyad symmetry upstream of their transcriptional start codons, which are resemble

the motifs found upstream of many putative iron-responsive genes in the Rhodobacteraceae. These "IR boxes", their sequences and positions are shown in Figure 4.10 below.

Figure 4.10 The IR boxes upstream of *fbpA* and *fbpB* of *R. pomeroyi*



Upper panel shows the R. pomeroyi genomic fbp region, with sequences 5' of fbpA and fbpB shown in the zoomed boxes, dotted lines. The locations of the two IR motifs (boxes 1 and 2) upstream region of fbpA and the single IR 5' of fbpB (box 3) are shown in red. The numbers on the DNA sequences denote the distances from the corresponding "A" of the ATG translational starts of fbpA (green highlight) and fbpB (purple highlight).

Lower panel shows the consensus sequence for all three IR boxes generated using WEBLOGO. The conserved TC motif was used as a target for subsequent site-directed mutagenesis, and was changed to both a TG and GC motif for all three boxes.

The *lacZ*-fusion plasmids pBIO1845 and pBIO1846 contained the promoter regions of *fbpA* and *fbpB* respectively, including all perceived IR boxes, and so were used as templates to generate site directed mutations in these putative regulatory motifs. To do this, the mutagenic primers shown in Table 4.1 were used to alter the conserved TC motif shown in Figure 4.10. Both the T and C bases were mutated to a G for each of the three IR boxes (6 mutants in total). Since *fbpA* has two IR boxes, a seventh mutant was constructed, where the T nucleotide of the conserved TC motif in each IR box was changed to a G. Care was taken to not disrupt the putative -10 and -35 promoter sequences, which were predicted to overlap the 3' end of the IR boxes, hence the selection of bases at the 5' end of the IR boxes for mutagenesis.

Table 4.1 Oligonucleotide primer sequences for IR box site directed mutagenesis

Oligonucleotide primers used to mutate the bases of IR boxes 1-3 as shown in Figure 4.10, of fbpA (boxes 1 and 2) and fbpB (box 3) of R. pomeroyi. The primer names, sequence and nucleotide target for mutagenesis are shown along with the resultant mutagenised plasmid name. All bases listed as a target were mutated to a G.

Oligo Name	Sequence	Target	Plasmid
fbpA51TtoGFWD	GCGACAGCATTACCCGACTGAAATAAGCAGTTTTATCTTGC	**IR box 1 'T'**	**pBIO2106**
fbpA51TtoGREV	GCAAGATAAAACTGCTTATTTCAGTCGGGTAATGCTGTCGC		
fbpA51CtoGFWD	GCGACAGCATTACCCGACTGAAATAATGAGTTTTATCTTGC	**IR box 1 'C'**	**pBIO2107**
fbpA51CtoGREV	GCAAGATAAAACTCATTATTTCAGTCGGGTAATGCTGTCGC		
fbpA2TtoGFWD	GCGAAATCCGGTAATTGACTATTTCAGGCGGATTAACTGAATCG	**IR box 2 'T'**	**pBIO2108**
fbpA2TtoGREV	CGATTCAGTTAATCCGCCTGAAATAGTCAATTACCGGATTTCGC		
fbpA2CtoGFWD	GCGAAATCCGGTAATTGACTATTTCAGTGGGATTAACTGAATCG	**IR box 2 'C'**	**pBIO2109**
fbpA2CtoGREV	CGATTCAGTTAATCCCACTGAAATAGTCAATTACCGGATTTCGC		
fbpBTtoGFWD	TCAGGCACTGGTATTTCCGACTAAACTGGGCGATTAAGGGCATTGGAACC	**IR box 3 'T'**	**pBIO2110**
fbpBTtoGREV	GGTTCCAATGCCCTTAATCGCCCAGTTTAGTCGGAAATACCAGTGCCTGA		
fbpBCtoGFWD	TCAGGCACTGGTATTTCCGACTAAACTGGTGGATTAAGGGCATTGGAACC	**IR box 3 'C'**	**pBIO2111**
fbpBCtoGREV	GGTTCCAATGCCCTTAATCCACCAGTTTAGTCGGAAATACCAGTGCCTGA		
fbpA51TtoG	Both sets of primers used sequentially.	**IR box 1 and 2 'T'**	**pBIO2112**
fbpA2TtoG	Both sets of primers used sequentially.		

Each mutagenic reaction was performed, as detailed in Materials and Methods, and the mutated plasmid DNA was used to transform *E. coli* XL10-GOLD cells. Transformants were selected on LB agar with spectinomycin added at 200 µg/ml. Plasmids containing the correct mutations were assigned pBIO numbers shown in Table 4.1 above.

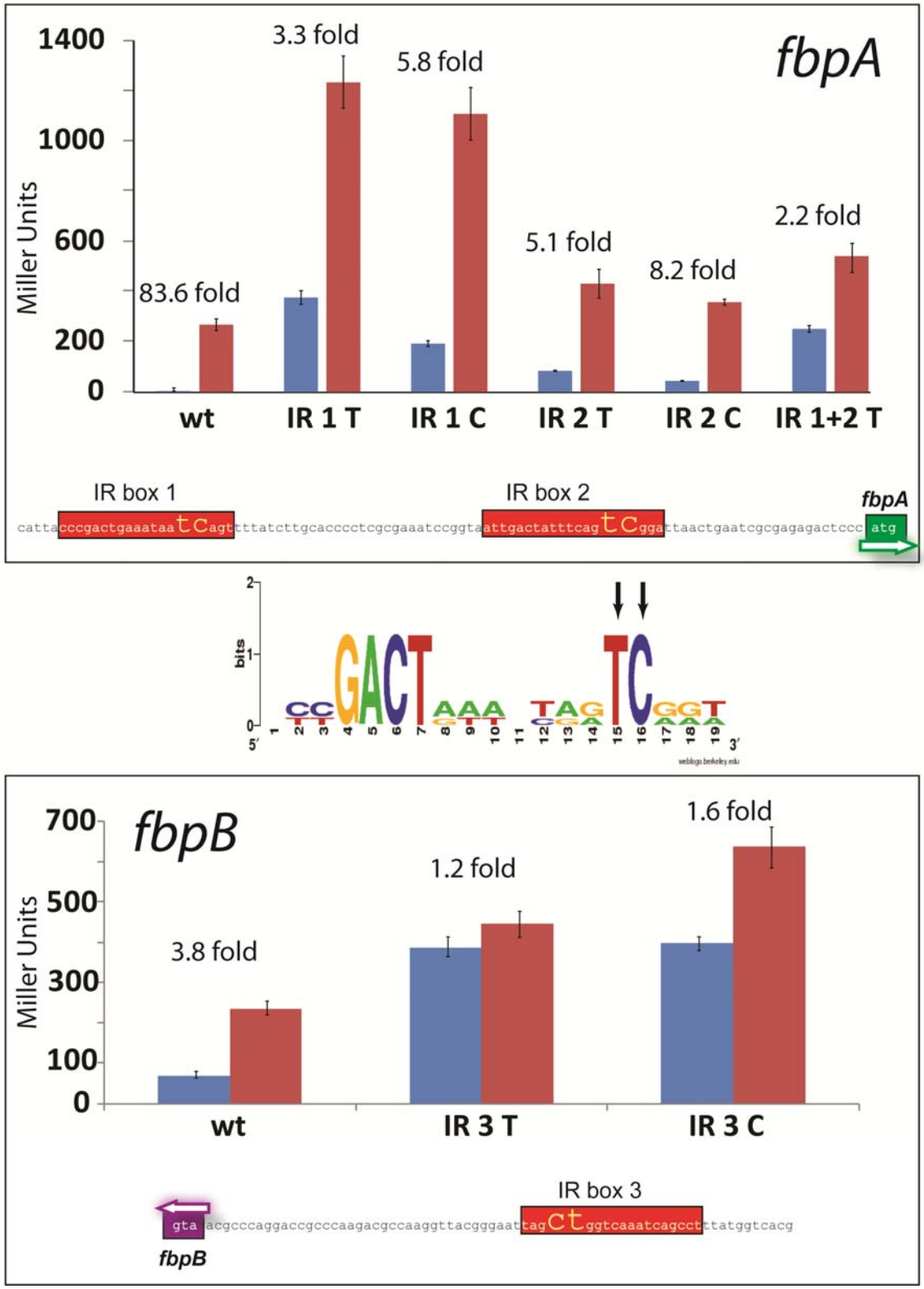
Having generated, and sequence verified, a suite of single base-pair mutations in the IR boxes of *fbpA* and *fbpB*, each of the mutant plasmids was mobilised into *R. pomeroyi* and the transconjugants were assayed for β-galactosidase activities after growth in Fe-depleted and Fe-replete conditions.

As shown in Figure 4.11, all of the mutations resulted in an increase in the level of expression of the corresponding fusion, though there were differences in the details of this deregulation in the individual mutations.

Thus for *fbpA-lacZ*, both mutations (refered to here as T and C) in IR box 1 greatly increased the expression of the fusion both in +Fe: 4.6- (T) and 4.2-fold (C) compared to wild type, and –Fe: 118- (T) and 60.1-fold (C) when compared to wild type. Mutations in IR box 2 also enhanced the transcription of *fbpA-lacZ*, in both media, though not to the same extent as those in box 1: 1.6- (T) and 1.3-fold (C) in the +Fe media, and 26.5- (T) and 13.7-fold (C) in the –Fe media, compared to the wild type. Perhaps surprisingly, the mutant plasmid pBIO2112, which had mutations in both IR box 1 and IR box 2 behaved similarly to pBIO2110, which had mutations only in IR box 2.

Turning to the *fbpB-lacZ* fusion, its expression was also enhanced by each of the mutations in the IR box 3. The “T” mutation led to an enhanced constitutive expression, in which the transcription of the fusion was similar in both –Fe and +Fe media. When the “C” was mutated, though, there was even higher expression in the –Fe than the +Fe media (Figure 4.11).

Figure 4.11 Effects of mutations in the IR boxes on the expression of *fbpA* and *fbpB*

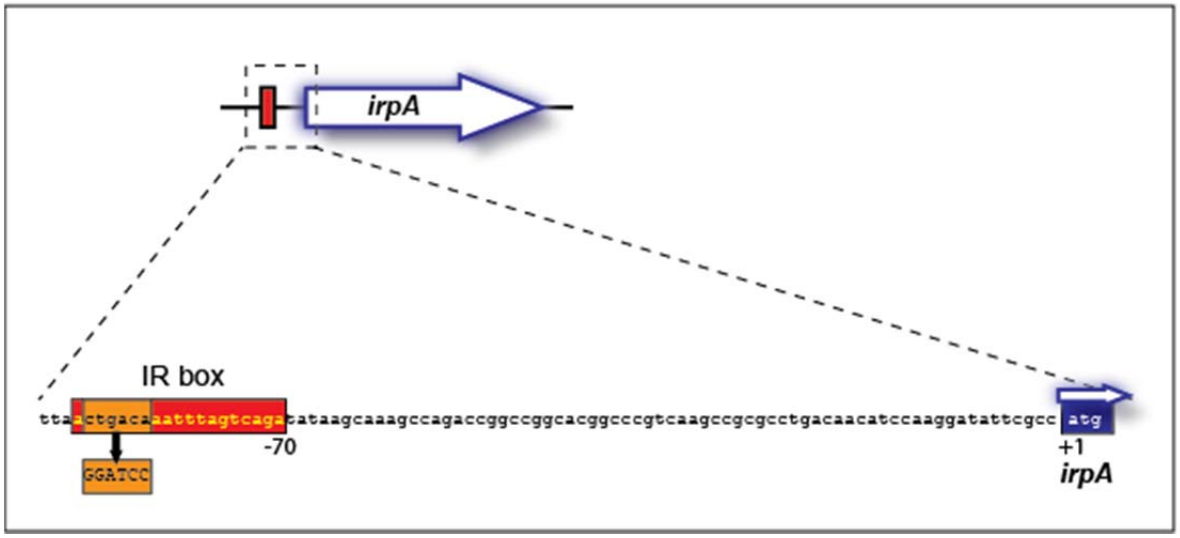


The fbpA-lacZ and fbpB-lacZ fusion plasmids pBIO1845 and pBIO1846 respectively were used to generate IR box mutants. The highly conserved TC motif in the IR boxes of fbpA and fbpB (arrowed in middle panel) was mutated, so that each base became a G nucleotide, separately, in 6 different mutant plasmids. In a seventh mutant, the conserved T bases in both fbpA IR boxes were mutated to G. Expression of the lacZ fusions in R. pomeroyi containing the various mutant plasmids after growth in MBM with 20 μM $FeCl_3$ (BLUE BARS) or none added (RED BARS) and is shown in Miller units in the upper and lower panels, for fbpA and fbpB respectively. Wild type fusion is labelled wt. All data are the average of 3 biological and two technical replicates.

4.1.8 'The "Irp" *operon of* Ruegeria pomeroyi.

Of the transcriptional units that were preceded by IR motifs, located in their predicted regulatory regions, another one whose gene products were implicated in Fe uptake was the 5-gene operon comprising *SPO0086 – SPO0090,* in which the product of the promoter-proximal gene, *SPO0086* was very similar to IrpA in other bacteria. The location and sequence of this IR motif is shown in Figure 4.12.

Figure 4.12 The *irpA* promoter region showing IR box location and sequence

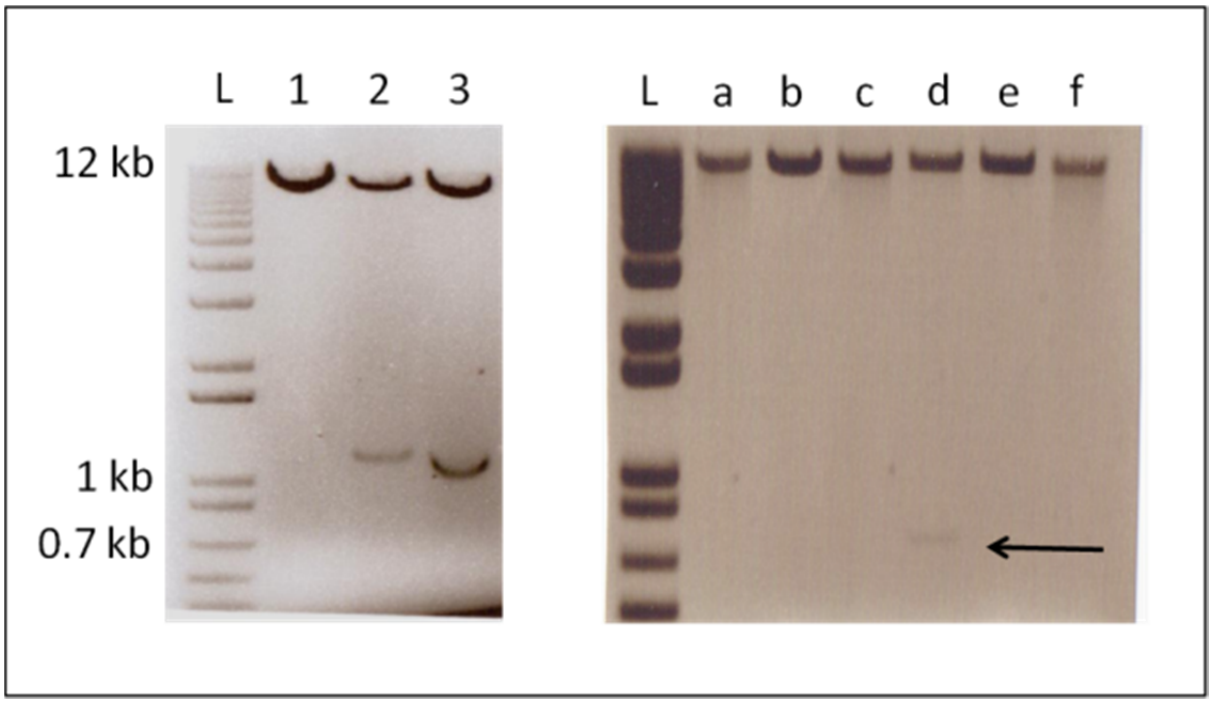


The sequence 5' of irpA is shown, including the IR box (red box) 70bp upstream of the ATG start of irpA. The sequence in orange was subject to SDM, from ctgaca to ggatcc, creating a BamHI site.

4.1.9 Expression of irpA *is repressed by iron in* R. pomeroyi

To study the expression of the *irp* operon, a transcriptional fusion plasmid, pBIO1847, was constructed by cloning a 1016bp region spanning the 5' upstream region of *irpA* of *R. pomeroyi* into pBIO1878, following amplification by PCR using primers **irpAfwd** and **irpArev** and *R. pomeroyi* genomic DNA as the template. DNA from plasmid pBIO1847 was also used as a template for site-directed mutagenesis (SDM) of the IR motif upstream region of *irpA*. Briefly, primers **IrpABamHIFWD** and **IrpABamHIREV** were used to substitute the CTGACA (which includes the adjacent, highly conserved GA – see figure 3.3b) to GGATCC, which represents a *Bam*HI site to facilitate screening of potential mutants (see Figure 4.13).

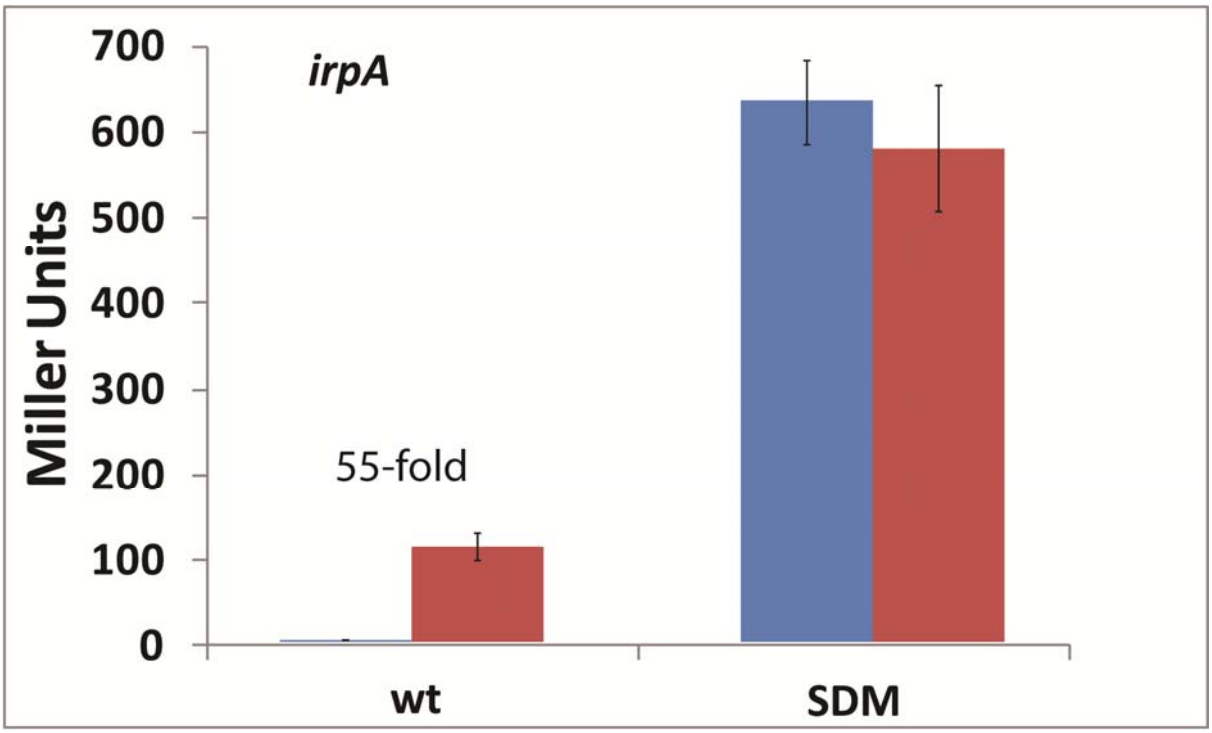
Figure 4.13 Gel photos of clone, and site-directed mutant clone, of the promoter region of *irpA* into pBIO1878



The left panel shows the restriction digest pattern of the DNA of three potential recombinant plasmids, containing the irpA promoter region cloned into pBIO1878, and digested with XbaI plus PstI, and separated on a 1% agarose gel. A fragment of the correct size (1016 bp) is seen in Lanes 1 and 2. The plasmid in Lane 2 was used as the template for SDM, where a BamHI site was made in the IR motif, 744 bp downstream of the PstI site. The right panel shows the DNA of 6 potential mutant derivatives of pBIO1847, digested with PstI and BamHI. Sample 'd' liberated a fragment of the correct size (see arrow). Following sequence verification, this mutated plasmid was named pBIO2115.

The plasmids pBIO1847 and pBIO2115 were introduced by conjugation into *R. pomeroyi* J470. For each plasmid, three different transconjugants were grown in MBM minimal medium either containing 20 µM $FeCl_3$ or with no added Fe, before assaying β-galactosidase activities.

Figure 4.14 Effects of Fe and the IR motif on the expression of *irpA-lacZ*



Plasmids pBIO1847 (wt irpA-lacZ) and pBIO2115 (SDM irpA-lacZ) in R. pomeroyi were assayed for β-galactosidase activity following growth in MBM either containing 20μM $FeCl_3$ (blue bars) or no added iron (red bars). Data are in Miller units (y-axis) and represent the average of three biological replicates.

As shown in (Figure 4.14), the expression of the wild type version of the *irpA-lacZ* fusion (in plasmid pBIO1847) was much higher (55-fold) in the Fe-depleted than the Fe-replete media. Furthermore, the removal of the IR box in the mutated plasmid pBIO2115 resulted in greatly increased expression, both in the absence and even more dramatically (313-fold compared to the wild-type) in the presence of added Fe. Thus, the *irpA* operon is regulated in response to Fe and this requires a functional IR box motif.

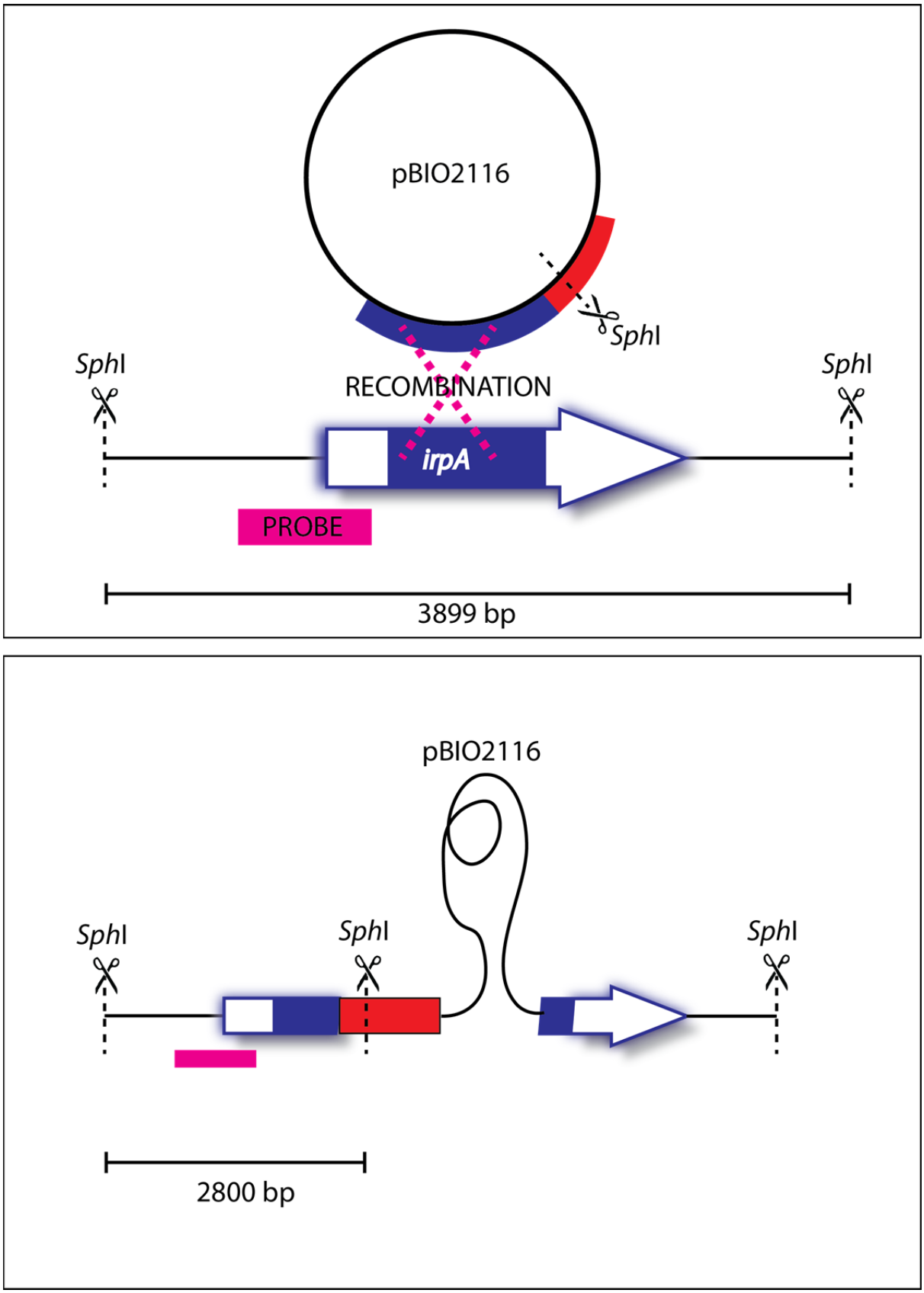
4.1.10 Construction of an IrpA⁻ strain of R. pomeroyi

Mutations in *irpA* of *Synechococcus elongatus* PCC 7942 had been shown to be deficient in their growth in low-Fe media (Reddy *et al.* 1988). To examine the effects of mutating the homologous gene in *Ruegeria,* an IrpA⁻ strain was made, as follows. The vector used to construct this mutant, pBIO1879, was derived from the wide host-range "suicide" plasmid pK19mob (Schafer *et al.* 1994),

and has a spectinomycin resistance cassette cloned into the PCS, and so confers resistance to both spectinomycin and kanamycin (Todd *et al.* 2011). The chosen method of mutagenesis involves the cloning of an internal fragment of the targeted gene into pBIO1879, followed by the introduction of the resulting plasmid in a recipient bacterium (in this case *Ruegeria* pomeroyi) in which it cannot replicate. Therefore, by plating on selective media containing spectinomycin plus kanamycin, insertional mutants, generated by homologous recombination between the cloned internal fragment and the target gene can be obtained (see Figure 4.15).

An internal fragment of *irpA* was amplified using PCR, using primers **IrpApk19fwd** and **IrpApk19rev**, using *R. pomeroyi* genomic DNA as a template. This 740 bp PCR product was purified and digested with *Eco*RI and *Xba*I, ligated into pBIO1879, then transformed into *E. coli,* a host species in which the plasmid can replicate normally. Plasmid DNA was isolated from a selection of the transformants and one, termed pBIO2116, that contained the correct insert (as checked by restriction digests and sequencing) was retained for further use.

Figure 4.15 Insertion and ratification of insertion mutation into *R. pomeroyi irpA*

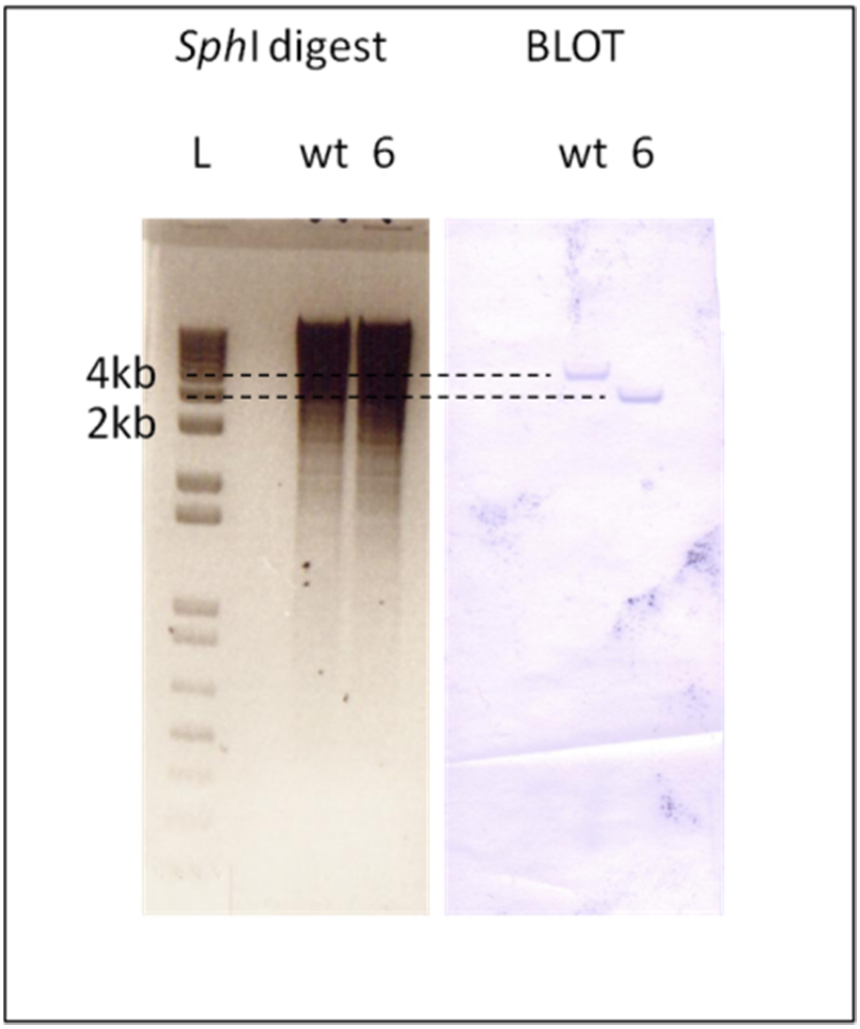


***The pK19mob derived suicide vector pBIO2116 integrates into* irpA *of the* R. pomeroyi *genome, via a single recombination event with the cloned internal* irpA *DNA, shown in blue. The dimensions of the DNA used as the probe in the Southern blots are shown in pink. As shown, this would hybridise to a 3899 bp fragment in the wild type, and a 2,800 bp fragment if pBIO2116 has inserted into* irpA.**

This plasmid was then mobilised into *R. pomeroyi* J470 by conjugation, selecting transconjugants on HY medium containing rifampicin (to kill the donor *E. coli*) plus spectinomycin and kanamycin (conferred by the incoming plasmid). Colonies arose at a frequency of ~10^{-2}, and several of these were purified and checked for insertions into *irpA,* as follows.

First, a 'colony-PCR' based approach was used, with primers **irpA1F1** and **irpA2R2**, which are located to either side of the *irpA* gene. These would amplify a 1751bp region if presented with wild type template DNA, but if there was a large insertion within the gene, no PCR product would be made. Of 6 colonies that were examined, one failed to generate a PCR product, so likely contained an insertion in *irpA*. This was confirmed by a Southern blot, in which genomic DNA was isolated from this putative mutant and probed with a DIG-labelled DNA fragment that spanned the 5' end of the *irpA* gene. This would reveal a ~4 kb (exact size is 3899 bp) band in a Southern blot with the wild type DNA, but if the plasmid pBIO2116 had inserted into *irpA,* the predicted size of the hybridising band would be smaller, since pBIO2116 contains a *Sph*I site within the spectinomycin resistance cassette. The DNA from the putative IrpA- mutant did indeed, lead to the production of a hybridising fragment of the expected size for an insertional mutation, as shown in Figure 4.16 below. This IrpA- mutant was named J533.

Figure 4.16 Verification by Southern blot of an insertional mutation into *irpA*



Genomic preps of wild type* R. pomeroyi *(wt) and putative IrpA⁻ strain (6) digested with* SphI *and separated on a 1% agarose gel (left-hand panel), were blotted and probed with DIG-labelled DNA corresponding to the 5' end of* irpA*. The sizes of the hybridising bands are indicated. The size marker is shown as L.

4.1.11 Phenotypic analysis of the IrpA⁻ strain of R. pomeroyi

Although the IrpA⁻ strain of *Synechococcus* grew poorly on iron deficient media compared to the wild type strain (Reddy *et al.* 1988), no such defect was seen when the IrpA⁻ mutant strain J533 of *R. pomeroyi* was cultured in MBM minimal medium to which no $FeCl_3$ had been added.

There was no detectable difference between the wild type and IrpA$^-$ strain after 60 hours of growth. To see if there was an effect of residual iron from the starter culture, the MBM cultures were sub-cultured into MBM containing iron or not as before. These cultures were still identical for growth in both iron-depleted and -replete MBM after another 70 hours. It is therefore unlikely that IrpA alone is required for iron uptake or storage, as suggested by Reddy et al. (1988) for the *Synechococcus* IrpA protein.

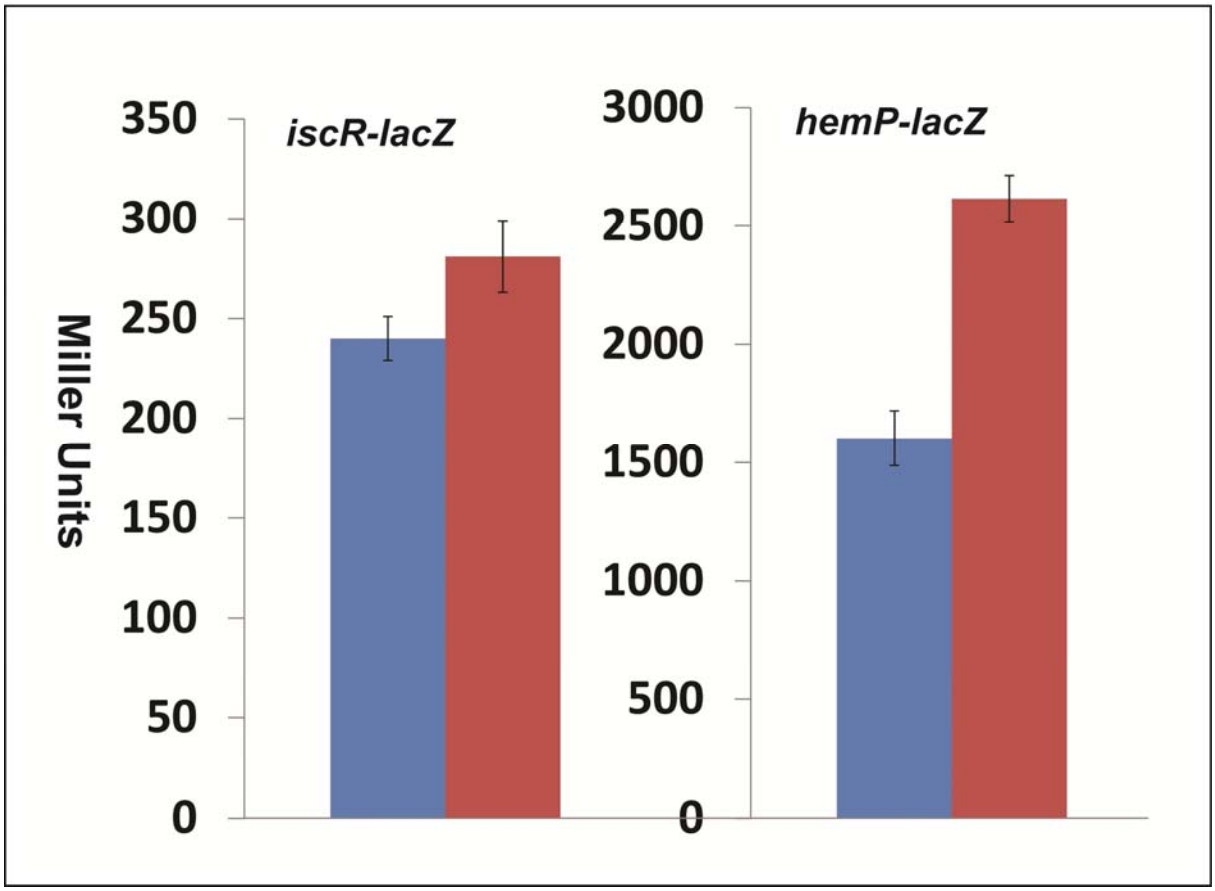
4.1.12 Iron-responsive expression of the hemP *and* iscR *genes of* R. pomeroyi

As described in Chapter 3, two other *Ruegeria pomeroyi* genes, namely *hemP* and *iscR* are preceded by predicted IR boxes, these two genes being predicted to encode, respectively, a polypeptide involved in haem uptake and in the regulation of the complex operon that includes *iscR* itself, plus the downstream *suf* genes (Table 3.2).

To examine the expression of *hemP* and of *iscR*, transcriptional *lacZ* fusions to each gene were constructed, using the same general approach as described above for the *fbp* genes. For *hemP,* a 546 bp spanning its promoter region was amplified, using primers **SPO0789XbaIF1** and **SPO0789PstIR1**. For *iscR*, an 840 bp region spanning its 5' upstream region was amplified, using primers **iscRpS4F** and **iscRpS4R**. The resultant products were each purified, digested with *Xba*I plus *Pst*I, and cloned, separately, into pBIO1878. The sequence verified *hemP-lacZ* and *iscR*-lacZ fusion plasmids were named pBIO2117 and pBIO2118 respectively. These plasmids were crossed into *R. pomeroyi* by triparental conjugation as described earlier and the transconjugants were assayed for β-galactosidase after growth in Fe-depleted and Fe-replete MBM minimal medium.

As shown in Figure 4.17, both the *hemP*- and *iscR-lacZ* fusions were expressed at significantly higher level in the Fe-depleted medium than in the medium to which 20 µM $FeCl_2$ had been added. However, the factors of increase were much less than had been seen with the *fbp-lacZ* fusions, especially for *hemP*, where the *hemP* fusion was expressed <2-fold more in the –Fe than in the + Fe medium. This was due, largely, to the higher expression of both these fusions in the Fe-replete medium. Note that the absolute levels of expression were considerably greater for the *hemP*- than the *iscR-lacZ* fusion.

Figure 4.17 Effect of iron limitation on expression of *hemP-* and *iscR-lacZ* fusions



Assays were performed on R. pomeroyi containing the iscR-lacZ and hemP-lacZ fusion plasmids pBIO2118 and pBIO2117 respectively, after pre-growth in MBM containing 20 µM $FeCl_3$ (RED BARS) or no added iron (BLUE BARS). Results are averages of three biological and two technical replicates.

4.2 Discussion

The *fbp* genes of *R. pomeroyi* are expressed separately, immediately obvious due to the convergent transcription of each gene. Although the *fbpABC* genes are arranged contiguously in *Vibrio*, the genes still have very different expression patterns, as the RNA levels of each gene differ significantly, *fbpA* is expressed at a much greater level than *fbpB* (Wyckoff *et al.* 2006). This was also clearly true of *R. pomeroyi*, shown via the expression of *lacZ*-fusions. The regulation of each of these two genes was also different, with *fbpA* far more inducible by low iron conditions than *fbpB*.

It is possible that FbpA is capable of binding to extracellular iron and facilitate transport across the outer membrane without the need for a TBDR, as the evidence of (Ferreiros *et al.* 1999) in *Neisseria* show.

However, mutations in the *fbp* genes of *R. pomeroyi* have shown that there must be at least one other system of iron uptake encoded on the *Ruegeria* genome. The bioinformatics predictions made in this work and in (Rodionov *et al.* 2006) did not give any insight into the identity of this transporter.

R. pomeroyi is predicted to lack TonB, or any TBDR. Given that FbpABC of *V. cholerae* is able to enhance growth of TonB$^-$ *E. coli* in low iron conditions (Wyckoff *et al.* 2006), it is possible that iron is transported into the cell in ferrous form – possibly via a ferric reductase, where it is internalised through a porin, much like the predicted product of *irpB* (*SPO0087*). Indeed, the bioinformatics study on the *irp* operon of *R. pomeroyi* alludes to fascinating future data on the role of these genes in iron uptake and homeostasis.

The expression of several iron uptake genes - those with an IR box motif upstream, was not completely deregulated in response to site directed mutations made in these motifs. This phenotype must mean another regulator – or regulatory system is controlling these genes. Whether this is via an uncharacterised transcriptional regulator, or a small RNA such as in the case of RyhB (Massé *et al.* 2005), remains unresolved.

The expression of *fbpA* and *irpA* in particular appeared to be highly inducible by low iron, something which was not so apparent from the expression of the *lacZ*-fusions for *fbpB*, *hemP* and *iscR*, although all these genes also had an IR box motif. Perhaps the cognate regulator of these IR boxes has highly specific binding properties, and has simply lost the ability to control these boxes. Bioinformatic searches for such motifs does risk finding 'pseudo-motifs' - relics of iron regulation in an ancestral strain.

Chapter 5 - Iron-Responsive transcriptional regulators in *R. pomeroyi* DSS-3

5.1 Introduction

As shown in Chapter 4, two potential (though not ratified) iron uptake systems in *R. pomeroyi* are tightly controlled, and have been shown to be expressed in Fe-depleted condition. This regulation was shown to require IR boxes, as shown by the effects of disrupting these *cis*-acting sequences. As mentioned before, the canonical IR box sequences are similar to those of the "IRO box" which are the target of an Rrf2 family transcriptional regulator, RirA.

A second Fe-responsive transcriptional regulator that is characteristic of the α-Proteobacteria is Irr, which can bind to very different motifs, known as ICE boxes (see above).

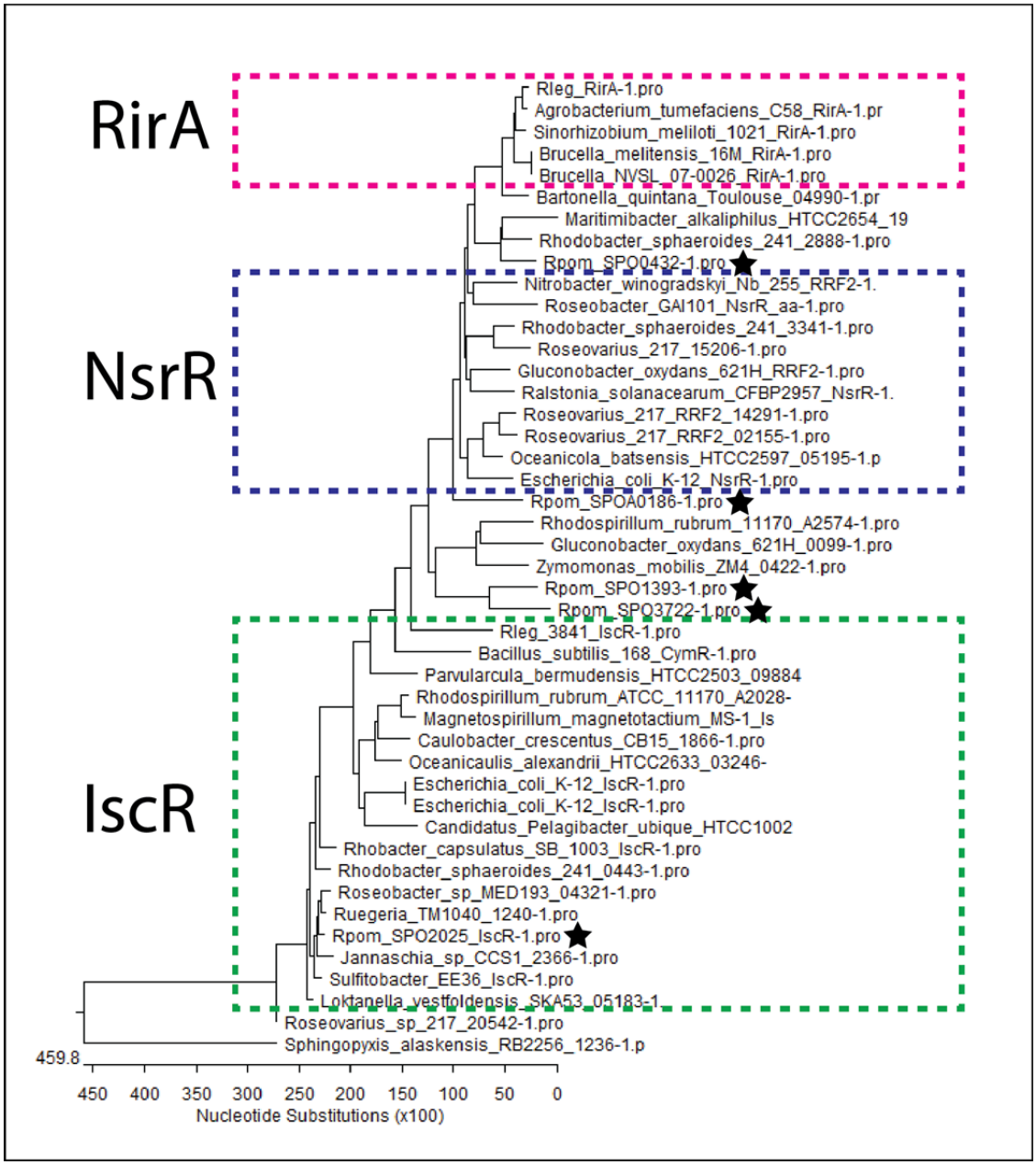
The genome of *Ruegeria pomeroyi* has several genes with products in the Rrf2 family of transcriptional regulators plus one gene that resembles *irr*. This observation, coupled with the fact that this bacterium has motifs that correspond to ICE boxes and to IR boxes, underpins the work described in this chapter, in which evidence was sought to define the roles, if any, of these regulators in iron homeostasis in *Ruegeria*.

5.2 *in vivo* analysis of iron responsive regulators of *R. pomeroyi*

5.2.1 The Rrf2 family of proteins in Ruegeria pomeroyi *and the Roseobacters*

A BLASTp search of the proteins encoded by the genome of *R. pomeroyi*, using the *Rhizobium leguminosarum* RirA amino acid sequence (gene locus *RL_0777*) as the probe revealed five members of the Rrf2 family proteins, encoded by the genes *SPO0432*, *SPOA0186*, *SPO1393*, *SPO3722* and *SPO2025*. To show the relationship between the five Rrf2 family proteins and several characterised examples of Rrf2 family transcriptional regulators a phylogenetic tree was made.

Figure 5.1 Phylogenetic tree of Rrf2 family transcriptional regulator peptide sequences



Phylogenetic tree generated using an alignment of peptide sequences of Rrf2 family proteins. Those with a functional annotation are labelled accordingly – RirA, IscR and NsrR (Nitrosative stress response Regulator). Marked with a star are the 5 Rrf2 peptides found in the deduced proteome of R. pomeroyi.

As shown in Figure 5.1 and in Rodionov *et al.*, (2006), none of these *Ruegeria* Rrf2 family proteins cluster with the characterised examples of RirA. However, there is a likely candidate for an NsrR-type regulator, the product of *SPOA0186*, and a likely candidate for an IscR-type regulator, the product of

SPO2025. Interestingly, two Rrf2 family proteins (the products of *SPO1393* and *SPO3722*) are not very similar to each other (42% identical), but form something of an out-group of the Rrf2 super-family in this bacterium.

As table 5.1 below shows, only SPO2025 is present in all the Roseobacter genomes. The next most common and indeed the most similar to RirA of *Rhizobium* was *SPO0432*. Proteins homologous to both *SPO1393* and *SPO3722* were only found in *Ruegeria pomeroyi*.

Table 5.1 Prevalence of Rrf2 gene homologues of *Ruegeria* in the Roseobacters

Gene	No. of hits in Roseobacters <1E^{-20}
SPO0432	26
SPOA0186	10
SPO1393	1
SPO3722	1
SPO2025	38

5.2.2 Construction and analysis of mutations in genes for Rrf2-family proteins in Ruegeria

Since there was no obvious candidate that matched RirA *sensu stricto,* it was decided to make insertional mutations in all five genes that encode Rrf2-family proteins and determine if these have any effects on the expression of one or more genes that contain IR motifs. The approach taken was the same as that used to make the *irpA* mutation, above. Thus, fragments internal to each of the five genes were cloned into the suicide plasmid pBIO1879 and these were used to generate insertional mutations into the corresponding chromosomal gene following the introduction of the various mutagenic plasmids into *Ruegeria pomeroyi* J470. The particular primers used to generate the insert fragments for this set of constructions are shown in Table 5.2 below.

Table 5.2 Primer sequences used to generate mutant strains of *R. pomeroyi*.

Primer	Sequence	Plasmid	Mutant
SPO0432EcoF	ATCGGAATTCGCATTACCAAGCGCACAAAT	pBIO2119	J534
SPO0432XbaR	ACGTTCTAGATTATCACAGACCAGCGCATC		
SPO3722F	CACCGAAGGACTGGAATGG	pBIO2120	J535
SPO3722R	ACGTTCTAGATGAGAGCTTTTCCTGAAACCA		
SPO1393F	AGTCGAATTCATTGGGTGACGGGGTAGAG	pBIO2121	J536
SPO1393R	TACGTCTAGAGCCTGGAGATTCTCAAATCC		
SPO2025F	TGACGAATTCGTCGACAAAGGGGCGCTAT	pBIO2122	J537
SPO2025R	AGTCTCTAGATCTTCACCACATCCGAAAGC		
SPOA0186F	ACGTGAATTCCTCCAAGTTCTCCGACTATGC	pBIO2123	J538
SPOA0186R	GACTTCTAGACCGGATCGTATTTTGACCTG		

Each of the five recombinant plasmids was ratified by verifying the correct insert, and then crossed into *R. pomeroyi* J470 by tri-parental conjugation. Mutants were selected for using spectinomycin, kanamycin and rifampicin as detailed earlier. Each mutant was checked using Southern blots and/or PCR. The mutant strains with ratified insertions in the five *SPO* genes were named as follows: SPO1393^{-} = J536, SPO3722^{-} = J535, SPO0432^{-} = J534, SPOA0186^{-} = J538, SPO2025^{-} = J537.

Then, into each of these mutants was introduced each of the two transcriptional fusion plasmids containing *fbpA-lacZ* (pBIO1845) and *irpA-lacZ* (pBIO1847). The array of transconjugants were then grown in Fe-depleted and Fe-replete media as described above and assayed for β-galactosidase activity. In no case was the behaviour of either fusion, in either of the growth media markedly different from the case when the wild type strain harboured these plasmids (not shown). Thus, it appears that neither *irpB* nor *fbpA* is under the control of any of the Rrf2 family proteins examined here.

5.2.3 Ruegeria pomeroyi Irr – a global iron-responsive regulator in other α-proteobacteria

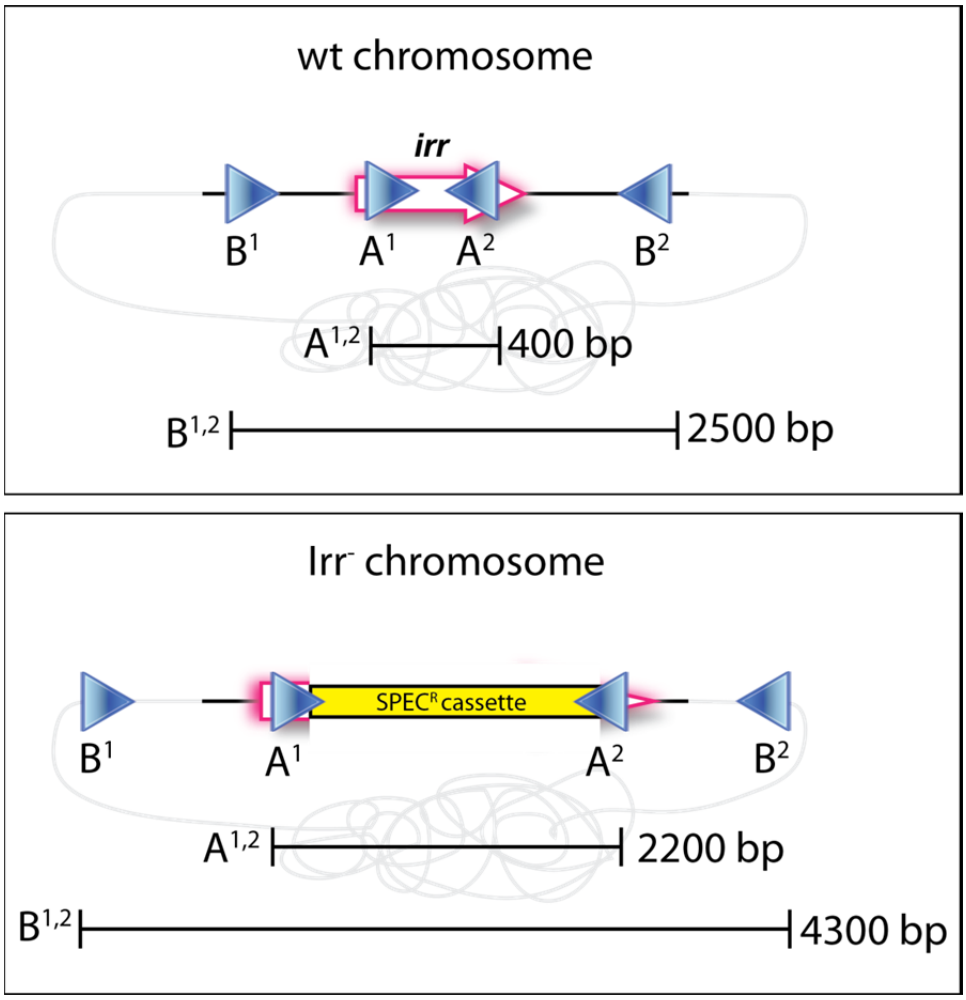
The second, "global" iron-responsive transcriptional regulator that is found in alpha-Proteobacteria is the iron responsive regulator, Irr. *R. pomeroyi* has a predicted *irr* gene *SPOA0445*, on its large resident plasmid whose translated product is 57% identical to *Rhizobium* Irr. Furthermore, there are ICE boxes in the promoter regions of several genes that are Irr-regulated in other bacteria. This

section examines if *SPOA0455* does indeed encode a functional Irr regulator that acts on these ICE boxes.

Therefore, an Irr$^-$ mutant strain was made, using the pEX18Ap delivery system (see Chapter 4, and Material and Methods for the pEX18Ap procedure) to create an insertion into *SPOA0455.* Briefly, a 2.2 kb region that flanked the *irr* coding sequence was amplified from *R. pomeroyi* genomic DNA using standard PCR protocols, and primers **irrflankEcoFWD** and **irrflankHindIIIREV**. This product was digested with *Eco*RI and *Hind*III, and ligated into pEX18Ap, cut using the same enzymes. The ligation products were used to transform *E. coli* 803 competent cells, selecting transformants by their ampicillin resistance. After screening the plasmids from several transformants, one (termed pBIO2113) was confirmed by sequencing to have the correct insert. Into this plasmid was then introduced the 1.8 kb spectinomycin cassette (as detailed in chapter 4) cloned into a *Pst*I site that is internal to *irr*, 220 bp downstream of its start codon. Following ligation, transformants of *E. coli* 803 were selected on media containing ampicillin and spectinomycin. Following the usual ratification procedures, one recombinant plasmid, named pBIO2114, was confirmed to have the correct constitution. This plasmid was then mobilised into *R. pomeroyi* and recombinants that were resistant to spectinomycin, but sensitive to ampicillin, were chosen as candidates in which the spectinomycin cassette had recombined into the genomic version of *irr.*

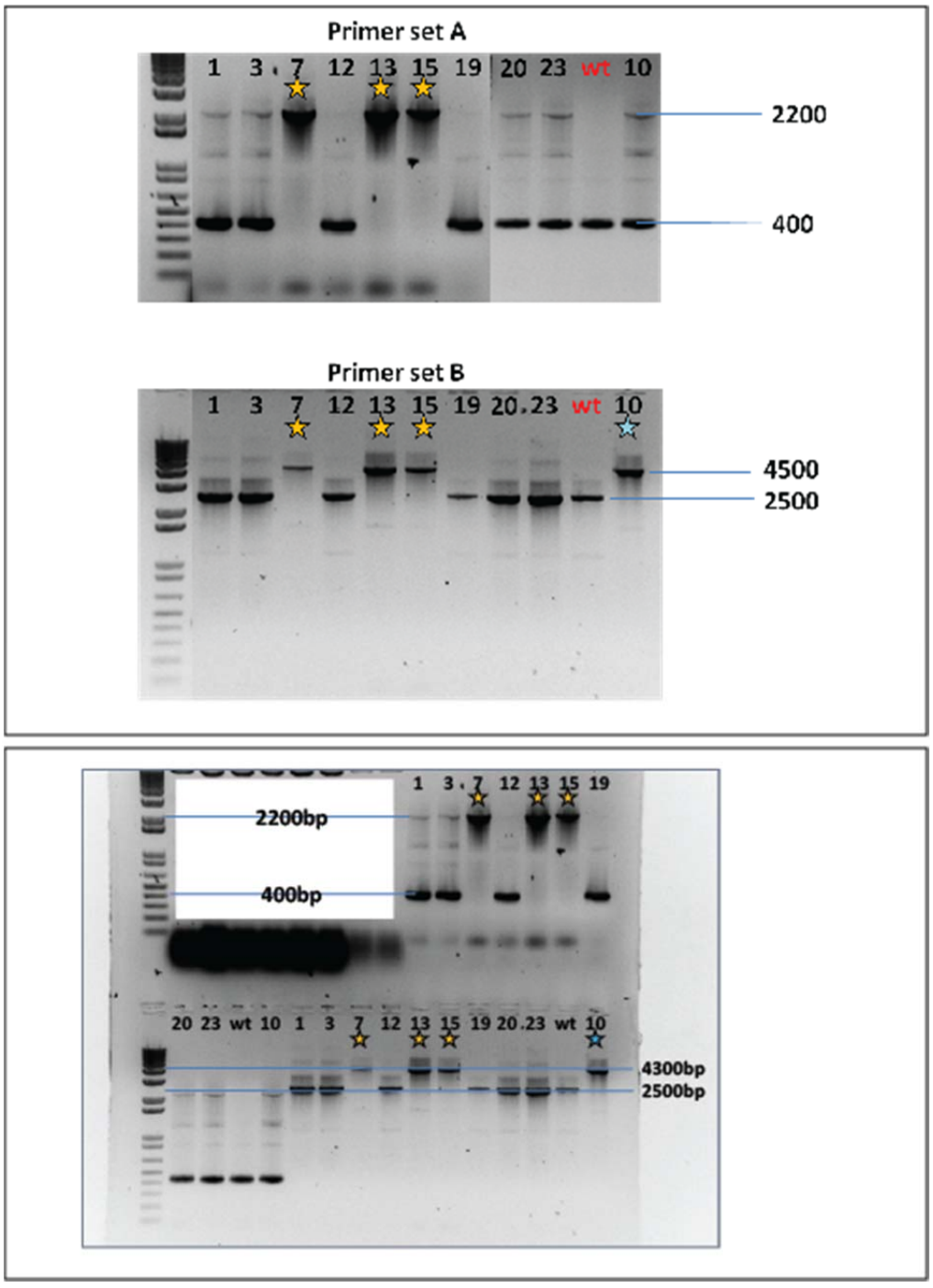
Several potential mutants were tested using two sets of primers that flanked the *irr* gene **Irrflank1F** and **Irrflank2R** (labelled primer set B in Figure 5.2, which amplify a 2.5 kb region in the wild type) and primers which flanked the *Pst*I site within the *irr* gene **IrrcheckF** and **IrrcheckR** (labelled primer set A in Figure 5.2, which amplify a 400 bp region in the wild type). Of ten mutants screened, three were correct in both primer sets, and did not make any secondary products. The Irr$^-$ discussed in this work relates to sample 13 in Figure 5.3, and was renamed J539.

Figure 5.2 Map of Irr⁻ recombinant mutant



Map of* irr *locus in wild type and Irr⁻ strain of* R. pomeroyi *showing position of primers used to screen for successful mutation, and showing predicted sizes of amplified products using these primers.

Figure 5.3 PCR screening of potential Irr⁻ mutants of *R. pomeroyi*



Upper panel shows the results of electrophoretic separation (1% agarose gel) of PCR products generated using primers which flank a* PstI *site within the* irr *gene of* R. pomeroyi *(primer set A), and primers which anneal either side of the* irr *gene (primer set B). These primers were used in colony PCR reactions on potential Irr⁻ mutants of* R. pomeroyi *(numbered) and the wild type* R. pomeroyi *(wt). Colonies which generated a mutant PCR product without a wild type product are shown with a gold star. The blue star indicates a colony which did not produce a mutant product with both primer sets. The lower panel shows the agarose gel photo without any editing.

5.2.4 *Phenotype of Irr⁻ mutant of* R. pomeroyi

It was immediately obvious that colonies and liquid cultures of the Irr⁻ mutant strain of *R. pomeroyi* J539 were pigmented, with a brick-red colour. This was particularly pronounced under conditions of iron deficiency, in which the chelating agent dipyridyl (30 µM) was added to HY rich medium and was abolished by adding extra (100 µM) $FeCl_3$ into HY rich medium.

Previous work in both *Rhizobium leguminosarum* and *Bradyrhizobium japonicum* (Hamza *et al.* 1998) had shown that an Irr⁻ strain accumulates Protoporphyrin IX (PPIX), due to constitutive expression of HemB, likely due to an uncoupling of the haem biosynthetic pathway from iron availability.

However, in *R. pomeroyi*, the pigment produced by the Irr⁻ strain did not fluoresce under UV light, making it unlikely to be PPIX. Furthermore, attempts to isolate the pigment using acetone (Yeoman *et al.* 1997) were also unsuccessful. The pigment appeared to be a precipitate which was separate from the cell pellet. In support of the red pigment being unrelated to PPIX, the expression of *Rhodobacter sphaeroides hemB* was shown to be unchanged in an Irr mutant (Peuser *et al.* 2012). Furthermore, in a microarray study performed as part of this work (see chapter 7) expression of *hemB* of *Ruegeria* {*SPO2076*} was shown to be unchanged in an Irr⁻ strain.

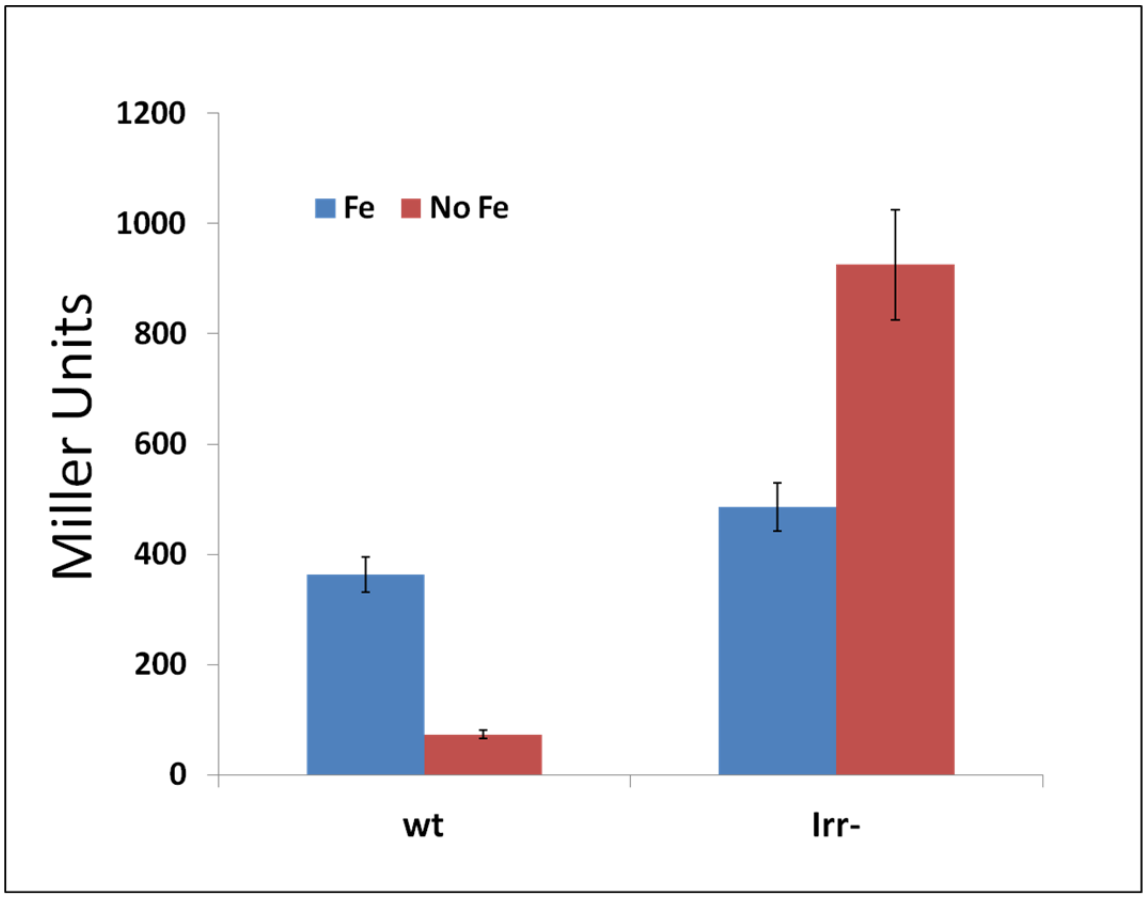
5.2.5 *Expression of* mbfA *in the Irr⁻ strain of* R. pomeroyi

The gene *SPO0382* (*mbfA*) was predicted to be preceded with an ICE box, and, indeed, a homologue of this gene had been shown to be regulated by Irr, in other alpha-proteobacteria, namely *Rhizobium leguminosarum, Bradyrhizobium japonicum, Agrobacterium tumefaciens* and *Brucella abortus* in Irr repressed *mbfA* in Fe-depleted conditions (Martinez *et al.* 2005; Rudolph *et al.* 2006; Todd *et al.* 2006; Ruangkiattikul *et al.* 2012). Furthermore, a homologue of *mbfA* has been shown to be Irr-regulated in *Rhodobacter* (Peuser *et al*. 2011).

To test the expression of *mbfA* in *R. pomeroyi*, a fusion of its promoter to the *lacZ* gene in pBIO1878 was made. The primers **MbfApXba1fwd** and **MbfApPst1rev** were used to amplify a 759 bp region that spanned the upstream region of *mbfA*, this was digested with *Xba*I and *Pst*I, and cloned into pBIO1878, to generate pBIO1929. This fusion plasmid was crossed into *R. pomeroyi* by conjugation, and single colonies of purified transconjugants were used to make starter cultures for β-galactosidase assays. As shown in Figure 5.4, in the wild type background, the expression of the

mbfA-lacZ fusion is considerably higher (~5-fold) in the +Fe than the –Fe medium. Strikingly though, in the Irr$^-$ mutant, expression of the fusion was greatly enhanced in both sets of media – indeed, in the absence of Irr, the expression is *greater* in the Fe-depleted than the Fe-replete media. This suggests that the *mbfA* promoter is subject to another, as yet unknown, Fe-responsive regulator, whose action is normally masked by the opposing regulatory action of Irr.

Figure 5.4 Effect of iron limitation and *irr* on expression of *mbfA* in *R. pomeroyi*



Ruegeria pomeroyi containing the mbfA-lacZ fusion plasmid (pBIO1929) were grown in minimal medium (MBM) either supplemented with 20 μM $FeCl_3$ (Fe) or not (No Fe) and assayed for β-galactosidase activity, expressed in Miller units. Error bars represent the standard deviation of 2 biological, and three technical replicates.

To confirm that the mutation in *irr* was indeed responsible for the altered expression of the *mbfA-lacZ* fusion, the effects of introducing a wild-type version of *irr* were determined. To do this, a fragment of DNA that contained the entire *irr* gene plus its upstream regulatory sequence was generated by PCR from genomic DNA using the primers **irrCOMPFWD** and **irrCOMPREV**. This

fragment was then cloned (using *Xba*I) into pOT2, another, wide host-range plasmid, which confers resistance to gentamicin and is compatible with pBIO1845, the *lacZ* fusion plasmid. The resulting plasmid, called pBIO1928, was mobilised into the *R. pomeroyi* Irr$^-$ mutant that harboured the *mbfA-lacZ* fusion plasmid pBIO1929. The expression pattern of β-galactosidase activities were restored to normal, being higher in +Fe than –Fe media, conforming that the mutation in *irr* was indeed responsible for the altered expression of the *mbfA-lacZ* fusion.

5.2.6 Expression of iscR *in the Irr$^-$ strain of* R. pomeroyi

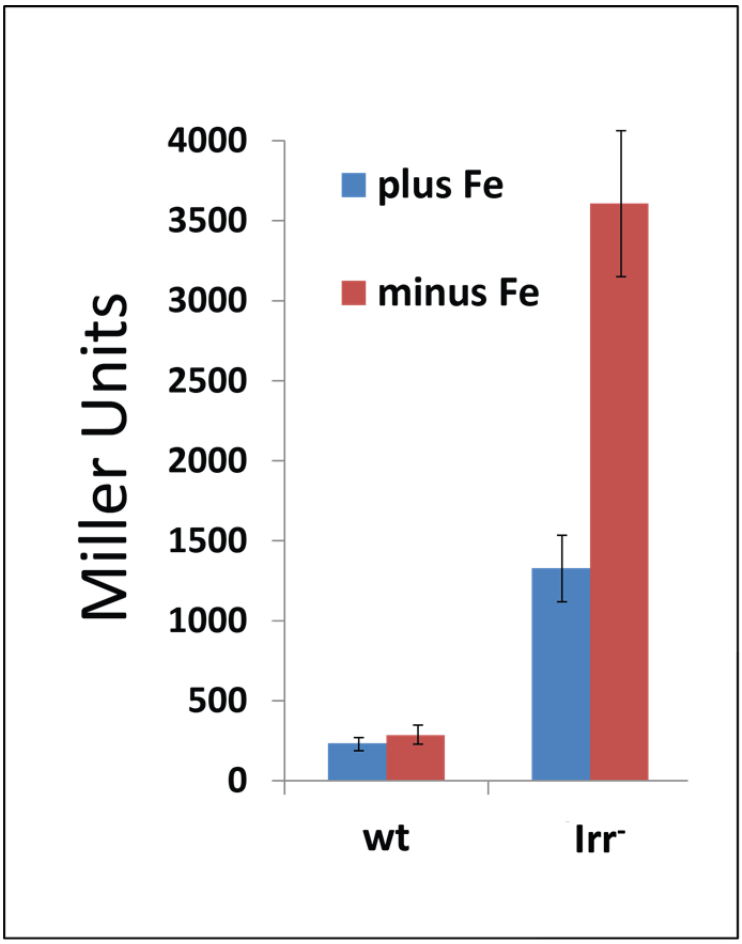
IscR is predicted to regulate the biosynthesis of Fe-S clusters, and indeed is found as part of a *suf* gene cluster in *R. pomeroyi* (see chapter 3 for details).

The potential regulation of IscR in *R. pomeroyi* is intriguing, and leads us to believe that the regulation of the Fe-S synthesis pathway in *R. pomeroyi* is of particular importance to the Fe-homeostasis in this bacterium. There is a motif homologous to the IR box, and a motif homologous to the ICE boxes discussed earlier (see Figure 3.3). This feature has been identified in several proteobacteria (Rodionov *et al.* 2006).

A fusion was made to *iscR* (*SPO2025*) of *R. pomeroyi* described in chapter 4 – pBIO2118. This fusion was crossed into the *R. pomeroyi* strain J470 and the Irr$^-$ strain J539.

Here, shown in figure 5.5, the expression of *iscR* is clearly hugely deregulated in the Irr$^-$ background, but is still clearly Fe regulated (~2-fold Fe-repressed).

Figure 5.5 Effect of Fe on a *iscR* fusion in both wild type, and Irr⁻ *R. pomeroyi*



Ruegeria pomeroyi containing either the iscR-lacZ fusion plasmid (pBIO2118) was grown in minimal medium (MBM) either supplemented with 20 µM $FeCl_3$ (Iron +) or not (Iron -) and assayed for β-galactosidase activity, expressed in Miller units. Error bars represent the standard deviation of 2 biological, and three technical replicates.

5.3 Discussion

It was clear that Irr, one of the recognised global Fe-responsive gene regulators in the alpha-proteobacteria behaves in a conventional way in *Ruegeria pomeroyi* as expected from the canonical systems of the rhizobiales. Further characterisation would be required to ascertain if this Irr behaves more like that of *Rhizobium*, or *Bradyrhizobium* in response to haem binding.

The expression of *mbfA* and *iscR* is likely controlled by the recognition of the ICE boxes that precede these genes by Irr in Fe-depleted conditions. It would be surprising if the other genes *fssA* and *ccpA*

(*SPO0382* and *SPO0330*) (see Table 3.1) with a conserved ICE box did not respond in a similar way, though this was not examined directly.

Peuser *et al*. (2012) performed a microarray study in the well characterised α-proteobacteria *Rhodobacter sphaeroides*, and showed that repression of *mbfA* in this strain was mediated by Irr under low iron conditions. Conversely, a homologue of *iscR* in *Rhodobacter* (*RSP_0443*) was not regulated by Irr under high or low iron conditions. This related bacterial species would likely use Irr in a similar way to Ruegeria, especially as it is likely that Rhodobacter was isolated from a marine environment. To further investigate the transcriptome of Ruegeria, a transcriptomic experiment was performed as part of this work, including the Irr^- strain, which adds to this interesting story (see chapter 7).

In contrast, the picture is much less clear concerning the identity of a regulator or regulators that *repress* genes under Fe-replete conditions. As shown in Chapter 4, there are at least some genes whose expression is massively increased in low-Fe media, including some of those that are predicted – though not confirmed – to be involved in the import of Fe. In most bacterial taxa, these are the types of gene that are repressed by Fur and, in the special case of at least some members of the alpha-proteobacteria, by a very different transcriptional regulator, RirA.

However, close homologues of RirA are confined to *Rhizobium,* and a few close relatives, namely *Sinorhizobium, Mesorhizobium, Agrobacterium, Brucella* and *Bartonella,* so the identity of any analogous regulator in other, alpha-proteobacteria is not immediately obvious. However, the "iron-rhodo" boxes that precede several genes that are expected, *a priori,* to be involved in iron uptake and therefore repressed under +Fe conditions has a similar sequence to that of the IRO box recognition site for the RirA regulator (see Figure 3.3). Given the experimentally confirmed importance (see Chapter 4) of the IR boxes, this provides circumstantial, though not cast-iron evidence that the IR boxes are also recognition sites for transcriptional regulators that are in the Rrf2 family and so would have some similarity to RirA. However, this was not supported by the evidence described in this chapter; none of the mutant strains, with insertions in each of the genes that encode Rrf2-family proteins in *Ruegeria pomeroyi* was altered in the Fe-dependent repression of those genes (*fbpA* and *irpA*) that have IR regulatory sequences.

Taken together, these findings mean that *R. pomeroyi* may use a novel Fe-responsive transcriptional regulator to regulate genes under the control of *cis*-acting IR boxes. In time, a library of transposon mutants could be created for *R. pomeroyi*, allowing the potential identification of candidate regulators of the IR box, as was performed in Rhizobium to identify RirA (Todd *et al.* 2002). Here, the authors utilised both an iron regulated promoter-gfp fusion to identify a Tn5 mutant which was

deregulated for *gfp* expression in high iron conditions. This mutant was also shown to produce ~3-fold more vicibactin. Both phenotypes were corrected by using a gene library of *Rhizobium leguminosarum*, and the correcting clone was mapped to finally identify the RirA gene locus.

Of course, there could be functional redundancy in this regulatory network of *Ruegeria*, which would make identifying the regulator of IR boxes a lot more difficult. This may be evident in both the lack of complete deregulation of several of the site-directed mutants in IR boxes, and the lack of phenotype for any single Rrf2 family mutant in *Ruegeria*.

It would be expected that there would be reasonable conservation of the IR box-binding transcriptional regulator in those closely related marine species – the Roseobacters, so a more complete and detailed analysis of potential transcriptional regulators could provide more targets for testing.

These negative results show that the classical-type Fe-responsive transcriptional regulator(s) that represses Fe-uptake genes remain(s) elusive. It is clearly not an Rrf2-type (unless, of course there is redundancy between the five Rrf2 family proteins in *Ruegeria*). We assumed that the regulator would be an Rrf2-type given the similarity of IR and IRO boxes, but this may have been an oversight, there is great similarity between IR, IRO and IscR boxes in the α-proteobacteria, but all have very different and distinct regulons.

Furthermore, the IR boxes are not recognised by the γ-proteobacterial global iron regulator “Fur”, which is actually a Mur – see chapter 6, for Mn responsive regulation.

Without any further target genes identifiable, this work is left for future projects, and would be of great interest, potentially identifying a novel iron-responsive regulator in marine α-proteobacteria. The difference between the RirA-mediated IRO box regulation in *Rhizobium* and what we observe in *R. pomeroyi* is also very exciting. The shift away from the Fur paradigm of *E. coli*, to the Irr/RirA system of *Rhizobium* was an abrupt change in our understanding of iron uptake, and the potential for another such shift is clearly possible here in the marine α-proteobacteria.

Chapter 6_a - Manganese Uptake and Regulation in *R. pomeroyi*

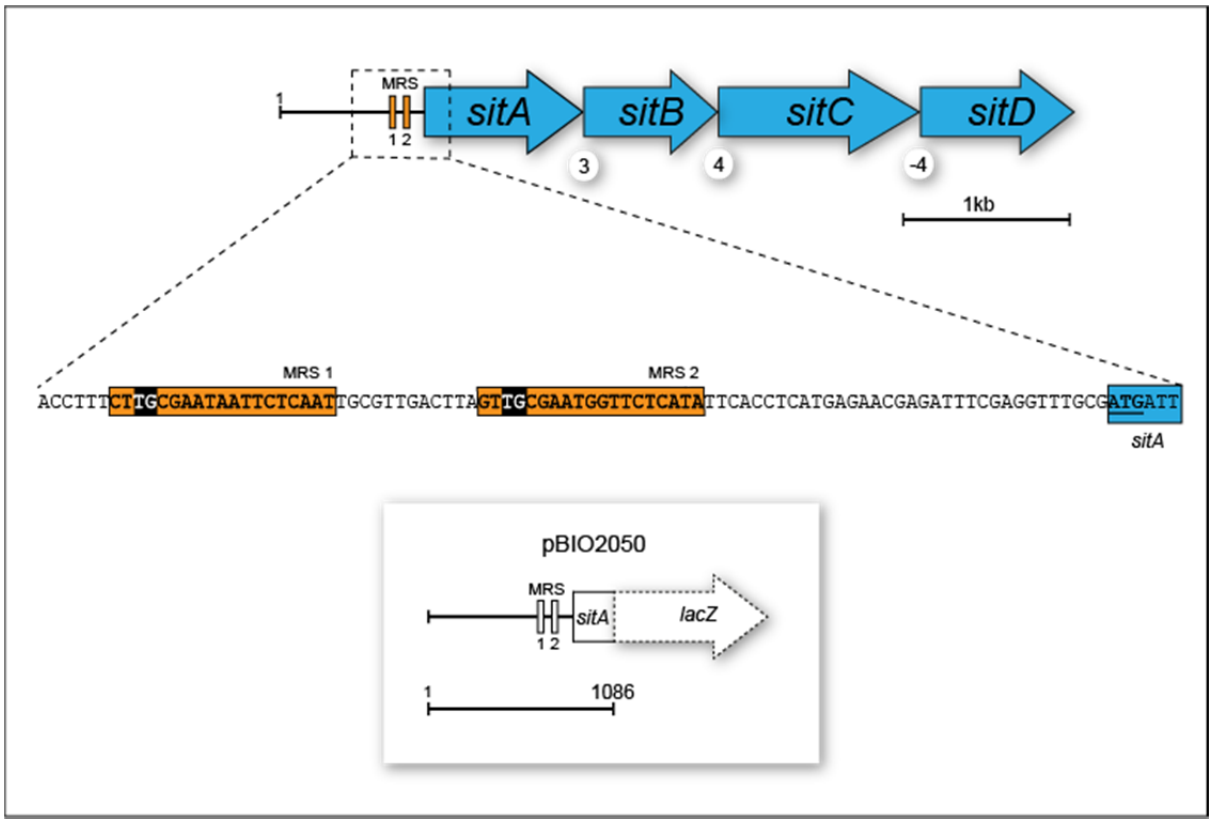
6.1 Introduction

Like iron, manganese is largely biologically unavailable in the marine environment. Bacteria have therefore evolved highly specific transport systems to import this physiologically important metal. Somewhat less studied than iron uptake systems in bacteria, Mn transport has been shown to be tightly regulated in response to both Mn availability and to oxidative stress. Here, I will examine the Mn responsive regulation and uptake of this metal in *Ruegeria*, and further afield.

6.1.1 Ruegeria pomeroyi *has a homologue of the SitABCD manganese transporter*

Inspection of the *R. pomeroyi* DSS-3 genome identified at least two sets of genes with a likely role in Mn uptake (Rodionov *et al.* 2006). One of these comprised the consecutive chromosomal genes *SPO3366, SPO3365, SPO3364* and *SPO3363,* which are predicted to encode the individual polypeptides that comprise the ABC-class Mn^{2+} -transporter SitABCD (Figure 6.1) on the basis of the striking similarity with the corresponding gene products in other bacteria – see below; *sitA* encodes the periplasmic binding protein, *sitB* the ATPase and *sitC* and *sitD* the two inner membrane permease polypeptides. These genes are likely expressed as a single operon from a single promoter upstream of *sitA*. We confirmed that *Ruegeria pomeroyi sitABCD* are indeed involved in Mn uptake as follows.

Figure 6.1 Map of the *sit* locus of *R. pomeroyi*



The operon structure of* R. pomeroyi sitABCD *is shown, with the sizes of the intergenic gaps indicated, in base pairs, in circles between genes. The "-4" between* sitC *and* sitD *denotes overlap between these two genes, suggestive of translational coupling. The positions of two MRS boxes are shown upstream of* sitA*. The sequence of this upstream region is shown as the zoomed (dotted lines) region. Bases targeted for site-directed mutagenesis in the two MRS boxes are shaded black. The start codon of* sitA *is shown in blue, and underlined. The inset shows the dimensions of the 1086 bp cloned DNA in the* sitA-lacZ *fusion plasmid pBIO2050.

6.1.2 The expression of sitABCD *responds to manganese levels*

In order to study the regulation of *sitABCD*, a 1086 bp region spanning the predicted regulatory region of this operon, and extending into *sitA* itself was cloned into the wide host-range *lacZ* transcriptional fusion plasmid pBIO1878, generating pBIO2050 (Figure 6.1). To do this, oligonucleotide primers **SitAF2** and **SitAR2** were used to amplify the insert DNA, using *R. pomeroyi* gDNA as a template in a standard PCR reaction. This PCR product was purified and digested using *XbaI* and *PstI*, as was the vector pBIO1878. These were ligated together and used to transform *E. coli* 803 competent cells. Transformants were purified on selective LB agar medium (containing

spectinomycin and tetracycline as detailed before). A single transformant was used to purify the recombinant plasmid, which was checked for the presence of an insert and sequence-verified.

The resultant plasmid, pBIO2050, was crossed into *R. pomeroyi* by conjugation and the purified transconjugant strain was used to conduct β-galactosidase assays. The cells were grown in MBM or in MBM to which extra $MnCl_2$ (20 μM) had been added. In both media, the fusion was expressed at barely detectable levels, which was surprising, since it had been anticipated that the *sitABCD* promoter would be expressed at higher levels in the Mn-deficient medium, not least because there were two convincing MRS regulatory sequences upstream of *sitA.*

It was then realised that a component of MBM is a proprietary blend of sea salts from Sigma, the recipe of which is unavailable. It was plausible that these sea salts contained sufficient levels of Mn to repress *sitABCD,* even with no addition of $MnCl_2$. Therefore, a new, defined "sea salts" cocktail, termed Rob's Sea Salts (RSS), was devised. It was designed to comprise a mix of magnesium, calcium, sodium and potassium that resembled those in natural seawater, with the exception of manganese, which was deliberately omitted. The constitution of RSS is shown in the Materials and Methods (Chapter 9).

The experiment above was therefore repeated, but this time using RSS as the background medium, to which extra $MnCl_2$ was added, or not. In this case, it was found that the expression of the *sitA-lacZ* fusion was 16-fold higher in the cultures that lacked Mn (789 Miller Units) than when 20 μM $MnCl_2$ was present (42 Miller Units), shown in Figure 6.4. Thus the expression of *sitABCD* was repressed in Mn-replete conditions, as expected by the precedents seen in other bacteria that contain these genes (Diaz-Mireles *et al.* 2004; Platero *et al.* 2004).

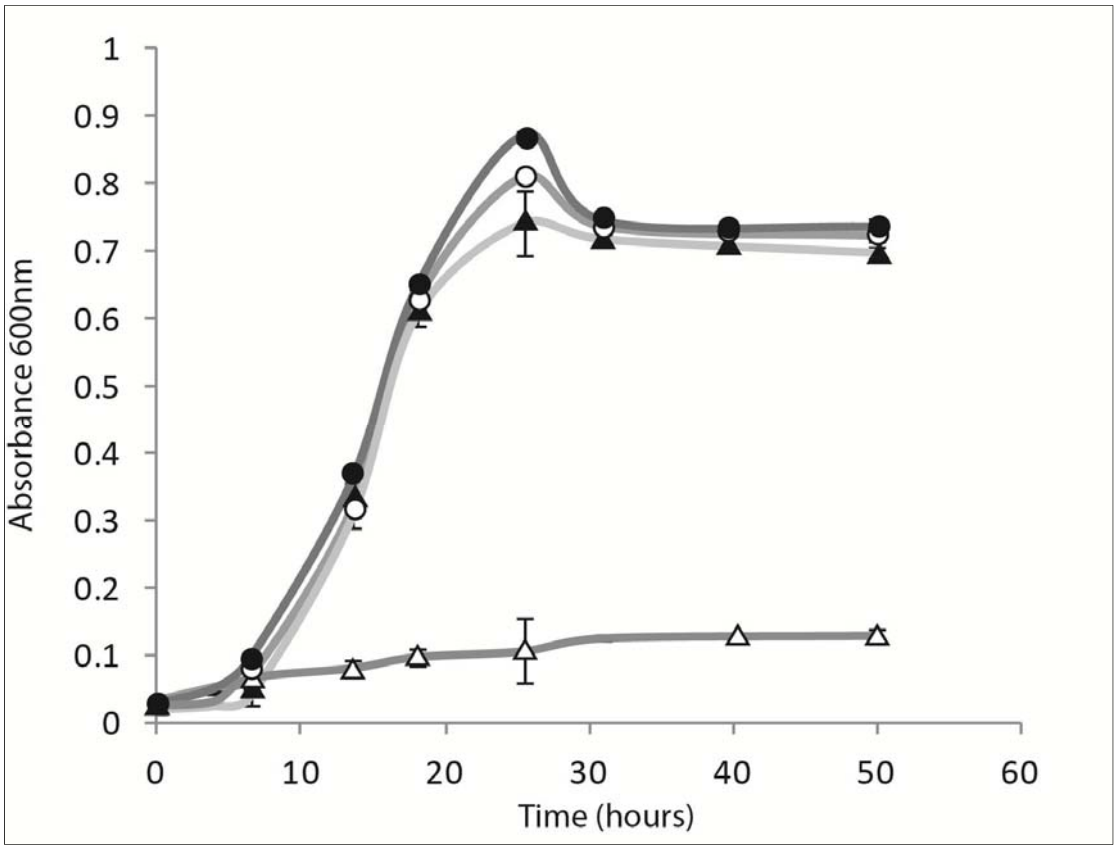
6.1.3 A SitA$^-$ strain of R. pomeroyi *requires manganese for growth*

The wild type *R. pomeroyi* DSS-3 does not show any growth limitation when Mn is excluded from the medium, as shown in Figure 6.2. If SitABCD is the only Mn-specific transporter encoded by the *R. pomeroyi* genome, as predicted bioinformatically, and by Rodionov and colleagues (2006), then a deletion mutant should have a growth phenotype during Mn limitation. To test this, a SitA mutant was made using the pK19mob derivative pBIO1879, into which a fragment of SitA, >100bp from each end of the coding sequence was cloned into pBIO1879, generating pBIO2124. This was sequence verified and crossed into *R. pomeroyi* J470 by conjugation. Successful single recombinant mutants

were screened as detailed before, selecting for $Spec^R$ and Kan^R colonies. These were purified and checked by PCR.

Cultures of wild type *R. pomeroyi* and J529 were grown at 28°C for two days before being diluted 1:100 into RSS medium with or without added Mn (as with MBM minimal medium experiments, succinate was added at 10 mM, and vitamin solution {1:1000} was added to all cultures, refer to Material and Methods, chapter 9). As shown in Figure 6.2, growth of the $SitA^-$ strain J529 was deficient in growth without added Mn.

Figure 6.2 Effects of mutating *Ruegeria pomeroyi sitA* on growth in manganese-depleted media



Cultures of* R. pomeroyi *DSS-3 wild-type (circles) or the SitA⁻ mutant J529 (triangles) were diluted, in triplicate, into RSS minimal media that either lacked (open symbols) or contained (filled symbols) added 20μM $MnCl_2$. Growth at 28°C, with shaking, was monitored by measuring absorbance at 600nm.

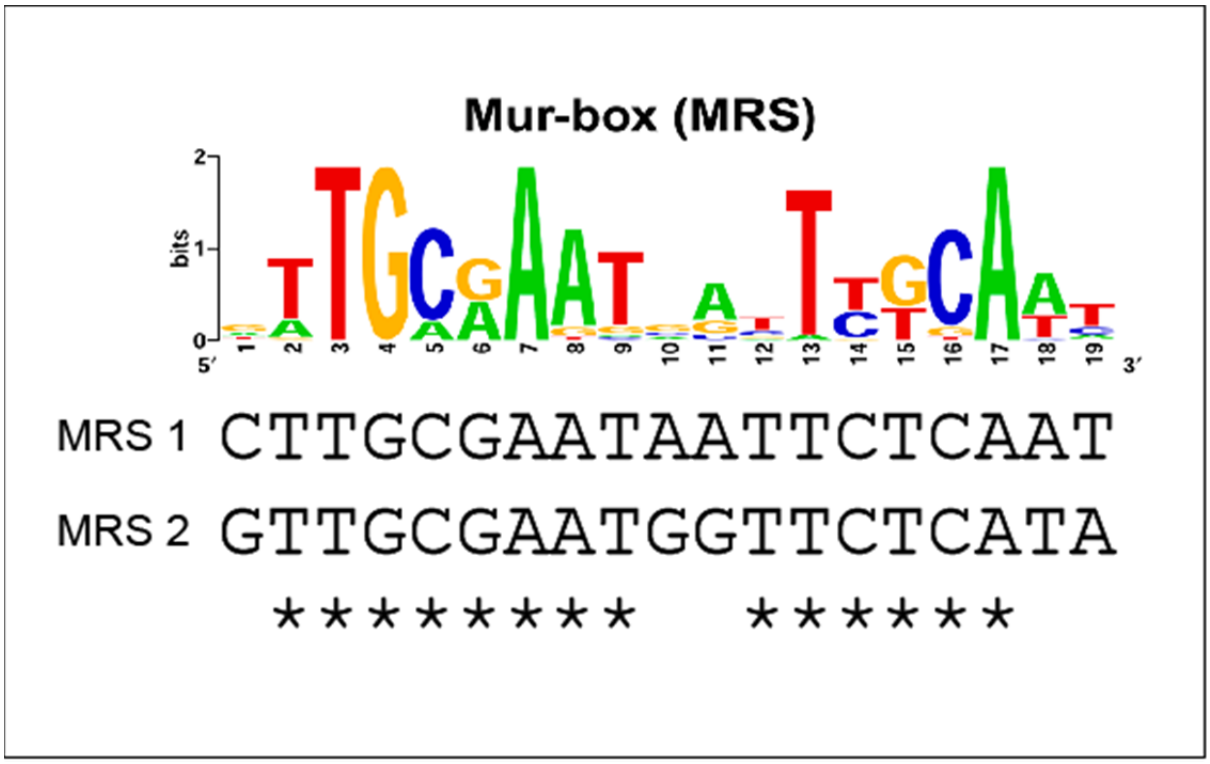
As shown in Figure 6.2 above, the $SitA^-$ strain J529 was unable to grow well without added Mn, but addition of 20 μM $MnCl_2$ restored growth to that of the wild type, which grew well irrespective of

the addition of extra $MnCl_2$. Thus, the SitABCD polypeptides do indeed appear to constitute a very effective manganese import system.

6.1.4 Two cis-acting *motifs regulate expression of* sitABCD

Rodionov *et al.* (2006) identified canonical target sequences upstream of predicted and ratified Mn-regulated genes in various α-Proteobacteria, including several members of the Rhodobacteraceae, including *R. pomeroyi* DSS-3. These 19 bp "Mur recognition sequences" (MRS) have dyad symmetry, and are the targets for the Mn^{2+}-responsive transcriptional regulator Mur (Figure 6.3).

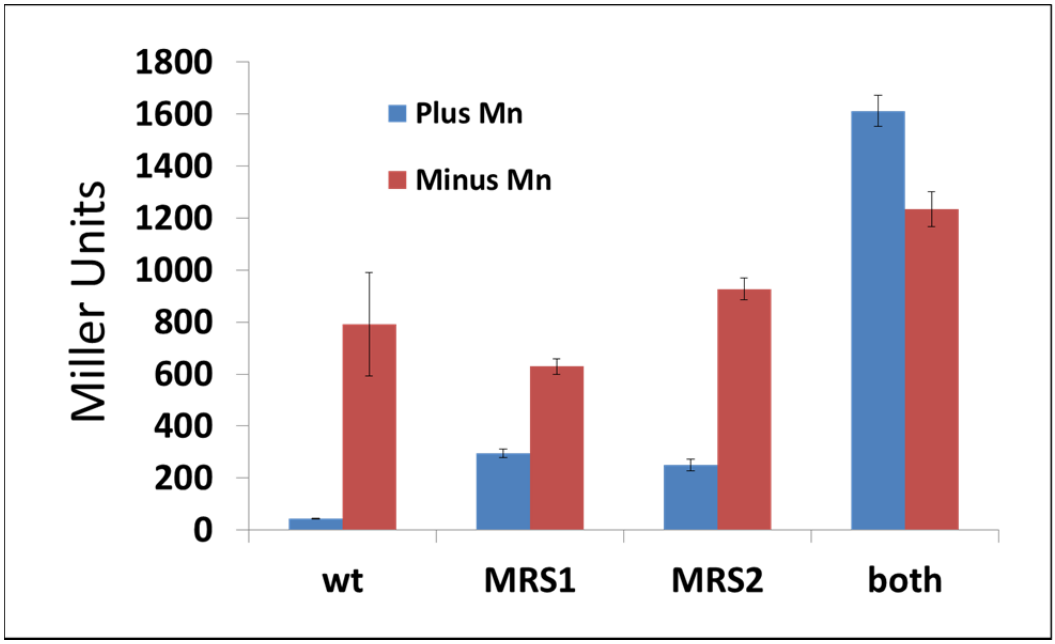
Figure 6.3 Mur-box (MRS) of the Rhodobacteraceae and an alignment of the two MRS boxes upstream of *sitA* in *R. pomeroyi*



Top: logo of the Rhodobacteraceae MRS consensus sequence (Rodionov* et al.*, 2006). Below: sequences found 5' of* sitA *of* R. pomeroyi*. Identical bases in the two MRS motifs are marked with a star.

There are two such MRS boxes centred 75 and 45 bps upstream of the ATG translational start of *R. pomeroyi sitA*, termed MRS1 and MRS2 respectively (Figures 6.1, and 6.3). To establish the effects (if any) of these potential *cis*-acting elements on transcription of *sitA*, site-directed mutants within each of them were constructed. To do this, the highly conserved TG motif, found at position 3 and 4 within the 19 bp MRS box, and highlighted in Figure 6.1, was replaced with AA, using the Agilent Quikchange lightening mutagenesis kit. Briefly, the plasmid pBIO2050 was used as a template for mutagenesis, and the mutagenic primers **MRS1sdmF**, **MRS1sdmR**, **MRS2sdmF** and **MRS2sdmR** were used to mutate both boxes separately, and then to create a plasmid in which both boxes contained the TG → AA mutation. Following sequence verification, three new plasmids were named: MRS1 mutant, pBIO2100, MRS2 mutant pBIO2101 and both, pBIO2102. These were each crossed into *R. pomeroyi* J470 by conjugation and the resultant transconjugants were assayed for β-galactosidase activity in both Mn replete (20 µM) and Mn limited (no addition) conditions in RSS minimal medium. The results of these assays are shown in Figure 6.4.

Figure 6.4 β-galactosidase activity of *sitA-lacZ* fusion in *R. pomeroyi* and the effect of mutating the MRS boxes



The wild type* sitA-lacZ *fusion plasmid pBIO2050, or derivatives (respectively pBIO2100, pBIO2101 and pBIO2102) containing mutations in the MRS1 or MRS2 or in both regulatory sequences were introduced into wild type* R. pomeroyi *DSS-3. The transconjugants were grown in RSS minimal medium either without Mn or with 20µM $MnCl_2$ added. Data shown represent two biological and three technical replicates.

Compared to the wild type fusion, the mutation in the upstream MRS1 caused a ~7-fold increase in β-galactosidase activity in Mn-replete conditions, but was little changed under Mn-limitation. Similarly, the mutation in MRS2 caused a ~6-fold higher expression of β-galactosidase than the wild type in Mn-replete conditions (Figure 6.4). The fusion plasmid with mutations in both MRS1 and MRS2 was deregulated even further, under both Mn replete (38-fold) and Mn-depleted (1.5-fold) conditions. Thus, both MRS1 and MRS2 contribute to the Mn-responsive, Mur-dependent repression of the *sitABCD* operon, as had been seen in other bacteria, such as *Rhizobium leguminosarum* (Diaz-Mireles *et al.* 2004).

6.1.5 Mur regulates sitABCD *in* Ruegeria pomeroyi

The predicted regulator of MRS boxes is the Fur-family transcriptional regulator Mur. There is a good Mur homologue in *R. pomeroyi*, encoded by the gene *SPO2477*, whose product is 67% identical to Mur of *Rhizobium leguminosarum*, which has been shown to regulate *sitA* in that species (Diaz-Mireles *et al.* 2004; Diaz-Mireles *et al.* 2005). To demonstrate the effects of *R. pomeroyi* Mur on the expression of *sitA*, an insertion mutant in the *mur* gene was made, using single recombination of the pK19*mob*-derived pBIO1879 into the *mur* locus. Briefly (see Figure 4.15 for the procedure used), primers **FURFwd** and **FURRev** were used to generate a PCR product that was internal to the coding sequence of *mur* of *R. pomeroyi*. This 231 bp fragment was ligated into pBIO1879 following digestion with *Xba*I and *Bam*HI. The resultant recombinant plasmid was purified, sequence-verified, and named pBIO1861. This was crossed into *R. pomeroyi* J470 by conjugation, and derivatives in which pBIO1861 had inserted into *mur via* a single resultant single recombination mutant colonies were selected using rifampicin, spectinomycin and kanamycin as described earlier and in Materials and Methods. The insertion into the *mur* gene was verified by Southern blot, performed as detailed earlier and the Mur$^-$ mutant strain was named J528. The *sitA-lacZ* fusion plasmid pBIO2050 was then crossed into the Mur$^-$ *R. pomeroyi* strain J528 and β-galactosidase assays were performed in cultures grown in Mn, or without, as detailed earlier.

Table 6.1 The effect of a Mur- mutation on the expression of a *sitA-lacZ* fusion.

	WT ***sitA-lacZ***	**Mur-** ***sitA-lacZ***
Plus Mn	42±1	1736±178
Minus Mn	791±30	1817±204

The wild type* sitA-lacZ *fusion plasmid pBIO2050 was introduced into wild type and Mur- mutant* Ruegeria pomeroyi *DSS-3 recipients. Transconjugants were grown in media that either did or did not have added $MnCl_2$ before assaying β-galactosidase in triplicate. Activities are shown in Miller Units, with standard errors.

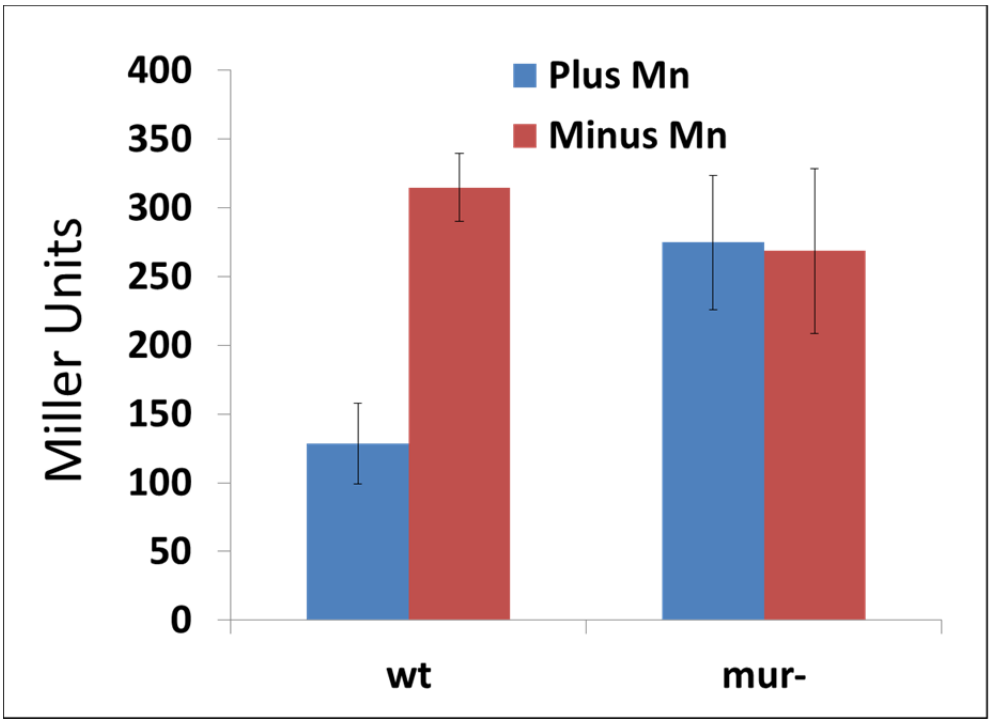
As shown in table 6.1, the Mn-dependent repression of the *sitA-lacZ* fusion was completely abolished in the Mur- background, just as was noted when the two MRS boxes had been mutated, in plasmid pBIO2102 (see above). Thus, Mur is required for the Mn-dependent repression of *sitA* in *R. pomeroyi*.

6.1.6 Mur regulates another Fur-family transcriptional regulator, irr *in* R. pomeroyi

There is a predicted *irr* gene (*SPOA0445*) on the large plasmid of *Ruegeria pomeroyi*. Interestingly, this gene has a predicted MRS sequence (Rodionov *et al*. 2006), suggesting that it might be regulated in response to Mn^{2+} availability, via the action of the Mur regulator. Both these predictions were verified as follows. An *irr-lacZ* transcriptional fusion was made, using a 198 bps DNA fragment that spanned the predicted transcriptional start of the *irr* gene, and covered the entire intergenic region upstream of *irr*. This amplified region was cloned into the promoter-probe plasmid pBIO1878. The resultant *irr-lacZ* fusion plasmid was sequence-verified and named pBIO2125. It was then crossed into *R. pomeroyi* J470, and into the Mur- strain J528 as described before, and single colonies of transconjugants were used to inoculate RSS medium either lacking Mn, or containing 20 µM as detailed earlier. These cultures were assayed for β-galactosidase activity. As shown in Figure 6.5 the *irr-lacZ* fusion is repressed ~2-fold by growth in the presence of added 20µM $MnCl_2$. in the wild type

background. However, this Mn-dependent repression was completely absent in the Mur$^-$ background, with constitutive expression of *irr-lacZ* in both Mn conditions.

Figure 6.5 Effects of Mn-limitation of the expression of the *irr-lacZ* fusion



The* irr-lacZ *fusion plasmid pBIO2125 was crossed into both the wild type and the Mur$^-$* R. pomeroyi *strains. Transconjugants were grown in RSS medium with or without added 20µM $MnCl_2$. The β-galactosidase levels were assayed and shown as the means of two biological and three technical replicates.

Chapter 6_b - Manganese uptake in other Marine Bacteria

6.2 Diversity of *mur*, *sitABCD* and other genes involved in Mn uptake and sensing in the Roseobacters

6.2.1 Mur

Inspection of the genomes of 37 other Roseobacters showed that none of them contained a MntR-type transcriptional regulator, but that all of them contained at least one gene whose product was within the Mur branch of the Fur super-family. However, we discerned different sub-types of these Mur polypeptides, judged by their sequences in different strains and species (Table 6.2). In most Roseobacter strains, the Mur polypeptide closely resembles (>70% identical) that of *R. pomeroyi* DSS-3 (above). However, those of *Sulfitobacter, Citreicella, Pelagibaca*, and one strain (GAI101) of *Roseobacter* are only ~40% identical to that of *R. pomeroyi*, with those of *Sulfitobacter, Pelagibaca bermudensis* and *Roseobacter* GAI101 being very similar to each other. *Citreicella* Mur is very similar (65% identical) to that of *Sinorhizobium meliloti,* a ratified manganese-responsive regulator in that species (Platero *et al.* 2007). Finally, one Roseobacter strain, *Octadecabacter antarcticus* 307, had two Mur polypeptides; one resembled that in *Ruegeria pomeroyi* and the other is of the *Sulfitobacter/Roseobacter* GA101 type. These different sub-types of Mur are seen in a relatedness tree, which also includes Mur polypeptides from other bacteria (Figure 6.6).

Figure 6.6 Phylogenetic tree of Mur peptides in the α-proteobacteria

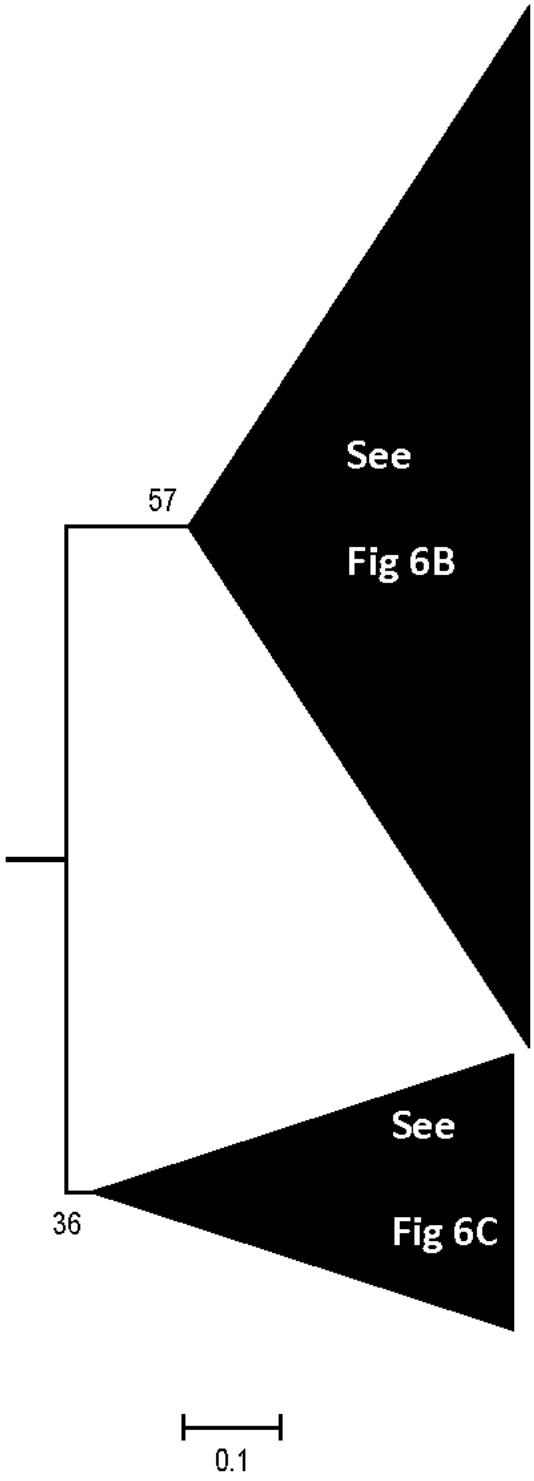


Figure 6.6B

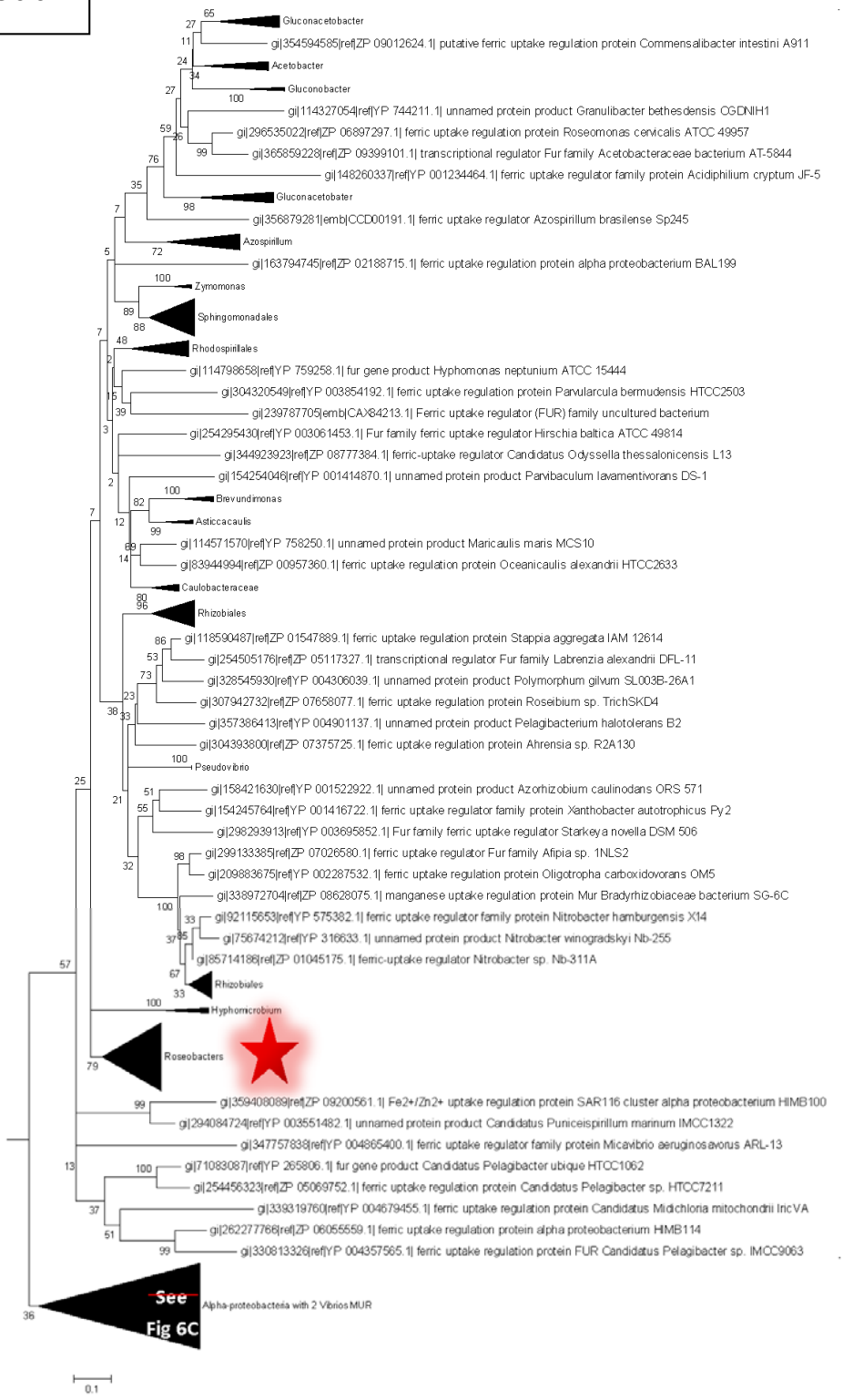
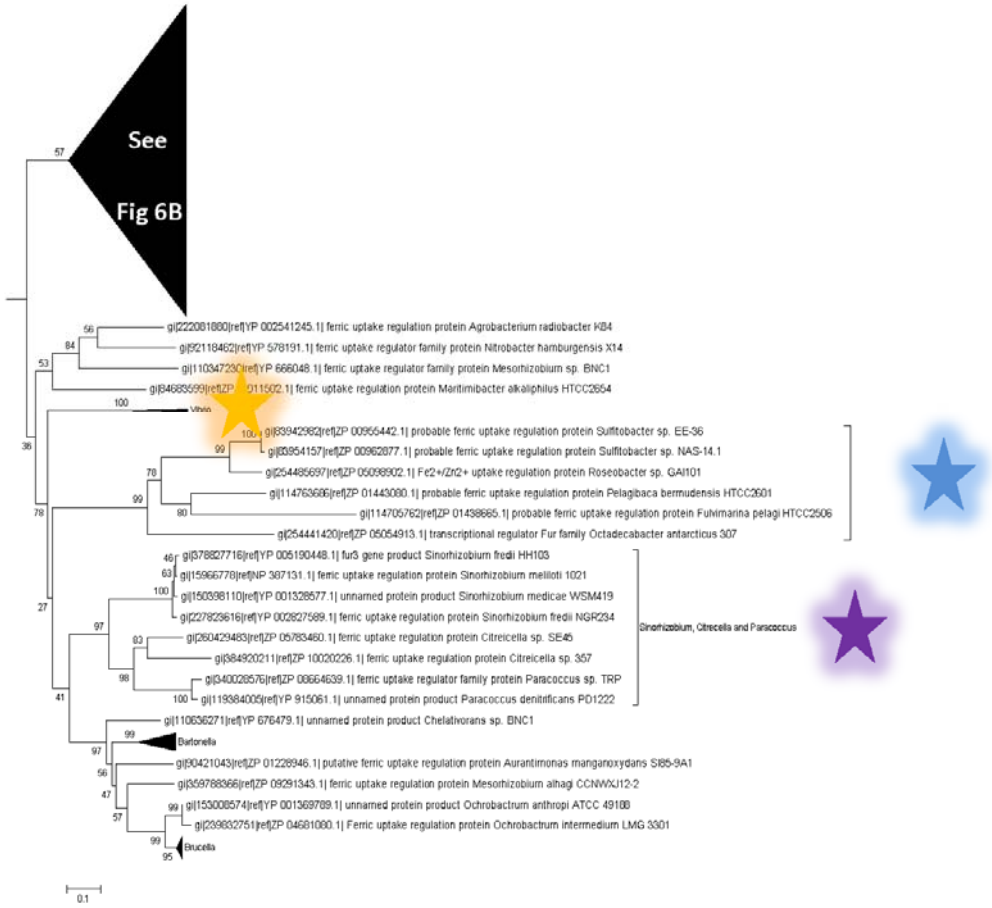

Gluconacetobacter
gi|354594585|ref|ZP 09012624.1| putative ferric uptake regulation protein Commensalibacter intestini A911
Acetobacter
Gluconobacter
gi|114327054|ref|YP 744211.1| unnamed protein product Granulibacter bethesdensis CGDNIH1
gi|296535022|ref|ZP 06897297.1| ferric uptake regulation protein Roseomonas cervicalis ATCC 49957
gi|365859228|ref|ZP 09399101.1| transcriptional regulator Fur family Acetobacteraceae bacterium AT-5844
gi|148260337|ref|YP 001234464.1| ferric uptake regulator family protein Acidiphilium cryptum JF-5
Gluconacetobater
gi|356879281|emb|CCD00191.1| ferric uptake regulator Azospirillum brasilense Sp245
Azospirillum
gi|163794745|ref|ZP 02188715.1| ferric uptake regulation protein alpha proteobacterium BAL199
Zymomonas
Sphingomonadales
Rhodospirillales
gi|114798658|ref|YP 759258.1| fur gene product Hyphomonas neptunium ATCC 15444
gi|304320549|ref|YP 003854192.1| ferric uptake regulation protein Parvularcula bermudensis HTCC2503
gi|239787705|emb|CAX84213.1| Ferric uptake regulator (FUR) family uncultured bacterium
gi|254295430|ref|YP 003061453.1| Fur family ferric uptake regulator Hirschia baltica ATCC 49814
gi|344923923|ref|ZP 08777384.1| ferric-uptake regulator Candidatus Odyssella thessalonicensis L13
gi|154254046|ref|YP 001414870.1| unnamed protein product Parvibaculum lavamentivorans DS-1
Brevundimonas
Asticcacaulis
gi|114571570|ref|YP 758250.1| unnamed protein product Maricaulis maris MCS10
gi|83944994|ref|ZP 00957360.1| ferric uptake regulation protein Oceanicaulis alexandrii HTCC2633
Caulobacteraceae
Rhizobiales
gi|118590487|ref|ZP 01547889.1| ferric uptake regulation protein Stappia aggregata IAM 12614
gi|254505176|ref|ZP 05117327.1| transcriptional regulator Fur family Labrenzia alexandrii DFL-11
gi|328545930|ref|YP 004306039.1| unnamed protein product Polymorphum gilvum SL003B-26A1
gi|307942732|ref|ZP 07658077.1| ferric uptake regulation protein Roseibium sp. TrichSKD4
gi|357386413|ref|YP 004901137.1| unnamed protein product Pelagibacterium halotolerans B2
gi|304393800|ref|ZP 07375725.1| ferric uptake regulation protein Ahrensia sp. R2A130
Pseudovibrio
gi|158421630|ref|YP 001522922.1| unnamed protein product Azorhizobium caulinodans ORS 571
gi|154245764|ref|YP 001416722.1| ferric uptake regulator family protein Xanthobacter autotrophicus Py2
gi|298293913|ref|YP 003695852.1| Fur family ferric uptake regulator Starkeya novella DSM 506
gi|299133385|ref|ZP 07026580.1| ferric uptake regulator Fur family Afipia sp. 1NLS2
gi|209883675|ref|YP 002287532.1| ferric uptake regulation protein Oligotropha carboxidovorans OM5
gi|338972704|ref|ZP 08628075.1| manganese uptake regulation protein Mur Bradyrhizobiaceae bacterium SG-6C
gi|92115653|ref|YP 575382.1| ferric uptake regulator family protein Nitrobacter hamburgensis X14
gi|75674212|ref|YP 316633.1| unnamed protein product Nitrobacter winogradskyi Nb-255
gi|85714186|ref|ZP 01045175.1| ferric-uptake regulator Nitrobacter sp. Nb-311A
Rhizobiales
Hyphomicrobium
Roseobacters
gi|359408089|ref|ZP 09200561.1| Fe2+/Zn2+ uptake regulation protein SAR116 cluster alpha proteobacterium HIMB100
gi|294084724|ref|YP 003551482.1| unnamed protein product Candidatus Puniceispirillum marinum IMCC1322
gi|347757838|ref|YP 004865400.1| ferric uptake regulator family protein Micavibrio aeruginosavorus ARL-13
gi|71083087|ref|YP 265806.1| fur gene product Candidatus Pelagibacter ubique HTCC1062
gi|254456323|ref|ZP 05069752.1| ferric uptake regulation protein Candidatus Pelagibacter sp. HTCC7211
gi|339319760|ref|YP 004679455.1| ferric uptake regulation protein Candidatus Midichloria mitochondrii IricVA
gi|262277766|ref|ZP 06055559.1| ferric uptake regulation protein alpha proteobacterium HIMB114
gi|330813326|ref|YP 004357565.1| ferric uptake regulation protein FUR Candidatus Pelagibacter sp. IMCC9063
See
Fig 6C
Alpha-proteobactesia with 2 Vibrios MUR
0.1

Figure 6.6C



Mega 5 was used to construct a neighbour-joining tree of the Mur polypeptides of the alpha-proteobacteria.

Figure 6a) shows that there are two sub-groups, which are shown in detail in 6b and 6c.

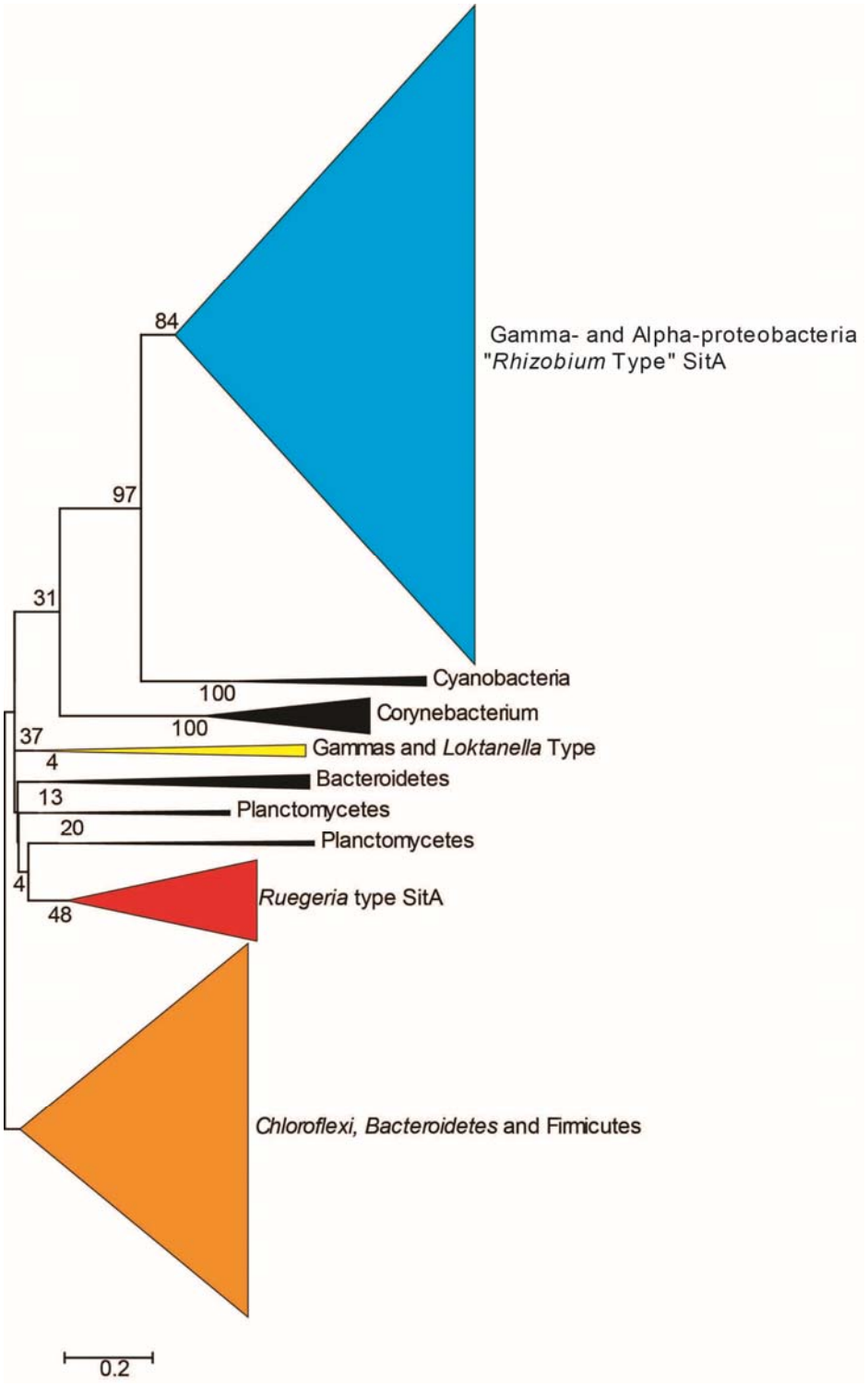
6b) the triangle marked with the red star includes Mur of Ruegeria pomeroyi and contains the other closely related polypeptides.

6c) the close relationship of the Murs of Citreicella to those of Sinorhizobium is demonstrated (purple star), these being also similar to Mur of Roseobacter sp GA101, Pelagibaca bermudensis HTCC2601, Sulfitobacter and one of those in Octadecabacter antarcticus 307 (blue stars). Note, too, the two Mur-like polypeptides in Vibrio strains Vibrio sinaloensis DSM 21326 and Vibrio caribbenthicus ATCC BAA-2122 (Orange star).

6.2.2 SitABCD

This ABC-type transporter is also widespread in the Roseobacters, with all but four strains (see below) containing the corresponding four genes, arranged contiguously (Table 6.2). Closer examination of the sequences of SitA, SitB, SitC and SitD showed that in most strains, these closely resemble (~70% identical) those in *R. pomeroyi* DSS-3 itself (Table 6.2). Several other Roseobacters contained a somewhat distinct version of the SitABCD polypeptides, which were very similar to each other in the different strains (~77% identity) but less so (40-50% identity) to those of the *R. pomeroyi* group (Table 6.2). This second sub-class of Roseobacter SitABCD polypeptides closely resembled (~75 % identical) those of various strains of *Rhizobium, Sinorhizobium* and *Agrobacterium,* and other bacteria, whose function as manganese transporters has been ratified (Davies and Walker 2007; Diaz-Mireles *et al.* 2004). Finally, the SitABCD polypeptides of *Loktanella vestfoldensis* SKA53 are somewhat divergent from those homologues in all the other Roseobacters and more closely resembles deduced SitA-like polypeptides in two other species of marine bacteria, *Halomonas elongata* and *Pelagibacterium halotolerans*. A phylogenetic tree was drawn, using an alignment of SitA peptides closely homologous to both the *Rhizobium* type, and the *Ruegeria* type, and is shown in Figure 6.7. Peptide sequences homologous to SitB, SitC and SitD always showed very similar phylogenetic relationships.

Figure 6.7 Phylogenetic tree of SitA-like peptides

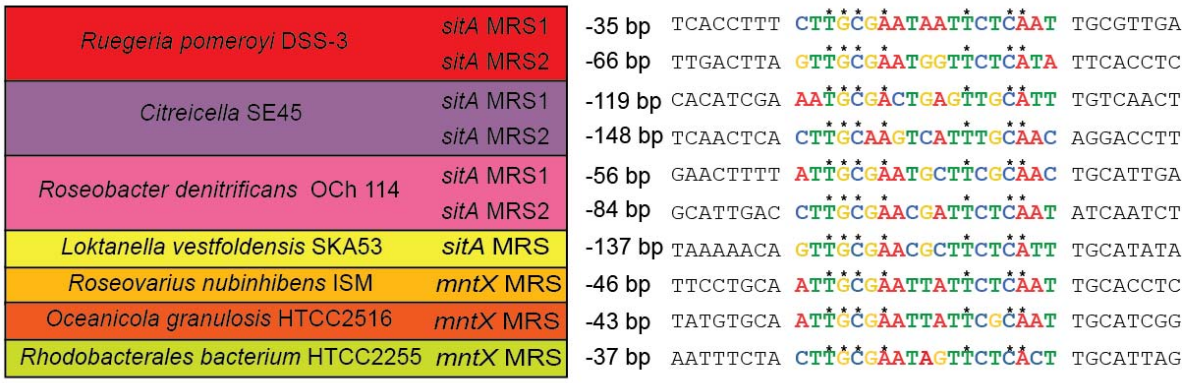


Using Mega5, a tree of SitA peptides, identified due to their homology to peptides from* Ruegeria pomeroyi *and from* Rhizobium leguminosarum *was constructed using the neighbour-joining method, bootstrap values are shown for 500 replicates performed.

It was noted that all those Roseobacter strains that had a form of the Mur polypeptide that did not closely resemble that of *Ruegeria pomeroyi* (see above) also had SitABCD polypeptides that were somewhat divergent from those in that species (Table 6.2). However, some strains with the "non–*R. pomeroyi*" version of SitABCD (*e.g. Dinoroseobacter shibae*) did have the "conventional" form of Mur that resembles that of *R. pomeroyi* (Table 6.2).

Although the SitA polypeptides may be of different sub-classes, all the corresponding *sitA* genes are preceded by sequences that strongly resemble MRS motifs, indicating that they are regulated in a similar fashion, via the Mur transcriptional regulator (Figure 6.8).

Figure 6.8 Comparison of MRS sequences that precede the *sitA* and *mntX* genes of selected Roseobacter strains



The sequences of the ratified MRS1 and MRS2 motifs of Ruegeria pomeroyi were compared, using MEME (Bailey and Elkan 1994), with those that preceded different sub-classes (see Table 6.2) of the sitA and mntX genes in a selection of Roseobacter strains. Conserved bases in these motifs are denoted by asterisks. Distances, in base pairs, from the gene-proximal end of the MRS box to the corresponding ATG start codons are shown.

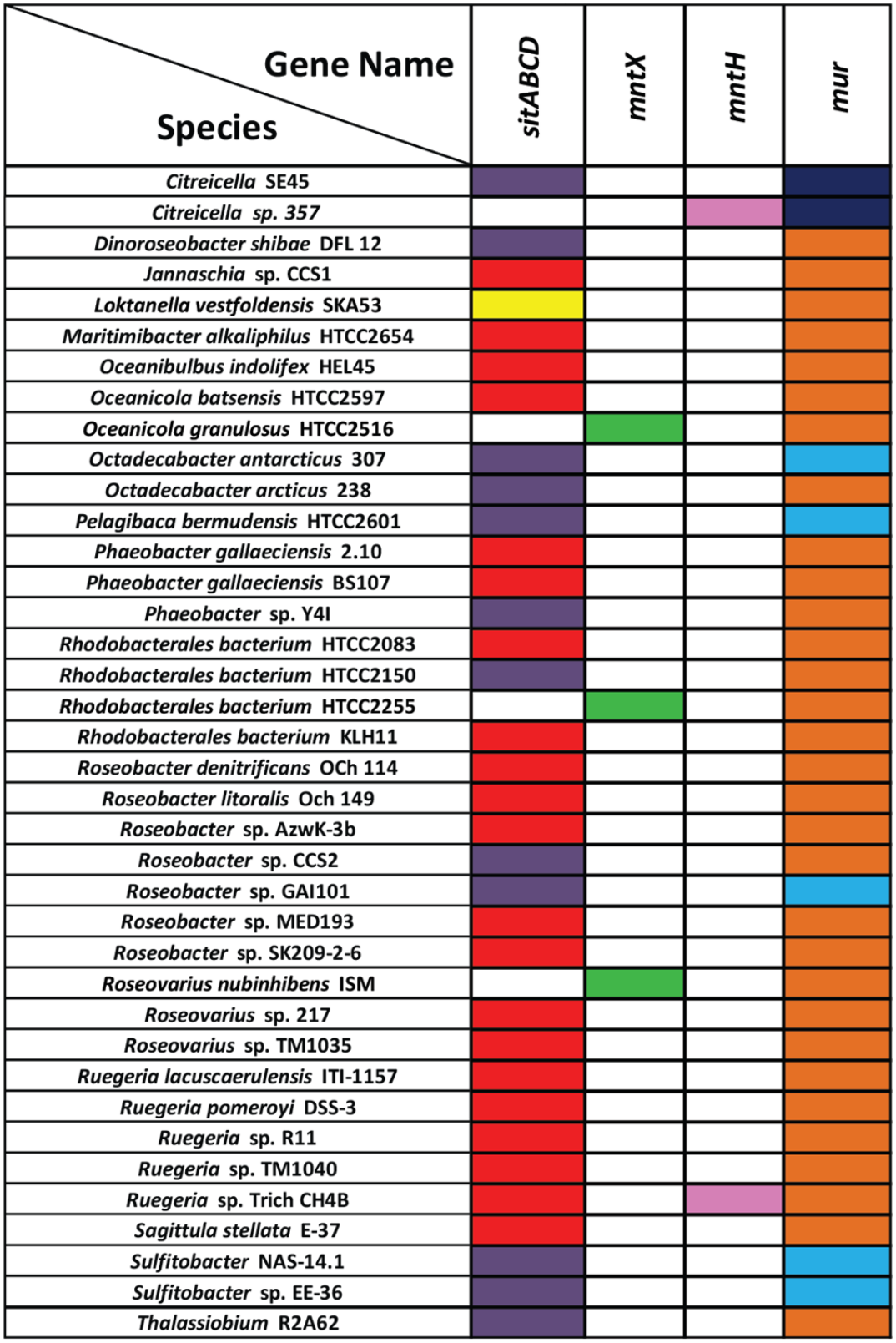
6.2.3 The Mn^{2+} specific transporter MnH is also found in the Roseobacters

Two Roseobacter strains, *Ruegeria* sp. TrichCH4B and *Citreicella* sp. 357, contain a gene (SCH4B_0376 and C357_18417 respectively) whose product resembles MntH, a very different Mn^{2+} transporter, being ~50% (E value $1e^{-120}$) identical to *E. coli* MntH.. These two *mntH* genes were both preceded by convincing MRS boxes, strongly suggesting that they, too, are regulated by Mur, in response to Mn^{2+} availability (Figure 6.8). Note that *Ruegeria* sp. TrichCH4B contains both MntH *and*

SitABCD, whereas in *Citreicella sp.* 357, MntH is its *only* recognisable manganese transporter (Table 6.2).

Table 6.2 Distribution of sub-types of the SitA, MntX, MntH and Mur polypeptides in genome-sequenced Roseobacter strains

In-fills with the same colours represent polypeptides that closely resemble each other. In the case of the SitA, B, C and D polypeptides, all four components of this transport system showed a coherent relatedness pattern; thus all four polypeptides of (e.g.) **Sulfitobacter** ***were most similar to those in strains (e.g.*** **Octadecabacter***) with the same in-fill pattern. Empty boxes represent absence of the corresponding polypeptide. Note that*** **Octadecabacter antarcticus** ***307 has two Mur sequences, one resembling that in most of the Roseobacters (Including*** **Ruegeria pomeroyi***) and one that is similar to those in*** **Sulfitobacter, Pelagibaca** ***and*** **Roseobacter** ***GAI101.***


Gene Name
Species
sitABCD
mntX
mntH
mur
Citreicella SE45
Citreicella sp. 357
Dinoroseobacter shibae DFL 12
Jannaschia sp. CCS1
Loktanella vestfoldensis SKA53
Maritimibacter alkaliphilus HTCC2654
Oceanibulbus indolifex HEL45
Oceanicola batsensis HTCC2597
Oceanicola granulosus HTCC2516
Octadecabacter antarcticus 307
Octadecabacter arcticus 238
Pelagibaca bermudensis HTCC2601
Phaeobacter gallaeciensis 2.10
Phaeobacter gallaeciensis BS107
Phaeobacter sp. Y4I
Rhodobacterales bacterium HTCC2083
Rhodobacterales bacterium HTCC2150
Rhodobacterales bacterium HTCC2255
Rhodobacterales bacterium KLH11
Roseobacter denitrificans OCh 114
Roseobacter litoralis Och 149
Roseobacter sp. AzwK-3b
Roseobacter sp. CCS2
Roseobacter sp. GAI101
Roseobacter sp. MED193
Roseobacter sp. SK209-2-6
Roseovarius nubinhibens ISM
Roseovarius sp. 217
Roseovarius sp. TM1035
Ruegeria lacuscaerulensis ITI-1157
Ruegeria pomeroyi DSS-3
Ruegeria sp. R11
Ruegeria sp. TM1040
Ruegeria sp. Trich CH4B
Sagittula stellata E-37
Sulfitobacter NAS-14.1
Sulfitobacter sp. EE-36
Thalassiobium R2A62

6.2.4 A novel class of Marine Mn uptake systems, MntX

We noted that three members, namly *Roseovarius nubinhibens* ISM, *Oceanicola granulosus* HTCC2516 and *Rhodobacterales* strain HTCC22 of the Roseobacter group lack homologues of both MntH and SitABCD and contained no known manganese transporter. However, these three strains, and *only* these three were found to have a predicted MRS motif that preceded a gene whose product was likely to be an inner membrane polypeptide, and therefore was a possible candidate to be a novel Mn^{2+} transporter. This MRS motif was first noted by Rodionov *et al.* (2006) in *Roseovarius nubinhibens* ISM and *Oceanicola granulosus* HTCC2516, who termed the corresponding gene *mntX.* The MntX polypeptides are ~400 amino acids in length (e.g. 387 for *Roseovarius nubinhibens* ISM_02005 gene product) and are categorised as "function unknown", with their C-terminal 300 amino acids corresponding to a domain of unknown function (DUF2899 [pfam11449]). They have predicted trans-membrane helices, as shown in Figure 6.10. {This MntX has no similarity to a hydrophobic Mn exporter, also termed MntX, described in *Neisseria meningitides* by Veyrier *et al*. (2011).}

Confirmation of that MntX is indeed a Mn^{2+} transporter and that *mntX* is regulated by Mur in response to Mn availability forms the subject matter of the following sections.

6.2.5 Expression of mntX of Roseovarius nubinhibens is regulated by Mn levels via the Mur transcriptional regulator

To study the regulation of *mntX* of *Roseovarius nubinhibens* ISM, a *lacZ* transcriptional fusion to this gene was made. This comprised a 569 bp fragment that spanned its predicted promoter, plus its predicted MRS *cis*-acting regulatory sequence, and extended into the first 180 bps of the *mntX* structural gene, cloned into the promoter-probe plasmid pBIO1628, forming pBIO2067. This plasmid was mobilised by conjugation into wild type *Roseovarius nubinhibens* and into two strains of *Ruegeria pomeroyi*, namely the wild type J470 and the Mur- mutant J528. For both wild type versions of these two species, the β-galactosidase activities were ~16-fold greater when transconjugants were grown in Mn-depleted than in Mn-replete medium, with respectively, 1607 and 94 Miller Units. However, in the Mur^- mutant of *Ruegeria pomeroyi,* the fusion was expressed at high level in both +Mn and –Mn media (1861 and 1889 Miller Units respectively). Thus, the *mntX* gene of one Roseobacter strain (*Roseovarius nubinhibens*) is indeed regulated by Mur in response to

Mn^{2+}, even if the regulatory gene is supplied by a different species (namely *Ruegeria pomeroyi*). This is consistent with the similarity of the MRS box sequences in the different Roseobacters, as shown in Figure 6.8.

6.2.6 Cloning and complementation of mntX *of* R. nubinhibens

To confirm that this predicted transporter gene really is involved in Mn transport, a functional complementation test was used, in an attempt to restore the mutant phenotype of the $SitA^-$ mutant of *Ruegeria pomeroyi.* This was done, initially, with the *mntX* gene of *Roseovarius nubinhibens,* from whose genomic DNA a 1574 bp fragment that included the *mntX* gene (*ISM_02005*) plus upstream regulatory sequences was amplified and cloned into the wide host-range vector pOT2, forming the recombinant plasmid pBIO2066. This was mobilised into the $SitA^-$ strain J529 of *R. pomeroyi* by conjugation. The growth of J529 with pBIO2066 was restored to wild type levels without added Mn – refer to Figure 6.11 below. Thus, MntX of *Roseovarius nubinhibens* is able to complement the growth of a Mn transporter mutant, in a heterologous bacterial strain.

6.2.7 The distribution of MntX in other bacteria

We found that there are many significant MntX homologues, in addition to those in the three Roseobacter strains. These homologues were restricted to a few genera in the Orders Vibrionales, Altermonadales and Oceanospirillales of γ-proteobacteria and in two α-proteobacterial clades, namely SAR11 and SAR116. Significantly, all these taxa are sea-dwelling and are considered individually as follows.

6.2.8 *The γ-proteobacterial MntX*

<u>Vibrionales</u>

Among this Order of marine bacteria, there are genome-sequenced strains in the genera *Aliivibrio* (*A. salmonicida*), *Photobacterium* (five species, six strains) and *Vibrio* itself (20 species, 99 strains). The single *Aliivibrio,* and three *Photobacterium* strains contain MntX homologues (E values $<e^{-75}$) as do all

but four of the total of the 99 sequenced strains of *Vibrio* itself, the exceptions being the strains of *V. campbelii, V. caribbenthicus, V. nigripulchritudo* and *V. sinaloensis*. Strikingly, all these strains that lacked *mntX* contained at least one other known Mn^{2+} transporter, either SitABCD alone (*V. caribbenthicus, V. sinaloensis, V. nigripulchritudo*) or both SitABCD plus MntH (three *Photobacterium* strains and *V. campbellii* DS40M4). Furthermore, the *sitABCD* operon of *V. caribbenthicus* and *V. sinaloensis* abut a gene that encodes a Mur-like polypeptide whose sequence resembled those of *Citreicella, Sulfitobacter* and a few other Roseobacters (Figure 6.6). Finally, some *Vibrio* and *Photobacterium* strains contain MntH and MntX, but no SitABCD transporters (Table 6.3). (The available genomes of all those strains that had no known Mn transporters and were in draft form were not included here.)

Altermonadales

MntX homologues occur in some strains of *Colwellia, Alteromonas*, *Pseudoalteromonas,* all of which are in the Altermonadales Order of γ-proteobacteria. As in other clades, there is diversity even within a single genus; thus, *Alteromonas macleodii* ATCC 27126 contains *mntX* but strain "Deep ecotype" does not (Table 6.3).

Oceanospirillales

Within the Order Oceanospirillales, too, some strains of a given genus, namely *Marinomonas,* harbour *mntX* (*M. mediterranea MMB-1* and *M. posidonica* IVIA-Po-181), but strain MWYL1 lacks the gene (Table 6.3).

Table 6.3 Distribution of manganese transporters in α-proteobacterial genera that have at least one strain with a homologue of MntX

Names of the genome-sequenced strains in those genera with at least one MntX homologue are shown in the left-hand column. The presence of a close homologue of the Mn^{2+} transporters MntX, SitA or MntH is denoted by a coloured box, containing the E value in comparison to the corresponding polypeptide in* Roseovarius nubinhibens *(MntX),* Ruegeria pomeroyi *(SitA) or* E. coli *(MntH). Those strains whose deduced proteomes lacked any of these polypeptides, and whose genome was only available in draft form are not included.

Genome-sequenced strains in genera with at least one MntX homologue	MntX	SitA	MntH
Aliivibrio salmonicida LFI1238	1.00E-74		
Alteromonadales bacterium TW7	2.00E-83		
Alteromonas macleodii ATCC 27126	4.00E-75		
Alteromonas macleodii str. 'Deep ecotype'			
Colwellia psychrerythraea 34H	2.00E-71		
Marinomonas mediterranea MMB-1	2.00E-73	2E-35[1]	
Marinomonas sp. MWYL1			
Marinomonas posidonica IVIA-Po-181	5.00E-78	3E-48[1]	
Photobacterium angustum S14		2.00E-154	3.00E-169
Photobacterium damselae subsp. damselae CIP 102761	6.00E-76		0
Photobacterium leiognathi subsp. mandapamensis svers.1.1		8.00E-153	5.00E-167
Photobacterium profundum 3TCK	4.00E-80		
Photobacterium profundum SS9	3.00E-78		
Photobacterium sp. SKA34		4.00E-154	3.00E-168
Pseudoalteromonas atlantica T6c			
Pseudoalteromonas haloplanktis TAC125	3.00E-84		
Pseudoalteromonas sp BSi20311	7.00E-82		
Pseudoalteromonas sp BSi20429	4.00E-87		
Pseudoalteromonas sp BSi20439	7.00E-82		
Pseudoalteromonas sp BSi20480	1.00E-82		
Pseudoalteromonas sp BSi20495	4.00E-84		
Pseudoalteromonas sp BSi20652	2.00E-83		
Pseudoalteromonas sp SM9913	3.00E-84		
Pseudoalteromonas tunicata D2	1.00E-78		
Vibrio alginolyticus 12G01	2.00E-76		
Vibrio alginolyticus 40B	1.00E-76		
Vibrio brasiliensis LMG	3.00E-77		
Vibrio campbellii DS40M4		2.00E-159	6.00E-178
Vibrio caribbenthicus ATCC BAA-2122		2.00E-137	

Genome-sequenced strains in genera with at least one MntX homologue	MntX	SitA	MntH
Vibrio cholerae 12129(1)	3.00E-75		
Vibrio cholerae 1587	7.00E-76		
Vibrio cholerae 2740-80	5.00E-76		
Vibrio cholerae 623-39	7.00E-76		
Vibrio cholerae AM-19226	7.00E-76		
Vibrio cholerae B33	5.00E-76		
Vibrio cholerae BJG-01	7.00E-76		
Vibrio cholerae bv. albensis VL426	4.00E-76		
Vibrio cholerae BX 330286	5.00E-76		
Vibrio cholerae CIRS101	3.00E-76		
Vibrio cholerae CT 5369-93	7.00E-76		
Vibrio cholerae HC-02A1	1.00E-73		
Vibrio cholerae HC-06A1	3.00E-76		
Vibrio cholerae HC-19A1	5.00E-76		
Vibrio cholerae HC-21A1	3.00E-76		
Vibrio cholerae HC-22A1	3.00E-76		
Vibrio cholerae HC-23A1	3.00E-76		
Vibrio cholerae HC-28A1	3.00E-76		
Vibrio cholerae HC-32A1	3.00E-76		
Vibrio cholerae HC-33A2	3.00E-76		
Vibrio cholerae HC-38A1	3.00E-76		
Vibrio cholerae HC-40A1	5.00E-76		
Vibrio cholerae HC-43A1	3.00E-76		
Vibrio cholerae HC-48A1	3.00E-76		
Vibrio cholerae HC-48B2	5.00E-76		
Vibrio cholerae HC-49A2	5.00E-76		
Vibrio cholerae HC-61A1	3.00E-76		
Vibrio cholerae HC-70A1	3.00E-76		
Vibrio cholerae HCUF01	3.00E-76		
Vibrio cholerae HE-09	6.00E-76		
Vibrio cholerae HE39	1.00E-74		
Vibrio cholerae HE48	1.00E-74		
Vibrio cholerae HFU-02	5.00E-76		
Vibrio cholerae IEC224	3.00E-76		
Vibrio cholerae INDRE 91/1	5.00E-76		

Genome-sequenced strains in genera with at least one MntX homologue	MntX	SitA	MntH
Vibrio cholerae M66-2	5.00E-76		
Vibrio cholerae MAK 757	5.00E-76		
Vibrio cholerae MJ-1236	5.00E-76		
Vibrio cholerae MO10	5.00E-76		
Vibrio cholerae MZO-2	3.00E-75		
Vibrio cholerae MZO-3	6.00E-76		
Vibrio cholerae NCTC 8457	5.00E-76		
Vibrio cholerae O1 biovar El Tor str. N16961	5.00E-76		
Vibrio cholerae O1 str. 2010EL-1786	5.00E-76		
Vibrio cholerae O395	4.00E-76		
Vibrio cholerae RC27	4.00E-76		
Vibrio cholerae RC385	6.00E-76		
Vibrio cholerae RC9	5.00E-76		
Vibrio cholerae TM 11079-80	1.00E-75		
Vibrio cholerae TMA 21	6.00E-76		
Vibrio cholerae V51	7.00E-76		
Vibrio cholerae V52	7.00E-76		
Vibrio coralliilyticus ATCC BAA450	4.00E-70		
Vibrio fischeri ES114	5.00E-77		
Vibrio fischeri MJ11	2.00E-77		
Vibrio fischeri SR5	1.00E-77		
Vibrio furnissii CIP 102972	1.00E-72		5.00E-164
Vibrio furnissii NCTC 11218	4.00E-73		6.00E-164
Vibrio harveyi 1DA3	2.00E-76		1.00E-178
Vibrio harveyi ATCC BAA1116	4.00E-79		1.00E-178
Vibrio harveyi HY01	2.00E-79		2.00E-179
Vibrio ichthyoenteri ATCC 700023	1.00E-77		
Vibrio mimicus MB451	3.00E-76		
Vibrio mimicus SX4	5.00E-76		
Vibrio mimicus VM223	1.00E-76		
Vibrio mimicus VM573	2.00E-75		
Vibrio mimicus VM603	3.00E-76		
Vibrio nigripulchritudo ATCC 27043		6.00E-146	
Vibrio orientalis CIP 102891	4.00E-78		

Genome-sequenced strains in genera with at least one MntX homologue	MntX	SitA	MntH
Vibrio parahaemolyticus 10329	5.00E-79		
Vibrio parahaemolyticus 16	4.00E-81		
Vibrio parahaemolyticus AN5034	4.00E-80		
Vibrio parahaemolyticus AQ3810	1.00E-80		
Vibrio parahaemolyticus AQ4037	1.00E-80		
Vibrio parahaemolyticus K5030	4.00E-80		
Vibrio parahaemolyticus Peru466	4.00E-80		
Vibrio parahaemolyticus RIMD 2210633	4.00E-80		
Vibrio rotiferianus DAT722	3.00E-80		8.00E-178
Vibrio scophthalmi LMG 19158	5.00E-78		
Vibrio shilonii AK1	2.00E-63		7.00E-178
Vibrio sinaloensis DSM 21326		3.00E-139	
Vibrio sp AND4	4.00E-81		
Vibrio sp EJY3	3.00E-76		
Vibrio sp Ex25	2.00E-75		
Vibrio sp MED222	6.00E-71		
Vibrio sp N418	1.00E-74		1.00E-163
Vibrio splendidus 12B01	1.00E-73		
Vibrio splendidus ATCC 33789	2.00E-70		
Vibrio splendidus LGP32	6.00E-71		
Vibrio tubiashii ATCC 19109	5.00E-76		
Vibrio vulnificus CMCP6	8.00E-73		
Vibrio vulnificus MO624/O	9.00E-73		
Vibrio vulnificus YJ016	7.00E-72		

[1]***These genes are similar to Zn and Mn periplasmic binding proteins from ABC-class transporters, including*** **RL1049** ***from*** **R. leguminosarum.**

6.2.9 The α-proteobacterial MntX

In addition to the few Roseobacter strains described above, two other taxa of important marine α-Proteobacteria contain *mntX* genes. These two clades, SAR11 (*Candidatus* Pelagibacter ubique) and SAR116 (*Candidatus* Puniceispirillum marinum) were initially detected by culture-independent analysis of bacterial DNA sequence samples from the Sargasso Sea (Rappe *et al.* 2002; Stingl *et al.* 2007), but both were subsequently grown in pure culture and some strains have been genome-sequenced.

SAR11

These bacteria are the most abundant on Earth (Morris *et al.* 2002). Of four sequenced strains, one, *Candidatus* Pelagibacter sp. IMCC9063, encodes a homologue of MntX (gene tag *SAR11G3_00277*), which is 39% identical to that of *R. nubinhibens*. Interestingly, this *mntX*-like gene is adjacent to a divergently transcribed gene (SAR11G3_00278) whose product is predicted to be in the MntR family, being 50% identical to the *E. coli* version of this manganese-responsive transcriptional repressor. Strain IMCC9063 is in *Pelagibacter* subgroup 3, rather distantly related to other genome-sequenced strains (HTCC7211, HTCC1062 and HTCC1002) (Oh *et al.* 2011), all of which lack MntX. Indeed, these three strains lack genes for any known Mn^{2+} transporters.

SAR116

SAR116 bacteria are also widespread throughout the oceans, although they are not as abundant as the SAR11 group (Morris *et al.* 2012). The only genome-sequenced SAR116 strain, *Candidatus* Puniceispirillum marinum IMCC1322 (Oh *et al.* 2010) contains a gene, SAR116_1166, whose product is 46% identical to MntX of *R. nubinhibens*. The draft genome sequence of the SAR116 cluster alpha proteobacterium sp. HIMB100 also has a gene (HIMB100_00004540), whose product is 44% identical to MntX of *R. nubinhibens*.

6.2.10 MntX in the GOS

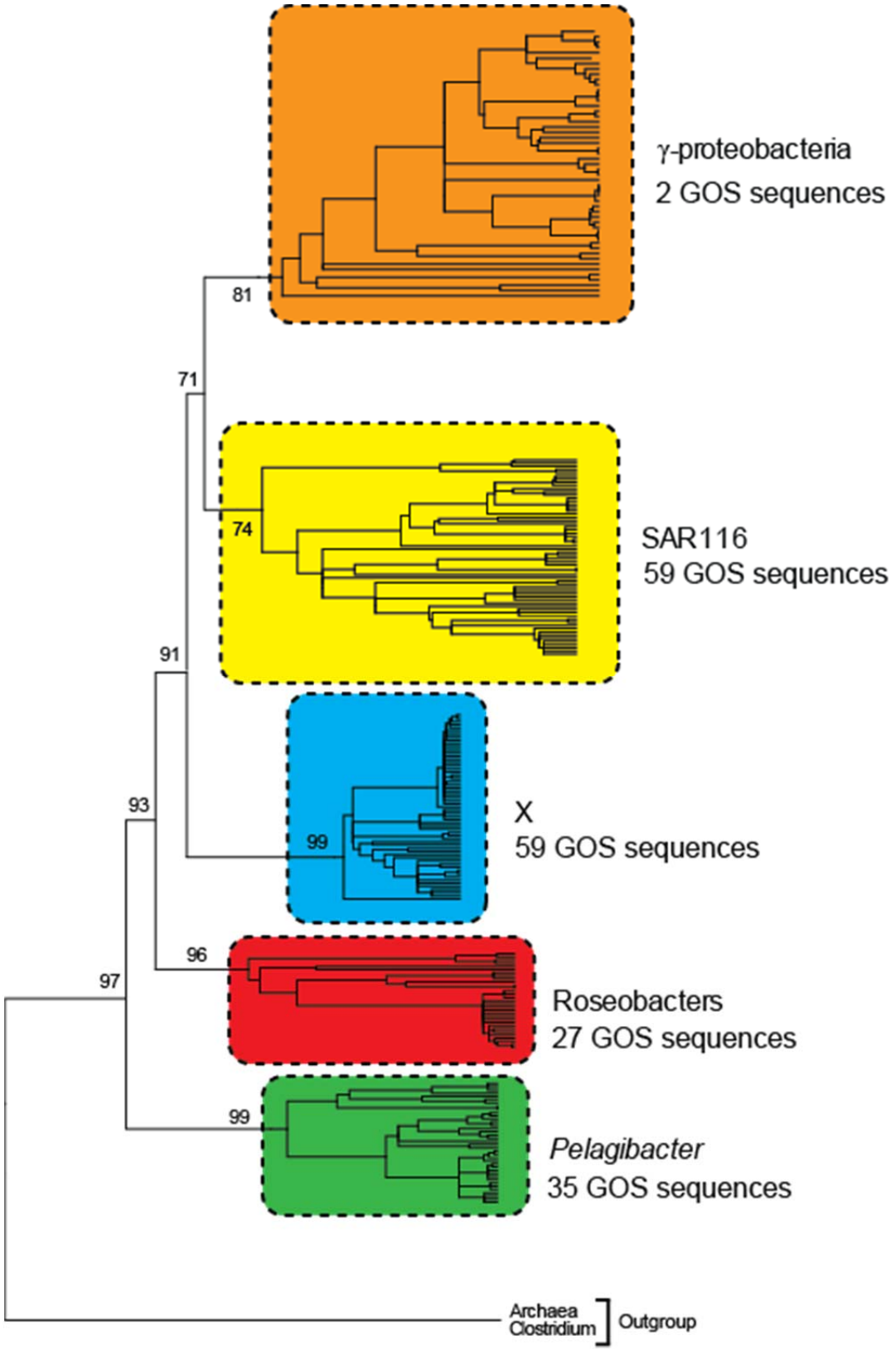
To identify all the MntX peptides possible, we interrogated the CAMERA database for the Global Oceanic Survey (GOS) in addition to the NCBI peptide records using *R. nubinhibens* MntX as a query sequence.

All resulting MntX polypeptides fell into 6 sub-classes, each being associated with one the above

bacterial lineages (Figure 6.9), as described below. One set of sequences did not cluster with any described taxanomic group. Closer examination of these peptide sequences revealed that they had a very low GC content; often below 30% (refer to Appendix 2). This unidentified clade of sequences, and presumably strains which harbour these peptides was named clade X in figure 6.9. These peptides could be indicative of a novel, and widespread new clade of bacteria, analogous to SAR11.

Individual phylogenetic trees were constructed for each of the 5 distinct groups of MntX peptides shown in Figure 6.9 and these are included as Appendix 1. In addition, some basic information about each of the MntX peptides shown in figure 6.9 is included as Appendix 2.

Figure 6.9 Phylogenetic tree of all MntX peptides

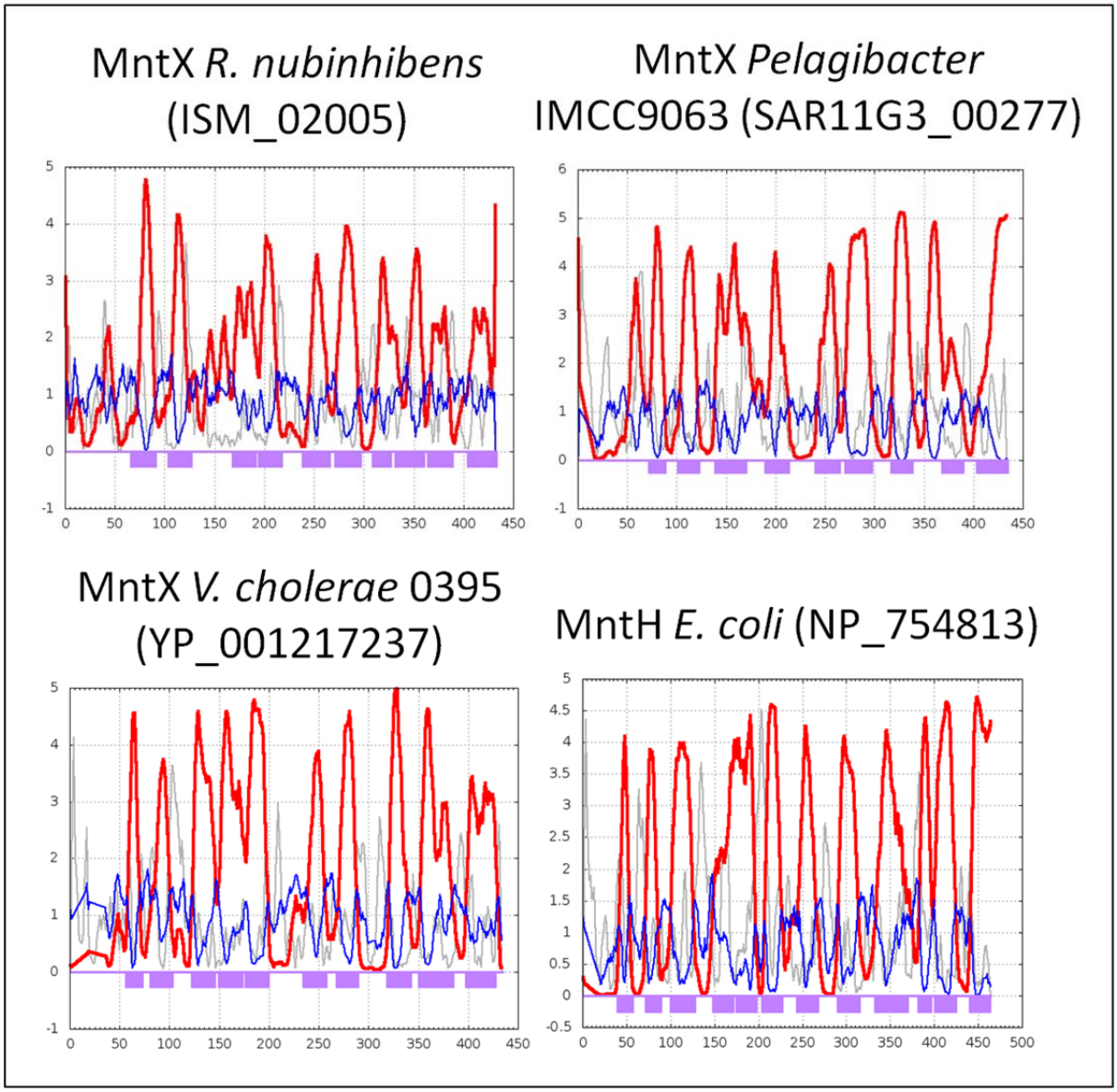


Using Mega5, a tree of the MntX homologues in the bacteria described in the text and in the GOS marine metagenome was constructed using the neighbour-joining method; bootstrap values are shown for 500 replicates performed. The MntX homologues were of five sub-classes as indicated, each corresponding to those found in the bacterial clade that is shown. Group "X", shown in blue, corresponds to those in the GOS that were not close homologues of a polypeptide in any known bacterium. The numbers of GOS sequences found in each of the five groups are indicated. Accession numbers of the individual GOS sequences are in Appendix 2.

6.2.11 Structural predictions for mntX

The translated products of *mntX* from *R. nubinhibens*, *Vibrio cholerae*, and from Pelagibacter IMCC9063 are predicted to be localised in the cytoplasmic membrane, as judged by the program pSORTB 3.0 (Yu *et al.* 2010). It was also possible to predict the presence of hydrophobic regions of these polypeptide sequences, which may indicate the trans-membrane (TM) parts of the protein that are embedded in the membrane *in vivo*. The presence of possible TM domains in any given peptide sequence can be evaluated using SPLIT4 {http://split4.pmfst.hr/split/4/ (Juretic *et al.* 2002)}, which predicted that MntX of *R. nubinhibens*, *V. cholerae*, and *Pelagibacter* all have ~10 TM domains, with a similar overall profile to that of another Mn^{2+} transporter, namely MntH of *E. coli* (Figure 6.10).

Figure 6.10 Prediction of TM domains in MntX proteins, with MntH for reference



SPLIT4 (Juretic et al. 2002) output for three MntX peptide sequences show the presence of hydrophobic regions of the peptide sequence (red lines). These are used to predict possible TM regions (purple boxes). The peptide sequence of E. coli MntH was included for reference.

6.2.12 Correction of the SitA⁻ mutant of Ruegeria pomeroyi DSS-3 *with the cloned* mntX *genes of* Candidatus *Pelagibacter sp. IMCC9063 and of* Vibrio cholerae

Although the MntX homologues were very similar to those in the various bacterial clades described above, it was important to confirm that these were functional Mn transporters by direct experimentation. It was decided to do this for two examples, namely *Candidatus* Pelagibacter sp.

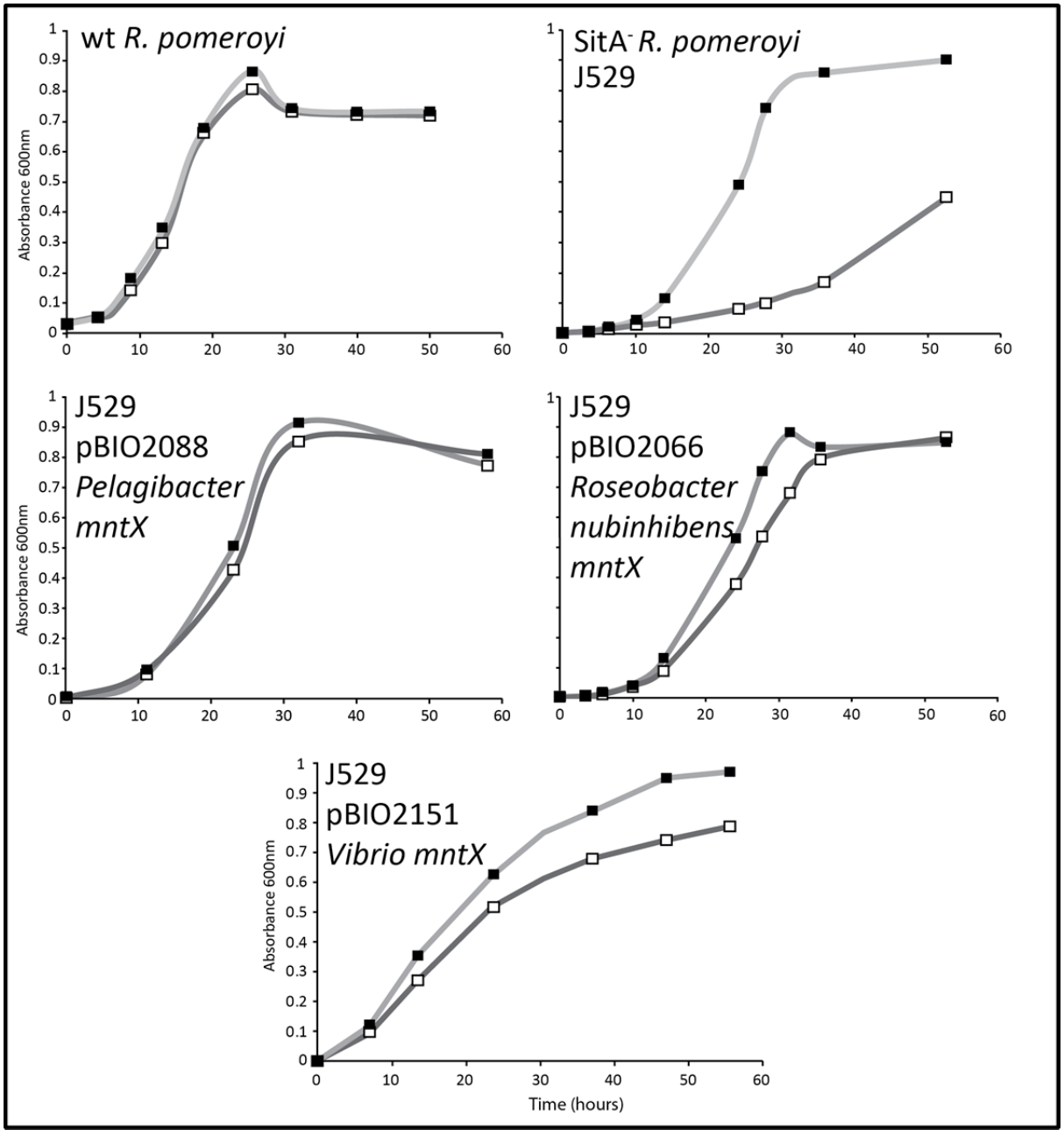
IMCC9063 and *Vibrio cholerae*, because these are (a) in different sub-phyla of the Proteobacteria and (b) because, in their different ways, they are very important bacteria, at a global level.

For *Candidatus* Pelagibacter sp. IMCC9063 we purchased (from GenScript) a 1345 bp fragment that contained its intact *mntX* gene (*SAR11G3_00277*), in a form whose codon usage was optimised {using OPTIMIZER (Puigbo *et al.* 2007)} for expression in the Roseobacters (whose GC content is ~60%, compared to ~30% in Pelagibacter). This *mntX*-like gene was sub-cloned into pRK415 (Keen *et al.* 1988) and the resulting plasmid (pBIO2088) was conjugated into the *Ruegeria pomeroyi* DSS-3 SitA$^-$ mutant J529.

For Vibrio *cholerae,* we obtained a plasmid, VcCD00018495, from the DNASU Plasmid Repository. This plasmid contains the *mntX* gene (*VC1688*) of *Vibrio cholerae* O1 biovar ElTor str. N16961, cloned in the vector pDONR221 (Nakagawa *et al.* 2008). Using primers **VcXbamp1** and **VcXecop2**, this *mntX* gene was then amplified and ligated to pRK415 that had been cut with *BamH*I and *EcoR*I, forming pBIO2150. This plasmid was conjugated into the *Ruegeria pomeroyi* DSS-3 SitA$^-$ mutant J529.

As shown in Figure 6.11, the cloned genes of both *V. cholera* and of Pelagibacter could complement the growth defect of the SitA mutant in Mn-depleted media, just as had been shown for the cloned *mntX* of *Roseovarius nubinhibens.*

Figure 6.11 Growth defect of the *R. pomeroyi* SitA$^-$ strain J529 is corrected by the cloned *mntX* genes of Pelagibacter, *Roseovarius nubinhibens* and *Vibrio cholerae*.



Cultures of* Ruegeria pomeroyi *wild type, or the SitA$^-$ mutant J529 or J529 corrected with cloned* mntX *of* Roseovarius nubinhibens *(pBIO2066),* Candidatus *Pelagibacter ubique (pBIO2088) or* Vibrio cholera *(pBIO2151) were diluted into RSS minimal medium either lacking any added $MnCl_2$ (white squares), or supplemented with 10 µM $MnCl_2$ (black squares). Cultures were grown, with shaking, at 28^{0}C, and growth was measured by absorbance at 600 nm.

6.3 Discussion

To date there has been no research into manganese uptake and regulation in marine bacteria.

The work described here initially generated a series of conventional results, relating to Mn homeostasis in *Ruegeria pomeroyi,* but more novelty emerged from a comparative study of the portfolio of the relevant genes in the different strains of Roseobacters (Table 6.2).

- All contained Mur and no other known, dedicated Mn-responsive transcriptional regulator.
- There were two distinct families of SitA peptides
- Three strains lacked any known Mn uptake genes – SitA or MntH
- These three strains all had a homologue of MntX – a novel Mn transporter

It was fascinating to see that SitABCD was not well conserved across the Roseobacters, the distribution of this Mn transporter was clearly divided into three separate groups, that of *R. pomeroyi*, a group homologous to the Rhizobial SitA, and another group, most similar to *Loktanella vesfoldenesis*. This was surprising and perhaps highlights the potential for diversity in this group of taxonomically distinct bacteria; applied to the wider marine community, diversity of metal transporters within taxonomic groups may be the rule rather than the exception.

From this analysis of the diversity of Mn transporters in the Roseobacters came the identification of MntX. Only those Roseobacter strains which lacked homologues of either SitABCD or MntH contained a homologue of MntX. One strain, *Ruegeria* sp. Trich CH4B had a homologue of MntH and SitABCD, it would be interesting to see the effect of mutations in each Mn-uptake system of this strain.

In the Roseobacters, the *mntX* gene was always preceded by a MRS box; both protein and MRS box were well conserved between *Roseovarius nubinhibens* ISM, *Oceanicola granulosus* HTCC2516 and *Rhodobacterales* strain HTCC22. The MntX protein is structurally predicted to be similar to MntH, and is located in the inner membrane making a good candidate for being a functional Mn transporter. Indeed, we were able to show that the *R. nubinhibens mntX* gene encodes a functional Mn transporter, and that regulation of *mntX* is via Mur.

The MntX peptide is found in a limited number of orders of the Proteobacteria, namely in the Oceanospirillales, the Altermonadales, the Vibrionales, all in the γ-subphylum, and in the SAR11, SAR116 and Roseobacter clades of α-proteobacteria. MntX is not distributed throughout each genus which has a homologue to this Mn transporter, indicating that MntX may have been acquired by

horizontal gene transfer (HGT). Also, since none of the Roseobacters which have SitABCD or MntH also had MntX it may be that this system is more beneficial in the marine habitat.

It must be noted that nearly all sequenced strains of the Vibrionales contained MntX, and indeed all *Vibrio cholerae* strains have a homologue of MntX. This may either mean that these bacteria acquired *mntX* early in their evolution, or that it originated from these bacteria. The function of one of the *Vibrio cholerae mntX* genes was demonstrated, in the complementation of the SitA$^-$ strain of *R. pomeroyi*. This gene is also likely regulated by MntR, and not Mur, since the γ-proteobacteria use MntR to regulate Mn homeostasis. Unfortunately, I was unable to identify any potential *cis*-acting motifs homologous to MntH-boxes upstream of the *Vibrio mntX* gene. It is of course pertinent to mention the potential for MntX to be a target for therapeutic research. *Vibrio cholerae* is still a very dangerous pathogen where water sanitation is insufficient, and since MntX is likely an inner membrane protein, it could represent a potential vaccine antigen.

MntX was also found in the abundant α-proteobacterial SAR11 and SAR116 groups, of which Candidatus Pelagibacter sp. IMCC9063 encoded another functional MntX protein, capable of complementing the SitA$^-$ strain of *R. pomeroyi.*

Given the abundance of the Roseobacters, Vibrios and SAR11/116 in the oceans, it was unsurprising to find that MntX was 82% as abundant in the GOS samples as SitA, and ~4-fold more abundant than MntH. This surely makes MntX a hugely important component of the marine Mn cycle and indeed for the bioavailability of Mn globally.

Fascinatingly, the analysis of MntX peptides found in the GOS survey revealed the presence of an as-yet unidentified group of bacteria, which harbour MntX (group X in the MntX phylogenetic tree, Figure 6.9). These bacteria likely have a very low genomic GC content, with all homologues of MntX being between 28 and 33% GC in this group. This is very comparable to the GC content of SAR11 bacteria, and perhaps is the first identification of a new large and abundant clade of bacteria related to SAR11. Further study into these bacteria would be extremely rewarding, perhaps using the novel group X MntX homologues as DNA probes to identify these previously uncharacterised bacteria.

Since MntX appears to be a solely marine Mn transporter, it would be of interest to perform biochemical studies on this transporter to show if the saline environment is of benefit to this transporter system, or perhaps it functions better than SitABCD/MntH when there is very low Mn concentration, as found in the oceans.

Finally, the fact that both SitA and MntX have been shown to be Mn-repressed means that these transporters are not always required either due to high levels of available Mn, such as in marine

sediments or algal blooms, or simply that these bacteria can simply shut down a lot of gene expression and wait for a better environment for growth. We already know that there are many strategies for survival in the oceans, such as the extreme minimalism of SAR11, and the extreme levels of iron uptake systems shown by some Roseobacters. All those in between can alter gene expression to suit a variety of conditions experienced by these bacteria in the variable habitat of the ocean.

Finally, this study identified bacterial strains which had no characterised systems for Mn uptake – most noteworthy in the SAR11 clade. These must have yet another novel Mn transporter, or could even have lost their requirement for this metal, in both cases; this would be an interesting study.

Chapter 7 - Microarray study of the Fe- and Mn-responsive transcriptome of *Ruegeria pomeroyi*

7.1 Introduction

The volume of data generated from a transcriptomics experiment is vast. The transcription of each of the >4000 genes of *R. pomeroyi* was measured using two conditions, and in two different mutant strains, so to go through all those genes whose expression went up or down in response to one or more of these parameters is not practical. Instead, only those genes of particular interest or whose on/off ratio in response to one or more of the conditions was truly out of the ordinary will be discussed here; also, this chapter will be presented with discussion forming part of the main text. The full data set is available at Appendix 3.

7.1.1 Methodology

A microarray chip was designed for *Ruegeria pomeroyi* DSS-3 using ArrayDesigner (Premier Biosoft). Here, each gene on both the main chromosome and the megaplasmid had a minimum of three oligonucleotides, each 60 nucleotides in length, designed, and randomised, before being printed in single spots on a glass slide by Agilent. Each array was printed eight separate times on a single glass slide. These eight arrays allowed the comparison of eight pairs of fluorescently labelled populations of cDNA, synthesised using total RNA extractions from different genotypes of *R. pomeroyi* cells that had been grown in our chosen conditions. The cDNA copies of a given gene would be labelled with two fluorescent dyes, which competitively bind to the oligonucleotide spot printed on the slide. If the gene is differentially expressed in one of the conditions, then the relative fluorescence will be higher for one colour than the other. The array is also, to a degree, quantitative, in that highly expressed genes will have a high level of fluorescence due to the higher level of cDNA copies of the mRNA; this does of course depend on the binding affinity of the individual oligo probes, and so is not truly quantitative.

I chose to use type I arrays (DeRisi *et al.* 1997), where RNA from two different conditions are compared on a single array. For example, two cultures of *R. pomeroyi*, one grown with added $FeCl_3$, and one without, would be used to prepare total RNA, which could then be compared on a single array. (In contrast, Type II arrays use labelled genomic DNA as a control on each array, to which RNA from a single condition can be compared.) Type II arrays can be compared to each other, but are less economical. For this work, we intended the arrays to be provide an overview of the transcriptional changes which occur during Fe and Mn limitation, hence our choice of type I arrays.

7.1.2 Performing the microarray

My array experiments consisted of the following comparisons:

1. Wild type *R. pomeroyi* grown in MBM with, or without extra, 20µM, $FeCl_3$.

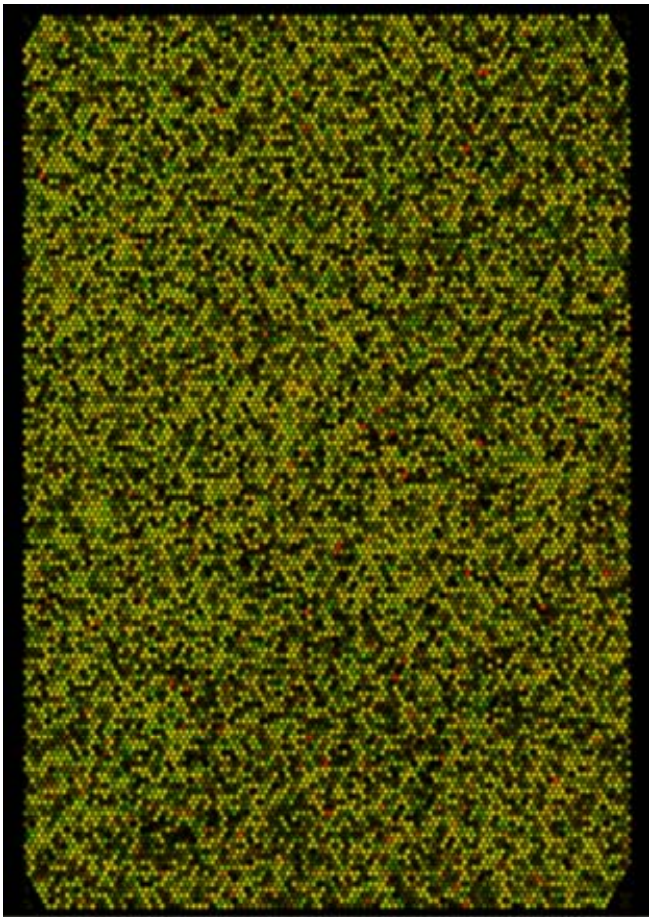
2. Wild type *R. pomeroyi* grown in RSS with, or without extra, 20µM, $MnCl_2$.

3. Wild type *R. pomeroyi* and the Mur^- strain J528, both grown in RSS with 20µM $FeCl_3$ plus 20µM $MnCl_2$ added.

4. Wild type *R. pomeroyi* and the Irr^- strain J539 grown in MBM with 20µM $FeCl_3$ added.

Each comparison was performed in duplicate on cultures derived from single colonies of each of the strains that were used. The RNA was extracted from 100 ml cultures grown to early exponential phase (the RNA extraction and labelling method is detailed in Materials and Methods), which equated to around 14 hours of growth in each condition. At this point, the cultures in all the conditions tested were at a similar growth phase and optical densities (OD_{600nm} = 0.15). Total RNA was checked for quality and quantity and was labelled during reverse transcription using either Cy3 (green) or Cy5 (red) fluorescent residues. The cDNA samples were purified and hybridised to the array slide. Where RNA from each condition was in equal concentration, the hybridised probe would fluoresce yellow, and where either Cy3 or Cy5 labelled RNA proliferated, the probe would fluoresce red or green (see Figure 7.1).

Figure 7.1 Scanned microarray slide from this work



Scanned array showing both fluorescent channels together. Green or red spots indicate where a gene was expressed at different levels in the two conditions. Yellow spots indicated equal levels of binding of both fluorescently labelled cDNA samples.

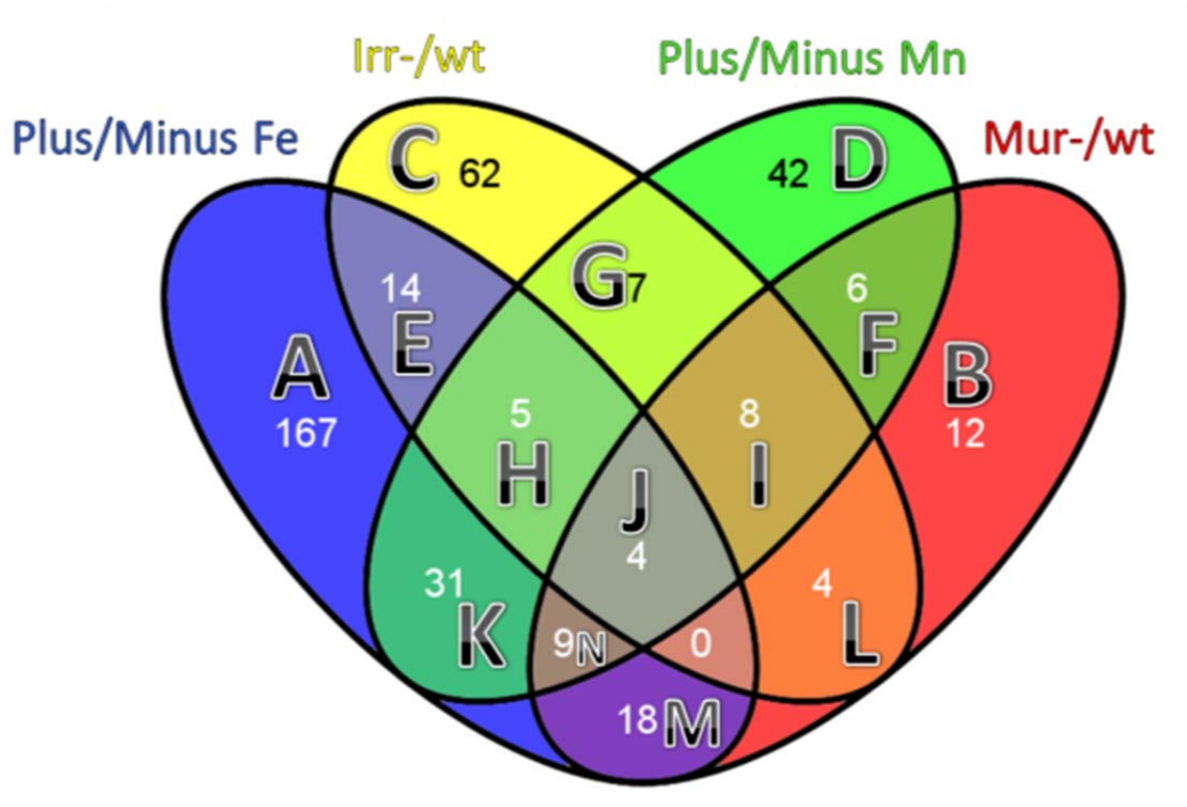
The relative fluorescence of each spot on each array was measured, and these data were normalised to eliminate any bias of the total fluorescence of each dye. These values of relative fluorescence were used to calculate a ratio for each probe, which could then be used to calculate the relative fold-change in expression for each gene, based on the three technical replicates of the three separate probes to each gene, and the two biological replicates of the two separate arrays. These values could then be assigned significance, to establish if they were statistically similar between all replicates, based on their p-value in a t-test of normalised values.

Large scale, batch analysis of groups of similarly behaving genes was performed first, to obtain a sense of the overall changes occurring across all arrays. These analyses are detailed in the following sections.

7.2.1 Venn diagrams of gene expression patterns

A selection of the genes whose expression changed in each condition was used to populate lists, as shown below. Only those genes that (a) behaved in a similar way in all the replicates (and which therefore had small errors associated with the measurements) and (b) had a significant–fold difference greater expression than the control condition, were used (see Figure 7.2 for different fold-change cut-off values used). These lists were compared using Venn diagrams, to see if any genes were co-regulated by the environmental conditions (+/- Mn and/or Fe), or genotype (Mur^-, Irr^-, wild type) wild type/mutant) as shown in Figure 7.2.

Figure 7.2 Venn diagram showing numbers of genes that were differentially expressed depending on availability of Mn and/or Fe and/or the *mur* or *irr* genotype



Venn diagram produced using Venny (Oliveros 2007). The integers in each of the areas represent the numbers of genes whose expression was of affected (either positively or negatively) by the particular environmental and genetic variables. Thus, for example, the expression of 42 genes (in Box D) was affected by the* mur *genotype but not by that of* irr *or the presence of added Mn or Fe. In contrast, expression of the 4 genes in Box J was affected by all four of these variables. The cut off values of the –fold differences were; 3-fold for Fe limitation, 1.5-fold for Irr⁻ vs. wild type, and 2-fold for both Mn limitation and for Mur⁻ vs. wild type. The letters A-N correspond to those used in the gene list in Table 7.1.

Table 7.1 Lists of *Ruegeria pomeroyi* genes in the categories in the Venn diagram in Figure 7.2

A						B	C		D	
SPO0021	SPO0432	SPO1409	SPO2370	SPO3230	**SPO3770**	SPO1139	**SPO0185**	**SPO2014**	SPO0162	SPO2994
SPO0045	SPO0692	SPO1419	SPO2450	SPO3275	SPO3882	SPO1533	**SPO0186**	**SPO2015**	SPO0351	SPO3161
SPO0050	SPO0759	SPO1548	SPO2508	SPO3288	SPOA0037	SPO2093	SPO0274	**SPO2016**	SPO0459	SPO3284
SPO0051	SPO0789	SPO1557	SPO2516	SPO3329	**SPOA0056**	SPO2432	SPO0323	**SPO2017**	SPO0537	SPO3509
SPO0052	SPO0858	SPO1587	SPO2567	**SPO3354**	**SPOA0057**	SPO2717	SPO0328	**SPO2020**	SPO0761	SPO3513
SPO0071	SPO0909	SPO1689	SPO2580	**SPO3355**	**SPOA0059**	SPO2721	SPO0330	**SPO2021**	SPO0886	SPO3540
SPO0088	SPO0930	SPO1780	**SPO2614**	SPO3381	**SPOA0061**	SPO3364	**SPO0608**	**SPO2022**	SPO1226	SPO3671
SPO0090	SPO0937	SPO1794	**SPO2615**	SPO3409	SPOA0186	SPO3596	**SPO0609**	SPO2025	SPO1317	SPO3823
SPO0112	SPO0943	SPO1796	SPO2619	SPO3410	SPOA0289	SPO3597	**SPO0610**	SPO2159	SPO1500	SPOA0337
SPO0115	**SPO1017**	SPO1799	**SPO2631**	SPO3457	SPOA0315	SPO3615	**SPO0611**	SPO2163	SPO1507	SPOA0349
SPO0175	**SPO1018**	SPO1848	**SPO2632**	**SPO3459**	SPOA0321	SPOA0224	**SPO0612**	SPO2180	**SPO1512**	SPOA0410
SPO0179	**SPO1019**	SPO1849	**SPO2633**	**SPO3460**	SPOA0338		**SPO0613**	SPO2236	**SPO1516**	
SPO0180	**SPO1020**	SPO1860	**SPO2635**	**SPO3461**			**SPO0614**	SPO2390	**SPO1518**	
SPO0181	**SPO1021**	SPO1909	**SPO2637**	SPO3484			**SPO0615**	SPO2573	**SPO1520**	
SPO0192	SPO1060	SPO1938	SPO2802	**SPO3523**			SPO0628	SPO2645	**SPO1521**	
SPO0197	**SPO1063**	SPO1983	SPO2804	**SPO3524**			SPO0646	SPO3085	**SPO1524**	
SPO0198	**SPO1064**	SPO2102	SPO2817	**SPO3525**			SPO0662	SPO3543	SPO1564	
SPO0201	SPO1089	SPO2106	SPO2839	**SPO3526**			SPO0671	SPO3589	SPO1568	
SPO0202	SPO1177	**SPO2130**	SPO2846	**SPO3527**			SPO0718	SPO3685	SPO1569	
SPO0203	SPO1195	**SPO2131**	SPO2871	**SPO3529**			SPO0831	SPO3774	SPO1692	
SPO0227	SPO1236	SPO2135	SPO2872	SPO3532			SPO0855	SPO3842	SPO1798	
SPO0254	SPO1256	SPO2222	SPO2876	SPO3547			SPO1054	**SPO3843**	SPO1840	
SPO0255	SPO1271	**SPO2240**	SPO2930	SPO3604			SPO1173	SPOA0104	SPO1878	
SPO0307	SPO1281	**SPO2241**	SPO2932	SPO3606			SPO1405	SPOA0152	SPO1929	
SPO0313	SPO1351	**SPO2242**	SPO2962	SPO3613			SPO1440	SPOA0225	SPO1975	
SPO0314	SPO1366	SPO2246	SPO3032	**SPO3700**			SPO1478	SPOA0351	SPO2048	
SPO0363	SPO1376	SPO2247	SPO3078	**SPO3701**			SPO1718	SPOA0388	SPO2107	
SPO0382	SPO1387	SPO2295	SPO3095	**SPO3721**			SPO1957	SPOA0411	**SPO2252**	
SPO0388	SPO1392	SPO2324	SPO3103	SPO3722			SPO1973	**SPOA0443**	**SPO2253**	
SPO0390	SPO1393	SPO2335	SPO3118	**SPO3767**			SPO1978	**SPOA0444**	**SPO2255**	
SPO0404	SPO1398	SPO2346	SPO3139	**SPO3768**			SPO1999	**SPOA0446**	SPO2263	

E	F	G	H	I	J	K	L	M	N
SPO0086	SPO0834	SPO0698	SPO0222	SPO1055	SPO1216	SPO0900	SPO0154	SPO0089	SPO0769
SPO0087	SPO0919	SPO1217	SPO0701	SPO2576	**SPO2398**	**SPO1502**	SPO1977	SPO0157	SPO0833
SPO0169	SPO0921	**SPO1682**	SPO1565	**SPOA0392**	**SPO2399**	**SPO1503**	SPO2018	SPO0784	SPO1555
SPO0199	SPO1556	**SPO1863**	SPO1861	**SPOA0393**	SPOA0399	**SPO1504**	SPO2577	SPO0924	**SPO1790**
SPO0647	SPO1789	SPO2154	SPO2264	**SPOA0395**		SPO1508		SPO1015	**SPO1791**
SPO0790	SPO2331	**SPO2396**		**SPOA0396**		**SPO1514**		SPO1280	**SPO3363**
SPO2023		**SPO2397**		**SPOA0397**		**SPO1515**		SPO1593	**SPO3365**
SPO2486				**SPOA0398**		**SPO1517**		SPO1795	SPO3366
SPO3014						SPO1847		SPO2568	
SPO3287						SPO1862		SPO2686	
SPO3359						SPO2257		SPO2706	
SPO3360						**SPO2261**		SPO2867	
SPO3607						**SPO2262**		SPO3027	
SPOA0445						SPO2289		SPO3081	
						SPO2371		SPO3445	
						SPO2628		SPO3781	
						SPO2634		SPOA0273	
						SPO2636			
		ICE BOX				SPO3017			
		IR BOX				SPO3031			
		MUR BOX				SPO3033			
		RRF-2				SPO3600			
		Operons				**SPOA0339**			
						SPOA0340			
						SPOA0341			
						SPOA0342			
						SPOA0343			
						SPOA0345			
						SPOA0346			
						SPOA0347			
						SPOA0348			

Each set of genes shown in Figure 7.2 had an associated letter. These letters are shown here, as lists of genes which populated each section of the Venn diagram. Any gene which has a predicted regulatory motif (ICE, IR, MUR, see Chapter 3) or was a predicted Rrf-2 family transcriptional regulator (Chapter 3), or was in a predicted operon of genes, is coloured according to the key shown in column G.

This analysis revealed some expected, and also some surprising findings. As expected, there were 13 genes which were altered in expression in response to both Irr and to Fe, consistent with the known responses of the Irr regulator to Fe availability. Similarly, 27 genes responded to both the *mur* genotype and to its cognate co-regulator Mn. However, 31 genes were altered in both Fe and Mur, and 24 in both Irr and Mn. Thus, there is still considerable cross-talk in the regulatory networks for Mn and Fe homeostasis. Indeed, Mur of *R. pomeroyi* was shown to repress the *irr* locus in response to Mn levels (chapter 4).The *mur* gene is thought to have evolved from the global iron regulator gene *fur*, and clearly still has potential to be involved (directly or indirectly) in the response to Fe availability.

No genes were regulated by Mur, Irr and by Fe above the cut-off values used in this analysis, but 9 genes were shown to be regulated by Mn, Fe and Irr. This may show that Mur plays a lesser role in the homeostasis of Mn and Fe than the levels of Fe and Mn themselves, and that Irr is the more important regulator. Indeed, the fact that Mur itself is regulated by Irr makes this regulatory hierarchy more probable.

A total of 12 genes changed in response to Mn independently of Mur, or Fe, or Irr, indicating the presence of a yet unidentified Mn-responsive transcriptional regulator. Similarly, a total of 31 genes responded to Fe AND Mn limitation, but to neither Mur nor Irr.

Although not shown in the Venn diagram, it was apparent that several adjacent, contiguous genes displayed the same pattern of differential expression, consistent with their being part of the same transcriptional units (operons), and also demonstrating the robustness of the data.

In what follows, some of the more interesting of these operons are described in more detail.

7.3.1 Effects of manganese availability and mutations in mur *on the transcriptome of* Ruegeria pomeroyi

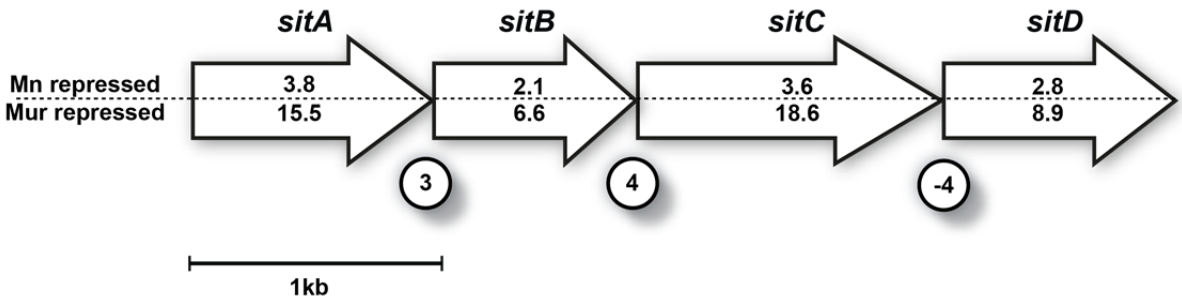
The focus of this section is on those operons whose expression was markedly affected (>5-fold difference) by the *mur* genotype and/or the availability of Mn. These fell into one of four classes, depending on their response to Mn and to the *mur* genotype, as follows.

7.3.2 Class I – expression repressed in Mn-replete medium, and enhanced in Mur⁻ mutant

As shown in Table 7.1, a total of 12 genes, in just two clusters, behaved in a conventional way for those that are repressed by the Mur regulator, in cells grown in Mn-replete conditions.

SPO3366, SPO3365, SPO3364 and *SPO3363* (*sitABCD*)

Figure 7.3 *sitABCD* map with expression ratios



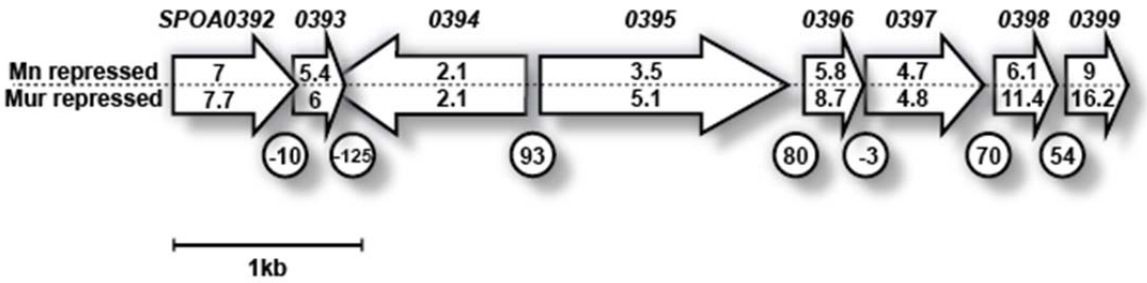
Scale map of the sitABCD locus of R. pomeroyi (SPO3363-SPO3366) including intergenic gaps (circled) and fold-change ratios for both +/- Mn and wt/mur microarray experiments (Mn repressed and Mur repressed).

Reassuringly, the *sitABCD* genes were among those whose expression was most strikingly repressed in the +Mn medium and this effect was dependent on a functional *mur* gene. The expression of *mur* itself was not affected significantly by the presence of added Mn in the medium. Here, the fold-change ratio of *sitA* expression shown in Figure 7.3 is lower (3.8-fold) to that obtained using a *sitA-lacZ* fusion (16-fold), but both show that *sitA* expression is repressed by Mn (see Chapter 6).

Interestingly, the *sit* genes appear to be induced by Fe (see Appendix 3, *sitA*, *sitC* and *sitD* all ~4-fold induced by Fe), although the mechanism of this regulation is unknown.

SPOA0392 – SPOA0399

Figure 7.4 *SPOA0392-SPOA0399* map with expression ratios



Scale map of the* SPOA0392-SPOA0399 *locus of* R. pomeroyi *including intergenic gaps (circled) and fold-change ratios for both +/- Mn and wt/mur microarray experiments (Mn repressed and Mur repressed).

R. pomeroyi DSS-3 has a resident, 491,611 bp, megaplasmid (Moran *et al.* 2004). It has a cluster of 8 contiguous genes, arranged in at least four predicted transcriptional units (Figure 7.4), whose expression was markedly reduced in cells grown in Mn-replete medium. This only occurred in the wild type strain, showing that Mur was required for this repression. The leftmost (as shown in Figure 7.4) of these genes, *SPOA0392*, encodes a polypeptide that is weakly predicted to be an RpoE-type σ -factor of RNA polymerase, but the closest homologue, FecI of *Pseudomonas,* is only 34% identical to the *SPOA0392* gene product. So, if this *Ruegeria* gene does indeed encode a σ-factor, it must be of a rather novel type and predictions of its function are not possible. Downstream of *SPOA0392,* and in the same orientation, is *SPO0393,* which encodes a small (99 amino acid) polypeptide with significant similarity to one of the components of refractile inclusion bodies (R-bodies), which are ribbon-like polypeptides associated with the ability of some bacteria to act as killers in endosymbiotic interactions with eukaryotes (Pond *et al.* 1989). At the other end of the cluster lie the adjacent genes *SPOA0398* and *SPOA0399,* whose products are 78% identical to each other and less so (34%) to that of *SPOA0393,* with all three having significant identity to other R-body proteins in *Caedibacter taeniospiralis*, an obligate endosymbiont of *Paramecium* (Beier *et al.* 2002; Jeblick and Kusch 2005). I could find no links between manganese availability and R-bodies in the literature and the reason why the expression of these three genes should be elevated in Mn-deficient media, under the control of Mur, is unknown. Between the two sets of R-body genes are four other genes (*SPOA0394 – SPOA0397*), one of which, *SPO0394* is in the opposite orientation and shows only a modest response to Mur and to Mn availability. The genes in this cluster do not occur in any other genome-sequenced

Roseobacter species, their products have no known function, and they have no homologues in any known organism. However, the SPO0397 gene product has three significant matches in the Global Ocean Sampling metagenome (Sun *et al.* 2010), pointing to the presence of the corresponding gene in (unknown) marine organisms.

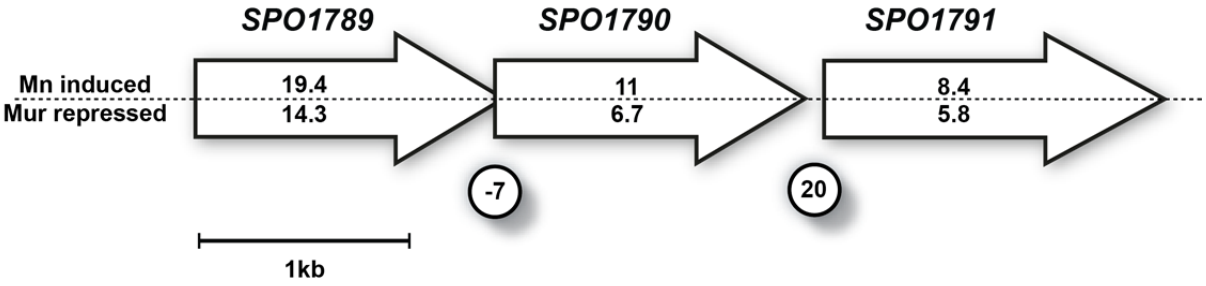
The *sitABCD* operon has two MRS motifs in its promoter region (see Chapter 6), but no such sequence was seen 5' of any of the genes in the *SPOA0392 – SPOA0399* cluster. It is not known, therefore, if Mur acts directly by binding to motifs that share only very limited similarity to the canonical MRS boxes or indirectly, perhaps by affecting the expression of another regulatory system that affects the transcription of these R-body genes.

7.3.3 Class II – expression enhanced in Mn-replete medium, and enhanced in wild type, compared to Mur⁻ mutant

There were several groups of different genes, in four separate regions of the *R. pomeroyi* genome, whose expression was enhanced in the +Mn medium in the wild type strain, but this induction was not seen in the Mur⁻ mutant (Table 7.2).

SPO1789, SPO1790, and *SPO1791.*

Figure 7.5 *SPO1789-SPO1791* map with expression ratios

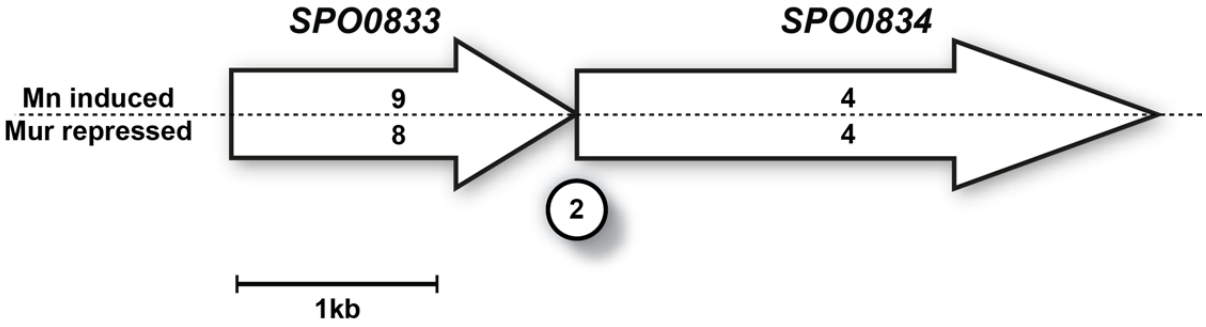


Scale map of the* SPO1789-SPO1791 *locus of* R. pomeroyi *including intergenic gaps (circled) and fold-change ratios for both +/- Mn and wt/mur microarray experiments (Mn induced and Mur repressed).

These three genes are strongly predicted to encode the components of an ABC transporter, respectively its permease, ATPase and periplasmic binding protein. Their expression was enhanced 19.4-, 11- and 8.4-fold respectively in the "+Mn" compared to the "-Mn" medium and by 14.3-, 6.7- and 5.8-fold respectively in the Mur^+ wild type compared to the Mur^- mutant (see Figure 7.5 and Table 7.2). There are close homologues (> 60% identical) of all these gene products in many other Roseobacter strains, and also in bacteria in other sub-phyla of Proteobacteria. There were no close homologues to any transporter whose substrate specificity has been ratified, although the products of the *SPO1789* and *SPO1791* genes are classified as likely being involved in the import of tungstate or sulfate. However, this prediction needs to be ratified. Without knowing the identity of the substrate, and, indeed, without being certain if this transporter acts as an exporter or an importer, the adaptive advantage of its enhanced expression in Mn-rich medium is not clear.

SPO0833 and *SPO0834.*

Figure 7.6 *SPO0833-SPO0834* map with expression ratios

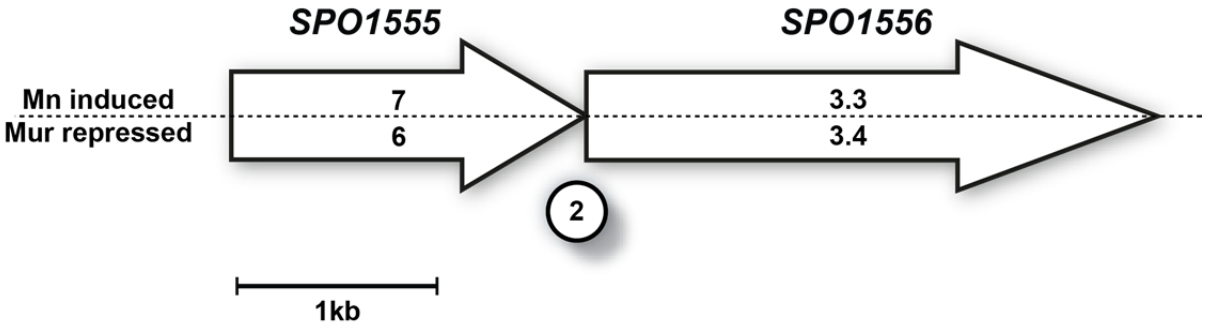


Scale map of the* SPO0833-SPO834 *locus of* R. pomeroyi *including intergenic gaps (circled) and fold-change ratios for both +/- Mn and wt/mur microarray experiments (Mn induced and Mur repressed).

The consecutive genes *SPO0833* and *SPO0834* are in a predicted two-gene operon whose expression was much enhanced (9- and 4-fold) in the +Mn media and 8- and 4-fold higher in the in wild type strain, relative to the Mur^- mutant. Their corresponding products are highly conserved, not only in the Roseobacters, but in a wide range of other bacterial clades and, strikingly, in the products of two other, *SPO1555* and *SPO1556,* in *R. pomeroyi* DSS-3 itself (see below). Their products are strongly predicted to encode the two polypeptides of a family of NADH:ubiquinone reductases. The predicted sub-type of this family that most closely resembled the *SPO0833* and *SPO1555* gene products are the β-subunit of a molybdopterin-containing formate dehydrogenase and those of *SPO0834* and *SPO1556* correspond to the α-polypeptide of the same enzyme.

SPO1555 and *SPO1556*

Figure 7.7 *SPO1555-SPO1556* map with expression ratios



Scale map of the* SPO1555-SPO1556 *locus of* R. pomeroyi *including intergenic gaps (circled) and fold-change ratios for both +/- Mn and wt/mur microarray experiments (Mn induced and Mur repressed).

As mentioned above, *SPO1555* and *SPO1556* are two contiguous genes (see Figure 7.7) that respond similarly to *SPO0833* and *SPO0834* with regard to manganese availability and to the *mur* genotype. Not only are the gene products of *SPO1555* and *SPO1556* very similar (>98% identical) to those of *SPO0833* and *SPO0834* respectively, but so too were the corresponding DNA sequences of the genes. This was the only example in which these genes had been duplicated in any of the genome-sequenced Roseobacters.

Perhaps coincidentally, at least some formate dehydrogenases contain tungsten, a metal that occurs in only a few metallo-enzymes. Furthermore, in *Desulfovibrio vulgaris* Hildenborough, the expression of the FdhAB formate dehydrogenase is induced by addition of tungstate (da Silva *et al.* 2011). Direct experiments are required to show if the purported formate dehydrogenases of *Ruegeria* (and other, related bacteria) do indeed contain tungsten. If so, it would provide a functional, though not mechanistic, explanation for the parallel induction of the two sets of genes that encode this enzyme plus a putative transport system for this metallic co-factor, encoded by the *SPO1789, SPO1790,* and *SPO1791* genes (see above).

The *SPO1216* gene forms a single-gene transcriptional unit that encodes a 239 amino acid polypeptide with no domains with known function. There is a near-identical homologue in just one

other Roseobacter strain, namely *Dinoroseobacter shibae* DFL 12; other than that, there are no homologues in any known organism, or in any metagenomic data base.

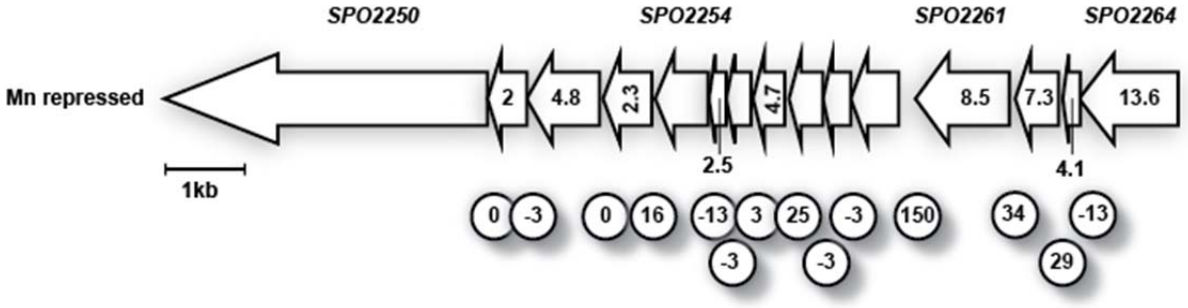
These findings of genes whose expression is enhanced in Mn-replete media and which require a functional Mur regulator for this induction are novel for this particular regulator. However, other members of the Fur super-family, including Fur itself, have analogous properties. Thus, although Fur is an Fe-responsive repressor of genes involved in iron uptake, for example, it is required for the expression of some other genes (e.g., the *sdh* operon for succinate dehydrogenase in *E. coli*), giving Fur the initial appearance of acting as an activator. However, this is due to its ability to repress a repressor, in this case the small RNA *ryhB,* which can act post-transcriptionally to inhibit the expression of several target genes (including *sdH*). Since transcription of *ryhB* itself is repressed by Fur in Fe-replete media, the *sdh* (and several other) targets for the RyhB RNA will be expressed in these conditions. Conversely, in a Fur^- mutant, RyhB RNA is made constitutively, and so the expression of its targets will be lowered under all conditions (Massé *et al.* 2007). Since small RNAs have not (yet) been identified in Roseobacters, it is possible that an analogous mechanism exists here, but this would require further work to demonstrate a role for such molecules in this particular case. There are no conserved sequences in the vicinity of the promoters of any of the genes that displayed this form of regulation. Indeed, the regions immediately upstream of *SPO0833* and *SPO1555* had very little similarity to each other, despite the remarkable similarities of the genes themselves and their patterns of regulation (see above).

7.3.4 Class III – expression repressed in Mn-replete medium, independent of mur genotype

There was one transcriptional unit that appeared to be repressed by Mn, but, in contrast to the cases described above, this was unaffected by the genotype at the *mur* locus (Table 7.2).

SPO2264 – SPO2261

Figure 7.8 Map of *SPO2250-SPO2264*



Scale map of the* SPO2250-SPO2264 *locus of* R. pomeroyi *including intergenic gaps (circled) and fold-change ratios for +/- Mn microarray experiments (Mn repressed).

Gene Transfer Agents (GTAs) are very small, virus-like particles, first found in *Rhodobacter* (Marrs 1974), and then shown to be a feature of the Rhodobacterales family, including many strains of the Roseobacter clade (Biers *et al.* 2008). There are also homologues of the corresponding genes in other genera of alpha-proteobacteria, including *Agrobacterium, Brucella* and *Caulobacter*. In *R. pomeroyi* DSS-3, Biers *et al.* (2008) identified a cluster of ~15 genes whose products correspond to the various components required to make its GTA (shown Figure 7.8).

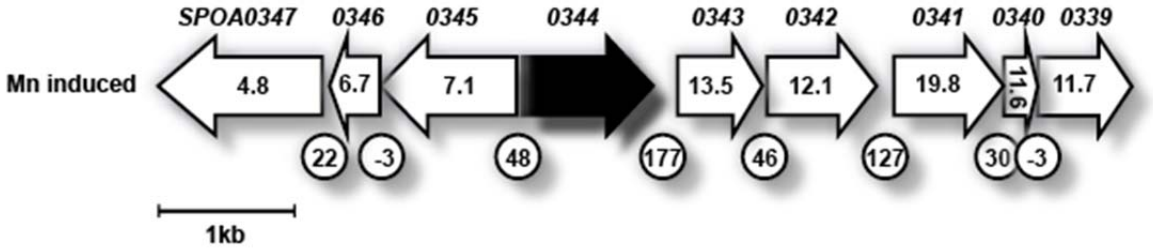
Within that cluster are four consecutive genes, *SPO2264 – SPO2261,* which are predicted to be in one operon. The expression of all four genes is much lower in the +Mn medium, with that of the promoter-proximal gene, *SPO2264* having the highest factor of reduction (11.4-fold). The promoter-proximal gene (*SPO2260*) of a downstream operon is also significantly repressed by Mn, as are some of the other genes in the cluster, though to a lesser degree (Table 7.2; Figure 7.8). I am unaware of any reports that describe any biochemical or functional connections between manganese and GTAs.

7.3.5 Class IV – expression enhanced in Mn-replete medium, independent of the mur genotype

There were at least three other gene clusters whose expression was greater, sometimes to a remarkable extent, in the +Mn medium, irrespective of the *mur* genotype. These are as follows.

SPOA0343 –SPOA0339 and *SPOA0345-SPOA0347*

Figure 7.9 Map of *SPOA0339-SPOA0347*



Scale map of the* SPOA0339-SPOA0347 *locus of* R. pomeroyi *including intergenic gaps (circled) and fold-change ratios for + Mn microarray experiments (Mn induced).

There is a cluster of nine closely linked genes, *SPOA0347 – SPOA0339* with a remarkable response to Mn availability. As shown in table 7.2, the expression of some of these was markedly *enhanced* (by factors as high as 20-fold) in Mn-replete medium, but this response was not mediated by Mur, since they displayed no differential expression in the Mur$^-$ mutant and in the wild type strains. This cluster comprised two, divergently transcribed sets of genes, *SPOA0343* - *SPOA0339* and *SPOA0345* - *SPOA0347*, which were separated by *SPOA0344,* whose expression was unaffected by the availability of manganese or the *mur* genotype (Table 7.2; Figure 7.9).

Three of these Mn-induced genes, *SPOA0345-SPOA0347*, were contiguous and are likely in a single operon. The other five may be co-transcribed, or may comprise two operons, *SPOA0343-SPOA0342* and *SPOA0341-SPOA0339*, separated by 128 bps (see Figure 7.9). None of these eight gene products

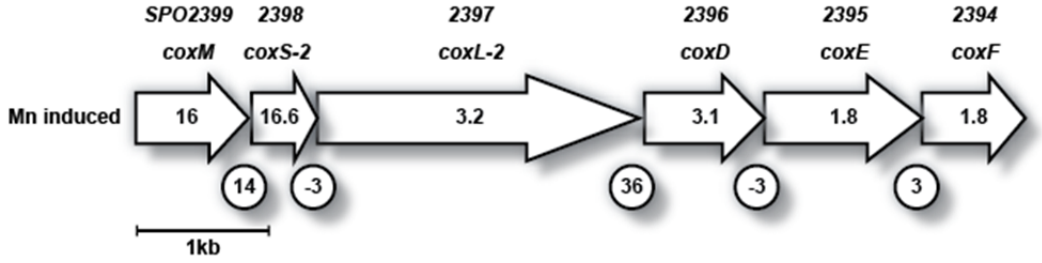
had close similarity to polypeptides of known function, although those of *SPOA0339, SPOA0340, SPOA0342, SPOA0345, SPOA0346* and *SPOA0347* could be allocated to general polypeptide families (Table 7.2). But even taking these various gene products together did not predict their overall biochemical function. However, it was noted that the closest homologues (ranging from 30% – 50% identical) of all of the gene products in this cluster occurred in a limited number of bacterial strains, namely *Erwinia tasmaniensis* Et1/99*, Acinetobacter sp.* ATCC 27244, *Photorhabdus asybiotic,* and *Klebsiella oxytoca* KCTC 1686. And, in each of these strains, the corresponding genes that encoded the homologues were often clustered, as in *R. pomeroyi* DSS-3. Thus, even though these versions of the genes may have diverged very considerably in their sequences compared to those in *Ruegeria,* there has been long-term, concerted selection to maintain their linkage within the genomes of different bacteria, suggesting that the individual gene functions in these clusters operate co-ordinately towards similar biochemical purposes.

It is noteworthy that *SPOA0344,* which is located between the highly induced *SPOA0343* and *SPOA0345* but whose expression is not itself affected by the addition of $MnCl_2$, encodes a LysR-type regulatory (LTTR) protein. Members of this very widespread family normally activate their target gene(s) in response to a cognate small molecular weight co-inducer and are often autoregulatory, repressing their own transcription (Maddocks and Oyston 2008). There are no known members of the LTTR family that respond to Mn^{2+}, but the location of *SPOA0344,* between two sets of genes whose expression is markedly enhanced by this metal makes this gene a strong candidate for encoding a regulator that does sense manganese. In that connection, it was noted that there is a motif with dyad symmetry (5'-TTTCC-N_6-GGAAA-3'), respectively 137 and 79 bps upstream of the ATG starts of both *SPOA0343* and of *SPOA0345,* which might represent binding sites for the SPOA0344 regulatory protein.

The *cox* genes, implicated in carbon monoxide oxidation

Cox cluster I

Figure 7.10 Map of SPO2394-SPO2399



Scale map of the* SPO2394-SPO2399 *locus of* R. pomeroyi *including intergenic gaps (circled) and fold-change ratios for + Mn microarray experiments (Mn induced).

A feature of the Roseobacters is that most strains of this clade contain a group of *cox* genes (Cluster I – Figure 7.10), which are predicted to encode the enzyme carbon monoxide dehydrogenase, which catalyses the production of CO_2 from CO (Cunliffe 2011). Indeed, several strains, including *R. pomeroyi* DSS-3, have been shown to have CO oxidation activity (Cunliffe 2011), and it has very recently been shown in *Ruegeria pomeroyi* DSS-3 that these do indeed function on CO oxidation, since a mutation in one of them (*coxL-2 – SPO2397*) completely abolished this ability (Simone Payne and Michael Cunliffe, personal communication) though it has not been formally shown that this is due to their annotated *cox* genes. Furthermore, some Roseobacters , including *R. pomeroyi* DSS-3, contain another cluster (Cluster II) of genes whose products have some sequence similarity to the *bona fide* Cox polypeptides, but which may not function in CO oxidation (Simone Payne and Michael Cunliffe, personal communication) (Cunliffe, 2011).

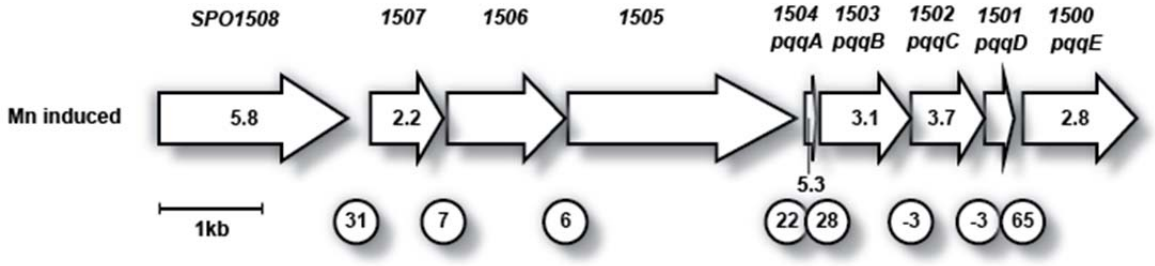
The expression of several of the genes within both the Form I cluster (*SPO2394* – to *SPO2499* inclusive; Figure 7.10) and in the Form II cluster (*SPO1515 – SPO1521*) was markedly enhanced in cells grown in +Mn medium, but that the *mur* genotype was not involved in this effect (Table 7.2). This enhanced expression is particularly pronounced with the consecutive and likely co-transcribed *coxM, coxS-2, coxL-2, coxD, coxE* and *coxG* genes in the Form I cluster; the signal for the promoter-proximal *coxM* gene is 16-fold greater in the Mn-grown cells. Several of the Form II genes show more

modestly enhanced expression in response to added Mn (Table 7.2). These include the consecutive genes *coxG, coxS-1, coxS-2* and *coxM,* plus two upstream genes *SPO1515* and *SPO1516,* which respectively encode a putative cytochrome c550 and a predicted periplasmic binding protein of an ABC transporter, though their functional link, if any, with carbon monoxide is unknown.

Although the CO dehydrogenase of *Oligotropha carboxidovorans* is a metallo-protein, with a very unusual metallo-cofactor, $CuSMoO_2$ (Resch *et al.* 2005), no functional links between manganese and the CO dehydrogenase enzyme have been reported in the literature.

SPO1508- SPO1500 region

Figure 7.11 Map of SPO1500-SPO1508



Scale map of the* SPO1500-SPO1508 *locus of* R. pomeroyi *including intergenic gaps (circled) and fold-change ratios for + Mn microarray experiments (Mn induced).

Close to the Form II cluster of *cox* genes is another predicted operon, *SPO1504-SPO1500,* whose expression is enhanced by factors ranging from 1.6- to 5.3-fold for the different genes (Table 7.2). These five genes are predicted to encode components of the enzymes needed to make the bacterial redox active cofactor, pyrroloquinoline quinone (Puehringer et al. 2008). There is evidence that a quinone is a used as a cofactor in Mn(II) oxidase of a strain of the alpha-proteobacterium *Erythrobacter,* a genus that is closely related to the Roseobacters (Johnson and Tebo 2008). Although several Rosebacters do have Mn(II) oxidase activity, *R. pomeroyi* DSS-3 does not (Hansel and Francis 2006), so the significance of this observation in terms of the effect of Mn on the expression of this *pqq* operon is not known.

Not far upstream of *SPO1504,* is *SPO1508* forming a predicted one gene operon that likely encodes

an ethanol dehydrogenase of a type that (perhaps significantly – see above) has PQQ as a co-factor. Though closely linked to *SPO1504-SPO1500* (Figure 7.11) it is not co-transcribed with these genes.

Table 7.2 Genes whose expression is affected by the Mur regulator and/or Mn^{2+} availability.

A. Class I genes; expression is reduced by Mn, and greater in Mur^- mutant than wild type.

[a] Gene	[b] Factor of reduction with added Mn^{2+}	[c] Factor of increase in Mur^- mutant	[d] Predicted general function
SPO3363	**3.8 ± 0.1**	**15.5 ± 1.1**	Permease of ABC transporter; SitD
SPO3364	2.0 ± 0.3	**6.6 ± 0.7**	Permease ABC transporter; SitC
SPO3365	**3.6 ± 0.2**	**18.3 ± 2.6**	ATPase of ABC transporter; SitB
SPO3366	**2.8 ± 0.1**	**8.8 ± 1.6**	Periplasmic binding protein of ABC transporter; SitA
SPOA0392	**6.95 ± 0.6**	**7.7 ± 0.4**	Weak homology to RpoE-type σ-factor
SPOA0393	**5.4 ± 0.6**	**6 ± 0**	R body protein RebB-like protein
SPOA0394	**2.1 ± 0.2**	2.1 ± 0.3	Hypothetical; no known domains
SPOA0395	**3.5 ± 0**	**5.1 ± 1.0**	Hypothetical; no known domains
SPOA0396	**5.75 ± 0.1**	**8.65 ± 2.2**	Hypothetical; no known domains
SPOA0397	**4.7 ± 0.6**	4.75 ± 0.9	Hypothetical; no known domains
SPOA0398	**6.1 ± 0.1**	**11.4 ± 0.1**	R body protein RebB-like protein
SPOA0399	**9.0 ± 0.5**	**16.2 ± 0.5**	R body protein RebB-like protein

B. Class II genes; expression is enhanced by Mn, and lower in Mur$^-$ mutant than wild type.

[a] Gene	[b] Factor of increase with added Mn^{2+}	[c] Factor of reduction in Mur$^-$ mutant	[d] Predicted general function
SPO1789	**19.35 ± 2.7**	**14.25 ± 0.4**	Related to permease of sulfate/tungstate ABC-type- transporter
SPO1790	**10.5 ± 2.8**	6.65 ± 0.9	Related to ATPase of sulfate/tungstate ABC-type- transporter
SPO1791	**8.4 ± 2.4**	**5.75 ± 0.5**	Related to periplasmic binding protein of sulfate/tungstate ABC-type-transporter
SPO0833	**8.8 ± 0.2**	**7.9 ± 0.3**	β polypeptides, molybdopterin-containing formate dehydrogenase
SPO1555	**7 ± 0.1**	5.95 ± 0.1	β polypeptides, molybdopterin-containing formate dehydrogenase
SPO0834	**3.9 ± 0.0**	**3.85 ± 0.5**	α polypeptides, molybdopterin-containing formate dehydrogenase
SPO1556	**3.25 ± 0.2**	**3.4 ± 0.2**	α polypeptides, molybdopterin-containing formate dehydrogenase
SPO1216	**10 ± 0.1**	**12.55 ± 2.1**	Hypothetical; no known domains

C. Class III genes; expression is reduced by Mn, and is unaffected by *mur* genotype.

[a] Gene	[b] Factor of reduction with added Mn^{2+}	[d] Predicted general function
SPO2261	**8.5 ± 1.4**	GTA gene cluster; major capsid protein
SPO2262	**7.3± 0.5**	GTA gene cluster; possible peptidase
SPO2263	4.1 ± 1.0	GTA gene cluster; no known domains
SPO2264	**13.6 ± 2.2**	GTA gene cluster; phage portal polypeptide

D. Class IV genes; expression is enhanced by Mn, and is unaffected by *mur* genotype.

[a] Gene	[b] Factor of increase with added Mn^{2+}	[d] Predicted general function
SPOA0339	**11.7± 0.5**	Subfamily of haloacid dehalogenase superfamily of aspartate nucleophile hydrolases
SPOA0340	**11.6 ± 1.4**	Related to 4-oxalocrotonate tautomerase
SPOA0341	**19.8 ± 0.6**	Hypothetical; no known domains
SPOA0342	**12.1 ± 0.5**	Related to AfsA family protein, involved in A-factor biosynthesis
SPOA0343	**13.5 ± 2.0**	Hypothetical; no known domains
SPOA0344	**No change**	LysR-type transcriptional regulator
SPOA0345	**7.1 ± 0.6**	In superfamily of soluble NAD(P)(H) oxidoreductases
SPOA0346	**6.7 ± 0.4**	Related to 4-carboxymuconolactone decarboxylase
SPOA0347	**4.8 ± 0.4**	Low-level similarity to major facilitator subfamily (MFS) of transporters
SPO2394	1.8± 0.15	Carbon monoxide dehydrogenase, CoxF subunit
SPO2395	1.8 ± 0.0	Carbon monoxide dehydrogenase, CoxE subunit
SPO2396	3.1 ± 0.1	Carbon monoxide dehydrogenase, CoxD subunit
SPO2397	3.2 ± 0.2	Carbon monoxide dehydrogenase, CoxL-2 subunit
SPO2398	**16.6 ± 3.1**	Carbon monoxide dehydrogenase, CoxS-2 subunit
SPO2399	**16.0 ± 1.3**	Carbon monoxide dehydrogenase, CoxM subunit
SPO1515	**8.2 ± 0.5**	Putative cytochrome *c550*
SPO1516	**2.3 ± 0.1**	Periplasmic-binding protein of ABC transporter; substrate unknown
SPO1517	**6.5 ± 0.5**	Membrane attachment for CoxG subunit (Form II) of CO dehydrogenase

SPO1518	**2.5 ± 0.4**	S-I subunit of CO dehydrogenase
SPO1519	**No change**	L-I subunit of CO dehydrogenase
SPO1520	**2.1 ± 0.1**	Medium sub-unit CO dehydrogenase
SPO1504	**5.3 ± 0.1**	PqqA-like; coenzyme PQQ synthesis protein A
SPO1503	**3.1 ± 0.0**	PqqB-like; coenzyme PQQ synthesis protein B
SPO1502	**3.7 ± 0.1**	PqqC-like; coenzyme PQQ synthesis protein C
SPO1501	No change	PqqD-like; coenzyme PQQ synthesis protein D
SPO1500	2.8 ± 0.4	PqqE-like; coenzyme PQQ synthesis protein E
SPO1508	5.8 ± 0.1	Strongly predicted quinoprotein (PQQ-dependent type I alcohol dehydrogenase)

Tables 7.2: A, B, C and D respectively show the gene numbers in Classes I, II, III and IV, described in text. Column [a]; Clusters of genes whose levels of expression are affected by Mn availability and/or* mur *genotype are grouped. Column [b]; Mean ratios plus standard errors of increase or decrease in the microarray signals in "+" and "-" manganese media. Column [c]; Mean ratios plus standard errors of increase or decrease in the microarray signals in wild type compared to the Mur⁻ mutant in Mn-replete medium. Column [d]; Polypeptide family of gene product, where known, is indicated Bold typeface indicates RNA levels significantly reduced/increased (p <0.05).

7.4.1 Genes regulated by iron in Ruegeria pomeroyi

The expression of many *Ruegeria pomeroyi* genes was affected by the availability of Fe. In some cases, this appeared to be mediated by (or implicated) Irr or the Mur (or both) transcriptional regulators, but in other cases, neither of these was involved. Some examples of such genes are presented in the following section, note that these are given in much more abridged style than the Mn-regulated genes. The data generated in this experiment presented literally dozens of different combinations. So, I will restrict myself to those in which there is a really big difference irrespective of Irr and Mur and Mn.

7.4.2 Effects of iron availability and mutations in irr *on the transcriptome of* Ruegeria pomeroyi

There were 23 genes that were altered above the chosen cut-off points in their expression in both Fe limitation and in the Irr$^-$ mutant (refer to Table 7.3). Of these, 10 had similar responses; repressed by Fe, and were expressed higher in the Irr$^-$ background (see Table 7.1, sections E, H and J in Figure 7.2).

Table 7.3 Genes affected by both Fe limitation and the *irr* mutation

Venn box[a]	Gene[b]	result in Fe[c]	result in Irr[d]
E	*SPO0086*	49.7 ± 9.1	3.83 ± 0.15
E	*SPO0087*	56.25 ± 0.04	4.135 ± 0.4
E	*SPO0169*	4.53 ± 1.4	3.71 ± 1.4
E	*SPO0199*	5.96 ± 0.5	1.615 ± 0.06
E	*SPO0647*	3.08 ± 0.02	1.56 ± 0.03
E	*SPO0790*	28 ± 0.4	2.31 ± 0.03
E	*SPO2023*	4.42 ± 0.2	2.3 ± 0
E	*SPO2486*	2.975 ± 0.4	3.04 ± 0.2
E	*SPO3014*	6.69 ± 0.4	2.235 ± 0.1
E	*SPO3287*	45.85 ± 5.1	1.995 ± 0.01
E	*SPO3359*	16 ± 0.5	1.96 ± 0.03
E	*SPO3360*	13.25 ± 0.1	1.985 ± 0.04
E	*SPO3607*	4.095 ± 0.03	1.7 ± 0.05
E	*SPOA0445*	3.52 ± 0.04	n/a
H	*SPO0222*	32.15 ± 1.2	5.8 ± 0.5
H	*SPO0701*	13.85 ± 0.1	2.105 ± 0.02
H	*SPO1565*	4.125 ± 0.2	1.55 ± 0.01
H	*SPO1861*	3.085 ± 0.02	1.545 ± 0.04
H	*SPO2264*	8.8 ± 0.4	2.145 ± 0.2
J	*SPO1216*	6.655 ± 0.4	13.7 ± 1
J	*SPO2398*	6.36 ± 0.6	3.38 ± 0.09
J	*SPO2399*	7.87 ± 0.3	3.44 ± 0.2
J	*SPOA0399*	3.205 ± 0.2	15.7 ± 1.2

(Column a) shows those genes from sections E and H and J of Venn diagram, Figure 7.2, their resultant expression (in fold change, ± the standard deviation {Column b}). Red indicates that the gene was expressed higher in the absence of Fe than its presence (Column c) or that expression was higher in the Irr- mutant than in the wild type (Column d). The green boxes indicate the opposite ratio of expression.

Six genes had the opposite phenotype, being induced by iron, but expressed at lower levels in the Irr$^-$ mutant than in the wild type. These genes include the *cox* genes *SPO2398* and *SPO2399* which are discussed above in relation to their responses to manganese. Another gene that displayed this pattern was *SPO1216*, which was expressed 6.6-fold higher when Fe was present in the medium, and 13.7-fold less in the Irr$^-$ strain compared to the wild type. The translated product of *SPO1216* does not have any predicted function, and there is only one other homologous peptide found in the ncbi database – in *Dinoroseobacter shibae* DFL-12.

Finally, there were six genes that were shown to the repressed by Fe, and were expressed at higher levels in the Irr$^-$ background. These genes may be under the control of a repressor in the Irr regulatory hierarchy, and would be good targets for further experiments to elucidate the Fe-regulatory networks in *R. pomeroyi*.

Four of these genes have predicted function, and two were adjacent to each other in the genome. These two genes, *SPO3359* and *SPO3360*, were closely linked to the *sitABCD* operon, and were ~14-fold repressed by the added $FeCl_3$, and were 2-fold lower in the Irr$^-$ background compared to the wild type. These two genes are predicted to encode an L-threonine 3-dehydrogenase and a 2-amino-3-ketobutyrate coenzyme A ligase respectively; these are both well conserved in the Roseobacters, and are closely related to peptides found in both α- and γ-proteobacteria.

Two other, unlinked genes, *SPO0222* and *SPO0701,* were significantly Fe repressed, 32- and 14-fold respectively, and were 5.8- and 2.1-fold lower in the Irr$^-$ background. The translated product of *SPO0222* is predicted to be an alanine dehydrogenase, which is well conserved in the Roseobacters and indeed throughout the proteobacteria.

Finally, *SPO0701* is predicted to encode a Type 1 glyceraldehyde-3-phosphate dehydrogenase. It is difficult to assign any likely link to iron for these genes, other than these preliminary transcriptomic data.

In summary, there are clearly some interesting target genes here for further study into the role Irr plays in regulated iron uptake and usage in *R. pomeroyi*. Given that the genes presented in table 7.2 exhibit differential regulation in response to both Fe, and Irr, there must be other transcriptional regulatory elements which mediate this, and indeed this précis of the *R. pomeroyi* transcriptional response to Fe should allow a focussed approach into this future work. Note that 12 out of the 23 genes shown in table have no predicted function; there is therefore still much to learn about the "iron-ome" in this bacterium.

7.5.1 Genes that enhance the story already told in this thesis – regulation and uptake of Mn and Fe

So far, we have defined the system for Mn uptake, via SitABCD, and the regulation of this process, via Mur in *R. pomeroyi*, and this microarray analysis has verified our findings. However, the same cannot be said for Fe; an FbpAB$^-$ strain of *R. pomeroyi* did not have a growth deficiency on low iron,

meaning there must be functional redundancy for inner membrane iron transport, or that these genes do not encode an iron-specific transporter. Also, Fe-responsive regulation has been demonstrated for Irr of *R. pomeroyi*, but the regulator of other iron-responsive genes – those with an IR box has not been identified. The following provides a walk-through of the transcriptional responses of genes already studied in this work, and provides further insight into the 'unknown' aspects of *Ruegeria* iron metabolism.

7.5.2 Irr

The transcription of Irr was *induced* ~3.5-fold by Fe. This agrees with findings in Rhizobium (Todd *et al.* 2002), but in *Brucella abortis*, *Bradyrhizobium japonicum* and *Rhodobacter sphaeroides*, Irr was not Fe-regulated at a transcriptional level (Martinez *et al.* 2005; Peuser *et al.* 2012; Qi *et al.* 1999). In these organisms, Irr is regulated at a post-transcriptional level. It would be of interest to study the effect of high/low Fe on Irr protein levels in *R. pomeroyi*, and also whether this protein has a haem binding capacity. As shown above, several genes were altered in expression in the Irr^- strain of *R. pomeroyi*.

7.5.3 MbfA

The expression of *mbfA* homologues have been shown to be regulated by Irr in *Rhizobium*, *Bradyrhizobium* and *Brucella* (Martinez *et al.* 2005; Qi *et al.* 1999; Todd *et al.* 2002).

In *Ruegeria*, *mbfA* expression was Fe induced, as shown by both *lacZ* fusion, and in the microarray study. This regulation is likely due to Irr, via an ICE box motif, as *mbfA* expression was significantly higher in the Irr^- background than in the wild type (13.5-fold), also in agreement with *lacZ* fusion data.

7.5.4 IscR

Another gene with a conserved ICE motif was the regulator of [Fe-S] biosynthesis, *iscR*. Indeed, it is likely that this gene forms part of a single transcriptional unit with the downstream *suf* genes. The expression of *iscR* was only significantly differently (2.5-fold) regulated in the Irr mutant compared to the wild type, and not by Fe levels. Furthermore, the downstream *suf* genes showed little regulation in response to either Irr, or Fe (all <2-fold). A *lacZ* fusion to *iscR* showed considerable deregulation in the Irr- strain, which is not apparent in the microarray data. It is clear that further work on the regulation of both *iscR* and the *suf* genes is required.

7.5.5 RRF-2 family proteins

It was hypothesised that the regulator of the IR boxes of *R. pomeroyi* may be an Rrf2 family protein, similar to RirA found in the rhizobiales. However, mutant strains lacking each individual Rrf2 family protein found in *R. pomeroyi* were not deregulated in expression of genes under the control of IR boxes (see Chapter 4). It was of interest to observe the transcriptional response of each Rrf2 gene in *R. pomeroyi*, to both Fe, and to Irr since RirA has been shown to be Irr and Fe regulated in *Rhizobium* (Todd *et al.* 2006; Todd *et al.* 2002).

Interestingly, four of the Rrf2 family genes were iron regulated:

SPO0432 – 7.8-fold Fe induced

SPO3722 – 5.4-fold Fe repressed

SPO1393 – 3.9-fold Fe repressed

SPOA0186 – 3.4-fold Fe repressed

And, as discussed, the fifth Rrf2 family gene, *iscR* (*SPO2025*) was not Fe regulated, but was Irr repressed.

This result would appear to show that there may well be functional redundancy between these regulators, and it is possible that multiple, clearly Fe-responsive regulators are responsible for the repression of genes under the control of IR boxes. Crucially, none of the Rrf2 family genes were altered in expression by either Mn or Mur.

7.5.6 The *fbpAB* genes

As shown in Chapter 4, the expression of *fbpA* and *fbpB* is Fe-repressed, mediated by IR boxes of which *fbpA* has two and *fbpB* just one. As discussed earlier, there is a lack of a cognate ATPase gene for this putative iron transporter, FbpAB, and it was proposed that *SPO2689* may encode a likely candidate (refer to Chapter 4).

The microarray data confirm that *fbpA* is highly Fe-repressed; indeed it is one of the most Fe-repressed genes in the array data (~45-fold). However, and in agreement with *lacZ* fusion data, expression of *fbpB* is far less Fe-repressed (3.9-fold).

The expression of any potential ATPase peptide is less clear, the hypothesised *SPO2689* is poorly induced in low Fe conditions (<2-fold), and is unlikely to be the ATPase for the FbpAB transporter. Indeed, this transporter may not be required at all by *R. pomeroyi* as a functional mutant was unaffected in growth (Chapter 4). Furthermore, as shown in Table 7.4, there were no other ABC-class transporter genes induced >5-fold by Fe limitation in this microarray experiment.

7.5.7 The irp genes

The *irp* locus of *R. pomeroyi* is a fascinating prospect for a novel iron uptake mechanism (see Chapter 3). Here, the microarray study further emphasised this potential: As shown in Table 7.4, the genes *SPO0086-SPO0090* were all hugely Fe-repressed, and are therefore very likely to form a single transcriptional unit. Indeed *SPO0086* (*irpA*) was the single highest iron regulated gene in all replicates of these conditions. Furthermore, there were strong predictions of signal peptides, and localisation to the outer membrane for *SPO0086*, and other genes in this operon (Table 7.4).

In Chapter 4, *irpA* was shown to be Fe-repressed, and that this was mediated by a copy of an IR box.

The expression of both *SPO0086* and *SPO0087* were also shown to be Irr repressed, albeit by a low level compared to the level of Fe-repression (Appendix 3). This could be an artefact of the Fe status of an Irr^- strain compared to the wild type, or may represent a cross-over in regulation from Irr to the transcriptional regulator of IR boxes.

7.6.1 Genes highly regulated by iron and manganese limitation

A detailed predictive functional analysis was performed on all those genes whose expression was altered, >5-fold in the iron limitation experiment. This list of 98 genes was analysed using a variety of online predictive programs to gain an insight into the putative function, location and structure of all 98 proteins.

Table 7.4 *Ruegeria pomeroyi* genes whose expression was altered >5-fold in response to iron limitation; predicted function, cellular location, structural prediction and prevalence in the Roseobacters

Gene ID - operons shaded	Iron Array Result	Manganese Array Result	Function (if known)	Accession number	Localisation (pSORTB)	Signal Peptide (SIGNALP)	TAT signal (TATP)	Beta Barrel (MCMBB)	Pred TMBB	Presence in other Roseobacters (max 150)
SPO0086	56.3	1.48	lipoprotein, putative	YP_165360	OuterMembrane 9.93	YES		0.014	YES	33
SPO0087	58.8	1.245	hypothetical	YP_165361	Unknown	YES		0.052	YES	8
SPO0088	29.7	1.11	thiol oxidoreductase	YP_165362	CytoplasmicMembrane 9.82			-0.042	YES	33
SPO0089	11	1.9	Imelysin, Peptidase_M75	YP_165363	Unknown	YES		-0.018	YES	30
SPO0090	14.8	1.13	hypothetical	YP_165364	Unknown		YES	0.003	YES	32
SPO0181	7.66	1.0375	Flagella rod protein FliC	YP_165451	Unknown MLS		YES (But no TA	0.009	NO	30
SPO0197	6.37	1.24	flagellar motor switch protein FliN	YP_165467	Extracellular 2.00			-0.004		20
SPO0198	6.2	1.08	ABC transporter ATP-binding protein, flagellar	YP_165468	Extracellular 0.26			-0.031		18
SPO0199	5.45	1.15	Flagella MS-ring protein	YP_165469	Extracellular 0.00			0.008	Possible	32
SPO0222	33.3	4.025	Alanine dehydrogenase [Amino acid transport and metabolism]	YP_165491	Periplasmic 0.01			-0.024		78
SPO0227	5.28	1.51	Peptidase M10 serralysin C terminal	YP_165496	Extracellular MLS* 10.00			-0.067		100
SPO0254	6.01	1.72	organic hydroperoxide resistance protein OsmC	YP_165518	Cytoplasmic 9.26			-0.001		11
SPO0313	9.97	1.425	Glyoxalase/Bleomycin resistance protein	YP_165576	Unknown			0.001	NO	23
SPO0390	5.5	1.23	glutamate/leucine/phenylalanine/valine dehydrogenase	YP_165653	Cytoplasmic 9.97			0		17
SPO0432	7.42	1.775	rirA' RRF-2 family transcriptional regulator	YP_165695	Cytoplasmic 8.96			-0.069		28
SPO0692	9.04	1.0005	Cytochrome C oxidase subunit II, periplasmic	YP_165947	Periplasmic 9.76		YES	-0.032		49
SPO0701	13.7	4.02	glyceraldehyde-3-phosphate dehydrogenase	YP_165955	Cytoplasmic 9.97			-0.013		121
SPO0759	9.11	1.11	hypothetical	YP_166012	Unknown			-0.01		1
SPO0784	12.8	1.585	chloramphenicol acetyltransferase	YP_166037	Unknown			-0.044		26
SPO0789	18.8	1.0045	Hemin uptake protein hemP	YP_166042	Unknown			-0.024		1
SPO0790	28.4	1.0605	hypothetical	YP_166043	Unknown			-0.087		21
SPO0858	13.9	1.155	MauG methylamine utilisation protein	YP_166111	Periplasmic 9.76	YES		-0.028		49
SPO0900	5.5	2.465	bifunctional sulfate adenylyltransferase '*sat*'	YP_166153	Cytoplasmic 9.97			-0.058		38
SPO1018	5.93	1.535	branched-chain amino acid ABC transporter ATPase	YP_166270	Cytoplasmic MLS 9.12			-0.039		150
SPO1019	8.37	1.355	branched-chain amino acid ABC transporter permease	YP_166271	CytoplasmicMembrane 10.00			-0.023		150
SPO1020	7.33	1.385	branched-chain amino acid ABC transporter permease	YP_166272	CytoplasmicMembrane 10.00			-0.051		150
SPO1021	7.58	1.62	branched-chain amino acid ABC transporter substrate binding	YP_166273	Unknown	YES	YES	-0.002		39
SPO1177	9.85	1.06	hypothetical	YP_166424	Unknown			-0.006		1
SPO1216	7.05	9.985	hypothetical	YP_166463	CytoplasmicMembrane 10.00			-0.026		2
SPO1280	5.48	1.635	hypothetical	YP_166525	Cytoplasmic 8.96			-0.052		33
SPO1351	8.23	1.65	MetZ - O-succinylhomoserine sulfhydrylase - Methionine biosynthesis	YP_166593	Cytoplasmic 9.97			-0.01		135
SPO1366	5.41	1.11	ilvC ketol-acid reductoisomerase Isoleucine biosynthesis	YP_166608	Cytoplasmic 9.97			-0.064		37
SPO1387	7.65	1.215	cation efflux system protein	YP_166629	CytoplasmicMembrane 10.00			-0.075		40
SPO1409	5.28	1.265	rpoH heatr shock sigma factor	YP_166650	Cytoplasmic 9.97			-0.023		112
SPO1515	9.3	8.165	cytochrome c550	YP_166756	Unknown MLS	YES		-0.011		8
SPO1517	5.76	6.49	coxG carbon monoxide dehydrogenase operon G protein	YP_166758	Unknown			-0.034		52
SPO1593	5.49	1.82	zinc-dependent alcohol dehydrogenase	YP_166834	CytoplasmicMembrane 9.82			-0.022		100
SPO1689	12.1	1.0225	hypothetical	YP_166928	Unknown	YES		-0.018		3
SPO1795	12.6	1.15	HybA - formate dehydrogenase, iron-sulfur subunit	YP_167032	Cytoplasmic 9.97			-0.132		31
SPO1796	24.8	1.07	formate dehydrogenase subunit alpha	YP_167033	Periplasmic 9.76			-0.041		97
SPO1847	5.24	2.29	Long-chain acyl-CoA synthetases	YP_167084	CytoplasmicMembrane 7.88			-0.049		150
SPO1909	8.03	1.07	NTF2_like domain, hypothetical protein	YP_167145	Cytoplasmic 8.96			-0.03		8
SPO2130	6.47	1.755	alpha-isopropylmalate/homocitrate synthase	YP_167358	Cytoplasmic 9.97			-0.008		75
SPO2131	8.54	1.045	cysS - cysteinyl-tRNA synthetase	YP_167359	Cytoplasmic 10.00			-0.039		36
SPO2135	5.86	1.205	Hypothetical	YP_167363	Unknown	YES		0.004	Possible	2
SPO2222	5.51	1.055	dihydrolipoamide dehydrogenase	YP_167448	Cytoplasmic 9.97			-0.039		150
SPO2246	9.66	1.305	CysK - cysteine synthase A	YP_167472	Cytoplasmic 9.26			-0.008		56
SPO2261	10.8	8.44	HK97 family major capsid protein	YP_167486	Unknown			0.008	YES	34

Gene ID - operons shaded	Iron Array Result	Manganese Array Result	Function (if known)	Accession number	Localisation (pSORTB)	Signal Peptide (SIGNALP)	TAT signal (TATP)	Beta Barrel (MCMBB)	Pred TMBB	Presence in other Roseobacters (max 150)
SPO2262	7.83	7.23	HK97 family phage prohead protease	YP_167487	Unknown			0.02	YES	36
SPO2264	8.4	13.6	HK97 family portal protein	YP_167489	Unknown		YES	-0.011		33
SPO2398	5.74	16.55	coxS carbon monoxide dehydrogenase, small subunit	YP_167617	Cytoplasmic 9.97			-0.121		150
SPO2399	8.18	16	coxM carbon monoxide dehydrogenase, medium subunit	YP_167618	Cytoplasmic 9.97			-0.027		80
SPO2508	10.5	1.54	hypothetical	YP_167723	Unknown			-0.005		1
SPO2614	17.7	1.105	hypothetical	YP_167824	Cytoplasmic 8.96			-0.06		1
SPO2615	18.5	1.15	Oye family NADH-dependent flavin oxidoreductase	YP_167825	Cytoplasmic 9.97			0.017	YES	96
SPO2632	9.08	1.925	CobJ type uroporphyrin-III C-methyltransferase	YP_167842	Cytoplasmic 9.26			-0.01		100
SPO2633	8.67	1.675	hypothetical	YP_167843	Unknown			-0.011		33
SPO2634	10.8	2.43	CysI - sulfite reductase	YP_167844	Cytoplasmic 9.97			-0.031		37
SPO2636	8.25	2.225	hypothetical	YP_167846	Unknown			0.013	NO	37
SPO2637	5.43	1.565	ferredoxin-NADP reductase	YP_167847	Cytoplasmic 9.97			-0.049		46
SPO2686	5.84	1.515	LysM/M23/M37 peptidase	YP_167896	OuterMembrane 9.92	YES		0.016	YES	38
SPO2706	14.5	1.845	caiD-1 carnitinyl-CoA dehydratase	YP_167916	Cytoplasmic 9.97			-0.057		150
SPO2839	5.05	1.64	GlcB - malate synthase G	YP_168047	Cytoplasmic 9.97			-0.053		35
SPO2867	6.69	1.21	CobJ type precorrin-3B C(17)-methyltransferase	YP_168075	Cytoplasmic 9.97			-0.031		36
SPO2962	10.8	1.93	hypothetical	YP_168170	Unknown			-0.058		1
SPO3014	7.04	1.56	hypothetical	YP_168218	Unknown			-0.097		2
SPO3027	7.61	1.28	HisC - histidinol-phosphate aminotransferase	YP_168231	Periplasmic 9.80			-0.025		77
SPO3118	6.09	1.06	hypothetical	YP_168321	Unknown		YES	0.041	Possible	1
SPO3287	50.9	1.155	FbpA - ferric iron ABC transporter periplasmic binding protein	YP_168483	Periplasmic 9.76			0.01	YES	41
SPO3355	5.34	1.93	SerA - serine biosynthesis D-3-phosphoglycerate dehydrogenase	YP_168551	Cytoplasmic 9.97			-0.02		150
SPO3359	15.5	1.3	L-threonine 3-dehydrogenase	YP_168555	Cytoplasmic 9.97			-0.035		57
SPO3360	13.2	1.695	2-amino-3-ketobutyrate CoA ligase	YP_168556	Cytoplasmic 9.97			-0.008		92
SPO3409	5.32	1.37	anti-anti-sigma factor	YP_168605	Unknown			0.01	NO	30
SPO3445	7.42	1.255	lpxK tetraacyldisaccharide 4'-kinase	YP_168641	Unknown			-0.016		37
SPO3523	5.68	1.18	CcoP cytochrome c oxidase, cbb3-type subunit III	YP_168718	Unknown			-0.01		37
SPO3524	6.68	1.3	CcoQ cytochrome c oxidase, cbb3-type subunit IV	YP_168719	CytoplasmicMembrane 9.82			-0.015		8
SPO3525	8.25	1.36	CcoO-1 cbb3-type cytochrome c oxidase subunit II	YP_168720	Unknown			-0.029		37
SPO3526	6.66	1.27	CcoN-1 cbb3-type cytochrome c oxidase subunit I	YP_168721	CytoplasmicMembrane 10.00			-0.04		39
SPO3529	5.97	1.155	serine hydroxymethyltransferase	YP_168724	Cytoplasmic 9.97			-0.022		61
SPO3547	8.45	1.89	hypothetical	YP_168742	Unknown			-0.074		6
SPO3606	5.28	1.215	mandelate racemase	YP_168801	Periplasmic 9.51			-0.026		37
SPO3613	5.7	1.1	LysE - amino acid transporter	YP_168808	CytoplasmicMembrane 10.00			-0.026		59
SPO3721	7.17	1.46	hypothetical	YP_168915	CytoplasmicMembrane 10.00			-0.058		1
SPO3722	5.33	1.145	RRF2 family trascriptional regulator	YP_168916	Unknown			-0.053		2
SPO3770	5.24	1.585	GltD type oxidoreductase	YP_168965	Cytoplasmic 9.97			-0.039		73
SPOA0061	6.16	1.83	KatG - catalase/peroxidase HPI (heme binding site)	YP_164892	Cytoplasmic 9.26			-0.02		39
SPOA0273	8	1.355	PuuR - transcriptional repressor, putrescine degradation	YP_165102	Cytoplasmic 9.97			-0.017		11
SPOA0321	6.05	1.05	glyoxalase family protein	YP_165148	Unknown			-0.05		7
SPOA0339	149	11.65	HAD family hydrolase	YP_165166	Cytoplasmic 9.97			-0.015		1
SPOA0340	109	11.6	4-Oxalocrotonate Tautomerase	YP_165167	Unknown			-0.032		1
SPOA0341	164	19.8	hypothetical	YP_165168	Cytoplasmic 8.96			-0.05		1
SPOA0342	47.4	12.05	hypothetical	YP_165169	Cytoplasmic 8.96			-0.071		1
SPOA0343	86.5	13.5	hypothetical	YP_165170	Cytoplasmic 8.96			-0.002		1
SPOA0345	79.8	7.125	aldo/keto reductase family oxidoreductase	YP_165172	Cytoplasmic 9.97			-0.04		57
SPOA0346	91.2	6.665	carboxymuconolactone decarboxylase family protein	YP_165173	Unknown			-0.031		4
SPOA0347	29.8	4.745	MFS - secondary transporter superfamily	YP_165174	CytoplasmicMembrane 10.00			0.011	YES	13
SPOA0348	10.4	3.35	hypothetical	YP_165175	Unknown			-0.031		13

*MLS means this protein may have multiple localisation sites.

The 97 genes with >5-fold difference in expression are listed in column 1, and the relative fold change in expression is shown for Fe limitation in column 2, and for Mn in column 3. The accession number of each protein is shown in column 4, and the predicted subcellular location as given by pSORTB (Yu* et al. *2010) in column 5. Column 6 contains the prediction of a SEC signal peptide {SignalP, (Petersen* et al. *2011)}, and column 7 contains a TAT signal peptide prediction {TATP, (Bendtsen* et al. *2005)}. Columns 8 and 9 contain predictions for beta-barrel structure, and transmembrane beta-barrel structure respectively {PredTMBB, (Bagos* et al. *2004)}. Each peptide sequence was used to interrogate the Roseobase database, and the relative numbers of homologues found were converted into a scale from 1, where there was only one homologue, to 150, where there were multiple homologues in many of the Roseobacter strains. These data are shown in column 10.

There are a few intriguing genes which were highly regulated by Fe limitation, referring to table 7.4. Given that the only homologue for an Fe-specific ABC-class transporter is incomplete (*fbpA* and *fbpB*), it was of interest to see that *SPO1018-SPO0121* were all induced >6-fold in the absence of iron. These genes encode a complete ABC-class transporter, an ATPase, 2 permease proteins and a substrate binding protein (respectively, *SPO1018-SPO1021*). These genes are annotated as a branched –chain amino acid transporter, but are <10% ID to FbpAB or SitABCD. However, given their induction by iron limitation, further work on these genes would be useful for our understanding of their possible role in Fe uptake.

The two genes of the transcriptional unit *SPO0789-SPO0790* were both highly induced (19- and 28-fold respectively) in the absence of Fe. Interestingly, the former is predicted to be a haemin uptake protein, HemP (pfam10636), but the *SPO0790* product has no predicted function. HemP has been shown to be required for haem uptake in *Yersinia enterocolitica*, where is serves as a haemin uptake system, and is Fur regulated (Stojiljkovic and Hantke 1992). *R. pomeroyi* is the only genome-sequenced Roseobacter that contains such a *hemP* like gene, unlike *SPO0790* which is present in >20 Roseobacter genomes.

A suite of cytochrome genes (*SPO3523-SPO3526*) were shown to be repressed in low Fe (5 to 8-fold). These four genes encode all four subunits of a Cbb3-class cytochrome C oxidase. This family of cytochromes are haem-copper oxidases, and catalyse the final step in aerobic respiration of dioxygen to water. It is interesting to see that a haem containing protein complex is repressed in low

Fe conditions, and could be an example of bacterial adaption to a low Fe environment, conserving the demand for the metal by down-regulating gene products which require Fe.

The Cox genes introduced above for their Mn-responsive expression also show a significant increase in expression by Fe, and that this is likely mediated by Irr. The expression of *coxL-2* (*SPO2399*) is ~5-fold induced by iron, and shows a ~3-fold induction by Irr.

Finally, and of note, a gene encoding a predicted anti-anti sigma factor (*SPO3409*) was 5.3-fold Fe-repressed. The deduced protein of this gene is in the STAS and SulP families (pfam01740) which are proposed to be regulatory over anion transport – including sulphur, from where the SulP name is derived. Given that *SPO3409* was Fe-repressed, this gene product would therefore be in a higher concentration during Fe-limitation, and would be predicted to increase its binding to its cognate anti sigma factor, releasing the sigma factor which would, in turn, allow the expression of a suite of genes. Further microarray analysis of a mutant in this gene might be instructive in the analysis of such a regulatory circuit.

Chapter 8 - General Discussion

The work described in this thesis represents the first sortie into the genetics and genomics of manganese and of iron homeostasis in the Roseobacters and is one of very few studies on this subject in any marine bacteria. The recent work on *Rhodobacter* and *Pelagibacter* only appeared well into the project (Peuser *et al*., 2011; Smith *et al*., 2010).

In what follows, I summarise the major outcomes of the work in the form of a series of questions that address future challenges in these topics, and outline the sorts of experiments that could be used to answer these. The discussion deals separately with the two metals.

8.1 Iron - Bioinformatically based outcomes

8.1.1 Paucity of ferrous iron and Fe-reductase genes

One consistent observation of the deduced proteomes of the Roseobacters was that they lack the FeoA/B ferrous iron uptake system, although the *feoAB* genes are commonly found in other alpha-proteobacteria, such as *Rhodobacter sphaeroides* and *Caulobacter crescentus*. This suggests that the Roseobacters may not use this reduced form of the metal, consistent with the fact that the surface waters of the oceans are fully oxygenated. Furthermore, there were no examples of any enzyme that resembled a flavo-reductase in the deduced proteomes of any Roseobacters. However, given that UV light has been shown to reduce Fe(II), the Roseobacters may simply not require a cognate reductase (Butler and Theisen 2010).

However, Roseobacters are also found in marine sediments (Wagner-Döbler and Biebl, 2006), where the O_2 tension would be lower, so the Roseobacters may be able to import Fe(II), but via an uncharacterised transporter. FeoAB mutants are deficient in Fe(II) uptake, shown by growth, and by final Fe content of cells. For growth experiments, Fe(II) can be produced by the addition of ascorbate to $FeCl_3$ (Kammler *et al.* 1993). To identify a potential Fe(II) uptake system, a Tn5 mutant library could be screened for increased expression of an iron-repressed reporter fusion during growth on Fe(II) supplemented media.

All Roseobacters lacked any known ferric reductases that correspond to the *ferAB* or *mtrAB* gene products. However, *Oceanicola granulosus* HTCC2516 was unusual in that it encodes a protein (*OG2516_12819*) that is 34% identical to YqjH of *E. coli* – a polypeptide that is implicated in ferric iron reduction from siderophores (Miethke *et al.* 2011). Indeed, the *Oceanicola* gene product is annotated as a siderophore-interacting protein. It would be interesting to see if *Oceanicola* can grow with only reduced Fe, and if so, to examine the effect of a mutation in the *OG2516_12819* gene.

It is possible that Roseobacters simply have no need to reduce Fe (III) and instead entirely rely on the uptake of Fe-chelates. It has been shown that Fe-siderophore complexes can be reduced by sunlight, which causes an increase in Fe uptake by marine microorganisms (Amin *et al.* 2009). This may make ferric reductases redundant in the case of the Roseobacters.

The status of Fe in the oxygenated open water is likely to be mostly fully oxidised. However, within other marine environments, such as marine snow, sediment and in large clusters of bacteria, it would be possible for areas of reduced Fe to exist, and would likely be a target for uptake by bacteria inhabiting such places.

To further study the Fe status of different habitats, and how this relates to the types of bacteria Fe uptake systems would require careful sampling of bacteria from such habitats, and then to study the presence of Fe(II) uptake genes in these strains. Currently, the Roseobacter strains that have available genome sequences were not sampled precisely from specific marine habitats. Although demanding, it might be instructive to examine the expression of genes, and indeed, genomes of the Roseobacters in more precisely defined niches, in which, for example, the O_2 levels were much lower than in the surface waters of the oceans. This might be done by high throughput metatranscriptomics, for example.

Another major outcome of the work in this thesis was the demonstration of the diversity of the predicted systems for the uptake of iron. There is a bewildering variety in the numbers and identities of the different, predicted mechanisms for the acquisition of this metal, with some strains being predicted to have multiple (the maximum predicted number, In *Ruegeria* sp. Trich CH4B, was ten) TonB-dependent receptors and others with none (see Chapters 2 and 6).

8.1.2 Marine siderophore production and uptake

Several strains of Roseobacter that contain TBDRs lack predicted siderophore synthesis genes (see Chapter 2). These strains are most probably siderophore 'pirates', being able to use siderophores that are made by other strains. This phenomenon is not unique to the Roseobacters and has been reported in many bacteria (Traxler *et al.* 2012).

However, this strategy may be expected to be more prevalent in marine bacteria since unattached siderophores will drift away from the bacterial cell that produced them. Alison Butler and colleagues have shown that marine bacteria can produce lipid-bound, amphiphilic siderophores that can form micelles, as described in Butler and Theisen (2010). However, there is no evidence that any Roseobacter siderophores have these properties, as there is no information about the siderophore biosynthetic genes for those molecules identified by Alison Butler's lab.

It was noted that several strains of Roseobacters have genes that are predicted to be involved in siderophore production – and other genes involved in uptake (see Chapter 2). This raises a pertinent question: Is it beneficial to synthesise a siderophore in a marine environment? The likelihood of a single cell ever synthesising, exporting and then recovering a siderophore seems highly unlikely.

Since very little is known about the biosynthetic genes of marine siderophores, bioinformatic predictions about the presence of siderophores in any Roseobacter should be treated with caution. The logical next step in this area of my work would be to screen all of the Roseobacter strains for siderophore production using CAS plate, or other assays (see Chapter 4). Those strains which do produce siderophores would be used to construct mutant libraries, and screened again for a CAS phenotype. This would function two-fold, firstly in the identification of any potential negative regulators of siderophore production (a larger CAS halo) and secondly to identify siderophore biosynthetic genes (no CAS halo). This would represent the first example of siderophore biosynthetic gene identification in marine bacteria.

Furthermore, and importantly to supplement the data generated in Chapter 2, would be to identify the cognate molecules taken up by each TBDR. One approach to achieve this would be to take those Roseobacters with a single, or small number of receptor genes, and to perform metabolic arrays, for growth on many different Fe-ligand sources. Once a potential Fe-ligand has been identified, the

cognate outer membrane receptors can be systematically mutated until the strain no-longer grows on that Fe source.

Since there is no exact information about the siderophores that may be produced by members of the Roseobacter clade, it would also be pertinent to perform siderophore purification, and structural analysis on these molecules. These novel siderophores could be used to identify their cognate receptors using metabolomics if a high enough concentration can be purified. This strategy would be particularly useful in those strains which appear to have both siderophore synthesis and uptake systems in their genome.

8.1.3 TonB

TonB is required for outer membrane transport of several Fe-bound compounds: siderophores, haem and vitamin B_{12}, for example It was therefore surprising to find that TonB was missing from many Roseobacter strains, as had been noted by Rodionov *et al*. (2006.) However, given the significant variation of TonB peptides (*E. coli* TonB is only ~30% identical to TonB of *Rhizobium* for example), it could be that a gene performing the function of TonB is present in these genomes, but is unidentifiable by means of homology-based searches. Importantly, some Roseobacters *do* have siderophore biosynthetic genes, and yet do not appear to have TonB.

It was also apparent that several Roseobacters lacked both a copy of TonB, and any identifiable TBDR's, and these species could indeed represent a class of bacteria which use a novel means of outer membrane iron transport. This may be via Fbp class transporters which can span the periplasm – such as may occur in *Vibrio* (Wyckoff *et al.* 2006), or even via the IrpA system, as described in chapter 3. In both cases, TonB-independent outer membrane Fe transport could be possible, and would be a significant change in our understanding of iron uptake by gram negative bacteria.

TonB functions to energise outer membrane transport with two other proteins – ExbB and ExbD. It should be noted that *R. pomeroyi* likely does not have functional ExbBD proteins. Indeed, the presence of *exbBD* genes in the Rosobacters is unresolved – there were no proteins with greater than 50 % identity to either ExbB or ExbD from *E. coli* K-12 encoded in any Roseobacter genome.

The lack of knowledge in marine metal uptake systems is exemplified by our observations in *R. pomeroyi*, a strain that apparently lacks any known TBDR, lacks TonB itself (see Chapter 2), does not require its FbpABC-type transporter for iron uptake, does not use RirA to regulate Fe uptake and yet

does regulate this process using motifs homologous to IRO boxes of *Rhizobium*. There are therefore some major unanswered questions even in this one "model" strain:

How does *Ruegeria pomeroyi* import iron complexes through the outer membrane?

Does *R. pomeroyi* really lack a TonB-type system and, if so, what, if anything, does it use in its place?

How does *R. pomeroyi* import iron from the periplasm to the cytoplasm?

What transcriptional regulator binds to IR boxes?

These questions extend further than just this species, as similar portfolios of genes exist in other Roseobacters. Indeed, the IR box may be present in many of the Rhodobacteraceae, as identified in Rodionov *et al*. (2006).

To answer these questions will take some careful and thorough experiments, as detailed below.

8.1.4 Iron transporters in R. pomeroyi

Fbp

Although a clear objective of this work was to identify the transporters responsible for Fe uptake in *R. pomeroyi*, this was unsuccessful, despite identifying a likely *a priori* candidate pair of genes*, fbpA and fbpB,* whose expression was markedly induced in lo-Fe and whose products comprised two of the polypeptide components of an ABC transporter that closely resembled those involved in Fe import in other bacteria. There were also no clear indications of a TonB-dependent uptake system for Fe-ligands, and indeed no alternative identified for the inner membrane transport of Fe. All we know is that growth of *R. pomeroyi* is limited when Fe is at, or < 0.5 µM. There was an indication that another ABC-class transporter, encoded by the *SPO1018-SPO1021* genes, might be involved, since its expression was induced by Fe limitation. It would be interesting to mutate these genes, either alone, or in combination with a mutation in *fbpA* and examine its Fe uptake phenotype.

It would be expected that the further microarray experiments may generate more potential target genes for investigation. The regulon of the IR box regulator may indeed include the entire range of iron uptake genes, which our bioinformatic predictions are currently missing.

IrpA

A second set of gene products whose initial properties made them promising candidates for *the*, or at least "*a*" set of Fe transporters were those encoded by an operon that included the *irpA* gene plus *SPO0087-SPO0090*. However, this too did not come to fruition. Even though the IrpA is known in other bacteria to be an Fe transporter, and indeed this study confirmed that it was markedly induced in Fe-depleted conditions, it was a big disappointment when a mutation in the *irpA* gene was not deficient in growth on Fe limited media. Furthermore, the predictions made for IrpB were tantalising, but experimental work failed to produce any meaningful results.

The range of metal uptake strategies used by the Roseobacters could well reflect the niches that these bacteria occupy. Very little is known of the various strains that have been studied in the laboratory, which have been obtained almost randomly by sampling various coastal and far-ocean sites. Although some strains (e.g. *Dinoroseobacter shibae* DFL 12) were obtained from blooms of dinoflagillates (e.g. *Prorocentrum lima*) this does not necessarily mean that the particular isolate that was cultivated on a Petri dish in Georgia or in Braunschweig was necessarily adapted to life in association with that species of marine plankton. It may be, therefore, that a particular strategy for the acquisition of iron and/or manganese is linked to a particular lifestyle, but our lack of knowledge of their precise niches precludes such a judgment. And, of course, the bioinformatic insights presented the predicted functions of any given set of genes also pose many unanswered questions. Most notably, just because a strain has a TBDR that resembles (say) FhuA, this only suggests but does not prove that its function is to recognise hydroxamate-type siderophores and it certainly does not reveal the exact chemical structure of such a molecule. Similarly with manganese, the each of the different Mnt systems may be more suited to particular lifestyles.

And, as if the complexity revealed already were not enough, the few genome-sequenced strains of Roseobacters are but a tiny fraction of those that are in the oceans and even more diversity is yet to be uncovered.

8.2 Iron - Experimentally based outcomes

8.2.1 Regulation of the fbpAB *genes of* R. pomeroyi

Unusually, the *fbpA* and *fbpB* genes were not co-transcribed and were not near *fbpC.* This is not unique, though, where the transcription of *fbpA* of *Vibrio cholerae* is different from *fbpBC* (Mey *et al.* 2005).

A potential candidate for a complete Fe-ABC transporter in *R. pomeroyi* may be *SPO1018-SPO1021* predicted to be an ABC-class transporter, with binding protein, two permease proteins, and an ATPase; which were all ~7-fold Fe-repressed (Chapter 7). These genes are annotated as a branched chain amino acid transporter, but lack any functional characterisation.

Crucially, given the phenotype of the FbpAB$^-$ strain, there must be another high-affinity Fe-specific, inner-membrane transport system in *R. pomeroyi*.

8.2.2 The IR box cognate regulator

The work on the IR box-containing promoters of *irpA*, *fbpA* and *fbpB* in Chapter 4 showed that these motifs are responsible for (or at least contribute to) the Fe-responsive regulation of these genes. Point mutations in the most conserved bases in the IR boxes caused deregulation of *lacZ* fusions, under Fe-repressed conditions. It should be noted that there is significant homology between IR boxes and IRO boxes of *Rhizobium*, as shown in Rodionov *et al*. (2006), and that the predicted IscR box and IR box of *Ruegeria* is actually the same motif. Given this similarity, it was anticipated that an Rrf2 family transcriptional repressor might be responsible for the regulation of IR boxes in *R. pomeroyi*. This was not the case, as shown in Chapter 5.

Perhaps this was to be not wholly unexpected, since none of the Rrf2 family proteins of *R. pomeroyi* closely resembled the RirA sub-group of this family (Chapter 5), the closest homologue to RirA of *Rhizobium* being just 30% identical to *SPO0432* of *Ruegeria*. Despite this, four of the five Rrf2 genes in *R. pomeroyi* were shown to be significantly regulated by Fe, but not at all by Mn (Chapter 7). Furthermore, the expression of the fifth Rrf2 gene, *iscR*, was confirmed, by the use of *a lacZ* fusion, to be Fe-regulated, and affected by the *irr* genotype. Given the differences we observe between *E.*

coli, *Bradyrhizobium* and *Rhizobium*, in terms of Fur, Irr and RirA mediated regulation, it is possible that their distant marine cousins use a wholly new, or significantly adapted system of Fe-regulation.

By far the most important missing detail in this work is the identity of the regulator which binds to IR boxes in *R. pomeroyi*. To this end, the first future project would entail the construction of a Tn5 mutant library of *R. pomeroyi*, with complete genome coverage. This could be achieved using the E-Z-Tn5 kit from Illumina, for example. Having generated such a library, the potential regulator of both *fbpA*, and *irpA* could be found. These genes both showed large induction by Fe-limitation, enough that a fluorescent fusion could be shown to be differentially expressed on an agar plate with varied Fe levels. Here, a *gfp*, or other fluorescent reporter gene could be fused to the promoter of either *fbpA* or *irpA*, and crossed into the complete set of the *R. pomeroyi* mutant library. The library could then be plated onto Fe-replete medium, to obtain many single colonies. Those that were deregulated in expression of the fusion should fluoresce brightly. These colonies may well have a mutation in the IR box regulator. By simply mapping the location of Tn5 in these strains, the identity of the regulator should be apparent.

8.2.3 The marine Irr story

The global Fe-responsive regulator Irr has been shown to be a repressor of iron storage and iron utilisation genes in *Rhizobium leguminosarum*, and as a repressor and activator of such genes in *Bradyrhizobium japonicum*. Irr binds to motifs known as ICE boxes, and these are well conserved in several α-proteobacteria (Rodionov *et al*., 2006). Several ICE box-like motifs were identified in the genome of *R. pomeroyi*, upstream of genes known to be Fe-regulated in other α-proteobacteria – *mbfA*, *iscR*, *fssA* and *ccpA*. However, when analysing the transcriptional response of these genes, we found that *fssA* (*SPO0382*) was Fe-repressed, but was unchanged in expression in the Irr mutant. However, the converse was true for *mbfA*, *iscR* and *ccpA*, all were repressed by Irr, and not shown to be significantly Fe-regulated.

It should be said here, that the microarray conditions used to study Irr were not complete – Irr represses genes in low Fe conditions, and yet the mutant transcriptome was produced from high Fe cultures, where it was compared to the wild type, also from high Fe cultures. It was hoped that many genes would be significantly deregulated by the lack of Irr peptide, even in this Fe-replete state.

Therefore, it is possible that we are yet to show the full extent of the Irr-regulon in *R. pomeroyi*, or the extent to which the genes mentioned above are regulated.

Nevertheless, it is likely that Irr does function as a regulator of Fe storage in *R. pomeroyi*, as demonstrated by the expression of *mbfA*. Whether this is in tandem with another RirA-type repressor or not, remains to be shown.

It is interesting to note that some genes were shown to be positively regulated by Irr, such as *SPO1957*, which was ~16-fold higher in the wild type than in the Irr mutant, and that again, as with *mbfA* and friends, this was not mediated by Fe. Clearly, more work needs to be done to verify these results, and to study the Irr regulator in detail.

Finally, it would be of interest to observe if Irr binds to haem, as has been shown for other Irr peptides, and indeed if a haem-Irr complex is stable or degraded.

8.2.4 Pigment production by Irr- R. pomeroyi

Another 'loose-end' in this study is the red pigment produced by the Irr mutant strain of *R. pomeroyi*. Although the Irr mutants of *Rhizobium* and *Bradyrhizobium* have a coloured phenotype, due to protoporphyrin IX (PPIX) over-production, the pigment in the Irr$^-$ *R. pomeroyi* mutant did not fluoresce under UV light, which is a property of PPIX. Attempts to isolate the pigment were unsuccessful (see Chapter 5), but it was noted that it was extracellular, because it formed a particulate layer on top of the pellet when cells were centrifuged. Finally, the red pigment was dark, brick red, not the light pink of PPIX.

Taken together, these observations suggest that Irr of *R. pomeroyi* represses the production of a highly pigmented, extracellular particle, or at least a particle that can be separated from the cells when grown in culture. The identity of this pigmented substance could be identified by careful physical separation and then further characterisation. Also, the identity of the genes responsible for the production of the substance in the Irr$^-$ strain could become evident once more is known about the pigment itself, and once further microarrays are performed – see below.

8.3 Manganese - Bioinformatically based outcomes

8.3.1 MntX

Possibly the most surprising, and potentially the most important outcome of the work on manganese was the identification of a novel Mn-specific transporter, MntX. This peptide was found to in three Roseobacter species, namely *Oceanicola granulosis* HTCC2516, *Rhodobacterales bacterium* HTCC2255 and *Roseovarius nubinhibens* ISM, but was far more widespread than that, being present in several gamma proteobacterial genera, many other α-proteobacteria, and potentially in the Firmicutes and Archaea too (see Chapter 6). The MntX polypeptide was also present at every sampling site present in the GOS data, at a frequency similar to that of the SitABCD transporter, but was not represented in any other metagenomic data base. It is therefore a very important player in manganese uptake in the oceans, but it is not clear why it should be confined to bacteria, even very distantly related ones, that are mainly (e.g. *Vibrio)* or exclusively (e.g. the SAR11 and SAR116 clades, *Alteromonas,* and the Roseobacters) marine in origin.

8.3.2 Manganese uptake and regulation in the Roseobacters

In *Ruegeria pomeroyi* the priamry means of Mn uptake is via SitABCD. The expression of the *sit* genes is repressed by Mn, via the Mur transcriptional regulator, which likely binds to two MRS-like motifs found upstream of *sitA*. However, not all Roseobacters have the *sit* genes, and indeed those that do, are in two subclasses of peptides, one being similar to the version in *R. pomeroyi*, and the other closer to the Sit polypeptides in *Rhizobium* SitABCD – furthermore, it was shown that a third type was present, but found only in *Loktanella*. Thus the *sitABCD* genes were likely acquired, on more than one occasion by the different Roseobacter species. Either the acquisition of SitABCD in the Roseobacters happened on two separate occasions, or that significant evolution away from the Rhizobial type peptides has occurred.

Furthermore, one Roseobacter, *Ruegeria* sp. Trich CH4B lacked SitABCD altogether, and had a copy of MntH, and *Citreicella* sp. 357 had both SitABCD and MntH. These species clearly have either acquired these genes separately, or all the other Roseobacters have lost MntH during their evolution.

A final point of interest in this Mn-uptake story is that the hugely abundant SAR11 bacteria still do not appear to have a known Mn-specific transporter. Only one member of this clade was found to have MntX, the others lacked SitABCD, MntH and MntX. This either means that the non-MntX SAR11 strains do not have a requirement for Mn, or that they use another novel Mn transporter.

These data could be obtained by testing the Mn-requirement of the SAR11 strains, and then performing a full bioinformatic search of the genome sequences for potential MRS, or MntR regulatory motifs. It is expected that genes involved in uptake of Mn by these strains would be regulated by one of these Mn-responsive regulators, since they are the only two we have observed in the α-proteobacteria. Any potential transporter genes could be cloned, or synthesised and tested in the SitA$^-$ strain of *R. pomeroyi*, as demonstrated for MntX in chapter 6.

8.4 Manganese - Experimentally based outcomes

8.4.1 SitABCD

The function and regulation of the ABC-class transporter SitABCD in *R. pomeroyi* was similar to that which had been found in other alpha-proteobacteria, notably the Rhizobia. It is the main Mn transporter of *R. pomeroyi*, as a mutant strain was unable to grow well without the addition of exogenous $MnCl_2$. There may be other non-specific, and/or low affinity transporters that import Mn when present at higher levels in the medium. The expression of *sitA* was shown to be repressed by Mn, most likely by the binding of Mur to the MRS motifs found upstream of *sitA*. Further, confirmatory work could include the exact mapping of the transcript start site(s) by 5' RACE, or by 5' transcriptome sequencing. Also, direct foot-printing of Mur protein to the MRS sequences would confirm the direct interaction between these two regulatory components.

8.4.2 MntX is a functional Mn transporter

The three strains of Roseobacters that lacked SitABCD led me to investigate the function of MntX, which was thought to be a likely Mn transporter because (a) it only occurred in the three strains of Roseobacter that lacked any known Mn transporters; (b) the *mntX* gene is preceded by a MRS motif

in all three strains of Roseobacter, and (c) MntX is predicted to be a membrane-spanning protein. This work showed that MntX of *Roseovarius nubinhibens* is indeed a functional Mn transporter, that can correct the Mn-deficient growth phenotype of a *Ruegeria pomeroyi* SitA$^-$ mutant. Furthermore, this MntX was also regulated by Mur of *Ruegeria*, when a transcriptional fusion to *mntX* from *Roseovarius* was expressed in both the wild type and Mur$^-$ *Ruegeria* strains.

One strain of Roseobacter, *Ruegeria* sp. Trich CH4B has both SitABCD and MntH Mn transporters, and it would be very interesting to make mutants in each gene to observe the relative importance of each system in this strain. Perhaps this strain uses each transporter in quite different environmental conditions – such as in different oxygen concentrations for example. This may show that this strain is adapted to take up Mn in different environmental niches within the ocean, or, it may just happen to have two Mn specific transporters.

Moving away from the Roseobacters, the MntX transporter was found in several orders of the Proteobacteria. Specifically, these are the Vibrionales, Oceanospirillales and Altermonadales, all in the γ-proteobacteria; and in the SAR11, SAR116 and Roseobacter clades of the α-proteobacteria, and in two cases, namely *Vibrio cholera* El Tor and of C*andidatus* Pelagibacter sp. IMCC9063, the MntX was shown directly to be a functional Mn transporter. Strikingly, all these bacteria live in marine or brackish habitats, showing that MntX is clearly an important Mn transporter in this habitat.

Cholera is a major disease, with 3–5 million cases and 100,000–120,000 deaths worldwide each year, and every single sequenced strain of *V. cholerae* encodes *mntX* in their genome. This makes MntX a potentially important component of *Vibrio* pathogenesis.

MntX occurs in several bacterial clades that are abundant in the oceans – namely SAR11, SAR116 and the Roseobacters. Subsequently it was not surprising to see large numbers of homologues in the GOS marine metagenome database. Furthermore, MntX homologues in the GOS metagenome were found to be 82% as abundant as SitABCD, and 373% compared to MntH (Green et al, 2012, in press). Of great interest was the group of bacteria which did not cluster with peptides from any known genus, when MntX was used to construct a neighbour-joining tree (see Chapter 6). This group of bacteria was shown to have ~30% GC content of the region surrounding, and including MntX, which is similar to the GC content of SAR11 strains. However, these MntX homologues may well be in a novel group of abundant and low GC organisms. It would be of great interest to attempt to culture these strains, or at least prove their existence by probing seawater samples using the identified *mntX* genes from this group.

Finally, these observations on MntX distribution have provided another interesting observation. Several strains of bacteria, including *Pelagibacter ubique*, lack SitABCD, MntH and MntX, and must therefore either not require Mn for growth, or must possess another novel Mn transporter.

8.5 The transcriptome of R. pomeroyi – some conclusions

An interesting aspect of the effects of the environment (high and low Fe; high and low Mn) or genotype (wild type, Mur-, Irr-) on the *R. pomeroyi* transcriptome was that the expression of many genes was affected by more than one of these parameters, and in some cases, by as many as 4. Thus, the transcriptional responses of *R. pomeroyi* to both Fe and Mn limitation are linked to some degree.

Regulatory interplay between these two metals has been seen in other alpha-proteobacteria. For example, Mn deficiency in *Bradyrhizobium japonicum* caused cells to be Fe deficient (Puri *et al.* 2010). This was likely due to a lack of Mn binding to Irr, which normally inhibits Irr-haem binding. Therefore in the absence of Mn, more Irr protein was degraded, thus affecting the global Fe status of the cell (Puri *et al.* 2010).

There were several very interesting clusters of genes that were significantly regulated in the microarray data, the importance of these will be discussed in the following:

Firstly, a completely uncharacterised gene cluster, likely comprising two separate operons – *SPOA0339-SPOA0347* was highly induced by both Fe and Mn. These genes had very little functional predictions available in the NCBI databases, but their regulation does present an interesting prospect. The gene product of *SPOA0344* encodes a LysR-type transcriptional regulator, not known for their metal responsive regulation. Additionally, a conserved, 16 bp motif was found upstream of both *SPOA0343* and *SPOA0345*, which could be the cognate binding site for this LysR regulator. Pending further investigation, this regulator may be a novel, and highly Fe- and Mn-responsive transcriptional regulator.

The *cox* cluster genes of *R. pomeroyi* also showed significant Mn- and Fe-responsive regulation, and this was independent of Mur, but not Irr. This could be a good example of the regulation of Fe-responsive genes by Irr, which can be also mediated by a Mn deficiency.

Also, and very interestingly, a cluster of genes which encode components of GTAs, capable of disseminating genetic material of *R. pomeroyi*, possibly as a means of propagating beneficial traits to other *Ruegeria* cells. The exact cause and function of GTAs are not fully understood, but the idea that extreme stress, such as metal deficiency, could induce their production, in an attempt to form a natural 'library' of the genome, is an attractive thought. If such a strategy gave a selective advantage to the species as a whole, then it could certainly have been selected for in the evolution of *R. pomeroyi*, and indeed other bacteria that harbour GTA-like genes.

8.5.1 Future microarray studies

The microarrays performed as part of this study were always intended to be 'a first pass' at the transcriptional response of *R. pomeroyi* to Mn and Fe limitation, and the role that Irr and Mur played in this. As such, an important extension of this study has to be further microarray experiments. It would be immediately important to perform some Type II arrays, where all results can be compared between experiments, allowing more analysis of the transcriptional regulatory networks to be performed. Here, both Fe- and Mn-limited cultures would be used on arrays with a labelled gDNA sample as the control.

In addition, I would perform arrays on the Irr mutant, in both high and low Fe and Mn, to fully characterise the Irr-ome already alluded to in this study. Similarly, once the regulator of IR boxes was identified, microarray analysis of a mutant strain in this regulator would be fascinating – and would be performed in the same conditions used to analyse the response of the Irr^- strain, again using type II arrays.

Having completed these new transcriptomics experiments, there should be further scope for future work on the nature of iron uptake and regulation in *R. pomeroyi*.

8.5.2 Other targets for study

The array data already collected have provided numerous targets for further study, all of which would make very interesting, small projects. These include:

- The mechanisms and the functions of the metal-dependent regulation of the *cox* genes.
- The production of GTAs in response to metal (and other) limitations
- The potential predicted LysR transcriptional regulator SPOA0344 and its interactions with Fe and/or Mn.
- Finally, a study of the effects on the *R. pomeroyi* transcriptome of a mutation in the predicted anti-anti sigma factor gene – *SPO3409*.

Chapter 9 - Materials and Methods

9.0 Media and General Growth Conditions

9.0.1 Luria-Bertani (LB) medium

Luria-Bertani (LB) medium (Maniatis *et al.* 1982) was used to maintain *E. coli* and comprises, per litre ddH_2O:

10 g Tryptone

5 g Yeast extract

5 g NaCl

1.5 g D-glucose

Adjusted to pH 7.2 using 1M HCl or 1M NaOH.

E. coli strains were routinely grown at 37°C with 200 rpm agitation.

9.0.2 Half-YTSS (HY) Medium

R. pomeroyi strains were maintained on half strength YTSS medium (Gonzalez *et al*. 1997) which comprises, per litre ddH_2O:

2 g Yeast extract

1.25 g Tryptone

20 g Sea salts (Sigma)

9.0.3 Marine Basal Medium (MBM)

R. pomeroyi was grown in defined medium MBM (Baumann and Baumann 1981) to analyse growth and gene expression during iron limitation. It comprises per litre of ddH_2O:

75 ml 1M Tris HCl pH 7.5
43 mg K_2HPO_4

0.75 g NH_4Cl

20 g Sea salts (Sigma)

Supplemented 1:1000 with vitamins solution from (Gonzalez *et al.* 1997) which comprises, per 100 ml of ddH_2O:

2 mg Biotin

2 mg Folic acid

10 mg Pyridoxine-HCl

5 mg Riboflavin

5 mg Thiamine

5 mg Nicotinic acid

5 mg Pantothenic acid

5 mg Cyanocobalamin

5 mg of p-Aminobenzoic acid

The pH was adjusted to 7.

9.0.4 Rob's Sea Salts (RSS) Medium

R. pomeroyi was grown in RSS to analyse growth and gene expression during manganese limitation using succinate at 10mM as carbon source, and vitamin solution added. RSS comprises per litre of ddH_2O:

75 ml 1M Tris HCl pH 7.5

43 mg K_2HPO_4

0.75 g NH_4Cl

17 g NaCl

1.5 g $MgCl_2$

0.75 g $CaCl_2$

0.75 g KCl

9.0.5 Growth experiments

All *R. pomeroyi* experiments were performed at 28°C, with 180 rpm of agitation. For all growth experiments, a starter culture in complete HY media with selective antibiotic(s) was inoculated using a single colony of the desired strain. This was incubated for two days, or until in stationary phase. This culture was diluted 1 in 200 into minimal medium: MBM for Fe limitation and RSS for Mn limitation. As appropriate, $FeCl_3$ or $MnCl_2$ was added to the media, along with vitamin solution and succinate as detailed above. Growth was measured as optical density at 600nm wavelength in a spectrophotometer.

9.1 Strain storage

9.1.1 Glycerol storage

Strains of *E. coli* were grown overnight at 28°C in LB with antibiotics. An aliquot (1 ml) of overnight culture was mixed with the same volume of 50% glycerol solution and frozen at -80°C.

9.1.2 DMSO storage

Cultures of *R. pomeroyi* strains were grown to stationary phase, then stored in 15% glycerol plus 15% DMSO at -80°C.

9.2 *in vivo* genetic manipulations

9.2.1 Bacterial Conjugations

Plasmids were transferred by conjugation from *E. coli* strains JM101 or 803 to *R. pomeroyi* strains using patch crosses (Johnston *et al.* 1978) or filter crosses (Beringer and Hopwood 1976) in tri-parental matings with *E. coli* 803 containing helper plasmid pRK2013 to mobilise the transfer of plasmids between strains.

9.2.2 Conjugation via patch crosses

R. pomeroyi and *E. coli* strains were cultured on HY and LB agar medium, respectively, prior to patch crossing. A sterile loop was used to transfer approximately a 3:1:1 ratio of donor:helper:recipient bacteria where they were mixed in a patch on an HY agar medium plate and incubated for 48 hours at 28°C. These patches were then streaked onto selective HY agar plates containing the appropriate antibiotics, incubated at 28°C for ~4 days, allowing single colony transconjugants to form.

9.2.3 Conjugation via filter crosses

Filter crosses were used when selecting for low frequency events, such as insertional mutations with pEX18Ap. *R. pomeroyi* strains were grown in HY medium overnight at 28°C, and the *E. coli* donor and helper strains were grown overnight at 37°C in LB medium, all **without** antibiotics. A 3:1:1 ratio of donor:helper:recipient was used, with 1.5 ml of the donor, and 0.5 ml of the other cultures mixed

and pelleted via centrifugation. These were resuspended in 200µl of HY and spread onto a sterile nitrocellulose filter (Whatman) positioned on a HY plate without any selective antibiotics. This was incubated for 48 hours at 28°C, after which the cells were washed off the filters using MBM medium and diluted sufficiently to obtain single colonies when 200 µl of the diluted cells were spread onto selective HY agar medium. The selective plates were incubated for around 4 days.

9.3 Methods of Nucleic Acid Purification

9.3.1 Purification of plasmid DNA using QIAGEN Miniprep kit

For small-scale (< 5 µg), high purity isolation of plasmids from *E. coli*, to use for restriction digest analyses, transformation, sequencing, and as PCR templates, Plasmid Miniprep kits (Qiagen) were used, which employ a protocol optimised from Birnboim and Doly (1979). Cells are lysed using an alkaline buffer and a silica gel column facilitates the purification of plasmid DNA. This was done (see below) according to manufacturer's specifications, using all the reagents supplied with the kit. All centrifugation steps, were performed at 16,000 x g in a 5415 D Microcentrifuge (Eppendorf).

1. A single colony of *E. coli* containing the required plasmid was inoculated into 5 ml LB liquid, containing the appropriate antibiotics, and incubated at 37 °C overnight.

2. Cells were pelleted (1.5 ml culture for high copy number plasmids; 3 ml for low copy number plasmids) by centrifugation in 1.5 ml microfuge tubes; the supernatant was removed.

3. Pelleted cells were resuspended in 250 µl P1 resuspension buffer, containing 100 µg ml^{-1} RNase A to remove RNA, and incubated at room temperature for 5 minutes.

4. 250 µl P2 lysis buffer was added and mixed well by inversion. Samples were then incubated at room temperature for no more than 5 minutes.

5. 350 µl P3 (stored at 4 °C) neutralisation buffer was added and mixed well by inversion. Samples were then incubated on ice for 5 minutes to precipitate protein, genomic DNA and cell debris.

6. Each tube was centrifuged for 15 minutes to clear precipitate.

7. The resultant supernatant was applied to a Qiaprep spin column and centrifuged for 1 minute. The pelleted precipitate was discarded.

8. The eluate was discarded and 500 µl PB binding buffer was applied to the column and centrifuged for 1 minute. This step removes excess nuclease activity and high carbohydrate content from *endA* mutant strains such as JM101.

9. The eluate was discarded and 750 µl PE wash buffer was applied to the column and centrifuged for 1 minute.

10. The eluate was discarded and the column and collection tube was centrifuged again for 1 minute to remove residual wash buffer from the column matrix.

11. Spin columns were transferred to clean, labelled 1.5 ml microfuge tubes and DNA was eluted by pipetting 50 µl dH_2O onto the matrix and allowed to stand for 1 minute. This was then centrifuged for 1 minute; the spin column was discarded and the eluted DNA stored at -20 °C.

9.3.2 Mini-preparation of plasmid DNA by alkaline lysis and phenol-chloroform purification

To isolate and purify DNA of plasmids > 10 kb in size the following method was used, as the QIAGEN Miniprep spin column did not yield sufficient DNA. Buffers used here were from this kit however, as they still provided means of cell lysis. All centrifugation steps were performed at 16,000 x g in a 5415 D Microcentrifuge (Eppendorf).

1. A single colony of *E. coli* containing the required plasmid was inoculated into 5 ml LB liquid, containing the appropriate antibiotics, and incubated at 37 °C overnight.

2. Cells were pelleted (total of 3 ml) by centrifugation in 1.5 ml microfuge tubes; the supernatant was completely removed.

3. Pelleted cells were resuspended in 250 µl P1 resuspension buffer, containing 100 µg ml^{-1} RNase A to remove RNA, and incubated at room temperature for 5 minutes.

4. 250 µl P2 lysis buffer was added and mixed well by inversion. Samples were then incubated at room temperature for no more than 5 minutes.

5. 350 µl P3 (stored at 4 °C) neutralisation buffer was added and mixed well by inversion. Samples were then incubated on ice for 5 minutes to precipitate protein, genomic DNA and cell debris.

6. Each tube was centrifuged for 15 minutes to clear precipitate.

7. The resultant supernatant was transferred to a clean 1.5 ml microfuge tube to which 400 µl of phenol-chloroform (phenol:chloroform:isoamyl alcohol 25:24:1, Sigma) were added and mixed by vortexing for 10 seconds. Samples were then centrifuged for 2 minutes.

8. The upper aqueous layer was transferred to a clean 1.5 ml microfuge tube containing 700 µl room temperature 100% ethanol to precipitate plasmid DNA. Samples were then centrifuged for 15 minutes.

9. The supernatant was then discarded and the resultant DNA pellet was washed in 500 µl 70% (v/v) ethanol and centrifuged for 2 minutes.

10. The supernatant was then completely removed using a micropipette, and the DNA pellet was air-dried for 10 minutes.

11. The pelleted DNA was resuspended in 30 µl dH_2O and stored at -20 °C.

9.3.3 Purification of plasmid DNA using QIAGEN Midi kit

The QIAGEN plasmid Midi Kit was used to purify high quality plasmid DNA in large quantities (~100 µg). This DNA was of sufficient quality for sequencing, cloning and site-directed mutagenesis.

The QIAGEN kit used alkaline lysis, optimised from Birnboim and Doly (1979), followed by column-based purification of plasmid DNA, and precipitation of the DNA using isoproponol. The procedure was performed according to manufacturer's specifications, using all the reagents supplied with the kit:

1. A single colony of *E. coli* containing the required plasmid was inoculated into 100 ml LB media, containing the appropriate antibiotic(s), and incubated at 37 °C, with 200 rpm of shaking for 16 hours.

2. The culture was used to fill a 50 ml centrifuge tube (Corning), and centrifuged to produce a pellet (9000 x g for 10 minutes in an Eppendorf Centrifuge, model 5804R).

3. This pellet was resuspended in 4 ml of P1 buffer (stored at 4 °C), containing 100 µg ml-1 RNase A to remove RNA.

4. Then, 4 ml of P2 lysis buffer was added and inverted until a blue colour appeared (indicating alkaline pH); this was incubated at room temperature for 5 minutes.

5. To precipitate all cellular debris, 4 ml of neutralisation buffer N3 was added, mixed well by inversion and incubated on ice for 15 minutes.

6. Precipitates were pelleted by centrifugation for 15 minutes.

7. A column (supplied with the kit) was equilibrated by adding 4 ml QBT equilibration buffer, which was discarded after passing through the column by gravity.

8. The supernatant from Step 6 was applied to the column, allowing it to enter the column matrix by gravity flow. The eluate was discarded.

9. The DNA bound to the column matrix was washed by two separate additions of 10 ml of QC buffer to the column; again, the eluate was discarded.

10. Plasmid DNA was eluted from the matrix by adding 5 ml QF elution buffer, and the eluate was collected in a sterile 50 ml Falcon tube (Corning).

11. Eluted plasmid DNA was precipitated by adding 3.5 ml of 100% isopropanol, mixed by inversion and centrifuged at 9000 x g for 30 minutes to pellet precipitated plasmid DNA.

12. The DNA pellet was washed by adding 1 ml 70% ethanol and centrifuged as before for 2 minutes. The resultant supernatant was removed completely using a micropipette, and the DNA pellet was air-dried for 10 minutes.

13. The dried pellet was rehydrated in 80 µl of Ultra-pure water (Sigma).

9.3.4 Purification of genomic DNA

A Wizard genomic DNA purification kit (Promega) was used to purify genomic DNA from *Ruegeria pomeroyi* strains and from *Roseovarius nubinhibens* ISM. This genomic DNA (gDNA) was used for PCR amplifications and Southern blot analyses.

1. A single colony of either *Ruegeria* or *Roseovarius* was inoculated into 5 ml HY media and grown for 2 days at 28°C.

2. Using a benchtop Eppendorf centrifuge, 1.5 ml of each culture was pelleted at 13,000 x g.

3. The supernatant was removed, and 600 µl Nuclei lysis solution was added and used to resuspend the pellet. Cells were lysed by incubating at 80 °C for 5 minutes before cooling to room temperature.

4. To remove RNA from the samples, 3 µl of RNase solution were added and mixed into the lysate; this was incubated at 37 °C for 1 hour.

5. To this, 200 µl of Protein precipitation solution was added and mixed well; this mixture was incubated on ice for 5 minutes to precipitate all cellular debris.

6. The precipitate was removed by centrifugation for 3 minutes.

7. The DNA was precipitated from the supernatant using 600 µl of isoproponol. This was collected by centrifugation for 2 minutes; the supernatant was discarded.

8. The pelleted DNA was washed with 600 µl room temperature 70% ethanol (v/v) and mixed by inversion. DNA was again pelleted by centrifugation for 2 minutes and the supernatant was removed carefully.

9. The DNA pellet was air-dried for 10 minutes.

10. Dried DNA pellets were then resuspended in 100 µl Ultra-pure water (Sigma) and incubated for 1 hour at 65 °C. Genomic DNA preparations were always stored at -20 °C.

9.3.5 RNA purification for microarrays

The extraction of RNA from bacteria requires careful measures to ensure there is no degradation. A clean space was used, where all equipment was treated with RNaseZAP® (Ambion) and all plastics were autoclaved prior to use to ensure no contamination with RNase enzymes. TipOne® RNase-free filter tips (*StarLab*) were used when pipetting.

Firstly, a single colony of *Ruegeria pomeroyi* Rif^R strain J470 was used to inoculate HY broth with 20 µg/ml rifampicin; this was grown for 48 hours at 28°C with shaking.

For the experiments in which the effects of Fe were measured, this starter culture was diluted 1 in 200 into 100ml of MBM minimal medium, pre-warmed to 28°C and with vitamin solution added (1 in 1000 dilution) and succinate at 10 mM. In total 2 biological replicates were performed, with either 20 µM $FeCl_3$ or no iron added to each flask.

For Mn limitation experiments the cultures were diluted 1 in 200 into RSS media, pre-warmed to 28°C with 20 µM $FeCl_3$, vitamins and succinate as in MBM. Here, 2 replicates were performed with 20 µM $MnCl_2$ or no manganese added to each flask.

For the "Irr^- vs. wild type" microarray comparison experiment, both cultures were grown in 20 µM $FeCl_3$ in MBM as detailed above.

For the "Mur^- vs. wild type" experiment, two replicates were performed, where both cultures were grown in RSS with 20 µM $MnCl_2$ and 20 µM $FeCl_3$ as detailed above.

To grow the cells and stabilise the RNA the following steps were performed:

1. All cultures were incubated in 250 ml conical flasks for exactly 16 hours at 28°C, with 180 rpm shaking.

2. Following growth, the cells were killed and their RNA was stabilised using a 1 in 5 addition of 10 % Phenol:Ethanol solution (Sigma), before being put on ice for 1 hour.

3. The cells were harvested by centrifugation (3200 x g at 4 °C for 10 minutes in an Eppendorf Centrifuge, model 5804R); then, the supernatant was removed, and the cell pellet was resuspended in the residual liquid.

4. This was centrifuged again at 13000 x g for 30 seconds, and all residual supernatant was removed.

5. Each sample was frozen in dry ice pellets and stored overnight at -80°C.

To extract and purify the RNA, three cell lysis steps were used, since *R. pomeroyi* cells grown in minimal medium gave poor RNA yield when any of these three steps was omitted.

1. Treatment with lysozyme: 100 µl RNase-free TE buffer (10 mM Tris, 1 mM EDTA, pH 8.0) containing 100 mg ml^{-1} chicken egg white lysozyme (Sigma) was added to each sample, which was then incubated at 37°C for 30 minutes.

2. Five successive freeze-thaw cycles using dry ice were performed on each sample.

3. Mechanical shearing: 1 g of 0.1 µM acid-washed glass beads (Sigma) were added to each sample, and were agitated in an MP Biomedicals FastPrep24 machine, on setting 6, for 40 seconds. Samples were all immediately cooled on ice. The resultant supernatant was removed following centrifugation (2 minutes at 13,200 x g).

Total RNA was purified from the resultant lysates using the Promega SV total RNA kit as per the manufacturer's protocol, as follows.

1. 75 µl Lysis Reagent were added and mixed by inversion.

2. 350 µl RNA dilution buffer were then added and mixed by inversion, and samples were incubated for 3 minutes at 70 °C, before being centrifuged for 10 minutes at 13000 x g at 4 °C.

3. 200 µl 100% ethanol were added and mixed by pipette.

4. A spin column was used to bind and clean the RNA, here, each sample was added to a column and centrifuged for 30 s at 13000 x g at 4 °C, the flow through was discarded.

5. The RNA, bound to the column matrix, was washed using 600 µl Wash buffer) and centrifuged for 30 s at 13000 x g at 4 °C, the flow through was discarded.

6. A DNase mix (see below) was prepared, and 50 µl was added to the RNA in the each column. These were incubated at 37 °C for 40 minutes to remove any DNA contamination.

DNase mix comprised (all supplied with kit):

a. 5 µl 90 mM $MnCl_2$

b. 40 µl DNase core buffer

c. 5 µl DNase solution

7. To inactivate the DNase, 200 µl of DNase stop mix was added to each column and then removed by centrifugation for 30 s at 13000 x g at 4 °C. The flow through was discarded.

8. The RNA sample bound to the matrix in each spin column was washed twice by adding 600 µl Wash Buffer and centrifuging for 30 s at 13000 x g at 4 °C. After each wash, the flow through was discarded.

9. The RNA was eluted into a clean microfuge tube by applying 80 µl of Ultra-pure water (Sigma), incubating for 2 minutes at room temperature before being centrifuged for 2 minutes at 4500 x g.

10. To ensure there was no DNA in any sample, TURBO DNA-free (Ambion) was used, according to the protocol supplied, as follows:

a. To each RNA sample, 0.1 volumes of 10 x Turbo buffer, and 1 µl of Turbo DNase enzyme was added and incubated at 37 °C for 30 minutes.

b. Following incubation, 0.1 volumes of DNase inactivation reagent were added, mixed well and incubated for 5 minutes at room temperature.

c. This mixture was then centrifuged for 90 s at 13000 x g at 4°C to pellet any precipitate, and the supernatant was harvested into a clean microfuge tube.

The RNA was assayed for purity and lack of degradation using a Bioanalyser chip (Agilent 2100). Here, the appearance of 16S and 23S ribosome bands were required to be bright and sharp, with no smearing, as this would indicate RNA degradation.

The concentration of the RNA was determined using a Nanodrop Spectrophotometer NS-1000 (Thermo Scientific) and it was ensured that both the 260/280 and 260/230nm ratios were >2. All RNA samples were stored at -80°C until required.

9.4 Microarrays

9.4.1 Performing microarray experiments

An 8 × 15K microarray slide (Agilent) specific for the genome of *R. pomeroyi* DSS-3 was used to visualise relative mRNA levels between samples. An Affinity Script kit (GE Healthcare) was used to produce cDNA, from each RNA sample, which was then labelled with single-stranded DNA containing the Cy3 or Cy5 florescence marker as follows:

10 µg of RNA dried using a rotary vacuum, then resuspended in 7.7 µl of RNase free water.

Random priming reactions set up with:

7.7 µl of RNA sample (10 µg)

5 µg (1.7 µl) of random hexamers (Invitrogen)

These were incubated at 70^{o}C for 5 mins then placed on ice for 10 mins before being briefly centrifuged to collect any evaporated liquid.

To each tube, the following were added:

a. 2 µl of 10 x RT buffer

b. 2 µl of 0.1 M DTT

c. 0.6 µl of 50 x dNTPs (25 mM of dATP, dGTP, dTTP and 10 mM of dCTP, which was 25 µl of dA, dG, dT and 10 µl of dCTP from Amersham Pharmacia 100 mM stock dNTP kit.

d. 2 µl of Cy3 or Cy5-dCTP (1 mM stock from Amersham Pharmacia) and 4 µl of reverse transcriptase (AffinityScript, Stratagene), total volume is 20 µl.

These were pipette mixed, and incubated at 25^{o}C for 10 mins, before being incubated overnight at 42^{o}C.

In the morning, the RNA was degraded to leave only the labelled cDNA as follows:

a. 15 µl of freshly made 0.1 M NaOH, to hydrolyse RNA. This was incubated at 70^{o}C for 10 mins

b. To this, 15 µl of 0.1 M HCl was added to neutralise the NaOH.

Clean up (Invitrogen PureLink PCR Purification Kit):

1. 50 µl of labelled RNA/gDNA reactions were added to 200 µl of PureLink binding buffer B2 and mixed well by inversion.

2. Sample was added to a spin column and centrifuged at 10,000 x g in a microcentrifuge for 1 minute.

3. The flow through was discarded, and column washed with 650 µl of Wash Buffer, then spun as before.

4. The flow through discarded again, and the empty spin column was spun at full speed for 3 mins to remove all traces of wash buffer.

4. DNA was eluted using 50 uL DEPC-treated water and spun after incubating for 1 min at room temperature, elution was performed by centrifugation into a clean eppendorf for 2 minutes at maximum speed.

The labelled cDNA was mixed as per the design of experiments and hybridised to the microarray slide using the Agilent Hi-RPM Gene Expression Hybridization Kit according to the manufacturer's instructions, as follows:

1. Both conditions for each array were dried in a rotary vacuum, then resuspended in 10 µl of DEPC-treated water, before being mixed.

2. To this 20 µl sample, 25 µl of hybridisation buffer (Agilent) and 5 µl of blocking reagent (Agilent) were added, and boiled for 3 minutes before being cooled to room temperature.

3. 40 µl of each sample was applied to a well on an Agilent hybridisation chamber, held in a clamp (Agilent). The array was carefully applied on top of the chamber, and clamped down firmly. This was incubated in a hybridisation oven at 65^{o}C overnight.

Washing the hybridised arrays:

1. The hybridisation chamber and microarray, held in the clamp was disassembled in wash buffer 1 (Agilent) away from bright light.

2. The array was loaded into a foil covered 50 ml falcon tube filled with wash buffer 1 and rotated gently for 1 minute at room temperature.

3. The array slide was transferred to another falcon tube containing wash buffer 2, prewarmed to 37^{o}C and rotated again for 2 minutes.

4. Finally, the array slide was dried by placing in acetonitrile and removing, then into stabilisation buffer, air dried and then stored in the dark before scanning.

Scanning:

The array slide was scanned using a GenePix 4000B scanner, and data acquired using GenePix 6.0 software.

9.4.2 Microarray analysis

DNA microarrays were scanned using an Axon GenePix 4000A microarray laser scanner (Axon Instruments) and the data from detected features were initially processed using the GenePix 3.0 software. Statistical analysis of the data was performed with Marray as described in Holmes *et al.* (2005).

All data were deposited in a large file (Appendix 3) where for each gene, the relative expression change was shown as a ratio for the pair of conditions under comparison, and the P-value for each gene is shown.

9.5 Manipulation and in vitro analysis of nucleic acids – DNA amplification and plasmid construction

9.5.1 Design of oligonucleotides used for PCR and SDM

DNA oligonucleotide primers were ordered from MWG Biotech, and designed using Primer3Plus (Untergasser *et al.* 2007) and ARTEMIS (Rutherford *et al.* 2000). Where appropriate, they had a GC content <60%, a melting temperature (Tm) of ~60 °C and a length of 18-22 base pairs. For those that incorporated a restriction site, this was placed to the 5' end of the primer, with a further 4 bases added upstream to ensure that the enzyme could clamp the DNA. Sequences and use of primers are listed in Table 10.1.

9.5.2 Polymerase chain reaction (PCR) amplification of DNA

A TC-512 Thermal cycler machine (Techne) was used to perform PCR to amplify fragments from genomic or plasmid DNA. Typically, Taq master mix (Roche) was used according to specifications of the manufacturer. Unless otherwise stated, standard PCR reactions were set up as follows:

1 µl genomic DNA template (~ 50 ng / µl)

22 µl dH_2O

1 µl Forward primer (20 pmol μl^{-1})

1 µl Reverse primer (20 pmol μl^{-1})

25 µl Taq Master Mix

Thermal cycling was always performed as follows: (30 cycles)

1. Denaturation was performed at 95°C for 2 minutes

2. Primer annealing was at 2°C below the melting temperature of the primer pair used.

3. Extension was at 72°C for 30 seconds per kb of DNA to be amplified, so for a 2 kb amplicon, a one minute extension time was used.

4. Finally, a 5 minute extension was performed, and this was quickly cooled to 10°C.

9.5.3 Colony PCR

A single colony was picked to a small PCR tube using a toothpick, with just enough cell material to see a trace on the side of the tube. These cells were mixed with 10 µl of Ultra-pure water (Sigma), and vortexed to mix. The tube was heated to 99°C for 10 minutes in a TC-512 Thermal cycler machine (Techne) to lyse the cells. To use the released plasmid DNA as a template in a PCR reaction, the cell debris was pelleted by centrifugation at 13,000 x g for 2 minutes, and 1 µl of the supernatant

was carefully transferred from the top of the 10 µl sample to a fresh PCR tube. A normal PCR reaction (see above) was then performed, using the 1 µl of the colony preparation as the template.

9.5.4 Southern blot

Before the lab-based work, a virtual digest of the relevant DNA was performed using NEBcutter (http://tools.neb.com/NEBcutter2/index.php). Here, the sites of restriction endonuclease cleavage were visualised, to select an enzyme which would cut the genome either side of the target gene, generating a genomic fragment that would be easily visualised on a gel (ideally, 3 - 10 kb).

The genomic DNA to be tested was purified using the Promega Wizard genomic DNA kit (see above) and the resultant fragments were electrophoretically separated on a 1% agarose gel.

The agarose gel was treated using the following solutions, to allow DNA transfer onto a nitrocellulose membrane:

Denaturation Solution (500ml)

0.5M NaOH (10g)

1.5M NaCl (43.75g)

Neutralising Solution (500ml)

1M Tris-HCl pH 8 (60.55g)

1.5M NaCl (45.75g)

Depurination Solution (500ml)

0.2M HCl (4.55ml)

20x SSC (in 2L)

346.6g NaCl

176.4g Tri Sodium Citrate pH 7

Method

1. A photo of the finished gel was produced with a ruler alongside to allow measurement of the migration of each band relative to the size marker (1kb Plus, Roche). The gel was carefully placed in a plastic box for subsequent treatment:

2. The gel was depurinated by soaking for 20 mins in Depurination Solution before being washed with dH_2O.

3. Next, the gel was immersed in Denaturation Solution for 20 minutes before being washed with dH_2O.

4. Finally, the gel was neutralised by immersion in Neutralising Solution for 20 mins, before a final wash with dH_2O.

The DNA could then be transferred from the gel to a nylon membrane (Hybond-N+, Amersham) by upward capillary action as in Sambrook *et al*. (1989). Once transferred, the DNA was fixed to the membrane by cross-linking using UV light (254nm wavelength for 20 seconds, using a UV Stratalinker 2400, Stratagene).

To label and hybridise a probe to the DNA on the nylon membrane, the following steps were performed, using reagents and protocols from the (Roche) DIG High Prime DNA Labelling and Detection kit:

1. To make the probe, 4 µl of reagent 1 was added to 20 µl of purified PCR product, and incubated at 37°C overnight.

(This procedure attaches a steroid isolated from digitalis plants, dixoxigenin (DIG), to the DNA probe. A PCR product was used that would bind within the digested genomic DNA fragment containing the suspected mutation).

2. The nylon filter was incubated in 20ml DIG-easy hybridisation solution (Roche) at 42°C, for 30 minutes (prehybridisation).

3. 5 µl of the DIG-labelled probe was heat denatured at 95°C for 10 minutes and added to 5ml of DIG-easy hybridisation solution.

4. The nylon filter was removed from the prehybridisation solution and the probe-containing hybridisation solution was added at a volume of 2.5 ml per 100cm^2 of membrane. This was incubated overnight at 42°C, with gentle agitation.

5. The filter was washed to remove all remaining unbound probe, and the hybridisation solution:

a. 2 x 5 minutes with 50 ml of solution 1 (2x SSC, 0.1% SDS) at room temperature.

Then,

b. 2 x 15 minutes with solution 2 (0.1x SSC, 0.1% SDS) at 68°C.

The targeted genomic fragments were now bound by many copies of probe, which had DIG steroid attached. To visualise the probe signals an anti-DIG antibody was bound to the membrane. This required the following reagents:

<u>Maleic Acid Buffer</u>

0.1 M Maleic acid

0.15 M NaCl;

Adjusted to pH 7.5 with NaOH.

Blocking Solution (500 ml)

50 ml Blocking reagent (Roche)

450 ml Maleic Acid Buffer.

Detection Buffer

0.1 M Tris-HCl

0.1 M NaCl

50 mM $MgCl_2$

Adjusted to pH 9.5.

Method:

1. The membrane was immersed in Maleic Acid Buffer for 5 minutes, before being removed.

2. The membrane was incubated for 30 min in 100 ml of Blocking Solution at room temperature.

3. The Anti-DIG-AP-conjugate (Alkaline Phosphatase conjugated to the anti-DIG antibody) was diluted 1 in 10,000 in 5 ml of Blocking Solution and added to the membrane, this was incubated for 30 minutes at room temperature.

4. The membrane was washed for 15 minutes in 100 ml of Maleic Acid Buffer, then removed, and repeated with fresh buffer.

5. Following washing, the membrane was equilibrated for 5 minutes by incubation in Detection Buffer at room temperature.

6. Finally, 5 ml of a solution of 5-Bromo-4-chloro-3-indolyl phosphate, toluidine salt [BCIP] and Nitro blue tetrazolium chloride [NBT] (Roche) was added to the membrane. Briefly, BCIP is dephosphorylated by the alkaline phosphatase enzyme, and then oxidised by NBT.

Dephosphorylated and oxidised BCIP is dark blue in colour, as is reduced NBT, providing an intense coloured band at the site of the probe.

9.5.5 Purification of PCR-amplified DNA

Following PCR amplification, DNA was purified using a High-Pure PCR purification kit (*Roche*) according to the supplied protocol as follows. All centrifugation steps were performed at 16,000 x g in a 5415 D Microcentrifuge (Eppendorf).

1. For each 50 µl PCR reaction, 500 µl Binding buffer was added and mixed using a pipette.

2. This was applied to a High Pure filter column and centrifuged for 1 minute; the eluate was discarded.

3. To the column, 500 µl of Wash buffer was added, centrifuged for 1 minute and the eluate was discarded.

4. Here, 200 µl of Wash buffer was added, and again centrifuged for 1 minute, discarding the eluate.

5. To collect the purified PCR product, the column was transferred to a 1.5 ml microfuge tube and 30 µl of Ultra-pure water (Sigma) was added, allowed to stand for 2 minutes and then centrifuged for 1 minute. The resultant PCR products were routinely stored at -20°C.

9.5.6 Restriction enzyme digestion

DNA digestions were carried out using restriction enzymes supplied by *Roche* with their supplied buffers. Here, around 300 ng of plasmid DNA was cut in a 20 µl reaction as follows:

2 µl of appropriate buffer solution

17 µl of Ultra-pure water containing 300 ng of plasmid DNA

1 µl (10 units) of the appropriate enzyme(s)

These reactions were always incubated at 37°C for 4 hours to ensure all DNA was cut. To inactivate the enzymes, samples were heated to 65°C for 10 minutes.

9.5.7 Dephosphorylation of plasmid DNA

To prevent religation of plasmid DNA when only cut with one enzyme, rAPID Alkaline Phosphatase (Roche) was used to dephosphorylate the 5' ends. To a typical 20 µl digest reaction, 10 units of rAPID Alkaline Phosphatase was added, without any extra buffer or water. Reactions were incubated for 30 minutes at 37 °C, and were stopped by heating at 75 °C for 2 minutes.

9.5.8 Ligation of DNA fragments

Concentrations of vector and insert DNA were determined using a nanodrop spectrophotometer (Agilent), before being mixed in a 1:3 molar ratio of vector:insert, calculated using a ligation calculator (http://www.insilico.uni-duesseldorf.de/Lig_Input.html). The insert DNA was ligated to the vector using Roche T4 DNA ligase overnight at 11°C in a 10 µl reaction, containing 0.5 µl of enzyme, 1 µl of 10 x ligase buffer (Roche), and the correct molar ratio of DNA in 8.5 µl of Ultra-pure water (Sigma).

9.5.9 DNA gel electrophoresis

All separations of DNA performed used 1 % agarose dissolved in TBE buffer (45 mM Tris-borate, 1 mM EDTA, pH 8.0) containing ethidium bromide (500 ng /ml) to stain the DNA. Samples (5 µll) were mixed with loading buffer containing 0.25% bromophenol blue and 30% glycerol (v/v). Gels were run in SCIE-PLAS mini or midi horizontal gel tanks, with 1x TBE as running buffer, at 70-100 mV until desired separation had occurred. To measure the sizes of DNA fragments, a lane loaded with 1 kb+ DNA ladder (Invitrogen) was added to each gel prior to running.

9.5.10 Extraction of DNA from agarose gels

To extract digested DNA from agarose gels, a QIAquick Gel Extraction kit (Qiagen) was used, as per the supplied protocol.

1. A sterile scalpel was used to cut around and remove the desired DNA fragment.

2. To this, 300 µl of QG buffer was added in a 1.5 ml microfuge tube. This was incubated for 10 minutes at 50 °C to melt the agarose.

3. This sample was decanted into a QIAquick spin column and centrifuged for 1 minute. The eluate was discarded.

4. The column was washed by adding 750 µl PE buffer before centrifuging for 1 minute. The eluate was discarded.

5. The column was transferred to a clean 1.5 ml microfuge tube, and the DNA was eluted by adding 30 µl of Ultra-pure water (Sigma).

9.5.11 Site-directed mutagenesis (SDM)

Site directed mutagenesis was performed using an Agilent Quikchange Lightening kit. Mutagenesis of plasmids was achieved by using two primers, which are the reverse compliment of each other, which span the region targeted for mutagenesis. The nucleotides to be mutated are altered within the primer sequences, which are then used in a PCR reaction, with a long elongation cycle time to allow replication of the entire plasmid. New copies of the plasmid will contain the mutated bases, due to the incorporation of the primers into the PCR products. The newly synthesised DNA from a PCR reaction is not methylated, so the restriction endonuclease *Dpn*I is used to cut the methylated template plasmids into small pieces (*Dpn*I cuts at 5'-GATC-3' sites). The linear PCR products that contain the mutations are used to transform a strain of *E. coli* (XL10-GOLD) which can repair the nicked-DNA plasmids to generate functionally replicating mutated versions of the original template plasmid.

Reactions were set up as follows, using reagents supplied with the Agilent kit:

2.5 µl Reaction Buffer

62.5 ng of each oligonucleotide primer

25 ng of template plasmid DNA

0.5 µl of dNTP mix

0.75 µl of Quik Solution

0.5 µl Quikchange Enzyme

20.25 µl of Ultra Pure H_2O

The thermal cycles used to generate the site-directed mutants in this work were as follows:

2 minutes at 95°C, 1 cycle.

18 cycles of:

20 seconds at 95°C

10 seconds at 60°C

5 minutes at 68°C

Followed by:

5 minutes at 68°C

1. To each reaction, 2 µl of *Dpn*I was added, and incubated for 2 hours at 37°C.

2. 1 µl of *DpnI* treated sample was used to transform *E. coli* XL10-Gold (Agilent) according to the manufacturer's specification.

3. Transformed XL10-Gold cells were selected by plating on LB containing the appropriate antibiotics.

9.6 Generation of genomic insertion mutants of *R. pomeroyi*

9.6.1 pK19 derivatives

Several of the insertional mutations that were made in this study were based on a suicide plasmid, pBIO1879 (Todd *et al.* 2011), which is a derivative of pK19*mob* (Schafer *et al.* 1994) into which a spectinomycin resistance (Spc^R) cassette was cloned into the polycloning site, and so confers resistance to both spectinomycin in addition to kanamycin, present on pK19*mob*.

Firstly, a fragment internal to the targeted gene was ligated into pBIO1879. The newly formed recombinant plasmid was then introduced into *Ruegeria* by tri-parental conjugation (see above). Since pK19*mob* and its derivatives cannot replicate outside the enteric bacteria, selection for Spc^R/Kan^R transconjugants can yield recombinants between the cloned internal fragment and the target gene, generating a targeted, insertional mutation. See Figure 4.15 in Chapter 4 for an illustration of this procedure.

9.6.2 pEX18Ap derivatives

pEX18Ap (Hoang *et al.* 1998) is a wide host range plasmid that encodes ampicillin resistance (via its *bla* gene) and can be mobilised from *E. coli* to many different proteobacteria, but it fails to replicate in such hosts. It also contains a polylinker cloning region and a *sacB* gene, which encodes a levan-sucrase that cleaves sucrose into glucose plus fructose, the latter being polymerised to levan, a toxin for most bacteria (Merlin *et al.* 2002). pEX18Ap is therefore a selectable, suicide vector that can be used to generate genomic mutants. This can be achieved by cloning a selectable marker between two regions of DNA that flank the gene that is targeted for mutagenesis, crossing this construct into the target strain, and then selecting for the cloned marker, usually spectinomycin resistance (200 µg /ml), making sure that the resultant transconjugants are sucrose resistant and have therefore lost the pEX18Ap derivative.

9.7 Transformation of *E. coli* with plasmid DNA

9.7.1 Preparation of competent cells

Recipient E. coli cells for transformations were made competent using ice-cold $CaCl_2$ (Sambrook *et al.* 1989), as follows:

1. A single colony of the required *E. coli* strain was used to inoculate 5 ml LB media. This was incubated overnight at 37°C with 200 rpm of shaking.

2. This culture was then diluted 1 in 100 into 100 ml of LB media and incubated for ~1.5 hours until the OD_{600nm} value reached ~0.4.

3. The cultures were cooled on ice for 10 minutes, before harvesting the cells in two 50 ml centrifuge tubes (Corning) at 4500 x g for 10 minutes at 4 °C using an Eppendorf centrifuge, model 5804R.

4. The supernatant was quickly removed and the cells were resuspended in 15 ml of ice-cold 0.1M $CaCl_2$ and incubated for 30 minutes on ice.

5. The cells were pelleted by centrifugation as before, the supernatant discarded, and the cell pellet was resuspended, in 2 ml of ice-cold 0.1M $CaCl_2$. This was incubated on ice for at least 2 hours.

6. The now competent cells were used immediately or within 24 hours, if stored on ice.

9.7.2 Transformation of competent cells

1. Either 5 µl of a ligation reaction, or 0.5 µl of a plasmid preparation was added to 100 µl of competent *E. coli* cells in an ice-cold microfuge tube.

2. These were incubated for 30 minutes on ice.

3. The tubes were transferred to a water bath at 42°C for 1 minute, and returned to ice for a further 2 minutes.

4. Then, 500 µl pre-warmed LB broth (42°C) was added to each tube and incubated at 37°C for one hour, to allow expression of the introduced selectable marker..

5. Cells were plated onto selective LB medium containing the appropriate antibiotic(s) using a sterile spreader. Transformants were screened following overnight incubation at 37°C.

9.7.3 DNA sequencing

Sequencing was carried out by Genome Enterprise Ltd., (John Innes Centre, UK) using an AbiPrism 3730 capillary sequencer. Plasmid DNA that was to be used as template for sequencing reactions was isolated using the Qiagen Midiprep method as detailed earlier. For each sample, 5 µg of template DNA was sent to be sequenced, using primers specific to the cloned fragment, or to the vector, where appropriate, at a concentration of 1.5 pmol / µl.

9.7.4 β-Galactosidase assays

The plasmid pBIO1878 is a derivative of the wide host-range promoter-probe plasmid vector pMP220 derivative (Spaink 1987). It has an additional Spc^R cassette, cloned into the *Sph*I site of pMP220 in order to facilitate counter-selection when the plasmid was to be introduced into strains of *Ruegeria*. The cloning sites in pBIO1878 are upstream of a *lacZ* gene, which has a ribosome binding site derived from the chloramphenicol acetyl transferase gene of *E. coli*, but lacks any promoter or operator sequence. Thus, a promoter from a gene of choice, cloned in the correct orientation into the PCS of pBIO1878 will control the expression of β-galactosidase encoded by yhe reporter *lacZ* .

The assay for β-galactosidase involves the cleavage of o-nitrophenyl-ß-D-galactoside (ONPG) to o-nitrophenol a yellow product that absorbs at 420nm and is measured in a spectrophotometer (Genova spectrophotometer {*Jenway*}).

Reagents required:

Z-buffer - in 50 ml of dH_2O

1 ml 3M $Na_2HPO_4 \cdot 7H_2O$

0.5 ml 4M $NaHPO_4 \cdot 7H_2O$

0.5 ml 1M KCl

0.5 ml $MgSO_4 \cdot 7H_2O$

175 µl β-mercaptoethanol

ONPG solution – per ml of dH_2O

4 mg O-nitrophenyl-β-D-galactopyranoside

1. *R. pomeroyi* strains were inoculated from single colonies into 5 ml HY medium containing appropriate antibiotics and grown for 2 days at 28°C.

2. These starter cultures were used to inoculate either MBM (for Fe limitation experiments) or RSS (for Mn limitation) containing 10 mM succinate and vitamin solution as described earlier.

3. These cultures were grown for ~15 hours or until the OD_{600nm} had reached at least 0.1. The cultures which lacked iron rarely grew above an OD_{600nm} value of 0.15.

4. From each culture, 500 µl aliquots were added to a 2 ml microfuge tube containing 500 µl Z-buffer.

5. Using a Pasteur pipette, 2 drops of chloroform and 1 drop of 0.1% SDS (w/v) were added to each microfuge tube and vortexed for 10 seconds. These were then incubated at 28° C for 5 minutes.

6. To each tube, 200 µl ONPG solution was added, before returning the tubes to 28°C.

7. When sufficient yellow colour had developed, the reactions were stopped using 500 µl 1M sodium bicarbonate, and the length of incubation was recorded.

8. All tubes were centrifuged for 3 minutes at 13,200 x g to clear the cell debris.

9. A 1 ml aliquot from each tube was transferred to a 2 ml cuvette and the OD_{420nm} was recorded.

10. β-galactosidase activities, in Miller Units, were calculated using the following equation:

$$\text{Miller Units} = \frac{1000 \text{ x } OD420nm}{t \text{ x } V \text{ x } OD600nm}$$

Where,

t = time in minutes, and V = volume of culture

9.7.5 CAS assay plates

Chrome azural sulfonate (CAS) solution was made as follows:

60.5 mg	CAS, dissolved in 50 ml dH_2O
10 ml	1 mM $FeCl_3 \cdot 6H_2O$ in 10 mM HCl
72.9 mg	HDTMA (Hexadecyltrimethylammonium bromide) in 40 ml dH_2O.

These constituents were mixed and autoclaved. Then 20 ml of this CAS solution was added per 200 ml of MBM agar to make CAS plates.

9.8 in silico analyses

9.8.1 DNA sequence analysis

DNA sequences returned from TGAC were analysed using *BioEdit.* Sequences were compared to genomic and protein sequences available from the National Centre for Biotechnology Information (NCBI - www.ncbi.nlm.nih.gov) using the Basic Local Alignment Search Tool, BLAST (Altschul *et al.* 1997).

DNA sequence motifs were discovered, and logo graphics of these motifs generated using MEME (Bailey and Elkan 1994).

9.8.2 Sequence alignments and phylogenetic trees

Evolutionary analyses were conducted in MEGA5 (Tamura *et al.* 2011). Alignments were performed using the Neighbor-Joining method (Saitou and Nei 1987). Bootstrap consensus trees were inferred from 500 replicates and are taken to represent the evolutionary history of the taxa analyzed (Felsenstein 1985). Branches corresponding to partitions reproduced in fewer than 50% bootstrap replicates are collapsed. The percentages of replicate trees in which the associated taxa clustered together in the bootstrap test (500 replicates) are shown next to the branches (Felsenstein 1985). The trees are drawn to scale, with branch lengths in the same units as those of the evolutionary distances used to infer the phylogenetic tree. The evolutionary distances were computed using the JTT matrix-based method (Jones *et al.* 1992) and are in the units of the number of amino acid substitutions per site.

9.8.3 Database searches

Searches for homologous protein sequences in the NCBI non-redundant protein database were done using BLAST. Metagenomic databases were interrogated using BLAST, with input sequences obtained from NCBI, using the Community Cyberinfrastructure for Advanced Microbial Ecology Research and Analysis (CAMERA), described by Sun *et al*. (2010).

9.8.4 Other bioinformatic tools

Several online programmes were used to analyse peptide sequences where indicated in the text. They are available at the following websites:

- SignalP (Petersen *et al.* 2011) – used to predict the presence of a SEC-signal peptide.
- TatP (Bendtsen *et al.* 2005) – used to predict the presence of a TAT-signal peptide.
- iMembrane (Kelm *et al.* 2009) – predicts putative tertiary / membrane structure of a protein based on closest homologue within the iMembrane database.
- String 9.0 (Szklarczyk *et al.* 2011) – functional prediction / neighbourhood / co-occurance analysis of genes.

- PredTM-BB (Bagos *et al.* 2004) – predicts whether a protein is likely found within a bacterial membrane, and can be used to draw the secondary structure of a protein integrated in a membrane.

Table 9.1 Details of Strains, Plasmids and Oligonucleotide primers used in this work

STRAINS

Strain	Description	Source
Escherichia coli 803	Met$^-$; used as host for transformation with large plasmids	Wood (1966)
E. coli XL10-Gold	High transformation rate, used for site directed mutagenesis	Stratagene
E. coli JM101	Used as host for pUC18-based plasmids	Messing (1979)
Dinoroseobacter shibae DFL-12	Lab strain	Biebl *et al* . (2005)
Sulfitobacter EE36	Lab strain	Gonzalez *et al* . (1996)
Silicibacter lacuscaerulensis ITI-1157	Lab strain	Petursdottir and Kristjansson (1997)
Fulvimarina pelagi HTCC2506	Lab strain	Cho and Giovannoni (2003)
Loktanella vestfoldensis SKA53	Lab strain	Van Trappen *et al* . (2004)
J469	*R. pomeroyi* wild type strain	González (2003)
J470	J469, Rif^R	Todd *et al* . (2011)
J528	Mur$^-$ strain of *R. pomeroyi* , generated using pBIO1861. Spec^R Rif^R Kan^R	This Work
J529	SitA$^-$ strain of *R. pomeroyi* , generated using pBIO2124. Spec^R Rif^R Kan^R	This Work
J531	FbpAB$^-$ strain of *R. pomeroyi* , generated using pBIO2104. Spec^R Rif^R.	This Work
J532	FbpAB$^-$ strain of *R. pomeroyi* , generated using pBIO2104. Spec^R Rif^R.	This Work
J533	IrpA$^-$ strain of *R. pomeroyi* , generated using pBIO2116. Spec^R Rif^R Kan^R	This Work
J534	SPO0432$^-$ strain of *R. pomeroyi* , generated using pBIO2119. Spec^R Rif^R Kan^R	This Work
J535	SPO3722$^-$ strain of *R. pomeroyi* , generated using pBIO2120. Spec^R Rif^R Kan^R	This Work
J536	SPO1393$^-$ strain of *R. pomeroyi* , generated using pBIO2121. Spec^R Rif^R Kan^R	This Work
J537	SPO2025$^-$ strain of *R. pomeroyi* , generated using pBIO2122. Spec^R Rif^R Kan^R	This Work
J538	SPOA0186$^-$ strain of *R. pomeroyi* , generated using pBIO2123. Spec^R Rif^R Kan^R	This Work
J539	Irr- strain of *R. pomeroyi* , generated using pBIO2114. Rif^R Amp^R Spec^R	This Work

PRIMERS

Oligo Name	Sequence	Restriction site / Function	Plasmid
fbpA fwd:	GCTCTAGAGCATTACGTGCACGAGGGC	PstI / XbaI	
fbpA rev:	CGCTGTCCTGCAGGTTGGCGGGAATGC	PstI / XbaI	
fbpB fwd:	GCGCTTTGCTGCAGGAAGGCCGCCCGC	PstI / XbaI	
fbpB rev:	CGTCTAGACCACCAAGATCAAGGGC	PstI / XbaI	
irpA fwd:	GCTCTAGACGCGATCGATCGCTGCCCG	PstI / XbaI	
irpA rev:	CGGTCGCCGCCTGCAGATAGGCGCC	PstI / XbaI	
IrpApk19FWD	GGTGAATTCCTGGCCGCTGGACG	EcoRI	
IrpApk19REV	CCATCTAGACGTTCCGGATACC	XbaI	
mbfApXba1FWD	GCGCTCTAGACCGCTCGCGCTCGGCCAGGC	Amplifies *mbfA* promoter	
mbfApPst1REV	GCGCCTGCAGCGTTCATGCAGGGCGATCAG	Amplifies *mbfA* promoter	
irrCOMPFWD	GCGCTCTAGAGTCTTCCTTGTCAAAGCTGC	Amplifies *irr* and its promoter	
irrCOMPREV	GCGCTCTAGACCGCGCGGGCGGCACAGGTC	Amplifies *irr* and its promoter	
fbpA51TtoGFWD	GCGACAGCATTACCCGACTGAAATAAGCAGTTTTATCTTGC	Mutagenesis of IR box 1 'T'	
fbpA51TtoGREV	GCAAGATAAAACTGCTTATTTCAGTCGGGTAATGCTGTCGC		pBIO2106
fbpA51CtoGFWD	GCGACAGCATTACCCGACTGAAATAATGAGTTTTATCTTGC	Mutagenesis of IR box 1 'C'	
fbpA51CtoGREV	GCAAGATAAAACTCATTATTTCAGTCGGGTAATGCTGTCGC		pBIO2107
fbpA2TtoGFWD	GCGAAATCCGGTAATTGACTATTTCAGGCGGATTAACTGAATCG	Mutagenesis of IR box 2 'T'	
fbpA2TtoGREV	CGATTCAGTTAATCCGCCTGAAATAGTCAATTACCGGATTTCGC		pBIO2108
fbpA2CtoGFWD	GCGAAATCCGGTAATTGACTATTTCAGTGGGATTAACTGAATCG	Mutagenesis of IR box 2 'C'	
fbpA2CtoGREV	CGATTCAGTTAATCCCACTGAAATAGTCAATTACCGGATTTCGC		pBIO2109
fbpBTtoGFWD	TCAGGCACTGGTATTTCCGACTAAACTGGGCGATTAAGGGCATTGGAACC	Mutagenesis of IR box 3 'T'	
fbpBTtoGREV	GGTTCCAATGCCCTTAATCGCCCAGTTTAGTCGGAAATACCAGTGCCTGA		pBIO2110
fbpBCtoGFWD	TCAGGCACTGGTATTTCCGACTAAACTGGTGGATTAAGGGCATTGGAACC	Mutagenesis of IR box 3 'C'	
fbpBCtoGREV	GGTTCCAATGCCCTTAATCCACCAGTTTAGTCGGAAATACCAGTGCCTGA		pBIO2111
IrpABamHIFWD	ATCGGTGTGATCGGGGTGTTGACTTAAGGATCCAATTTAGTCAGATATAAGCAAAGCCAG	Mutagenesis of IR box upstream of *irpA*	
IrpABamHIREV	CTGGCTTTGCTTATATCTGACTAAATTGGATCCTTAAGTCAACACCCCGATCACACCGAT		pBIO2115
SpecPstIF	GCGCCTGCAGATCGTGCCGTGATCGAAAT	spec cassette amplification *Pst* I	
SpecPstIR	GCGCCTGCAGTCATCCACCGGATCAGCTTAGTA	spec cassette amplification *Pst* I	
P1	GCTGGTGCTGCCGCTGGCC	fbpAB mutant check primers	
P2	AGATCGCTTGGCCTCGCGCG	fbpAB mutant check primers	
P3	CACCTCGGCCATCGCCGAGG	fbpAB mutant check primers	
irpA1F1	GCATGGATCCCGTCGACGGGCTGGTCGAACA	irpA mutant check primers	
irpA2R2	GCTGAAAGTATCGTTGAACC	irpA mutant check primers	
SPO0789XbaIF1	GCACTCTAGACCTCGCTCTGCATCAGTGTG	SPO0789 promoter cloning	
SPO0789PstIR1	CGATCTGCAGGCAAGATTGCCGCCCTTGGT	SPO0789 promoter cloning	
iscRpS4F	TGCATCTAGAGTGTCCATGTGCTGGTTCTG	iscR promoter cloning	
iscRpS4R	GCATCTGCAGTGCAGCGCGATATCGGTCAG	iscR promoter cloning	
SPO0432EcoF	ATCGGAATTCGCATTACCAAGCGCACAAAT	pBIO1879 cloning to create mutagenic suicide plasmid	
SPO0432XbaR	ACGTTCTAGATTATCACAGACCAGCGCATC	pBIO1879 cloning to create mutagenic suicide plasmid	
SPO3722F	CACCGAAGGACTGGAATGG	pBIO1879 cloning to create mutagenic suicide plasmid	
SPO3722R	ACGTTCTAGATGAGAGCTTTTCCTGAAACCA	pBIO1879 cloning to create mutagenic suicide plasmid	
SPO1393F	AGTCGAATTCATTGGGTGACGGGGTAGAG	pBIO1879 cloning to create mutagenic suicide plasmid	
SPO1393R	TACGTCTAGAGCCTGGAGATTCTCAAATCC	pBIO1879 cloning to create mutagenic suicide plasmid	
SPO2025F	TGACGAATTCGTCGACAAAGGGGCGCTAT	pBIO1879 cloning to create mutagenic suicide plasmid	
SPO2025R	AGTCTCTAGATCTTCACCACATCCGAAAGC	pBIO1879 cloning to create mutagenic suicide plasmid	
SPOA0186F	ACGTGAATTCCTCCAAGTTCTCCGACTATGC	pBIO1879 cloning to create mutagenic suicide plasmid	
SPOA0186R	GACTTCTAGACCGGATCGTATTTTGACCTG	pBIO1879 cloning to create mutagenic suicide plasmid	
irrflankEcoFWD	CACTATGCCAGAAGACGGAAT	irr flanking region amplification for pEX18Ap cloning	
irrflankHindIIIREV	GCGCAAGCTTGCAGGCCTCTGTTCAAATCA	irr flanking region amplification for pEX18Ap cloning	
Irrflank1F	CACTATGCCAGAAGACGGAAT	irr mutant screening	
Irrflank2R	GCGCAAGCTTGCAGGCCTCTGTTCAAATCA	irr mutant screening	
IrrcheckF	CAGGAAATCGCCACCGATTG	irr mutant screening	
IrrcheckR	CCTTGCGGCGCAGCCGGATC	irr mutant screening	
SitAF2	GCGCTCTAGAGCCGCGAGATCACGATGTCG	sitA promoter cloning	
SitAR2	GCGACTGCAGCGAACTTGTCGGCATAATCG		
MRS1sdmF	TTTACCTTTCGGACAAAATTCACCTTTCTAACGAATAATTCTCAATTGCGTT	MRS box mutagenesis upstream of *sitA*	
MRS1sdmR	AACGCAATTGAGAATTATTCGTTAGAAAGGTGAATTTTGTCCGAAAGGTAAA	MRS box mutagenesis upstream of *sitA*	
MRS2sdmF	CTTGCGAATAATTCTCAATTGCGTTGACTTAGTAACGAATGGTTCTCATATT	MRS box mutagenesis upstream of *sitA*	
MRS2sdmR	AATATGAGAACCATTCGTTACTAAGTCAACGCAATTGAGAATTATTCGCAAG	MRS box mutagenesis upstream of *sitA*	
FURFwd	GCTCTAGACGGGGTCGCAGAACTCG	internal fragment of Mur for cloning into pBIO1879	
FURRev	GCGGATCCCGATGTCGAGGAGCTGTATGC		
irrpromfwd	CTTGTCAAAGCTGCTCGGGT	Irr promoter cloning	
irrpromrev	GCGATTTCCTGAGAATTTGGCGT		
VcXbamp1	GCGGATCCGAAGGAGATATACATATGTCGATAATAATTCTCATTCA	cloning Vibrio mntX into pRK415	
VcXecop2	GCGAATTCTACATTTCAAATAACCAAAAGT		
SitApk19F	ACTGGAATTCGCGATGGTGGTGATGTTGT	internal fragment of *sitA* of *R. pomeroyi*	
SitApk19R	ATCGTCTAGAGTGGCAACCACCGGTATG		
MntXpF	ACGTTCTAGAGTGGATCACCCCGGTTTC	mntX of R. nubinhibens promoter fusion	
MntXpR	GCATCTGCAGCACATAGGCATCGACCATCA		
MntXF	ACGTTCTAGAGTGGATCACCCCGGTTTC	mntX of R. nubinhibens cloning	
MntXR	CGATCTGCAGCCCCGCCTAGTTCATAAAGC		

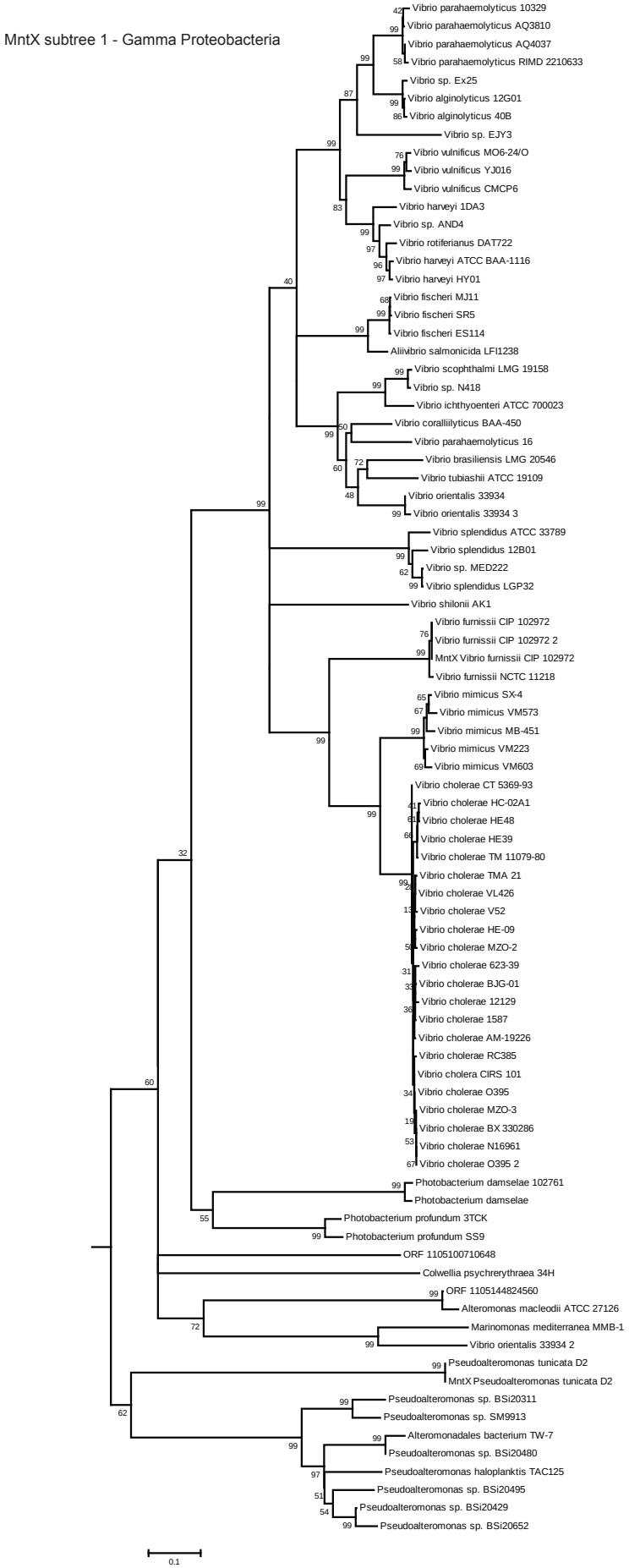
PLASMIDS

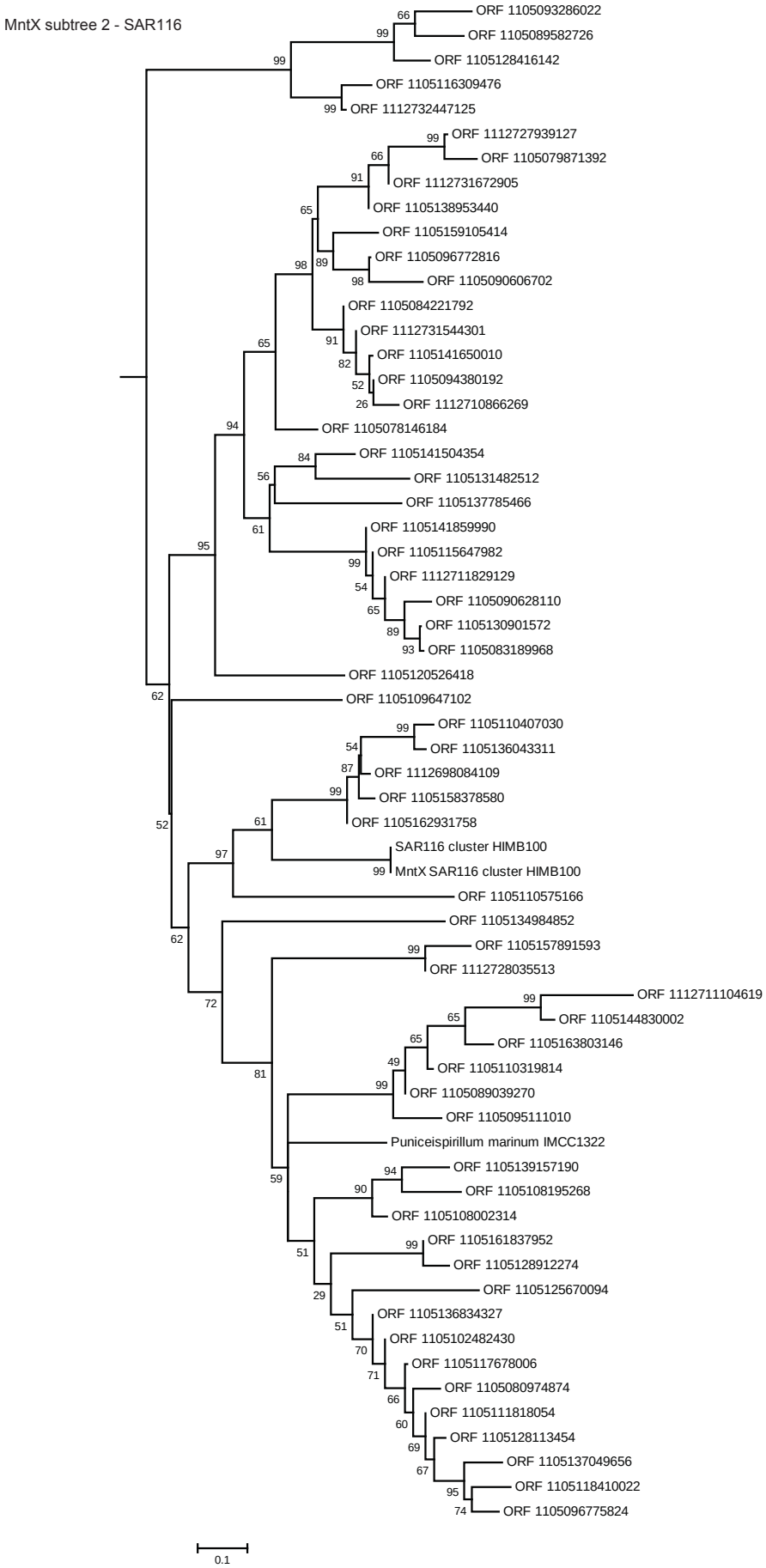
Vector	Function	Source	Marker Selection
pRK2013	Used as mobilising plasmid in tri-parental crosses	Figurski and Helinski (1979)	Kan^R
pμP220	Wide host-range lacZ promoter probe vector	Spaink *et al* . (1987)	Tet^R
pOT2	Broad host-range promoter probe vector with promoterless gfp gene	Allaway *et al* . (2001)	$Gent^R$
pBIO1879	pK19mob::spec, Suicide insertion plasmid with a spectinomycin resistence cassette	Todd *et al* . (2011)	$Spec^R$, Kan^R
pRK415	Broad host-range expression vector	Keen *et al* . (1988)	Tet^R
pDONR221	pUC origin Gateway vector	Nakagawa *et al.* (2008)	Kan^R
pBIO1845	pBIO1878 with *fbpA* promoter from *R. pomeroyi* cloned in using *Xba* I and *Bam* HI	This Work	$Spec^R$, Tet^R
pBIO1846	pBIO1878 with *fbpB* promoter from *R . pomeroyi* cloned in using *Xba* I and *Bam* HI	This Work	$Spec^R$, Tet^R
pBIO1847	pBIO1878 with *irpA* promoter from *R. pomeroyi* cloned in using *Xba* I and *Bam* HI	This Work	$Spec^R$, Tet^R
pBIO1861	pBIO1879 with internal fragment of *mur* cloned in using *Xba* I and *Bam* HI	This Work	$Spec^R$, Kan^R
pBIO1863	pBIO1879 with internal fragment of iscR cloned in using XbaI and EcoRI	This Work	$Spec^R$, Kan^R
pBIO1864	pBIO1879 with internal fragment of rirA cloned in using XbaI and EcoRI	This Work	$Spec^R$, Kan^R
pBIO1928	Contains *irr* plus promoter of J470 in pOT2	This Work	$Gent^R$
pBIO1929	Contains J470 *mbfA* promoter-*LacZ* fusion in pS4	This Work	$Spec^R$, Tet^R
pBIO2088	*Candidatus* Pelagibacter sp. IMCC9063 mntX gene cloned into pRK415	This Work	
pBIO2050	1086 bp promoter region of *sitA* cloned into pBIO1878	This Work	$Spec^R$, Tet^R
pBIO2100	MRS1 box mutation in pBIO2050	This Work	$Spec^R$, Tet^R
pBIO2101	MRS2 box mutation in pBIO2050	This Work	$Spec^R$, Tet^R
pBIO2102	MRS1 and MRS2 box mutation in pBIO2050	This Work	$Spec^R$, Tet^R
pBIO2103	5011bp region flanking *fbpAB* of *R. pomeroyi* in pEX18Ap	This Work	Amp^R
pBIO2104	5011bp region flanking *fbpAB* of *R. pomeroyi* in pEX18Ap	This Work	Amp^R
pBIO2105	pBIO2104 with a 1.8 kb $Spec^R$ cassette cloned into *Pst* I	This Work	Amp^R, $Spec^R$
pBIO2106	pBIO2104 with a 1.8 kb $Spec^R$ cassette cloned into *Pst* I	This Work	Amp^R, $Spec^R$
pBIO2107	pBIO1878 with mutation in IR box 1 T	This Work	$Spec^R$, Tet^R
pBIO2108	pBIO1878 with mutation in IR box 1 C	This Work	$Spec^R$, Tet^R
pBIO2109	pBIO1878 with mutation in IR box 2 T	This Work	$Spec^R$, Tet^R
pBIO2110	pBIO1878 with mutation in IR box 2 C	This Work	$Spec^R$, Tet^R
pBIO2111	pBIO1879 with mutation in IR box 3 T	This Work	$Spec^R$, Tet^R
pBIO2112	pBIO1879 with mutation in IR box 3 C	This Work	$Spec^R$, Tet^R
pBIO2113	*irr* flanking region cloned into pEX18Ap	This Work	Amp^R
pBIO2114	pBIO2113 with a 1.8 kb $Spec^R$ cassette cloned into *Pst* I	This Work	Amp^R, $Spec^R$
pBIO2115	pBIO1847 with mutation, IR box changed to *Bam* HI site	This Work	$Spec^R$, Tet^R
pBIO2116	*irpA* internal fragment cloned into pBIO1879	This Work	$Spec^R$, Kan^R
pBIO2117	*SPO0789* promoter cloned into pBIO1878	This Work	$Spec^R$, Tet^R
pBIO2118	*iscR* promoter cloned into pBIO1878	This Work	$Spec^R$, Tet^R
pBIO2119	*SPO0432* internal fragment cloned into pBIO1879	This Work	$Spec^R$, Kan^R
pBIO2120	*SPO3722* internal fragment cloned into pBIO1879	This Work	$Spec^R$, Kan^R
pBIO2121	*SPO1393* internal fragment cloned into pBIO1879	This Work	$Spec^R$, Kan^R
pBIO2122	*SPO2025* internal fragment cloned into pBIO1879	This Work	$Spec^R$, Kan^R
pBIO2123	*SPOA0186* internal fragment cloned into pBIO1879	This Work	$Spec^R$, Kan^R
pBIO2124	*sitA* internal fragment cloned into pBIO1879	This Work	$Spec^R$, Kan^R
pBIO2125	*irr* promoter fusion cloned into pBIO1878	This Work	$Spec^R$, Tet^R

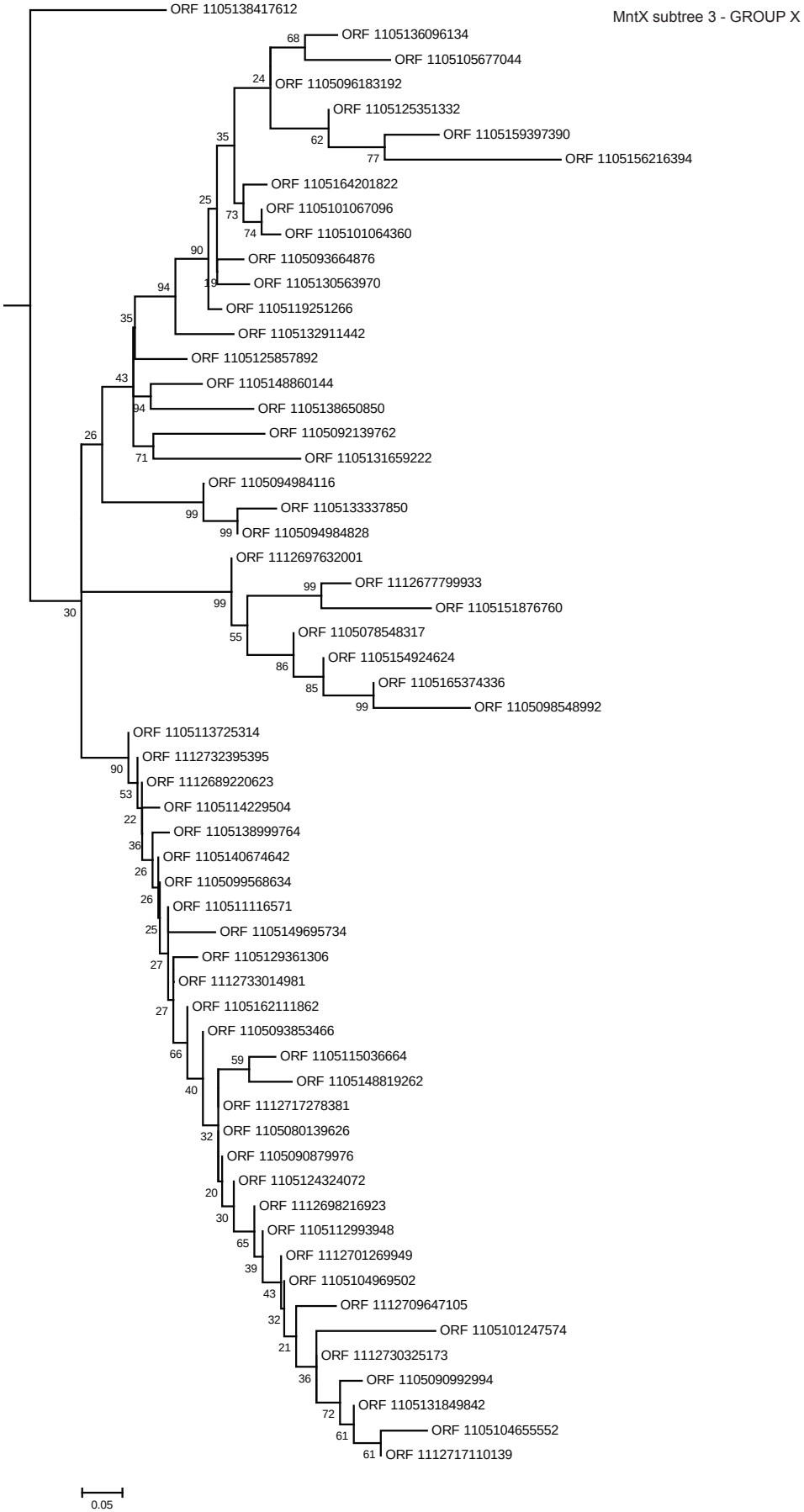
Appendix

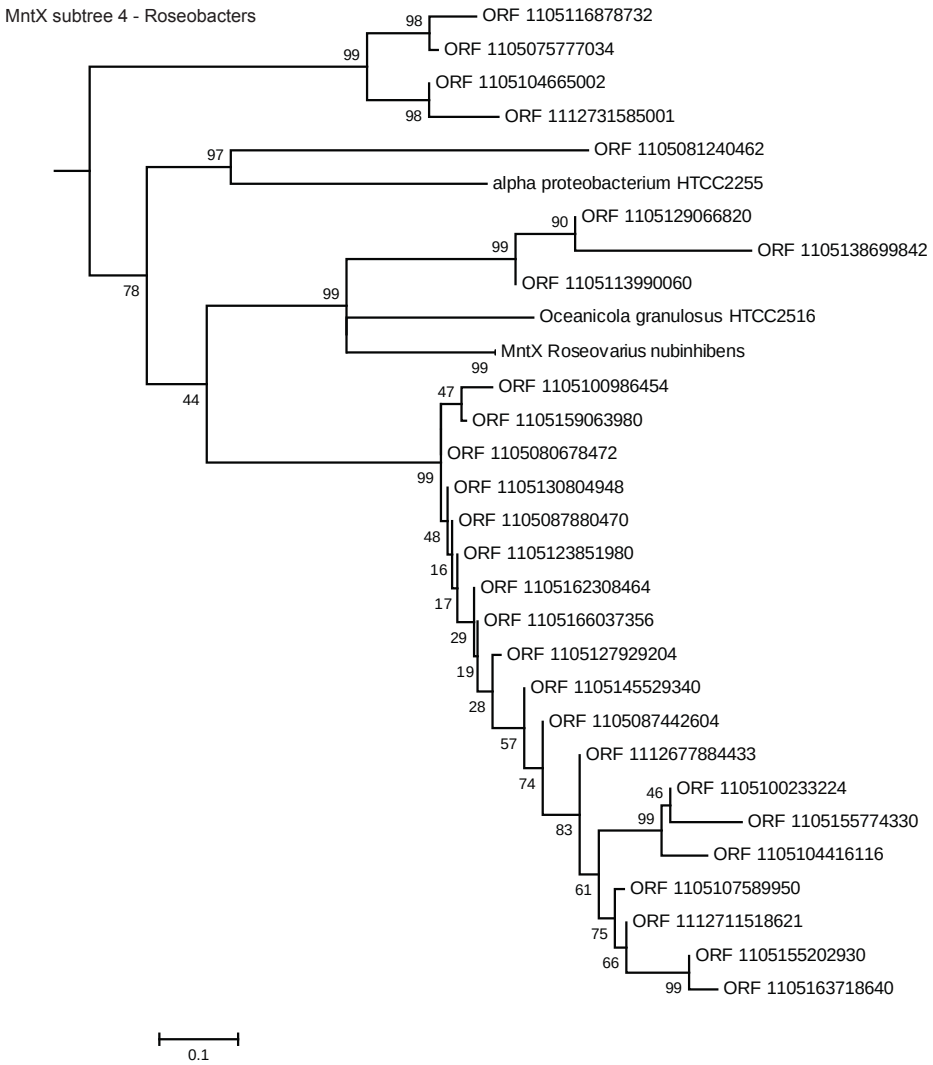
Appendix Figure 1. Blow-up of relatedness tree of MntX polypeptides

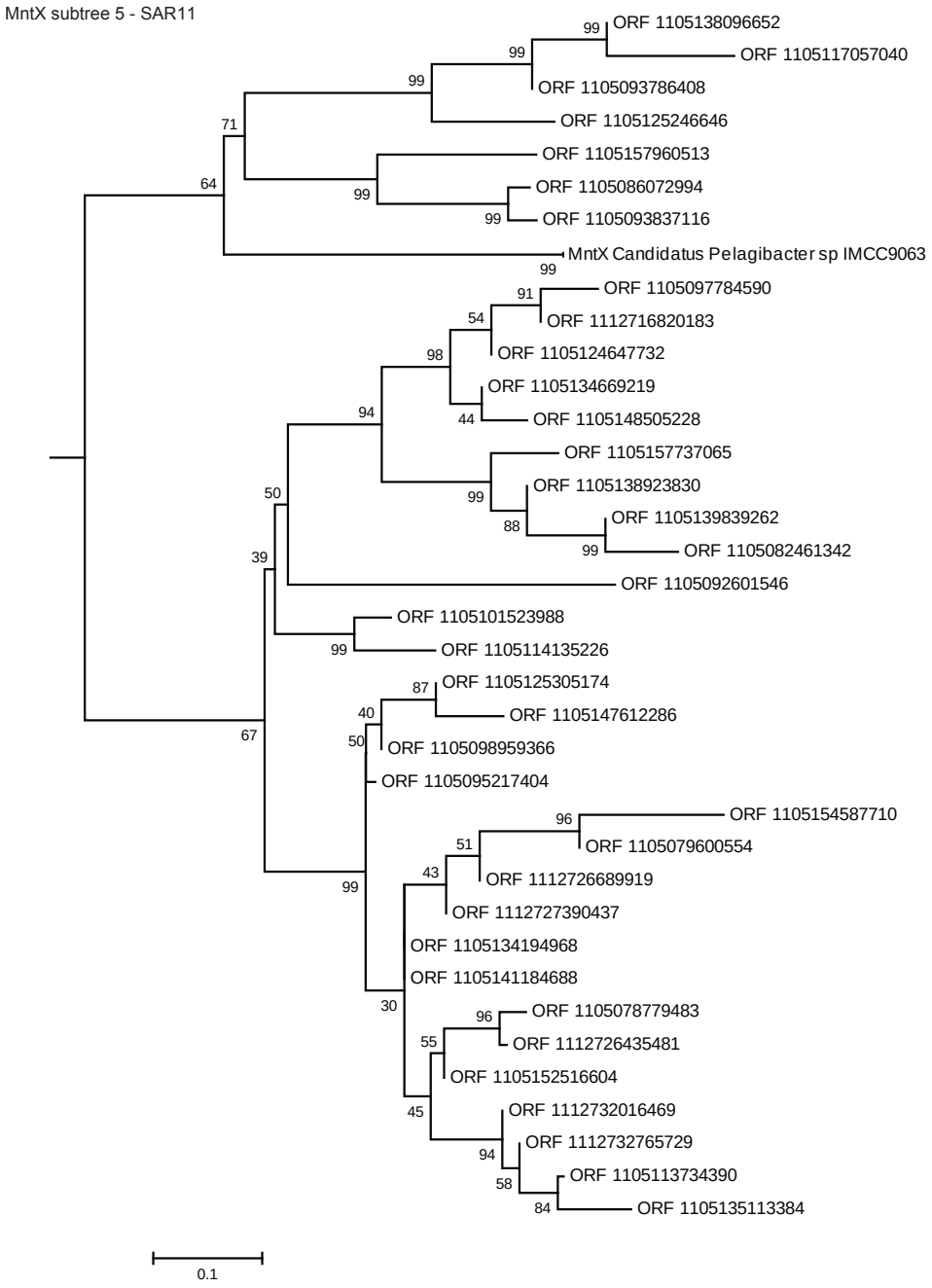
The individual sequences in each of the five sub-groups of MntX polypeptides in the relatedness tree in Figure 6.9 are shown in higher magnification. Those with the prefix “ORF” are from the GOS data base and are described further in Appendix Table 1. The MntX subtrees 1-5 contain the MntX sequences of the γ-proteobacterial, SAR116, Class X, Roseobacter and Pelagibacter types, respectively.


MntX subtree 1 - Gamma Proteobacteria
Vibrio parahaemolyticus 10329
Vibrio parahaemolyticus AQ3810
Vibrio parahaemolyticus AQ4037
Vibrio parahaemolyticus RIMD 2210633
Vibrio sp. Ex25
Vibrio alginolyticus 12G01
Vibrio alginolyticus 40B
Vibrio sp. EJY3
Vibrio vulnificus MO6-24/O
Vibrio vulnificus YJ016
Vibrio vulnificus CMCP6
Vibrio harveyi 1DA3
Vibrio sp. AND4
Vibrio rotiferianus DAT722
Vibrio harveyi ATCC BAA-1116
Vibrio harveyi HY01
Vibrio fischeri MJ11
Vibrio fischeri SR5
Vibrio fischeri ES114
Aliivibrio salmonicida LFI1238
Vibrio scophthalmi LMG 19158
Vibrio sp. N418
Vibrio ichthyoenteri ATCC 700023
Vibrio coralliilyticus BAA-450
Vibrio parahaemolyticus 16
Vibrio brasiliensis LMG 20546
Vibrio tubiashii ATCC 19109
Vibrio orientalis 33934
Vibrio orientalis 33934 3
Vibrio splendidus ATCC 33789
Vibrio splendidus 12B01
Vibrio sp. MED222
Vibrio splendidus LGP32
Vibrio shilonii AK1
Vibrio furnissii CIP 102972
Vibrio furnissii CIP 102972 2
MntX Vibrio furnissii CIP 102972
Vibrio furnissii NCTC 11218
Vibrio mimicus SX-4
Vibrio mimicus VM573
Vibrio mimicus MB-451
Vibrio mimicus VM223
Vibrio mimicus VM603
Vibrio cholerae CT 5369-93
Vibrio cholerae HC-02A1
Vibrio cholerae HE48
Vibrio cholerae HE39
Vibrio cholerae TM 11079-80
Vibrio cholerae TMA 21
Vibrio cholerae VL426
Vibrio cholerae V52
Vibrio cholerae HE-09
Vibrio cholerae MZO-2
Vibrio cholerae 623-39
Vibrio cholerae BJG-01
Vibrio cholerae 12129
Vibrio cholerae 1587
Vibrio cholerae AM-19226
Vibrio cholerae RC385
Vibrio cholera CIRS 101
Vibrio cholerae O395
Vibrio cholerae MZO-3
Vibrio cholerae BX 330286
Vibrio cholerae N16961
Vibrio cholerae O395 2
Photobacterium damselae 102761
Photobacterium damselae
Photobacterium profundum 3TCK
Photobacterium profundum SS9
ORF 1105100710648
Colwellia psychrerythraea 34H
ORF 1105144824560
Alteromonas macleodii ATCC 27126
Marinomonas mediterranea MMB-1
Vibrio orientalis 33934 2
Pseudoalteromonas tunicata D2
MntX Pseudoalteromonas tunicata D2
Pseudoalteromonas sp. BSi20311
Pseudoalteromonas sp. SM9913
Alteromonadales bacterium TW-7
Pseudoalteromonas sp. BSi20480
Pseudoalteromonas haloplanktis TAC125
Pseudoalteromonas sp. BSi20495
Pseudoalteromonas sp. BSi20429
Pseudoalteromonas sp. BSi20652
0.1


MntX subtree 2 - SAR116
ORF 1105093286022
ORF 1105089582726
ORF 1105128416142
ORF 1105116309476
ORF 1112732447125
ORF 1112727939127
ORF 1105079871392
ORF 1112731672905
ORF 1105138953440
ORF 1105159105414
ORF 1105096772816
ORF 1105090606702
ORF 1105084221792
ORF 1112731544301
ORF 1105141650010
ORF 1105094380192
ORF 1112710866269
ORF 1105078146184
ORF 1105141504354
ORF 1105131482512
ORF 1105137785466
ORF 1105141859990
ORF 1105115647982
ORF 1112711829129
ORF 1105090628110
ORF 1105130901572
ORF 1105083189968
ORF 1105120526418
ORF 1105109647102
ORF 1105110407030
ORF 1105136043311
ORF 1112698084109
ORF 1105158378580
ORF 1105162931758
SAR116 cluster HIMB100
MntX SAR116 cluster HIMB100
ORF 1105110575166
ORF 1105134984852
ORF 1105157891593
ORF 1112728035513
ORF 1112711104619
ORF 1105144830002
ORF 1105163803146
ORF 1105110319814
ORF 1105089039270
ORF 1105095111010
Puniceispirillum marinum IMCC1322
ORF 1105139157190
ORF 1105108195268
ORF 1105108002314
ORF 1105161837952
ORF 1105128912274
ORF 1105125670094
ORF 1105136834327
ORF 1105102482430
ORF 1105117678006
ORF 1105080974874
ORF 1105111818054
ORF 1105128113454
ORF 1105137049656
ORF 1105118410022
ORF 1105096775824
0.1


MntX subtree 3 - GROUP X
ORF 1105138417612
ORF 1105136096134
ORF 1105105677044
ORF 1105096183192
ORF 1105125351332
ORF 1105159397390
ORF 1105156216394
ORF 1105164201822
ORF 1105101067096
ORF 1105101064360
ORF 1105093664876
ORF 1105130563970
ORF 1105119251266
ORF 1105132911442
ORF 1105125857892
ORF 1105148860144
ORF 1105138650850
ORF 1105092139762
ORF 1105131659222
ORF 1105094984116
ORF 1105133337850
ORF 1105094984828
ORF 1112697632001
ORF 1112677799933
ORF 1105151876760
ORF 1105078548317
ORF 1105154924624
ORF 1105165374336
ORF 1105098548992
ORF 1105113725314
ORF 1112732395395
ORF 1112689220623
ORF 1105114229504
ORF 1105138999764
ORF 1105140674642
ORF 1105099568634
ORF 110511116571
ORF 1105149695734
ORF 1105129361306
ORF 1112733014981
ORF 1105162111862
ORF 1105093853466
ORF 1105115036664
ORF 1105148819262
ORF 1112717278381
ORF 1105080139626
ORF 1105090879976
ORF 1105124324072
ORF 1112698216923
ORF 1105112993948
ORF 1112701269949
ORF 1105104969502
ORF 1112709647105
ORF 1105101247574
ORF 1112730325173
ORF 1105090992994
ORF 1105131849842
ORF 1105104655552
ORF 1112717110139
0.05


MntX subtree 4 - Roseobacters
ORF 1105116878732
ORF 1105075777034
ORF 1105104665002
ORF 1112731585001
ORF 1105081240462
alpha proteobacterium HTCC2255
ORF 1105129066820
ORF 1105138699842
ORF 1105113990060
Oceanicola granulosus HTCC2516
MntX Roseovarius nubinhibens
ORF 1105100986454
ORF 1105159063980
ORF 1105080678472
ORF 1105130804948
ORF 1105087880470
ORF 1105123851980
ORF 1105162308464
ORF 1105166037356
ORF 1105127929204
ORF 1105145529340
ORF 1105087442604
ORF 1112677884433
ORF 1105100233224
ORF 1105155774330
ORF 1105104416116
ORF 1105107589950
ORF 1112711518621
ORF 1105155202930
ORF 1105163718640
98
99
98
97
90
99
78
99
99
47
44
99
48
16
17
29
19
28
57
74
46
99
83
61
75
66
99
0.1


MntX subtree 5 - SAR11
ORF 1105138096652
ORF 1105117057040
ORF 1105093786408
ORF 1105125246646
ORF 1105157960513
ORF 1105086072994
ORF 1105093837116
MntX Candidatus Pelagibacter sp IMCC9063
ORF 1105097784590
ORF 1112716820183
ORF 1105124647732
ORF 1105134669219
ORF 1105148505228
ORF 1105157737065
ORF 1105138923830
ORF 1105139839262
ORF 1105082461342
ORF 1105092601546
ORF 1105101523988
ORF 1105114135226
ORF 1105125305174
ORF 1105147612286
ORF 1105098959366
ORF 1105095217404
ORF 1105154587710
ORF 1105079600554
ORF 1112726689919
ORF 1112727390437
ORF 1105134194968
ORF 1105141184688
ORF 1105078779483
ORF 1112726435481
ORF 1105152516604
ORF 1112732016469
ORF 1112732765729
ORF 1105113734390
ORF 1105135113384
0.1

Appendix Table 1. Details of the MntX homologues in the GOS data base

The CAMERA data set "GOS: All ORF Peptides" was interrogated using MntX of *Roseovarius nubinhibens* (locus: *ISM_02005*). All GOS homologous sequences (in column [a]) with E-values <$1E^{-20}$, (values in column [b]) are shown, together with their geographic origin (column [c]) and habitat (column [d]). Column [e] lists the GOS homologues on the bases of the clusters shown in Figure 6.9 and Appendix Figure 1, using abbreviations: "116" = SAR116 group; "G" = gamma-proteobacteria; "P" = *Pelagibacter*; "R" = Roseobacters; "X" = the cluster that contains only GOS sequences. Those GOS homologues with insufficient coverage of the MntX polypeptide to be included in the neighbor-joining trees are shown as "not used" in column [e].

Subject Name[a]	E-Value[b]	Sample Position[c]	Habitat[d]	Cluster[e]
JCVI_PEP_1105136834328	1.13E-52	Cape May, NJ	Coastal	116
JCVI_PEP_1105111818055	2.45E-50	Newport Harbor, RI	Coastal	116
JCVI_PEP_1105117678007	1.68E-49	Block Island, NY	Coastal	116
JCVI_PEP_1105102482431	1.03E-47	Block Island, NY	Coastal	116
JCVI_PEP_1105138953441	8.65E-47	250 miles from Panama City	Open Ocean	116
JCVI_PEP_1105078146185	2.08E-46	Upwelling, Fernandina Island	Coastal upwelling	116
JCVI_PEP_1105159105415	2.69E-46	Off Nags Head, NC	Coastal	116
JCVI_PEP_1105141859991	1.31E-45	Rangirora Atoll	Coral Reef Atoll	116
JCVI_PEP_1105162931759	7.76E-45	Wolf Island	Coastal	116
JCVI_PEP_1105115647983	6.74E-45	Hydrostation S	Open Ocean	116
JCVI_PEP_1105158378581	6.68E-44	Devil's Crown, Floreana Island	Coastal	116
JCVI_PEP_1105084221793	5.61E-44	Rangirora Atoll	Coral Reef Atoll	116
JCVI_PEP_1105128416143	2.10E-42	Upwelling, Fernandina Island	Coastal upwelling	116
JCVI_PEP_1105120526419	4.05E-42	Upwelling, Fernandina Island	Coastal upwelling	116
JCVI_PEP_1112711829130	1.85E-41	International water between Madagascar and South Africa	Open Ocean	116
JCVI_PEP_1105116309477	2.56E-41	Sargasso Station 13	Open Ocean	116
JCVI_PEP_1105095111011	1.16E-40	Cabo Marshall, Isabella Island	Coastal	116
JCVI_PEP_1105128113455	9.03E-40	Off Nags Head, NC	Coastal	116
JCVI_PEP_1105089039271	2.13E-39	Rangirora Atoll	Coral Reef Atoll	116
JCVI_PEP_1105109647103	2.79E-39	Hydrostation S	Open Ocean	116
JCVI_PEP_1105096772817	9.66E-39	Gulf of Maine	Coastal	116
JCVI_PEP_1112732447126	2.54E-38	Moorea, Outside Cooks Bay	Coastal	116
JCVI_PEP_1105094380193	2.50E-38	Devil's Crown, Floreana Island	Coastal	116
JCVI_PEP_1105141650011	4.27E-38	Coastal Floreana	Coastal	116
JCVI_PEP_1105093286023	6.98E-38	Coastal Floreana	Coastal	116
JCVI_PEP_1105161837953	1.98E-37	250 miles from Panama City	Open Ocean	116
JCVI_PEP_1105157891594	2.86E-37	Yucatan Channel	Open Ocean	116
JCVI_PEP_1112731544302	5.13E-37	St. Anne Island, Seychelles	Coastal sample	116
JCVI_PEP_1105110407031	8.46E-37	Wolf Island	Coastal	116
JCVI_PEP_1105080974875	7.40E-37	Off Nags Head, NC	Coastal	116
JCVI_PEP_1105128912275	1.13E-36	Northeast of Colon	Coastal	116
JCVI_PEP_1105130901573	2.19E-36	North James Bay, Santigo Island	Coastal	116
JCVI_PEP_1105083189969	3.67E-36	North James Bay, Santigo Island	Coastal	116
JCVI_PEP_1105136043312	2.38E-35	Wolf Island	Coastal	116
JCVI_PEP_1105139157191	2.93E-35	134 miles NE of Galapagos	Open Ocean	116
JCVI_PEP_1105110319815	2.28E-34	Upwelling, Fernandina Island	Coastal upwelling	116
JCVI_PEP_1112728035514	1.81E-33	Outside Seychelles, Indian Ocean	Open Ocean	116
JCVI_PEP_1105110575167	2.19E-33	Gulf of Panama	Coastal	116

JCVI_PEP_1105141504355	1.16E-32	Rosario Bank	Open Ocean	116
JCVI_PEP_1105108002315	1.16E-31	Devil's Crown, Floreana Island	Coastal	116
JCVI_PEP_1105131482513	1.93E-31	Sargasso Station 13	Open Ocean	116
JCVI_PEP_1112698084110	2.72E-31	Coccos Keeling, Inside Lagoon	Lagoon Reef	116
JCVI_PEP_1105090606703	4.61E-31	Devil's Crown, Floreana Island	Coastal	116
JCVI_PEP_1105137785467	1.77E-30	Sargasso Station 13	Open Ocean	116
JCVI_PEP_1105118410023	2.47E-30	Gulf of Maine	Coastal	116
JCVI_PEP_1105137049657	4.77E-30	Newport Harbor, RI	Coastal	116
JCVI_PEP_1105089582727	7.18E-29	Upwelling, Fernandina Island	Coastal upwelling	116
JCVI_PEP_1105125670095	4.21E-28	250 miles from Panama City	Open Ocean	116
JCVI_PEP_1105096775825	5.63E-28	Gulf of Maine	Coastal	116
JCVI_PEP_1105108195269	3.04E-27	Rangirora Atoll	Coral Reef Atoll	116
JCVI_PEP_1112731672906	2.68E-26	St. Anne Island, Seychelles	Coastal sample	116
JCVI_PEP_1105163803147	2.71E-26	Upwelling, Fernandina Island	Coastal upwelling	116
JCVI_PEP_1105134984853	5.41E-26	Hydrostation S	Open Ocean	116
JCVI_PEP_1112711104620	5.41E-26	Indian Ocean	Open Ocean	116
JCVI_PEP_1112727939128	2.89E-25	Outside Seychelles, Indian Ocean	Open Ocean	116
JCVI_PEP_1105079871393	1.42E-23	Northeast of Colon	Coastal	116
JCVI_PEP_1105144830003	4.54E-23	Sargasso Station 13	Open Ocean	116
JCVI_PEP_1105090628111	5.50E-22	Sargasso Station 13	Open Ocean	116
JCVI_PEP_1112710866270	1.17E-20	Indian Ocean	Open Ocean	116
JCVI_PEP_1105100710649	5.03E-42	Upwelling, Fernandina Island	Coastal upwelling	G
JCVI_PEP_1105144824561	3.79E-41	Sargasso Station 13	Open Ocean	G
JCVI_PEP_1105086072995	7.77E-44	Delaware Bay, NJ	Estuary	P
JCVI_PEP_1105093837117	1.40E-43	Delaware Bay, NJ	Estuary	P
JCVI_PEP_1105095217405	1.85E-42	Warm seep, Roca Redonda	Warm Seep	P
JCVI_PEP_1105101523989	2.69E-42	Newport Harbor, RI	Coastal	P
JCVI_PEP_1105152516605	3.67E-42	Warm seep, Roca Redonda	Warm Seep	P
JCVI_PEP_1105134669220	3.24E-41	Sargasso Station 13	Open Ocean	P
JCVI_PEP_1105124647733	1.66E-39	Devil's Crown, Floreana Island	Coastal	P
JCVI_PEP_1105114135227	2.03E-39	Off Nags Head, NC	Coastal	P
JCVI_PEP_1105078779484	4.26E-39	Warm seep, Roca Redonda	Warm Seep	P
JCVI_PEP_1105134194969	6.31E-39	North James Bay, Santigo Island	Coastal	P
JCVI_PEP_1105093786409	3.73E-38	Off Nags Head, NC	Coastal	P
JCVI_PEP_1105125305175	2.17E-37	Warm seep, Roca Redonda	Warm Seep	P
JCVI_PEP_1105125246647	2.26E-37	Gulf of Maine	Coastal	P
JCVI_PEP_1105157960514	3.35E-37	Chesapeake Bay, MD	Estuary	P
JCVI_PEP_1105154587711	4.34E-37	Warm seep, Roca Redonda	Warm Seep	P
JCVI_PEP_1105098959367	6.70E-37	Warm seep, Roca Redonda	Warm Seep	P
JCVI_PEP_1105079600555	6.64E-37	Warm seep, Roca Redonda	Warm Seep	P
JCVI_PEP_1112727390438	1.73E-36	East coast Zanzibar (Tanzania), offshore Paje lagoon	Fringing Reef	P
JCVI_PEP_1105147612287	2.32E-36	Warm seep, Roca Redonda	Warm Seep	P

JCVI_PEP_1105141184689	3.64E-35	North James Bay, Santigo Island	Coastal	P
JCVI_PEP_1112726689920	2.25E-34	West coast Zanzibar (Tanzania), harbour region	Harbor	P
JCVI_PEP_1105113734391	4.34E-33	Warm seep, Roca Redonda	Warm Seep	P
JCVI_PEP_1105138923831	2.66E-32	Wolf Island	Coastal	P
JCVI_PEP_1112732765730	9.44E-32	St. Anne Island, Seychelles	Coastal sample	P
JCVI_PEP_1105138096653	5.68E-31	Chesapeake Bay, MD	Estuary	P
JCVI_PEP_1105157737066	3.44E-30	Warm seep, Roca Redonda	Warm Seep	P
JCVI_PEP_1105139839263	2.94E-28	Warm seep, Roca Redonda	Warm Seep	P
JCVI_PEP_1105117057041	3.45E-27	Chesapeake Bay, MD	Estuary	P
JCVI_PEP_1105092601547	9.86E-27	Coastal Floreana	Coastal	P
JCVI_PEP_1112726435482	6.13E-26	West coast Zanzibar (Tanzania), harbour region	Harbor	P
JCVI_PEP_1105097784591	3.53E-25	201 miles from F. Polynesia	Open Ocean	P
JCVI_PEP_1105082461343	1.17E-23	Warm seep, Roca Redonda	Warm Seep	p
JCVI_PEP_1112732016470	1.64E-23	St. Anne Island, Seychelles	Coastal sample	P
JCVI_PEP_1105135113385	2.78E-23	North James Bay, Santigo Island	Coastal	P
JCVI_PEP_1105148505229	2.62E-23	Sargasso Station 13	Open Ocean	P
JCVI_PEP_1112716820184	6.14E-22	Indian Ocean	Open Ocean	P
JCVI_PEP_1105113990061	5.79E-105	Bedford Basin, Nova Scotia	Embayment	R
JCVI_PEP_1105129066821	2.56E-95	Cape May, NJ	Coastal	R
JCVI_PEP_1105100986455	5.74E-82	Yucatan Channel	Open Ocean	R
JCVI_PEP_1105162308465	5.28E-79	North James Bay, Santigo Island	Coastal	R
JCVI_PEP_1105116878733	1.58E-78	134 miles NE of Galapagos	Open Ocean	R
JCVI_PEP_1105123851981	8.58E-73	Warm seep, Roca Redonda	Warm Seep	R
JCVI_PEP_1105087880471	2.24E-72	Warm seep, Roca Redonda	Warm Seep	R
JCVI_PEP_1105087442605	1.09E-68	Northeast of Colon	Coastal	R
JCVI_PEP_1105159063981	2.34E-68	Northeast of Colon	Coastal	R
JCVI_PEP_1105104665003	3.06E-66	134 miles NE of Galapagos	Open Ocean	R
JCVI_PEP_1105080678473	4.38E-65	Rosario Bank	Open Ocean	R
JCVI_PEP_1105075777035	6.43E-64	Yucatan Channel	Open Ocean	R
JCVI_PEP_1105127929205	6.37E-64	Warm seep, Roca Redonda	Warm Seep	R
JCVI_PEP_1105130804949	2.63E-63	Hydrostation S	Open Ocean	R
JCVI_PEP_1105138699843	5.86E-63	Newport Harbor, RI	Coastal	R
JCVI_PEP_1105145529341	3.65E-59	Warm seep, Roca Redonda	Warm Seep	R
JCVI_PEP_1105081240463	2.49E-56	Upwelling, Fernandina Island	Coastal upwelling	R
JCVI_PEP_1105104416117	3.62E-56	Wolf Island	Coastal	R
JCVI_PEP_1105166037357	4.07E-56	201 miles from F. Polynesia	Open Ocean	R
JCVI_PEP_1105107589951	7.48E-56	Yucatan Channel	Open Ocean	R
JCVI_PEP_1105100233225	9.00E-55	Coastal Floreana	Coastal	R
JCVI_PEP_1112711518622	1.05E-51	International water between Madagascar and South Africa	Open Ocean	R
JCVI_PEP_1112677884434	4.66E-48	500 Miles west of the Seychelles in the Indian Ocean	Open Ocean	R
JCVI_PEP_1105155202931	8.65E-47	Off Key West, FL	Coastal	R

JCVI_PEP_1105163718641	1.19E-46	South of Charleston, SC	Coastal	R
JCVI_PEP_1105155774331	6.15E-43	North James Bay, Santigo Island	Coastal	R
JCVI_PEP_1112731585002	6.63E-43	St. Anne Island, Seychelles	Coastal sample	R
JCVI_PEP_1105119251267	1.41E-58	Sargasso Stations 3	Open Ocean	X
JCVI_PEP_1105090879977	2.23E-56	Warm seep, Roca Redonda	Warm Seep	X
JCVI_PEP_1105148860145	8.20E-56	Yucatan Channel	Open Ocean	X
JCVI_PEP_1105154924625	1.95E-54	Off Key West, FL	Coastal	X
JCVI_PEP_1105162111863	3.25E-54	Yucatan Channel	Open Ocean	X
JCVI_PEP_1105096183193	2.49E-53	Mangrove on Isabella Island	Mangrove	X
JCVI_PEP_1105132911443	1.02E-52	Upwelling, Fernandina Island	Coastal upwelling	X
JCVI_PEP_1105093664877	3.20E-52	Sargasso Stations 3	Open Ocean	X
JCVI_PEP_1105101067097	9.79E-50	Sargasso Station 13	Open Ocean	X
JCVI_PEP_1105129361307	1.09E-47	Warm seep, Roca Redonda	Warm Seep	X
JCVI_PEP_1105111165715	1.09E-47	Sargasso Station 13	Open Ocean	X
JCVI_PEP_1105099568635	1.63E-47	Sargasso Station 13	Open Ocean	X
JCVI_PEP_1105124324073	1.70E-47	Sargasso Stations 3	Open Ocean	X
JCVI_PEP_1105112993949	6.51E-47	Off Key West, FL	Coastal	X
JCVI_PEP_1105138999765	9.32E-47	Warm seep, Roca Redonda	Warm Seep	X
JCVI_PEP_1105092139763	5.33E-46	Sargasso Stations 3	Open Ocean	X
JCVI_PEP_1112732395396	9.89E-46	Moorea, Outside Cooks Bay	Coastal	X
JCVI_PEP_1105093853467	1.24E-45	Off Key West, FL	Coastal	X
JCVI_PEP_1105130563971	2.58E-45	Sargasso Stations 3	Open Ocean	X
JCVI_PEP_1105094984117	4.22E-45	Block Island, NY	Coastal	X
JCVI_PEP_1112689220624	4.40E-45	500 Miles west of the Seychelles in the Indian Ocean	Open Ocean	X
JCVI_PEP_1105140674643	6.91E-45	Warm seep, Roca Redonda	Warm Seep	X
JCVI_PEP_1105113725315	1.07E-44	30 miles from Cocos Island	Open Ocean	X
JCVI_PEP_1105114229505	9.33E-44	Sargasso Station 13	Open Ocean	X
JCVI_PEP_1105115036665	9.81E-44	Warm seep, Roca Redonda	Warm Seep	X
JCVI_PEP_1105138417613	1.36E-43	Upwelling, Fernandina Island	Coastal upwelling	X
JCVI_PEP_1105133337851	1.80E-43	Gulf of Maine	Coastal	X
JCVI_PEP_1105101064361	1.36E-41	Sargasso Station 13	Open Ocean	X
JCVI_PEP_1105149695735	1.61E-41	Sargasso Station 13	Open Ocean	X
JCVI_PEP_1105136096135	1.14E-40	Cabo Marshall, Isabella Island	Coastal	X
JCVI_PEP_1105148819263	1.48E-40	Warm seep, Roca Redonda	Warm Seep	X
JCVI_PEP_1112697632002	1.98E-40	Moorea, Cooks Bay	Coral Reef	X
JCVI_PEP_1105078548318	2.05E-39	Sargasso Station 13	Open Ocean	X
JCVI_PEP_1105165374337	1.93E-39	Rosario Bank	Open Ocean	X
JCVI_PEP_1105104969503	2.91E-39	Warm seep, Roca Redonda	Warm Seep	X
JCVI_PEP_1105138650851	8.31E-39	North Seamore Island	Coastal	X
JCVI_PEP_1105125351333	1.20E-37	Sargasso Station 13	Open Ocean	X
JCVI_PEP_1105094984829	3.52E-37	Block Island, NY	Coastal	X
JCVI_PEP_1112701269950	1.25E-36	Indian Ocean	Open Ocean	X
JCVI_PEP_1105131659223	1.14E-36	Sargasso Stations 3	Open Ocean	X
JCVI_PEP_1105125857893	1.24E-36	Upwelling, Fernandina Island	Coastal	X

			upwelling	
JCVI_PEP_1105159397391	2.15E-36	Sargasso Stations 3	Open Ocean	X
JCVI_PEP_1112698216924	2.54E-36	Coccos Keeling, Inside Lagoon	Lagoon Reef	X
JCVI_PEP_1105164201823	3.01E-36	Sargasso Station 13	Open Ocean	X
JCVI_PEP_1112733014982	2.70E-35	Moorea, Outside Cooks Bay	Coastal	X
JCVI_PEP_1112717278382	2.44E-34	Indian Ocean	Open Ocean	X
JCVI_PEP_1105080139627	1.51E-32	Devil's Crown, Floreana Island	Coastal	X
JCVI_PEP_1105156216395	2.82E-32	Mangrove on Isabella Island	Mangrove	X
JCVI_PEP_1105104655553	3.68E-32	Northeast of Colon	Coastal	X
JCVI_PEP_1105131849843	1.08E-30	Warm seep, Roca Redonda	Warm Seep	X
JCVI_PEP_1112717110140	1.71E-30	Indian Ocean	Open Ocean	X
JCVI_PEP_1105098548993	9.29E-30	250 miles from Panama City	Open Ocean	X
JCVI_PEP_1112677799934	1.16E-29	500 Miles west of the Seychelles in the Indian Ocean	Open Ocean	X
JCVI_PEP_1105101247575	1.65E-29	Sargasso Station 13	Open Ocean	X
JCVI_PEP_1105090992995	4.07E-28	North Seamore Island	Coastal	X
JCVI_PEP_1112709647106	3.56E-28	International Water Outside of Reunion Island	Open Ocean	X
JCVI_PEP_1112730325174	2.00E-27	St. Anne Island, Seychelles	Coastal sample	X
JCVI_PEP_1105151876761	3.72E-22	30 miles from Cocos Island	Open Ocean	X
JCVI_PEP_1105105677045	2.39E-21	Sargasso Stations 3	Open Ocean	X
JCVI_PEP_1105107514191	1.28E-75	Off Nags Head, NC	Coastal	Not used
JCVI_PEP_1105099089301	7.07E-52	Off Key West, FL	Coastal	Not used
JCVI_PEP_1105136338456	3.10E-50	134 miles NE of Galapagos	Open Ocean	Not used
JCVI_PEP_1112690003418	8.93E-50	500 Miles west of the Seychelles in the Indian Ocean	Open Ocean	Not used
JCVI_PEP_1105116878665	6.45E-49	134 miles NE of Galapagos	Open Ocean	Not used
JCVI_PEP_1105143559379	2.97E-47	Newport Harbor, RI	Coastal	Not used
JCVI_PEP_1112700253728	2.76E-44	Indian Ocean	Open Ocean	Not used
JCVI_PEP_1112727904146	3.73E-44	Outside Seychelles, Indian Ocean	Open Ocean	Not used
JCVI_PEP_1105114026345	2.98E-42	Browns Bank, Gulf of Maine	Coastal	Not used
JCVI_PEP_1112731465778	5.21E-42	St. Anne Island, Seychelles	Coastal sample	Not used
JCVI_PEP_1105113025343	1.04E-39	Upwelling, Fernandina Island	Coastal upwelling	Not used
JCVI_PEP_1105159847901	1.32E-39	Hydrostation S	Open Ocean	Not used
JCVI_PEP_1105110435823	7.84E-39	South of Charleston, SC	Coastal	Not used
JCVI_PEP_1112727988980	8.67E-39	Outside Seychelles, Indian Ocean	Open Ocean	Not used
JCVI_PEP_1105135357286	1.12E-38	South of Charleston, SC	Coastal	Not used
JCVI_PEP_1112689810654	1.28E-38	500 Miles west of the Seychelles in the Indian Ocean	Open Ocean	Not used
JCVI_PEP_1105083323561	3.58E-38	Sargasso Stations 3	Open Ocean	Not used
JCVI_PEP_1112732711068	3.61E-38	Moorea, Outside Cooks Bay	Coastal	Not used
JCVI_PEP_1112700904284	6.81E-38	Indian Ocean	Open Ocean	Not used
JCVI_PEP_1105089169351	6.58E-38	North Seamore Island	Coastal	Not used
JCVI_PEP_1105147669289	1.30E-37	Hydrostation S	Open Ocean	Not used
JCVI_PEP_1105096718169	5.08E-37	Sargasso Station 13	Open Ocean	Not used
JCVI_PEP_1105106372949	7.04E-37	Sargasso Station 13	Open Ocean	Not used

JCVI_PEP_1112715377066	1.07E-36	International waters between Madagascar and South Africa	Open Ocean	Not used
JCVI_PEP_1112732036080	1.15E-36	St. Anne Island, Seychelles	Coastal sample	Not used
JCVI_PEP_1105113364519	1.01E-35	Warm seep, Roca Redonda	Warm Seep	Not used
JCVI_PEP_1112736930156	1.53E-35	International water between Madagascar and South Africa	Open Ocean	Not used
JCVI_PEP_1105114415063	8.61E-35	134 miles NE of Galapagos	Open Ocean	Not used
JCVI_PEP_1105111010569	1.69E-33	Sargasso Station 13	Open Ocean	Not used
JCVI_PEP_1105113630737	2.48E-33	Hydrostation S	Open Ocean	Not used
JCVI_PEP_1105104989057	3.01E-33	Hydrostation S	Open Ocean	Not used
JCVI_PEP_1105141522597	5.44E-33	Off Key West, FL	Coastal	Not used
JCVI_PEP_1105154687927	8.12E-33	Wolf Island	Coastal	Not used
JCVI_PEP_1112716329812	1.61E-32	Indian Ocean	Open Ocean	Not used
JCVI_PEP_1105106556727	1.43E-32	Northeast of Colon	Coastal	Not used
JCVI_PEP_1105113595619	1.39E-32	Sargasso Station 13	Open Ocean	Not used
JCVI_PEP_1105164191053	1.93E-32	Sargasso Stations 3	Open Ocean	Not used
JCVI_PEP_1105105072647	1.78E-32	Sargasso Stations 3	Open Ocean	Not used
JCVI_PEP_1105109654545	2.00E-32	Sargasso Station 13	Open Ocean	Not used
JCVI_PEP_1105086669349	1.97E-32	Cabo Marshall, Isabella Island	Coastal	Not used
JCVI_PEP_1112740668362	1.95E-32	Indian Ocean	Open Ocean	Not used
JCVI_PEP_1105154381661	2.40E-32	30 miles from Cocos Island	Open Ocean	Not used
JCVI_PEP_1105116215075	2.84E-32	Sargasso Station 13	Open Ocean	Not used
JCVI_PEP_1112717206458	3.68E-32	Indian Ocean	Open Ocean	Not used
JCVI_PEP_1105095036641	3.24E-32	Off Key West, FL	Coastal	Not used
JCVI_PEP_1105119379713	2.96E-32	North Seamore Island	Coastal	Not used
JCVI_PEP_1105097618317	4.35E-32	Tropical South Pacific	Open Ocean	Not used
JCVI_PEP_1105145646771	4.13E-32	Rosario Bank	Open Ocean	Not used
JCVI_PEP_1105120406825	6.22E-32	Rosario Bank	Open Ocean	Not used
JCVI_PEP_1112732355738	5.87E-32	St. Anne Island, Seychelles	Coastal sample	Not used
JCVI_PEP_1105166013885	5.97E-32	250 miles from Panama City	Open Ocean	Not used
JCVI_PEP_1112677954140	5.97E-32	500 Miles west of the Seychelles in the Indian Ocean	Open Ocean	Not used
JCVI_PEP_1112736829988	5.92E-32	International water between Madagascar and South Africa	Open Ocean	Not used
JCVI_PEP_1105155324503	1.12E-31	Sargasso Station 13	Open Ocean	Not used
JCVI_PEP_1105091666459	1.24E-31	Sargasso Station 13	Open Ocean	Not used
JCVI_PEP_1112701697274	1.32E-31	500 Miles west of the Seychelles in the Indian Ocean	Open Ocean	Not used
JCVI_PEP_1112678137292	1.67E-31	500 Miles west of the Seychelles in the Indian Ocean	Open Ocean	Not used
JCVI_PEP_1105096964981	1.61E-31	Coastal Floreana	Coastal	Not used
JCVI_PEP_1105165869551	2.27E-31	North James Bay, Santigo Island	Coastal	Not used
JCVI_PEP_1105082141787	1.87E-31	Hydrostation S	Open Ocean	Not used
JCVI_PEP_1105091831231	2.10E-31	Upwelling, Fernandina Island	Coastal upwelling	Not used
JCVI_PEP_1105110024891	1.92E-31	Sargasso Stations 3	Open Ocean	Not used
JCVI_PEP_1112697730458	2.68E-31	Moorea, Cooks Bay	Coral Reef	Not used

JCVI_PEP_1105117775409	2.79E-31	North James Bay, Santigo Island	Coastal	Not used
JCVI_PEP_1112700762872	4.13E-31	500 Miles west of the Seychelles in the Indian Ocean	Open Ocean	Not used
JCVI_PEP_1112711565750	5.40E-31	International water between Madagascar and South Africa	Open Ocean	Not used
JCVI_PEP_1112730419344	5.58E-31	St. Anne Island, Seychelles	Coastal sample	Not used
JCVI_PEP_1105085284613	5.49E-31	Upwelling, Fernandina Island	Coastal upwelling	Not used
JCVI_PEP_1105103638901	1.10E-30	Sargasso Station 13	Open Ocean	Not used
JCVI_PEP_1105158948811	1.43E-30	Newport Harbor, RI	Coastal	Not used
JCVI_PEP_1105118294623	1.89E-30	Sargasso Station 13	Open Ocean	Not used
JCVI_PEP_1112732506124	2.64E-30	St. Anne Island, Seychelles	Coastal sample	Not used
JCVI_PEP_1105132253699	2.53E-30	Upwelling, Fernandina Island	Coastal upwelling	Not used
JCVI_PEP_1105145195751	3.30E-30	Northern Gulf of Maine	Coastal	Not used
JCVI_PEP_1112710545372	2.96E-30	Indian Ocean	Open Ocean	Not used
JCVI_PEP_1112736597466	3.04E-30	International water between Madagascar and South Africa	Open Ocean	Not used
JCVI_PEP_1105115884603	4.21E-30	Coastal Floreana	Coastal	Not used
JCVI_PEP_1105104491509	5.49E-30	Coastal Floreana	Coastal	Not used
JCVI_PEP_1105144133381	4.69E-30	Wolf Island	Coastal	Not used
JCVI_PEP_1112689265682	6.94E-30	500 Miles west of the Seychelles in the Indian Ocean	Open Ocean	Not used
JCVI_PEP_1105150593617	7.17E-30	North James Bay, Santigo Island	Coastal	Not used
JCVI_PEP_1105084814695	8.99E-30	Devil's Crown, Floreana Island	Coastal	Not used
JCVI_PEP_1105118423279	1.08E-29	Gulf of Maine	Coastal	Not used
JCVI_PEP_1105085958526	1.47E-29	Sargasso Station 13	Open Ocean	Not used
JCVI_PEP_1105102055405	1.72E-29	Block Island, NY	Coastal	Not used
JCVI_PEP_1105143160005	1.40E-29	Browns Bank, Gulf of Maine	Coastal	Not used
JCVI_PEP_1112731010420	1.86E-29	St. Anne Island, Seychelles	Coastal sample	Not used
JCVI_PEP_1105117204245	2.23E-29	North James Bay, Santigo Island	Coastal	Not used
JCVI_PEP_1112677871538	2.73E-29	500 Miles west of the Seychelles in the Indian Ocean	Open Ocean	Not used
JCVI_PEP_1105163551669	2.75E-29	Yucatan Channel	Open Ocean	Not used
JCVI_PEP_1105105202075	2.82E-29	Sargasso Stations 3	Open Ocean	Not used
JCVI_PEP_1105098197629	2.39E-29	North James Bay, Santigo Island	Coastal	Not used
JCVI_PEP_1105135289252	3.39E-29	Yucatan Channel	Open Ocean	Not used
JCVI_PEP_1105146897813	3.06E-29	Yucatan Channel	Open Ocean	Not used
JCVI_PEP_1105127980721	3.09E-29	201 miles from F. Polynesia	Open Ocean	Not used
JCVI_PEP_1105103115679	3.36E-29	Bay of Fundy, Nova Scotia	Estuary	Not used
JCVI_PEP_1105138603371	4.24E-29	Block Island, NY	Coastal	Not used
JCVI_PEP_1112701310826	4.24E-29	Indian Ocean	Open Ocean	Not used
JCVI_PEP_1105091541629	4.73E-29	Sargasso Station 13	Open Ocean	Not used
JCVI_PEP_1105124799295	5.97E-29	Bay of Fundy, Nova Scotia	Estuary	Not used
JCVI_PEP_1105126693923	8.00E-29	134 miles NE of Galapagos	Open Ocean	Not used
JCVI_PEP_1105129750425	6.88E-29	North Seamore Island	Coastal	Not used
JCVI_PEP_1105108274835	1.36E-28	Warm seep, Roca Redonda	Warm Seep	Not used

JCVI_PEP_1105158222097	1.77E-28	Northeast of Colon	Coastal	Not used
JCVI_PEP_1105147549529	1.55E-28	Sargasso Station 13	Open Ocean	Not used
JCVI_PEP_1105136237363	1.65E-28	Rangirora Atoll	Coral Reef Atoll	Not used
JCVI_PEP_1105140117765	1.48E-28	Sargasso Station 13	Open Ocean	Not used
JCVI_PEP_1105122641279	1.68E-28	Sargasso Station 13	Open Ocean	Not used
JCVI_PEP_1105125171135	1.59E-28	134 miles NE of Galapagos	Open Ocean	Not used
JCVI_PEP_1105143074023	2.12E-28	Upwelling, Fernandina Island	Coastal upwelling	Not used
JCVI_PEP_1105119959175	2.47E-28	Sargasso Station 13	Open Ocean	Not used
JCVI_PEP_1105146457801	2.41E-28	30 miles from Cocos Island	Open Ocean	Not used
JCVI_PEP_1105087623455	2.31E-28	Off Key West, FL	Coastal	Not used
JCVI_PEP_1105116097393	2.91E-28	Devil's Crown, Floreana Island	Coastal	Not used
JCVI_PEP_1105119057297	3.25E-28	Sargasso Station 13	Open Ocean	Not used
JCVI_PEP_1105126224171	2.51E-28	Wolf Island	Coastal	Not used
JCVI_PEP_1105158569931	2.53E-28	Warm seep, Roca Redonda	Warm Seep	Not used
JCVI_PEP_1105105227201	3.90E-28	Warm seep, Roca Redonda	Warm Seep	Not used
JCVI_PEP_1105113173947	3.30E-28	Warm seep, Roca Redonda	Warm Seep	Not used
JCVI_PEP_1112700650814	3.68E-28	Indian Ocean	Open Ocean	Not used
JCVI_PEP_1105098554789	3.65E-28	250 miles from Panama City	Open Ocean	Not used
JCVI_PEP_1105092898513	3.59E-28	Cabo Marshall, Isabella Island	Coastal	Not used
JCVI_PEP_1105118401697	5.14E-28	Rangirora Atoll	Coral Reef Atoll	Not used
JCVI_PEP_1105092561319	6.55E-28	Mangrove on Isabella Island	Mangrove	Not used
JCVI_PEP_1105125434021	9.14E-28	Off Nags Head, NC	Coastal	Not used
JCVI_PEP_1105156491461	9.53E-28	Rangirora Atoll	Coral Reef Atoll	Not used
JCVI_PEP_1105092387615	1.18E-27	Sargasso Stations 3	Open Ocean	Not used
JCVI_PEP_1105162749005	1.59E-27	30 miles from Cocos Island	Open Ocean	Not used
JCVI_PEP_1112715898796	1.47E-27	International waters between Madagascar and South Africa	Open Ocean	Not used
JCVI_PEP_1112736927170	1.64E-27	International water between Madagascar and South Africa	Open Ocean	Not used
JCVI_PEP_1105105125543	1.77E-27	Upwelling, Fernandina Island	Coastal upwelling	Not used
JCVI_PEP_1105165471345	3.39E-27	North Seamore Island	Coastal	Not used
JCVI_PEP_1112710779374	3.28E-27	Indian Ocean	Open Ocean	Not used
JCVI_PEP_1105114874431	3.14E-27	Hydrostation S	Open Ocean	Not used
JCVI_PEP_1112731646012	3.84E-27	St. Anne Island, Seychelles	Coastal sample	Not used
JCVI_PEP_1105080855761	6.08E-27	30 miles from Cocos Island	Open Ocean	Not used
JCVI_PEP_1105106333735	5.68E-27	Sargasso Station 13	Open Ocean	Not used
JCVI_PEP_1105141696121	5.59E-27	Devil's Crown, Floreana Island	Coastal	Not used
JCVI_PEP_1105120443141	7.74E-27	Delaware Bay, NJ	Estuary	Not used
JCVI_PEP_1105097461657	8.92E-27	Sargasso Station 13	Open Ocean	Not used
JCVI_PEP_1105081307505	8.70E-27	Yucatan Channel	Open Ocean	Not used
JCVI_PEP_1112736226318	8.92E-27	International water between Madagascar and South Africa	Open Ocean	Not used
JCVI_PEP_1105088248059	8.48E-27	Sargasso Station 13	Open Ocean	Not used

JCVI_PEP_1105165585411	9.38E-27	Delaware Bay, NJ	Estuary	Not used
JCVI_PEP_1105106739435	1.03E-26	Delaware Bay, NJ	Estuary	Not used
JCVI_PEP_1105152531997	1.25E-26	Upwelling, Fernandina Island	Coastal upwelling	Not used
JCVI_PEP_1105102340705	1.30E-26	Sargasso Station 13	Open Ocean	Not used
JCVI_PEP_1112736547410	1.46E-26	International water between Madagascar and South Africa	Open Ocean	Not used
JCVI_PEP_1112715632406	2.16E-26	International waters between Madagascar and South Africa	Open Ocean	Not used
JCVI_PEP_1105108895531	2.33E-26	Sargasso Station 13	Open Ocean	Not used
JCVI_PEP_1105110703857	1.89E-26	Sargasso Station 13	Open Ocean	Not used
JCVI_PEP_1105100445535	3.09E-26	Sargasso Stations 3	Open Ocean	Not used
JCVI_PEP_1112697484856	4.58E-26	Moorea, Cooks Bay	Coral Reef	Not used
JCVI_PEP_1105139830403	5.64E-26	Off Key West, FL	Coastal	Not used
JCVI_PEP_1105162291717	8.41E-26	Newport Harbor, RI	Coastal	Not used
JCVI_PEP_1105095790659	1.16E-25	Bay of Fundy, Nova Scotia	Estuary	Not used
JCVI_PEP_1105161697585	1.18E-25	Chesapeake Bay, MD	Estuary	Not used
JCVI_PEP_1105133358451	1.86E-25	Yucatan Channel	Open Ocean	Not used
JCVI_PEP_1105157143905	2.00E-25	Chesapeake Bay, MD	Estuary	Not used
JCVI_PEP_1105135428984	2.55E-25	Rangirora Atoll	Coral Reef Atoll	Not used
JCVI_PEP_1105107383401	2.62E-25	Sargasso Stations 3	Open Ocean	Not used
JCVI_PEP_1105151220301	2.68E-25	Chesapeake Bay, MD	Estuary	Not used
JCVI_PEP_1105093949197	3.81E-25	Gulf of Panama	Coastal	Not used
JCVI_PEP_1105139459569	4.98E-25	Newport Harbor, RI	Coastal	Not used
JCVI_PEP_1112689421410	7.43E-25	500 Miles west of the Seychelles in the Indian Ocean	Open Ocean	Not used
JCVI_PEP_1112726506970	7.68E-25	West coast Zanzibar (Tanzania), harbour region	Harbor	Not used
JCVI_PEP_1105145927877	9.54E-25	Sargasso Station 13	Open Ocean	Not used
JCVI_PEP_1105141881745	7.62E-25	Coastal Floreana	Coastal	Not used
JCVI_PEP_1105118643945	1.59E-24	Sargasso Station 13	Open Ocean	Not used
JCVI_PEP_1112736431814	1.45E-24	International water between Madagascar and South Africa	Open Ocean	Not used
JCVI_PEP_1105139672153	1.53E-24	Warm seep, Roca Redonda	Warm Seep	Not used
JCVI_PEP_1105143724721	2.18E-24	Warm seep, Roca Redonda	Warm Seep	Not used
JCVI_PEP_1112730289950	2.13E-24	St. Anne Island, Seychelles	Coastal sample	Not used
JCVI_PEP_1112732611676	2.53E-24	Moorea, Outside Cooks Bay	Coastal	Not used
JCVI_PEP_1105095212519	3.25E-24	Warm seep, Roca Redonda	Warm Seep	Not used
JCVI_PEP_1105142526283	4.50E-24	Sargasso Station 13	Open Ocean	Not used
JCVI_PEP_1112711765764	4.32E-24	International water between Madagascar and South Africa	Open Ocean	Not used
JCVI_PEP_1112730564854	4.81E-24	St. Anne Island, Seychelles	Coastal sample	Not used
JCVI_PEP_1105159007305	4.28E-24	134 miles NE of Galapagos	Open Ocean	Not used
JCVI_PEP_1112701681448	4.01E-24	500 Miles west of the Seychelles in the Indian Ocean	Open Ocean	Not used
JCVI_PEP_1105091810867	6.08E-24	Warm seep, Roca Redonda	Warm Seep	Not used
JCVI_PEP_1105124126853	5.46E-24	Newport Harbor, RI	Coastal	Not used

JCVI_PEP_1105141429891	8.08E-24	Off Key West, FL	Coastal	Not used
JCVI_PEP_1105125820711	7.94E-24	Northeast of Colon	Coastal	Not used
JCVI_PEP_1105125216765	8.71E-24	134 miles NE of Galapagos	Open Ocean	Not used
JCVI_PEP_1105119376039	1.18E-23	North Seamore Island	Coastal	Not used
JCVI_PEP_1105099708065	1.68E-23	Coastal Floreana	Coastal	Not used
JCVI_PEP_1105113485987	2.92E-23	Yucatan Channel	Open Ocean	Not used
JCVI_PEP_1105124122977	2.60E-23	Newport Harbor, RI	Coastal	Not used
JCVI_PEP_1105128061417	3.15E-23	250 miles from Panama City	Open Ocean	Not used
JCVI_PEP_1105127055507	2.69E-23	Sargasso Station 13	Open Ocean	Not used
JCVI_PEP_1105093675327	2.75E-23	Warm seep, Roca Redonda	Warm Seep	Not used
JCVI_PEP_1105165959985	3.88E-23	Sargasso Station 13	Open Ocean	Not used
JCVI_PEP_1105126736045	6.89E-23	Gulf of Panama	Coastal	Not used
JCVI_PEP_1105122405441	5.41E-23	134 miles NE of Galapagos	Open Ocean	Not used
JCVI_PEP_1112716859452	8.35E-23	Indian Ocean	Open Ocean	Not used
JCVI_PEP_1112700318142	9.31E-23	Indian Ocean	Open Ocean	Not used
JCVI_PEP_1105106811677	1.39E-22	Cape May, NJ	Coastal	Not used
JCVI_PEP_1105147329807	1.83E-22	Sargasso Stations 3	Open Ocean	Not used
JCVI_PEP_1105127299435	1.74E-22	Yucatan Channel	Open Ocean	Not used
JCVI_PEP_1112730859118	1.86E-22	St. Anne Island, Seychelles	Coastal sample	Not used
JCVI_PEP_1105098531181	2.14E-22	Gulf of Panama	Coastal	Not used
JCVI_PEP_1105142526493	2.09E-22	Sargasso Station 13	Open Ocean	Not used
JCVI_PEP_1105100740193	2.51E-22	Hydrostation S	Open Ocean	Not used
JCVI_PEP_1105140347375	3.12E-22	Coastal Floreana	Coastal	Not used
JCVI_PEP_1105155289873	2.85E-22	North Seamore Island	Coastal	Not used
JCVI_PEP_1112716468310	3.17E-22	Indian Ocean	Open Ocean	Not used
JCVI_PEP_1105135987488	2.99E-22	Sargasso Station 13	Open Ocean	Not used
JCVI_PEP_1105149886963	3.12E-22	134 miles NE of Galapagos	Open Ocean	Not used
JCVI_PEP_1105080298835	3.54E-22	Upwelling, Fernandina Island	Coastal upwelling	Not used
JCVI_PEP_1105091051111	5.41E-22	Warm seep, Roca Redonda	Warm Seep	Not used
JCVI_PEP_1105146303567	5.50E-22	Cabo Marshall, Isabella Island	Coastal	Not used
JCVI_PEP_1105086989417	4.86E-22	Gulf of Maine	Coastal	Not used
JCVI_PEP_1105131426975	6.90E-22	Sargasso Station 13	Open Ocean	Not used
JCVI_PEP_1105100950699	8.42E-22	Off Nags Head, NC	Coastal	Not used
JCVI_PEP_1105151211469	8.50E-22	Chesapeake Bay, MD	Estuary	Not used
JCVI_PEP_1105160660249	1.21E-21	Upwelling, Fernandina Island	Coastal upwelling	Not used
JCVI_PEP_1105129908865	1.28E-21	250 miles from Panama City	Open Ocean	Not used
JCVI_PEP_1105091806945	1.14E-21	Sargasso Station 13	Open Ocean	Not used
JCVI_PEP_1112707080748	1.31E-21	West coast Zanzibar (Tanzania), harbour region	Harbor	Not used
JCVI_PEP_1105083202315	1.66E-21	Devil's Crown, Floreana Island	Coastal	Not used
JCVI_PEP_1105093948591	1.60E-21	Gulf of Panama	Coastal	Not used
JCVI_PEP_1105149813711	1.54E-21	Chesapeake Bay, MD	Estuary	Not used
JCVI_PEP_1105112940361	1.71E-21	Sargasso Station 13	Open Ocean	Not used
JCVI_PEP_1112736667600	1.64E-21	International water between Madagascar and South Africa	Open Ocean	Not used

JCVI_PEP_1112701128738	1.96E-21	Indian Ocean	Open Ocean	Not used
JCVI_PEP_1105100457189	2.16E-21	Bay of Fundy, Nova Scotia	Estuary	Not used
JCVI_PEP_1112726649886	1.74E-21	West coast Zanzibar (Tanzania), harbour region	Harbor	Not used
JCVI_PEP_1105134931704	1.83E-21	Sargasso Station 13	Open Ocean	Not used
JCVI_PEP_1112728035934	2.53E-21	Outside Seychelles, Indian Ocean	Open Ocean	Not used
JCVI_PEP_1105117730315	2.92E-21	North James Bay, Santigo Island	Coastal	Not used
JCVI_PEP_1105150508493	2.69E-21	Chesapeake Bay, MD	Estuary	Not used
JCVI_PEP_1112689973594	3.81E-21	500 Miles west of the Seychelles in the Indian Ocean	Open Ocean	Not used
JCVI_PEP_1105130457819	3.75E-21	Sargasso Station 13	Open Ocean	Not used
JCVI_PEP_1112701696480	3.75E-21	500 Miles west of the Seychelles in the Indian Ocean	Open Ocean	Not used
JCVI_PEP_1105092807081	3.60E-21	Sargasso Station 13	Open Ocean	Not used
JCVI_PEP_1105139938083	3.78E-21	Sargasso Station 13	Open Ocean	Not used
JCVI_PEP_1105156577609	3.81E-21	Chesapeake Bay, MD	Estuary	Not used
JCVI_PEP_1105081942563	3.15E-21	Sargasso Stations 3	Open Ocean	Not used
JCVI_PEP_1112708273324	4.47E-21	West coast Zanzibar (Tanzania), harbour region	Harbor	Not used
JCVI_PEP_1105127048611	4.58E-21	Chesapeake Bay, MD	Estuary	Not used
JCVI_PEP_1112731372198	4.62E-21	St. Anne Island, Seychelles	Coastal sample	Not used
JCVI_PEP_1112697229568	4.94E-21	Madagascar Waters	Open Ocean	Not used
JCVI_PEP_1112710167110	4.43E-21	Indian Ocean	Open Ocean	Not used
JCVI_PEP_1112731662020	4.01E-21	St. Anne Island, Seychelles	Coastal sample	Not used
JCVI_PEP_1105096213641	6.45E-21	Sargasso Station 13	Open Ocean	Not used
JCVI_PEP_1105146521897	5.84E-21	Warm seep, Roca Redonda	Warm Seep	Not used
JCVI_PEP_1105104110707	5.15E-21	Rangirora Atoll	Coral Reef Atoll	Not used
JCVI_PEP_1105100076867	5.42E-21	Warm seep, Roca Redonda	Warm Seep	Not used
JCVI_PEP_1105158351529	5.65E-21	Sargasso Station 13	Open Ocean	Not used
JCVI_PEP_1105104652049	5.84E-21	Northeast of Colon	Coastal	Not used
JCVI_PEP_1105111584485	7.44E-21	Bay of Fundy, Nova Scotia	Estuary	Not used
JCVI_PEP_1105097457325	7.88E-21	Sargasso Station 13	Open Ocean	Not used
JCVI_PEP_1112700722492	1.11E-20	Indian Ocean	Open Ocean	Not used
JCVI_PEP_1105154510997	9.63E-21	Warm seep, Roca Redonda	Warm Seep	Not used
JCVI_PEP_1105161925515	1.04E-20	Upwelling, Fernandina Island	Coastal upwelling	Not used
JCVI_PEP_1105108169439	1.02E-20	Coastal Floreana	Coastal	Not used
JCVI_PEP_1105160085301	9.71E-21	Sargasso Station 13	Open Ocean	Not used
JCVI_PEP_1112736817690	1.43E-20	International water between Madagascar and South Africa	Open Ocean	Not used
JCVI_PEP_1105134803719	1.24E-20	30 miles from Cocos Island	Open Ocean	Not used
JCVI_PEP_1105161199357	1.17E-20	Off Key West, FL	Coastal	Not used
JCVI_PEP_1105141830183	1.51E-20	Equatorial Pacific TAO Buoy	Open Ocean	Not used
JCVI_PEP_1112709099426	1.77E-20	East coast Zanzibar (Tanzania), offshore Paje lagoon	Fringing Reef	Not used
JCVI_PEP_1112711357040	1.59E-20	International water between Madagascar and South Africa	Open Ocean	Not used

JCVI_PEP_1112729206852	1.76E-20	St. Anne Island, Seychelles	Coastal sample	Not used
JCVI_PEP_1112710886578	1.74E-20	Indian Ocean	Open Ocean	Not used
JCVI_PEP_1112700685818	1.86E-20	Indian Ocean	Open Ocean	Not used
JCVI_PEP_1105156079629	1.64E-20	Sargasso Station 13	Open Ocean	Not used
JCVI_PEP_1105115760905	2.08E-20	North James Bay, Santigo Island	Coastal	Not used
JCVI_PEP_1105161930303	2.13E-20	Upwelling, Fernandina Island	Coastal upwelling	Not used
JCVI_PEP_1105157010119	2.20E-20	Upwelling, Fernandina Island	Coastal upwelling	Not used
JCVI_PEP_1112709338490	3.00E-20	Madagascar Waters	Open Ocean	Not used
JCVI_PEP_1105075560255	2.92E-20	North James Bay, Santigo Island	Coastal	Not used
JCVI_PEP_1105158717777	3.26E-20	Warm seep, Roca Redonda	Warm Seep	Not used
JCVI_PEP_1105125545815	2.67E-20	Rosario Bank	Open Ocean	Not used
JCVI_PEP_1105108872723	2.87E-20	Coastal Floreana	Coastal	Not used
JCVI_PEP_1105122486497	3.69E-20	Rosario Bank	Open Ocean	Not used
JCVI_PEP_1105124317113	3.95E-20	Yucatan Channel	Open Ocean	Not used
JCVI_PEP_1105083261181	3.75E-20	Delaware Bay, NJ	Estuary	Not used
JCVI_PEP_1105149163675	4.82E-20	Cape May, NJ	Coastal	Not used
JCVI_PEP_1105164402459	4.78E-20	Rangirora Atoll	Coral Reef Atoll	Not used
JCVI_PEP_1105086250205	4.58E-20	Newport Harbor, RI	Coastal	Not used
JCVI_PEP_1105097981111	8.36E-20	Sargasso Station 13	Open Ocean	Not used
JCVI_PEP_1105138279939	9.40E-20	Wolf Island	Coastal	Not used
JCVI_PEP_1105075079390	8.94E-20	30 miles from Cocos Island	Open Ocean	Not used
JCVI_PEP_1105127489175	8.36E-20	North Seamore Island	Coastal	Not used

Appendix Table 2. Full microarray dataset discussed in this work

Mn 1			Mn 2			Mur 1			Mur 2			Fe 1			Fe 2			Irr 1			Irr 2		
Gene ID	Ratio of +Mn vs -Mn	p-value	Gene ID	Ratio of +Mn vs -Mn	p-value	Gene ID	Ratio of wt vs Mur-	p-value	Gene ID	Ratio of wt vs Mur-	p-value	Gene ID	Ratio of +Fe vs -Fe	p-value	Gene ID	Ratio of +Fe vs -Fe	p-value	Gene ID	Ratio of wt vs Irr-	p-value	Gene ID	Ratio of wt vs Irr-	p-value
SPO0001	1.16	0.051	SPO0001	1.23	0.106	SPO0001	0.92	0.645	SPO0001	0.85	0.059	SPO0001	1.86	0.000	SPO0001	2.03	0.000	SPO0001	1.09	0.416	SPO0001	1.11	0.339
SPO0002	1.49	0	SPO0002	1.38	0	SPO0002	0.89	0.119	SPO0002	0.91	0.323	SPO0002	2.29	0.001	SPO0002	2.07	0.000	SPO0002	1.24	0.118	SPO0002	1.08	0.437
SPO0003	0.94	0.512	SPO0003	1.01	0.71	SPO0003	0.93	0.368	SPO0003	0.89	0.947	SPO0003	1.32	0.019	SPO0003	1.27	0.054	SPO0003	0.86	0.365	SPO0003	0.92	0.516
SPO0004	0.91	0.23	SPO0004	0.97	0.978	SPO0004	0.75	0.596	SPO0004	0.76	0.78	SPO0004	1.44	0.002	SPO0004	1.47	0.001	SPO0004	1.01	0.866	SPO0004	1.04	0.504
SPO0005	1.4	0.332	SPO0005	1.37	0.218	SPO0005	0.78	0.548	SPO0005	0.78	0.745	SPO0005	0.93	0.803	SPO0005	0.88	0.618	SPO0005	0.89	0.679	SPO0005	1.00	0.978
SPO0006	1.18	0.143	SPO0006	1.27	0.009	SPO0006	0.93	0.614	SPO0006	0.93	0.337	SPO0006	1.41	0.022	SPO0006	1.45	0.076	SPO0006	1.12	0.466	SPO0006	1.23	0.658
SPO0007	1.33	0.359	SPO0007	1.35	0.124	SPO0007	0.85	0.287	SPO0007	0.88	0.17	SPO0007	1.62	0.063	SPO0007	1.59	0.023	SPO0007	1.43	0.235	SPO0007	1.37	0.304
SPO0008	1.02	0.762	SPO0008	1.02	0.423	SPO0008	0.99	0.006	SPO0008	0.87	0.031	SPO0008	1.42	0.005	SPO0008	1.48	0.001	SPO0008	1.17	0.123	SPO0008	1.21	0.120
SPO0009	0.9	0.509	SPO0009	0.95	0.976	SPO0009	0.91	0.043	SPO0009	0.96	0.049	SPO0009	0.89	0.463	SPO0009	0.96	0.763	SPO0009	0.95	0.449	SPO0009	0.95	0.608
SPO0010	1.28	0.052	SPO0010	1.15	0.035	SPO0010	0.74	0.741	SPO0010	0.65	0.459	SPO0010	0.84	0.429	SPO0010	0.89	0.921	SPO0010	1.20	0.356	SPO0010	1.14	0.477
SPO0011	1.33	0.001	SPO0011	1.19	0.02	SPO0011	0.98	0.082	SPO0011	1	0.274	SPO0011	1.23	0.135	SPO0011	1.24	0.009	SPO0011	0.99	0.805	SPO0011	1.01	1.000
SPO0012	1.83	0.062	SPO0012	1.52	0.001	SPO0012	0.97	0.704	SPO0012	0.96	0.325	SPO0012	0.82	0.370	SPO0012	0.79	0.000	SPO0012	1.26	0.249	SPO0012	1.21	0.039
SPO0013	1.36	0.375	SPO0013	1.41	0.255	SPO0013	0.98	0.583	SPO0013	1.01	0.709	SPO0013	1.22	0.564	SPO0013	1.18	0.559	SPO0013	1.06	0.863	SPO0013	1.11	0.778
SPO0014	0.74	0.013	SPO0014	0.77	0.007	SPO0014	0.99	0.989	SPO0014	0.9	0.198	SPO0014	0.33	0.000	SPO0014	0.35	0.000	SPO0014	1.01	0.960	SPO0014	0.95	0.517
SPO0015	1.18	0.24	SPO0015	1.03	0.318	SPO0015	0.93	0.623	SPO0015	0.82	0.482	SPO0015	0.93	0.350	SPO0015	1.06	0.762	SPO0015	1.06	0.388	SPO0015	1.04	0.772
SPO0016	1.33	0.009	SPO0016	1.17	0.068	SPO0016	0.88	0.347	SPO0016	0.96	0.601	SPO0016	0.68	0.068	SPO0016	0.64	0.003	SPO0016	0.80	0.037	SPO0016	0.77	0.076
SPO0017	1.47	0.1	SPO0017	1.47	0.022	SPO0017	0.93	0.53	SPO0017	0.79	0.562	SPO0017	1.06	0.677	SPO0017	0.96	0.934	SPO0017	0.99	0.947	SPO0017	1.05	0.824
SPO0018	1.32	0.032	SPO0018	1.37	0.001	SPO0018	0.81	0.146	SPO0018	0.75	0.107	SPO0018	1.11	0.027	SPO0018	1.08	0.079	SPO0018	1.02	0.669	SPO0018	1.01	0.715
SPO0019	1.37	0.034	SPO0019	1.16	0.02	SPO0019	0.8	0.046	SPO0019	0.8	0.096	SPO0019	0.43	0.000	SPO0019	0.45	0.000	SPO0019	0.96	0.653	SPO0019	0.94	0.666
SPO0020	0.52	0.006	SPO0020	0.58	0.054	SPO0020	0.86	0.599	SPO0020	0.74	0.683	SPO0020	1.95	0.032	SPO0020	1.88	0.068	SPO0020	1.26	0.106	SPO0020	1.23	0.129
SPO0021	1.01	0.24	SPO0021	1.11	0.24	SPO0021	0.77	0.669	SPO0021	0.98	0.886	SPO0021	0.21	0.000	SPO0021	0.20	0.000	SPO0021	0.91	0.617	SPO0021	0.95	0.509
SPO0022	0.74	0.128	SPO0022	0.74	0.124	SPO0022	1	0.089	SPO0022	0.97	0.044	SPO0022	0.61	0.006	SPO0022	0.69	0.068	SPO0022	1.21	0.606	SPO0022	1.08	0.884
SPO0023	1.11	0.112	SPO0023	1.18	0.197	SPO0023	0.92	0.947	SPO0023	0.97	0.947	SPO0023	1.13	0.286	SPO0023	1.15	0.302	SPO0023	1.20	0.222	SPO0023	1.22	0.201
SPO0024	1.17	0.116	SPO0024	1.22	0.115	SPO0024	0.89	0.058	SPO0024	0.99	0.158	SPO0024	1.26	0.015	SPO0024	1.25	0.005	SPO0024	1.26	0.106	SPO0024	1.20	0.210
SPO0025	1.88	0.003	SPO0025	1.62	0.012	SPO0025	0.85	0.064	SPO0025	0.85	0.02	SPO0025	1.33	0.053	SPO0025	1.51	0.000	SPO0025	1.46	0.008	SPO0025	1.32	0.046
SPO0026	1.41	0.157	SPO0026	1.48	0.182	SPO0026	0.78	0.553	SPO0026	0.79	0.54	SPO0026	1.08	0.802	SPO0026	1.07	0.821	SPO0026	1.06	0.913	SPO0026	1.10	0.776
SPO0027	1.14	0.482	SPO0027	1.07	0.72	SPO0027	0.74	0.236	SPO0027	0.7	0.616	SPO0027	0.79	0.264	SPO0027	0.80	0.504	SPO0027	0.96	0.811	SPO0027	0.95	0.856
SPO0028	0.96	0.996	SPO0028	1.02	0.757	SPO0028	0.92	0.738	SPO0028	0.94	0.703	SPO0028	1.07	0.756	SPO0028	1.02	0.923	SPO0028	0.93	0.614	SPO0028	0.91	0.752
SPO0029	1.69	0.001	SPO0029	1.59	0.002	SPO0029	0.85	0.889	SPO0029	0.95	0.66	SPO0029	1.04	0.606	SPO0029	1.06	0.509	SPO0029	1.03	0.867	SPO0029	1.03	0.773
SPO0030	1.81	0.017	SPO0030	1.57	0.015	SPO0030	0.96	0.168	SPO0030	0.88	0.222	SPO0030	0.83	0.299	SPO0030	0.85	0.536	SPO0030	1.21	0.347	SPO0030	1.11	0.503
SPO0031	1.11	0.621	SPO0031	1.09	0.624	SPO0031	0.98	0.869	SPO0031	0.99	0.825	SPO0031	1.28	0.214	SPO0031	1.25	0.265	SPO0031	1.02	0.876	SPO0031	1.03	0.833
SPO0032	0.88	0.656	SPO0032	0.93	0.913	SPO0032	0.97	0.908	SPO0032	0.92	0.704	SPO0032	0.91	0.676	SPO0032	0.79	0.325	SPO0032	0.91	0.754	SPO0032	1.01	0.988
SPO0033	1.08	0.181	SPO0033	1.08	0.055	SPO0033	0.93	0.523	SPO0033	0.96	0.742	SPO0033	1.41	0.016	SPO0033	1.57	0.002	SPO0033	0.94	0.329	SPO0033	1.00	0.778
SPO0034	0.95	0.712	SPO0034	0.96	0.969	SPO0034	0.8	0.811	SPO0034	0.94	0.297	SPO0034	1.02	0.325	SPO0034	0.96	0.641	SPO0034	0.95	0.786	SPO0034	0.97	0.807
SPO0035	1.07	0.606	SPO0035	1.07	0.066	SPO0035	0.9	0.155	SPO0035	0.93	0.037	SPO0035	1.02	0.755	SPO0035	1.08	0.065	SPO0035	1.07	0.530	SPO0035	1.05	0.455
SPO0036	0.87	0.493	SPO0036	0.93	0.796	SPO0036	0.95	0.882	SPO0036	0.83	0.655	SPO0036	1.11	0.415	SPO0036	1.08	0.389	SPO0036	1.00	0.985	SPO0036	0.98	0.941
SPO0037	0.97	0.799	SPO0037	1.01	0.444	SPO0037	0.42	0.681	SPO0037	0.99	0.335	SPO0037	1.29	0.074	SPO0037	1.16	0.303	SPO0037	1.34	0.017	SPO0037	1.03	0.881
SPO0038	1.33	0.215	SPO0038	1.34	0.034	SPO0038	0.99	0.344	SPO0038	0.92	0.295	SPO0038	0.76	0.230	SPO0038	0.68	0.162	SPO0038	0.82	0.020	SPO0038	0.83	0.225
SPO0039	1.19	0.001	SPO0039	1.24	0.01	SPO0039	0.93	0.474	SPO0039	0.4	0.94	SPO0039	1.09	0.058	SPO0039	1.06	0.016	SPO0039	1.05	0.376	SPO0039	1.06	0.437
SPO0040	1.07	0.303	SPO0040	1.04	0.643	SPO0040	0.9	0.781	SPO0040	0.93	0.187	SPO0040	0.60	0.001	SPO0040	0.56	0.001	SPO0040	0.82	0.220	SPO0040	0.79	0.070
SPO0041	1.27	0.42	SPO0041	1.12	0.716	SPO0041	0.93	0.595	SPO0041	0.86	0.579	SPO0041	0.58	0.212	SPO0041	0.57	0.278	SPO0041	0.88	0.761	SPO0041	0.90	0.795
SPO0042	1.49	0.427	SPO0042	1.26	0.69	SPO0042	0.93	0.875	SPO0042	0.91	0.861	SPO0042	0.81	0.782	SPO0042	0.78	0.727	SPO0042	0.94	0.891	SPO0042	0.94	0.904
SPO0043	0.94	0.772	SPO0043	0.9	0.704	SPO0043	0.95	0.971	SPO0043	0.94	0.935	SPO0043	0.93	0.714	SPO0043	0.94	0.608	SPO0043	1.03	0.834	SPO0043	1.03	0.800
SPO0044	1.66	0.043	SPO0044	1.38	0.178	SPO0044	0.95	0.342	SPO0044	0.98	0.512	SPO0044	0.64	0.149	SPO0044	0.65	0.155	SPO0044	0.97	0.956	SPO0044	1.06	0.742
SPO0045	1.09	0.229	SPO0045	1.04	0.539	SPO0045	0.83	0.47	SPO0045	0.96	0.597	SPO0045	0.30	0.001	SPO0045	0.30	0.000	SPO0045	1.04	0.826	SPO0045	1.09	0.606
SPO0046	0.83	0.56	SPO0046	0.83	0.252	SPO0046	0.88	0.218	SPO0046	0.93	0.143	SPO0046	0.37	0.001	SPO0046	0.43	0.000	SPO0046	0.93	0.692	SPO0046	0.97	0.787
SPO0046.1	0.98	0.967	SPO0046.1	1.01	0.892	SPO0046.1	0.83	0.856	SPO0046.1	0.85	0.941	SPO0046.1	0.38	0.032	SPO0046.1	0.40	0.021	SPO0046.1	1.01	0.992	SPO0046.1	1.02	0.982
SPO0047	0.96	0.858	SPO0047	0.96	0.583	SPO0047	1	0.092	SPO0047	0.89	0.035	SPO0047	0.37	0.000	SPO0047	0.40	0.001	SPO0047	1.21	0.123	SPO0047	1.21	0.106
SPO0048	0.85	0.542	SPO0048	0.88	0.114	SPO0048	0.86	0.01	SPO0048	0.86	0.025	SPO0048	0.42	0.000	SPO0048	0.47	0.000	SPO0048	1.43	0.017	SPO0048	1.30	0.038
SPO0049	0.56	0.002	SPO0049	0.65	0.04	SPO0049	0.92	0.252	SPO0049	1.01	0.051	SPO0049	0.36	0.000	SPO0049	0.36	0.000	SPO0049	1.10	0.698	SPO0049	1.11	0.495
SPO0050	0.66	0.154	SPO0050	0.7	0.119	SPO0050	0.93	0.14	SPO0050	0.94	0.099	SPO0050	0.21	0.000	SPO0050	0.22	0.000	SPO0050	1.11	0.608	SPO0050	1.13	0.407
SPO0051	1.03	0.705	SPO0051	1.03	0.459	SPO0051	0.83	0.976	SPO0051	0.8	0.852	SPO0051	0.20	0.000	SPO0051	0.21	0.000	SPO0051	1.03	0.875	SPO0051	1.08	0.541
SPO0052	1.46	0.012	SPO0052	1.34	0.017	SPO0052	1	0.43	SPO0052	0.92	0.207	SPO0052	0.25	0.000	SPO0052	0.26	0.000	SPO0052	1.01	0.983	SPO0052	1.01	0.930
SPO0053	1.29	0.006	SPO0053	1.24	0.015	SPO0053	0.95	0.601	SPO0053	0.8	0.38	SPO0053	0.37	0.000	SPO0053	0.39	0.000	SPO0053	0.88	0.382	SPO0053	0.91	0.356
SPO0054	1.18	0.315	SPO0054	1.19	0.014	SPO0054	0.97	0.517	SPO0054	0.96	0.576	SPO0054	0.32	0.002	SPO0054	0.37	0.000	SPO0054	1.01	0.864	SPO0054	0.99	0.732
SPO0055	0.98	0.983	SPO0055	0.95	0.932	SPO0055	0.9	0.092	SPO0055	0.89	0.835	SPO0055	1.62	0.002	SPO0055	1.56	0.013	SPO0055	1.04	0.714	SPO0055	0.99	0.997
SPO0056	1.08	0.167	SPO0056	1.16	0.06	SPO0056	0.92	0.635	SPO0056	0.78	0.984	SPO0056	0.80	0.295	SPO0056	0.86	0.049	SPO0056	1.14	0.505	SPO0056	1.07	0.846
SPO0057	0.89	0.454	SPO0057	0.95	0.853	SPO0057	0.81	0.602	SPO0057	0.82	0.99	SPO0057	1.22	0.081	SPO0057	1.24	0.040	SPO0057	1.02	0.766	SPO0057	1.12	0.362
SPO0058	1.14	0.5	SPO0058	1.14	0.575	SPO0058	0.95	0.788	SPO0058	0.97	0.903	SPO0058	1.04	0.116	SPO0058	1.03	0.211	SPO0058	0.94	0.842	SPO0058	0.97	0.973
SPO0059	1.33	0.149	SPO0059	1.24	0.103	SPO0059	0.93	0.568	SPO0059	0.93	0.745	SPO0059	0.99	0.159	SPO0059	0.95	0.612	SPO0059	1.25	0.010	SPO0059	1.29	0.012
SPO0060	1.24	0.094	SPO0060	1.23	0.003	SPO0060	0.86	0.998	SPO0060	0.96	0.683	SPO0060	1.11	0.059	SPO0060	1.12	0.062	SPO0060	1.00	0.909	SPO0060	1.05	0.485
SPO0061	1.96	0	SPO0061	1.65	0.004	SPO0061	0.82	0.03	SPO0061	0.91	0.037	SPO0061	0.76	0.186	SPO0061	0.72	0.014	SPO0061	1.06	0.451	SPO0061	0.92	0.245
SPO0062	0.93	0.218	SPO0062	1.09	0.03	SPO0062	0.91	0.02	SPO0062	0.93	0.02	SPO0062	1.83	0.000	SPO0062	1.93	0.000	SPO0062	1.00	0.776	SPO0062	1.07	0.069
SPO0063	1.35	0.026	SPO0063	1.34	0.224	SPO0063	0.97	0.011	SPO0063	0.92	0.001	SPO0063	1.04	0.101	SPO0063	1.01	0.034	SPO0063	1.04	0.527	SPO0063	1.08	0.122
SPO0064	0.68	0.081	SPO0064	0.79	0.08	SPO0064	1	0.149	SPO0064	0.9	0.078	SPO0064	2.27	0.000	SPO0064	2.44	0.000	SPO0064	1.19	0.407	SPO0064	1.20	0.181
SPO0065	1.1	0.502	SPO0065	1.02	0.532	SPO0065	0.75	0.234	SPO0065	0.91	0.272	SPO0065	0.81	0.050	SPO0065	0.79	0.050	SPO0065	1.05	0.563	SPO0065	1.00	0.934
SPO0066	0.67	0.008	SPO0066	0.7	0.024	SPO0066	0.99	0.971	SPO0066	0.81	0.568	SPO0066	1.06	0.235	SPO0066	1.08	0.065	SPO0066	0.86	0.251	SPO0066	0.88	0.414
SPO0067	1.45	0	SPO0067	1.39	0	SPO0067	0.98	0.705	SPO0067	0.89	0.731	SPO0067	0.78	0.010	SPO0067	0.75	0.000	SPO0067	1.10	0.449	SPO0067	1.01	0.877
SPO0068	1.21	0.191	SPO0068	1.17	0.042	SPO0068	0.79	0.027	SPO0068	1	0.069	SPO0068	0.66	0.005	SPO0068	0.67	0.007	SPO0068	1.00	0.944	SPO0068	1.01	0.772
SPO0069	1	0.809	SPO0069	1.06	0.061	SPO0069	0.88	0.038	SPO0069	0.68	0.225	SPO0069	0.83	0.214	SPO0069	0.85	0.119	SPO0069	1.10	0.612	SPO0069	1.03	0.783
SPO0070	0.89	0.367	SPO0070	0.9	0.764	SPO0070	0.78	0.557	SPO0070	0.92	0.602	SPO0070	0.92	0.969	SPO0070	0.88	0.836	SPO0070	1.00	0.934	SPO0070	0.99	0.961
SPO0071	0.95	0.944	SPO0071	0.85	0.589	SPO0071	0.76	0.501	SPO0071	0.99	0.742	SPO0071	0.24	0.000	SPO0071	0.27	0.000	SPO0071	0.84	0.376	SPO0071	0.84	0.479
SPO0072	1.43	0.009	SPO0072	1.33	0.001	SPO0072	0.65	0.771	SPO0072	0.78	0.85	SPO0072	1.04	0.422	SPO0072	1.07	0.130	SPO0072	1.14	0.145	SPO0072	1.13	0.069
SPO0073	1.1	0.447	SPO0073	1.02	0.769	SPO0073	0.82	0.921	SPO0073	0.93	0.727	SPO0073	1.23	0.489	SPO0073	1.18	0.371	SPO0073	1.12	0.586	SPO0073	1.08	0.725
SPO0074	1.3	0.029	SPO0074	1.1	0.483	SPO0074	0.79	0.01	SPO0074	0.65	0.01	SPO0074	0.75	0.216	SPO0074	0.68	0.019	SPO0074	1.24	0.010	SPO0074	1.11	0.027
SPO0075	0.81	0.022	SPO0075	0.77	0.016	SPO0075	0.99	0.626	SPO0075	0.83	0.967	SPO0075	0.96	0.205	SPO0075	0.97	0.146	SPO0075	0.93	0.744	SPO0075	0.95	0.738
SPO0076	1.65	0.002	SPO0076	1.43	0.008	SPO0076	1.01	0.02	SPO0076	0.68	0.022	SPO0076	0.59	0.005	SPO0076	0.61	0.001	SPO0076	1.02	0.736	SPO0076	0.98	0.981
SPO0077	0.99	0.926	SPO0077	0.98	0.954	SPO0077	0.93	0.128	SPO0077	0.76	0.171	SPO0077	0.93	0.320	SPO0077	0.90	0.512	SPO0077	0.99	0.882	SPO0077	0.97	0.999
SPO0078	0.8	0.008	SPO0078	0.89	0.337	SPO0078	0.87	0.138	SPO0078	0.8	0.125	SPO0078	0.79	0.350	SPO0078	0.69	0.120	SPO0078	0.99	0.564	SPO0078	0.99	0.697
SPO0079	1.21	0.172	SPO0079	1.17	0.027	SPO0079	0.91	0.982	SPO0079	0.98	0.63	SPO0079	1.36	0.013	SPO0079	1.39	0.003	SPO0079	1.27	0.038	SPO0079	1.27	0.088
SPO0080	1.42	0	SPO0080	1.35	0.002	SPO0080	0.94	0.054	SPO0080	1	0.022	SPO0080	0.83	0.342	SPO0080	0.89	0.941	SPO0080	1.18	0.167	SPO0080	1.13	0.137
SPO0081	0.86	0.04	SPO0081	0.91	0.259	SPO0081	0.86	0.533	SPO0081	0.89	0.322	SPO0081	1.17	0.035	SPO0081	1.24	0.002	SPO0081	1.12	0.102	SPO0081	1.17	0.044
SPO0082	1.24	0.035	SPO0082	1.23	0.012	SPO0082	0.96	0.777	SPO0082	0.79	0.991	SPO0082	0.93	0.867	SPO0082	0.97	0.450	SPO0082	1.17	0.038	SPO0082	1.18	0.138
SPO0083	1.03	0.838	SPO0083	1.07	0.331	SPO0083	0.78	0.399	SPO0083	0.92	0.294	SPO0083	0.85	0.690	SPO0083	0.83	0.505	SPO0083	1.23	0.133	SPO0083	1.21	0.001
SPO0084	0.95	0.928	SPO0084	1.04	0.216	SPO0084	0.97	0.017	SPO0084	0.93	0.11	SPO0084	2.08	0.001	SPO0084	1.86	0.000	SPO0084	0.98	0.745	SPO0084	0.96	0.524
SPO0085	0.57	0.042	SPO0085	0.63	0.073	SPO0085	0.84	0.575	SPO0085	1	0.873	SPO0085	0.67	0.050	SPO0085	0.63	0.018	SPO0085	1.11	0.594	SPO0085	1.27	0.086
SPO0086	0.69	0.052	SPO0086	0.66	0.008	SPO0086	0.99	0.731	SPO0086	0.78	0.528	SPO0086	0.02	0.000	SPO0086	0.02	0.000	SPO0086	0.25	0.000	SPO0086	0.27	0.000
SPO0087	0.76	0.368	SPO0087	0.85	0.763	SPO0087	0.86	0.809	SPO0087	0.95	0.629	SPO0087	0.02	0.000	SPO0087	0.02	0.000	SPO0087	0.22	0.001	SPO0087	0.27	0.000
SPO0088	0.91	0.913	SPO0088	0.89	0.9	SPO0088	0.94	0.712	SPO0088	0.76	0.831	SPO0088	0.03	0.000	SPO0088	0.03	0.000	SPO0088	0.66	0.272	SPO0088	0.71	0.341
SPO0089	0.47	0.003	SPO0089	0.6	0.02	SPO0089	0.93	0.006	SPO0089	0.98	0.001	SPO0089	0.10	0.000	SPO0089	0.09	0.000	SPO0089	1.38	0.297	SPO0089	1.51	0.075
SPO0090	0.86	0.86	SPO0090	0.91	0.945	SPO0090	0.96	0.991	SPO0090	0.88	0.973	SPO0090	0.07	0.001	SPO0090	0.07	0.001	SPO0090	0.69	0.599	SPO0090	0.73	0.633
SPO0091	1.53	0.001	SPO0091	1.47	0.001	SPO0091	0.57	0.18	SPO0091	0.97	0.365	SPO0091	1.10	0.276	SPO0091	1.24	0.016	SPO0091	1.14	0.336	SPO0091	1.15	0.049
SPO0092	1.14	0.706	SPO0092	1.31	0.537	SPO0092	0.92	0.845	SPO0092	0.92	0.819	SPO0092	1.67	0.162	SPO0092	1.55	0.146	SPO0092	1.35	0.468	SPO0092	1.16	0.699
SPO0093	0.93	0.896	SPO0093	0.95	0.994	SPO0093	0.89	0.066	SPO0093	0.56	0.046	SPO0093	0.63	0.009	SPO0093	0.67	0.001	SPO0093	1.07	0.566	SPO0093	1.01	0.786
SPO0094	1.11	0.722	SPO0094	1.12	0.696	SPO0094	0.74	0.666	SPO0094	0.97	0.509	SPO0094	0.20	0.054	SPO0094	0.36	0.015	SPO0094	0.92	0.864	SPO0094	1.02	0.982
SPO0095	1	0.949	SPO0095	1.03	0.609	SPO0095	0.98	0.803	SPO0095	0.97	0.926	SPO0095	1.13	0.352	SPO0095	1.13	0.188	SPO0095	0.95	0.912	SPO0095	0.96	0.901
SPO0096	1.11	0.755	SPO0096	1.03	0.869	SPO0096	0.72	0.191	SPO0096	0.91	0.783	SPO0096	0.89	0.688	SPO0096	0.91	0.926	SPO0096	0.87	0.291	SPO0096	0.97	0.953
SPO0097	0.98	0.973	SPO0097	1.01	0.775	SPO0097	0.8	0.851	SPO0097	0.79	0.513	SPO0097	0.69	0.106	SPO0097	0.70	0.114	SPO0097	1.11	0.703	SPO0097	1.03	0.874
SPO0098	1.04	0.803	SPO0098	1	0.814	SPO0098	0.86	0.525	SPO0098	0.72	0.058	SPO0098	0.88	0.763	SPO0098	0.88	0.275	SPO0098	1.04	0.912	SPO0098	0.93	0.330
SPO0099	0.91	0.541	SPO0099	0.92	0.48	SPO0099	0.9	0.096	SPO0099	0.98	0.135	SPO0099	0.73	0.028	SPO0099	0.78	0.094	SPO0099	1.01	0.964	SPO0099	1.04	0.723
SPO0100	0.93	0.762	SPO0100	0.97	0.846	SPO0100	0.93	0.431	SPO0100	0.93	0.186	SPO0100	0.78	0.029	SPO0100	0.78	0.034	SPO0100	1.01	0.947	SPO0100	1.14	0.192
SPO0101	0.71	0.124	SPO0101	0.77	0.099	SPO0101	0.89	0.662	SPO0101	0.88	0.653	SPO0101	0.44	0.001	SPO0101	0.43	0.006	SPO0101	0.83	0.626	SPO0101	0.83	0.494
SPO0102	0.52	0	SPO0102	0.53	0.007	SPO0102	0.98	0.18	SPO0102	0.91	0.006	SPO0102	2.65	0.000	SPO0102	2.68	0.000	SPO0102	1.04	0.653	SPO0102	0.98	0.903
SPO0103	0.68	0.061	SPO0103	0.66	0.046	SPO0103	0.95	0.145	SPO0103	0.98	0.094	SPO0103	2.25	0.009	SPO0103	1.87	0.007	SPO0103	1.02	0.855	SPO0103	0.97	0.884
SPO0104	0.76	0.166	SPO0104	0.75	0.175	SPO0104	0.93	0.988	SPO0104	0.94	0.571	SPO0104	1.15	0.320	SPO0104	1.18	0.019	SPO0104	0.75	0.014	SPO0104	0.82	0.036
SPO0105	0.79	0.239	SPO0105	0.79	0.094	SPO0105	1	0.501	SPO0105	0.96	0.82	SPO0105	0.93	0.766	SPO0105	0.99	0.894	SPO0105	0.97	0.897	SPO0105	0.95	0.370
SPO0106	1.1	0.358	SPO0106	1.03	0.45	SPO0106	0.94	0.441	SPO0106	0.85	0.634	SPO0106	1.65	0.010	SPO0106	1.59	0.004	SPO0106	1.12	0.445	SPO0106	1.13	0.372
SPO0107	0.93	0.765	SPO0107	0.91	0.774	SPO0107	0.93	0.792	SPO0107	1	0.714	SPO0107	1.27	0.273	SPO0107	1.21	0.272	SPO0107	0.95	0.885	SPO0107	0.97	0.931
SPO0108	0.95	0.912	SPO0108	1.06	0.277	SPO0108	0.83	0.133	SPO0108	0.94	0.06	SPO0108	1.07	0.926	SPO0108	0.93	0.035	SPO0108	1.19	0.391	SPO0108	1.13	0.457
SPO0109	0.9	0.673	SPO0109	0.88	0.55	SPO0109	0.96	0.181	SPO0109	0.86	0.636	SPO0109	0.72	0.061	SPO0109	0.70	0.006	SPO0109	1.24	0.193	SPO0109	1.19	0.289
SPO0110	1.12	0.299	SPO0110	1.05	0.417	SPO0110	0.94	0.245	SPO0110	0.91	0.11	SPO0110	0.62	0.005	SPO0110	0.76	0.032	SPO0110	1.28	0.137	SPO0110	1.19	0.185
SPO0111	0.83	0.193	SPO0111	0.93	0.78	SPO0111	0.96	0.118	SPO0111	0.95	0.34	SPO0111	0.49	0.003	SPO0111	0.49	0.015	SPO0111	0.95	0.701	SPO0111	0.94	0.721
SPO0112	0.71	0.088	SPO0112	0.7	0.045	SPO0112	0.85	0.219	SPO0112	0.92	0.463	SPO0112	0.24	0.000	SPO0112	0.26	0.000	SPO0112	1.35	0.069	SPO0112	1.25	0.399
SPO0113	1.03	0.687	SPO0113	0.98	0.871	SPO0113	0.87	0.633	SPO0113	0.89	0.726	SPO0113	0.38	0.001	SPO0113	0.42	0.003	SPO0113	1.05	0.939	SPO0113	1.08	0.742
SPO0114	0.81	0.519	SPO0114	0.92	0.867	SPO0114	0.95	0.282	SPO0114	0.85	0.508	SPO0114	0.48	0.004	SPO0114	0.44	0.001	SPO0114	0.99	0.799	SPO0114	0.93	0.774
SPO0115	1.14	0.062	SPO0115	1.12	0.184	SPO0115	0.93	0.499	SPO0115	0.93	0.607	SPO0115	0.26	0.000	SPO0115	0.27	0.000	SPO0115	1.05	0.861	SPO0115	1.16	0.114
SPO0116	1.18	0.2	SPO0116	1.25	0.033	SPO0116	0.99	0.477	SPO0116	0.94	0.778	SPO0116	0.39	0.000	SPO0116	0.42	0.000	SPO0116	1.30	0.082	SPO0116	1.09	0.556
SPO0118	0.69	0.089	SPO0118	0.78	0.254	SPO0118	0.9	0.785	SPO0118	0.95	0.831	SPO0118	1.19	0.633	SPO0118	1.30	0.335	SPO0118	1.25	0.404	SPO0118	1.13	0.676
SPO0119	0.85	0.414	SPO0119	0.86	0.324	SPO0119	0.52	0.308	SPO0119	0.81	0.084	SPO0119	1.88	0.004	SPO0119	1.98	0.001	SPO0119	1.19	0.364	SPO0119	1.16	0.303
SPO0120	1.2	0.336	SPO0120	1.11	0.551	SPO0120	0.95	0.256	SPO0120	0.85	0.448	SPO0120	0.77	0.117	SPO0120	0.68	0.066	SPO0120	0.88	0.257	SPO0120	0.78	0.089
SPO0122	1.19	0.324	SPO0122	1.17	0.002	SPO0122	1	0.013	SPO0122	0.97	0.008	SPO0122	0.66	0.024	SPO0122	0.68	0.009	SPO0122	0.92	0.562	SPO0122	0.95	0.657
SPO0123	0.55	0.002	SPO0123	0.62	0.014	SPO0123	0.78	0.956	SPO0123	0.93	0.1	SPO0123	1.21	0.005	SPO0123	1.21	0.001	SPO0123	0.75	0.012	SPO0123	0.85	0.154
SPO0124	0.81	0.106	SPO0124	0.88	0.245	SPO0124	0.88	0.233	SPO0124	0.96	0.122	SPO0124	0.87	0.771	SPO0124	0.87	0.864	SPO0124	0.96	0.931	SPO0124	0.96	0.863
SPO0125	0.96	0.957	SPO0125	1.02	0.66	SPO0125	0.96	0.218	SPO0125	0.99	0.72	SPO0125	1.24	0.025	SPO0125	1.46	0.087	SPO0125	1.15	0.472	SPO0125	1.06	0.824
SPO0126	1.6	0.039	SPO0126	1.2	0.579	SPO0126	0.97	0.805	SPO0126	0.9	0.597	SPO0126	0.85	0.890	SPO0126	1.13	0.579	SPO0126	1.03	0.923	SPO0126	1.06	0.856
SPO0127	0.99	0.801	SPO0127	1.02	0.527	SPO0127	0.97	0.337	SPO0127	0.98	0.452	SPO0127	1.04	0.428	SPO0127	1.23	0.014	SPO0127	1.09	0.335	SPO0127	1.02	0.800
SPO0128	0.7	0.01	SPO0128	0.8	0.019	SPO0128	0.9	0.697	SPO0128	0.56	0.583	SPO0128	0.99	0.545	SPO0128	0.93	0.672	SPO0128	0.96	0.934	SPO0128	1.06	0.293
SPO0129	0.96	0.882	SPO0129	0.97	0.782	SPO0129	0.96	0.334	SPO0129	0.91	0.295	SPO0129	0.88	0.311	SPO0129	0.96	0.786	SPO0129	0.97	0.868	SPO0129	0.93	0.664
SPO0130	0.59	0	SPO0130	0.74	0.002	SPO0130	0.96	0.518	SPO0130	0.71	0.434	SPO0130	1.06	0.004	SPO0130	1.06	0.004	SPO0130	0.88	0.056	SPO0130	0.92	0.410
SPO0131	1.47	0.004	SPO0131	1.28	0.019	SPO0131	0.97	0.161	SPO0131	0.96	0.204	SPO0131	1.21	0.017	SPO0131	1.23	0.009	SPO0131	1.17	0.237	SPO0131	1.15	0.050
SPO0132	0.98	0.771	SPO0132	0.99	0.653	SPO0132	0.96	0.637	SPO0132	0.87	0.953	SPO0132	0.64	0.022	SPO0132	0.69	0.020	SPO0132	1.02	0.802	SPO0132	0.98	0.841
SPO0133	0.98	0.943	SPO0133	0.93	0.608	SPO0133	0.88	0.232	SPO0133	0.98	0.024	SPO0133	0.68	0.018	SPO0133	0.61	0.000	SPO0133	1.07	0.418	SPO0133	0.99	0.998
SPO0134	1.08	0.266	SPO0134	1.03	0.491	SPO0134	0.98	0.397	SPO0134	0.99	0.659	SPO0134	0.74	0.029	SPO0134	0.76	0.034	SPO0134	0.97	0.783	SPO0134	1.00	0.951
SPO0135	1.52	0.012	SPO0135	1.34	0.006	SPO0135	0.74	0.648	SPO0135	0.98	0.028	SPO0135	0.51	0.000	SPO0135	0.54	0.000	SPO0135	1.20	0.152	SPO0135	1.10	0.485
SPO0136	0.89	0.47	SPO0136	0.91	0.22	SPO0136	0.88	0.142	SPO0136	0.96	0.155	SPO0136	1.17	0.072	SPO0136	1.23	0.002	SPO0136	0.98	0.740	SPO0136	1.01	0.899

SPO0137	1.02	0.816	SPO0137	1.01	0.566	SPO0137	0.88	0.892	SPO0137	0.81	0.843	SPO0137	1.11	0.461	SPO0137	1.10	0.255	SPO0137	1.27	0.159	SPO0137	1.16	0.133
SPO0138	1.07	0.311	SPO0138	1.04	0.248	SPO0138	0.93	0.51	SPO0138	0.95	0.609	SPO0138	1.09	0.116	SPO0138	1.13	0.047	SPO0138	0.98	0.856	SPO0138	1.01	0.778
SPO0139	0.68	0	SPO0139	0.74	0.001	SPO0139	0.9	0.13	SPO0139	0.93	0.671	SPO0139	0.97	0.116	SPO0139	0.95	0.007	SPO0139	0.83	0.011	SPO0139	0.87	0.028
SPO0140	1.3	0.078	SPO0140	1.23	0.031	SPO0140	0.93	0.15	SPO0140	0.94	0.033	SPO0140	0.68	0.003	SPO0140	0.76	0.021	SPO0140	1.05	0.562	SPO0140	1.02	0.788
SPO0141	0.85	0.19	SPO0141	0.89	0.443	SPO0141	0.81	0.547	SPO0141	0.95	0.995	SPO0141	0.62	0.007	SPO0141	0.65	0.008	SPO0141	0.98	0.882	SPO0141	1.02	0.839
SPO0142	1.04	0.259	SPO0142	0.81	0.031	SPO0142	0.93	0.403	SPO0142	0.68	0.18	SPO0142	1.98	0.000	SPO0142	1.92	0.000	SPO0142	1.20	0.103	SPO0142	1.16	0.054
SPO0143	0.68	0.047	SPO0143	0.77	0.033	SPO0143	0.97	0.804	SPO0143	0.9	0.665	SPO0143	1.18	0.140	SPO0143	1.18	0.265	SPO0143	1.01	0.978	SPO0143	1.04	0.852
SPO0144	1.49	0.011	SPO0144	1.34	0.016	SPO0144	0.99	0.231	SPO0144	1.01	0.233	SPO0144	0.63	0.003	SPO0144	0.54	0.001	SPO0144	0.98	0.847	SPO0144	0.93	0.690
SPO0145	0.88	0.479	SPO0145	0.98	0.719	SPO0145	0.78	0.009	SPO0145	0.88	0.016	SPO0145	1.53	0.003	SPO0145	1.58	0.000	SPO0145	1.28	0.404	SPO0145	1.25	0.155
SPO0146	0.78	0.034	SPO0146	0.81	0.129	SPO0146	0.59	0.932	SPO0146	0.94	0.055	SPO0146	1.06	0.318	SPO0146	1.22	0.171	SPO0146	1.17	0.075	SPO0146	1.19	0.188
SPO0147	1.5	0.006	SPO0147	1.37	0.013	SPO0147	0.74	0.524	SPO0147	0.84	0.321	SPO0147	0.72	0.037	SPO0147	0.76	0.052	SPO0147	1.03	0.698	SPO0147	0.88	0.338
SPO0148	1.16	0.09	SPO0148	1.34	0.005	SPO0148	0.99	0.623	SPO0148	0.93	0.541	SPO0148	1.15	0.020	SPO0148	1.04	0.025	SPO0148	1.07	0.502	SPO0148	1.00	0.832
SPO0149	1.05	0.813	SPO0149	0.95	0.906	SPO0149	0.93	0.916	SPO0149	0.78	0.853	SPO0149	1.89	0.024	SPO0149	1.88	0.014	SPO0149	1.12	0.571	SPO0149	1.10	0.633
SPO0150	1.7	0.002	SPO0150	1.41	0.026	SPO0150	0.87	0.025	SPO0150	0.88	0.008	SPO0150	0.72	0.080	SPO0150	0.66	0.019	SPO0150	1.19	0.191	SPO0150	1.01	0.807
SPO0151	1.35	0.292	SPO0151	1.26	0.015	SPO0151	0.85	0.286	SPO0151	0.98	0.114	SPO0151	1.28	0.017	SPO0151	1.39	0.001	SPO0151	1.15	0.277	SPO0151	1.12	0.330
SPO0152	1.28	0.392	SPO0152	1.24	0.485	SPO0152	0.92	0.533	SPO0152	0.97	0.525	SPO0152	0.88	0.807	SPO0152	0.92	0.822	SPO0152	0.81	0.519	SPO0152	0.80	0.308
SPO0153	1.32	0.144	SPO0153	1.39	0.004	SPO0153	0.9	0.001	SPO0153	0.74	0.001	SPO0153	0.83	0.088	SPO0153	0.78	0.004	SPO0153	0.71	0.011	SPO0153	0.68	0.023
SPO0154	1.25	0.058	SPO0154	1.26	0.043	SPO0154	0.99	0.002	SPO0154	0.56	0	SPO0154	1.34	0.019	SPO0154	1.41	0.000	SPO0154	0.41	0.000	SPO0154	0.46	0.000
SPO0155	1.06	0.52	SPO0155	1.09	0.06	SPO0155	0.99	0.906	SPO0155	0.76	0.198	SPO0155	1.43	0.007	SPO0155	1.48	0.000	SPO0155	0.87	0.260	SPO0155	0.95	0.765
SPO0156	1.12	0.437	SPO0156	1.08	0.325	SPO0156	0.87	0.574	SPO0156	0.92	0.924	SPO0156	1.25	0.412	SPO0156	1.59	0.104	SPO0156	1.31	0.051	SPO0156	1.10	0.784
SPO0157	1.23	0.035	SPO0157	1.2	0.005	SPO0157	0.9	0	SPO0157	0.95	0	SPO0157	0.31	0.000	SPO0157	0.33	0.000	SPO0157	1.31	0.042	SPO0157	1.39	0.001
SPO0160	1.28	0.017	SPO0160	1.27	0	SPO0160	0.53	0.004	SPO0160	0.83	0.001	SPO0160	0.64	0.000	SPO0160	0.71	0.000	SPO0160	1.07	0.694	SPO0160	1.04	0.659
SPO0161	0.83	0.15	SPO0161	0.88	0.525	SPO0161	0.99	0.066	SPO0161	0.98	0.151	SPO0161	1.05	0.228	SPO0161	0.94	0.836	SPO0161	1.16	0.140	SPO0161	1.14	0.108
SPO0162	0.23	0	SPO0162	0.25	0	SPO0162	0.96	0.199	SPO0162	0.89	0.285	SPO0162	1.64	0.002	SPO0162	1.64	0.002	SPO0162	1.20	0.159	SPO0162	1.12	0.319
SPO0163	0.75	0.203	SPO0163	0.76	0.185	SPO0163	0.95	0.44	SPO0163	0.96	0.793	SPO0163	0.99	0.900	SPO0163	1.07	0.529	SPO0163	1.30	0.403	SPO0163	1.28	0.505
SPO0164	0.97	0.866	SPO0164	1.03	0.093	SPO0164	0.89	0.71	SPO0164	0.91	0.536	SPO0164	1.63	0.020	SPO0164	1.70	0.006	SPO0164	1.09	0.679	SPO0164	0.97	0.608
SPO0165	1.13	0.192	SPO0165	1.11	0.081	SPO0165	0.81	0.683	SPO0165	0.85	0.394	SPO0165	1.59	0.003	SPO0165	1.61	0.003	SPO0165	0.95	0.612	SPO0165	0.86	0.258
SPO0166	0.85	0.193	SPO0166	0.89	0.255	SPO0166	0.87	0.138	SPO0166	0.5	0.284	SPO0166	1.75	0.000	SPO0166	1.63	0.000	SPO0166	0.84	0.058	SPO0166	0.82	0.019
SPO0167	0.66	0.005	SPO0167	0.74	0.005	SPO0167	0.91	0.034	SPO0167	0.95	0.036	SPO0167	2.63	0.001	SPO0167	2.09	0.000	SPO0167	0.82	0.044	SPO0167	0.86	0.039
SPO0168	1.17	0.008	SPO0168	1.2	0	SPO0168	0.95	0.23	SPO0168	0.98	0.383	SPO0168	1.77	0.004	SPO0168	1.82	0.002	SPO0168	0.94	0.549	SPO0168	0.91	0.255
SPO0169	1.02	0.463	SPO0169	1.13	0.173	SPO0170	0.98	0.933	SPO0170	0.88	0.92	SPO0169	0.17	0.016	SPO0169	0.32	0.000	SPO0169	0.20	0.031	SPO0169	0.43	0.004
SPO0170	1.08	0.697	SPO0170	1.19	0.279	SPO0171	0.97	0.86	SPO0171	0.85	0.32	SPO0170	0.71	0.068	SPO0170	0.76	0.013	SPO0170	1.09	0.807	SPO0170	1.06	0.916
SPO0171	1.16	0.045	SPO0171	1.24	0.011	SPO0172	0.71	0.032	SPO0172	0.82	0.002	SPO0171	0.75	0.017	SPO0171	0.98	0.106	SPO0171	0.93	0.405	SPO0171	0.83	0.016
SPO0172	0.99	0.523	SPO0172	0.78	0.082	SPO0173	0.69	0.904	SPO0173	0.88	0.577	SPO0172	1.05	0.863	SPO0172	1.00	0.371	SPO0172	1.02	0.894	SPO0172	0.93	0.552
SPO0173	1.04	0.324	SPO0173	1.05	0.015	SPO0174	0.96	0.246	SPO0174	0.95	0.243	SPO0173	0.89	0.503	SPO0173	0.88	0.112	SPO0173	1.01	0.888	SPO0173	1.09	0.617
SPO0174	1.21	0.067	SPO0174	1.19	0.003	SPO0175	0.7	0.981	SPO0175	0.97	0.842	SPO0174	0.32	0.002	SPO0174	0.38	0.000	SPO0174	1.01	0.912	SPO0174	0.96	0.670
SPO0175	1.28	0.011	SPO0175	1.32	0.009	SPO0176	0.98	0.132	SPO0176	0.91	0.175	SPO0175	0.28	0.000	SPO0175	0.32	0.000	SPO0175	0.93	0.477	SPO0175	0.85	0.098
SPO0176	0.93	0.996	SPO0176	0.88	0.362	SPO0177	0.96	0.681	SPO0177	0.69	0.664	SPO0176	0.28	0.000	SPO0176	0.35	0.000	SPO0176	1.02	0.954	SPO0176	0.96	0.701
SPO0177	0.89	0.19	SPO0177	1.02	0.69	SPO0178	0.72	0.914	SPO0178	0.81	0.964	SPO0177	0.58	0.011	SPO0177	0.61	0.014	SPO0177	0.91	0.615	SPO0177	0.95	0.669
SPO0178	1.1	0.885	SPO0178	1.12	0.884	SPO0179	0.75	0.033	SPO0179	0.88	0.002	SPO0178	0.36	0.342	SPO0178	0.42	0.404	SPO0178	0.81	0.830	SPO0178	1.05	0.974
SPO0179	0.81	0.192	SPO0179	0.85	0.347	SPO0180	0.93	0.006	SPO0180	0.67	0.29	SPO0179	0.23	0.000	SPO0179	0.27	0.000	SPO0179	1.15	0.579	SPO0179	1.12	0.446
SPO0180	0.85	0.659	SPO0180	0.92	0.843	SPO0181	0.94	0.576	SPO0181	0.97	0.686	SPO0180	0.22	0.000	SPO0180	0.28	0.000	SPO0180	1.00	0.714	SPO0180	1.13	0.250
SPO0181	0.92	0.941	SPO0181	1.02	0.412	SPO0182	0.93	0.012	SPO0182	0.94	0.109	SPO0181	0.14	0.000	SPO0181	0.13	0.000	SPO0181	1.03	0.941	SPO0181	0.93	0.429
SPO0182	0.8	0.346	SPO0182	0.65	0.013	SPO0183	0.99	0.68	SPO0183	0.98	0.613	SPO0182	0.33	0.000	SPO0182	0.37	0.000	SPO0182	1.05	0.924	SPO0182	1.08	0.805
SPO0183	1.12	0.742	SPO0183	1.06	0.826	SPO0184	0.96	0.634	SPO0184	0.94	0.694	SPO0183	0.60	0.269	SPO0183	0.56	0.221	SPO0183	0.77	0.523	SPO0183	0.80	0.640
SPO0184	1.14	0.596	SPO0184	1.17	0.471	SPO0185	0.89	0.252	SPO0185	0.74	0.196	SPO0184	0.78	0.411	SPO0184	0.77	0.311	SPO0184	1.20	0.492	SPO0184	1.22	0.436
SPO0185	1.34	0.065	SPO0185	1.13	0.546	SPO0186	0.94	0.011	SPO0186	0.79	0.087	SPO0185	0.93	0.739	SPO0185	1.04	0.743	SPO0185	1.50	0.046	SPO0185	1.56	0.022
SPO0186	0.95	0.803	SPO0186	0.89	0.239	SPO0187	0.95	0.425	SPO0187	0.88	0.842	SPO0186	0.68	0.009	SPO0186	0.70	0.020	SPO0186	1.51	0.060	SPO0186	1.54	0.026
SPO0187	0.8	0.259	SPO0187	0.99	0.933	SPO0188	1	0.058	SPO0188	0.93	0.089	SPO0187	0.56	0.050	SPO0187	0.63	0.291	SPO0187	0.72	0.227	SPO0187	0.78	0.280
SPO0188	1.22	0.026	SPO0188	1.16	0.047	SPO0189	0.98	0.566	SPO0189	0.94	0.536	SPO0188	0.62	0.005	SPO0188	0.63	0.000	SPO0188	0.97	0.221	SPO0188	0.95	0.565
SPO0189	1.02	0.684	SPO0189	0.95	0.946	SPO0190	0.99	0.125	SPO0190	0.97	0.369	SPO0189	0.79	0.183	SPO0189	0.88	0.015	SPO0189	0.95	0.678	SPO0189	0.99	0.876
SPO0190	0.97	0.789	SPO0190	1.02	0.643	SPO0191	0.96	0.995	SPO0191	0.88	0.959	SPO0190	0.70	0.155	SPO0190	0.70	0.038	SPO0190	0.89	0.656	SPO0190	0.86	0.561
SPO0191	1	0.86	SPO0191	0.94	0.999	SPO0192	0.9	0.913	SPO0192	0.93	0.598	SPO0191	0.54	0.053	SPO0191	0.55	0.023	SPO0191	0.87	0.590	SPO0191	0.84	0.421
SPO0192	0.86	0.738	SPO0192	0.94	0.963	SPO0193	0.93	0.853	SPO0193	1	0.819	SPO0192	0.25	0.000	SPO0192	0.31	0.002	SPO0192	0.93	0.631	SPO0192	0.91	0.565
SPO0193	1	0.733	SPO0193	1.05	0.643	SPO0194	0.98	0.725	SPO0194	0.96	0.882	SPO0193	0.43	0.020	SPO0193	0.47	0.003	SPO0193	1.09	0.847	SPO0193	0.99	0.869
SPO0194	1	0.853	SPO0194	0.93	0.989	SPO0195	0.67	0.832	SPO0195	0.97	0.751	SPO0194	0.63	0.049	SPO0194	0.63	0.053	SPO0194	1.03	1.000	SPO0194	1.02	0.992
SPO0195	1.18	0.157	SPO0195	1.26	0.007	SPO0196	0.79	0.755	SPO0196	0.91	0.725	SPO0195	0.74	0.017	SPO0195	1.03	0.122	SPO0195	1.00	0.780	SPO0195	0.97	0.501
SPO0196	0.91	0.912	SPO0196	0.97	0.977	SPO0197	0.8	0.822	SPO0197	0.96	0.316	SPO0196	0.74	0.498	SPO0196	0.72	0.448	SPO0196	0.90	0.842	SPO0196	1.01	0.992
SPO0197	1.35	0.036	SPO0197	1.13	0.288	SPO0198	0.95	0.622	SPO0198	0.9	0.74	SPO0197	0.12	0.000	SPO0197	0.16	0.000	SPO0197	1.11	0.862	SPO0197	0.87	0.463
SPO0198	0.99	0.831	SPO0198	1.08	0.695	SPO0199	0.96	0.693	SPO0199	0.93	0.706	SPO0198	0.15	0.002	SPO0198	0.16	0.001	SPO0198	0.94	0.726	SPO0198	0.98	0.851
SPO0199	1.22	0.033	SPO0199	1.08	0.178	SPO0200	0.75	0.406	SPO0200	0.95	0.82	SPO0199	0.15	0.001	SPO0199	0.18	0.000	SPO0199	0.60	0.142	SPO0199	0.65	0.114
SPO0200	0.71	0.453	SPO0200	0.88	0.876	SPO0201	0.91	0.939	SPO0201	0.93	0.749	SPO0200	0.38	0.031	SPO0200	0.38	0.000	SPO0200	1.00	0.912	SPO0200	1.11	0.805
SPO0201	0.97	0.773	SPO0201	1.06	0.077	SPO0202	0.83	0.036	SPO0202	0.64	0.041	SPO0201	0.19	0.001	SPO0201	0.22	0.000	SPO0201	1.09	0.851	SPO0201	1.06	0.878
SPO0202	0.99	0.484	SPO0202	0.9	0.799	SPO0203	0.87	0.39	SPO0203	0.76	0.249	SPO0202	0.21	0.000	SPO0202	0.29	0.000	SPO0202	1.23	0.327	SPO0202	1.11	0.587
SPO0203	1.03	0.218	SPO0203	1.14	0.026	SPO0204	0.78	0.93	SPO0204	0.82	0.804	SPO0203	0.27	0.001	SPO0203	0.32	0.000	SPO0203	1.08	0.681	SPO0203	0.96	0.672
SPO0204	1.2	0.131	SPO0204	1.17	0.099	SPO0205	0.82	0.286	SPO0205	0.7	0.068	SPO0204	0.40	0.001	SPO0204	0.50	0.000	SPO0204	0.88	0.543	SPO0204	1.00	0.757
SPO0205	1.02	0.55	SPO0205	0.77	0.258	SPO0206	0.89	0.393	SPO0206	0.85	0.364	SPO0205	0.87	0.311	SPO0205	1.02	0.560	SPO0205	0.86	0.604	SPO0205	1.15	0.295
SPO0206	0.93	0.923	SPO0206	0.94	0.997	SPO0207	0.82	0.003	SPO0207	0.76	0.013	SPO0206	0.84	0.415	SPO0206	0.86	0.079	SPO0206	0.99	0.829	SPO0206	1.00	0.924
SPO0207	1.18	0.036	SPO0207	1.1	0.032	SPO0209	0.97	0.087	SPO0209	0.88	0.017	SPO0207	0.79	0.160	SPO0207	1.01	0.494	SPO0207	1.00	0.745	SPO0207	0.96	0.682
SPO0209	1.11	0.336	SPO0209	1.08	0.191	SPO0210	0.91	0.624	SPO0210	0.78	0.654	SPO0209	0.79	0.014	SPO0209	0.83	0.018	SPO0209	1.01	0.946	SPO0209	0.89	0.104
SPO0210	1.28	0.049	SPO0210	1.31	0.001	SPO0211	0.92	0.359	SPO0211	0.83	0.096	SPO0210	0.81	0.115	SPO0210	0.72	0.025	SPO0210	1.17	0.011	SPO0210	1.08	0.140
SPO0211	1.03	0.371	SPO0211	1.05	0.134	SPO0212	0.84	0.985	SPO0212	0.88	0.988	SPO0211	1.47	0.056	SPO0211	1.61	0.004	SPO0211	1.01	0.735	SPO0211	1.00	0.808
SPO0212	0.69	0.241	SPO0212	0.76	0.464	SPO0213	0.89	0.669	SPO0213	0.78	0.67	SPO0212	0.90	0.360	SPO0212	1.05	0.990	SPO0212	0.94	0.663	SPO0212	1.03	0.926
SPO0213	0.99	0.976	SPO0213	0.85	0.715	SPO0214	0.88	0.053	SPO0214	0.91	0.153	SPO0213	1.24	0.315	SPO0213	1.24	0.520	SPO0213	1.01	0.973	SPO0213	0.95	0.934
SPO0214	1.2	0.278	SPO0214	1.14	0.304	SPO0215	0.93	0.35	SPO0215	0.83	0.792	SPO0214	1.17	0.212	SPO0214	1.19	0.183	SPO0214	0.88	0.435	SPO0214	0.80	0.186
SPO0215	1.73	0.001	SPO0215	1.58	0.005	SPO0216	0.94	0.108	SPO0216	0.93	0.336	SPO0215	0.70	0.014	SPO0215	0.68	0.012	SPO0215	1.17	0.164	SPO0215	1.00	0.829
SPO0216	1.34	0.009	SPO0216	1.46	0	SPO0217	0.93	0.936	SPO0217	0.91	0.69	SPO0216	0.99	0.398	SPO0216	0.88	0.774	SPO0216	1.06	0.674	SPO0216	1.05	0.414
SPO0217	0.8	0.293	SPO0217	0.74	0.175	SPO0218	0.98	0.013	SPO0218	0.93	0	SPO0217	1.10	0.848	SPO0217	1.20	0.530	SPO0217	0.53	0.349	SPO0217	1.05	0.954
SPO0218	1.07	0.193	SPO0218	1.03	0.172	SPO0219	0.95	0.003	SPO0219	0.89	0	SPO0218	0.75	0.001	SPO0218	0.74	0.000	SPO0218	0.88	0.120	SPO0218	0.95	0.383
SPO0219	1.08	0.012	SPO0219	1.11	0	SPO0220	0.95	0.169	SPO0220	0.89	0.529	SPO0219	0.97	0.007	SPO0219	1.01	0.000	SPO0219	1.07	0.025	SPO0219	1.01	0.561
SPO0220	1.67	0.002	SPO0220	1.57	0.092	SPO0221	0.93	0.629	SPO0221	0.98	0.826	SPO0220	1.11	0.010	SPO0220	1.14	0.295	SPO0220	1.09	0.442	SPO0220	1.08	0.734
SPO0221	1.42	0.092	SPO0221	1.26	0.259	SPO0222	0.88	0.003	SPO0222	0.9	0	SPO0221	1.25	0.262	SPO0221	1.20	0.482	SPO0221	1.23	0.499	SPO0221	1.16	0.596
SPO0222	0.25	0	SPO0222	0.24	0	SPO0223	0.95	0.382	SPO0223	0.9	0.668	SPO0222	0.03	0.000	SPO0222	0.03	0.000	SPO0222	6.31	0.002	SPO0222	5.29	0.000
SPO0223	1.06	0.365	SPO0223	1.07	0.067	SPO0224	0.8	0.96	SPO0224	0.93	0.807	SPO0223	1.58	0.003	SPO0223	1.65	0.000	SPO0223	0.97	0.781	SPO0223	0.99	0.888
SPO0224	0.85	0.344	SPO0224	0.87	0.542	SPO0225	0.81	0.421	SPO0225	0.78	0.904	SPO0224	1.12	0.192	SPO0224	1.02	0.218	SPO0224	1.10	0.493	SPO0224	1.04	0.738
SPO0225	0.97	0.791	SPO0225	1.14	0.041	SPO0226	0.7	0.419	SPO0226	0.81	0.634	SPO0225	1.32	0.137	SPO0225	1.22	0.291	SPO0225	1.23	0.388	SPO0225	1.16	0.567
SPO0226	1.53	0.005	SPO0226	1.52	0.019	SPO0227	0.9	0.001	SPO0227	1.02	0.067	SPO0226	1.35	0.165	SPO0226	1.57	0.004	SPO0226	1.12	0.750	SPO0226	0.96	0.712
SPO0227	1.65	0.021	SPO0227	1.37	0.016	SPO0228	0.85	0.969	SPO0228	0.97	0.643	SPO0227	5.09	0.000	SPO0227	5.28	0.000	SPO0227	1.00	0.653	SPO0227	0.96	0.992
SPO0228	0.88	0.826	SPO0228	0.89	0.726	SPO0229	0.99	0.184	SPO0229	0.65	0.04	SPO0228	0.86	0.276	SPO0228	0.70	0.023	SPO0228	0.70	0.040	SPO0228	0.65	0.101
SPO0229	1.22	0.198	SPO0229	1.26	0.009	SPO0230	0.97	0.101	SPO0230	0.9	0.008	SPO0229	1.08	0.000	SPO0229	0.91	0.029	SPO0229	1.07	0.030	SPO0229	0.96	0.993
SPO0230	0.93	0.652	SPO0230	0.91	0.692	SPO0231	0.93	0.144	SPO0231	0.87	0.368	SPO0230	1.20	0.125	SPO0230	1.33	0.001	SPO0230	1.08	0.633	SPO0230	1.06	0.445
SPO0231	1.63	0.002	SPO0231	1.5	0	SPO0232	0.58	0.653	SPO0232	0.98	0.726	SPO0231	0.83	0.143	SPO0231	0.83	0.265	SPO0231	1.00	0.855	SPO0231	1.02	0.581
SPO0232	0.76	0.018	SPO0232	0.81	0.034	SPO0233	0.86	0.872	SPO0233	0.93	0.929	SPO0232	0.88	0.801	SPO0232	0.83	0.722	SPO0232	0.87	0.259	SPO0232	0.83	0.069
SPO0233	1.05	0.654	SPO0233	1.01	0.695	SPO0234	0.77	0.936	SPO0234	0.94	0.872	SPO0233	1.40	0.103	SPO0233	1.35	0.088	SPO0233	1.24	0.358	SPO0233	1.17	0.094
SPO0234	0.81	0.468	SPO0234	0.81	0.649	SPO0235	0.84	0.255	SPO0235	0.99	0.162	SPO0234	0.36	0.005	SPO0234	0.39	0.017	SPO0234	0.85	0.303	SPO0234	0.86	0.566
SPO0235	0.94	0.919	SPO0235	1.02	0.803	SPO0236	0.81	0.249	SPO0236	0.53	0.48	SPO0235	0.49	0.037	SPO0235	0.52	0.058	SPO0235	0.94	0.830	SPO0235	0.91	0.574
SPO0236	0.91	0.858	SPO0236	0.82	0.542	SPO0237	0.53	0.782	SPO0237	0.98	0.406	SPO0236	1.07	0.796	SPO0236	1.08	0.869	SPO0236	1.10	0.876	SPO0236	1.03	0.895
SPO0237	0.8	0.413	SPO0237	0.87	0.394	SPO0238	0.68	0.869	SPO0238	0.85	0.975	SPO0237	1.22	0.186	SPO0237	1.37	0.065	SPO0237	0.91	0.748	SPO0237	1.05	0.902
SPO0238	0.82	0.634	SPO0238	0.95	0.95	SPO0239	0.98	0.452	SPO0239	0.8	0.726	SPO0238	1.31	0.191	SPO0238	1.36	0.144	SPO0238	0.98	0.833	SPO0238	1.05	0.903
SPO0239	0.97	0.914	SPO0239	0.98	0.891	SPO0240	0.95	0.863	SPO0240	0.81	0.168	SPO0239	1.07	0.908	SPO0239	1.06	0.950	SPO0239	0.89	0.496	SPO0239	0.88	0.510
SPO0240	0.63	0.002	SPO0240	0.69	0.003	SPO0241	0.78	0.925	SPO0241	0.85	0.896	SPO0240	1.35	0.002	SPO0240	1.35	0.002	SPO0240	0.84	0.161	SPO0240	0.94	0.543
SPO0241	1.01	0.878	SPO0241	1.03	0.789	SPO0247	0.83	0.483	SPO0247	0.52	0.442	SPO0241	1.14	0.791	SPO0241	1.06	0.977	SPO0241	0.94	0.789	SPO0241	0.93	0.829
SPO0247	1.07	0.452	SPO0247	1.2	0.192	SPO0248	0.98	0.782	SPO0248	0.65	0.78	SPO0247	1.59	0.081	SPO0247	1.37	0.263	SPO0247	0.89	0.189	SPO0247	0.95	0.801
SPO0248	1.22	0.586	SPO0248	1.24	0.707	SPO0249	0.78	0.436	SPO0249	0.96	0.588	SPO0248	0.88	0.883	SPO0248	0.85	0.856	SPO0248	1.05	0.892	SPO0248	1.06	0.861
SPO0249	1.08	0.301	SPO0249	1.08	0.355	SPO0250	0.88	0.496	SPO0250	0.91	0.666	SPO0249	0.96	0.647	SPO0249	0.98	0.690	SPO0249	0.93	0.686	SPO0249	0.95	0.844
SPO0250	0.89	0.53	SPO0250	0.9	0.601	SPO0251	0.83	0.735	SPO0251	0.81	0.862	SPO0250	1.00	0.739	SPO0250	1.06	0.382	SPO0250	0.90	0.495	SPO0250	0.93	0.610
SPO0251	0.74	0.032	SPO0251	0.85	0.046	SPO0252	0.94	0.322	SPO0252	0.83	0.346	SPO0251	1.07	0.295	SPO0251	1.04	0.473	SPO0251	0.90	0.566	SPO0251	0.89	0.445
SPO0252	1.03	0.54	SPO0252	1.02	0.702	SPO0253	0.83	0.169	SPO0253	0.98	0.316	SPO0252	0.57	0.002	SPO0252	0.56	0.000	SPO0252	0.79	0.058	SPO0252	0.84	0.258
SPO0253	1.1	0.19	SPO0253	1.16	0.216	SPO0254	0.88	0.457	SPO0254	0.72	0.276	SPO0253	1.05	0.024	SPO0253	1.08	0.123	SPO0253	1.00	0.807	SPO0253	0.98	0.993
SPO0254	0.56	0.01	SPO0254	0.61	0.014	SPO0255	0.67	0.092	SPO0255	0.88	0.056	SPO0254	0.17	0.000	SPO0254	0.17	0.000	SPO0254	1.12	0.386	SPO0254	1.02	0.782
SPO0255	1.13	0.072	SPO0255	1.13	0.297	SPO0256	0.85	0.905	SPO0256	0.68	0.804	SPO0255	0.23	0.000	SPO0255	0.23	0.000	SPO0255	0.89	0.250	SPO0255	0.85	0.080
SPO0256	0.83	0.097	SPO0256	0.96	0.835	SPO0257	0.85	0.279	SPO0257	0.93	0.626	SPO0256	1.06	0.794	SPO0256	0.97	0.530	SPO0256	1.10	0.681	SPO0256	1.21	0.181
SPO0257	1.12	0.107	SPO0257	0.99	0.897	SPO0258	0.93	0.953	SPO0258	0.83	0.956	SPO0257	0.75	0.084	SPO0257	0.79	0.313	SPO0257	0.81	0.021	SPO0257	0.86	0.671
SPO0258	1.05	0.801	SPO0258	0.96	0.98	SPO0259	0.9	0.048	SPO0259	0.82	0.071	SPO0258	0.88	0.834	SPO0258	0.88	0.879	SPO0258	0.99	0.998	SPO0258	1.05	0.801
SPO0259	0.93	0.949	SPO0259	1.06	0.073	SPO0260	0.93	0.003	SPO0260	0.61	0.015	SPO0259	1.53	0.091	SPO0259	1.44	0.011	SPO0259	1.51	0.033	SPO0259	1.28	0.029
SPO0260	1.06	0.046	SPO0260	1.09	0.139	SPO0261	0.96	0.459	SPO0261	0.84	0.99	SPO0260	1.72	0.007	SPO0260	1.70	0.001	SPO0260	0.92	0.257	SPO0260	0.85	0.054
SPO0261	1.37	0.014	SPO0261	1.31	0.02	SPO0262	0.98	0.594	SPO0262	0.77	0.078	SPO0261	1.28	0.014	SPO0261	1.16	0.013	SPO0261	1.12	0.443	SPO0261	1.07	0.661
SPO0262	1.19	0.039	SPO0262	1.12	0.018	SPO0263	1	0.74	SPO0263	0.81	0.847	SPO0262	0.96	0.333	SPO0262	0.95	0.274	SPO0262	0.94	0.622	SPO0262	0.91	0.229
SPO0263	1.17	0.213	SPO0263	1.05	0.692	SPO0264	0.85	0.115	SPO0264	0.87	0.024	SPO0263	0.93	0.626	SPO0263	1.19	0.664	SPO0263	1.22	0.280	SPO0263	1.03	0.986
SPO0264	1.3	0.292	SPO0264	1.32	0.003	SPO0265	0.82	0.977	SPO0265	0.87	0.916	SPO0264	0.60	0.000	SPO0264	0.57	0.000	SPO0264	1.07	0.270	SPO0264	1.05	0.494
SPO0265	1.55	0.425	SPO0265	1.49	0.354	SPO0266	0.9	0.708	SPO0266	1.01	0.377	SPO0265	0.84	0.656	SPO0265	0.89	0.721	SPO0265	1.15	0.848	SPO0265	1.06	0.933
SPO0266	1.42	0.144	SPO0266	1.34	0.076	SPO0267	0.94	0.389	SPO0267	0.85	0.522	SPO0266	0.92	0.331	SPO0266	0.99	0.758	SPO0266	0.94	0.634	SPO0266	0.91	0.588
SPO0267	0.93	0.289	SPO0267	1.03	0.394	SPO0268	0.98	0.998	SPO0268	1	0.886	SPO0267	1.25	0.055	SPO0267	1.16	0.083	SPO0267	0.95	0.615	SPO0267	1.04	0.515
SPO0268	0.87	0.758	SPO0268	0.98	0.916	SPO0269	0.71	0.49	SPO0269	0.99	0.324	SPO0268	1.04	0.840	SPO0268	1.01	0.949	SPO0268	1.05	0.889	SPO0268	0.97	0.890
SPO0269	0.98	0.975	SPO0269	1.06	0.314	SPO0270	0.94	0.323	SPO0270	0.97	0.505	SPO0269	1.29	0.014	SPO0269	1.23	0.012	SPO0269	1.00	0.998	SPO0269	1.03	0.739
SPO0270	1.03	0.334	SPO0270	0.95	0.893	SPO0271	0.93	0.603	SPO0271	0.85	0.179	SPO0270	1.11	0.012	SPO0270	1.09	0.238	SPO0270	0.96	0.640	SPO0270	0.96	0.864
SPO0271	0.91	0.494	SPO0271	1.02	0.723	SPO0272	0.53	0.095	SPO0272	0.84	0.282	SPO0271	1.86	0.001	SPO0271	1.60	0.001	SPO0271	0.94	0.776	SPO0271	0.94	0.757
SPO0272	1	0.872	SPO0272	1.09	0.153	SPO0273	0.93	0.336	SPO0273	0.94	0.34	SPO0272	1.45	0.000	SPO0272	1.37	0.001	SPO0272	0.80	0.040	SPO0272	0.89	0.300
SPO0273	1.78	0.011	SPO0273	1.59	0.032	SPO0274	0.97	0.575	SPO0274	1.01	0.221	SPO0273	0.93	0.682	SPO0273	1.02	0.378	SPO0273	1.02	0.644	SPO0273	1.04	0.675
SPO0274	0.74	0.258	SPO0274	0.82	0.482	SPO0275	0.87	0.001	SPO0275	0.96	0.005	SPO0274	0.79	0.164	SPO0274	0.93	0.167	SPO0274	0.61	0.008	SPO0274	0.63	0.012
SPO0275	1.1	0.253	SPO0275	1.08	0.095	SPO0276	0.97	0.259	SPO0276	0.96	0.163	SPO0275	0.63	0.008	SPO0275	0.68	0.007	SPO0275	0.84	0.187	SPO0275	0.81	0.050
SPO0276	1.35	0.183	SPO0276	1.18	0.022	SPO0277	0.84	0.11	SPO0277	0.73	0.354	SPO0276	0.86	0.130	SPO0276	0.82	0.002	SPO0276	0.95	0.299	SPO0276	0.94	0.333
SPO0277	1.15	0.007	SPO0277	1.24	0.003	SPO0278	0.87	0.969	SPO0278	0.97	0.7	SPO0277	1.38	0.015	SPO0277	1.36	0.003	SPO0277	1.12	0.450	SPO0277	1.12	0.463
SPO0278	1.5	0.003	SPO0278	1.47	0.003	SPO0280	0.94	0.001	SPO0280	0.96	0.041	SPO0278	1.20	0.073	SPO0278	1.21	0.004	SPO0278	1.03	0.787	SPO0278	0.98	0.899
SPO0280	1.63	0	SPO0280	1.56	0	SPO0281	0.74	0.029	SPO0281	0.49	0.281	SPO0280	1.50	0.004	SPO0280	1.37	0.004	SPO0280	0.99	0.651	SPO0280	0.99	0.600
SPO0281	0.54	0.003	SPO0281	0.58	0.001	SPO0282	0.71	0.309	SPO0282	0.89	0.226	SPO0281	0.50	0.003	SPO0281	0.49	0.001	SPO0281	1.38	0.115	SPO0281	1.26	0.136
SPO0282	1.3	0.01	SPO0282	1.22	0.008	SPO0283	0.79	0.876	SPO0283	0.78	0.911	SPO0282	1.42	0.082	SPO0282	1.39	0.010	SPO0282	1.32	0.176	SPO0282	1.12	0.463
SPO0283	1.29	0.364	SPO0283	1.1	0.56	SPO0284	0.88	0.326	SPO0284	0.84	0.097	SPO0283	0.67	0.210	SPO0283	0.63	0.209	SPO0283	0.87	0.623	SPO0283	0.92	0.773
SPO0284	1.03	0.619	SPO0284	1.18	0.065	SPO0285	0.88	0.388	SPO0285	0.84	0.368	SPO0284	1.27	0.007	SPO0284	1.26	0.000	SPO0284	1.07	0.455	SPO0284	1.11	0.104

SPO0285	1.13	0.011	SPO0285	1.18	0.019	SPO0286	0.93	0.445	SPO0286	0.92	0.162	SPO0285	1.23	0.061	SPO0285	1.32	0.015	SPO0285	1.03	0.749	SPO0285	1.01	0.918
SPO0286	1.82	0.001	SPO0286	1.63	0.005	SPO0287	0.83	0.519	SPO0287	0.93	0.554	SPO0286	0.85	0.282	SPO0286	0.86	0.171	SPO0286	0.96	0.788	SPO0286	0.97	0.818
SPO0287	1.62	0	SPO0287	1.58	0	SPO0288	0.94	0.69	SPO0288	0.74	0.327	SPO0287	1.00	0.747	SPO0287	1.04	0.523	SPO0287	1.09	0.512	SPO0287	1.05	0.686
SPO0288	1.17	0.312	SPO0288	1.13	0.349	SPO0289	0.78	0.975	SPO0289	0.63	0.993	SPO0288	0.79	0.005	SPO0288	0.81	0.064	SPO0288	0.99	0.971	SPO0288	0.90	0.620
SPO0289	1.04	0.938	SPO0289	1.04	0.916	SPO0290	0.75	0.662	SPO0290	0.79	0.507	SPO0289	0.57	0.515	SPO0289	0.58	0.513	SPO0289	0.85	0.828	SPO0289	0.83	0.756
SPO0290	0.98	0.94	SPO0290	0.91	0.181	SPO0291	0.88	0.006	SPO0291	0.84	0.026	SPO0290	0.63	0.004	SPO0290	0.67	0.006	SPO0290	1.02	0.734	SPO0290	1.06	0.381
SPO0291	0.74	0.004	SPO0291	0.72	0.015	SPO0292	0.98	0.53	SPO0292	0.98	0.47	SPO0291	0.93	0.351	SPO0291	0.93	0.683	SPO0291	1.01	0.890	SPO0291	1.05	0.639
SPO0292	1.09	0.519	SPO0292	0.97	0.991	SPO0293	0.76	0.007	SPO0293	0.81	0.012	SPO0292	1.12	0.596	SPO0292	1.15	0.526	SPO0292	0.96	0.863	SPO0292	1.01	0.962
SPO0293	1.61	0.005	SPO0293	1.42	0.08	SPO0294	0.71	0.606	SPO0294	0.93	0.763	SPO0293	0.54	0.000	SPO0293	0.51	0.012	SPO0293	1.04	0.811	SPO0293	1.02	0.942
SPO0294	1.29	0.024	SPO0294	1.28	0.299	SPO0295	0.75	0.507	SPO0295	0.85	0.17	SPO0294	0.89	0.295	SPO0294	0.93	0.412	SPO0294	1.01	0.987	SPO0294	1.10	0.152
SPO0295	1.32	0.038	SPO0295	1.25	0.08	SPO0296	0.71	0.367	SPO0296	0.97	0.372	SPO0295	0.61	0.002	SPO0295	0.60	0.000	SPO0295	1.01	0.607	SPO0295	0.98	0.997
SPO0296	1.19	0.314	SPO0296	1.12	0.418	SPO0297	0.85	0.97	SPO0297	0.79	0.973	SPO0296	0.61	0.176	SPO0296	0.61	0.055	SPO0296	0.75	0.311	SPO0296	0.75	0.325
SPO0297	1.06	0.896	SPO0297	1.05	0.922	SPO0298	0.79	0.8	SPO0298	0.86	0.864	SPO0297	0.99	0.879	SPO0297	0.99	0.850	SPO0297	0.98	0.989	SPO0297	1.00	0.961
SPO0298	1.2	0.197	SPO0298	1.23	0.098	SPO0299	0.96	0.707	SPO0299	0.95	0.746	SPO0298	0.68	0.040	SPO0298	0.70	0.022	SPO0298	0.90	0.480	SPO0298	0.88	0.384
SPO0299	1.3	0.098	SPO0299	1.14	0.051	SPO0300	0.89	0.078	SPO0300	1.01	0.118	SPO0299	1.11	0.812	SPO0299	1.21	0.452	SPO0299	1.13	0.613	SPO0299	1.00	0.932
SPO0300	1.28	0.014	SPO0300	1.08	0.225	SPO0301	0.76	0.936	SPO0301	1.01	0.786	SPO0300	0.51	0.001	SPO0300	0.50	0.000	SPO0300	1.01	0.966	SPO0300	0.97	0.467
SPO0301	0.77	0.166	SPO0301	0.78	0.437	SPO0302	0.83	0.879	SPO0302	0.94	0.996	SPO0301	0.81	0.351	SPO0301	0.85	0.544	SPO0301	1.01	0.905	SPO0301	1.00	0.960
SPO0302	0.79	0.603	SPO0302	0.81	0.533	SPO0303	0.71	0.132	SPO0303	0.81	0.266	SPO0302	0.92	0.754	SPO0302	0.93	0.738	SPO0302	1.03	0.939	SPO0302	1.12	0.764
SPO0303	1.46	0.001	SPO0303	1.4	0.001	SPO0304	0.82	0.653	SPO0304	0.98	0.786	SPO0303	0.49	0.000	SPO0303	0.47	0.000	SPO0303	1.03	0.161	SPO0303	1.04	0.133
SPO0304	1.18	0.491	SPO0304	1.17	0.54	SPO0305	0.68	0.639	SPO0305	0.7	0.609	SPO0304	0.90	0.921	SPO0304	0.93	0.752	SPO0304	0.97	0.996	SPO0304	1.02	0.875
SPO0305	1.16	0.369	SPO0305	0.99	0.912	SPO0306	0.86	0.788	SPO0306	0.8	0.791	SPO0305	1.07	0.586	SPO0305	1.23	0.323	SPO0305	0.98	0.923	SPO0305	0.99	0.974
SPO0306	0.92	0.428	SPO0306	0.95	0.886	SPO0307	0.87	0.219	SPO0307	0.67	0.328	SPO0306	0.75	0.029	SPO0306	0.78	0.010	SPO0306	0.94	0.410	SPO0306	1.01	0.813
SPO0307	0.81	0.731	SPO0307	0.88	0.844	SPO0308	0.9	0.577	SPO0308	0.83	0.268	SPO0307	4.77	0.008	SPO0307	4.09	0.026	SPO0307	0.88	0.881	SPO0307	0.91	0.899
SPO0308	1.15	0.09	SPO0308	1.09	0.105	SPO0309	0.79	0.784	SPO0309	0.79	0.876	SPO0308	1.23	0.003	SPO0308	1.39	0.003	SPO0308	1.10	0.374	SPO0308	1.08	0.367
SPO0309	1.12	0.513	SPO0309	1.11	0.54	SPO0310	0.85	0.976	SPO0310	0.93	0.695	SPO0309	0.92	0.848	SPO0309	0.97	0.934	SPO0309	0.99	0.947	SPO0309	1.02	0.870
SPO0310	1.15	0.255	SPO0310	0.99	0.882	SPO0311	0.94	0.199	SPO0311	0.83	0.293	SPO0310	0.74	0.236	SPO0310	0.73	0.147	SPO0310	0.81	0.124	SPO0310	0.83	0.140
SPO0311	1.27	0.089	SPO0311	1.23	0.14	SPO0312	0.85	0.768	SPO0312	0.75	0.911	SPO0311	1.12	0.397	SPO0311	1.12	0.370	SPO0311	1.01	0.967	SPO0311	1.03	0.865
SPO0312	0.75	0.234	SPO0312	0.81	0.295	SPO0313	0.9	0.277	SPO0313	0.98	0.008	SPO0312	1.28	0.054	SPO0312	1.12	0.197	SPO0312	1.01	0.763	SPO0312	1.04	0.390
SPO0313	0.7	0.237	SPO0313	0.7	0.025	SPO0314	0.96	0.004	SPO0314	0.83	0.099	SPO0313	0.11	0.000	SPO0313	0.10	0.000	SPO0313	1.33	0.219	SPO0313	1.36	0.008
SPO0314	1.3	0.023	SPO0314	1.37	0.322	SPO0315	0.88	0.906	SPO0315	0.7	0.623	SPO0314	0.29	0.000	SPO0314	0.28	0.000	SPO0314	0.90	0.621	SPO0314	0.87	0.361
SPO0315	0.61	0.004	SPO0315	0.67	0.001	SPO0316	0.95	0.478	SPO0316	0.78	0.623	SPO0315	0.72	0.031	SPO0315	0.73	0.016	SPO0315	0.96	0.808	SPO0315	0.93	0.514
SPO0316	1.07	0.462	SPO0316	1.05	0.561	SPO0317	0.86	0.223	SPO0317	0.72	0.4	SPO0316	1.34	0.076	SPO0316	1.27	0.033	SPO0316	0.91	0.718	SPO0316	0.93	0.738
SPO0317	1.22	0.019	SPO0317	1.1	0.006	SPO0318	0.87	0.204	SPO0318	0.79	0.088	SPO0317	0.84	0.103	SPO0317	0.82	0.196	SPO0317	0.97	0.975	SPO0317	0.98	0.931
SPO0318	1.3	0	SPO0318	1.28	0.001	SPO0319	0.97	0.064	SPO0319	0.93	0.17	SPO0318	1.13	0.019	SPO0318	1.13	0.052	SPO0318	0.92	0.402	SPO0318	0.90	0.289
SPO0319	1.44	0.003	SPO0319	1.47	0	SPO0320	0.94	0.903	SPO0320	0.91	0.899	SPO0319	1.28	0.018	SPO0319	1.21	0.012	SPO0319	1.10	0.365	SPO0319	1.12	0.255
SPO0320	0.99	0.896	SPO0320	0.99	0.822	SPO0321	0.9	0.647	SPO0321	0.75	0.943	SPO0320	1.02	0.553	SPO0320	1.01	0.704	SPO0320	1.14	0.409	SPO0320	1.12	0.590
SPO0321	1.2	0.41	SPO0321	1.19	0.246	SPO0322	0.91	0.182	SPO0322	0.98	0.063	SPO0321	1.09	0.084	SPO0321	1.03	0.516	SPO0321	1.20	0.251	SPO0321	1.09	0.539
SPO0322	0.75	0.024	SPO0322	0.73	0.018	SPO0323	0.85	0.229	SPO0323	0.91	0.024	SPO0322	0.48	0.001	SPO0322	0.39	0.000	SPO0322	0.95	0.967	SPO0322	0.76	0.010
SPO0323	1.44	0.039	SPO0323	1.74	0.001	SPO0324	0.92	0.492	SPO0324	0.99	0.853	SPO0323	0.54	0.003	SPO0323	0.66	0.006	SPO0323	1.81	0.005	SPO0323	1.63	0.005
SPO0324	1.2	0.014	SPO0324	1.16	0.006	SPO0325	0.83	0.192	SPO0325	0.94	0.116	SPO0324	1.12	0.171	SPO0324	1.14	0.111	SPO0324	1.04	0.785	SPO0324	1.06	0.257
SPO0325	0.77	0.066	SPO0325	0.75	0.016	SPO0326	0.85	0.289	SPO0326	0.81	0.308	SPO0325	1.07	0.052	SPO0325	1.00	0.088	SPO0325	0.97	0.959	SPO0325	1.00	0.767
SPO0326	0.7	0.001	SPO0326	0.67	0.002	SPO0327	0.97	0.978	SPO0327	0.94	0.567	SPO0326	0.67	0.003	SPO0326	0.66	0.026	SPO0326	0.99	0.513	SPO0326	1.07	0.001
SPO0327	0.88	0.804	SPO0327	0.89	0.737	SPO0328	0.78	0.003	SPO0328	0.9	0.002	SPO0327	0.47	0.015	SPO0327	0.61	0.001	SPO0327	1.03	0.966	SPO0327	0.92	0.560
SPO0328	1.17	0.121	SPO0328	1.2	0.006	SPO0329	0.9	0.002	SPO0329	0.88	0.016	SPO0328	1.04	0.988	SPO0328	1.12	0.356	SPO0328	0.65	0.017	SPO0328	0.63	0.004
SPO0329	0.77	0.007	SPO0329	0.78	0.011	SPO0330	0.95	0.407	SPO0330	0.85	0.315	SPO0329	1.35	0.014	SPO0329	1.37	0.001	SPO0329	0.67	0.004	SPO0329	0.68	0.016
SPO0330	1.28	0.109	SPO0330	1.22	0.265	SPO0331	0.92	0.447	SPO0331	0.79	0.096	SPO0330	1.19	0.301	SPO0330	1.29	0.165	SPO0330	0.34	0.000	SPO0330	0.33	0.004
SPO0331	1.07	0.139	SPO0331	1.04	0.381	SPO0332	0.88	0.699	SPO0332	0.96	0.433	SPO0331	0.72	0.012	SPO0331	0.74	0.010	SPO0331	1.12	0.283	SPO0331	1.10	0.176
SPO0332	1.31	0.021	SPO0332	1.29	0.051	SPO0333	0.79	0.789	SPO0333	0.81	0.661	SPO0332	0.95	0.789	SPO0332	0.95	0.678	SPO0332	1.03	0.716	SPO0332	1.04	0.497
SPO0333	1.32	0.187	SPO0333	1.18	0.224	SPO0334	0.85	0.239	SPO0334	0.9	0.182	SPO0333	0.59	0.441	SPO0333	0.55	0.011	SPO0333	0.86	0.710	SPO0333	0.86	0.596
SPO0334	1.23	0.044	SPO0334	1.2	0.132	SPO0335	0.79	0.466	SPO0335	0.95	0.54	SPO0334	1.59	0.002	SPO0334	1.63	0.002	SPO0334	1.19	0.065	SPO0334	1.26	0.032
SPO0335	0.57	0.017	SPO0335	0.63	0.001	SPO0336	0.99	0.021	SPO0336	0.84	0.028	SPO0335	0.83	0.104	SPO0335	0.85	0.335	SPO0335	1.02	0.833	SPO0335	0.97	0.913
SPO0336	1.08	0.142	SPO0336	1.05	0.296	SPO0337	0.81	0.847	SPO0337	0.95	0.877	SPO0336	0.89	0.643	SPO0336	0.88	0.575	SPO0336	1.00	0.601	SPO0336	1.03	0.063
SPO0337	1.37	0.001	SPO0337	1.24	0.104	SPO0338	0.72	0.689	SPO0338	0.85	0.333	SPO0337	0.97	0.678	SPO0337	0.94	0.773	SPO0337	1.10	0.217	SPO0337	1.13	0.094
SPO0338	1.56	0	SPO0338	1.39	0	SPO0339	0.74	0.204	SPO0339	0.86	0.229	SPO0338	0.72	0.000	SPO0338	0.64	0.041	SPO0338	0.79	0.105	SPO0338	0.88	0.340
SPO0339	1.6	0.005	SPO0339	1.44	0.023	SPO0340	0.69	0.479	SPO0340	0.78	0.271	SPO0339	0.66	0.079	SPO0339	0.70	0.130	SPO0339	0.90	0.452	SPO0339	0.88	0.367
SPO0340	1.08	0.835	SPO0340	1.06	0.359	SPO0341	0.74	0.939	SPO0341	0.89	0.887	SPO0340	0.95	0.456	SPO0340	0.97	0.146	SPO0340	1.02	0.735	SPO0340	0.99	0.873
SPO0341	1.2	0.359	SPO0341	1.55	0.067	SPO0342	0.78	0.463	SPO0342	0.94	0.78	SPO0341	0.65	0.016	SPO0341	0.74	0.018	SPO0341	1.15	0.643	SPO0341	1.15	0.665
SPO0342	0.87	0.116	SPO0342	0.93	0.729	SPO0343	0.81	0.729	SPO0343	0.9	0.896	SPO0342	0.56	0.107	SPO0342	0.43	0.011	SPO0342	0.70	0.076	SPO0342	0.75	0.079
SPO0343	0.97	0.846	SPO0343	1	0.823	SPO0344	0.93	0.005	SPO0344	0.85	0	SPO0343	1.20	0.047	SPO0343	1.16	0.075	SPO0343	0.98	0.989	SPO0343	0.97	0.949
SPO0344	0.57	0.001	SPO0344	0.62	0	SPO0345	0.94	0.462	SPO0345	0.81	0.445	SPO0344	2.50	0.000	SPO0344	2.53	0.000	SPO0344	0.97	0.887	SPO0344	1.15	0.011
SPO0345	1.01	0.924	SPO0345	1.04	0.365	SPO0346	0.92	0.034	SPO0346	0.82	0.063	SPO0345	0.89	0.941	SPO0345	0.90	0.668	SPO0345	0.88	0.450	SPO0345	0.94	0.740
SPO0346	0.93	0.102	SPO0346	0.97	0.629	SPO0347	0.85	0.888	SPO0347	0.77	0.623	SPO0346	1.47	0.000	SPO0346	1.46	0.000	SPO0346	0.99	0.748	SPO0346	1.00	0.812
SPO0347	0.85	0.251	SPO0347	0.88	0.243	SPO0348	0.84	0.2	SPO0348	0.83	0.096	SPO0347	1.22	0.024	SPO0347	1.20	0.010	SPO0347	0.84	0.083	SPO0347	0.88	0.343
SPO0348	1.11	0.582	SPO0348	1.04	0.171	SPO0349	0.86	0.678	SPO0349	0.85	0.547	SPO0348	1.51	0.002	SPO0348	1.53	0.000	SPO0348	0.97	0.618	SPO0348	0.98	0.768
SPO0349	1.08	0.381	SPO0349	1.28	0.028	SPO0350	0.78	0.299	SPO0350	0.69	0.273	SPO0349	1.37	0.000	SPO0349	1.30	0.000	SPO0349	0.93	0.745	SPO0349	1.03	0.053
SPO0350	1.56	0.002	SPO0350	1.48	0.002	SPO0351	0.49	0.811	SPO0351	0.75	0.866	SPO0350	0.85	0.061	SPO0350	0.85	0.010	SPO0350	0.98	0.656	SPO0350	0.95	0.609
SPO0351	4.47	0	SPO0351	3.6	0	SPO0352	0.85	0.003	SPO0352	0.61	0.001	SPO0351	0.42	0.002	SPO0351	0.42	0.002	SPO0351	0.85	0.460	SPO0351	0.93	0.732
SPO0352	1.27	0.074	SPO0352	1.21	0.015	SPO0353	0.89	0.969	SPO0353	0.78	0.992	SPO0352	1.73	0.000	SPO0352	1.84	0.000	SPO0352	1.06	0.441	SPO0352	1.03	0.496
SPO0353	1.19	0.098	SPO0353	1.09	0.133	SPO0354	0.93	0.121	SPO0354	0.79	0.053	SPO0353	1.04	0.146	SPO0353	1.04	0.145	SPO0353	1.01	0.716	SPO0353	1.01	0.783
SPO0354	0.81	0.025	SPO0354	0.88	0.014	SPO0355	0.97	0.576	SPO0355	0.75	0.63	SPO0354	1.60	0.000	SPO0354	1.54	0.000	SPO0354	1.13	0.071	SPO0354	1.19	0.147
SPO0355	1.52	0.046	SPO0355	1.31	0.038	SPO0356	0.97	0.326	SPO0356	0.94	0.488	SPO0355	1.04	0.663	SPO0355	0.99	0.797	SPO0355	1.16	0.322	SPO0355	1.05	0.729
SPO0356	1.1	0.614	SPO0356	1.1	0.518	SPO0357	0.71	0.617	SPO0357	0.88	0.585	SPO0356	0.98	0.839	SPO0356	0.97	0.888	SPO0356	0.85	0.471	SPO0356	0.82	0.361
SPO0357	0.75	0.496	SPO0357	0.81	0.414	SPO0358	0.36	0.167	SPO0358	0.88	0.133	SPO0357	0.96	0.976	SPO0357	0.90	0.750	SPO0357	0.97	0.908	SPO0357	0.92	0.778
SPO0358	1.13	0.314	SPO0358	1.13	0.34	SPO0359	0.98	0.111	SPO0359	0.78	0.22	SPO0358	2.02	0.000	SPO0358	1.90	0.000	SPO0358	0.94	0.880	SPO0358	0.93	0.564
SPO0359	1.24	0.287	SPO0359	1.17	0.021	SPO0360	0.93	0.041	SPO0360	0.78	0.093	SPO0359	2.69	0.000	SPO0359	2.34	0.000	SPO0359	1.03	0.322	SPO0359	1.03	0.466
SPO0360	0.81	0.122	SPO0360	0.95	0.576	SPO0361	0.82	0.23	SPO0361	0.9	0.113	SPO0360	3.13	0.000	SPO0360	2.80	0.000	SPO0360	0.96	0.994	SPO0360	1.00	0.812
SPO0361	1.15	0.376	SPO0361	0.98	0.977	SPO0362	0.96	0.517	SPO0362	0.81	0.189	SPO0361	2.71	0.001	SPO0361	2.43	0.001	SPO0361	0.96	0.954	SPO0361	0.89	0.549
SPO0362	1.06	0.413	SPO0362	0.96	0.846	SPO0363	0.98	0.499	SPO0363	0.47	0.274	SPO0362	0.97	0.618	SPO0362	0.99	0.098	SPO0362	1.03	0.848	SPO0362	0.93	0.593
SPO0363	0.74	0.071	SPO0363	0.86	0.466	SPO0364	0.98	0.963	SPO0364	0.81	0.996	SPO0363	0.20	0.001	SPO0363	0.18	0.000	SPO0363	0.93	0.643	SPO0363	0.98	0.936
SPO0364	0.91	0.92	SPO0364	1.04	0.723	SPO0365	0.9	0.065	SPO0365	0.92	0.048	SPO0364	1.03	0.881	SPO0364	1.03	0.813	SPO0364	1.09	0.841	SPO0364	1.09	0.796
SPO0365	2.29	0	SPO0365	1.75	0	SPO0366	0.93	0.029	SPO0366	0.91	0.066	SPO0365	0.36	0.000	SPO0365	0.35	0.000	SPO0365	1.06	0.641	SPO0365	0.90	0.279
SPO0366	1.47	0.006	SPO0366	1.55	0.003	SPO0367	0.92	0.608	SPO0367	1	0.034	SPO0366	1.24	0.007	SPO0366	1.16	0.022	SPO0366	0.78	0.105	SPO0366	0.72	0.045
SPO0367	1.32	0.034	SPO0367	1.41	0.174	SPO0368	0.88	0.126	SPO0368	0.98	0.055	SPO0367	1.74	0.000	SPO0367	1.63	0.000	SPO0367	0.76	0.094	SPO0367	0.81	0.178
SPO0368	1.15	0.192	SPO0368	1.14	0.296	SPO0369	0.86	0.996	SPO0369	0.93	0.981	SPO0368	2.01	0.001	SPO0368	2.30	0.000	SPO0368	0.98	0.666	SPO0368	0.92	0.515
SPO0369	0.95	0.999	SPO0369	0.93	0.996	SPO0370	0.8	0.003	SPO0370	0.99	0.003	SPO0369	0.93	0.859	SPO0369	1.00	0.960	SPO0369	1.01	0.990	SPO0369	0.85	0.822
SPO0370	1.04	0.429	SPO0370	1.02	0.513	SPO0371	0.94	0.307	SPO0371	0.74	0.197	SPO0370	1.23	0.013	SPO0370	1.24	0.002	SPO0370	0.93	0.581	SPO0370	0.91	0.281
SPO0371	0.8	0.324	SPO0371	0.81	0.399	SPO0372	0.91	0.034	SPO0372	0.39	0.002	SPO0371	0.53	0.053	SPO0371	0.57	0.045	SPO0371	0.70	0.151	SPO0371	0.73	0.198
SPO0372	1.44	0.096	SPO0372	1.36	0.005	SPO0373	0.96	0.051	SPO0373	0.97	0.01	SPO0372	0.59	0.012	SPO0372	0.75	0.003	SPO0372	1.13	0.677	SPO0372	0.99	0.775
SPO0373	0.87	0.162	SPO0373	0.83	0.079	SPO0374	0.94	0.526	SPO0374	0.89	0.519	SPO0373	1.71	0.015	SPO0373	1.58	0.003	SPO0373	1.14	0.294	SPO0373	1.11	0.302
SPO0374	1.4	0.214	SPO0374	1.31	0.256	SPO0375	0.97	0.756	SPO0375	0.87	0.737	SPO0374	1.02	0.716	SPO0374	1.03	0.683	SPO0374	0.97	0.945	SPO0374	0.93	0.850
SPO0375	1.45	0.335	SPO0375	1.24	0.42	SPO0376	0.99	0.222	SPO0376	0.97	0.339	SPO0375	0.99	0.817	SPO0375	1.05	0.494	SPO0375	0.99	0.995	SPO0375	1.03	0.876
SPO0376	1.25	0.019	SPO0376	1.07	0.152	SPO0377	0.85	0.04	SPO0377	0.95	0.044	SPO0376	0.59	0.011	SPO0376	0.60	0.005	SPO0376	0.91	0.508	SPO0376	0.93	0.741
SPO0377	0.86	0.208	SPO0377	0.9	0.302	SPO0378	0.74	0.186	SPO0378	0.92	0.533	SPO0377	0.68	0.009	SPO0377	0.69	0.004	SPO0377	1.01	0.746	SPO0377	0.98	0.942
SPO0378	0.85	0.399	SPO0378	1	0.916	SPO0379	0.9	0	SPO0379	0.97	0.006	SPO0378	0.56	0.163	SPO0378	0.46	0.057	SPO0378	0.85	0.479	SPO0378	0.83	0.430
SPO0379	0.85	0.003	SPO0379	0.79	0.016	SPO0380	0.93	0.98	SPO0380	0.91	0.782	SPO0379	0.42	0.000	SPO0379	0.43	0.000	SPO0379	1.00	0.735	SPO0379	1.05	0.268
SPO0380	1.03	0.656	SPO0380	1.03	0.63	SPO0381	0.92	0.868	SPO0381	0.95	0.901	SPO0380	0.87	0.558	SPO0380	0.81	0.136	SPO0380	0.85	0.443	SPO0380	0.88	0.331
SPO0381	1.21	0.802	SPO0381	1.24	0.78	SPO0382	0.93	0.18	SPO0382	0.88	0.107	SPO0381	0.55	0.570	SPO0381	0.55	0.564	SPO0381	0.80	0.812	SPO0381	0.79	0.771
SPO0382	1.15	0.552	SPO0382	1.08	0.111	SPO0383	0.9	0.391	SPO0383	0.81	0.302	SPO0382	0.23	0.000	SPO0382	0.23	0.000	SPO0382	0.67	0.002	SPO0382	0.69	0.003
SPO0383	0.85	0.625	SPO0383	0.94	0.989	SPO0384	1	0.745	SPO0384	0.93	0.586	SPO0383	0.79	0.412	SPO0383	0.76	0.336	SPO0383	0.69	0.083	SPO0383	0.83	0.189
SPO0384	1.15	0.49	SPO0384	1.12	0.546	SPO0385	0.96	0.623	SPO0385	0.93	0.367	SPO0384	0.90	0.751	SPO0384	0.93	0.845	SPO0384	1.01	0.993	SPO0384	1.01	0.978
SPO0385	1.29	0.005	SPO0385	1.16	0.029	SPO0386	0.13	0.71	SPO0386	0.91	0.298	SPO0385	0.57	0.008	SPO0385	0.60	0.001	SPO0385	1.00	0.942	SPO0385	0.94	0.665
SPO0386	1.18	0.507	SPO0386	1.08	0.254	SPO0387	0.28	0.101	SPO0387	0.96	0.596	SPO0386	0.65	0.109	SPO0386	0.63	0.018	SPO0386	1.01	0.938	SPO0386	0.92	0.600
SPO0387	0.93	0.78	SPO0387	0.89	0.364	SPO0388	0.78	0.015	SPO0388	0.79	0.05	SPO0387	0.95	0.544	SPO0387	0.93	0.341	SPO0387	1.12	0.349	SPO0387	1.13	0.368
SPO0388	0.79	0.01	SPO0388	0.79	0.064	SPO0389	0.85	0.405	SPO0389	0.89	0.171	SPO0388	0.33	0.000	SPO0388	0.33	0.000	SPO0388	0.88	0.328	SPO0388	0.88	0.259
SPO0389	0.82	0.472	SPO0389	0.83	0.224	SPO0390	0.98	0.898	SPO0390	0.89	0.98	SPO0389	1.06	0.786	SPO0389	1.04	0.925	SPO0389	1.07	0.786	SPO0389	1.12	0.473
SPO0390	0.79	0.789	SPO0390	0.84	0.87	SPO0391	0.98	0.055	SPO0391	0.92	0.152	SPO0390	0.19	0.013	SPO0390	0.18	0.012	SPO0390	0.96	0.962	SPO0390	0.96	0.959
SPO0391	1.25	0.002	SPO0391	1.19	0.138	SPO0392	0.95	0.574	SPO0392	0.9	0.793	SPO0391	0.91	0.462	SPO0391	1.01	0.888	SPO0391	0.99	0.854	SPO0391	0.95	0.761
SPO0392	1.06	0.641	SPO0392	1.12	0.326	SPO0393	0.94	0.92	SPO0393	0.91	0.565	SPO0392	1.00	0.410	SPO0392	1.02	0.191	SPO0392	1.06	0.689	SPO0392	1.05	0.309
SPO0393	1.24	0.04	SPO0393	1.12	0.107	SPO0394	0.89	0.474	SPO0394	0.93	0.601	SPO0393	0.76	0.091	SPO0393	0.77	0.032	SPO0393	0.81	0.096	SPO0393	0.85	0.018
SPO0394	0.88	0.668	SPO0394	1.02	0.924	SPO0395	0.99	0.982	SPO0395	0.12	0.85	SPO0394	0.48	0.092	SPO0394	0.43	0.182	SPO0394	0.85	0.715	SPO0394	0.75	0.246
SPO0395	1.23	0.564	SPO0395	1.16	0.626	SPO0396	0.93	0.885	SPO0396	0.24	0.844	SPO0395	0.95	0.959	SPO0395	0.94	0.957	SPO0395	0.93	0.818	SPO0395	0.92	0.804
SPO0396	1.38	0.004	SPO0396	1.26	0.144	SPO0397	0.86	0.782	SPO0397	0.77	0.672	SPO0396	0.80	0.053	SPO0396	0.80	0.340	SPO0396	0.93	0.612	SPO0396	0.94	0.806
SPO0397	1.26	0.042	SPO0397	1.22	0.07	SPO0398	0.82	0.043	SPO0398	0.91	0.052	SPO0397	0.99	0.837	SPO0397	1.10	0.288	SPO0397	1.07	0.650	SPO0397	0.96	0.792
SPO0398	0.84	0.358	SPO0398	0.84	0.027	SPO0399	0.81	0.987	SPO0399	0.95	0.932	SPO0398	1.40	0.000	SPO0398	1.46	0.000	SPO0398	1.08	0.096	SPO0398	1.06	0.185
SPO0399	1.12	0.085	SPO0399	1.09	0.078	SPO0400	0.92	0.959	SPO0400	1	0.809	SPO0399	0.74	0.001	SPO0399	0.76	0.013	SPO0399	1.05	0.401	SPO0399	1.03	0.738
SPO0400	1.11	0.209	SPO0400	1.11	0.211	SPO0401	0.98	0.155	SPO0401	0.94	0.079	SPO0400	1.05	0.920	SPO0400	1.13	0.567	SPO0400	1.28	0.267	SPO0400	1.17	0.272
SPO0401	1.2	0.052	SPO0401	1.18	0.004	SPO0402	0.54	0.857	SPO0402	0.98	0.901	SPO0401	0.82	0.214	SPO0401	0.86	0.521	SPO0401	1.11	0.558	SPO0401	1.08	0.544
SPO0402	0.96	0.987	SPO0402	0.97	0.974	SPO0403	0.91	0.414	SPO0403	0.94	0.26	SPO0402	0.87	0.840	SPO0402	0.87	0.849	SPO0402	1.10	0.898	SPO0402	1.04	0.968
SPO0403	0.91	0.603	SPO0403	0.83	0.319	SPO0404	0.99	0.104	SPO0404	0.93	0.011	SPO0403	0.43	0.000	SPO0403	0.47	0.000	SPO0403	1.08	0.541	SPO0403	1.14	0.306
SPO0404	0.74	0.365	SPO0404	0.73	0.126	SPO0405	0.93	0.922	SPO0405	0.77	0.97	SPO0404	3.85	0.006	SPO0404	4.19	0.001	SPO0404	1.10	0.714	SPO0404	1.12	0.667
SPO0405	0.93	0.714	SPO0405	0.96	0.99	SPO0406	0.91	0.323	SPO0406	0.97	0.524	SPO0405	0.90	0.673	SPO0405	0.98	0.955	SPO0405	1.15	0.251	SPO0405	1.08	0.621
SPO0406	0.81	0.05	SPO0406	0.78	0.202	SPO0407	0.87	0.502	SPO0407	0.96	0.349	SPO0406	0.34	0.000	SPO0406	0.35	0.003	SPO0406	1.13	0.150	SPO0406	1.11	0.591
SPO0407	1.02	0.871	SPO0407	1	0.905	SPO0408	0.97	0.285	SPO0408	1.01	0.392	SPO0407	0.51	0.092	SPO0407	0.47	0.060	SPO0407	1.07	0.726	SPO0407	1.02	0.903
SPO0408	1.01	0.886	SPO0408	1	0.827	SPO0409	0.82	0.969	SPO0409	0.88	0.999	SPO0408	0.67	0.083	SPO0408	0.69	0.070	SPO0408	0.87	0.454	SPO0408	0.87	0.407
SPO0409	1.11	0.793	SPO0409	0.98	0.994	SPO0410	0.9	0.869	SPO0410	0.77	0.723	SPO0409	0.67	0.671	SPO0409	0.71	0.763	SPO0409	0.94	0.941	SPO0409	1.04	0.912
SPO0410	1.12	0.288	SPO0410	1.01	0.758	SPO0411	0.94	0.751	SPO0411	0.84	0.925	SPO0410	1.17	0.252	SPO0410	1.33	0.028	SPO0410	1.29	0.080	SPO0410	1.22	0.431
SPO0411	0.94	0.858	SPO0411	0.93	0.886	SPO0412	0.47	0.148	SPO0412	0.81	0.074	SPO0411	1.21	0.025	SPO0411	1.00	0.980	SPO0411	0.97	0.875	SPO0411	1.12	0.499
SPO0412	0.8	0.496	SPO0412	0.79	0.007	SPO0413	0.97	0.005	SPO0413	0.92	0.041	SPO0412	2.30	0.000	SPO0412	2.44	0.000	SPO0412	1.01	0.860	SPO0412	0.94	0.458
SPO0413	0.88	0.465	SPO0413	0.85	0.296	SPO0414	0.85	0.325	SPO0414	0.99	0.336	SPO0413	1.12	0.117	SPO0413	1.12	0.060	SPO0413	0.99	0.916	SPO0413	1.01	0.880
SPO0414	1.16	0.135	SPO0414	1.02	0.749	SPO0415	0.93	0.293	SPO0415	0.51	0.261	SPO0414	0.47	0.007	SPO0414	0.45	0.016	SPO0414	0.90	0.556	SPO0414	0.92	0.606
SPO0415	0.79	0.28	SPO0415	0.87	0.515	SPO0416	0.54	0.577	SPO0416	0.95	0.494	SPO0415	1.59	0.014	SPO0415	1.61	0.023	SPO0415	1.18	0.587	SPO0415	1.25	0.279
SPO0416	1.1	0.464	SPO0416	1.07	0.521	SPO0417	0.98	0.436	SPO0417	0.93	0.278	SPO0416	1.05	0.669	SPO0416	1.09	0.530	SPO0416	1.05	0.762	SPO0416	1.11	0.417
SPO0417	0.93	0.85	SPO0417	1.05	0.169	SPO0418	0.95	0.207	SPO0418	0.87	0.092	SPO0417	1.30	0.023	SPO0417	1.27	0.002	SPO0417	1.14	0.544	SPO0417	1.09	0.268
SPO0418	1.7	0.001	SPO0418	1.5	0.001	SPO0419	0.93	0.06	SPO0419	0.99	0.088	SPO0418	0.93	0.850	SPO0418	0.95	0.919	SPO0418	0.96	0.797	SPO0418	0.94	0.515
SPO0419	1.47	0.001	SPO0419	1.34	0.001	SPO0420	0.98	0.505	SPO0420	0.93	0.496	SPO0419	0.94	0.846	SPO0419	0.99	0.584	SPO0419	0.99	0.954	SPO0419	0.93	0.561
SPO0420	1.06	0.369	SPO0420	1.13	0.032	SPO0421	0.96	0.713	SPO0421	0.79	0.624	SPO0420	1.51	0.000	SPO0420	1.47	0.000	SPO0420	1.05	0.374	SPO0420	1.06	0.072
SPO0421	0.99	0.72	SPO0421	1	0.766	SPO0422	0.87	0.179	SPO0422	0.98	0.156	SPO0421	1.37	0.072	SPO0421	1.48	0.091	SPO0421	1.08	0.690	SPO0421	1.08	0.723
SPO0422	1.3	0.043	SPO0422	1.38	0.014	SPO0423	0.93	0.32	SPO0423	0.86	0.396	SPO0422	1.20	0.090	SPO0422	1.20	0.045	SPO0422	1.03	0.694	SPO0422	0.98	0.924
SPO0423	0.94	0.971	SPO0423	0.83	0.606	SPO0424	0.81	0.247	SPO0424	0.95	0.031	SPO0423	1.48	0.316	SPO0423	1.45	0.299	SPO0423	1.02	0.999	SPO0423	1.00	0.978

SPO0424	1.05	0.169	SPO0424	0.83	0.183	SPO0425	0.62	0.701	SPO0425	0.33	0.256	SPO0424	1.35	0.087	SPO0424	1.21	0.047	SPO0424	1.02	0.896	SPO0424	0.99	0.766
SPO0425	0.82	0.041	SPO0425	0.91	0.44	SPO0426	0.72	0.4	SPO0426	0.97	0.206	SPO0425	1.12	0.012	SPO0425	1.18	0.016	SPO0425	0.80	0.128	SPO0425	0.84	0.097
SPO0426	1.11	0.042	SPO0426	1.15	0.08	SPO0427	0.78	0.052	SPO0427	0.86	0.004	SPO0426	0.76	0.037	SPO0426	0.85	0.238	SPO0426	1.12	0.100	SPO0426	1.06	0.203
SPO0427	1.37	0.024	SPO0427	1.32	0.002	SPO0428	0.99	0.613	SPO0428	0.97	0.673	SPO0427	0.58	0.006	SPO0427	0.57	0.001	SPO0427	0.84	0.339	SPO0427	0.83	0.205
SPO0428	1.05	0.312	SPO0428	0.98	0.923	SPO0429	0.9	0.383	SPO0429	0.39	0.072	SPO0428	1.11	0.540	SPO0428	1.00	0.922	SPO0428	0.94	0.743	SPO0428	0.95	0.876
SPO0429	0.81	0.03	SPO0429	0.75	0.084	SPO0430	0.84	0.422	SPO0430	0.99	0.328	SPO0429	0.72	0.002	SPO0429	0.77	0.003	SPO0429	1.20	0.064	SPO0429	1.14	0.362
SPO0430	1.45	0.001	SPO0430	1.33	0.001	SPO0431	0.94	0.83	SPO0431	0.96	0.717	SPO0430	1.03	0.137	SPO0430	1.08	0.052	SPO0430	1.10	0.292	SPO0430	1.07	0.271
SPO0431	1.37	0.536	SPO0431	1.4	0.468	SPO0432	0.93	0.004	SPO0432	0.94	0.001	SPO0431	0.86	0.704	SPO0431	0.90	0.763	SPO0431	1.04	0.982	SPO0431	0.88	0.787
SPO0432	0.57	0.004	SPO0432	0.55	0.007	SPO0433	0.98	0.559	SPO0433	0.89	0.497	SPO0432	8.19	0.000	SPO0432	7.42	0.000	SPO0432	1.30	0.030	SPO0432	1.39	0.010
SPO0433	1.25	0.604	SPO0433	1.24	0.388	SPO0434	0.97	0.003	SPO0434	0.95	0.007	SPO0433	0.92	0.669	SPO0433	0.93	0.703	SPO0433	1.22	0.549	SPO0433	1.20	0.375
SPO0434	1.01	0.945	SPO0434	1.08	0.14	SPO0435	0.86	0.607	SPO0435	0.75	0.633	SPO0434	0.69	0.030	SPO0434	0.69	0.007	SPO0434	0.99	0.921	SPO0434	0.99	0.869
SPO0435	1.11	0.1	SPO0435	0.94	0.877	SPO0436	0.86	0.028	SPO0436	0.6	0.074	SPO0435	0.89	0.559	SPO0435	1.02	0.441	SPO0435	0.99	0.959	SPO0435	0.94	0.634
SPO0436	1.03	0.379	SPO0436	1.05	0.139	SPO0437	0.93	0.932	SPO0437	0.71	0.409	SPO0436	1.05	0.476	SPO0436	1.07	0.147	SPO0436	0.98	0.735	SPO0436	0.99	0.718
SPO0437	1.16	0.326	SPO0437	0.99	0.976	SPO0438	0.94	0.053	SPO0438	0.7	0.069	SPO0437	0.93	0.453	SPO0437	0.90	0.344	SPO0437	0.85	0.415	SPO0437	0.98	0.804
SPO0438	0.76	0.026	SPO0438	0.78	0.109	SPO0439	0.96	0.917	SPO0439	0.93	0.93	SPO0438	1.13	0.077	SPO0438	1.11	0.005	SPO0438	0.79	0.082	SPO0438	0.83	0.082
SPO0439	0.83	0.373	SPO0439	0.96	0.939	SPO0440	0.81	0.74	SPO0440	0.98	0.633	SPO0439	0.83	0.387	SPO0439	0.76	0.319	SPO0439	1.02	0.947	SPO0439	1.03	0.882
SPO0440	1.01	0.461	SPO0440	0.97	0.827	SPO0441	0.84	0.288	SPO0441	0.99	0.062	SPO0440	0.94	0.421	SPO0440	0.92	0.402	SPO0440	1.25	0.318	SPO0440	1.27	0.067
SPO0441	0.83	0.73	SPO0441	0.95	0.721	SPO0442	0.76	0.019	SPO0442	0.93	0.005	SPO0441	1.08	0.641	SPO0441	0.95	0.532	SPO0441	1.12	0.839	SPO0441	1.17	0.528
SPO0442	1.28	0.029	SPO0442	1.21	0.025	SPO0443	0.62	0.038	SPO0443	0.81	0.026	SPO0442	0.60	0.000	SPO0442	0.62	0.000	SPO0442	0.98	0.610	SPO0442	1.05	0.560
SPO0443	1.09	0.538	SPO0443	1.15	0.155	SPO0444	0.89	0.44	SPO0444	0.85	0.463	SPO0443	0.58	0.047	SPO0443	0.56	0.004	SPO0443	0.90	0.741	SPO0443	0.87	0.318
SPO0444	0.89	0.614	SPO0444	0.85	0.679	SPO0445	0.79	0.85	SPO0445	0.99	0.889	SPO0444	1.39	0.234	SPO0444	1.29	0.289	SPO0444	0.99	0.999	SPO0444	0.93	0.776
SPO0445	1.14	0.644	SPO0445	1.51	0.456	SPO0446	0.81	0.25	SPO0446	0.93	0.35	SPO0445	0.50	0.019	SPO0445	0.52	0.006	SPO0445	0.83	0.482	SPO0445	0.89	0.782
SPO0446	0.95	0.642	SPO0446	1.02	0.469	SPO0447	0.74	0.633	SPO0447	0.93	0.326	SPO0446	1.11	0.027	SPO0446	1.16	0.007	SPO0446	1.01	0.882	SPO0446	1.03	0.806
SPO0447	0.88	0.582	SPO0447	0.98	0.175	SPO0448	0.72	0.922	SPO0448	0.87	0.929	SPO0447	2.32	0.000	SPO0447	2.35	0.000	SPO0447	1.27	0.050	SPO0447	1.31	0.012
SPO0448	1	0.98	SPO0448	0.97	0.995	SPO0449	0.83	0.629	SPO0449	0.9	0.645	SPO0448	0.71	0.769	SPO0448	0.74	0.832	SPO0448	0.81	0.809	SPO0448	0.88	0.876
SPO0449	1.51	0.381	SPO0449	1.31	0.524	SPO0450	0.89	0.508	SPO0450	0.93	0.541	SPO0449	0.74	0.636	SPO0449	0.79	0.747	SPO0449	0.93	0.907	SPO0449	0.98	0.987
SPO0450	1.62	0.064	SPO0450	1.43	0.123	SPO0451	0.71	0.159	SPO0451	0.93	0.144	SPO0450	0.68	0.056	SPO0450	0.73	0.156	SPO0450	1.07	0.834	SPO0450	1.18	0.442
SPO0451	0.98	0.993	SPO0451	0.93	0.733	SPO0452	0.91	0.785	SPO0452	0.9	0.618	SPO0451	0.70	0.122	SPO0451	0.70	0.045	SPO0451	0.87	0.612	SPO0451	0.83	0.439
SPO0452	0.9	0.314	SPO0452	0.9	0.304	SPO0453	0.47	0.284	SPO0453	0.97	0.296	SPO0452	0.78	0.155	SPO0452	0.79	0.235	SPO0452	0.93	0.520	SPO0452	0.93	0.583
SPO0453	1.17	0.174	SPO0453	1.18	0.016	SPO0454	0.92	0.995	SPO0454	0.98	0.744	SPO0453	0.83	0.170	SPO0453	0.86	0.021	SPO0453	1.23	0.334	SPO0453	1.18	0.424
SPO0454	1.04	0.647	SPO0454	1.02	0.612	SPO0455	0.78	0.891	SPO0455	0.75	0.998	SPO0454	0.89	0.572	SPO0454	0.95	0.775	SPO0454	0.90	0.417	SPO0454	0.88	0.382
SPO0455	1.2	0.446	SPO0455	1.16	0.694	SPO0456	0.83	0.39	SPO0456	0.91	0.458	SPO0455	1.32	0.291	SPO0455	1.44	0.291	SPO0455	1.18	0.676	SPO0455	1.12	0.700
SPO0456	0.9	0.703	SPO0456	0.85	0.057	SPO0457	0.9	0.97	SPO0457	0.72	0.953	SPO0456	0.79	0.028	SPO0456	0.82	0.108	SPO0456	0.93	0.359	SPO0456	0.92	0.504
SPO0457	0.88	0.334	SPO0457	1.01	0.668	SPO0458	0.91	0.227	SPO0458	0.65	0.469	SPO0457	0.91	0.800	SPO0457	0.87	0.660	SPO0457	1.16	0.296	SPO0457	1.13	0.280
SPO0458	1.14	0.524	SPO0458	1.23	0.423	SPO0459	0.69	0.596	SPO0459	0.89	0.605	SPO0458	0.82	0.260	SPO0458	0.75	0.221	SPO0458	0.94	0.682	SPO0458	0.81	0.443
SPO0459	2.27	0.048	SPO0459	2.43	0.002	SPO0460	0.64	0.389	SPO0460	0.76	0.244	SPO0459	0.39	0.009	SPO0459	0.43	0.011	SPO0459	0.83	0.375	SPO0459	0.84	0.547
SPO0460	1.38	0.018	SPO0460	1.19	0.199	SPO0461	0.81	0.016	SPO0461	0.83	0.007	SPO0460	0.40	0.005	SPO0460	0.41	0.001	SPO0460	0.99	0.876	SPO0460	0.84	0.517
SPO0461	0.73	0.011	SPO0461	0.81	0.033	SPO0462	0.86	0.999	SPO0462	0.71	0.989	SPO0461	1.58	0.002	SPO0461	1.68	0.000	SPO0461	0.98	0.656	SPO0461	0.88	0.022
SPO0462	0.91	0.168	SPO0462	0.91	0.617	SPO0463	0.96	0.089	SPO0463	0.64	0.064	SPO0462	0.47	0.000	SPO0462	0.45	0.000	SPO0462	0.95	0.252	SPO0462	0.92	0.370
SPO0463	0.82	0.038	SPO0463	0.83	0.007	SPO0464	0.93	0.457	SPO0464	0.83	0.04	SPO0463	1.29	0.002	SPO0463	1.34	0.000	SPO0463	1.14	0.094	SPO0463	1.12	0.093
SPO0464	0.78	0.052	SPO0464	0.82	0.022	SPO0465	0.83	0.661	SPO0465	0.85	0.888	SPO0464	0.88	0.652	SPO0464	0.96	0.699	SPO0464	0.93	0.730	SPO0464	0.92	0.483
SPO0465	1.02	0.12	SPO0465	0.98	0.661	SPO0466	0.69	0.999	SPO0466	0.68	0.791	SPO0465	1.10	0.891	SPO0465	1.30	0.064	SPO0465	1.14	0.525	SPO0465	1.07	0.732
SPO0466	1.03	0.844	SPO0466	0.96	0.927	SPO0467	0.83	0.847	SPO0467	0.91	0.847	SPO0466	0.96	0.860	SPO0466	0.99	0.990	SPO0466	1.06	0.816	SPO0466	1.09	0.393
SPO0467	1.1	0.676	SPO0467	1.01	0.871	SPO0468	0.56	0.926	SPO0468	0.99	0.947	SPO0467	1.11	0.868	SPO0467	1.13	0.850	SPO0467	0.85	0.683	SPO0467	0.85	0.716
SPO0468	0.98	0.994	SPO0468	0.99	0.976	SPO0469	0.39	0.93	SPO0469	0.46	0.877	SPO0468	0.80	0.874	SPO0468	0.85	0.922	SPO0468	0.89	0.914	SPO0468	0.90	0.923
SPO0469	0.76	0.129	SPO0469	0.75	0.105	SPO0470	0.68	0.988	SPO0470	0.92	0.383	SPO0469	1.06	0.797	SPO0469	0.93	0.544	SPO0469	0.94	0.745	SPO0469	0.96	0.790
SPO0470	0.69	0.008	SPO0470	0.84	0.226	SPO0471	0.97	0.778	SPO0471	0.99	0.681	SPO0470	1.75	0.050	SPO0470	2.14	0.000	SPO0470	1.17	0.583	SPO0470	1.20	0.434
SPO0471	0.93	0.844	SPO0471	0.98	0.854	SPO0472	0.85	0.777	SPO0472	0.71	0.79	SPO0471	0.95	0.711	SPO0471	0.88	0.496	SPO0471	0.89	0.426	SPO0471	0.94	0.805
SPO0472	0.93	0.903	SPO0472	0.89	0.295	SPO0473	0.72	0.569	SPO0473	0.83	0.37	SPO0472	1.20	0.263	SPO0472	1.25	0.059	SPO0472	1.01	0.944	SPO0472	1.07	0.635
SPO0473	1.14	0.107	SPO0473	1.04	0.253	SPO0474	0.92	0.669	SPO0474	0.85	0.547	SPO0473	1.19	0.390	SPO0473	1.44	0.024	SPO0473	0.99	0.583	SPO0473	1.07	0.583
SPO0474	1.13	0.572	SPO0474	1.06	0.653	SPO0475	0.97	0.646	SPO0475	1.02	0.575	SPO0474	0.83	0.555	SPO0474	0.88	0.584	SPO0474	0.87	0.686	SPO0474	0.88	0.703
SPO0475	1.21	0.203	SPO0475	1.25	0.052	SPO0476	0.86	0.85	SPO0476	0.78	0.789	SPO0475	1.06	0.703	SPO0475	1.12	0.137	SPO0475	1.25	0.116	SPO0475	1.25	0.063
SPO0476	1.19	0.056	SPO0476	1.12	0.118	SPO0477	0.88	0.712	SPO0477	0.76	0.069	SPO0476	1.10	0.636	SPO0476	1.26	0.018	SPO0476	1.30	0.306	SPO0476	1.20	0.133
SPO0477	0.7	0.079	SPO0477	0.86	0.056	SPO0478	0.93	0.092	SPO0478	0.96	0.305	SPO0477	1.62	0.001	SPO0477	1.55	0.003	SPO0477	1.17	0.389	SPO0477	1.10	0.733
SPO0478	0.98	0.869	SPO0478	0.94	0.951	SPO0479	0.92	0.85	SPO0479	0.73	0.493	SPO0478	1.13	0.284	SPO0478	1.14	0.038	SPO0478	1.34	0.006	SPO0478	1.25	0.043
SPO0479	0.79	0.287	SPO0479	0.84	0.262	SPO0481	0.88	0.019	SPO0481	0.96	0.063	SPO0479	0.86	0.210	SPO0479	0.91	0.627	SPO0479	1.03	0.811	SPO0479	1.09	0.529
SPO0481	2.11	0	SPO0481	1.78	0	SPO0482	0.93	0.24	SPO0482	0.81	0.122	SPO0481	0.75	0.002	SPO0481	0.76	0.003	SPO0481	0.98	0.693	SPO0481	0.89	0.127
SPO0482	1.25	0.02	SPO0482	1.16	0.012	SPO0483	0.83	0	SPO0483	0.76	0.001	SPO0482	0.83	0.445	SPO0482	0.89	0.408	SPO0482	1.01	0.577	SPO0482	0.93	0.271
SPO0483	1.74	0	SPO0483	1.81	0	SPO0484	0.88	0.026	SPO0484	0.97	0	SPO0483	0.40	0.000	SPO0483	0.39	0.000	SPO0483	1.14	0.041	SPO0483	1.16	0.057
SPO0484	0.9	0.153	SPO0484	1.08	0.599	SPO0485	0.88	0.127	SPO0485	0.66	0.186	SPO0484	2.18	0.000	SPO0484	2.12	0.000	SPO0484	1.13	0.225	SPO0484	1.31	0.084
SPO0485	0.94	0.732	SPO0485	1.16	0.424	SPO0486	0.93	0.376	SPO0486	0.81	0.781	SPO0485	2.15	0.002	SPO0485	1.91	0.003	SPO0485	1.14	0.366	SPO0485	1.20	0.244
SPO0486	1.27	0.001	SPO0486	1.41	0.01	SPO0487	0.93	0.112	SPO0487	0.51	0.284	SPO0486	1.36	0.004	SPO0486	1.26	0.000	SPO0486	1.06	0.259	SPO0486	1.07	0.276
SPO0487	1.31	0.005	SPO0487	1.36	0.006	SPO0488	0.95	0.01	SPO0488	0.32	0.019	SPO0487	1.53	0.000	SPO0487	1.42	0.000	SPO0487	1.15	0.051	SPO0487	1.14	0.005
SPO0488	2.41	0	SPO0488	1.93	0.001	SPO0489	0.99	0.708	SPO0489	0.78	0.749	SPO0488	0.63	0.038	SPO0488	0.57	0.016	SPO0488	0.88	0.485	SPO0488	0.92	0.728
SPO0489	1.06	0.473	SPO0489	1.11	0.548	SPO0490	0.92	0.476	SPO0490	0.91	0.691	SPO0489	1.03	0.840	SPO0489	1.06	0.912	SPO0489	0.97	0.764	SPO0489	0.99	0.693
SPO0490	0.88	0.807	SPO0490	0.95	0.992	SPO0491	0.96	0.021	SPO0491	0.83	0.013	SPO0490	0.34	0.013	SPO0490	0.35	0.010	SPO0490	0.75	0.476	SPO0490	0.78	0.476
SPO0491	1.18	0.137	SPO0491	1.25	0.098	SPO0492	0.7	0.261	SPO0492	0.74	0.474	SPO0491	1.89	0.000	SPO0491	1.94	0.000	SPO0491	1.34	0.004	SPO0491	1.30	0.097
SPO0492	1.04	0.377	SPO0492	0.99	0.786	SPO0493	0.93	0.032	SPO0493	0.92	0.002	SPO0492	0.68	0.007	SPO0492	0.74	0.002	SPO0492	0.94	0.238	SPO0492	0.95	0.553
SPO0493	0.88	0.015	SPO0493	0.93	0.546	SPO0494	0.92	0	SPO0494	0.93	0	SPO0493	2.10	0.000	SPO0493	2.04	0.000	SPO0493	1.04	0.084	SPO0493	1.14	0.046
SPO0494	1	0.722	SPO0494	1.06	0.011	SPO0495	0.81	0.011	SPO0495	0.87	0.005	SPO0494	2.01	0.000	SPO0494	2.02	0.000	SPO0494	1.15	0.004	SPO0494	1.21	0.000
SPO0495	1.16	0.073	SPO0495	1.15	0.002	SPO0496	0.95	0.807	SPO0496	0.89	0.638	SPO0495	1.64	0.000	SPO0495	1.61	0.000	SPO0495	1.07	0.010	SPO0495	1.13	0.001
SPO0496	1.13	0.234	SPO0496	1.36	0.02	SPO0497	0.62	0.077	SPO0497	0.97	0.138	SPO0496	1.39	0.000	SPO0496	1.28	0.000	SPO0496	0.99	0.464	SPO0496	1.03	0.089
SPO0497	1.01	0.982	SPO0497	1.1	0.44	SPO0498	0.9	0.033	SPO0498	0.92	0.03	SPO0497	2.44	0.001	SPO0497	2.13	0.003	SPO0497	0.92	0.771	SPO0497	0.97	0.933
SPO0498	1.11	0.636	SPO0498	1.15	0.132	SPO0499	0.98	0.024	SPO0499	0.93	0.103	SPO0498	1.79	0.001	SPO0498	1.71	0.001	SPO0498	1.00	0.906	SPO0498	1.07	0.432
SPO0499	1.34	0.015	SPO0499	1.2	0.001	SPO0500	0.93	0.019	SPO0500	0.9	0.071	SPO0499	1.34	0.000	SPO0499	1.32	0.001	SPO0499	1.08	0.208	SPO0499	1.19	0.004
SPO0500	0.87	0.183	SPO0500	1	0.959	SPO0501	0.95	0.719	SPO0501	0.83	0.661	SPO0500	1.79	0.000	SPO0500	1.65	0.003	SPO0500	1.15	0.106	SPO0500	1.28	0.000
SPO0501	1.84	0.005	SPO0501	1.67	0	SPO0502	0.98	0.91	SPO0502	0.88	0.861	SPO0501	1.16	0.021	SPO0501	1.05	0.012	SPO0501	1.01	0.757	SPO0501	1.00	0.624
SPO0502	1.57	0.017	SPO0502	1.58	0.005	SPO0503	0.99	0.086	SPO0503	0.98	0.015	SPO0502	1.20	0.013	SPO0502	1.19	0.002	SPO0502	0.88	0.336	SPO0502	0.93	0.604
SPO0503	1.82	0	SPO0503	1.75	0	SPO0504	0.89	0.811	SPO0504	0.88	0.641	SPO0503	0.99	0.277	SPO0503	1.04	0.015	SPO0503	0.85	0.218	SPO0503	0.83	0.010
SPO0504	1.19	0.065	SPO0504	1.39	0.002	SPO0505	1	0.01	SPO0505	0.9	0.012	SPO0504	0.86	0.607	SPO0504	0.88	0.135	SPO0504	1.97	0.058	SPO0504	1.49	0.171
SPO0505	1.82	0	SPO0505	1.7	0	SPO0506	0.84	0.157	SPO0506	0.88	0.106	SPO0505	0.90	0.235	SPO0505	0.85	0.736	SPO0505	1.02	0.301	SPO0505	0.95	0.754
SPO0506	1.03	0.553	SPO0506	1.06	0.226	SPO0507	0.97	0.225	SPO0507	0.98	0.024	SPO0506	0.96	0.167	SPO0506	1.02	0.004	SPO0506	1.08	0.165	SPO0506	1.14	0.046
SPO0507	0.85	0.202	SPO0507	0.86	0.221	SPO0508	0.98	0.115	SPO0508	0.77	0.588	SPO0507	1.34	0.016	SPO0507	1.37	0.006	SPO0507	1.26	0.087	SPO0507	1.21	0.101
SPO0508	1.29	0.007	SPO0508	1.38	0.005	SPO0509	0.88	0.308	SPO0509	0.94	0.408	SPO0508	1.28	0.050	SPO0508	1.28	0.048	SPO0508	1.39	0.020	SPO0508	1.30	0.197
SPO0509	1.21	0.3	SPO0509	1.18	0.342	SPO0510	0.93	0.045	SPO0510	0.7	0.124	SPO0509	0.95	0.451	SPO0509	0.91	0.466	SPO0509	0.90	0.753	SPO0509	0.93	0.862
SPO0510	1.38	0.001	SPO0510	1.37	0.01	SPO0511	0.97	0.983	SPO0511	0.97	0.473	SPO0510	0.91	0.220	SPO0510	0.93	0.128	SPO0510	0.96	0.850	SPO0510	0.98	0.597
SPO0511	1.23	0.003	SPO0511	1.26	0	SPO0512	0.92	0.77	SPO0512	0.83	0.656	SPO0511	1.42	0.001	SPO0511	1.44	0.004	SPO0511	1.02	0.470	SPO0511	1.06	0.075
SPO0512	1.95	0.14	SPO0512	1.85	0.146	SPO0513	0.83	0.214	SPO0513	0.65	0.29	SPO0512	0.92	0.931	SPO0512	0.94	0.843	SPO0512	0.96	0.979	SPO0512	0.94	0.931
SPO0513	1.18	0.128	SPO0513	0.99	0.872	SPO0514	0.97	0.818	SPO0514	0.97	0.875	SPO0513	0.94	0.590	SPO0513	0.94	0.594	SPO0513	1.07	0.466	SPO0513	1.07	0.424
SPO0514	1.36	0.024	SPO0514	1.34	0.003	SPO0515	0.97	0.562	SPO0515	0.98	0.379	SPO0514	0.72	0.011	SPO0514	0.74	0.010	SPO0514	1.07	0.385	SPO0514	1.07	0.390
SPO0515	1.51	0.101	SPO0515	1.33	0.003	SPO0516	0.74	0.648	SPO0516	0.9	0.529	SPO0515	0.78	0.328	SPO0515	0.74	0.019	SPO0515	0.93	0.732	SPO0515	0.90	0.449
SPO0516	1.6	0.01	SPO0516	1.45	0.018	SPO0517	0.41	0.732	SPO0517	1.02	0.492	SPO0516	1.38	0.044	SPO0516	1.41	0.047	SPO0516	1.24	0.271	SPO0516	1.14	0.399
SPO0517	1.16	0.469	SPO0517	1.23	0.195	SPO0518	0.88	0.584	SPO0518	0.93	0.548	SPO0517	2.01	0.008	SPO0517	1.95	0.011	SPO0517	1.08	0.710	SPO0517	1.10	0.577
SPO0518	1.22	0.267	SPO0518	1.24	0.191	SPO0519	0.71	0.038	SPO0519	0.97	0.058	SPO0518	1.84	0.023	SPO0518	1.88	0.017	SPO0518	1.10	0.704	SPO0518	1.18	0.427
SPO0519	0.88	0.089	SPO0519	0.85	0.023	SPO0520	0.87	0.303	SPO0520	0.85	0.332	SPO0519	1.36	0.000	SPO0519	1.27	0.001	SPO0519	1.01	0.371	SPO0519	0.89	0.468
SPO0520	1.13	0.382	SPO0520	1.14	0.203	SPO0521	0.82	0.14	SPO0521	1	0.89	SPO0520	1.90	0.001	SPO0520	1.60	0.001	SPO0520	0.87	0.456	SPO0520	0.88	0.497
SPO0521	1.02	0.946	SPO0521	1.08	0.308	SPO0522	0.82	0.868	SPO0522	0.83	0.882	SPO0521	2.17	0.000	SPO0521	1.94	0.001	SPO0521	0.91	0.635	SPO0521	0.98	0.908
SPO0522	0.99	0.977	SPO0522	1.02	0.87	SPO0523	0.91	0.005	SPO0523	0.94	0.152	SPO0522	2.16	0.021	SPO0522	2.04	0.037	SPO0522	0.98	0.971	SPO0522	0.95	0.941
SPO0523	1	0.691	SPO0523	1.01	0.3	SPO0524	0.83	0.896	SPO0524	0.86	0.865	SPO0523	0.66	0.004	SPO0523	0.68	0.028	SPO0523	0.89	0.317	SPO0523	0.91	0.268
SPO0524	0.91	0.772	SPO0524	0.96	0.961	SPO0525	0.98	0.155	SPO0525	0.87	0.004	SPO0524	0.40	0.001	SPO0524	0.38	0.004	SPO0524	1.01	0.962	SPO0524	0.99	0.968
SPO0525	1	0.77	SPO0525	1.03	0.694	SPO0526	0.65	0.683	SPO0526	0.95	0.839	SPO0525	0.85	0.277	SPO0525	0.93	0.495	SPO0525	0.97	0.842	SPO0525	0.90	0.170
SPO0526	1.46	0.056	SPO0526	1.29	0.036	SPO0527	0.94	0.787	SPO0527	0.89	0.285	SPO0526	0.94	0.827	SPO0526	0.96	0.995	SPO0526	1.25	0.215	SPO0526	1.16	0.065
SPO0527	1.02	0.763	SPO0527	0.95	0.914	SPO0528	0.86	0.104	SPO0528	0.81	0.32	SPO0527	0.69	0.143	SPO0527	0.78	0.052	SPO0527	1.06	0.875	SPO0527	1.04	0.864
SPO0528	0.6	0	SPO0528	0.7	0.066	SPO0529	0.87	0.044	SPO0529	0.97	0.147	SPO0528	1.14	0.006	SPO0528	1.17	0.048	SPO0528	1.08	0.140	SPO0528	1.15	0.183
SPO0529	0.92	0.417	SPO0529	0.91	0.446	SPO0530	0.91	0.606	SPO0530	0.91	0.982	SPO0529	0.77	0.075	SPO0529	0.79	0.074	SPO0529	1.07	0.411	SPO0529	0.97	0.857
SPO0530	0.83	0.401	SPO0530	0.88	0.631	SPO0531	0.97	0.34	SPO0531	0.81	0.626	SPO0530	0.83	0.560	SPO0530	1.05	0.737	SPO0530	1.04	0.839	SPO0530	1.05	0.829
SPO0531	1.58	0.041	SPO0531	1.4	0.002	SPO0532	0.86	0.614	SPO0532	0.44	0.641	SPO0531	0.97	0.910	SPO0531	1.14	0.364	SPO0531	1.16	0.592	SPO0531	1.14	0.747
SPO0532	1.55	0.066	SPO0532	1.44	0.076	SPO0533	0.9	0.303	SPO0533	0.93	0.407	SPO0532	1.04	0.510	SPO0532	1.12	0.376	SPO0532	0.94	0.871	SPO0532	0.93	0.792
SPO0533	1.27	0.282	SPO0533	1.12	0.316	SPO0534	0.79	0.631	SPO0534	0.81	0.621	SPO0533	0.34	0.002	SPO0533	0.36	0.002	SPO0533	0.78	0.301	SPO0533	0.85	0.335
SPO0534	1.61	0.003	SPO0534	1.59	0.002	SPO0535	0.75	0.202	SPO0535	0.83	0.117	SPO0534	0.92	0.317	SPO0534	0.89	0.251	SPO0534	1.05	0.412	SPO0534	0.93	0.401
SPO0535	1.53	0.005	SPO0535	1.45	0.001	SPO0536	0.78	0.548	SPO0536	0.85	0.499	SPO0535	1.02	0.981	SPO0535	1.03	0.994	SPO0535	1.04	0.858	SPO0535	0.91	0.544
SPO0536	1.2	0.494	SPO0536	1.2	0.49	SPO0537	0.67	0.029	SPO0537	0.71	0.005	SPO0536	0.66	0.168	SPO0536	0.65	0.078	SPO0536	1.14	0.710	SPO0536	1.15	0.513
SPO0537	2.68	0	SPO0537	2.27	0	SPO0538	0.78	0.112	SPO0538	0.88	0.103	SPO0537	1.04	0.261	SPO0537	1.13	0.098	SPO0537	1.20	0.022	SPO0537	1.04	0.596
SPO0538	1.91	0.03	SPO0538	1.78	0.028	SPO0539	0.71	0.818	SPO0539	0.97	0.529	SPO0538	0.81	0.750	SPO0538	0.74	0.444	SPO0538	0.88	0.725	SPO0538	0.75	0.307
SPO0539	1.01	0.546	SPO0539	0.93	0.863	SPO0540	0.8	0.386	SPO0540	0.83	0.329	SPO0539	0.98	0.666	SPO0539	0.95	0.099	SPO0539	1.30	0.004	SPO0539	1.23	0.118
SPO0540	1.17	0.504	SPO0540	1.07	0.644	SPO0541	0.93	0.144	SPO0541	0.95	0.514	SPO0540	0.83	0.554	SPO0540	0.87	0.739	SPO0540	0.93	0.584	SPO0540	0.88	0.506
SPO0541	1.17	0.186	SPO0541	1.1	0.256	SPO0543	0.87	0.111	SPO0543	0.91	0.028	SPO0541	0.85	0.200	SPO0541	0.94	0.750	SPO0541	1.16	0.627	SPO0541	1.11	0.625
SPO0543	0.96	0.851	SPO0543	1.13	0.196	SPO0544	0.97	0.345	SPO0544	0.81	0.261	SPO0543	0.97	0.620	SPO0543	0.94	0.284	SPO0543	0.98	0.695	SPO0543	1.02	0.964
SPO0544	0.92	0.621	SPO0544	1.09	0.075	SPO0545	0.79	0.131	SPO0545	0.9	0.277	SPO0544	1.07	0.966	SPO0544	1.17	0.355	SPO0544	0.95	0.607	SPO0544	0.99	0.747
SPO0545	0.72	0.128	SPO0545	0.7	0.297	SPO0546	0.6	0.247	SPO0546	0.93	0.176	SPO0545	1.28	0.052	SPO0545	1.43	0.103	SPO0545	1.10	0.682	SPO0545	1.08	0.754
SPO0546	0.74	0.279	SPO0546	0.75	0.218	SPO0547	0.6	0.663	SPO0547	0.96	0.842	SPO0546	2.24	0.013	SPO0546	2.08	0.003	SPO0546	1.46	0.209	SPO0546	1.35	0.089
SPO0547	1.35	0.15	SPO0547	1.24	0.254	SPO0548	0.84	0.049	SPO0548	0.87	0.138	SPO0547	0.63	0.036	SPO0547	0.66	0.031	SPO0547	0.88	0.434	SPO0547	0.93	0.748
SPO0548	1.06	0.573	SPO0548	1	0.722	SPO0549	0.77	0.844	SPO0549	0.88	0.876	SPO0548	0.91	0.928	SPO0548	0.93	0.893	SPO0548	0.85	0.249	SPO0548	0.89	0.520
SPO0549	1.31	0.012	SPO0549	1.25	0.248	SPO0550	0.7	0.758	SPO0550	0.77	0.771	SPO0549	1.06	0.690	SPO0549	1.10	0.543	SPO0549	0.99	0.969	SPO0549	1.00	0.985
SPO0550	1.1	0.337	SPO0550	1.11	0.306	SPO0551	0.66	0.009	SPO0551	0.74	0.206	SPO0550	1.26	0.412	SPO0550	1.10	0.597	SPO0550	0.93	0.767	SPO0550	0.95	0.766
SPO0551	0.79	0.536	SPO0551	0.87	0.506	SPO0552	0.71	0.483	SPO0552	0.74	0.366	SPO0551	1.35	0.414	SPO0551	0.98	0.623	SPO0551	0.95	0.962	SPO0551	1.07	0.877
SPO0552	1.31	0.058	SPO0552	1.26	0.036	SPO0553	0.96	0.763	SPO0553	0.74	0.823	SPO0552	1.08	0.382	SPO0552	1.09	0.414	SPO0552	0.87	0.417	SPO0552	0.93	0.587
SPO0553	1.3	0.115	SPO0553	1.35	0.197	SPO0554	0.79	0.631	SPO0554	0.72	0.499	SPO0553	1.45	0.123	SPO0553	1.57	0.107	SPO0553	1.00	0.909	SPO0553	1.07	0.735
SPO0554	1.41	0.009	SPO0554	1.38	0.011	SPO0555	0.97	0.023	SPO0555	0.74	0.006	SPO0554	1.71	0.014	SPO0554	1.81	0.005	SPO0554	1.22	0.269	SPO0554	1.06	0.780
SPO0555	1.25	0.135	SPO0555	1.32	0	SPO0556	0.82	0.455	SPO0556	0.93	0.385	SPO0555	1.12	0.367	SPO0555	1.17	0.010	SPO0555	0.91	0.570	SPO0555	0.91	0.081
SPO0556	0.81	0.243	SPO0556	0.94	0.9	SPO0557	0.89	0.869	SPO0557	0.83	0.882	SPO0556	1.12	0.238	SPO0556	1.04	0.544	SPO0556	0.93	0.582	SPO0556	0.96	0.808
SPO0557	0.83	0.347	SPO0557	0.87	0.601	SPO0558	0.89	0.066	SPO0558	0.81	0.106	SPO0557	0.89	0.925	SPO0557	0.86	0.843	SPO0557	0.90	0.644	SPO0557	0.93	0.724
SPO0558	0.86	0.033	SPO0558	0.93	0.469	SPO0559	0.69	0.854	SPO0559	0.87	0.842	SPO0558	1.22	0.007	SPO0558	1.14	0.015	SPO0558	0.94	0.614	SPO0558	0.97	0.669
SPO0559	0.77	0.634	SPO0559	0.76	0.724	SPO0560	0.09	0.343	SPO0560	0.83	0.202	SPO0559	1.35	0.517	SPO0559	1.43	0.471	SPO0559	1.00	0.983	SPO0559	1.03	0.921
SPO0560	0.95	0.177	SPO0560	0.9	0.617	SPO0562	0.93	0.313	SPO0562	0.63	0.197	SPO0560	0.50	0.000	SPO0560	0.41	0.002	SPO0560	0.66	0.000	SPO0560	0.68	0.007
SPO0562	1.02	0.816	SPO0562	1.07	0.437	SPO0563	0.8	0.933	SPO0563	0.63	0.877	SPO0562	1.32	0.003	SPO0562	1.28	0.043	SPO0562	1.12	0.231	SPO0562	1.10	0.478
SPO0563	1.18	0.21	SPO0563	1.22	0.004	SPO0564	0.87	0.806	SPO0564	0.83	0.967	SPO0563	1.02	0.791	SPO0563	1.08	0.369	SPO0563	0.97	0.663	SPO0563	1.01	0.983
SPO0564	0.88	0.322	SPO0564	0.9	0.847	SPO0565	0.94	0.574	SPO0565	0.79	0.715	SPO0564	1.45	0.009	SPO0564	1.63	0.089	SPO0564	0.95	0.487	SPO0564	0.93	0.799
SPO0565	0.76	0.697	SPO0565	0.81	0.405	SPO0566	0.72	0.71	SPO0566	0.65	0.618	SPO0565	1.04	0.772	SPO0565	0.99	0.931	SPO0565	0.86	0.534	SPO0565	0.90	0.249

SPO0566	0.75	0.017	SPO0566	0.81	0.06	SPO0567	0.8	0.346	SPO0567	0.65	0.558	SPO0566	0.78	0.078	SPO0566	0.76	0.013	SPO0566	0.98	0.829	SPO0566	0.99	0.889
SPO0567	1.26	0.138	SPO0567	1.14	0.072	SPO0568	0.81	0.245	SPO0568	0.74	0.227	SPO0567	0.88	0.268	SPO0567	1.03	0.840	SPO0567	1.05	0.907	SPO0567	0.99	0.816
SPO0568	1.12	0.326	SPO0568	0.95	0.852	SPO0569	0.95	0.728	SPO0569	0.88	0.932	SPO0568	0.81	0.030	SPO0568	0.72	0.099	SPO0568	1.06	0.953	SPO0568	0.86	0.605
SPO0569	0.99	0.611	SPO0569	1.02	0.653	SPO0570	0.98	0.137	SPO0570	0.79	0.23	SPO0569	0.93	0.619	SPO0569	0.88	0.080	SPO0569	0.81	0.413	SPO0569	0.70	0.046
SPO0570	0.98	0.784	SPO0570	1.07	0.317	SPO0571	0.92	0.368	SPO0571	0.94	0.305	SPO0570	0.96	0.615	SPO0570	1.04	0.979	SPO0570	1.25	0.565	SPO0570	1.11	0.799
SPO0571	0.66	0.456	SPO0571	0.63	0.491	SPO0572	0.93	0.711	SPO0572	0.78	0.711	SPO0571	3.38	0.015	SPO0571	2.57	0.133	SPO0571	1.19	0.748	SPO0571	1.23	0.711
SPO0572	1.26	0.014	SPO0572	1.07	0.477	SPO0573	0.85	0.069	SPO0573	0.82	0.015	SPO0572	0.87	0.335	SPO0572	0.80	0.156	SPO0572	0.93	0.556	SPO0572	0.96	0.818
SPO0573	2.17	0.011	SPO0573	1.93	0.009	SPO0574	0.82	0.72	SPO0574	0.83	0.84	SPO0573	0.41	0.003	SPO0573	0.40	0.000	SPO0573	1.17	0.323	SPO0573	1.06	0.568
SPO0574	0.81	0.259	SPO0574	0.83	0.299	SPO0575	0.74	0.162	SPO0575	0.71	0.056	SPO0574	0.88	0.742	SPO0574	0.99	0.729	SPO0574	0.97	0.879	SPO0574	0.88	0.381
SPO0575	1.03	0.666	SPO0575	1.06	0.78	SPO0576	0.85	0.124	SPO0576	0.07	0.238	SPO0575	0.68	0.153	SPO0575	0.61	0.077	SPO0575	0.76	0.262	SPO0575	0.74	0.160
SPO0576	0.66	0.007	SPO0576	0.73	0.009	SPO0577	0.93	0.721	SPO0577	0.95	0.527	SPO0576	1.30	0.079	SPO0576	1.33	0.063	SPO0576	0.98	0.859	SPO0576	0.99	0.951
SPO0577	0.96	0.772	SPO0577	1.01	0.556	SPO0578	0.78	0.03	SPO0578	0.96	0.256	SPO0577	1.00	0.794	SPO0577	0.89	0.204	SPO0577	1.04	0.991	SPO0577	0.95	0.684
SPO0578	1.15	0.008	SPO0578	1.13	0.061	SPO0579	0.88	0.904	SPO0579	0.93	0.926	SPO0578	0.85	0.054	SPO0578	0.96	0.380	SPO0578	0.86	0.034	SPO0578	0.86	0.223
SPO0579	1.17	0.736	SPO0579	1.17	0.775	SPO0580	0.89	0.823	SPO0580	1.02	0.966	SPO0579	0.90	0.911	SPO0579	0.88	0.906	SPO0579	0.98	0.976	SPO0579	1.01	0.981
SPO0580	0.76	0.324	SPO0580	0.81	0.664	SPO0581	0.91	0.391	SPO0581	0.81	0.557	SPO0580	0.67	0.386	SPO0580	0.57	0.212	SPO0580	0.79	0.638	SPO0580	0.89	0.731
SPO0581	0.75	0.205	SPO0581	0.78	0.408	SPO0582	0.81	0.295	SPO0582	0.81	0.446	SPO0581	1.14	0.181	SPO0581	1.09	0.301	SPO0581	0.88	0.332	SPO0581	0.91	0.625
SPO0582	0.8	0.153	SPO0582	0.88	0.741	SPO0583	0.95	0.364	SPO0583	0.85	0.486	SPO0582	0.68	0.034	SPO0582	0.75	0.207	SPO0582	0.78	0.086	SPO0582	0.83	0.241
SPO0583	0.77	0.296	SPO0583	0.72	0.294	SPO0584	0.78	0.413	SPO0584	0.87	0.18	SPO0583	0.97	0.945	SPO0583	0.89	0.631	SPO0583	0.97	0.810	SPO0583	0.98	0.892
SPO0584	1.15	0.089	SPO0584	1.16	0.072	SPO0585	0.4	0.937	SPO0585	0.69	0.863	SPO0584	0.70	0.025	SPO0584	0.64	0.017	SPO0584	0.71	0.321	SPO0584	0.79	0.070
SPO0585	1.19	0.52	SPO0585	1.17	0.464	SPO0586	0.95	0.011	SPO0586	0.85	0.006	SPO0585	0.79	0.443	SPO0585	0.88	0.605	SPO0585	1.12	0.753	SPO0585	0.98	0.872
SPO0586	0.77	0.063	SPO0586	0.63	0.026	SPO0587	0.73	0.009	SPO0587	0.99	0.015	SPO0586	1.64	0.008	SPO0586	1.63	0.002	SPO0586	0.88	0.429	SPO0586	1.05	0.691
SPO0587	0.87	0.539	SPO0587	0.79	0.065	SPO0588	0.93	0.98	SPO0588	0.98	0.969	SPO0587	1.31	0.214	SPO0587	1.58	0.006	SPO0587	0.88	0.714	SPO0587	0.93	0.742
SPO0588	0.78	0.71	SPO0588	0.83	0.862	SPO0589	0.83	0.92	SPO0589	0.87	0.821	SPO0588	1.46	0.544	SPO0588	1.32	0.667	SPO0588	1.04	0.973	SPO0588	1.02	0.991
SPO0589	0.81	0.554	SPO0589	0.86	0.784	SPO0590	0.93	0.055	SPO0590	0.86	0.387	SPO0589	0.93	0.762	SPO0589	0.93	0.676	SPO0589	0.98	0.839	SPO0589	0.94	0.465
SPO0590	1.55	0.049	SPO0590	1.55	0.013	SPO0591	0.93	0.011	SPO0591	0.98	0.025	SPO0590	1.05	0.993	SPO0590	1.11	0.823	SPO0590	1.17	0.385	SPO0590	1.03	0.984
SPO0591	1.08	0.262	SPO0591	1.05	0.101	SPO0592	0.74	0.627	SPO0592	0.69	0.161	SPO0591	1.85	0.006	SPO0591	1.96	0.000	SPO0591	0.91	0.147	SPO0591	0.91	0.141
SPO0592	0.92	0.883	SPO0592	0.98	0.981	SPO0593	0.72	0.936	SPO0593	0.84	0.971	SPO0592	0.93	0.885	SPO0592	0.88	0.587	SPO0592	1.01	0.932	SPO0592	1.05	0.821
SPO0593	0.99	0.813	SPO0593	1.08	0.019	SPO0594	0.99	0.188	SPO0594	0.97	0.024	SPO0593	1.18	0.555	SPO0593	1.12	0.790	SPO0593	0.88	0.366	SPO0593	0.84	0.014
SPO0594	0.85	0.547	SPO0594	0.96	0.736	SPO0595	0.92	0.541	SPO0595	0.94	0.083	SPO0594	1.77	0.032	SPO0594	2.17	0.000	SPO0594	1.14	0.781	SPO0594	1.00	0.786
SPO0595	1.09	0.168	SPO0595	1.09	0.025	SPO0596	0.85	0.204	SPO0596	0.74	0.002	SPO0595	1.55	0.243	SPO0595	1.60	0.011	SPO0595	0.92	0.402	SPO0595	0.88	0.223
SPO0596	0.85	0.387	SPO0596	0.95	0.815	SPO0597	0.99	0.678	SPO0597	0.86	0.807	SPO0596	1.86	0.001	SPO0596	1.99	0.000	SPO0596	1.14	0.554	SPO0596	1.10	0.448
SPO0597	0.78	0.354	SPO0597	0.8	0.378	SPO0598	0.94	0.384	SPO0598	0.95	0.087	SPO0597	1.13	0.611	SPO0597	0.87	0.509	SPO0597	0.92	0.430	SPO0597	0.93	0.748
SPO0598	0.75	0.186	SPO0598	0.87	0.691	SPO0599	0.97	0.459	SPO0599	0.89	0.102	SPO0598	0.86	0.955	SPO0598	0.83	0.893	SPO0598	0.93	0.928	SPO0598	1.03	0.768
SPO0599	1.06	0.512	SPO0599	1.1	0.24	SPO0600	0.98	0.178	SPO0600	0.78	0.121	SPO0599	1.06	0.499	SPO0599	1.11	0.262	SPO0599	1.14	0.582	SPO0599	1.15	0.207
SPO0600	0.62	0.036	SPO0600	0.53	0.037	SPO0601	0.98	0.035	SPO0601	0.76	0.071	SPO0600	2.08	0.036	SPO0600	2.24	0.010	SPO0600	1.13	0.727	SPO0600	1.16	0.674
SPO0601	0.85	0.03	SPO0601	0.88	0.139	SPO0602	0.9	0.172	SPO0602	0.38	0.028	SPO0601	1.09	0.051	SPO0601	1.10	0.009	SPO0601	1.10	0.120	SPO0601	1.10	0.188
SPO0602	0.81	0.027	SPO0602	0.84	0.061	SPO0603	0.96	0.698	SPO0603	0.98	0.56	SPO0602	1.63	0.003	SPO0602	1.80	0.001	SPO0602	1.15	0.213	SPO0602	1.16	0.428
SPO0603	0.75	0.136	SPO0603	0.83	0.445	SPO0604	0.83	0.84	SPO0604	0.97	0.097	SPO0603	1.77	0.035	SPO0603	2.34	0.015	SPO0603	1.12	0.425	SPO0603	1.13	0.750
SPO0604	0.68	0.001	SPO0604	0.67	0	SPO0605	0.96	0.067	SPO0605	0.75	0.177	SPO0604	1.48	0.002	SPO0604	1.58	0.000	SPO0604	0.89	0.326	SPO0604	0.98	0.827
SPO0605	0.75	0.046	SPO0605	0.85	0.12	SPO0606	0.96	0.653	SPO0606	0.87	0.873	SPO0605	1.98	0.003	SPO0605	1.71	0.001	SPO0605	0.90	0.328	SPO0605	0.97	0.622
SPO0606	0.7	0.045	SPO0606	0.76	0.233	SPO0607	0.93	0.87	SPO0607	0.83	0.764	SPO0606	1.22	0.205	SPO0606	1.31	0.244	SPO0606	0.99	0.879	SPO0606	0.97	0.755
SPO0607	0.85	0.742	SPO0607	0.76	0.716	SPO0608	0.97	0.896	SPO0608	0.92	0.797	SPO0607	0.94	0.979	SPO0607	0.99	0.955	SPO0607	0.94	0.882	SPO0607	1.00	0.996
SPO0608	0.94	0.985	SPO0608	0.86	0.714	SPO0609	0.98	0.725	SPO0609	0.9	0.953	SPO0608	3.01	0.002	SPO0608	2.72	0.000	SPO0608	0.13	0.002	SPO0608	0.15	0.000
SPO0609	0.97	0.818	SPO0609	0.96	0.883	SPO0610	0.95	0.957	SPO0610	0.72	0.838	SPO0609	1.06	0.976	SPO0609	1.21	0.476	SPO0609	0.24	0.000	SPO0609	0.27	0.001
SPO0610	0.85	0.558	SPO0610	0.89	0.795	SPO0611	0.93	0.908	SPO0611	0.67	0.959	SPO0610	0.86	0.635	SPO0610	0.74	0.273	SPO0610	0.57	0.011	SPO0610	0.57	0.012
SPO0611	0.81	0.643	SPO0611	0.84	0.577	SPO0612	0.87	0.934	SPO0612	0.96	0.721	SPO0611	1.13	0.587	SPO0611	1.07	0.970	SPO0611	0.29	0.009	SPO0611	0.29	0.001
SPO0612	0.9	0.62	SPO0612	0.9	0.681	SPO0613	0.81	0.204	SPO0613	0.88	0.415	SPO0612	1.02	0.882	SPO0612	0.94	0.193	SPO0612	0.30	0.000	SPO0612	0.32	0.000
SPO0613	1.06	0.356	SPO0613	1.03	0.498	SPO0614	0.63	0.027	SPO0614	0.87	0.035	SPO0613	0.96	0.280	SPO0613	0.95	0.292	SPO0613	0.25	0.000	SPO0613	0.26	0.000
SPO0614	0.86	0.155	SPO0614	0.84	0.224	SPO0615	0.92	0.001	SPO0615	0.95	0.002	SPO0614	0.56	0.001	SPO0614	0.53	0.001	SPO0614	0.57	0.001	SPO0614	0.57	0.002
SPO0615	1.14	0.022	SPO0615	0.99	0.734	SPO0616	0.88	0.873	SPO0616	0.9	0.505	SPO0615	0.54	0.001	SPO0615	0.56	0.000	SPO0615	0.61	0.003	SPO0615	0.61	0.001
SPO0616	1.25	0.005	SPO0616	1.06	0.045	SPO0618	0.76	0.415	SPO0618	0.96	0.666	SPO0616	0.56	0.002	SPO0616	0.61	0.000	SPO0616	1.00	0.830	SPO0616	1.00	0.958
SPO0618	0.67	0.264	SPO0618	0.72	0.259	SPO0619	0.98	0.691	SPO0619	0.97	0.548	SPO0618	0.79	0.351	SPO0618	0.77	0.383	SPO0618	0.81	0.256	SPO0618	0.83	0.610
SPO0619	1.1	0.6	SPO0619	1.12	0.443	SPO0620	0.93	0.279	SPO0620	0.78	0.344	SPO0619	0.99	0.808	SPO0619	0.97	0.664	SPO0619	0.96	0.863	SPO0619	0.95	0.826
SPO0620	0.81	0.406	SPO0620	0.79	0.218	SPO0621	0.88	0.402	SPO0621	0.95	0.255	SPO0620	1.24	0.275	SPO0620	1.14	0.659	SPO0620	1.21	0.203	SPO0620	1.15	0.506
SPO0621	0.87	0.668	SPO0621	0.88	0.697	SPO0622	0.91	0.925	SPO0622	0.98	0.952	SPO0621	0.93	0.512	SPO0621	0.92	0.309	SPO0621	0.99	0.761	SPO0621	1.02	0.989
SPO0622	0.81	0.859	SPO0622	0.76	0.825	SPO0623	0.9	0.909	SPO0623	0.85	0.926	SPO0622	0.98	0.993	SPO0622	0.88	0.934	SPO0622	0.90	0.917	SPO0622	0.98	0.987
SPO0623	0.97	0.916	SPO0623	0.99	0.795	SPO0624	0.92	0.53	SPO0624	0.93	0.694	SPO0623	1.31	0.119	SPO0623	1.31	0.157	SPO0623	1.17	0.298	SPO0623	1.14	0.527
SPO0624	0.76	0.011	SPO0624	0.86	0.231	SPO0628	0.88	0.263	SPO0628	0.94	0.267	SPO0624	1.41	0.028	SPO0624	1.42	0.007	SPO0624	1.01	0.999	SPO0624	0.98	0.918
SPO0628	0.99	0.774	SPO0628	1.17	0.461	SPO0629	0.92	0.802	SPO0629	0.89	0.657	SPO0628	0.55	0.021	SPO0628	0.45	0.006	SPO0628	0.43	0.003	SPO0628	0.47	0.004
SPO0629	0.63	0.001	SPO0629	0.71	0.003	SPO0631	0.93	0.001	SPO0631	0.95	0.002	SPO0629	1.22	0.004	SPO0629	1.14	0.007	SPO0629	0.93	0.535	SPO0629	0.95	0.725
SPO0631	0.66	0.013	SPO0631	0.74	0.048	SPO0632	1.01	0.319	SPO0632	0.88	0.399	SPO0631	2.21	0.000	SPO0631	2.19	0.000	SPO0631	0.93	0.851	SPO0631	1.06	0.189
SPO0632	0.9	0.441	SPO0632	0.85	0.33	SPO0633	0.95	0.624	SPO0633	0.83	0.41	SPO0632	0.94	0.766	SPO0632	0.93	0.639	SPO0632	0.88	0.241	SPO0632	0.92	0.454
SPO0633	0.51	0.006	SPO0633	0.52	0.007	SPO0634	0.94	0.227	SPO0634	0.96	0.463	SPO0633	1.46	0.006	SPO0633	1.47	0.000	SPO0633	0.94	0.645	SPO0633	0.93	0.497
SPO0634	0.71	0.019	SPO0634	0.73	0.014	SPO0635	0.81	0.189	SPO0635	0.62	0.21	SPO0634	0.87	0.495	SPO0634	0.88	0.570	SPO0634	1.11	0.306	SPO0634	1.08	0.048
SPO0635	0.69	0.323	SPO0635	0.79	0.702	SPO0636	0.96	0.694	SPO0636	0.95	0.516	SPO0635	1.96	0.157	SPO0635	2.04	0.128	SPO0635	1.13	0.769	SPO0635	1.22	0.618
SPO0636	1.06	0.243	SPO0636	1.16	0.327	SPO0637	0.88	0.914	SPO0637	0.8	0.873	SPO0636	0.94	0.660	SPO0636	1.23	0.428	SPO0636	1.03	0.941	SPO0636	0.96	0.830
SPO0637	1.03	0.608	SPO0637	0.97	0.763	SPO0638	0.96	0.263	SPO0638	0.74	0.009	SPO0637	1.29	0.100	SPO0637	1.35	0.022	SPO0637	1.31	0.085	SPO0637	1.26	0.367
SPO0638	0.48	0.001	SPO0638	0.57	0	SPO0639	0.88	0.875	SPO0639	0.87	0.407	SPO0638	2.09	0.000	SPO0638	2.10	0.000	SPO0638	1.11	0.350	SPO0638	1.31	0.019
SPO0639	1.15	0.042	SPO0639	1.06	0.2	SPO0640	0.68	0.277	SPO0640	0.83	0.022	SPO0639	1.33	0.073	SPO0639	1.54	0.001	SPO0639	1.02	0.907	SPO0639	1.03	0.882
SPO0640	1.08	0.314	SPO0640	1.04	0.269	SPO0641	0.99	0.175	SPO0641	0.94	0.197	SPO0640	1.52	0.002	SPO0640	1.82	0.001	SPO0640	1.22	0.270	SPO0640	1.11	0.290
SPO0641	0.76	0.122	SPO0641	0.85	0.092	SPO0642	0.93	1	SPO0642	0.96	0.879	SPO0641	1.34	0.036	SPO0641	1.31	0.007	SPO0641	1.01	0.979	SPO0641	1.00	0.981
SPO0642	1.01	0.875	SPO0642	0.98	0.952	SPO0643	0.59	0.924	SPO0643	0.85	0.25	SPO0642	0.68	0.092	SPO0642	0.69	0.044	SPO0642	0.86	0.263	SPO0642	0.85	0.460
SPO0643	0.89	0.239	SPO0643	0.84	0.043	SPO0644	0.57	0.427	SPO0644	0.89	0.378	SPO0643	0.87	0.360	SPO0643	0.90	0.753	SPO0643	0.98	0.857	SPO0643	1.00	0.952
SPO0644	0.61	0.155	SPO0644	0.68	0.017	SPO0645	0.95	0.113	SPO0645	0.98	0.568	SPO0644	1.05	0.132	SPO0644	1.02	0.106	SPO0644	1.01	0.812	SPO0644	1.08	0.624
SPO0645	1.17	0.023	SPO0645	0.98	0.831	SPO0646	0.86	0.004	SPO0646	0.99	0.004	SPO0645	0.84	0.385	SPO0645	0.84	0.305	SPO0645	0.99	0.994	SPO0645	0.99	0.973
SPO0646	0.88	0.082	SPO0646	0.89	0.284	SPO0647	0.83	0.016	SPO0647	1	0.003	SPO0646	3.10	0.000	SPO0646	2.92	0.000	SPO0646	2.07	0.000	SPO0646	1.91	0.001
SPO0647	0.57	0.022	SPO0647	0.6	0.005	SPO0648	0.84	0.816	SPO0648	0.99	0.616	SPO0647	3.06	0.000	SPO0647	3.10	0.000	SPO0647	1.59	0.160	SPO0647	1.53	0.066
SPO0648	0.68	0.004	SPO0648	0.74	0.011	SPO0649	0.98	0.015	SPO0649	0.88	0.002	SPO0648	1.48	0.000	SPO0648	1.40	0.001	SPO0648	1.01	0.656	SPO0648	1.00	0.630
SPO0649	0.51	0	SPO0649	0.55	0.001	SPO0650	0.89	0.221	SPO0650	0.87	0.061	SPO0649	2.07	0.000	SPO0649	2.25	0.000	SPO0649	1.05	0.307	SPO0649	1.11	0.038
SPO0650	0.93	0.37	SPO0650	0.92	0.532	SPO0651	0.93	0.78	SPO0651	0.97	0.766	SPO0650	0.88	0.208	SPO0650	0.89	0.309	SPO0650	1.06	0.589	SPO0650	1.11	0.081
SPO0651	0.82	0.011	SPO0651	0.87	0.452	SPO0652	0.93	0.29	SPO0652	0.85	0.009	SPO0651	0.83	0.398	SPO0651	0.83	0.507	SPO0651	0.86	0.011	SPO0651	0.98	0.965
SPO0652	0.77	0.016	SPO0652	0.79	0.121	SPO0653	0.98	0.344	SPO0653	0.89	0.932	SPO0652	1.28	0.012	SPO0652	1.40	0.031	SPO0652	1.13	0.550	SPO0652	1.18	0.241
SPO0653	0.89	0.581	SPO0653	0.81	0.141	SPO0654	0.86	0.741	SPO0654	0.84	0.413	SPO0653	0.81	0.411	SPO0653	0.88	0.630	SPO0653	0.88	0.654	SPO0653	0.86	0.471
SPO0654	0.75	0.024	SPO0654	0.78	0.017	SPO0655	0.96	0.825	SPO0655	0.91	0.81	SPO0654	1.37	0.029	SPO0654	1.40	0.015	SPO0654	1.13	0.602	SPO0654	1.10	0.319
SPO0655	1.24	0.318	SPO0655	1.15	0.382	SPO0656	0.77	0.023	SPO0656	0.93	0.081	SPO0655	0.81	0.324	SPO0655	0.92	0.605	SPO0655	0.93	0.746	SPO0655	0.83	0.553
SPO0656	0.8	0.136	SPO0656	0.85	0.094	SPO0657	0.93	0.857	SPO0657	0.88	0.956	SPO0656	1.57	0.007	SPO0656	1.66	0.001	SPO0656	1.09	0.661	SPO0656	1.03	0.726
SPO0657	1.16	0.418	SPO0657	1.04	0.324	SPO0658	0.86	0.011	SPO0658	0.93	0.073	SPO0657	1.25	0.279	SPO0657	1.14	0.546	SPO0657	1.18	0.446	SPO0657	1.16	0.442
SPO0658	0.84	0.406	SPO0658	0.79	0.023	SPO0659	0.94	0.206	SPO0659	0.61	0.512	SPO0658	1.20	0.335	SPO0658	1.13	0.379	SPO0658	1.03	0.985	SPO0658	1.00	0.875
SPO0659	0.83	0.125	SPO0659	0.74	0.453	SPO0660	0.87	0.827	SPO0660	0.67	0.694	SPO0659	0.88	0.652	SPO0659	0.85	0.382	SPO0659	0.96	0.597	SPO0659	1.01	0.996
SPO0660	0.8	0.324	SPO0660	0.82	0.353	SPO0661	0.78	0.382	SPO0661	0.92	0.873	SPO0660	1.22	0.134	SPO0660	1.18	0.262	SPO0660	0.84	0.286	SPO0660	0.85	0.268
SPO0661	1.04	0.482	SPO0661	0.86	0.443	SPO0662	0.93	0.481	SPO0662	0.83	0.897	SPO0661	1.28	0.328	SPO0661	1.51	0.039	SPO0661	1.20	0.176	SPO0661	1.12	0.529
SPO0662	1.09	0.595	SPO0662	1.02	0.634	SPO0663	0.92	0.383	SPO0663	0.88	0.275	SPO0662	0.85	0.313	SPO0662	0.88	0.175	SPO0662	0.64	0.048	SPO0662	0.67	0.007
SPO0663	1.06	0.623	SPO0663	1.03	0.723	SPO0664	0.93	0.941	SPO0664	0.83	0.975	SPO0663	0.74	0.147	SPO0663	0.64	0.071	SPO0663	0.72	0.313	SPO0663	0.74	0.248
SPO0664	0.89	0.921	SPO0664	0.99	0.931	SPO0665	0.88	0.843	SPO0665	0.93	0.752	SPO0664	0.93	0.877	SPO0664	0.81	0.689	SPO0664	1.17	0.792	SPO0664	1.14	0.787
SPO0665	0.9	0.479	SPO0665	0.99	0.841	SPO0666	0.89	0.784	SPO0666	0.99	0.708	SPO0665	1.32	0.061	SPO0665	1.32	0.104	SPO0665	1.05	0.776	SPO0665	1.10	0.594
SPO0666	1.16	0.644	SPO0666	1.1	0.809	SPO0667	0.98	0.549	SPO0667	0.98	0.802	SPO0666	0.72	0.555	SPO0666	0.71	0.514	SPO0666	0.88	0.766	SPO0666	0.90	0.786
SPO0667	1.04	0.788	SPO0667	1.13	0.201	SPO0668	0.99	0.009	SPO0668	0.86	0.135	SPO0667	0.85	0.835	SPO0667	0.72	0.207	SPO0667	0.93	0.883	SPO0667	0.92	0.776
SPO0668	1.75	0	SPO0668	1.48	0.056	SPO0669	0.85	0.707	SPO0669	0.75	0.726	SPO0668	1.39	0.023	SPO0668	1.45	0.025	SPO0668	1.22	0.045	SPO0668	1.18	0.381
SPO0669	2.13	0	SPO0669	1.74	0	SPO0670	0.94	0.114	SPO0670	0.97	0.054	SPO0669	0.99	0.774	SPO0669	1.02	0.263	SPO0669	1.05	0.361	SPO0669	1.03	0.701
SPO0670	0.56	0.127	SPO0670	0.64	0.093	SPO0671	0.97	0.034	SPO0671	0.95	0.04	SPO0670	1.29	0.178	SPO0670	1.32	0.151	SPO0670	1.26	0.334	SPO0670	1.30	0.148
SPO0671	0.6	0	SPO0671	0.64	0.153	SPO0672	0.81	0.022	SPO0672	0.74	0.002	SPO0671	1.99	0.005	SPO0671	1.75	0.003	SPO0671	1.70	0.010	SPO0671	1.60	0.032
SPO0672	0.54	0.001	SPO0672	0.59	0	SPO0673	0.98	0.01	SPO0673	0.95	0.1	SPO0672	1.58	0.003	SPO0672	1.69	0.001	SPO0672	1.42	0.007	SPO0672	1.41	0.019
SPO0673	0.83	0.015	SPO0673	0.85	0.064	SPO0674	0.9	0.07	SPO0674	0.87	0.247	SPO0673	0.73	0.049	SPO0673	0.72	0.038	SPO0673	0.88	0.290	SPO0673	0.91	0.340
SPO0674	0.93	0.331	SPO0674	0.85	0.045	SPO0675	0.95	0.708	SPO0675	0.98	0.444	SPO0674	1.09	0.117	SPO0674	1.23	0.007	SPO0674	1.10	0.501	SPO0674	1.09	0.313
SPO0675	0.79	0.625	SPO0675	0.75	0.375	SPO0676	0.79	0.007	SPO0676	0.75	0.113	SPO0675	2.02	0.123	SPO0675	1.94	0.056	SPO0675	1.23	0.503	SPO0675	1.22	0.504
SPO0676	1.25	0.008	SPO0676	1.03	0.422	SPO0677	0.93	0.721	SPO0677	0.94	0.673	SPO0676	1.75	0.022	SPO0676	1.70	0.002	SPO0676	0.94	0.509	SPO0676	0.93	0.691
SPO0677	1.21	0.644	SPO0677	1.17	0.724	SPO0678	0.85	0.112	SPO0678	0.81	0.881	SPO0677	0.87	0.860	SPO0677	0.80	0.776	SPO0677	0.78	0.616	SPO0677	0.77	0.612
SPO0678	0.65	0.002	SPO0678	0.68	0.012	SPO0679	0.9	0.693	SPO0679	0.89	0.207	SPO0678	0.98	0.428	SPO0678	0.99	0.266	SPO0678	1.00	0.876	SPO0678	0.99	0.952
SPO0679	0.79	0.079	SPO0679	0.89	0.511	SPO0680	0.88	0.267	SPO0680	0.87	0.068	SPO0679	0.95	0.690	SPO0679	0.89	0.215	SPO0679	0.97	0.780	SPO0679	1.01	0.992
SPO0680	0.95	0.912	SPO0680	0.96	0.945	SPO0681	0.93	0.182	SPO0681	0.91	0.346	SPO0680	2.15	0.000	SPO0680	2.13	0.000	SPO0680	1.17	0.161	SPO0680	1.19	0.118
SPO0681	0.72	0.189	SPO0681	0.78	0.49	SPO0682	0.88	0.529	SPO0682	0.89	0.96	SPO0681	1.76	0.060	SPO0681	1.47	0.103	SPO0681	1.19	0.511	SPO0681	1.21	0.401
SPO0682	0.98	0.994	SPO0682	0.96	0.982	SPO0683	0.9	0.27	SPO0683	0.9	0.237	SPO0682	0.83	0.729	SPO0682	0.83	0.799	SPO0682	0.93	0.899	SPO0682	0.93	0.912
SPO0683	0.85	0.291	SPO0683	0.88	0.607	SPO0684	1	0.018	SPO0684	0.87	0.002	SPO0683	1.38	0.023	SPO0683	1.31	0.031	SPO0683	1.14	0.322	SPO0683	1.13	0.450
SPO0684	0.75	0.025	SPO0684	0.79	0.163	SPO0685	0.91	0.117	SPO0685	0.89	0.006	SPO0684	2.05	0.000	SPO0684	2.21	0.000	SPO0684	1.07	0.492	SPO0684	1.12	0.171
SPO0685	0.76	0.243	SPO0685	0.75	0.025	SPO0686	1	0.001	SPO0686	0.93	0.009	SPO0685	1.18	0.135	SPO0685	1.16	0.063	SPO0685	0.94	0.628	SPO0685	1.04	0.600
SPO0686	0.71	0.053	SPO0686	0.74	0.266	SPO0687	0.78	0.064	SPO0687	0.85	0.018	SPO0686	1.67	0.001	SPO0686	1.67	0.000	SPO0686	1.09	0.167	SPO0686	1.13	0.088
SPO0687	0.91	0.276	SPO0687	0.94	0.836	SPO0688	0.96	0.983	SPO0688	0.93	0.855	SPO0687	1.38	0.032	SPO0687	1.43	0.020	SPO0687	1.08	0.654	SPO0687	1.13	0.263
SPO0688	1.15	0.185	SPO0688	1.13	0.229	SPO0689	0.92	0.009	SPO0689	0.88	0.006	SPO0688	0.98	0.700	SPO0688	1.02	0.388	SPO0688	1.10	0.462	SPO0688	1.10	0.517
SPO0689	1.77	0	SPO0689	1.47	0.001	SPO0690	0.93	0.654	SPO0690	0.99	0.457	SPO0689	1.54	0.001	SPO0689	1.68	0.000	SPO0689	1.13	0.268	SPO0689	0.91	0.177
SPO0690	2.04	0.001	SPO0690	1.83	0.002	SPO0691	0.94	0.419	SPO0691	0.81	0.535	SPO0690	1.09	0.860	SPO0690	1.21	0.251	SPO0690	1.18	0.553	SPO0690	1.10	0.483
SPO0691	1.13	0.468	SPO0691	1.3	0.131	SPO0692	0.9	0.915	SPO0692	0.85	0.86	SPO0691	1.44	0.078	SPO0691	1.27	0.137	SPO0691	1.09	0.542	SPO0691	1.09	0.633
SPO0692	0.99	0.816	SPO0692	1.01	0.474	SPO0693	0.97	0.041	SPO0693	0.93	0.002	SPO0692	0.11	0.000	SPO0692	0.11	0.000	SPO0692	0.80	0.451	SPO0692	0.85	0.570
SPO0693	1.98	0.002	SPO0693	1.67	0.039	SPO0694	0.71	0.809	SPO0694	1.01	0.746	SPO0693	0.83	0.078	SPO0693	0.98	0.713	SPO0693	1.08	0.761	SPO0693	0.88	0.310
SPO0694	1	0.901	SPO0694	1.01	0.86	SPO0695	0.99	0.55	SPO0695	0.94	0.843	SPO0694	0.91	0.882	SPO0694	0.92	0.937	SPO0694	1.10	0.676	SPO0694	1.04	0.833
SPO0695	1.26	0.004	SPO0695	1.23	0.003	SPO0697	0.78	0.651	SPO0697	0.94	0.62	SPO0695	0.95	0.886	SPO0695	1.05	0.146	SPO0695	1.06	0.580	SPO0695	1.07	0.297
SPO0697	1.66	0.088	SPO0697	1.43	0.021	SPO0698	0.95	0.002	SPO0698	0.97	0.004	SPO0697	1.87	0.060	SPO0697	1.73	0.007	SPO0697	0.83	0.327	SPO0697	0.78	0.190
SPO0698	3.5	0	SPO0698	2.72	0	SPO0699	0.93	0.815	SPO0699	0.88	0.856	SPO0698	1.16	0.119	SPO0698	1.18	0.072	SPO0698	0.55	0.015	SPO0698	0.63	0.003
SPO0699	1.87	0.09	SPO0699	1.75	0.231	SPO0700	0.9	0.359	SPO0700	0.99	0.849	SPO0699	2.60	0.123	SPO0699	2.47	0.123	SPO0699	0.71	0.486	SPO0699	0.71	0.432
SPO0700	0.99	0.928	SPO0700	1.07	0.278	SPO0701	0.88	0.048	SPO0701	0.85	0.018	SPO0700	0.70	0.014	SPO0700	0.73	0.006	SPO0700	0.96	0.747	SPO0700	1.04	0.485
SPO0701	4.31	0	SPO0701	3.73	0	SPO0702	0.93	0.822	SPO0702	0.78	0.981	SPO0701	0.07	0.000	SPO0701	0.07	0.000	SPO0701	2.08	0.001	SPO0701	2.13	0.001
SPO0702	0.93	0.851	SPO0702	0.93	0.914	SPO0703	0.94	0.058	SPO0703	0.81	0.604	SPO0702	1.27	0.038	SPO0702	1.35	0.123	SPO0702	1.03	0.969	SPO0702	1.06	0.849
SPO0703	0.87	0.364	SPO0703	0.81	0.248	SPO0704	0.81	0.561	SPO0704	0.84	0.946	SPO0703	1.47	0.031	SPO0703	1.48	0.036	SPO0703	1.11	0.562	SPO0703	1.13	0.531
SPO0704	1.08	0.263	SPO0704	1.01	0.562	SPO0705	1	0.529	SPO0705	0.85	0.847	SPO0704	0.86	0.167	SPO0704	0.79	0.105	SPO0704	0.99	0.840	SPO0704	0.97	0.756
SPO0705	0.8	0.137	SPO0705	0.87	0.651	SPO0706	0.99	0.662	SPO0706	0.93	0.492	SPO0705	1.21	0.212	SPO0705	1.27	0.135	SPO0705	1.10	0.728	SPO0705	0.97	0.916
SPO0706	0.73	0.02	SPO0706	0.79	0	SPO0707	0.49	0.012	SPO0707	0.91	0.017	SPO0706	1.06	0.074	SPO0706	0.95	0.264	SPO0706	1.04	0.650	SPO0706	1.01	0.838
SPO0707	0.46	0	SPO0707	0.54	0	SPO0708	0.95	0.709	SPO0708	0.78	0.818	SPO0707	1.72	0.000	SPO0707	1.76	0.000	SPO0707	1.09	0.223	SPO0707	1.21	0.002
SPO0708	1.14	0.553	SPO0708	1.04	0.764	SPO0709	0.97	0.549	SPO0709	0.87	0.606	SPO0708	0.76	0.159	SPO0708	0.65	0.048	SPO0708	1.04	0.957	SPO0708	0.89	0.591
SPO0709	0.5	0.066	SPO0709	0.52	0.114	SPO0710	0.92	0.462	SPO0710	0.88	0.487	SPO0709	2.67	0.018	SPO0709	2.71	0.016	SPO0709	1.28	0.417	SPO0709	1.17	0.546
SPO0710	0.87	0.447	SPO0710	0.93	0.711	SPO0711	0.63	0.444	SPO0711	0.99	0.609	SPO0710	0.91	0.794	SPO0710	0.89	0.735	SPO0710	1.01	0.560	SPO0710	1.05	0.594

SPO0711	1.15	0.14	SPO0711	1.13	0.573	SPO0712	0.78	0.592	SPO0712	0.84	0.897	SPO0711	0.86	0.804	SPO0711	0.91	0.934	SPO0711	0.90	0.421	SPO0711	0.86	0.567
SPO0712	0.84	0.539	SPO0712	0.9	0.874	SPO0713	0.89	0.723	SPO0713	0.96	0.801	SPO0712	1.48	0.253	SPO0712	1.40	0.422	SPO0712	0.95	0.875	SPO0712	1.03	0.958
SPO0713	1.17	0.364	SPO0713	1.2	0.215	SPO0714	0.93	0.51	SPO0714	0.84	0.024	SPO0713	1.24	0.155	SPO0713	1.31	0.094	SPO0713	1.15	0.500	SPO0713	1.14	0.480
SPO0714	0.54	0	SPO0714	0.66	0.002	SPO0715	0.78	0.346	SPO0715	0.88	0.418	SPO0714	1.42	0.001	SPO0714	1.38	0.013	SPO0714	0.95	0.649	SPO0714	1.06	0.483
SPO0715	0.89	0.129	SPO0715	0.96	0.81	SPO0716	0.86	0.962	SPO0716	0.93	0.865	SPO0715	1.07	0.167	SPO0715	1.04	0.155	SPO0715	1.02	0.695	SPO0715	0.99	0.958
SPO0716	1.27	0.277	SPO0716	1.29	0.27	SPO0717	0.17	0.232	SPO0717	0.96	0.284	SPO0716	1.02	0.706	SPO0716	0.98	0.719	SPO0716	1.06	0.842	SPO0716	1.04	0.872
SPO0717	0.96	0.309	SPO0717	0.88	0.278	SPO0718	0.3	0.996	SPO0718	0.93	0.789	SPO0717	0.95	0.647	SPO0717	1.03	0.241	SPO0717	0.97	0.845	SPO0717	0.98	0.923
SPO0718	0.96	0.955	SPO0718	1	0.911	SPO0719	0.71	0.175	SPO0719	0.69	0.853	SPO0718	0.56	0.306	SPO0718	0.48	0.125	SPO0718	0.53	0.204	SPO0718	0.57	0.098
SPO0719	2.08	0	SPO0719	1.74	0	SPO0720	0.93	0.08	SPO0720	0.99	0.031	SPO0719	0.87	0.864	SPO0719	0.85	0.444	SPO0719	1.16	0.235	SPO0719	1.07	0.329
SPO0720	1.06	0.607	SPO0720	1.07	0.217	SPO0721	0.75	0.206	SPO0721	1.01	0.26	SPO0720	1.18	0.001	SPO0720	1.27	0.001	SPO0720	1.11	0.036	SPO0720	1.09	0.039
SPO0721	1.26	0.095	SPO0721	1.13	0.013	SPO0722	0.88	0.49	SPO0722	0.5	0.461	SPO0721	0.89	0.260	SPO0721	0.96	0.324	SPO0721	1.08	0.819	SPO0721	1.14	0.025
SPO0722	1.59	0	SPO0722	1.5	0.023	SPO0723	0.94	0.73	SPO0723	0.94	0.584	SPO0722	0.74	0.506	SPO0722	0.74	0.511	SPO0722	1.03	0.766	SPO0722	0.96	0.842
SPO0723	1.01	0.97	SPO0723	0.89	0.833	SPO0724	0.97	0.917	SPO0724	0.9	0.832	SPO0723	1.28	0.340	SPO0723	1.38	0.282	SPO0723	0.97	0.984	SPO0723	0.97	0.999
SPO0724	0.94	0.901	SPO0724	0.98	0.931	SPO0725	0.96	0.924	SPO0725	0.93	0.3	SPO0724	1.14	0.509	SPO0724	1.15	0.492	SPO0724	1.07	0.831	SPO0724	1.01	0.959
SPO0725	0.78	0.398	SPO0725	0.78	0.091	SPO0726	0.99	0.559	SPO0726	0.92	0.151	SPO0725	1.27	0.639	SPO0725	1.42	0.294	SPO0725	1.32	0.336	SPO0725	1.05	0.935
SPO0726	1	0.948	SPO0726	0.99	0.812	SPO0727	0.9	0.03	SPO0727	0.99	0.535	SPO0726	1.50	0.051	SPO0726	1.47	0.000	SPO0726	1.10	0.657	SPO0726	1.07	0.405
SPO0727	1.08	0.191	SPO0727	1.05	0.642	SPO0728	0.92	0.079	SPO0728	0.97	0.117	SPO0727	1.83	0.000	SPO0727	2.03	0.000	SPO0727	1.06	0.375	SPO0727	1.06	0.626
SPO0728	1.13	0.624	SPO0728	0.99	0.801	SPO0729	0.72	0.584	SPO0729	1	0.937	SPO0728	1.02	0.031	SPO0728	1.00	0.042	SPO0728	1.10	0.384	SPO0728	1.19	0.000
SPO0729	1.58	0.001	SPO0729	1.37	0.003	SPO0731	0.8	0.289	SPO0731	0.98	0.744	SPO0729	1.07	0.244	SPO0729	1.08	0.124	SPO0729	0.83	0.040	SPO0729	0.93	0.555
SPO0731	1.23	0.081	SPO0731	1.27	0.002	SPO0732	0.93	0.466	SPO0732	0.61	0.413	SPO0731	1.83	0.003	SPO0731	2.03	0.001	SPO0731	1.10	0.743	SPO0731	1.00	0.931
SPO0732	1	0.829	SPO0732	1.04	0.46	SPO0733	0.75	0.132	SPO0733	0.78	0.067	SPO0732	1.10	0.386	SPO0732	1.20	0.031	SPO0732	0.89	0.245	SPO0732	0.94	0.578
SPO0733	1.08	0.437	SPO0733	1.04	0.149	SPO0734	0.83	0.748	SPO0734	0.85	0.794	SPO0733	0.64	0.010	SPO0733	0.69	0.004	SPO0733	1.01	0.884	SPO0733	1.05	0.543
SPO0734	0.93	0.621	SPO0734	0.93	0.719	SPO0735	0.67	0.115	SPO0735	1.01	0.443	SPO0734	0.72	0.120	SPO0734	0.77	0.109	SPO0734	1.04	0.827	SPO0734	1.02	0.843
SPO0735	0.78	0.129	SPO0735	0.81	0.38	SPO0736	0.67	0.877	SPO0736	0.97	0.892	SPO0735	1.13	0.627	SPO0735	0.98	0.561	SPO0735	1.02	0.996	SPO0735	1.10	0.573
SPO0736	0.97	0.988	SPO0736	0.89	0.956	SPO0737	0.76	0.953	SPO0737	0.78	0.477	SPO0736	0.89	0.919	SPO0736	0.80	0.825	SPO0736	0.77	0.796	SPO0736	0.80	0.827
SPO0737	1.09	0.395	SPO0737	1	0.541	SPO0738	0.8	0.41	SPO0738	0.96	0.129	SPO0737	1.22	0.491	SPO0737	0.98	0.233	SPO0737	0.98	0.783	SPO0737	0.93	0.565
SPO0738	0.79	0.256	SPO0738	0.82	0.09	SPO0739	0.89	0.787	SPO0739	0.17	0.749	SPO0738	1.70	0.057	SPO0738	1.57	0.015	SPO0738	1.08	0.696	SPO0738	1.11	0.512
SPO0739	0.7	0.032	SPO0739	0.81	0.587	SPO0740	0.93	0.736	SPO0740	0.29	0.806	SPO0739	1.20	0.753	SPO0739	0.98	0.849	SPO0739	0.87	0.596	SPO0739	0.96	0.879
SPO0740	0.83	0.711	SPO0740	0.87	0.818	SPO0741	0.93	0.623	SPO0741	0.72	0.738	SPO0740	0.74	0.533	SPO0740	0.75	0.488	SPO0740	0.75	0.422	SPO0740	0.74	0.311
SPO0741	0.62	0.015	SPO0741	0.74	0.483	SPO0742	0.85	0.236	SPO0742	0.91	0.096	SPO0741	0.88	0.498	SPO0741	0.88	0.608	SPO0741	0.77	0.055	SPO0741	0.79	0.022
SPO0742	0.67	0.013	SPO0742	0.72	0.039	SPO0743	0.91	0.052	SPO0743	0.75	0.274	SPO0742	0.93	0.806	SPO0742	1.05	0.162	SPO0742	1.05	0.797	SPO0742	1.07	0.540
SPO0743	0.99	0.849	SPO0743	1.02	0.425	SPO0744	0.77	0.109	SPO0744	0.96	0.315	SPO0743	1.27	0.003	SPO0743	1.39	0.027	SPO0743	1.17	0.523	SPO0743	1.13	0.576
SPO0744	0.73	0.316	SPO0744	0.78	0.147	SPO0745	0.91	0.158	SPO0745	0.94	0.199	SPO0744	1.03	0.979	SPO0744	1.14	0.450	SPO0744	1.24	0.441	SPO0744	1.17	0.529
SPO0745	0.64	0.078	SPO0745	0.68	0.019	SPO0746	0.88	0.019	SPO0746	0.94	0.044	SPO0745	1.30	0.077	SPO0745	1.37	0.047	SPO0745	1.15	0.339	SPO0745	1.14	0.471
SPO0746	0.6	0.014	SPO0746	0.66	0.001	SPO0747	0.34	0.27	SPO0747	0.82	0.143	SPO0746	1.23	0.082	SPO0746	1.26	0.011	SPO0746	0.95	0.610	SPO0746	1.05	0.733
SPO0747	0.81	0.69	SPO0747	0.99	0.678	SPO0748	0.61	0.835	SPO0748	0.93	0.778	SPO0747	0.88	0.185	SPO0747	0.97	0.451	SPO0747	0.91	0.455	SPO0747	0.93	0.431
SPO0748	0.81	0.834	SPO0748	0.85	0.901	SPO0749	0.78	0.865	SPO0749	0.85	0.126	SPO0748	1.09	0.917	SPO0748	0.90	0.816	SPO0748	1.11	0.886	SPO0748	0.93	0.910
SPO0749	1.05	0.544	SPO0749	0.8	0.064	SPO0750	0.98	0.988	SPO0750	0.7	0.957	SPO0749	1.14	0.832	SPO0749	1.08	0.542	SPO0749	1.34	0.116	SPO0749	0.96	0.699
SPO0750	0.99	0.977	SPO0750	0.92	0.962	SPO0751	0.86	0.585	SPO0751	0.78	0.626	SPO0750	0.66	0.701	SPO0750	0.60	0.630	SPO0750	0.86	0.877	SPO0750	0.87	0.862
SPO0751	1.28	0.418	SPO0751	1.03	0.827	SPO0752	0.98	0.304	SPO0752	0.97	0.278	SPO0751	1.17	0.516	SPO0751	1.07	0.718	SPO0751	1.12	0.804	SPO0751	1.08	0.821
SPO0752	1.01	0.903	SPO0752	0.99	0.955	SPO0753	0.85	0.371	SPO0753	0.76	0.397	SPO0752	0.90	0.892	SPO0752	0.89	0.889	SPO0752	1.26	0.416	SPO0752	1.26	0.476
SPO0753	0.76	0.518	SPO0753	0.75	0.458	SPO0754	0.93	0.009	SPO0754	0.83	0.009	SPO0753	0.75	0.466	SPO0753	0.74	0.392	SPO0753	0.98	0.946	SPO0753	1.07	0.817
SPO0754	0.6	0.006	SPO0754	0.68	0.01	SPO0755	0.76	0.616	SPO0755	0.7	0.662	SPO0754	1.04	0.761	SPO0754	1.13	0.259	SPO0754	1.23	0.109	SPO0754	1.23	0.183
SPO0755	0.75	0.531	SPO0755	0.78	0.728	SPO0756	0.85	0.012	SPO0756	0.64	0.033	SPO0755	0.88	0.894	SPO0755	0.81	0.771	SPO0755	1.13	0.817	SPO0755	1.18	0.706
SPO0756	0.82	0.143	SPO0756	0.81	0.716	SPO0757	1	0.171	SPO0757	0.81	0.011	SPO0756	0.88	0.516	SPO0756	0.89	0.341	SPO0756	1.12	0.581	SPO0756	1.11	0.313
SPO0757	0.62	0.005	SPO0757	0.67	0.006	SPO0758	0.95	0.722	SPO0758	0.99	0.782	SPO0757	0.85	0.324	SPO0757	0.81	0.191	SPO0757	0.99	0.902	SPO0757	1.06	0.484
SPO0758	0.93	0.913	SPO0758	0.94	0.99	SPO0759	0.85	0.604	SPO0759	0.96	0.402	SPO0758	0.58	0.033	SPO0758	0.65	0.028	SPO0758	0.86	0.466	SPO0758	0.88	0.368
SPO0759	1.13	0.308	SPO0759	1.09	0.213	SPO0760	0.92	0.689	SPO0760	0.8	0.534	SPO0759	0.12	0.000	SPO0759	0.11	0.000	SPO0759	1.23	0.016	SPO0759	1.15	0.163
SPO0760	0.83	0.557	SPO0760	0.86	0.625	SPO0761	0.84	0.151	SPO0761	0.93	0.004	SPO0760	1.77	0.027	SPO0760	1.54	0.080	SPO0760	1.14	0.542	SPO0760	1.07	0.772
SPO0761	0.41	0	SPO0761	0.45	0	SPO0762	0.99	0.134	SPO0762	0.87	0.118	SPO0761	2.31	0.000	SPO0761	2.35	0.000	SPO0761	1.04	0.423	SPO0761	1.16	0.005
SPO0762	1.16	0.09	SPO0762	1.11	0.026	SPO0763	0.85	0.249	SPO0763	0.81	0.25	SPO0762	0.76	0.017	SPO0762	0.80	0.048	SPO0762	0.98	0.774	SPO0762	0.93	0.328
SPO0763	0.76	0.117	SPO0763	0.87	0.598	SPO0764	0.91	0.157	SPO0764	0.85	0.345	SPO0763	1.40	0.102	SPO0763	1.43	0.083	SPO0763	1.29	0.324	SPO0763	1.15	0.641
SPO0764	0.93	0.951	SPO0764	0.91	0.587	SPO0765	0.93	0.017	SPO0765	0.58	0.009	SPO0764	1.29	0.065	SPO0764	1.35	0.001	SPO0764	1.08	0.159	SPO0764	1.04	0.688
SPO0765	0.83	0.102	SPO0765	0.78	0.057	SPO0766	0.77	0.94	SPO0766	0.88	0.911	SPO0765	1.44	0.014	SPO0765	1.48	0.001	SPO0765	1.19	0.307	SPO0765	1.16	0.270
SPO0766	1.26	0.716	SPO0766	1.13	0.817	SPO0767	0.97	0.881	SPO0767	0.9	0.957	SPO0766	0.92	0.829	SPO0766	1.13	0.906	SPO0766	1.14	0.925	SPO0766	0.93	0.900
SPO0767	0.93	0.665	SPO0767	0.93	0.641	SPO0768	0.93	0.297	SPO0768	0.97	0.126	SPO0767	1.41	0.002	SPO0767	1.36	0.001	SPO0767	0.96	0.841	SPO0767	0.97	0.944
SPO0768	1.55	0.022	SPO0768	1.64	0.007	SPO0769	0.87	0	SPO0769	0.9	0.001	SPO0768	0.93	0.741	SPO0768	0.98	0.897	SPO0768	0.98	0.862	SPO0768	0.96	0.739
SPO0769	0.37	0	SPO0769	0.4	0.001	SPO0770	0.96	0.558	SPO0770	0.35	0.227	SPO0769	4.29	0.000	SPO0769	4.25	0.000	SPO0769	1.09	0.579	SPO0769	1.05	0.687
SPO0770	0.8	0.165	SPO0770	0.78	0.353	SPO0771	0.84	0.661	SPO0771	1	0.782	SPO0770	1.69	0.044	SPO0770	1.39	0.188	SPO0770	0.98	0.857	SPO0770	1.02	0.944
SPO0771	1.07	0.32	SPO0771	0.95	0.972	SPO0772	0.85	0.401	SPO0772	0.64	0.34	SPO0771	1.39	0.153	SPO0771	1.44	0.127	SPO0771	0.97	0.853	SPO0771	0.83	0.394
SPO0772	0.9	0.645	SPO0772	0.85	0.564	SPO0773	0.81	0.465	SPO0773	0.84	0.572	SPO0772	0.85	0.467	SPO0772	0.88	0.591	SPO0772	0.85	0.258	SPO0772	0.80	0.143
SPO0773	0.61	0.034	SPO0773	0.61	0.043	SPO0774	1.01	0.246	SPO0774	0.95	0.081	SPO0773	0.96	0.740	SPO0773	0.98	0.669	SPO0773	0.88	0.573	SPO0773	0.93	0.713
SPO0774	0.74	0.002	SPO0774	0.75	0.001	SPO0775	0.96	0.76	SPO0775	0.99	0.998	SPO0774	1.79	0.000	SPO0774	1.90	0.000	SPO0774	0.87	0.154	SPO0774	0.91	0.352
SPO0775	1.11	0.449	SPO0775	1.04	0.464	SPO0776	0.7	0.752	SPO0776	0.98	0.77	SPO0775	1.16	0.150	SPO0775	1.24	0.128	SPO0775	1.01	0.949	SPO0775	0.95	0.644
SPO0776	1.13	0.341	SPO0776	1.13	0.487	SPO0777	0.99	0.923	SPO0777	0.76	0.845	SPO0776	1.08	0.733	SPO0776	1.13	0.626	SPO0776	0.94	0.512	SPO0776	0.93	0.708
SPO0777	0.95	0.955	SPO0777	0.97	0.998	SPO0778	0.92	0.925	SPO0778	0.78	0.957	SPO0777	0.76	0.850	SPO0777	0.76	0.859	SPO0777	0.76	0.782	SPO0777	0.76	0.730
SPO0778	0.94	0.95	SPO0778	0.98	0.93	SPO0779	0.97	0.597	SPO0779	0.88	0.21	SPO0778	1.14	0.547	SPO0778	1.21	0.423	SPO0778	0.92	0.692	SPO0778	0.93	0.735
SPO0779	1.31	0.063	SPO0779	1.26	0.001	SPO0780	0.82	0.263	SPO0780	0.74	0.813	SPO0779	1.02	0.489	SPO0779	1.07	0.011	SPO0779	1.14	0.573	SPO0779	1.09	0.164
SPO0780	1	0.387	SPO0780	0.99	0.517	SPO0781	0.88	0.652	SPO0781	0.89	0.457	SPO0780	0.88	0.533	SPO0780	0.92	0.462	SPO0780	0.81	[redacted]	SPO0780	0.81	0.213
SPO0781	1.15	0.177	SPO0781	1.06	0.392	SPO0782	0.85	0.224	SPO0782	0.89	0.865	SPO0781	0.98	0.752	SPO0781	0.98	0.636	SPO0781	1.06	0.911	SPO0781	0.97	0.749
SPO0782	0.95	0.6	SPO0782	1.05	0.577	SPO0783	0.93	0.221	SPO0783	1	0.251	SPO0782	1.18	0.001	SPO0782	1.20	0.286	SPO0782	0.79	0.048	SPO0782	0.89	0.707
SPO0783	0.94	0.955	SPO0783	0.86	0.736	SPO0784	0.83	0.001	SPO0784	0.98	0.001	SPO0783	1.67	0.073	SPO0783	1.67	0.087	SPO0783	0.99	0.969	SPO0783	1.01	0.963
SPO0784	0.55	0.033	SPO0784	0.74	0.029	SPO0785	0.96	0.978	SPO0785	0.93	0.965	SPO0784	12.60	0.000	SPO0784	12.80	0.000	SPO0784	0.95	0.960	SPO0784	0.97	0.995
SPO0785	0.99	0.976	SPO0785	1.06	0.9	SPO0786	0.91	0.356	SPO0786	0.98	0.323	SPO0785	0.63	0.683	SPO0785	0.61	0.643	SPO0785	0.94	0.947	SPO0785	0.93	0.933
SPO0786	1.51	0.002	SPO0786	1.4	0.001	SPO0787	0.78	0.932	SPO0787	0.8	0.678	SPO0786	0.93	0.513	SPO0786	1.02	0.803	SPO0786	1.10	0.439	SPO0786	1.04	0.704
SPO0787	1.02	0.348	SPO0787	1	0.379	SPO0788	0.83	0.737	SPO0788	0.83	0.664	SPO0787	0.97	0.993	SPO0787	0.99	0.696	SPO0787	1.01	0.910	SPO0787	0.98	0.703
SPO0788	0.78	0.195	SPO0788	0.81	0.369	SPO0789	0.97	0.362	SPO0789	1	0.252	SPO0788	1.03	0.879	SPO0788	1.15	0.444	SPO0788	0.93	0.244	SPO0788	0.94	0.662
SPO0789	1.02	0.589	SPO0789	1.03	0.45	SPO0790	0.88	0.642	SPO0790	0.94	0.269	SPO0789	0.06	0.000	SPO0789	0.05	0.000	SPO0789	0.64	0.050	SPO0789	0.67	0.005
SPO0790	1.13	0.291	SPO0790	1.01	0.208	SPO0791	0.66	0.601	SPO0791	0.96	0.419	SPO0790	0.04	0.000	SPO0790	0.04	0.000	SPO0790	0.43	0.005	SPO0790	0.44	0.001
SPO0791	1.06	0.31	SPO0791	1.11	0.045	SPO0792	0.99	0.362	SPO0792	0.97	0.838	SPO0791	0.57	0.000	SPO0791	0.58	0.000	SPO0791	1.05	0.636	SPO0791	1.01	0.741
SPO0792	1.19	0.028	SPO0792	1.05	0.218	SPO0793	0.91	0.925	SPO0793	0.97	0.756	SPO0792	0.68	0.003	SPO0792	0.65	0.006	SPO0792	1.01	0.670	SPO0792	0.99	0.897
SPO0793	0.83	0.241	SPO0793	0.88	0.56	SPO0794	0.93	0.349	SPO0794	0.89	0.597	SPO0793	0.50	0.000	SPO0793	0.49	0.002	SPO0793	0.99	0.885	SPO0793	1.04	0.865
SPO0794	0.76	0.212	SPO0794	0.79	0.371	SPO0795	0.88	0.84	SPO0795	0.93	0.993	SPO0794	0.38	0.001	SPO0794	0.38	0.001	SPO0794	1.04	0.840	SPO0794	1.00	0.919
SPO0795	1.18	0.152	SPO0795	1.19	0.021	SPO0796	0.98	0.622	SPO0796	0.91	0.659	SPO0795	1.04	0.886	SPO0795	1.24	0.348	SPO0795	0.81	0.144	SPO0795	0.93	0.471
SPO0796	1.19	0.096	SPO0796	1.12	0.353	SPO0797	0.95	0.215	SPO0797	0.9	0.916	SPO0796	1.18	0.432	SPO0796	1.11	0.614	SPO0796	0.99	0.870	SPO0796	1.01	0.962
SPO0797	1.19	0.731	SPO0797	1.02	0.909	SPO0798	0.86	0.768	SPO0798	0.78	0.826	SPO0797	0.92	0.981	SPO0797	0.85	0.818	SPO0797	1.02	0.964	SPO0797	1.06	0.902
SPO0798	0.86	0.795	SPO0798	0.9	0.912	SPO0799	0.71	0.576	SPO0799	0.92	0.747	SPO0798	1.20	0.744	SPO0798	1.17	0.767	SPO0798	0.89	0.770	SPO0798	0.94	0.862
SPO0799	1.35	0.471	SPO0799	1.36	0.508	SPO0800	0.81	0.108	SPO0800	0.99	0.054	SPO0799	0.90	0.665	SPO0799	0.94	0.688	SPO0799	0.91	0.608	SPO0799	0.92	0.648
SPO0800	0.76	0.173	SPO0800	0.71	0.111	SPO0801	0.85	0.509	SPO0801	0.92	0.504	SPO0800	1.39	0.214	SPO0800	1.37	0.016	SPO0800	1.23	0.091	SPO0800	1.17	0.112
SPO0801	0.83	0.608	SPO0801	0.88	0.85	SPO0802	0.92	0.354	SPO0802	0.81	0.218	SPO0801	0.81	0.471	SPO0801	0.81	0.362	SPO0801	0.84	0.528	SPO0801	0.86	0.550
SPO0802	1.4	0.008	SPO0802	1.36	0.006	SPO0803	0.91	0.529	SPO0803	0.91	0.55	SPO0802	1.70	0.007	SPO0802	1.67	0.001	SPO0802	1.16	0.158	SPO0802	1.15	0.130
SPO0803	0.93	0.758	SPO0803	0.93	0.882	SPO0804	0.79	0.089	SPO0804	0.86	0.063	SPO0803	1.17	0.249	SPO0803	1.06	0.561	SPO0803	1.16	0.579	SPO0803	1.07	0.688
SPO0804	1.29	0.004	SPO0804	1.24	0.003	SPO0805	0.6	0.026	SPO0805	0.82	0.024	SPO0804	0.72	0.011	SPO0804	0.74	0.023	SPO0804	0.93	0.457	SPO0804	0.93	0.676
SPO0805	1.52	0.001	SPO0805	1.42	0.003	SPO0806	0.83	0.265	SPO0806	0.88	0.176	SPO0805	0.85	0.543	SPO0805	0.93	0.356	SPO0805	0.91	0.425	SPO0805	0.85	0.100
SPO0806	1.91	0.022	SPO0806	1.71	0.001	SPO0807	0.97	0.872	SPO0807	0.91	0.783	SPO0806	1.30	0.025	SPO0806	1.32	0.021	SPO0806	1.08	0.685	SPO0806	0.98	0.958
SPO0807	1.43	0.083	SPO0807	1.4	0.072	SPO0808	0.69	0.817	SPO0808	0.81	0.862	SPO0807	0.57	0.012	SPO0807	0.66	0.006	SPO0807	1.08	0.863	SPO0807	1.03	0.967
SPO0808	1.33	0.214	SPO0808	1.35	0.361	SPO0809	0.91	0.471	SPO0809	0.96	0.17	SPO0808	1.06	0.508	SPO0808	1.17	0.362	SPO0808	0.97	0.999	SPO0808	0.88	0.652
SPO0809	1.04	0.496	SPO0809	1	0.561	SPO0810	0.69	0.896	SPO0810	0.88	0.979	SPO0809	0.88	0.375	SPO0809	0.90	0.303	SPO0809	0.99	0.928	SPO0809	0.95	0.603
SPO0810	0.85	0.753	SPO0810	0.89	0.342	SPO0811	0.75	0.391	SPO0811	0.83	0.098	SPO0810	0.68	0.091	SPO0810	0.64	0.039	SPO0810	0.88	0.665	SPO0810	0.95	0.549
SPO0811	1.11	0.321	SPO0811	1.11	0.114	SPO0812	0.65	0.005	SPO0812	0.72	0.002	SPO0811	1.15	0.148	SPO0811	1.18	0.013	SPO0811	0.96	0.596	SPO0811	0.99	0.914
SPO0812	1.75	0	SPO0812	1.81	0.001	SPO0813	0.61	0.682	SPO0813	0.93	0.743	SPO0812	0.77	0.312	SPO0812	0.72	0.130	SPO0812	0.86	0.238	SPO0812	0.84	0.081
SPO0813	0.85	0.583	SPO0813	0.94	0.922	SPO0814	0.88	0.996	SPO0814	0.6	0.648	SPO0813	0.80	0.365	SPO0813	0.79	0.294	SPO0813	0.84	0.227	SPO0813	0.83	0.282
SPO0814	0.99	0.576	SPO0814	0.97	0.786	SPO0815	0.93	0.995	SPO0815	0.95	0.909	SPO0814	1.01	0.908	SPO0814	1.03	0.711	SPO0814	1.02	0.974	SPO0814	1.01	0.956
SPO0815	1.33	0.166	SPO0815	1.37	0.056	SPO0816	0.98	0.691	SPO0816	0.85	0.797	SPO0815	1.27	0.160	SPO0815	1.34	0.000	SPO0815	1.09	0.631	SPO0815	1.11	0.232
SPO0816	0.99	0.912	SPO0816	0.83	0.763	SPO0817	0.97	0.328	SPO0817	0.89	0.378	SPO0816	0.79	0.541	SPO0816	0.81	0.500	SPO0816	0.97	0.826	SPO0816	0.93	0.652
SPO0817	1.29	0.255	SPO0817	1.28	0.279	SPO0818	0.96	0.247	SPO0818	0.85	0.057	SPO0817	1.58	0.126	SPO0817	1.54	0.083	SPO0817	1.15	0.603	SPO0817	1.11	0.632
SPO0818	1.07	0.507	SPO0818	1.05	0.26	SPO0819	0.59	0.468	SPO0819	0.92	0.166	SPO0818	1.66	0.000	SPO0818	1.68	0.002	SPO0818	1.23	0.033	SPO0818	1.32	0.087
SPO0819	1.3	0.02	SPO0819	1.29	0.011	SPO0820	0.84	0.404	SPO0820	0.93	0.424	SPO0819	0.92	0.569	SPO0819	1.05	0.932	SPO0819	0.83	0.101	SPO0819	0.80	0.033
SPO0820	1.19	0.097	SPO0820	1.16	0.066	SPO0821	0.95	0.75	SPO0821	0.83	0.956	SPO0820	1.34	0.011	SPO0820	1.36	0.003	SPO0820	1.18	0.199	SPO0820	1.12	0.442
SPO0821	1.6	0.103	SPO0821	1.49	0.361	SPO0822	0.88	0.593	SPO0822	0.72	0.321	SPO0821	0.78	0.674	SPO0821	0.82	0.827	SPO0821	0.99	0.989	SPO0821	0.95	0.914
SPO0822	1.06	0.269	SPO0822	1.07	0.236	SPO0823	0.96	0.899	SPO0823	0.75	0.543	SPO0822	1.30	0.057	SPO0822	1.30	0.024	SPO0822	1.06	0.820	SPO0822	1.04	0.837
SPO0823	1.22	0.321	SPO0823	1.21	0.04	SPO0824	0.77	0.104	SPO0824	0.82	0.415	SPO0823	1.09	0.763	SPO0823	1.16	0.152	SPO0823	0.93	0.487	SPO0823	1.00	0.937
SPO0824	1.66	0.027	SPO0824	1.3	0.017	SPO0825	0.85	0.723	SPO0825	0.85	0.803	SPO0824	0.99	0.915	SPO0824	1.04	0.601	SPO0824	0.96	0.847	SPO0824	0.99	0.957
SPO0825	0.74	0.03	SPO0825	0.72	0.015	SPO0826	0.91	0.166	SPO0826	0.8	0.22	SPO0825	1.38	0.028	SPO0825	1.35	0.001	SPO0825	1.00	0.973	SPO0825	1.00	0.958
SPO0826	0.76	0.178	SPO0826	0.85	0.258	SPO0827	0.99	0.381	SPO0827	0.85	0.143	SPO0826	0.88	0.210	SPO0826	0.82	0.143	SPO0826	0.88	0.232	SPO0826	0.94	0.740
SPO0827	0.79	0.246	SPO0827	0.84	0.199	SPO0828	0.88	0.139	SPO0828	0.97	0.565	SPO0827	0.85	0.224	SPO0827	0.93	0.481	SPO0827	0.91	0.470	SPO0827	0.99	0.935
SPO0828	0.85	0.393	SPO0828	0.88	0.514	SPO0829	0.82	0.977	SPO0829	0.61	0.953	SPO0828	1.24	0.448	SPO0828	1.22	0.104	SPO0828	1.10	0.676	SPO0828	1.10	0.710
SPO0829	0.99	0.902	SPO0829	1.03	0.825	SPO0830	0.74	0.698	SPO0830	0.99	0.651	SPO0829	0.84	0.477	SPO0829	0.86	0.462	SPO0829	0.92	0.725	SPO0829	0.93	0.778
SPO0830	0.73	0.077	SPO0830	0.88	0.479	SPO0831	0.96	0.253	SPO0831	0.86	0.415	SPO0830	1.18	0.449	SPO0830	0.98	0.703	SPO0830	1.04	0.914	SPO0830	0.98	0.753
SPO0831	0.97	0.931	SPO0831	1.03	0.751	SPO0832	0.78	0.168	SPO0832	0.89	0.466	SPO0831	0.63	0.009	SPO0831	0.61	0.041	SPO0831	0.53	0.006	SPO0831	0.50	0.004
SPO0832	1.58	0.023	SPO0832	1.29	0.29	SPO0833	0.88	0	SPO0833	0.93	0	SPO0832	0.76	0.188	SPO0832	0.95	0.605	SPO0832	0.91	0.439	SPO0832	0.77	0.217
SPO0833	0.11	0	SPO0833	0.12	0	SPO0834	0.93	0	SPO0834	0.7	0	SPO0833	0.27	0.000	SPO0833	0.28	0.000	SPO0833	1.06	0.288	SPO0833	1.10	0.104
SPO0834	0.26	0	SPO0834	0.26	0	SPO0835	0.5	0.012	SPO0835	0.91	0.016	SPO0834	0.42	0.000	SPO0834	0.40	0.000	SPO0834	1.07	0.539	SPO0834	1.12	0.318
SPO0835	0.53	0.001	SPO0835	0.57	0	SPO0836	0.88	0.283	SPO0836	0.71	0.347	SPO0835	0.76	0.061	SPO0835	0.76	0.036	SPO0835	1.08	0.301	SPO0835	1.13	0.152
SPO0836	0.68	0.071	SPO0836	0.68	0.001	SPO0837	0.97	0.083	SPO0837	0.94	0.003	SPO0836	0.76	0.293	SPO0836	0.74	0.042	SPO0836	0.99	0.981	SPO0836	0.94	0.735
SPO0837	1.1	0.333	SPO0837	1.13	0.051	SPO0838	0.99	0.003	SPO0838	0.96	0	SPO0837	0.81	0.105	SPO0837	0.88	0.107	SPO0837	1.08	0.626	SPO0837	0.98	0.708
SPO0838	1.46	0.006	SPO0838	1.46	0.001	SPO0839	0.87	0.08	SPO0839	0.71	0.048	SPO0838	0.65	0.130	SPO0838	0.80	0.024	SPO0838	1.33	0.086	SPO0838	1.42	0.007
SPO0839	1.09	0.533	SPO0839	1.1	0.472	SPO0840	0.98	0.004	SPO0840	0.69	0.005	SPO0839	0.65	0.014	SPO0839	0.74	0.016	SPO0839	1.20	0.389	SPO0839	1.25	0.218
SPO0840	0.97	0.91	SPO0840	1.03	0.265	SPO0841	0.07	0.005	SPO0841	0.68	0.049	SPO0840	0.83	0.110	SPO0840	0.85	0.233	SPO0840	0.90	0.378	SPO0840	0.88	0.153
SPO0841	0.99	0.885	SPO0841	1	0.816	SPO0842	0.14	0.181	SPO0842	1	0.045	SPO0841	0.90	0.747	SPO0841	0.93	0.755	SPO0841	0.90	0.527	SPO0841	0.82	0.303
SPO0842	1.14	0.444	SPO0842	1.31	0.01	SPO0843	0.16	0.088	SPO0843	0.97	0.3	SPO0842	0.92	0.358	SPO0842	0.93	0.409	SPO0842	1.05	0.935	SPO0842	0.96	0.724
SPO0843	1.5	0.045	SPO0843	1.43	0.018	SPO0844	0.87	0.925	SPO0844	0.82	0.526	SPO0843	1.00	0.957	SPO0843	0.94	0.589	SPO0843	1.09	0.764	SPO0843	1.02	0.966
SPO0844	1.01	0.497	SPO0844	0.97	0.772	SPO0845	0.95	0.861	SPO0845	0.94	0.913	SPO0844	1.01	0.836	SPO0844	1.03	0.801	SPO0844	0.98	0.780	SPO0844	0.97	0.776
SPO0845	0.88	0.226	SPO0845	0.93	0.775	SPO0846	0.91	0.831	SPO0846	0.93	0.826	SPO0845	1.39	0.004	SPO0845	1.32	0.025	SPO0845	1.04	0.567	SPO0845	1.08	0.597
SPO0846	0.99	0.964	SPO0846	1.08	0.881	SPO0847	0.83	0.195	SPO0847	0.96	0.306	SPO0846	1.00	0.972	SPO0846	0.97	0.991	SPO0846	0.91	0.899	SPO0846	1.05	0.940
SPO0847	0.75	0.671	SPO0847	0.76	0.13	SPO0848	1	0.371	SPO0848	0.93	0.439	SPO0847	1.53	0.061	SPO0847	1.52	0.016	SPO0847	0.93	0.581	SPO0847	1.05	0.762
SPO0848	0.84	0.114	SPO0848	0.88	0.687	SPO0849	0.75	0.571	SPO0849	0.66	0.869	SPO0848	1.77	0.048	SPO0848	1.59	0.042	SPO0848	1.17	0.276	SPO0848	1.16	0.336
SPO0849	0.96	0.901	SPO0849	0.94	0.946	SPO0850	0.93	0.458	SPO0850	0.88	0.541	SPO0849	1.02	0.778	SPO0849	1.10	0.647	SPO0849	0.99	0.971	SPO0849	1.02	0.931
SPO0850	0.87	0.889	SPO0850	0.99	0.908	SPO0851	0.96	0.668	SPO0851	0.95	0.683	SPO0850	0.85	0.739	SPO0850	0.81	0.630	SPO0850	0.89	0.757	SPO0850	0.93	0.870

SPO0851	1.63	0.334	SPO0851	1.46	0.375	SPO0852	0.88	0.391	SPO0852	0.9	0.41	SPO0851	0.80	0.714	SPO0851	0.79	0.614	SPO0851	0.91	0.861	SPO0851	0.92	0.891
SPO0852	1.05	0.663	SPO0852	1.03	0.63	SPO0853	0.91	0.23	SPO0853	0.94	0.998	SPO0852	1.13	0.474	SPO0852	1.19	0.249	SPO0852	1.07	0.732	SPO0852	1.16	0.266
SPO0853	0.81	0.017	SPO0853	0.85	0.605	SPO0854	0.87	0.146	SPO0854	0.98	0.446	SPO0853	1.58	0.066	SPO0853	1.47	0.064	SPO0853	1.10	0.541	SPO0853	1.04	0.880
SPO0854	0.93	0.69	SPO0854	1	0.27	SPO0855	0.97	0.972	SPO0855	0.88	0.732	SPO0854	1.41	0.049	SPO0854	1.45	0.006	SPO0854	1.20	0.495	SPO0854	1.24	0.110
SPO0855	0.74	0.54	SPO0855	0.9	0.844	SPO0856	0.91	0.703	SPO0856	0.73	0.712	SPO0855	0.80	0.092	SPO0855	0.78	0.502	SPO0855	0.59	0.015	SPO0855	0.53	0.122
SPO0856	0.86	0.875	SPO0856	0.9	0.935	SPO0857	0.97	0.384	SPO0857	0.97	0.388	SPO0856	0.88	0.780	SPO0856	0.93	0.731	SPO0856	0.63	0.236	SPO0856	0.67	0.394
SPO0857	1.02	0.562	SPO0857	0.93	0.881	SPO0858	0.56	0.59	SPO0858	0.74	0.888	SPO0857	0.97	0.400	SPO0857	0.83	0.219	SPO0857	0.95	0.814	SPO0857	0.85	0.490
SPO0858	0.84	0.709	SPO0858	0.89	0.515	SPO0859	0.91	0.82	SPO0859	0.81	0.545	SPO0858	0.08	0.005	SPO0858	0.07	0.001	SPO0858	1.11	0.674	SPO0858	1.16	0.572
SPO0859	0.85	0.186	SPO0859	0.89	0.527	SPO0860	0.81	0.974	SPO0860	0.76	0.794	SPO0859	1.45	0.018	SPO0859	1.53	0.005	SPO0859	1.19	0.449	SPO0859	1.12	0.406
SPO0860	0.99	0.982	SPO0860	0.96	0.991	SPO0861	0.83	0.188	SPO0861	0.99	0.145	SPO0860	0.98	0.782	SPO0860	0.97	0.796	SPO0860	0.99	0.983	SPO0860	0.98	0.987
SPO0861	0.9	0.879	SPO0861	0.85	0.116	SPO0862	0.94	0.393	SPO0862	0.79	0.045	SPO0861	1.73	0.009	SPO0861	1.72	0.009	SPO0861	0.93	0.734	SPO0861	0.81	0.151
SPO0862	0.87	0.228	SPO0862	0.74	0.074	SPO0863	0.98	0.872	SPO0863	0.94	0.938	SPO0862	0.79	0.741	SPO0862	0.90	0.483	SPO0862	0.87	0.565	SPO0862	0.93	0.849
SPO0863	1.15	0.407	SPO0863	1.08	0.539	SPO0864	0.93	0.981	SPO0864	0.76	0.986	SPO0863	1.17	0.409	SPO0863	1.21	0.417	SPO0863	0.92	0.686	SPO0863	0.96	0.619
SPO0864	1.38	0.802	SPO0864	1.32	0.815	SPO0865	0.97	0.933	SPO0865	0.85	0.855	SPO0864	1.45	0.760	SPO0864	1.44	0.751	SPO0864	1.10	0.963	SPO0864	1.19	0.909
SPO0865	1.31	0.568	SPO0865	1.14	0.75	SPO0866	0.9	0.27	SPO0866	0.98	0.382	SPO0865	0.84	0.753	SPO0865	0.94	0.888	SPO0865	0.84	0.714	SPO0865	0.86	0.696
SPO0866	1.25	0.123	SPO0866	1.26	0.157	SPO0867	0.96	0.024	SPO0867	0.82	0.038	SPO0866	1.11	0.367	SPO0866	1.31	0.036	SPO0866	1.23	0.355	SPO0866	1.09	0.615
SPO0867	1.04	0.729	SPO0867	1.09	0.045	SPO0868	0.74	0.934	SPO0868	0.85	0.89	SPO0867	0.97	0.880	SPO0867	0.98	0.299	SPO0867	1.14	0.033	SPO0867	1.08	0.661
SPO0868	1.2	0.164	SPO0868	1.06	0.486	SPO0869	0.86	0.883	SPO0869	0.57	0.903	SPO0868	0.84	0.457	SPO0868	0.83	0.087	SPO0868	1.01	0.944	SPO0868	0.97	0.861
SPO0869	0.85	0.902	SPO0869	0.85	0.873	SPO0870	0.93	0.538	SPO0870	0.93	0.562	SPO0869	0.86	0.891	SPO0869	0.97	0.997	SPO0869	0.91	0.897	SPO0869	1.00	0.997
SPO0870	1.2	0.017	SPO0870	1.13	0.174	SPO0871	0.85	0.976	SPO0871	0.93	0.852	SPO0870	0.97	0.967	SPO0870	0.95	0.992	SPO0870	0.91	0.602	SPO0870	0.97	0.887
SPO0871	0.88	0.754	SPO0871	0.9	0.806	SPO0872	0.83	0.95	SPO0872	0.85	0.895	SPO0871	1.09	0.775	SPO0871	1.12	0.770	SPO0871	1.02	0.982	SPO0871	1.00	0.986
SPO0872	1.11	0.201	SPO0872	1.1	0.094	SPO0873	0.61	0.899	SPO0873	0.95	0.81	SPO0872	1.15	0.612	SPO0872	1.23	0.226	SPO0872	1.12	0.396	SPO0872	0.99	0.939
SPO0873	1.05	0.846	SPO0873	1.1	0.741	SPO0874	0.68	0.902	SPO0874	0.07	0.252	SPO0873	1.40	0.422	SPO0873	1.49	0.389	SPO0873	0.97	0.907	SPO0873	0.89	0.761
SPO0874	1.17	0.319	SPO0874	1.25	0.003	SPO0875	0.79	0.051	SPO0875	0.17	0.068	SPO0874	1.37	0.146	SPO0874	1.16	0.301	SPO0874	0.97	0.935	SPO0874	0.96	0.834
SPO0875	0.85	0.162	SPO0875	0.85	0.084	SPO0876	0.82	0.144	SPO0876	0.19	0.16	SPO0875	1.22	0.020	SPO0875	1.26	0.023	SPO0875	1.17	0.090	SPO0875	1.22	0.098
SPO0876	0.91	0.623	SPO0876	1.03	0.408	SPO0877	0.9	0.371	SPO0877	0.89	0.488	SPO0876	0.76	0.041	SPO0876	0.75	0.072	SPO0876	1.18	0.134	SPO0876	1.22	0.113
SPO0877	1.18	0.552	SPO0877	1.09	0.59	SPO0878	0.93	0.989	SPO0878	0.98	0.975	SPO0877	0.74	0.377	SPO0877	0.81	0.423	SPO0877	0.92	0.716	SPO0877	0.88	0.649
SPO0878	0.75	0.639	SPO0878	0.75	0.477	SPO0879	0.88	0.154	SPO0879	0.99	0.169	SPO0878	0.61	0.423	SPO0878	0.59	0.376	SPO0878	0.91	0.894	SPO0878	0.97	0.997
SPO0879	0.78	0.25	SPO0879	0.76	0.123	SPO0880	0.7	0.404	SPO0880	0.87	0.315	SPO0879	0.74	0.144	SPO0879	0.71	0.087	SPO0879	0.90	0.491	SPO0879	0.97	0.948
SPO0880	0.76	0.343	SPO0880	0.86	0.522	SPO0881	0.63	0.057	SPO0881	0.75	0.396	SPO0880	1.43	0.062	SPO0880	1.38	0.079	SPO0880	1.14	0.311	SPO0880	1.06	0.605
SPO0881	0.77	0.02	SPO0881	0.76	0.025	SPO0882	0.59	0.642	SPO0882	0.87	0.708	SPO0881	1.77	0.014	SPO0881	1.75	0.040	SPO0881	0.91	0.402	SPO0881	0.88	0.467
SPO0882	1.02	0.908	SPO0882	0.91	0.961	SPO0883	0.91	0.596	SPO0883	0.77	0.253	SPO0882	0.97	0.853	SPO0882	0.96	0.840	SPO0882	1.25	0.789	SPO0882	1.14	0.849
SPO0883	1.18	0.507	SPO0883	1.06	0.322	SPO0884	0.96	0.627	SPO0884	0.89	0.519	SPO0883	1.01	0.733	SPO0883	1.02	0.171	SPO0883	0.87	0.739	SPO0883	0.85	0.065
SPO0884	1.14	0.588	SPO0884	1.08	0.572	SPO0885	0.95	0.945	SPO0885	0.87	0.979	SPO0884	1.16	0.439	SPO0884	1.08	0.222	SPO0884	0.96	0.959	SPO0884	0.93	0.646
SPO0885	0.97	0.985	SPO0885	0.97	0.983	SPO0886	0.94	0.016	SPO0886	0.93	0	SPO0885	0.83	0.788	SPO0885	0.77	0.653	SPO0885	0.96	0.950	SPO0885	0.90	0.865
SPO0886	0.26	0.003	SPO0886	0.3	0	SPO0887	0.98	0.16	SPO0887	0.8	0.964	SPO0886	2.30	0.013	SPO0886	2.08	0.001	SPO0886	1.23	0.054	SPO0886	1.44	0.010
SPO0887	0.79	0.489	SPO0887	0.85	0.668	SPO0888	0.94	0.74	SPO0888	0.95	0.618	SPO0887	0.88	0.206	SPO0887	0.78	0.942	SPO0887	1.06	0.058	SPO0887	1.05	0.444
SPO0888	1.61	0.065	SPO0888	1.45	0.062	SPO0889	0.95	0.994	SPO0889	0.94	0.998	SPO0888	1.39	0.046	SPO0888	1.44	0.038	SPO0888	0.93	0.553	SPO0888	0.93	0.727
SPO0889	1.06	0.889	SPO0889	0.99	0.989	SPO0890	0.98	0.942	SPO0890	0.5	0.794	SPO0889	0.83	0.920	SPO0889	0.76	0.918	SPO0889	0.85	0.853	SPO0889	0.88	0.923
SPO0890	1.61	0.017	SPO0890	1.77	0.014	SPO0891	0.88	0.339	SPO0891	0.93	0.371	SPO0890	1.10	0.689	SPO0890	1.13	0.119	SPO0890	1.00	0.883	SPO0890	0.94	0.711
SPO0891	1.6	0.064	SPO0891	1.64	0.012	SPO0892	0.89	0.409	SPO0892	0.96	0.234	SPO0891	1.57	0.028	SPO0891	1.53	0.008	SPO0891	1.43	0.099	SPO0891	1.26	0.192
SPO0892	1.11	0.452	SPO0892	1.12	0.446	SPO0893	0.84	0.125	SPO0893	0.89	0.677	SPO0892	1.22	0.020	SPO0892	1.24	0.106	SPO0892	1.14	0.037	SPO0892	1.10	0.187
SPO0893	1.59	0.006	SPO0893	1.54	0.003	SPO0894	0.88	0.66	SPO0894	0.93	0.231	SPO0893	1.31	0.026	SPO0893	1.17	0.013	SPO0893	1.31	0.177	SPO0893	1.17	0.365
SPO0894	1.15	0.426	SPO0894	1.13	0.291	SPO0895	0.97	0.236	SPO0895	0.89	0.109	SPO0894	0.77	0.188	SPO0894	0.73	0.056	SPO0894	1.06	0.612	SPO0894	1.04	0.722
SPO0895	1.12	0.443	SPO0895	1.09	0.551	SPO0896	0.99	0.72	SPO0896	0.94	0.902	SPO0895	0.59	0.057	SPO0895	0.59	0.070	SPO0895	1.16	0.412	SPO0895	1.14	0.216
SPO0896	1.25	0.169	SPO0896	1.01	0.866	SPO0897	0.97	0.279	SPO0897	0.81	0.145	SPO0896	0.79	0.388	SPO0896	0.83	0.629	SPO0896	1.02	0.681	SPO0896	1.10	0.292
SPO0897	1.55	0.079	SPO0897	1.37	0.048	SPO0898	0.97	0.578	SPO0898	0.93	0.6	SPO0897	0.78	0.512	SPO0897	0.80	0.272	SPO0897	1.18	0.086	SPO0897	1.13	0.656
SPO0898	1.17	0.711	SPO0898	1.19	0.608	SPO0899	0.91	0.542	SPO0899	0.74	0.693	SPO0898	0.76	0.740	SPO0898	0.60	0.329	SPO0898	0.96	0.961	SPO0898	0.93	0.827
SPO0899	0.81	0.675	SPO0899	0.78	0.596	SPO0900	0.93	0.23	SPO0900	0.85	0.261	SPO0899	0.70	0.448	SPO0899	0.76	0.638	SPO0899	0.92	0.852	SPO0899	0.88	0.753
SPO0900	2.56	0.025	SPO0900	2.37	0.039	SPO0901	0.83	0.039	SPO0901	0.98	0.411	SPO0900	0.18	0.023	SPO0900	0.18	0.009	SPO0900	0.97	0.998	SPO0900	0.92	0.811
SPO0901	0.92	0.502	SPO0901	0.88	0.121	SPO0902	0.88	0.819	SPO0902	0.86	0.837	SPO0901	0.65	0.013	SPO0901	0.71	0.066	SPO0901	1.00	0.945	SPO0901	0.97	0.732
SPO0902	1.36	0.523	SPO0902	1.32	0.571	SPO0903	0.8	0.422	SPO0903	0.93	0.215	SPO0902	0.82	0.856	SPO0902	0.77	0.866	SPO0902	1.18	0.772	SPO0902	1.08	0.909
SPO0903	1.22	0.461	SPO0903	1.26	0.26	SPO0904	0.96	0.689	SPO0904	0.55	0.491	SPO0903	0.68	0.221	SPO0903	0.68	0.101	SPO0903	1.00	0.902	SPO0903	1.05	0.710
SPO0904	1.59	0.066	SPO0904	1.51	0.419	SPO0905	0.79	0.006	SPO0905	0.66	0.152	SPO0904	1.60	0.010	SPO0904	1.54	0.065	SPO0904	1.06	0.799	SPO0904	0.98	0.986
SPO0905	1.24	0.168	SPO0905	1.19	0.315	SPO0906	0.95	0.749	SPO0906	0.81	0.171	SPO0905	0.91	0.562	SPO0905	0.93	0.371	SPO0905	1.03	0.791	SPO0905	1.09	0.464
SPO0906	1.15	0.294	SPO0906	1.07	0.068	SPO0907	0.98	0.665	SPO0907	0.83	0.651	SPO0906	0.70	0.132	SPO0906	0.72	0.037	SPO0906	1.25	0.339	SPO0906	1.22	0.164
SPO0907	0.82	0.324	SPO0907	0.9	0.336	SPO0908	0.88	0.217	SPO0908	0.93	0.068	SPO0907	0.86	0.677	SPO0907	0.76	0.237	SPO0907	0.88	0.290	SPO0907	0.94	0.866
SPO0908	1.32	0.284	SPO0908	1.21	0.327	SPO0909	0.76	0.457	SPO0909	0.93	0.671	SPO0908	0.69	0.356	SPO0908	0.73	0.216	SPO0908	1.04	0.835	SPO0908	1.06	0.688
SPO0909	1.84	0.058	SPO0909	1.27	0.576	SPO0910	0.77	0.009	SPO0910	0.93	0.035	SPO0909	0.30	0.067	SPO0909	0.33	0.153	SPO0909	0.86	0.491	SPO0909	0.84	0.583
SPO0910	1.04	0.745	SPO0910	1.02	0.943	SPO0911	0.67	0.606	SPO0911	0.93	0.785	SPO0910	0.35	0.006	SPO0910	0.35	0.012	SPO0910	0.93	0.898	SPO0910	0.83	0.475
SPO0911	0.91	0.421	SPO0911	0.97	0.972	SPO0912	0.96	0.722	SPO0912	0.68	0.629	SPO0911	0.71	0.385	SPO0911	0.74	0.508	SPO0911	1.08	0.656	SPO0911	1.12	0.596
SPO0912	0.91	0.149	SPO0912	0.93	0.63	SPO0913	0.85	0.044	SPO0913	0.58	0.282	SPO0912	0.88	0.125	SPO0912	0.88	0.603	SPO0912	1.03	0.856	SPO0912	1.01	0.940
SPO0913	1.29	0.426	SPO0913	1.22	0.024	SPO0914	0.89	0.192	SPO0914	0.6	0.171	SPO0913	0.84	0.338	SPO0913	0.90	0.891	SPO0913	0.99	0.919	SPO0913	0.95	0.518
SPO0914	1.07	0.546	SPO0914	1.06	0.437	SPO0915	0.72	0.057	SPO0915	0.94	0.081	SPO0914	1.91	0.012	SPO0914	1.90	0.009	SPO0914	1.11	0.418	SPO0914	1.09	0.295
SPO0915	0.97	0.74	SPO0915	1	0.722	SPO0916	0.74	0.55	SPO0916	0.93	0.484	SPO0915	0.83	0.519	SPO0915	0.88	0.994	SPO0915	0.90	0.704	SPO0915	0.97	0.897
SPO0916	1.68	0.368	SPO0916	1.52	0.358	SPO0917	0.99	0.195	SPO0917	0.89	0.967	SPO0916	0.58	0.199	SPO0916	0.60	0.269	SPO0916	0.85	0.512	SPO0916	0.83	0.598
SPO0917	0.91	0.655	SPO0917	0.97	0.692	SPO0918	0.85	0.99	SPO0918	0.89	0.876	SPO0917	0.56	0.022	SPO0917	0.55	0.010	SPO0917	1.19	0.214	SPO0917	1.15	0.454
SPO0918	0.69	0.043	SPO0918	0.78	0.054	SPO0919	0.95	0.043	SPO0919	0.96	0.001	SPO0918	1.84	0.018	SPO0918	1.84	0.006	SPO0918	0.91	0.458	SPO0918	0.93	0.596
SPO0919	3.01	0.004	SPO0919	2.84	0.006	SPO0920	0.77	0.161	SPO0920	0.98	0.12	SPO0919	0.74	0.018	SPO0919	0.67	0.010	SPO0919	0.76	0.057	SPO0919	0.72	0.110
SPO0920	2.25	0.104	SPO0920	1.85	0.155	SPO0921	0.87	0.028	SPO0921	0.93	0.091	SPO0920	0.67	0.161	SPO0920	0.61	0.072	SPO0920	0.90	0.365	SPO0920	0.88	0.660
SPO0921	3.23	0.003	SPO0921	3.05	0.001	SPO0922	0.98	0.162	SPO0922	0.95	0.188	SPO0921	0.63	0.221	SPO0921	0.60	0.031	SPO0921	0.82	0.314	SPO0921	0.80	0.427
SPO0922	0.55	0.013	SPO0922	0.6	0.016	SPO0923	0.87	0.227	SPO0923	0.85	0.241	SPO0922	1.11	0.087	SPO0922	1.15	0.142	SPO0922	0.98	0.888	SPO0922	0.99	0.993
SPO0923	1.18	0.265	SPO0923	1.16	0.084	SPO0924	0.84	0.012	SPO0924	0.86	0.082	SPO0923	1.03	0.181	SPO0923	1.07	0.128	SPO0923	1.13	0.366	SPO0923	1.15	0.126
SPO0924	1.23	0.104	SPO0924	0.69	0.346	SPO0925	0.96	0.518	SPO0925	0.85	0.055	SPO0924	3.78	0.002	SPO0924	7.09	0.023	SPO0924	1.24	0.299	SPO0924	1.30	0.522
SPO0925	1.32	0.169	SPO0925	1.31	0.124	SPO0926	0.98	0.464	SPO0926	0.95	0.711	SPO0925	0.70	0.388	SPO0925	0.65	0.090	SPO0925	0.94	0.897	SPO0925	0.95	0.884
SPO0926	1.68	0.029	SPO0926	1.56	0.009	SPO0927	0.84	0.977	SPO0927	0.92	0.752	SPO0926	0.98	0.646	SPO0926	1.06	0.347	SPO0926	1.19	0.034	SPO0926	1.15	0.346
SPO0927	2.01	0.105	SPO0927	1.81	0.085	SPO0928	0.93	0.253	SPO0928	0.94	0.184	SPO0927	1.02	0.824	SPO0927	1.09	0.406	SPO0927	1.11	0.869	SPO0927	1.06	0.883
SPO0928	0.68	0.315	SPO0928	0.76	0.059	SPO0929	0.83	0.295	SPO0929	0.85	0.089	SPO0928	1.50	0.096	SPO0928	1.55	0.037	SPO0928	1.19	0.784	SPO0928	1.19	0.659
SPO0929	0.83	0.698	SPO0929	0.84	0.006	SPO0930	0.89	0.789	SPO0930	0.89	0.765	SPO0929	1.11	0.046	SPO0929	1.18	0.025	SPO0929	1.25	0.072	SPO0929	1.12	0.028
SPO0930	1.02	0.878	SPO0930	1.15	0.749	SPO0931	0.93	0.397	SPO0931	0.88	0.194	SPO0930	0.23	0.014	SPO0930	0.27	0.007	SPO0930	0.87	0.616	SPO0930	0.83	0.590
SPO0931	0.65	0.639	SPO0931	0.63	0.066	SPO0932	0.95	0.936	SPO0932	0.8	0.835	SPO0931	0.85	0.911	SPO0931	1.20	0.398	SPO0931	1.03	0.973	SPO0931	1.20	0.682
SPO0932	1.21	0.397	SPO0932	1.28	0.294	SPO0933	0.95	0.595	SPO0933	0.82	0.3	SPO0932	1.02	0.097	SPO0932	1.01	0.169	SPO0932	1.10	0.257	SPO0932	1.05	0.401
SPO0933	1.63	0.027	SPO0933	1.46	0.084	SPO0934	0.97	0.538	SPO0934	0.78	0.767	SPO0933	0.79	0.095	SPO0933	0.80	0.153	SPO0933	1.17	0.242	SPO0933	1.14	0.135
SPO0934	1.19	0.553	SPO0934	1.03	0.86	SPO0935	0.96	0.051	SPO0935	0.86	0.06	SPO0934	0.69	0.473	SPO0934	0.68	0.474	SPO0934	1.07	0.762	SPO0934	1.10	0.748
SPO0935	1.11	0.326	SPO0935	1.19	0.097	SPO0936	0.95	0.835	SPO0936	0.97	0.965	SPO0935	0.67	0.240	SPO0935	0.67	0.126	SPO0935	1.28	0.145	SPO0935	1.28	0.422
SPO0936	0.6	0.003	SPO0936	0.68	0.128	SPO0937	0.96	0.501	SPO0937	0.98	0.479	SPO0936	0.80	0.164	SPO0936	0.80	0.271	SPO0936	1.05	0.659	SPO0936	1.00	0.983
SPO0937	1.37	0.226	SPO0937	1.39	0.122	SPO0938	0.96	0.438	SPO0938	0.94	0.816	SPO0937	0.27	0.006	SPO0937	0.28	0.010	SPO0937	1.15	0.434	SPO0937	1.06	0.558
SPO0938	0.61	0.044	SPO0938	0.62	0.044	SPO0939	0.98	0.427	SPO0939	0.69	0.59	SPO0938	1.87	0.011	SPO0938	1.84	0.021	SPO0938	1.00	0.627	SPO0938	0.88	0.428
SPO0939	0.81	0.289	SPO0939	0.88	0.225	SPO0940	0.95	0.04	SPO0940	0.81	0.485	SPO0939	0.91	0.876	SPO0939	0.90	0.840	SPO0939	1.10	0.525	SPO0939	1.06	0.592
SPO0940	1.39	0.191	SPO0940	1.3	0.326	SPO0941	0.77	0.885	SPO0941	0.63	0.742	SPO0940	0.65	0.300	SPO0940	0.62	0.386	SPO0940	0.85	0.216	SPO0940	0.80	0.214
SPO0941	1.18	0.196	SPO0941	1.14	0.073	SPO0942	0.85	0.944	SPO0942	0.93	0.759	SPO0941	1.90	0.067	SPO0941	1.66	0.003	SPO0941	1.30	0.361	SPO0941	1.18	0.335
SPO0942	1.05	0.774	SPO0942	1.05	0.522	SPO0943	0.8	0.083	SPO0943	0.81	0.377	SPO0942	1.30	0.482	SPO0942	1.44	0.095	SPO0942	1.01	0.990	SPO0942	1.08	0.608
SPO0943	0.82	0.333	SPO0943	0.8	0.137	SPO0944	0.83	0.515	SPO0944	0.92	0.694	SPO0943	4.34	0.007	SPO0943	4.89	0.006	SPO0943	0.84	0.675	SPO0943	0.79	0.514
SPO0944	1.28	0.411	SPO0944	1.29	0.239	SPO0945	0.85	0.228	SPO0945	0.72	0.083	SPO0944	1.26	0.259	SPO0944	1.23	0.383	SPO0944	1.26	0.519	SPO0944	1.19	0.636
SPO0945	0.88	0.181	SPO0945	0.94	0.649	SPO0946	0.94	0.654	SPO0946	0.79	0.29	SPO0945	0.56	0.004	SPO0945	0.50	0.022	SPO0945	0.96	0.581	SPO0945	0.95	0.851
SPO0946	1.48	0.103	SPO0946	1.2	0.125	SPO0947	0.95	0.258	SPO0947	0.83	0.133	SPO0946	1.07	0.588	SPO0946	1.21	0.034	SPO0946	1.01	0.953	SPO0946	0.93	0.525
SPO0947	0.92	0.611	SPO0947	0.78	0.271	SPO0948	0.85	0.032	SPO0948	0.96	0.011	SPO0947	1.37	0.136	SPO0947	1.53	0.049	SPO0947	1.07	0.625	SPO0947	1.21	0.209
SPO0948	0.74	0.089	SPO0948	0.7	0.043	SPO0949	0.93	0.592	SPO0949	0.93	0.504	SPO0948	1.85	0.011	SPO0948	1.75	0.009	SPO0948	1.25	0.106	SPO0948	1.17	0.105
SPO0949	0.57	0.401	SPO0949	0.65	0.416	SPO0950	0.8	0.899	SPO0950	0.72	0.691	SPO0949	1.88	0.279	SPO0949	1.83	0.257	SPO0949	0.97	0.997	SPO0949	1.04	0.900
SPO0950	0.98	0.995	SPO0950	0.84	0.578	SPO0951	0.91	0.87	SPO0951	0.87	0.813	SPO0950	0.64	0.631	SPO0950	0.61	0.475	SPO0950	0.65	0.601	SPO0950	0.69	0.507
SPO0951	1.18	0.893	SPO0951	0.88	0.949	SPO0952	0.47	0	SPO0953	0.97	0.203	SPO0951	0.89	0.986	SPO0951	0.95	0.979	SPO0951	0.97	0.991	SPO0951	1.06	0.968
SPO0953	0.93	0.449	SPO0952	1.07	0	SPO0953	0.59	0.351	SPO0954	0.9	0.367	SPO0952	0.50		SPO0952	0.62	0.385	SPO0952	2.46		SPO0952	0.81	0.849
SPO0954	0.85	0.556	SPO0953	0.89	0.468	SPO0954	0.97	0.945	SPO0955	0.78	0.785	SPO0953	0.88	0.630	SPO0953	0.88	0.958	SPO0953	1.14	0.226	SPO0953	1.04	0.405
SPO0955	0.65	0.172	SPO0954	0.76	0.184	SPO0955	0.97	0.701	SPO0956	0.94	0.022	SPO0954	0.37	0.097	SPO0954	0.42	0.029	SPO0954	0.88	0.746	SPO0954	0.88	0.427
SPO0956	1.63	0.091	SPO0955	0.67	0.01	SPO0956	0.84	0.097	SPO0957	0.99	0.247	SPO0955	0.59	0.051	SPO0955	0.59	0.017	SPO0955	1.00	0.956	SPO0955	0.94	0.543
SPO0957	1.8	0.007	SPO0956	1.55	0.009	SPO0957	0.9	0.723	SPO0958	0.77	0.952	SPO0956	0.60	0.012	SPO0956	0.57	0.152	SPO0956	0.89	0.326	SPO0956	0.86	0.478
SPO0958	0.83	0.321	SPO0957	1.47	0.056	SPO0958	0.83	0.972	SPO0959	0.9	0.999	SPO0957	0.75	0.013	SPO0957	0.72	0.087	SPO0957	1.00	0.925	SPO0957	0.95	0.462
SPO0959	1.19	0.558	SPO0958	0.87	0.85	SPO0959	0.81	0.7	SPO0960	0.78	0.393	SPO0958	0.58	0.401	SPO0958	0.51	0.458	SPO0958	0.87	0.810	SPO0958	0.93	0.767
SPO0960	1.22	0.112	SPO0959	1.11	0.54	SPO0960	0.94	0.275	SPO0961	0.91	0.863	SPO0959	0.79	0.193	SPO0959	0.76	0.276	SPO0959	1.12	0.815	SPO0959	1.12	0.720
SPO0961	1.01	0.844	SPO0960	1.13	0.299	SPO0961	0.79	0.898	SPO0962	0.96	0.586	SPO0960	0.84	0.282	SPO0960	0.93	0.703	SPO0960	0.98	0.847	SPO0960	0.88	0.374
SPO0962	1	0.909	SPO0961	0.96	0.891	SPO0962	0.62	0.307	SPO0963	0.95	0.984	SPO0961	0.68	0.214	SPO0961	0.63	0.059	SPO0961	1.10	0.597	SPO0961	0.99	0.960
SPO0963	0.96	0.941	SPO0962	0.96	0.956	SPO0963	0.81	0.911	SPO0964	0.94	0.419	SPO0962	0.92	0.926	SPO0962	0.87	0.366	SPO0962	1.01	0.881	SPO0962	1.00	0.928
SPO0964	0.76	0.725	SPO0963	1.02	0.923	SPO0964	0.95	0.83	SPO0965	1	0.944	SPO0963	0.78	0.575	SPO0963	0.82	0.860	SPO0963	1.03	0.850	SPO0963	1.05	0.881
SPO0965	1.35	0.624	SPO0964	0.78	0.605	SPO0965	0.92	0.953	SPO0966	0.95	0.209	SPO0964	1.45	0.139	SPO0964	1.37	0.259	SPO0964	1.20	0.351	SPO0964	1.13	0.668
SPO0966	0.93	0.781	SPO0965	1.24	0.741	SPO0966	0.87	0.243	SPO0967	0.92	0.557	SPO0965	0.93	0.930	SPO0965	0.85	0.710	SPO0965	1.11	0.897	SPO0965	0.89	0.796
SPO0967	1.69	0.029	SPO0966	1.03	0.209	SPO0967	0.81	0.638	SPO0968	0.94	0.031	SPO0966	0.90	0.411	SPO0966	0.83	0.218	SPO0966	1.02	0.971	SPO0966	1.04	0.821
SPO0968	1.1	0.22	SPO0967	1.67	0.056	SPO0968	0.76	0.011	SPO0970	0.96	0.293	SPO0967	1.09	0.455	SPO0967	1.00	0.492	SPO0967	1.05	0.775	SPO0967	1.00	0.984
SPO0970	0.81	0.136	SPO0968	1.09	0.034	SPO0970	0.74	0.313	SPO0971	0.7	0.925	SPO0968	1.06	0.160	SPO0968	1.05	0.085	SPO0968	1.10	0.243	SPO0968	1.08	0.498
SPO0971	0.81	0.421	SPO0970	0.72	0.43	SPO0971	0.61	0.868	SPO0972	0.85	0.662	SPO0970	0.79	0.539	SPO0970	0.88	0.532	SPO0970	0.86	0.451	SPO0970	0.94	0.851
SPO0972	1.21	0.211	SPO0971	0.81	0.12	SPO0972	0.53	0.889	SPO0973	0.74	0.522	SPO0971	0.81	0.497	SPO0971	0.90	0.618	SPO0971	0.87	0.640	SPO0971	0.90	0.280
SPO0973	1.06	0.454	SPO0972	1.29	0.15	SPO0973	0.49	0.915	SPO0974	0.82	0.494	SPO0972	1.23	0.132	SPO0972	1.08	0.797	SPO0972	1.03	0.975	SPO0972	0.91	0.334
SPO0974	1.17	0.184	SPO0973	1.03	0.28	SPO0974	0.9	0.462	SPO0975	0.85	0.315	SPO0973	0.93	0.917	SPO0973	0.95	0.589	SPO0973	0.94	0.164	SPO0973	1.00	0.963
SPO0975	0.89	0.337	SPO0974	1.11	0.435	SPO0975	0.68	0.184	SPO0976	0.88	0.202	SPO0974	1.31	0.025	SPO0974	1.24	0.059	SPO0974	1.08	0.149	SPO0974	1.01	0.754
SPO0976	1.14	0.129	SPO0975	1.01	0.854	SPO0976	0.81	0.162	SPO0977	0.86	0.19	SPO0975	0.75	0.320	SPO0975	0.65	0.150	SPO0975	1.11	0.337	SPO0975	1.15	0.370
SPO0977	0.88	0.095	SPO0976	1.09	0.108	SPO0977	0.74	0.103	SPO0978	0.89	0.395	SPO0976	0.80	0.063	SPO0976	0.76	0.075	SPO0976	1.23	0.009	SPO0976	1.19	0.072
SPO0978	0.91	0.8	SPO0977	0.92	0.563	SPO0978	0.69	0.194	SPO0979	0.78	0.789	SPO0977	0.78	0.154	SPO0977	0.73	0.097	SPO0977	0.78	0.085	SPO0977	0.83	0.277
SPO0979	0.94	0.907	SPO0978	1	0.673	SPO0979	0.7	0.58	SPO0980	0.93	0.859	SPO0978	0.80	0.305	SPO0978	0.77	0.233	SPO0978	0.84	0.489	SPO0978	0.90	0.793
SPO0980	1.47	0.54	SPO0979	0.83	0.351	SPO0980	0.87	0.802	SPO0981	0.39	0.95	SPO0979	1.01	0.815	SPO0979	1.09	0.432	SPO0979	0.97	0.787	SPO0979	0.98	0.938
SPO0981	1.01	0.943	SPO0980	1.3	0.374	SPO0981	0.9	0.952	SPO0982	0.49	0.767	SPO0980	0.84	0.851	SPO0980	0.88	0.825	SPO0980	1.12	0.890	SPO0980	1.10	0.839
SPO0982	0.81	0.511	SPO0981	1.26	0.762	SPO0982	0.81	0.594	SPO0983	0.91	0.761	SPO0981	0.79	0.796	SPO0981	0.83	0.832	SPO0981	0.80	0.825	SPO0981	0.93	0.916
SPO0983	1.96	0.128	SPO0982	0.79	0.32	SPO0983	0.71	0.89	SPO0984	0.95	0.915	SPO0982	1.03	0.767	SPO0982	1.01	0.853	SPO0982	1.20	0.475	SPO0982	1.11	0.594
SPO0984	1.26	0.756	SPO0983	1.59	0.227	SPO0984	0.88	0.954	SPO0985	0.85	0.744	SPO0983	1.11	0.684	SPO0983	1.11	0.689	SPO0983	1.19	0.682	SPO0983	1.14	0.695
SPO0985	1.44	0.096	SPO0984	1.32	0.732	SPO0985	0.99	0.776	SPO0986	0.96	0.864	SPO0984	0.98	0.991	SPO0984	0.98	0.978	SPO0984	1.09	0.864	SPO0984	1.10	0.891
SPO0986	1.12	0.69	SPO0985	1.37	0.056	SPO0986	0.85	0.835	SPO0987	0.98	0.031	SPO0985	1.53	0.444	SPO0985	2.04	0.013	SPO0985	1.52	0.058	SPO0985	1.40	0.259
SPO0987	0.93	0.168	SPO0986	1.11	0.33	SPO0987	0.89	0.203	SPO0988	0.77	0.435	SPO0986	1.51	0.313	SPO0986	1.32	0.077	SPO0986	1.19	0.688	SPO0986	1.11	0.447
SPO0988	1.35	0.134	SPO0987	0.92	0.867	SPO0988	0.79	0.586	SPO0989	0.76	0.182	SPO0987	1.49	0.090	SPO0987	1.57	0.153	SPO0987	1.20	0.376	SPO0987	1.22	0.069
SPO0989	1.44	0.161	SPO0988	1.21	0.428	SPO0989	0.93	0.214	SPO0990	0.97	0.372	SPO0988	0.63	0.241	SPO0988	0.60	0.147	SPO0988	0.94	0.823	SPO0988	0.93	0.842
SPO0990	0.89	0.521	SPO0989	1.33	0.216	SPO0990	0.94	0.744	SPO0991	0.73	0.639	SPO0989	0.96	0.932	SPO0989	1.06	0.524	SPO0989	0.92	0.726	SPO0989	0.88	0.691
SPO0991	0.7	0.136	SPO0990	0.93	0.92	SPO0991	0.93	0.595	SPO0992	0.7	0.224	SPO0990	1.19	0.323	SPO0990	1.46	0.068	SPO0990	1.13	0.401	SPO0990	1.08	0.656

SPO0992	0.53	0.059	SPO0991	0.79	0.633	SPO0992	0.92	0.229	SPO0993	0.79	0.053	SPO0991	0.64	0.399	SPO0991	0.57	0.424	SPO0991	0.66	0.465	SPO0991	0.79	0.699
SPO0993	0.67	0.392	SPO0992	0.57	0.006	SPO0993	0.93	0.097	SPO0994	0.99	0.765	SPO0992	1.65	0.172	SPO0992	1.75	0.093	SPO0992	1.13	0.743	SPO0992	1.17	0.672
SPO0994	0.79	0.572	SPO0993	0.74	0.082	SPO0994	0.8	0.735	SPO0995	0.92	0.193	SPO0993	2.72	0.157	SPO0993	2.57	0.087	SPO0993	1.13	0.787	SPO0993	1.22	0.557
SPO0995	0.69	0.277	SPO0994	0.85	0.616	SPO0995	0.94	0.509	SPO0996	0.91	0.102	SPO0994	1.34	0.315	SPO0994	1.21	0.558	SPO0994	0.93	0.821	SPO0994	1.08	0.656
SPO0996	0.89	0.339	SPO0995	0.76	0.504	SPO0996	0.94	0.097	SPO0997	0.75	0.308	SPO0995	2.30	0.010	SPO0995	2.20	0.012	SPO0995	1.01	0.891	SPO0995	1.11	0.531
SPO0997	0.66	0.072	SPO0996	0.91	0.309	SPO0997	0.97	0.155	SPO0998	0.99	0.132	SPO0996	2.56	0.006	SPO0996	2.37	0.005	SPO0996	1.09	0.428	SPO0996	1.09	0.163
SPO0998	0.64	0.157	SPO0997	0.65	0.214	SPO0998	0.98	0.506	SPO0999	0.76	0.7	SPO0997	2.39	0.147	SPO0997	2.24	0.109	SPO0997	1.12	0.645	SPO0997	1.10	0.792
SPO0999	0.88	0.486	SPO0998	0.71	0.06	SPO0999	0.79	0.324	SPO1000	0.75	0.264	SPO0998	1.92	0.041	SPO0998	1.75	0.068	SPO0998	1.09	0.450	SPO0998	1.16	0.506
SPO1000	0.79	0.046	SPO0999	0.92	0.911	SPO1000	0.82	0.052	SPO1001	0.63	0.028	SPO0999	1.52	0.048	SPO0999	1.63	0.274	SPO0999	1.07	0.889	SPO0999	1.07	0.690
SPO1001	1.18	0.048	SPO1000	0.81	0.106	SPO1001	0.81	0.093	SPO1002	0.55	0.923	SPO1000	1.53	0.057	SPO1000	1.65	0.018	SPO1000	0.98	0.715	SPO1000	1.03	0.769
SPO1002	0.86	0.858	SPO1001	1.11	0.307	SPO1002	0.83	0.837	SPO1003	0.48	0.28	SPO1001	2.54	0.011	SPO1001	2.35	0.005	SPO1001	1.06	0.739	SPO1001	1.14	0.275
SPO1003	0.65	0.007	SPO1002	0.92	0.963	SPO1003	0.92	0.227	SPO1004	0.82	0.166	SPO1002	0.84	0.771	SPO1002	1.10	0.628	SPO1002	1.01	0.999	SPO1002	0.99	0.989
SPO1004	1.18	0.33	SPO1003	0.69	0.048	SPO1004	0.79	0.197	SPO1005	0.67	0.197	SPO1003	1.12	0.077	SPO1003	1.11	0.109	SPO1003	0.93	0.857	SPO1003	0.92	0.702
SPO1005	0.88	0.231	SPO1004	1.11	0.367	SPO1005	0.92	0.182	SPO1006	0.82	0.05	SPO1004	0.45	0.028	SPO1004	0.45	0.027	SPO1004	0.93	0.828	SPO1004	0.85	0.248
SPO1006	1.22	0.028	SPO1005	0.88	0.361	SPO1006	0.98	0.015	SPO1007	0.74	0.107	SPO1005	1.13	0.125	SPO1005	1.15	0.034	SPO1005	0.97	0.991	SPO1005	1.01	0.692
SPO1007	1.4	0.066	SPO1006	1.18	0.052	SPO1007	0.87	0.09	SPO1008	0.66	0.124	SPO1006	0.84	0.415	SPO1006	0.88	0.473	SPO1006	0.98	0.890	SPO1006	0.93	0.713
SPO1008	1.74	0.035	SPO1007	1.28	0.01	SPO1008	0.91	0.101	SPO1009	0.65	0.385	SPO1007	0.82	0.343	SPO1007	0.81	0.681	SPO1007	1.05	0.219	SPO1007	0.97	0.934
SPO1009	1.56	0.062	SPO1008	1.64	0.032	SPO1009	0.86	0.901	SPO1010	0.86	0.985	SPO1008	0.68	0.172	SPO1008	0.67	0.219	SPO1008	0.89	0.498	SPO1008	0.88	0.452
SPO1010	1.83	0.016	SPO1009	1.58	0.023	SPO1010	0.93	0.997	SPO1011	0.86	0.961	SPO1009	1.24	0.301	SPO1009	1.18	0.255	SPO1009	1.05	0.743	SPO1009	0.98	0.889
SPO1011	0.92	0.608	SPO1010	1.56	0.023	SPO1011	0.93	0.636	SPO1012	0.84	0.96	SPO1010	1.07	0.176	SPO1010	1.15	0.037	SPO1010	1.01	0.442	SPO1010	0.95	0.788
SPO1012	0.77	0.549	SPO1011	0.98	0.897	SPO1012	0.94	0.913	SPO1013	0.96	0.798	SPO1011	1.29	0.090	SPO1011	1.24	0.020	SPO1011	1.08	0.796	SPO1011	1.13	0.223
SPO1013	0.49	0.009	SPO1012	0.79	0.372	SPO1013	0.87	0.931	SPO1014	0.84	0.456	SPO1012	0.83	0.805	SPO1012	0.86	0.753	SPO1012	0.91	0.832	SPO1012	0.93	0.834
SPO1014	0.47	0.043	SPO1013	0.52	0.202	SPO1014	0.32	0.808	SPO1015	0.81	0.285	SPO1013	1.16	0.313	SPO1013	1.28	0.048	SPO1013	1.24	0.235	SPO1013	1.27	0.170
SPO1015	0.49	0.456	SPO1014	0.52	0.136	SPO1015	0.96	0.046	SPO1016	0.95	0.063	SPO1014	1.72	0.029	SPO1014	1.74	0.021	SPO1014	1.39	0.244	SPO1014	1.36	0.162
SPO1016	1.01	0.654	SPO1015	0.58	0.17	SPO1016	0.97	0.188	SPO1017	0.82	0.535	SPO1015	6.02	0.020	SPO1015	4.91	0.048	SPO1015	1.15	0.887	SPO1015	1.17	0.877
SPO1017	0.71	0.017	SPO1016	1	0.471	SPO1017	0.96	0.287	SPO1018	0.94	0.639	SPO1016	0.74	0.042	SPO1016	0.72	0.060	SPO1016	0.88	0.265	SPO1016	0.89	0.350
SPO1018	0.62	0.41	SPO1017	0.71	0.138	SPO1018	0.93	0.812	SPO1019	0.8	0.28	SPO1017	0.22	0.002	SPO1017	0.24	0.006	SPO1017	1.16	0.607	SPO1017	1.28	0.065
SPO1019	0.76	0.524	SPO1018	0.69	0.479	SPO1019	0.96	0.62	SPO1020	0.91	0.664	SPO1018	0.17	0.017	SPO1018	0.17	0.011	SPO1018	0.93	0.805	SPO1018	0.89	0.735
SPO1020	0.71	0.624	SPO1019	0.72	0.209	SPO1020	0.63	0.396	SPO1021	0.91	0.339	SPO1019	0.10	0.005	SPO1019	0.12	0.004	SPO1019	1.07	0.908	SPO1019	0.91	0.447
SPO1021	0.63	0.142	SPO1020	0.74	0.573	SPO1021	0.76	0.738	SPO1022	0.98	0.129	SPO1020	0.14	0.019	SPO1020	0.14	0.022	SPO1020	0.84	0.623	SPO1020	0.86	0.710
SPO1022	1.34	0.129	SPO1021	0.6	0.156	SPO1022	0.7	0.246	SPO1023	0.93	0.725	SPO1021	0.13	0.003	SPO1021	0.13	0.012	SPO1021	1.00	0.955	SPO1021	1.05	0.780
SPO1023	1.1	0.875	SPO1022	1.37	0.056	SPO1023	0.87	0.88	SPO1024	0.93	0.305	SPO1022	0.32	0.004	SPO1022	0.35	0.016	SPO1022	0.97	0.471	SPO1022	0.93	0.637
SPO1024	1.31	0.653	SPO1023	1.05	0.924	SPO1024	0.84	0.153	SPO1025	0.69	0.816	SPO1023	0.69	0.672	SPO1023	0.62	0.579	SPO1023	0.97	0.993	SPO1023	0.94	0.926
SPO1025	1.07	0.53	SPO1024	1.27	0.083	SPO1025	0.88	0.72	SPO1026	0.91	0.484	SPO1024	0.63	0.092	SPO1024	0.68	0.114	SPO1024	0.88	0.226	SPO1024	0.97	0.885
SPO1026	1.1	0.348	SPO1025	1	0.691	SPO1026	0.81	0.417	SPO1027	0.93	0.957	SPO1025	0.89	0.295	SPO1025	1.32	0.515	SPO1025	0.97	[redacted]	SPO1025	0.87	0.360
SPO1027	1.1	0.41	SPO1026	1.13	0.486	SPO1027	0.79	0.928	SPO1028	0.98	0.953	SPO1026	0.39	0.010	SPO1026	0.40	0.009	SPO1026	0.79	0.239	SPO1026	0.85	0.168
SPO1028	0.95	0.97	SPO1027	1.18	0.191	SPO1028	0.91	0.934	SPO1029	0.92	0.647	SPO1027	0.92	0.656	SPO1027	0.94	0.454	SPO1027	1.02	0.768	SPO1027	1.05	0.370
SPO1029	1.11	0.466	SPO1028	0.93	0.97	SPO1029	0.91	0.733	SPO1030	0.71	0.517	SPO1028	0.83	0.963	SPO1028	0.83	0.969	SPO1028	0.80	0.880	SPO1028	0.81	0.878
SPO1030	0.8	0.612	SPO1029	1.01	0.538	SPO1030	0.9	0.613	SPO1031	0.79	0.315	SPO1029	0.78	0.412	SPO1029	0.76	0.101	SPO1029	1.00	0.994	SPO1029	0.96	0.885
SPO1031	0.45	0.152	SPO1030	0.83	0.407	SPO1031	0.86	0.456	SPO1032	0.83	0.761	SPO1030	1.00	0.836	SPO1030	0.94	0.940	SPO1030	0.88	0.329	SPO1030	0.93	0.585
SPO1032	1.69	0.003	SPO1031	0.5	0.148	SPO1032	0.85	0.625	SPO1033	0.78	0.609	SPO1031	2.22	0.082	SPO1031	2.17	0.074	SPO1031	1.03	0.887	SPO1031	1.17	0.566
SPO1033	1.73	0.414	SPO1032	1.42	0.082	SPO1033	0.88	0.634	SPO1034	0.91	0.369	SPO1032	0.94	0.894	SPO1032	0.93	0.489	SPO1032	1.16	0.084	SPO1032	1.12	0.540
SPO1034	1.25	0.371	SPO1033	1.65	0.23	SPO1034	0.97	0.357	SPO1036	0.92	0.823	SPO1033	0.72	0.562	SPO1033	0.74	0.681	SPO1033	1.02	0.903	SPO1033	0.88	0.797
SPO1036	0.73	0.702	SPO1034	1.27	0.305	SPO1036	0.63	0.821	SPO1037	0.76	0.221	SPO1034	0.84	0.620	SPO1034	0.81	0.571	SPO1034	0.87	0.400	SPO1034	0.85	0.246
SPO1037	0.67	0.131	SPO1036	0.78	0.817	SPO1037	0.55	0.421	SPO1038	0.96	0.84	SPO1036	1.35	0.688	SPO1036	1.23	0.756	SPO1036	1.02	0.971	SPO1036	1.07	0.912
SPO1038	1.07	0.574	SPO1037	0.68	0.06	SPO1038	0.85	0.648	SPO1039	0.98	0.723	SPO1037	1.20	0.239	SPO1037	1.20	0.063	SPO1037	1.08	0.628	SPO1037	1.08	0.485
SPO1039	0.74	0.653	SPO1038	1.08	0.279	SPO1039	0.87	0.598	SPO1040	0.98	0.615	SPO1038	0.83	0.136	SPO1038	0.96	0.262	SPO1038	1.18	0.701	SPO1038	1.15	0.606
SPO1040	0.76	0.269	SPO1039	0.98	0.944	SPO1040	0.89	0.036	SPO1041	0.83	0.975	SPO1039	1.22	0.662	SPO1039	1.21	0.844	SPO1039	1.58	0.594	SPO1039	1.30	0.700
SPO1041	0.7	0.77	SPO1040	0.59	0.264	SPO1041	0.97	0.855	SPO1042	0.94	0.057	SPO1040	1.65	0.609	SPO1040	1.32	0.684	SPO1040	1.20	0.603	SPO1040	1.19	0.792
SPO1042	0.6	0.014	SPO1041	0.84	0.93	SPO1042	0.9	0.515	SPO1043	0.91	0.911	SPO1041	1.03	0.982	SPO1041	1.06	0.966	SPO1041	0.88	0.864	SPO1041	0.93	0.899
SPO1043	1.13	0.423	SPO1042	0.64	0.032	SPO1043	0.91	0.945	SPO1044	0.93	0.376	SPO1042	1.87	0.123	SPO1042	1.67	0.054	SPO1042	1.24	0.672	SPO1042	1.27	0.520
SPO1044	0.85	0.804	SPO1043	0.97	0.764	SPO1044	0.89	0.864	SPO1045	0.89	1	SPO1043	1.35	0.140	SPO1043	0.92	0.416	SPO1043	1.13	0.832	SPO1043	1.25	0.633
SPO1045	0.81	0.33	SPO1044	0.79	0.391	SPO1045	0.87	0.659	SPO1046	0.91	0.995	SPO1044	1.11	0.895	SPO1044	1.07	0.866	SPO1044	0.94	0.613	SPO1044	1.00	0.911
SPO1046	0.74	0.381	SPO1045	0.77	0.149	SPO1046	0.77	0.863	SPO1047	0.9	0.896	SPO1045	0.91	0.813	SPO1045	0.94	0.567	SPO1045	0.97	0.962	SPO1045	1.02	0.713
SPO1047	0.76	0.093	SPO1046	0.72	0.383	SPO1047	0.91	0.288	SPO1048	0.93	0.987	SPO1046	1.13	0.583	SPO1046	1.13	0.513	SPO1046	0.93	0.895	SPO1046	0.93	0.876
SPO1048	0.62	0.056	SPO1047	0.76	0.012	SPO1048	0.6	0.674	SPO1049	0.31	0.008	SPO1047	1.15	0.111	SPO1047	1.19	0.053	SPO1047	0.93	0.734	SPO1047	0.93	0.518
SPO1049	0.46	0.009	SPO1048	0.65	0.066	SPO1049	0.98	0.216	SPO1050	0.95	0.952	SPO1048	1.67	0.070	SPO1048	1.61	0.032	SPO1048	1.10	0.663	SPO1048	1.10	0.459
SPO1050	0.98	0.779	SPO1049	0.52	0.01	SPO1050	0.72	0.871	SPO1051	0.99	0.412	SPO1049	2.15	0.010	SPO1049	2.02	0.002	SPO1049	1.20	0.056	SPO1049	1.20	0.024
SPO1051	0.64	0.351	SPO1050	1.21	0.405	SPO1051	0.65	0.71	SPO1053	0.93	0.295	SPO1050	0.76	0.042	SPO1050	0.74	0.267	SPO1050	0.97	0.705	SPO1050	0.94	0.533
SPO1053	0.93	0.885	SPO1051	0.72	0.443	SPO1053	0.95	0.37	SPO1054	0.96	0.345	SPO1051	1.12	0.872	SPO1051	0.95	0.766	SPO1051	1.11	0.959	SPO1051	1.40	0.649
SPO1054	0.49	0.162	SPO1053	0.91	0.751	SPO1054	0.99	0.096	SPO1055	0.7	0.01	SPO1052	1.35	[redacted]	SPO1052	1.04	0.548	SPO1052	0.96	0.625	SPO1052	1.04	0.991
SPO1055	0.33	0.034	SPO1054	0.64	0.271	SPO1055	0.91	0.059	SPO1056	0.65	0.449	SPO1053	1.33	0.242	SPO1053	1.37	0.103	SPO1053	1.30	0.392	SPO1053	1.20	0.573
SPO1056	0.62	0.144	SPO1055	0.36	0.012	SPO1056	0.88	0.198	SPO1057	0.9	0.547	SPO1054	1.64	0.316	SPO1054	2.78	0.219	SPO1054	1.55	0.152	SPO1054	2.01	0.016
SPO1057	1.02	0.838	SPO1056	0.71	0.337	SPO1057	0.87	0.775	SPO1058	0.82	0.058	SPO1055	2.45	0.007	SPO1055	2.70	0.036	SPO1055	3.57	0.011	SPO1055	3.72	0.008
SPO1058	1.01	0.405	SPO1057	1.03	0.684	SPO1058	0.88	0.037	SPO1059	0.96	0.875	SPO1056	1.06	0.747	SPO1056	0.84	0.636	SPO1056	1.03	0.942	SPO1056	1.16	0.509
SPO1059	1.13	0.227	SPO1058	1.14	0.703	SPO1059	0.95	0.908	SPO1060	0.89	0.087	SPO1057	1.15	0.630	SPO1057	1.20	0.213	SPO1057	1.10	0.141	SPO1057	1.11	0.621
SPO1060	0.79	0.305	SPO1059	1.1	0.145	SPO1060	0.99	0.098	SPO1061	0.78	0.109	SPO1058	1.77	0.049	SPO1058	1.57	0.012	SPO1058	1.06	0.636	SPO1058	1.06	0.515
SPO1061	0.98	0.824	SPO1060	0.79	0.153	SPO1061	0.98	0.106	SPO1062	0.79	0.7	SPO1059	1.68	0.034	SPO1059	1.58	0.010	SPO1059	0.80	0.265	SPO1059	0.83	0.278
SPO1062	0.89	0.713	SPO1061	0.89	0.144	SPO1062	0.97	0.813	SPO1063	0.93	0.203	SPO1060	3.95	0.002	SPO1060	3.29	0.001	SPO1060	0.91	0.340	SPO1060	0.95	0.701
SPO1063	0.95	0.642	SPO1062	0.93	0.821	SPO1063	0.96	0.207	SPO1064	0.92	0.691	SPO1061	2.30	0.004	SPO1061	2.29	0.001	SPO1061	0.90	0.481	SPO1061	0.92	0.381
SPO1064	1.02	0.956	SPO1063	0.99	0.917	SPO1064	0.94	0.674	SPO1065	0.94	0.76	SPO1062	1.97	0.107	SPO1062	1.96	0.138	SPO1062	0.88	0.774	SPO1062	0.90	0.789
SPO1065	1.41	0.027	SPO1064	1.06	0.823	SPO1065	0.69	0.724	SPO1066	0.93	0.297	SPO1063	3.26	0.009	SPO1063	3.08	0.005	SPO1063	0.86	0.511	SPO1063	0.92	0.711
SPO1066	1.85	0.001	SPO1065	1.21	0.046	SPO1066	0.88	0.469	SPO1067	0.88	0.825	SPO1064	3.97	0.013	SPO1064	4.19	0.038	SPO1064	0.98	0.973	SPO1064	0.94	0.934
SPO1067	1.08	0.886	SPO1066	1.58	0.044	SPO1067	0.98	0.819	SPO1068	0.62	0.495	SPO1065	1.99	0.019	SPO1065	1.96	0.008	SPO1065	0.83	0.048	SPO1065	0.88	0.192
SPO1068	1.13	0.232	SPO1067	1.09	0.796	SPO1068	0.87	0.43	SPO1069	0.7	0.902	SPO1066	0.97	0.643	SPO1066	1.11	0.365	SPO1066	1.07	0.761	SPO1066	1.16	0.051
SPO1069	0.88	0.623	SPO1068	1.16	0.332	SPO1069	1	0.717	SPO1070	0.87	0.555	SPO1067	1.06	0.728	SPO1067	1.01	0.779	SPO1067	1.00	0.956	SPO1067	1.04	0.899
SPO1070	0.7	0.082	SPO1069	1.02	0.898	SPO1070	0.96	0.286	SPO1071	0.9	0.522	SPO1068	2.39	0.026	SPO1068	2.37	0.021	SPO1068	1.15	0.337	SPO1068	1.15	0.280
SPO1071	1.85	0.021	SPO1070	0.69	0.331	SPO1071	0.83	0.667	SPO1072	0.86	0.148	SPO1069	2.49	0.098	SPO1069	2.46	0.090	SPO1069	0.99	0.954	SPO1069	0.97	0.988
SPO1072	1.18	0.37	SPO1071	1.56	0.031	SPO1072	0.86	0.513	SPO1073	0.88	0.601	SPO1070	1.78	0.031	SPO1070	1.91	0.109	SPO1070	0.88	0.147	SPO1070	0.92	0.672
SPO1073	0.94	0.933	SPO1072	1.15	0.606	SPO1073	0.67	0.327	SPO1074	0.94	0.891	SPO1071	1.03	0.675	SPO1071	1.10	0.128	SPO1071	1.15	0.342	SPO1071	1.02	0.859
SPO1074	1.12	0.502	SPO1073	0.99	0.886	SPO1074	0.94	0.652	SPO1075	0.91	0.998	SPO1072	1.24	0.097	SPO1072	1.27	0.041	SPO1072	1.09	0.225	SPO1072	1.14	0.189
SPO1075	1.22	0.597	SPO1074	1.05	0.833	SPO1075	0.93	0.83	SPO1076	0.88	0.227	SPO1073	1.13	0.666	SPO1073	1.01	0.992	SPO1073	0.88	0.466	SPO1073	0.90	0.760
SPO1076	1.29	0.77	SPO1075	1.07	0.725	SPO1076	0.66	0.608	SPO1077	0.9	0.623	SPO1074	0.68	0.236	SPO1074	0.68	0.415	SPO1074	0.78	0.478	SPO1074	0.79	0.521
SPO1077	1.02	0.799	SPO1076	1.05	0.507	SPO1077	0.94	0.516	SPO1078	0.73	0.66	SPO1075	1.57	0.338	SPO1075	1.36	0.366	SPO1075	1.02	0.906	SPO1075	0.88	0.685
SPO1078	1.05	0.642	SPO1077	1.05	0.757	SPO1078	0.95	0.418	SPO1079	0.95	0	SPO1076	0.65	0.311	SPO1076	0.71	0.349	SPO1076	1.02	0.949	SPO1076	0.93	0.524
SPO1079	1.24	0.573	SPO1078	0.98	0.848	SPO1079	0.94	0.853	SPO1080	0.94	0.93	SPO1077	1.08	0.702	SPO1077	1.16	0.567	SPO1077	1.11	0.673	SPO1077	1.12	0.595
SPO1080	1	0.991	SPO1079	1.2	0.186	SPO1080	0.87	0.974	SPO1081	0.63	0.255	SPO1078	1.13	0.654	SPO1078	1.10	0.758	SPO1078	0.90	0.499	SPO1078	1.03	0.808
SPO1081	1.07	0.368	SPO1080	1.11	0.942	SPO1081	0.93	0.052	SPO1082	0.93	0.832	SPO1079	0.85	0.067	SPO1079	1.00	0.447	SPO1079	0.88	0.702	SPO1079	0.76	0.178
SPO1082	0.92	0.783	SPO1081	1.21	0.025	SPO1082	0.94	0.657	SPO1083	0.66	0.832	SPO1080	0.85	0.964	SPO1080	0.79	0.938	SPO1080	0.91	0.907	SPO1080	0.93	0.953
SPO1083	0.98	0.971	SPO1082	0.95	1	SPO1083	0.72	0.849	SPO1084	0.65	0.351	SPO1081	1.00	0.929	SPO1081	0.93	0.235	SPO1081	1.06	0.677	SPO1081	0.97	0.635
SPO1084	1.44	0.021	SPO1083	0.95	0.955	SPO1084	0.87	0.175	SPO1085	0.92	0.445	SPO1082	1.29	0.110	SPO1082	1.31	0.093	SPO1082	1.00	0.968	SPO1082	1.02	0.716
SPO1085	1.06	0.36	SPO1084	1.53	0.042	SPO1085	0.98	0.978	SPO1086	0.92	0.236	SPO1083	1.32	0.226	SPO1083	1.27	0.179	SPO1083	1.02	0.855	SPO1083	1.01	0.924
SPO1086	1.04	0.9	SPO1085	1	0.506	SPO1086	0.79	0.024	SPO1087	0.93	0.261	SPO1084	0.60	0.084	SPO1084	0.61	0.057	SPO1084	1.16	0.703	SPO1084	1.20	0.432
SPO1087	0.84	0.52	SPO1086	1.05	0.305	SPO1087	0.83	0.885	SPO1088	0.88	0.685	SPO1085	0.57	0.031	SPO1085	0.55	0.033	SPO1085	1.01	0.580	SPO1085	1.00	0.819
SPO1088	1.06	0.436	SPO1087	0.9	0.747	SPO1088	0.85	0.936	SPO1089	0.9	0.019	SPO1086	0.79	0.300	SPO1086	0.76	0.175	SPO1086	0.86	0.083	SPO1086	0.86	0.252
SPO1089	0.55	0.005	SPO1088	1.02	0.857	SPO1089	0.77	0.012	SPO1090	0.89	0.589	SPO1087	1.43	0.094	SPO1087	1.14	0.399	SPO1087	0.79	0.358	SPO1087	0.99	0.904
SPO1090	1.01	0.838	SPO1089	0.58	0.01	SPO1090	0.88	0.826	SPO1091	0.85	0.763	SPO1088	0.91	0.540	SPO1088	1.02	0.928	SPO1088	0.65	0.043	SPO1088	0.70	0.194
SPO1091	0.83	0.63	SPO1090	0.95	0.985	SPO1091	0.93	0.485	SPO1092	0.96	0.959	SPO1089	4.13	0.036	SPO1089	3.49	0.004	SPO1089	1.27	0.074	SPO1089	1.15	0.110
SPO1092	1.13	0.84	SPO1091	1.01	0.756	SPO1092	0.94	0.936	SPO1093	0.9	0.902	SPO1090	0.72	0.237	SPO1090	0.70	0.162	SPO1090	0.86	0.239	SPO1090	0.85	0.441
SPO1093	1.32	0.023	SPO1092	1.09	0.929	SPO1093	0.83	0.402	SPO1094	0.98	0.804	SPO1091	0.70	0.058	SPO1091	0.75	0.436	SPO1091	0.52	0.336	SPO1091	0.74	0.287
SPO1094	0.83	0.203	SPO1093	1.15	0.322	SPO1094	0.92	0.297	SPO1095	0.91	0.059	SPO1092	0.74	0.783	SPO1092	0.75	0.855	SPO1092	0.87	0.816	SPO1092	0.94	0.943
SPO1095	1.31	0.083	SPO1094	0.87	0.32	SPO1095	0.94	0.263	SPO1096	0.63	0.68	SPO1093	0.70	0.078	SPO1093	0.77	0.027	SPO1093	0.96	0.829	SPO1093	1.00	0.990
SPO1096	1.15	0.038	SPO1095	1.36	0.171	SPO1096	0.87	0.246	SPO1097	0.83	0.871	SPO1094	0.33	0.025	SPO1094	0.34	0.002	SPO1094	1.03	0.930	SPO1094	1.11	0.392
SPO1097	1.36	0.443	SPO1096	0.88	0.157	SPO1097	0.88	0.93	SPO1098	0.88	0.924	SPO1095	0.38	0.001	SPO1095	0.43	0.017	SPO1095	1.32	0.043	SPO1095	1.15	0.076
SPO1098	0.82	0.856	SPO1097	1.3	0.698	SPO1098	0.91	0.93	SPO1099	0.94	0.797	SPO1096	1.29	0.006	SPO1096	1.41	0.004	SPO1096	1.27	0.002	SPO1096	1.09	0.131
SPO1099	1.29	0.141	SPO1098	0.9	0.957	SPO1099	0.85	0.512	SPO1100	1	0.881	SPO1097	0.66	0.708	SPO1097	0.65	0.517	SPO1097	0.96	0.976	SPO1097	0.94	0.911
SPO1100	0.83	0.362	SPO1099	1.05	0.644	SPO1100	0.95	0.991	SPO1101	0.93	0.265	SPO1098	0.72	0.814	SPO1098	0.65	0.766	SPO1098	0.72	0.752	SPO1098	0.82	0.840
SPO1101	1.37	0.426	SPO1100	0.9	0.707	SPO1101	0.87	0.402	SPO1102	0.94	0.938	SPO1099	1.21	0.415	SPO1099	1.31	0.516	SPO1099	1.05	0.952	SPO1099	0.97	0.953
SPO1102	1.4	0.562	SPO1101	1.23	0.449	SPO1102	0.97	0.923	SPO1103	0.72	0.218	SPO1100	3.01	0.001	SPO1100	2.63	0.013	SPO1100	0.75	0.063	SPO1100	0.72	0.202
SPO1103	0.84	0.119	SPO1102	1.38	0.49	SPO1103	0.88	0.026	SPO1104	0.97	0.172	SPO1101	0.71	0.331	SPO1101	0.67	0.340	SPO1101	1.14	0.259	SPO1101	1.18	0.392
SPO1104	0.64	0.025	SPO1103	0.91	0.405	SPO1104	0.88	0.036	SPO1105	0.91	0.569	SPO1102	0.61	0.282	SPO1102	0.65	0.330	SPO1102	1.11	0.863	SPO1102	1.10	0.845
SPO1105	1.12	0.342	SPO1104	0.7	0.076	SPO1105	0.6	0.164	SPO1106	0.66	0.307	SPO1103	0.69	0.130	SPO1103	0.69	0.154	SPO1103	0.95	0.761	SPO1103	0.94	0.909
SPO1106	0.91	0.764	SPO1105	1.13	0.005	SPO1106	1.01	0.414	SPO1107	1	0.754	SPO1104	1.63	0.066	SPO1104	1.54	0.057	SPO1104	1.14	0.505	SPO1104	1.19	0.432
SPO1107	0.79	0.515	SPO1106	0.9	0.725	SPO1107	1.01	0.942	SPO1108	0.93	0.58	SPO1105	0.74	0.048	SPO1105	0.70	0.004	SPO1105	0.88	0.503	SPO1105	0.86	0.145
SPO1108	0.91	0.36	SPO1107	0.81	0.698	SPO1108	0.84	0.537	SPO1109	0.64	0.892	SPO1106	0.76	0.315	SPO1106	0.82	0.080	SPO1106	0.84	0.487	SPO1106	0.81	0.418
SPO1109	1.16	0.246	SPO1108	0.94	0.737	SPO1109	0.93	0.75	SPO1110	0.91	0.582	SPO1107	1.19	0.488	SPO1107	1.16	0.311	SPO1107	0.97	0.924	SPO1107	1.04	0.883
SPO1110	0.99	0.915	SPO1109	1.06	0.091	SPO1110	0.97	0.828	SPO1111	0.93	0.784	SPO1108	0.95	0.461	SPO1108	0.98	0.106	SPO1108	0.95	0.711	SPO1108	0.96	0.884
SPO1111	1.02	0.332	SPO1110	1.02	0.801	SPO1111	0.98	0.724	SPO1112	0.92	0.513	SPO1109	0.46	0.034	SPO1109	0.46	0.019	SPO1109	1.14	0.448	SPO1109	1.03	0.820
SPO1112	0.86	0.485	SPO1111	1.04	0.407	SPO1112	0.78	0.763	SPO1113	0.93	0.871	SPO1110	0.94	0.881	SPO1110	0.95	0.856	SPO1110	1.05	0.868	SPO1110	0.88	0.668
SPO1113	1.6	0.037	SPO1112	0.88	0.196	SPO1113	0.76	0.805	SPO1114	0.99	0.313	SPO1111	0.56	0.089	SPO1111	0.56	0.045	SPO1111	0.76	0.588	SPO1111	1.02	0.992
SPO1114	1.15	0.076	SPO1113	1.33	0.133	SPO1114	0.9	0.081	SPO1115	0.96	0.12	SPO1112	0.42	0.010	SPO1112	0.48	0.004	SPO1112	0.93	0.225	SPO1112	0.90	0.300
SPO1115	1.19	0.258	SPO1114	1.13	0.087	SPO1115	0.89	0.811	SPO1116	0.96	0.004	SPO1113	0.76	0.118	SPO1113	0.76	0.253	SPO1113	1.09	0.670	SPO1113	1.03	0.932
SPO1116	0.88	0.314	SPO1115	1.07	0.18	SPO1116	0.86	0.011	SPO1117	0.7	0.839	SPO1114	0.58	0.017	SPO1114	0.59	0.071	SPO1114	0.89	0.570	SPO1114	0.87	0.399
SPO1117	0.87	0.719	SPO1116	0.89	0.129	SPO1117	0.93	0.947	SPO1118	0.82	0.063	SPO1115	0.65	0.013	SPO1115	0.78	0.037	SPO1115	1.20	0.399	SPO1115	1.05	0.549
SPO1118	1.13	0.058	SPO1117	0.98	0.948	SPO1118	0.78	0.397	SPO1119	0.94	0.521	SPO1116	0.42	0.001	SPO1116	0.42	0.004	SPO1116	0.89	0.145	SPO1116	0.85	0.036
SPO1119	1.47	0.023	SPO1118	1.17	0.033	SPO1119	0.94	0.355	SPO1120	0.92	0.969	SPO1117	0.83	0.584	SPO1117	0.81	0.280	SPO1117	0.96	0.901	SPO1117	1.02	0.886
SPO1120	1.01	0.771	SPO1119	1.26	0.011	SPO1120	0.81	0.996	SPO1121	0.8	0.431	SPO1118	1.97	0.004	SPO1118	1.96	0.001	SPO1118	1.04	0.444	SPO1118	1.10	0.179
SPO1121	0.97	0.976	SPO1120	0.99	0.897	SPO1121	0.88	0.522	SPO1122	0.77	0.314	SPO1119	0.68	0.126	SPO1119	0.72	0.125	SPO1119	1.00	0.967	SPO1119	1.02	0.676
SPO1122	1.14	0.359	SPO1121	1.01	0.904	SPO1122	0.98	0.048	SPO1123	0.8	0.676	SPO1120	1.17	0.629	SPO1120	1.26	0.487	SPO1120	1.08	0.924	SPO1120	1.03	0.970
SPO1123	1.05	0.802	SPO1122	1.1	0.426	SPO1123	0.84	0.691	SPO1124	0.9	0.805	SPO1121	1.34	0.404	SPO1121	1.24	0.360	SPO1121	0.96	0.983	SPO1121	1.01	0.895
SPO1124	1.2	0.363	SPO1123	1.09	0.286	SPO1124	0.7	0.899	SPO1125	0.83	0.504	SPO1122	0.85	0.502	SPO1122	0.79	0.238	SPO1122	0.88	0.768	SPO1122	0.95	0.427
SPO1125	1.33	0.188	SPO1124	1.16	0.252	SPO1125	0.97	0.383	SPO1126	0.74	0.028	SPO1123	1.18	0.200	SPO1123	1.11	0.219	SPO1123	0.94	0.743	SPO1123	0.94	0.813
SPO1126	0.85	0.64	SPO1125	1.22	0.419	SPO1126	0.98	0.796	SPO1127	0.89	0.693	SPO1124	1.36	0.192	SPO1124	1.37	0.005	SPO1124	1.00	0.906	SPO1124	0.96	0.556
SPO1127	1.09	0.815	SPO1126	0.92	0.641	SPO1127	0.95	0.593	SPO1128	0.9	0.342	SPO1125	1.44	0.129	SPO1125	1.39	0.161	SPO1125	1.11	0.635	SPO1125	1.07	0.771
SPO1128	0.68	0.031	SPO1127	0.96	0.996	SPO1128	0.71	0.564	SPO1129	0.95	0.784	SPO1126	1.45	0.102	SPO1126	1.46	0.134	SPO1126	1.18	0.161	SPO1126	1.21	0.225
SPO1129	1.12	0.805	SPO1128	0.75	0.108	SPO1129	0.73	0.787	SPO1130	0.94	0.765	SPO1127	0.56	0.338	SPO1127	0.61	0.384	SPO1127	0.80	0.495	SPO1127	0.83	0.729
SPO1130	0.7	0.618	SPO1129	1.03	0.866	SPO1130	0.95	0.878	SPO1131	0.88	0.109	SPO1128	0.90	0.721	SPO1128	0.84	0.281	SPO1128	0.94	0.688	SPO1128	0.97	0.895
SPO1131	0.87	0.123	SPO1130	0.64	0.642	SPO1131	0.82	0.043	SPO1132	0.74	0.847	SPO1129	0.66	0.532	SPO1129	0.72	0.497	SPO1129	1.06	0.929	SPO1129	1.01	0.976
SPO1132	0.92	0.368	SPO1131	0.83	0.112	SPO1132	0.81	0.441	SPO1133	0.84	0.19	SPO1130	1.35	0.491	SPO1130	1.44	0.413	SPO1130	0.93	0.895	SPO1130	1.03	0.950

SPO1133	1.23	0.079	SPO1132	1.02	0.619	SPO1133	0.87	0.174	SPO1134	1.02	0.957	SPO1131	1.29	0.052	SPO1131	1.34	0.010	SPO1131	1.04	0.564	SPO1131	1.02	0.406
SPO1134	1	0.966	SPO1133	1.21	0.123	SPO1134	0.96	0.989	SPO1135	0.82	0.917	SPO1132	2.33	0.001	SPO1132	2.13	0.008	SPO1132	1.05	0.679	SPO1132	1.03	0.464
SPO1135	1.27	0.25	SPO1134	1.05	0.935	SPO1135	0.93	0.965	SPO1136	0.76	0.472	SPO1133	1.17	0.080	SPO1133	1.23	0.055	SPO1133	1.05	0.530	SPO1133	1.08	0.345
SPO1136	0.76	0.073	SPO1135	1.11	0.42	SPO1136	0.69	0.794	SPO1137	0.93	0.483	SPO1134	1.04	0.822	SPO1134	0.99	0.953	SPO1134	0.97	0.964	SPO1134	0.95	0.972
SPO1137	0.89	0.888	SPO1136	0.83	0.234	SPO1137	0.63	0.022	SPO1138	0.97	0.142	SPO1135	0.77	0.649	SPO1135	0.72	0.368	SPO1135	0.89	0.788	SPO1135	0.89	0.626
SPO1138	1.19	0.367	SPO1137	0.83	0.727	SPO1138	0.88	0.298	SPO1139	0.81	0.221	SPO1136	1.19	0.143	SPO1136	1.36	0.068	SPO1136	1.07	0.803	SPO1136	1.10	0.577
SPO1139	0.43	0.408	SPO1138	1.26	0.099	SPO1139	0.92	0.207	SPO1140	0.88	0.8	SPO1137	1.02	0.908	SPO1137	1.26	0.330	SPO1137	1.00	0.893	SPO1137	1.04	0.912
SPO1140	0.89	0.918	SPO1139	0.51	0.443	SPO1140	0.85	0.766	SPO1141	0.56	0.622	SPO1138	1.21	0.670	SPO1138	1.06	0.671	SPO1138	1.08	0.676	SPO1138	0.94	0.756
SPO1141	0.82	0.594	SPO1140	0.83	0.568	SPO1141	0.6	0.084	SPO1142	0.68	0.383	SPO1139	2.67	0.034	SPO1139	2.51	0.098	SPO1139	1.46	0.196	SPO1139	1.66	0.452
SPO1142	0.76	0.07	SPO1141	0.76	0.659	SPO1142	0.93	0.443	SPO1143	0.91	0.338	SPO1140	0.83	0.700	SPO1140	0.89	0.667	SPO1140	1.17	0.808	SPO1140	1.05	0.880
SPO1143	0.81	0.764	SPO1142	0.83	0.579	SPO1143	0.89	0.772	SPO1144	0.93	0.348	SPO1141	1.08	0.450	SPO1141	1.08	0.520	SPO1141	1.02	0.993	SPO1141	0.99	0.957
SPO1144	0.76	0.506	SPO1143	0.85	0.625	SPO1144	0.95	0.275	SPO1145	0.99	0.648	SPO1142	1.13	0.414	SPO1142	1.19	0.028	SPO1142	1.05	0.769	SPO1142	1.05	0.827
SPO1145	1.06	0.321	SPO1144	0.76	0.254	SPO1145	0.95	0.774	SPO1146	0.75	0.067	SPO1143	1.11	0.850	SPO1143	1.10	0.766	SPO1143	1.12	0.829	SPO1143	1.02	0.976
SPO1146	0.85	0.812	SPO1145	1.05	0.736	SPO1146	0.73	0.48	SPO1147	0.75	0.91	SPO1144	1.44	0.074	SPO1144	1.05	0.727	SPO1144	0.95	0.894	SPO1144	1.21	0.568
SPO1147	0.82	0.835	SPO1146	0.85	0.425	SPO1147	0.91	0.924	SPO1148	0.92	0.898	SPO1145	0.76	0.570	SPO1145	0.80	0.372	SPO1145	0.84	0.166	SPO1145	0.92	0.500
SPO1148	0.68	0.249	SPO1147	0.88	0.948	SPO1148	0.97	0.944	SPO1150	0.84	0.892	SPO1146	1.39	0.519	SPO1146	1.69	0.095	SPO1146	1.13	0.753	SPO1146	1.16	0.500
SPO1150	1.13	0.332	SPO1148	0.71	0.417	SPO1150	0.93	0.863	SPO1151	0.85	0.305	SPO1147	1.66	0.683	SPO1147	1.44	0.725	SPO1147	0.93	0.929	SPO1147	0.95	0.945
SPO1151	1.56	0.066	SPO1150	1.08	0.644	SPO1151	0.9	0.743	SPO1152	0.84	0.075	SPO1148	1.19	0.748	SPO1148	1.32	0.613	SPO1148	0.93	0.812	SPO1148	0.98	0.930
SPO1152	1.04	0.75	SPO1151	1.25	0.06	SPO1152	0.96	0.439	SPO1153	0.83	0.877	SPO1150	0.83	0.643	SPO1150	0.79	0.474	SPO1150	0.88	0.551	SPO1150	0.90	0.145
SPO1153	1.13	0.66	SPO1152	0.92	0.582	SPO1153	0.96	0.918	SPO1154	0.83	0.877	SPO1151	0.66	0.066	SPO1151	0.66	0.056	SPO1151	1.12	0.639	SPO1151	1.08	0.534
SPO1154	0.83	0.664	SPO1153	1.14	0.542	SPO1154	0.65	0.665	SPO1155	0.84	0.642	SPO1152	0.74	0.250	SPO1152	0.78	0.134	SPO1152	0.97	0.905	SPO1152	1.01	0.696
SPO1155	1.18	0.125	SPO1154	0.83	0.418	SPO1155	0.97	0.924	SPO1156	0.95	0.299	SPO1153	0.90	0.819	SPO1153	0.93	0.940	SPO1153	1.00	0.998	SPO1153	0.99	0.978
SPO1156	1.16	0.336	SPO1155	1.12	0.263	SPO1156	0.95	0.324	SPO1157	0.99	0.788	SPO1154	0.86	0.812	SPO1154	0.95	0.375	SPO1154	0.94	0.852	SPO1154	0.94	0.774
SPO1157	0.83	0.03	SPO1156	1.3	0.444	SPO1157	0.93	0.041	SPO1158	0.82	0.988	SPO1155	0.78	0.453	SPO1155	0.80	0.260	SPO1155	0.93	0.837	SPO1155	0.92	0.629
SPO1158	1.38	0.495	SPO1157	1.03	0.723	SPO1158	0.93	0.89	SPO1159	0.68	0.428	SPO1156	0.89	0.726	SPO1156	0.79	0.637	SPO1156	0.91	0.280	SPO1156	0.84	0.285
SPO1159	0.84	0.323	SPO1158	1.43	0.535	SPO1159	0.92	0.179	SPO1160	0.93	0.107	SPO1157	0.81	0.251	SPO1157	0.76	0.456	SPO1157	1.37	0.409	SPO1157	1.31	0.693
SPO1160	0.75	0.273	SPO1159	0.78	0.242	SPO1160	0.93	0.664	SPO1161	1	0.204	SPO1158	1.22	0.500	SPO1158	1.27	0.459	SPO1158	1.10	0.817	SPO1158	1.04	0.908
SPO1161	1.09	0.248	SPO1160	0.79	0.466	SPO1161	0.91	0.194	SPO1162	0.96	0.651	SPO1159	1.61	0.053	SPO1159	1.82	0.015	SPO1159	0.80	0.154	SPO1159	0.85	0.237
SPO1162	1.26	0.352	SPO1161	1.1	0.199	SPO1162	1	0.529	SPO1163	0.96	0.931	SPO1160	1.16	0.150	SPO1160	1.17	0.549	SPO1160	1.03	0.985	SPO1160	1.18	0.469
SPO1163	1.1	0.651	SPO1162	1.32	0.104	SPO1163	0.96	0.995	SPO1164	0.8	0.66	SPO1161	0.94	0.878	SPO1161	0.95	0.991	SPO1161	0.93	0.658	SPO1161	0.93	0.408
SPO1164	1	0.97	SPO1163	1.08	0.554	SPO1164	0.86	0.815	SPO1165	1.02	0.838	SPO1162	1.91	0.029	SPO1162	1.97	0.003	SPO1162	0.93	0.511	SPO1162	1.03	0.761
SPO1165	0.68	0.549	SPO1164	0.92	0.809	SPO1165	0.95	0.584	SPO1166	0.72	0.718	SPO1163	1.97	0.030	SPO1163	2.01	0.015	SPO1163	1.08	0.687	SPO1163	1.04	0.712
SPO1166	0.94	0.867	SPO1165	0.78	0.22	SPO1166	0.92	0.705	SPO1168	0.89	0.251	SPO1164	0.80	0.406	SPO1164	0.81	0.234	SPO1164	0.96	0.894	SPO1164	0.88	0.578
SPO1168	0.84	0.338	SPO1166	0.85	0.86	SPO1168	0.77	0.977	SPO1171	0.84	0.62	SPO1165	0.82	0.791	SPO1165	0.65	0.334	SPO1165	0.93	0.894	SPO1165	0.95	0.926
SPO1171	1.16	0.235	SPO1168	0.83	0.501	SPO1171	0.8	0.771	SPO1172	0.81	0.431	SPO1166	0.60	0.116	SPO1166	0.61	0.324	SPO1166	1.05	0.646	SPO1166	1.06	0.925
SPO1172	0.88	0.254	SPO1171	0.99	0.929	SPO1172	0.75	0.233	SPO1173	0.9	0.949	SPO1168	0.56	0.029	SPO1168	0.52	0.005	SPO1168	1.05	0.883	SPO1168	1.00	0.946
SPO1173	0.83	0	SPO1172	0.98	0.95	SPO1173	0.37	0	SPO1174	0.94	0.437	SPO1171	1.24	0.126	SPO1171	1.33	0.061	SPO1171	1.09	0.349	SPO1171	1.08	0.354
SPO1174	0.73	0.126	SPO1173	1.01	0	SPO1174	0.35	0.314	SPO1175	0.95	0.601	SPO1172	1.44	0.004	SPO1172	1.46	0.041	SPO1172	0.99	0.898	SPO1172	0.93	0.798
SPO1175	1.5	0.178	SPO1174	0.77	0.122	SPO1175	0.79	0.03	SPO1176	0.65	0.264	SPO1173	0.54	0.687	SPO1173	0.53	0.644	SPO1173	0.40		SPO1173	0.58	0.746
SPO1176	0.93	0.938	SPO1175	1.34	0.011	SPO1176	0.96	0.739	SPO1177	0.62	0.218	SPO1174	1.26	0.191	SPO1174	1.24	0.118	SPO1174	1.29	0.403	SPO1174	1.18	0.545
SPO1177	1.07	0.857	SPO1176	0.88	0.292	SPO1177	0.96	0.146	SPO1178	0.9	0.412	SPO1175	0.74	0.191	SPO1175	0.85	0.213	SPO1175	1.09	0.708	SPO1175	1.10	0.660
SPO1178	1.03	0.811	SPO1177	0.95	0.916	SPO1178	0.7	0.288	SPO1179	0.91	0.097	SPO1176	0.87	0.718	SPO1176	1.38	0.686	SPO1176	1.25	0.715	SPO1176	1.06	0.391
SPO1179	1.16	0.706	SPO1178	1.1	0.722	SPO1179	0.93	0.064	SPO1180	0.87	0.039	SPO1177	0.10	0.017	SPO1177	0.10	0.017	SPO1177	0.77	0.768	SPO1177	0.67	0.597
SPO1180	1.01	0.863	SPO1179	1.07	0.706	SPO1180	0.79	0.053	SPO1181	0.51	0.033	SPO1178	2.05	0.044	SPO1178	2.00	0.066	SPO1178	0.81	0.428	SPO1178	0.78	0.501
SPO1181	1.03	0.495	SPO1180	0.98	0.948	SPO1181	0.89	0.01	SPO1182	0.96	0.027	SPO1179	1.85	0.032	SPO1179	1.84	0.035	SPO1179	0.95	0.826	SPO1179	0.88	0.577
SPO1182	1.14	0.247	SPO1181	0.93	0.885	SPO1182	0.83	0.065	SPO1183	0.8	0.034	SPO1180	1.95	0.023	SPO1180	1.95	0.014	SPO1180	0.96	0.860	SPO1180	0.97	0.928
SPO1183	0.89	0.284	SPO1182	1.14	0.268	SPO1183	0.88	0.054	SPO1184	0.94	0.782	SPO1181	2.22	0.016	SPO1181	2.25	0.008	SPO1181	1.10	0.296	SPO1181	1.02	0.418
SPO1184	1.09	0.793	SPO1183	1.02	0.617	SPO1184	0.98	0.284	SPO1185	0.96	0.403	SPO1182	2.40	0.011	SPO1182	2.80	0.002	SPO1182	1.05	0.719	SPO1182	1.00	0.772
SPO1185	0.66	0.02	SPO1184	0.97	0.972	SPO1185	0.79	0.062	SPO1186	0.72	0.215	SPO1183	1.88	0.020	SPO1183	2.18	0.022	SPO1183	0.98	0.973	SPO1183	0.94	0.410
SPO1186	0.8	0.187	SPO1185	0.76	0.204	SPO1186	0.89	0.163	SPO1187	0.91	0.781	SPO1184	1.21	0.368	SPO1184	1.06	0.408	SPO1184	0.81	0.809	SPO1184	0.84	0.279
SPO1187	1.31	0.332	SPO1186	0.87	0.26	SPO1187	0.95	0.684	SPO1188	0.89	0.322	SPO1185	0.88	0.110	SPO1185	0.81	0.277	SPO1185	0.87	0.120	SPO1185	0.88	0.395
SPO1188	1.27	0.452	SPO1187	1.1	0.287	SPO1188	0.98	0.768	SPO1189	0.91	0.963	SPO1186	0.85	0.566	SPO1186	0.85	0.394	SPO1186	0.91	0.711	SPO1186	0.90	0.642
SPO1189	0.7	0.317	SPO1188	1.17	0.178	SPO1189	0.92	0.68	SPO1190	0.88	0.432	SPO1187	0.70	0.121	SPO1187	0.72	0.171	SPO1187	1.06	0.905	SPO1187	0.97	0.915
SPO1190	1.57	0.365	SPO1189	0.85	0.357	SPO1190	0.76	0.32	SPO1191	0.62	0.146	SPO1188	1.52	0.329	SPO1188	1.56	0.035	SPO1188	1.18	0.748	SPO1188	1.16	0.510
SPO1191	0.61	0.014	SPO1190	1.09	0.498	SPO1191	0.86	0.213	SPO1192	0.92	0.498	SPO1189	0.74	0.162	SPO1189	0.75	0.317	SPO1189	1.09	0.896	SPO1189	0.95	0.786
SPO1192	0.74	0.126	SPO1191	0.6	0.012	SPO1192	0.84	0.776	SPO1193	0.77	0.508	SPO1190	0.61	0.450	SPO1190	0.62	0.311	SPO1190	0.87	0.770	SPO1190	0.51	0.294
SPO1193	0.85	0.602	SPO1192	0.79	0.104	SPO1193	0.9	0.622	SPO1194	0.89	0.031	SPO1191	1.57	0.010	SPO1191	1.58	0.015	SPO1191	1.21	0.242	SPO1191	1.32	0.026
SPO1194	1.42	0.067	SPO1193	0.79	0.137	SPO1194	0.86	0.1	SPO1195	0.86	0.02	SPO1192	1.60	0.096	SPO1192	1.58	0.031	SPO1192	1.16	0.282	SPO1192	1.22	0.079
SPO1195	0.87	0.165	SPO1194	1.34	0.083	SPO1195	0.67	0.005	SPO1196	0.97	0.247	SPO1193	1.33	0.185	SPO1193	1.60	0.022	SPO1193	1.04	0.957	SPO1193	1.04	0.975
SPO1196	1.12	0.649	SPO1195	0.88	0.271	SPO1196	0.89	0.23	SPO1197	0.87	0.967	SPO1194	2.07	0.009	SPO1194	1.93	0.005	SPO1194	0.96	0.986	SPO1194	0.86	0.179
SPO1197	1.29	0.801	SPO1196	1.09	0.719	SPO1197	1.01	0.991	SPO1198	0.97	0.855	SPO1195	3.77	0.005	SPO1195	3.41	0.010	SPO1195	1.18	0.160	SPO1195	1.08	0.309
SPO1198	1.8	0.066	SPO1197	1.06	0.939	SPO1198	0.76	0.861	SPO1199	0.92	0.372	SPO1196	2.76	0.016	SPO1196	2.50	0.021	SPO1196	1.14	0.063	SPO1196	1.03	0.573
SPO1199	1.25	0.103	SPO1198	1.46	0.192	SPO1199	0.84	0.146	SPO1200	0.99	0.273	SPO1197	0.96	0.962	SPO1197	1.00	0.912	SPO1197	0.92	0.965	SPO1197	0.93	0.959
SPO1200	0.89	0.799	SPO1199	1.12	0.276	SPO1200	0.99	0.202	SPO1201	0.88	0.025	SPO1198	0.78	0.268	SPO1198	0.78	0.248	SPO1198	0.96	0.710	SPO1198	1.00	0.908
SPO1201	0.81	0.06	SPO1200	0.88	0.315	SPO1201	0.91	0.013	SPO1202	1.01	0.013	SPO1199	1.22	0.185	SPO1199	1.25	0.224	SPO1199	1.00	0.948	SPO1199	0.96	0.893
SPO1202	1.18	0.037	SPO1201	0.78	0.043	SPO1202	0.96	0.001	SPO1203	0.8	0.086	SPO1200	1.43	0.236	SPO1200	1.74	0.018	SPO1200	1.13	0.695	SPO1200	1.07	0.591
SPO1203	1.08	0.479	SPO1202	1.04	0.091	SPO1203	0.92	0.023	SPO1204	0.73	0.04	SPO1201	2.63	0.003	SPO1201	2.62	0.003	SPO1201	1.01	0.246	SPO1201	1.03	0.352
SPO1204	0.74	0.031	SPO1203	1	0.712	SPO1204	0.52	0.6	SPO1205	0.78	0.083	SPO1202	2.45	0.007	SPO1202	2.61	0.001	SPO1202	0.97	0.736	SPO1202	0.94	0.533
SPO1205	1.53	0.008	SPO1204	0.76	0.054	SPO1205	0.94	0.062	SPO1206	0.35	0.184	SPO1203	1.75	0.003	SPO1203	1.82	0.012	SPO1203	0.89	0.487	SPO1203	0.85	0.117
SPO1206	1.28	0.057	SPO1205	1.44	0.031	SPO1206	0.95	0.095	SPO1207	0.33	0.978	SPO1204	1.30	0.022	SPO1204	1.36	0.005	SPO1204	0.89	0.499	SPO1204	0.92	0.266
SPO1207	1.24	0.279	SPO1206	1.34	0.014	SPO1207	0.93	0.906	SPO1208	0.79	0.011	SPO1205	0.79	0.513	SPO1205	0.79	0.670	SPO1205	1.34	0.067	SPO1205	1.24	0.053
SPO1208	1	0.311	SPO1207	1.12	0.687	SPO1208	0.93	0.006	SPO1209	0.95	0.655	SPO1206	0.79	0.150	SPO1206	0.76	0.104	SPO1206	0.80	0.247	SPO1206	0.84	0.334
SPO1209	0.63	0.171	SPO1208	1.33	0.061	SPO1209	0.96	0.816	SPO1210	0.91	0.325	SPO1207	0.74	0.667	SPO1207	0.75	0.700	SPO1207	1.09	0.819	SPO1207	1.00	0.952
SPO1210	0.97	0.791	SPO1209	0.66	0.188	SPO1210	0.99	0.395	SPO1211	0.91	0.009	SPO1208	0.46	0.006	SPO1208	0.50	0.002	SPO1208	0.58	0.056	SPO1208	0.72	0.080
SPO1211	0.6	0.053	SPO1210	0.94	0.797	SPO1211	0.85	0.256	SPO1212	0.75	0.975	SPO1209	0.83	0.643	SPO1209	0.85	0.569	SPO1209	0.94	0.875	SPO1209	1.07	0.692
SPO1212	1	0.993	SPO1211	0.65	0.081	SPO1212	0.78	0.975	SPO1213	0.92	0.081	SPO1210	1.37	0.066	SPO1210	1.30	0.168	SPO1210	0.92	0.205	SPO1210	0.92	0.435
SPO1213	0.7	0.045	SPO1212	0.91	0.911	SPO1213	0.92	0.189	SPO1214	0.89	0.104	SPO1211	2.20	0.026	SPO1211	2.04	0.002	SPO1211	1.13	0.386	SPO1211	1.23	0.236
SPO1214	0.54	0.032	SPO1213	0.76	0.047	SPO1214	1	0.128	SPO1215	0.8	0.172	SPO1212	0.97	0.914	SPO1212	1.00	0.854	SPO1212	0.97	0.983	SPO1212	0.96	0.975
SPO1215	0.76	0.34	SPO1214	0.57	0.017	SPO1215	0.64	0.231	SPO1216	0.89	0.001	SPO1213	1.61	0.019	SPO1213	1.57	0.012	SPO1213	1.08	0.445	SPO1213	1.11	0.233
SPO1216	0.1	0.002	SPO1215	0.76	0.387	SPO1216	0.89	0.001	SPO1217	0.96	0.014	SPO1214	1.79	0.003	SPO1214	1.74	0.001	SPO1214	0.95	0.593	SPO1214	1.06	0.315
SPO1217	3.07	0.017	SPO1216	0.1	0.001	SPO1217	0.89	0.109	SPO1218	0.88	0.895	SPO1215	0.66	0.732	SPO1215	0.63	0.712	SPO1215	0.95	0.949	SPO1215	0.94	0.901
SPO1218	0.93	0.99	SPO1217	2.18	0.013	SPO1218	0.75	0.83	SPO1219	0.88	0.334	SPO1216	6.26	0.003	SPO1216	7.05	0.002	SPO1216	14.70	0.003	SPO1216	12.70	0.005
SPO1219	0.83	0.481	SPO1218	1.02	0.438	SPO1219	0.97	0.241	SPO1220	0.93	0.786	SPO1217	0.56	0.002	SPO1217	0.50	0.007	SPO1217	0.64	0.117	SPO1217	0.61	0.083
SPO1220	0.96	0.863	SPO1219	0.81	0.493	SPO1220	0.89	0.741	SPO1221	0.83	0.957	SPO1218	0.86	0.476	SPO1218	1.07	0.757	SPO1218	1.38	0.435	SPO1218	1.23	0.084
SPO1221	0.64	0.213	SPO1220	0.97	0.905	SPO1221	0.86	0.797	SPO1222	0.95	0.942	SPO1219	0.92	0.675	SPO1219	0.95	0.782	SPO1219	1.08	0.662	SPO1219	1.09	0.712
SPO1222	0.75	0.681	SPO1221	0.63	0.092	SPO1222	0.81	0.926	SPO1223	0.79	0.72	SPO1220	0.55	0.028	SPO1220	0.53	0.033	SPO1220	1.30	0.209	SPO1220	1.28	0.074
SPO1223	1.17	0.387	SPO1222	0.7	0.436	SPO1223	0.87	0.825	SPO1225	0.76	0.969	SPO1221	0.92	0.854	SPO1221	0.85	0.639	SPO1221	1.05	0.858	SPO1221	1.11	0.647
SPO1225	0.89	0.953	SPO1223	1.05	0.774	SPO1224	0.93	0	SPO1226	1.02	0.341	SPO1222	1.48	0.452	SPO1222	1.42	0.299	SPO1222	1.37	0.631	SPO1222	1.09	0.922
SPO1226	0.44	0.039	SPO1225	0.95	0.983	SPO1225	0.79	0.906	SPO1227	0.85	0.28	SPO1223	0.96	0.540	SPO1223	0.97	0.553	SPO1223	0.72	0.358	SPO1223	0.96	0.829
SPO1227	0.74	0.018	SPO1226	0.49	0.035	SPO1226	0.77	0.25	SPO1228	0.92	0.185	SPO1225	0.79	0.753	SPO1225	0.88	0.779	SPO1225	0.72	0.686	SPO1224	0.86	0.188
SPO1228	0.85	0.731	SPO1227	0.82	0.397	SPO1227	0.88	0.063	SPO1229	0.66	0.353	SPO1226	0.94	0.955	SPO1226	0.87	0.412	SPO1226	1.12	0.575	SPO1225	0.68	0.746
SPO1229	0.91	0.844	SPO1228	0.83	0.703	SPO1228	0.96	0.715	SPO1230	0.88	0.793	SPO1227	1.75	0.058	SPO1227	1.76	0.179	SPO1227	1.36	0.021	SPO1226	1.21	0.483
SPO1230	0.49	0.378	SPO1229	0.89	0.623	SPO1229	0.96	0.602	SPO1231	0.94	0.806	SPO1228	1.50	0.274	SPO1228	1.44	0.337	SPO1228	1.18	0.663	SPO1227	1.25	0.007
SPO1231	0.94	0.887	SPO1230	0.68	0.497	SPO1230	0.68	0.49	SPO1232	0.91	0.304	SPO1229	1.08	0.674	SPO1229	1.17	0.241	SPO1229	1.40	0.167	SPO1228	1.24	0.510
SPO1232	0.66	0.411	SPO1231	0.96	0.961	SPO1231	0.71	0.817	SPO1233	0.72	0.729	SPO1230	1.34	0.520	SPO1230	1.20	0.605	SPO1230	1.20	0.864	SPO1229	1.30	0.082
SPO1233	0.64	0.705	SPO1232	0.76	0.442	SPO1232	0.96	0.436	SPO1234	0.95	0.882	SPO1231	0.99	0.773	SPO1231	1.06	0.974	SPO1231	1.02	0.961	SPO1230	1.33	0.735
SPO1234	0.77	0.307	SPO1233	0.74	0.826	SPO1233	0.98	0.651	SPO1235	0.85	0.911	SPO1232	1.10	0.425	SPO1232	1.14	0.087	SPO1232	1.01	0.936	SPO1231	0.93	0.848
SPO1235	0.68	0.41	SPO1234	0.81	0.218	SPO1234	0.93	0.948	SPO1236	0.96	0.058	SPO1233	0.54	0.495	SPO1233	0.54	0.522	SPO1233	0.91	0.909	SPO1232	1.02	0.950
SPO1236	0.62	0.049	SPO1235	0.73	0.282	SPO1235	0.88	0.743	SPO1237	0.91	0.023	SPO1234	1.51	0.038	SPO1234	1.32	0.102	SPO1234	0.93	0.724	SPO1233	0.91	0.921
SPO1237	0.63	0.09	SPO1236	0.66	0.054	SPO1236	0.93	0.121	SPO1239	0.94	0.747	SPO1235	1.55	0.049	SPO1235	1.49	0.041	SPO1235	0.99	0.907	SPO1234	0.93	0.762
SPO1239	1.16	0.129	SPO1237	0.68	0.023	SPO1237	0.93	0.435	SPO1240	0.4	0.798	SPO1236	3.09	0.003	SPO1236	3.00	0.008	SPO1236	1.34	0.054	SPO1235	1.01	0.876
SPO1240	0.9	0.347	SPO1239	1.18	0.19	SPO1239	0.87	0.444	SPO1241	0.93	0.842	SPO1237	2.82	0.008	SPO1237	2.39	0.004	SPO1237	1.33	0.116	SPO1236	1.51	0.017
SPO1241	0.97	0.682	SPO1240	0.87	0.005	SPO1240	0.93	0.623	SPO1242	0.9	0.124	SPO1239	0.85	0.989	SPO1239	0.84	0.982	SPO1239	0.93	0.595	SPO1237	1.41	0.024
SPO1242	1.57	0.009	SPO1241	0.98	0.987	SPO1241	0.83	0.482	SPO1243	0.98	0.164	SPO1240	0.88	0.815	SPO1240	0.86	0.844	SPO1240	0.99	0.875	SPO1239	0.96	0.953
SPO1243	0.86	0.062	SPO1242	1.43	0.026	SPO1242	0.83	0.042	SPO1244	0.88	0.88	SPO1241	0.88	0.934	SPO1241	0.85	0.945	SPO1241	0.96	0.995	SPO1240	1.08	0.225
SPO1244	1.08	0.433	SPO1243	0.88	0.287	SPO1243	0.99	0.135	SPO1245	0.96	0.972	SPO1242	0.76	0.143	SPO1242	0.71	0.106	SPO1242	1.11	0.528	SPO1241	0.92	0.709
SPO1245	0.77	0.229	SPO1244	1.24	0.074	SPO1244	0.69	0.261	SPO1246	0.94	0.225	SPO1243	0.65	0.135	SPO1243	0.60	0.019	SPO1243	0.95	0.931	SPO1242	1.00	0.960
SPO1246	0.96	0.953	SPO1245	0.81	0.654	SPO1245	0.93	0.86	SPO1247	0.85	0.873	SPO1244	0.81	0.066	SPO1244	0.76	0.411	SPO1244	1.10	0.541	SPO1243	0.85	0.255
SPO1247	1.14	0.888	SPO1246	0.95	0.893	SPO1246	0.88	0.516	SPO1249	0.79	0.841	SPO1245	1.16	0.156	SPO1245	1.13	0.387	SPO1245	0.99	0.912	SPO1244	1.10	0.609
SPO1249	1.1	0.427	SPO1247	1.09	0.914	SPO1247	0.99	0.891	SPO1250	0.75	0.873	SPO1246	0.91	0.628	SPO1246	0.99	0.595	SPO1246	0.99	0.949	SPO1245	1.01	0.984
SPO1250	1.03	0.72	SPO1249	1.1	0.158	SPO1249	0.88	0.399	SPO1251	0.92	0.935	SPO1247	1.01	0.967	SPO1247	0.91	0.987	SPO1247	0.93	0.942	SPO1246	1.02	0.813
SPO1251	1.11	0.943	SPO1250	1.01	0.664	SPO1250	0.75	0.957	SPO1252	0.7	0.815	SPO1249	1.01	0.979	SPO1249	0.93	0.613	SPO1249	1.22	0.677	SPO1247	0.99	0.997
SPO1252	0.67	0.128	SPO1251	1.02	0.984	SPO1251	0.96	0.907	SPO1253	0.82	0.047	SPO1250	0.85	0.638	SPO1250	0.76	0.217	SPO1250	1.03	0.964	SPO1249	1.13	0.160
SPO1253	0.95	0.186	SPO1252	0.71	0.043	SPO1252	0.65	0.489	SPO1254	0.73	0.476	SPO1251	0.75	0.912	SPO1251	0.78	0.944	SPO1251	0.86	0.934	SPO1250	0.95	0.919
SPO1254	0.81	0.324	SPO1253	0.93	0.573	SPO1253	0.96	0.163	SPO1255	0.99	0.8	SPO1252	1.23	0.422	SPO1252	1.09	0.314	SPO1252	1.05	0.877	SPO1251	0.83	0.910
SPO1255	0.91	0.594	SPO1254	0.97	0.976	SPO1254	0.95	0.585	SPO1256	0.89	0.502	SPO1253	1.41	0.006	SPO1253	1.36	0.032	SPO1253	1.28	0.042	SPO1252	1.06	0.713
SPO1256	0.68	0.538	SPO1255	0.84	0.419	SPO1255	0.99	0.924	SPO1257	0.93	0.379	SPO1254	0.65	0.143	SPO1254	0.59	0.121	SPO1254	1.17	0.228	SPO1253	1.18	0.033
SPO1257	1.02	0.619	SPO1256	0.71	0.582	SPO1256	0.97	0.526	SPO1258	0.98	0.422	SPO1255	0.79	0.468	SPO1255	0.88	0.708	SPO1255	0.98	0.995	SPO1254	1.21	0.235
SPO1258	0.53	0.052	SPO1257	1.02	0.436	SPO1257	0.79	0.687	SPO1259	0.83	0.567	SPO1256	2.81	0.191	SPO1256	3.01	0.173	SPO1256	1.14	0.838	SPO1255	0.98	0.981
SPO1259	0.67	0.042	SPO1258	0.63	0.076	SPO1258	0.96	0.367	SPO1260	0.82	0.592	SPO1257	0.60	0.076	SPO1257	0.58	0.033	SPO1257	0.88	0.221	SPO1256	1.25	0.752
SPO1260	1.66	0.251	SPO1259	0.78	0.017	SPO1259	0.94	0.778	SPO1261	0.78	0.541	SPO1258	1.01	0.819	SPO1258	1.00	0.717	SPO1258	0.94	0.882	SPO1257	0.86	0.234
SPO1261	1.33	0.385	SPO1260	1.46	0.264	SPO1260	0.52	0.606	SPO1262	0.74	0.773	SPO1259	0.88	0.512	SPO1259	0.80	0.166	SPO1259	0.96	0.682	SPO1258	1.02	0.906
SPO1262	1.08	0.82	SPO1261	1.25	0.42	SPO1261	0.82	0.785	SPO1263	0.85	0.349	SPO1260	0.76	0.514	SPO1260	0.75	0.338	SPO1260	1.04	0.887	SPO1259	0.91	0.431
SPO1263	1.45	0.038	SPO1262	0.92	0.942	SPO1262	0.81	0.864	SPO1264	0.97	0.318	SPO1261	0.35	0.043	SPO1261	0.34	0.011	SPO1261	1.05	0.751	SPO1260	1.01	0.975
SPO1264	1.11	0.156	SPO1263	1.32	0.062	SPO1263	0.7	0.554	SPO1265	0.62	0.925	SPO1262	0.60	0.432	SPO1262	0.51	0.158	SPO1262	0.75	0.608	SPO1261	1.15	0.474
SPO1265	0.98	0.985	SPO1264	1.12	0.085	SPO1264	0.85	0.874	SPO1266	0.75	0.041	SPO1263	0.75	0.143	SPO1263	0.72	0.143	SPO1263	1.10	0.224	SPO1262	0.83	0.686
SPO1266	0.76	0.191	SPO1265	1.03	0.942	SPO1265	0.95	0.907	SPO1267	0.93	0.652	SPO1264	0.84	0.273	SPO1264	0.85	0.335	SPO1264	1.00	0.656	SPO1263	1.04	0.678
SPO1267	1.59	0.01	SPO1266	0.79	0.251	SPO1266	0.89	0.079	SPO1268	0.92	0.364	SPO1265	0.99	0.893	SPO1265	0.94	0.928	SPO1265	0.98	0.998	SPO1264	1.01	0.414
SPO1268	1.01	0.3	SPO1267	1.39	0.12	SPO1267	0.94	0.325	SPO1269	0.86	0.525	SPO1266	1.34	0.067	SPO1266	1.28	0.061	SPO1266	1.20	0.719	SPO1265	0.97	0.990
SPO1269	0.85	0.522	SPO1268	1.03	0.634	SPO1268	0.83	0.835	SPO1270	0.96	0.68	SPO1267	0.38	0.023	SPO1267	0.39	0.083	SPO1267	1.63	0.032	SPO1266	1.21	0.416
SPO1270	0.6	0.002	SPO1269	0.9	0.095	SPO1269	0.98	0.133	SPO1271	0.94	0.637	SPO1268	0.82	0.210	SPO1268	0.83	0.127	SPO1268	1.02	0.967	SPO1267	1.42	0.517
SPO1271	0.91	0.91	SPO1270	0.64	0.014	SPO1270	0.99	0.434	SPO1272	0.87	0.042	SPO1269	1.14	0.334	SPO1269	1.02	0.182	SPO1269	1.17	0.718	SPO1268	0.98	0.760
SPO1272	0.64	0.043	SPO1271	0.9	0.689	SPO1271	1	0.54	SPO1273	0.89	0.945	SPO1270	0.86	0.120	SPO1270	0.83	0.171	SPO1270	0.84	0.065	SPO1269	1.12	0.606
SPO1273	0.99	0.957	SPO1272	0.7	0.083	SPO1272	0.98	0.117	SPO1274	0.82	0.616	SPO1271	3.29	0.034	SPO1271	3.42	0.023	SPO1271	1.14	0.475	SPO1270	0.86	0.121
SPO1274	1.07	0.655	SPO1273	0.95	0.903	SPO1273	0.81	0.571	SPO1275	0.86	0.908	SPO1272	1.55	0.038	SPO1272	1.48	0.038	SPO1272	1.02	0.641	SPO1271	1.05	0.884
SPO1275	0.48	0.006	SPO1274	1.14	0.639	SPO1274	0.85	0.618	SPO1276	0.97	0.793	SPO1273	1.75	0.073	SPO1273	1.49	0.108	SPO1273	1.15	0.578	SPO1272	1.03	0.463
SPO1276	0.9	0.256	SPO1275	0.53	0.015	SPO1275	0.75	0.013	SPO1277	0.66	0.351	SPO1274	0.58	0.242	SPO1274	0.60	0.214	SPO1274	0.90	0.816	SPO1273	1.08	0.767
SPO1277	1.33	0.235	SPO1276	0.97	0.978	SPO1276	0.82	0.563	SPO1278	0.84	0.164	SPO1275	0.95	0.091	SPO1275	0.97	0.040	SPO1275	0.99	0.498	SPO1274	0.90	0.711
SPO1278	0.9	0.875	SPO1277	1.31	0.218	SPO1277	0.71	0.546	SPO1279	0.71	0.181	SPO1276	1.45	0.047	SPO1276	1.52	0.002	SPO1276	1.05	0.543	SPO1275	1.00	0.610

SPO1279	0.47	0.003	SPO1278	0.85	0.59	SPO1278	0.87	0.467	SPO1280	0.65	0.06	SPO1277	0.63	0.098	SPO1277	0.59	0.071	SPO1277	1.07	0.555	SPO1276	1.11	0.395
SPO1280	0.59	0.104	SPO1279	0.51	0.01	SPO1279	0.93	0.053	SPO1281	1.01	0.707	SPO1278	0.36	0.031	SPO1278	0.40	0.002	SPO1278	0.97	0.873	SPO1277	1.00	0.832
SPO1281	0.77	0.513	SPO1280	0.63	0.379	SPO1280	0.83	0.007	SPO1282	0.89	0.732	SPO1279	0.76	0.009	SPO1279	0.76	0.183	SPO1279	1.09	0.346	SPO1278	0.90	0.437
SPO1282	1.32	0.14	SPO1281	0.7	0.274	SPO1281	0.76	0.808	SPO1283	0.96	0.85	SPO1280	5.90	0.005	SPO1280	5.48	0.016	SPO1280	0.93	0.437	SPO1279	1.09	0.397
SPO1283	0.86	0.227	SPO1282	1.19	0.246	SPO1282	0.77	0.967	SPO1284	0.97	0.023	SPO1281	0.27	0.039	SPO1281	0.29	0.043	SPO1281	1.06	0.834	SPO1280	1.09	0.648
SPO1284	0.54	0.054	SPO1283	0.88	0.343	SPO1283	0.85	0.363	SPO1285	0.98	0.684	SPO1282	0.92	0.958	SPO1282	0.86	0.221	SPO1282	1.11	0.782	SPO1281	0.88	0.757
SPO1285	0.85	0.785	SPO1284	0.63	0.029	SPO1284	0.82	0.19	SPO1286	0.78	0.615	SPO1283	1.01	0.642	SPO1283	1.00	0.444	SPO1283	0.99	0.979	SPO1282	1.10	0.554
SPO1286	0.99	0.947	SPO1285	0.91	0.779	SPO1285	0.57	0.53	SPO1287	0.93	0.403	SPO1284	1.85	0.022	SPO1284	1.76	0.001	SPO1284	1.07	0.551	SPO1283	1.00	0.946
SPO1287	0.84	0.283	SPO1286	0.93	0.944	SPO1286	0.83	0.695	SPO1288	0.93	0.541	SPO1285	0.77	0.713	SPO1285	0.71	0.372	SPO1285	0.94	0.930	SPO1284	1.11	0.316
SPO1288	0.61	0.055	SPO1287	0.83	0.325	SPO1287	0.95	0.308	SPO1289	0.67	0.748	SPO1286	0.72	0.488	SPO1286	0.78	0.507	SPO1286	0.87	0.650	SPO1285	1.00	0.987
SPO1289	1.41	0.618	SPO1288	0.68	0.058	SPO1288	0.93	0.61	SPO1290	0.83	0.664	SPO1287	0.83	0.336	SPO1287	0.81	0.140	SPO1287	0.93	0.485	SPO1286	0.89	0.614
SPO1290	0.95	0.947	SPO1289	1.23	0.728	SPO1289	0.64	0.756	SPO1291	0.8	0.28	SPO1288	1.32	0.337	SPO1288	1.35	0.125	SPO1288	1.10	0.366	SPO1287	0.92	0.626
SPO1291	0.8	0.155	SPO1290	1	0.951	SPO1290	0.86	0.76	SPO1292	0.76	0.125	SPO1289	0.59	0.457	SPO1289	0.64	0.510	SPO1289	0.99	0.985	SPO1288	1.02	0.909
SPO1292	0.63	0.046	SPO1291	0.75	0.067	SPO1291	0.95	0.067	SPO1293	0.92	0.004	SPO1290	0.90	0.967	SPO1290	0.90	0.991	SPO1290	0.81	0.755	SPO1289	0.87	0.849
SPO1293	0.5	0.011	SPO1292	0.65	0.055	SPO1292	0.74	0.252	SPO1294	0.93	0.219	SPO1291	0.56	0.050	SPO1291	0.59	0.024	SPO1291	0.91	0.427	SPO1290	0.70	0.574
SPO1294	0.98	0.962	SPO1293	0.62	0.063	SPO1293	0.81	0.002	SPO1295	0.9	0.973	SPO1292	1.88	0.054	SPO1292	2.02	0.003	SPO1292	1.02	0.805	SPO1291	0.93	0.580
SPO1295	0.96	0.95	SPO1294	1.04	0.109	SPO1294	0.74	0.235	SPO1298	0.93	0.514	SPO1293	1.41	0.023	SPO1293	1.25	0.032	SPO1293	0.92	0.637	SPO1292	1.07	0.342
SPO1298	0.65	0.322	SPO1295	1	0.956	SPO1295	0.96	0.971	SPO1299	0.85	0.654	SPO1294	0.83	0.484	SPO1294	0.87	0.599	SPO1294	1.06	0.749	SPO1293	0.89	0.428
SPO1299	0.93	0.871	SPO1298	0.93	0.941	SPO1298	0.8	0.559	SPO1300	0.93	0.508	SPO1295	0.73	0.640	SPO1295	0.68	0.469	SPO1295	1.04	0.927	SPO1294	0.95	0.874
SPO1300	1.07	0.354	SPO1299	0.97	0.63	SPO1299	0.86	0.213	SPO1301	0.87	0.04	SPO1298	0.88	0.620	SPO1298	0.99	0.725	SPO1298	0.99	0.912	SPO1295	1.14	0.804
SPO1301	0.54	0.005	SPO1300	1.05	0.516	SPO1300	0.95	0.516	SPO1302	0.93	0.008	SPO1299	1.92	0.079	SPO1299	2.13	0.008	SPO1299	1.26	0.276	SPO1298	0.99	0.920
SPO1302	0.64	0.158	SPO1301	0.58	0.003	SPO1301	0.91	0.106	SPO1303	0.83	0.614	SPO1300	1.06	0.428	SPO1300	1.04	0.640	SPO1300	1.11	0.612	SPO1299	1.25	0.354
SPO1303	1.15	0.261	SPO1302	0.7	0.107	SPO1302	0.86	0.045	SPO1304	0.7	0.12	SPO1301	1.70	0.001	SPO1301	1.65	0.003	SPO1301	1.29	0.133	SPO1300	1.05	0.685
SPO1304	0.9	0.514	SPO1303	1.11	0.027	SPO1303	1	0.93	SPO1305	0.77	0.887	SPO1302	2.03	0.002	SPO1302	2.05	0.011	SPO1302	1.14	0.123	SPO1301	1.36	0.073
SPO1305	1.15	0.182	SPO1304	0.93	0.743	SPO1304	0.85	0.627	SPO1306	0.69	0.207	SPO1303	1.43	0.069	SPO1303	1.49	0.018	SPO1303	1.19	0.298	SPO1302	1.24	0.059
SPO1306	0.51	0.177	SPO1305	1.09	0.381	SPO1305	0.97	0.969	SPO1307	0.91	0.895	SPO1304	1.39	0.051	SPO1304	1.36	0.008	SPO1304	1.00	0.886	SPO1303	1.11	0.439
SPO1307	1.03	0.736	SPO1306	0.55	0.101	SPO1306	0.69	0.423	SPO1308	0.82	0.791	SPO1305	1.49	0.080	SPO1305	1.36	0.042	SPO1305	0.98	0.981	SPO1304	1.12	0.423
SPO1308	0.97	0.999	SPO1307	1.01	0.815	SPO1307	0.93	0.78	SPO1309	0.93	0.978	SPO1306	1.13	0.088	SPO1306	1.13	0.068	SPO1306	1.05	0.747	SPO1305	0.94	0.764
SPO1309	1.21	0.642	SPO1308	0.99	0.911	SPO1308	0.97	0.969	SPO1310	0.9	0.109	SPO1307	1.24	0.250	SPO1307	1.22	0.076	SPO1307	0.88	0.664	SPO1306	1.14	0.039
SPO1310	1.09	0.105	SPO1309	1.11	0.827	SPO1309	0.93	0.981	SPO1311	0.79	0.293	SPO1308	1.33	0.510	SPO1308	1.23	0.426	SPO1308	1.09	0.882	SPO1307	0.93	0.762
SPO1311	1.1	0.216	SPO1310	1.03	0.293	SPO1310	0.95	0.18	SPO1312	0.82	0.597	SPO1309	0.97	0.884	SPO1309	1.03	0.768	SPO1309	0.96	0.974	SPO1308	1.07	0.814
SPO1312	1.25	0.232	SPO1311	1.02	0.8	SPO1311	0.93	0.208	SPO1313	0.95	0.19	SPO1310	0.82	0.707	SPO1310	0.85	0.956	SPO1310	1.03	0.729	SPO1309	0.97	0.991
SPO1313	1.59	0.088	SPO1312	1.33	0.151	SPO1312	0.84	0.783	SPO1314	0.87	0.96	SPO1311	0.53	0.005	SPO1311	0.57	0.011	SPO1311	0.88	0.185	SPO1310	0.99	0.886
SPO1314	0.9	0.699	SPO1313	1.66	0.022	SPO1313	0.7	0.192	SPO1315	0.85	0.916	SPO1312	1.23	0.192	SPO1312	1.18	0.245	SPO1312	1.17	0.271	SPO1311	0.85	0.196
SPO1315	1.06	0.74	SPO1314	1.03	0.856	SPO1314	0.42	0.928	SPO1316	0.65	0.896	SPO1313	0.72	0.233	SPO1313	0.68	0.282	SPO1313	0.97	0.940	SPO1312	1.04	0.751
SPO1316	1.17	0.208	SPO1315	1.02	0.813	SPO1315	0.97	0.836	SPO1317	0.85	0.509	SPO1314	0.61	0.266	SPO1314	0.46	0.237	SPO1314	0.92	0.852	SPO1313	0.85	0.401
SPO1317	2.61	0.133	SPO1316	1.13	0.424	SPO1316	0.95	0.561	SPO1318	0.9	0.164	SPO1315	0.41	0.011	SPO1315	0.34	0.019	SPO1315	0.91	0.121	SPO1314	0.92	0.633
SPO1318	1.36	0.217	SPO1317	2.09	0.025	SPO1317	0.81	0.63	SPO1319	0.59	0.03	SPO1316	0.78	0.127	SPO1316	0.77	0.142	SPO1316	1.04	0.267	SPO1315	0.93	0.710
SPO1319	1.29	0.016	SPO1318	1.46	0.121	SPO1318	0.93	0.767	SPO1320	0.83	0.671	SPO1317	0.65	0.340	SPO1317	0.75	0.505	SPO1317	1.14	0.799	SPO1316	0.99	0.965
SPO1320	0.93	0.751	SPO1319	1.27	0.006	SPO1319	0.56	0.832	SPO1321	0.94	0.555	SPO1318	0.98	0.279	SPO1318	0.81	0.258	SPO1318	0.99	0.966	SPO1317	1.12	0.792
SPO1321	1.13	0.092	SPO1320	0.92	0.586	SPO1320	0.68	0.408	SPO1322	0.92	0.938	SPO1319	1.32	0.012	SPO1319	1.23	0.013	SPO1319	1.01	0.549	SPO1318	0.96	0.898
SPO1322	0.9	0.889	SPO1321	1.17	0.166	SPO1321	0.98	0.916	SPO1323	0.84	0.132	SPO1320	0.85	0.801	SPO1320	0.82	0.650	SPO1320	0.85	0.196	SPO1319	0.93	0.084
SPO1323	1.32	0.043	SPO1322	0.91	0.847	SPO1322	0.31	0.92	SPO1324	0.98	0.942	SPO1321	1.04	0.808	SPO1321	1.06	0.719	SPO1321	1.09	0.449	SPO1320	0.84	0.271
SPO1324	1.07	0.74	SPO1323	1.37	0.02	SPO1323	0.98	0.045	SPO1325	0.73	0.577	SPO1322	1.02	0.913	SPO1322	1.04	0.835	SPO1322	0.97	0.984	SPO1321	1.08	0.627
SPO1325	0.97	0.86	SPO1324	1.12	0.883	SPO1324	0.89	0.967	SPO1326	0.86	0.518	SPO1323	1.00	0.856	SPO1323	1.09	0.446	SPO1323	1.26	0.431	SPO1322	1.09	0.856
SPO1326	0.95	0.949	SPO1325	0.94	0.954	SPO1325	1	0.865	SPO1327	0.84	0.742	SPO1324	0.78	0.834	SPO1324	0.85	0.896	SPO1324	1.08	0.921	SPO1323	1.19	0.395
SPO1327	0.93	0.645	SPO1326	1.05	0.147	SPO1326	0.86	0.033	SPO1328	1.01	0.819	SPO1325	0.85	0.414	SPO1325	0.82	0.504	SPO1325	0.88	0.501	SPO1324	1.10	0.878
SPO1328	0.81	0.429	SPO1327	0.92	0.453	SPO1327	0.36	0.88	SPO1329	0.78	0.987	SPO1326	1.50	0.023	SPO1326	1.71	0.038	SPO1326	0.93	0.480	SPO1325	0.87	0.365
SPO1329	1.03	0.753	SPO1328	0.88	0.146	SPO1328	0.66	0.578	SPO1330	0.85	0.003	SPO1327	1.07	0.309	SPO1327	1.09	0.161	SPO1327	1.10	0.132	SPO1326	1.02	0.886
SPO1330	2.69	0.032	SPO1329	1	0.907	SPO1329	0.85	0.428	SPO1331	0.99	0.024	SPO1328	0.71	0.168	SPO1328	0.68	0.217	SPO1328	1.11	0.520	SPO1327	1.20	0.391
SPO1331	0.85	0.07	SPO1330	1.77	0.081	SPO1330	0.94	0.396	SPO1332	0.97	0.191	SPO1329	0.61	0.029	SPO1329	0.62	0.104	SPO1329	1.24	0.171	SPO1328	1.14	0.047
SPO1332	1.04	0.346	SPO1331	0.83	0.031	SPO1331	0.97	0.322	SPO1333	0.79	0.156	SPO1330	0.41	0.033	SPO1330	0.39	0.001	SPO1330	1.30	0.342	SPO1329	1.20	0.092
SPO1333	0.96	0.332	SPO1332	0.99	0.288	SPO1332	0.95	0.659	SPO1334	0.85	0.295	SPO1331	1.08	0.197	SPO1331	1.16	0.009	SPO1331	1.17	0.100	SPO1330	1.33	0.012
SPO1334	0.71	0.025	SPO1333	0.99	0.984	SPO1333	0.94	0.213	SPO1335	1.01	0.92	SPO1332	1.02	0.354	SPO1332	1.05	0.414	SPO1332	1.08	0.579	SPO1331	1.15	0.039
SPO1335	1.31	0.542	SPO1334	0.83	0.03	SPO1334	0.81	0.094	SPO1336	0.83	0.809	SPO1333	0.63	0.036	SPO1333	0.61	0.058	SPO1333	0.91	0.345	SPO1332	1.09	0.335
SPO1336	1.07	0.817	SPO1335	1.17	0.846	SPO1335	0.95	0.867	SPO1337	0.99	0.609	SPO1334	1.15	0.274	SPO1334	1.18	0.089	SPO1334	1.12	0.278	SPO1333	0.94	0.551
SPO1337	1.05	0.681	SPO1336	1.16	0.557	SPO1336	0.86	0.756	SPO1339	0.6	0.601	SPO1335	0.75	0.665	SPO1335	0.83	0.854	SPO1335	0.90	0.880	SPO1334	1.22	0.115
SPO1339	0.88	0.626	SPO1337	1.1	0.167	SPO1337	0.83	0.974	SPO1340	0.93	0.951	SPO1336	0.99	0.772	SPO1336	0.92	0.936	SPO1336	0.97	0.988	SPO1335	0.91	0.928
SPO1340	0.89	0.95	SPO1339	0.86	0.57	SPO1339	0.93	0.846	SPO1341	0.93	0.638	SPO1337	1.23	0.461	SPO1337	1.13	0.126	SPO1337	1.05	0.910	SPO1336	0.93	0.879
SPO1341	1.19	0.183	SPO1340	0.94	0.992	SPO1340	0.9	0.949	SPO1342	0.95	0.797	SPO1339	0.86	0.691	SPO1339	0.93	0.869	SPO1339	1.08	0.518	SPO1337	1.13	0.407
SPO1342	1.16	0.38	SPO1341	1.16	0.124	SPO1341	0.92	0.45	SPO1343	0.9	0.092	SPO1340	0.83	0.943	SPO1340	0.87	0.937	SPO1340	0.97	0.987	SPO1339	1.11	0.456
SPO1343	0.81	0.074	SPO1342	0.97	0.938	SPO1342	0.85	0.663	SPO1344	0.79	0.91	SPO1341	1.01	0.860	SPO1341	1.01	0.849	SPO1341	1.08	0.752	SPO1340	0.93	0.967
SPO1344	0.94	0.977	SPO1343	0.88	0.22	SPO1343	0.95	0.445	SPO1345	0.71	0.036	SPO1342	0.76	0.113	SPO1342	0.79	0.385	SPO1342	1.05	0.951	SPO1341	1.05	0.796
SPO1345	1.73	0.002	SPO1344	0.93	0.975	SPO1344	0.51	0.955	SPO1346	0.43	0.697	SPO1343	1.22	0.025	SPO1343	1.15	0.341	SPO1343	0.95	0.538	SPO1342	1.03	0.922
SPO1346	1.32	0.079	SPO1345	1.41	0.066	SPO1345	0.9	0.143	SPO1347	0.98	0.701	SPO1344	0.93	0.985	SPO1344	0.96	0.982	SPO1344	0.93	0.944	SPO1343	1.05	0.416
SPO1347	1.53	0.663	SPO1346	1.09	0.288	SPO1346	0.85	0.956	SPO1348	0.89	0.638	SPO1345	1.37	0.109	SPO1345	1.51	0.003	SPO1345	1.16	0.215	SPO1344	0.92	0.925
SPO1348	1.35	0.319	SPO1347	1.18	0.742	SPO1347	0.92	0.86	SPO1349	0.83	0.57	SPO1346	0.87	0.902	SPO1346	0.88	0.876	SPO1346	0.85	0.340	SPO1345	1.17	0.148
SPO1349	1.33	0.42	SPO1348	1.36	0.038	SPO1348	0.79	0.086	SPO1351	0.96	0.065	SPO1347	0.81	0.851	SPO1347	0.70	0.338	SPO1347	1.19	0.881	SPO1346	0.83	0.295
SPO1350	1.15	0.291	SPO1349	1.15	0.527	SPO1349	0.97	0.555	SPO1352	0.95	0.648	SPO1348	1.05	0.161	SPO1348	1.03	0.285	SPO1348	0.94	0.900	SPO1347	1.01	0.967
SPO1351	0.57	0.028	SPO1351	0.64	0.03	SPO1351	0.89	0.015	SPO1353	0.9	0.175	SPO1349	0.75	0.388	SPO1349	0.77	0.501	SPO1349	1.00	0.983	SPO1348	0.97	0.999
SPO1352	1.17	0.461	SPO1352	1.09	0.154	SPO1352	0.89	0.984	SPO1354	0.54	0.898	SPO1351	0.14	0.003	SPO1350	1.48		SPO1350	0.95	0.600	SPO1349	0.98	0.971
SPO1353	1.55	0.278	SPO1353	1.58	0.052	SPO1353	0.9	0.144	SPO1355	0.53	0.758	SPO1352	0.68	0.020	SPO1351	0.12	0.001	SPO1351	1.49	0.040	SPO1350	0.95	0.606
SPO1354	1.09	0.414	SPO1354	1.03	0.735	SPO1354	0.88	0.948	SPO1356	0.98	0.234	SPO1353	0.76	0.403	SPO1352	0.68	0.169	SPO1352	1.03	0.673	SPO1351	1.58	0.101
SPO1355	1.21	0.348	SPO1355	1.32	0.062	SPO1355	0.89	0.205	SPO1357	0.92	0.027	SPO1354	1.17	0.135	SPO1353	0.76	0.390	SPO1353	0.95	0.841	SPO1352	1.08	0.486
SPO1356	0.65	0.139	SPO1356	0.71	0.102	SPO1356	0.78	0.462	SPO1358	0.29	0.962	SPO1355	0.98	0.644	SPO1354	1.08	0.265	SPO1354	1.06	0.465	SPO1353	0.83	0.354
SPO1357	0.82	0.051	SPO1357	0.93	0.344	SPO1357	0.88	0.039	SPO1359	0.89	0.818	SPO1356	1.38	0.091	SPO1355	1.00	0.585	SPO1355	1.04	0.721	SPO1354	1.05	0.602
SPO1358	1.39	0.073	SPO1358	1.33	0.172	SPO1358	0.93	0.742	SPO1360	0.97	0.143	SPO1357	2.14	0.005	SPO1356	1.44	0.038	SPO1356	0.99	0.965	SPO1355	1.01	0.930
SPO1359	0.89	0.865	SPO1359	0.81	0.824	SPO1359	0.95	0.908	SPO1361	0.93	0.237	SPO1358	0.78	0.461	SPO1357	1.98	0.011	SPO1357	1.14	0.164	SPO1356	1.12	0.306
SPO1360	0.98	0.7	SPO1360	1.08	0.346	SPO1360	0.96	0.055	SPO1362	0.7	0.702	SPO1359	0.82	0.883	SPO1358	0.76	0.220	SPO1358	1.04	0.748	SPO1357	1.18	0.238
SPO1361	0.97	0.943	SPO1361	0.98	0.827	SPO1361	0.89	0.293	SPO1363	0.35	0.863	SPO1360	0.51	0.010	SPO1359	0.83	0.901	SPO1359	0.88	0.819	SPO1358	1.00	0.981
SPO1362	1.61	0.482	SPO1362	1.42	0.15	SPO1362	0.79	0.813	SPO1364	0.66	0.801	SPO1361	1.10	0.673	SPO1360	0.53	0.024	SPO1360	0.97	0.908	SPO1359	0.92	0.910
SPO1363	1.14	0.807	SPO1363	1.09	0.81	SPO1363	0.88	0.688	SPO1365	0.99	0.133	SPO1362	0.68	0.471	SPO1361	1.03	0.949	SPO1361	1.04	0.813	SPO1360	0.94	0.812
SPO1364	1.34	0.026	SPO1364	1.31	0.035	SPO1364	0.76	0.929	SPO1366	0.98	0.493	SPO1363	0.84	0.821	SPO1362	0.69	0.285	SPO1362	0.99	0.978	SPO1361	1.05	0.749
SPO1365	0.87	0.554	SPO1365	0.86	0.468	SPO1365	0.96	0.664	SPO1367	0.94	0.859	SPO1364	0.82	0.413	SPO1363	0.72	0.578	SPO1363	0.76	0.382	SPO1362	0.95	0.910
SPO1366	1.11	0.238	SPO1366	1.11	0.442	SPO1366	0.98	0.147	SPO1368	0.99	0.949	SPO1365	0.90	0.972	SPO1364	0.85	0.514	SPO1364	0.90	0.299	SPO1363	0.84	0.632
SPO1367	1.05	0.867	SPO1367	1.09	0.838	SPO1367	0.94	0.963	SPO1369	0.79	0.013	SPO1366	5.69	0.008	SPO1365	1.02	0.814	SPO1365	0.90	0.583	SPO1364	0.83	0.162
SPO1368	0.78	0.715	SPO1368	0.75	0.756	SPO1368	0.78	0.892	SPO1370	0.85	0.517	SPO1367	2.33	0.351	SPO1366	5.41	0.027	SPO1366	1.11	0.676	SPO1365	1.04	0.550
SPO1369	1.07	0.634	SPO1369	1.11	0.234	SPO1369	0.77	0.021	SPO1371	0.78	0.656	SPO1368	0.93	0.977	SPO1367	2.38	0.286	SPO1367	0.99	0.968	SPO1366	1.04	0.883
SPO1370	1.45	0.013	SPO1370	1.21	0.231	SPO1370	0.86	0.585	SPO1372	0.97	0.65	SPO1369	0.82	0.290	SPO1368	1.01	0.883	SPO1368	0.87	0.888	SPO1367	0.96	0.952
SPO1371	1.4	0.133	SPO1371	1.42	0.12	SPO1371	0.87	0.903	SPO1373	0.93	0.251	SPO1370	0.92	0.972	SPO1369	0.79	0.079	SPO1369	1.12	0.555	SPO1368	0.86	0.853
SPO1372	1.14	0.257	SPO1372	1.17	0.166	SPO1372	0.89	0.43	SPO1374	0.99	0.404	SPO1371	0.61	0.136	SPO1370	0.93	0.857	SPO1370	1.12	0.219	SPO1369	1.12	0.321
SPO1373	1.17	0.474	SPO1373	1.06	0.305	SPO1373	0.97	0.692	SPO1375	0.95	0.51	SPO1372	0.43	0.031	SPO1371	0.61	0.094	SPO1371	1.24	0.386	SPO1370	1.09	0.401
SPO1374	1.39	0.054	SPO1374	1.32	0.133	SPO1374	0.82	0.098	SPO1376	1	0.991	SPO1373	0.86	0.606	SPO1372	0.41	0.010	SPO1372	1.51	0.202	SPO1371	1.18	0.487
SPO1375	0.91	0.405	SPO1375	0.98	0.949	SPO1375	0.75	0.52	SPO1377	0.9	0.947	SPO1374	0.84	0.428	SPO1373	1.01	0.818	SPO1373	1.50	0.368	SPO1372	1.46	0.044
SPO1376	1.23	0.186	SPO1376	1.54	0.02	SPO1376	0.95	0.838	SPO1378	0.71	0.375	SPO1375	1.40	0.021	SPO1374	0.81	0.516	SPO1374	1.02	0.727	SPO1373	1.42	0.063
SPO1377	1.51	0.053	SPO1377	1.36	0.11	SPO1377	0.88	0.665	SPO1379	0.53	0.981	SPO1376	0.21	0.006	SPO1375	1.42	0.019	SPO1375	1.01	0.428	SPO1374	1.02	0.691
SPO1378	1.19	0.738	SPO1378	1.04	0.823	SPO1378	0.9	0.447	SPO1380	0.96	0.972	SPO1377	1.14	0.199	SPO1376	0.23	0.003	SPO1376	0.75	0.207	SPO1375	1.04	0.700
SPO1379	0.82	0.913	SPO1379	1.01	0.251	SPO1379	0.92	0.98	SPO1381	0.79	0.314	SPO1378	0.50	0.138	SPO1377	1.21	0.133	SPO1377	1.40	0.118	SPO1376	0.93	0.415
SPO1380	0.81	0.399	SPO1380	0.85	0.472	SPO1380	0.88	0.952	SPO1382	0.89	0.997	SPO1379	0.89	0.087	SPO1378	0.49	0.152	SPO1378	0.93	0.926	SPO1377	1.21	0.138
SPO1381	0.75	0.162	SPO1381	0.79	0.313	SPO1381	0.92	0.649	SPO1383	0.78	0.117	SPO1380	1.32	0.379	SPO1379	0.68	0.602	SPO1379	0.72	0.771	SPO1378	0.88	0.792
SPO1382	0.65	0.318	SPO1382	0.7	0.413	SPO1382	0.97	0.924	SPO1384	0.93	0.742	SPO1381	1.76	0.014	SPO1380	1.34	0.258	SPO1380	0.96	0.876	SPO1379	0.83	0.771
SPO1383	0.74	0.059	SPO1383	0.79	0.06	SPO1383	0.92	0.628	SPO1385	0.96	0.951	SPO1382	1.60	0.387	SPO1381	1.96	0.011	SPO1381	1.06	0.512	SPO1380	1.06	0.727
SPO1384	1.22	0.16	SPO1384	1.22	0.381	SPO1384	0.88	0.607	SPO1386	0.88	0.279	SPO1383	0.88	0.474	SPO1382	1.48	0.375	SPO1382	0.91	0.868	SPO1381	1.16	0.289
SPO1385	0.83	0.879	SPO1385	1.03	0.954	SPO1385	0.55	0.993	SPO1387	0.84	0.733	SPO1384	1.18	0.107	SPO1383	0.81	0.801	SPO1383	0.93	0.781	SPO1382	1.00	0.941
SPO1386	0.92	0.128	SPO1386	0.94	0.717	SPO1386	0.79	0.537	SPO1388	0.94	0.728	SPO1385	1.09	0.918	SPO1384	1.20	0.057	SPO1384	1.15	0.332	SPO1383	1.03	0.336
SPO1387	1.26	0.613	SPO1387	1.17	0.572	SPO1387	0.9	0.733	SPO1389	0.85	0.943	SPO1386	0.65	0.024	SPO1385	0.84	0.917	SPO1385	1.15	0.896	SPO1384	1.10	0.470
SPO1388	0.88	0.873	SPO1388	0.91	0.924	SPO1388	0.83	0.636	SPO1390	0.83	0.13	SPO1387	0.12	0.018	SPO1386	0.60	0.015	SPO1386	1.02	0.255	SPO1385	1.03	0.977
SPO1389	1.31	0.217	SPO1389	1.38	0.042	SPO1389	0.79	0.651	SPO1392	0.76	0.589	SPO1388	1.06	0.812	SPO1387	0.13	0.025	SPO1387	0.98	0.942	SPO1386	0.93	0.423
SPO1390	1.05	0.628	SPO1390	1.03	0.109	SPO1390	0.88	0.07	SPO1393	0.92	0.132	SPO1389	1.34	0.429	SPO1388	1.08	0.683	SPO1388	1.15	0.675	SPO1387	0.94	0.888
SPO1392	0.68	0.004	SPO1392	0.78	0.292	SPO1392	0.92	0.885	SPO1394	0.93	0.749	SPO1390	0.79	0.388	SPO1389	1.45	0.060	SPO1389	1.45	0.485	SPO1388	1.15	0.775
SPO1393	1.1	0.384	SPO1393	1.04	0.441	SPO1393	0.93	0.635	SPO1395	0.95	0.442	SPO1392	0.25	0.010	SPO1390	0.75	0.231	SPO1390	1.03	0.877	SPO1389	1.35	0.352
SPO1394	1.28	0.122	SPO1394	1.21	0.171	SPO1394	0.85	0.372	SPO1396	0.97	0.857	SPO1393	0.25	0.017	SPO1392	0.26	0.014	SPO1392	0.98	0.887	SPO1390	1.04	0.812
SPO1395	1.21	0.301	SPO1395	1.29	0.348	SPO1395	0.72	0.185	SPO1397	0.96	0.808	SPO1394	0.91	0.132	SPO1393	0.26	0.008	SPO1393	1.06	0.950	SPO1392	1.02	0.932
SPO1396	0.93	0.943	SPO1396	0.91	0.93	SPO1396	0.71	0.91	SPO1398	0.97	0.313	SPO1395	0.52	0.049	SPO1394	0.88	0.438	SPO1394	1.08	0.669	SPO1393	1.13	0.429
SPO1397	0.79	0.28	SPO1397	0.77	0.192	SPO1397	0.68	0.714	SPO1399	0.76	0.733	SPO1396	1.97	0.289	SPO1395	0.51	0.037	SPO1395	0.93	0.543	SPO1394	1.08	0.834
SPO1398	0.65	0.114	SPO1398	0.67	0.482	SPO1398	0.71	0.101	SPO1400	0.86	0.078	SPO1397	1.75	0.114	SPO1396	1.92	0.306	SPO1396	1.03	0.963	SPO1395	0.94	0.837
SPO1399	0.76	0.141	SPO1399	0.71	0.392	SPO1399	0.49	0.505	SPO1401	0.71	0.883	SPO1398	4.67	0.003	SPO1397	1.96	0.155	SPO1397	0.96	0.786	SPO1396	0.95	0.945
SPO1400	0.9	0.858	SPO1400	0.95	0.955	SPO1400	0.89	0.511	SPO1402	0.99	0.204	SPO1399	0.68	0.436	SPO1398	5.39	0.001	SPO1398	0.93	0.616	SPO1397	0.95	0.917
SPO1401	1.08	0.54	SPO1401	1.03	0.288	SPO1401	0.96	0.717	SPO1403	0.96	0.666	SPO1400	0.83	0.259	SPO1399	0.47	0.205	SPO1399	0.72	0.065	SPO1398	0.93	0.580
SPO1402	0.89	0.62	SPO1402	0.96	0.925	SPO1402	0.8	0.101	SPO1404	0.84	0.829	SPO1401	0.69	0.005	SPO1400	0.85	0.086	SPO1400	0.97	0.812	SPO1399	0.72	0.179
SPO1403	1.16	0.305	SPO1403	1.21	0.078	SPO1403	0.69	0.766	SPO1405	0.76	0.243	SPO1402	0.52	0.098	SPO1401	0.69	0.076	SPO1401	0.79	0.490	SPO1400	1.02	0.999
SPO1404	0.78	0.438	SPO1404	0.8	0.446	SPO1404	0.64	0.777	SPO1406	0.87	0.625	SPO1403	1.00	0.230	SPO1402	0.51	0.107	SPO1402	0.94	0.936	SPO1401	0.92	0.618
SPO1405	0.66	0.459	SPO1405	0.68	0.419	SPO1405	0.88	0.213	SPO1407	0.77	0.29	SPO1404	0.63	0.383	SPO1403	1.01	0.320	SPO1403	0.96	0.717	SPO1402	0.92	0.868
SPO1406	0.87	0.86	SPO1406	0.86	0.878	SPO1406	0.69	0.495	SPO1408	0.95	0.663	SPO1405	0.73	0.469	SPO1404	0.59	0.066	SPO1404	0.90	0.804	SPO1403	0.98	0.919
SPO1407	0.99	0.86	SPO1407	1.03	0.595	SPO1407	0.93	0.489	SPO1409	0.91	0.015	SPO1406	1.08	0.945	SPO1405	0.78	0.611	SPO1405	1.63	0.186	SPO1404	0.93	0.900
SPO1408	1.4	0.346	SPO1408	1.31	0.611	SPO1408	0.88	0.657	SPO1410	0.78	0.74	SPO1407	1.17	0.088	SPO1406	1.19	0.835	SPO1406	1.35	0.545	SPO1405	1.60	0.211
SPO1409	1.29	0.571	SPO1409	1.24	0.011	SPO1409	0.85	0.002	SPO1411	0.83	0.084	SPO1408	1.30	0.222	SPO1407	1.18	0.041	SPO1407	1.09	0.334	SPO1406	1.33	0.655
SPO1410	1.31	0.734	SPO1410	1.28	0.783	SPO1410	0.98	0.637	SPO1412	0.97	0.464	SPO1409	0.19	0.001	SPO1408	1.20	0.761	SPO1408	1.26	0.745	SPO1407	1.08	0.537
SPO1411	1.08	0.784	SPO1411	0.93	0.87	SPO1411	0.8	0.489	SPO1413	0.96	0.753	SPO1410	0.58	0.520	SPO1409	0.19	0.002	SPO1409	0.93	0.705	SPO1408	1.19	0.744
SPO1412	1.13	0.365	SPO1412	1.43	0.125	SPO1412	0.87	0.321	SPO1414	0.91	0.337	SPO1411	0.79	0.457	SPO1410	0.58	0.548	SPO1410	0.82	0.766	SPO1409	0.89	0.331
SPO1413	1.13	0.6	SPO1413	1.13	0.557	SPO1413	0.78	0.881	SPO1415	0.86	0.069	SPO1412	0.47	0.030	SPO1411	0.82	0.158	SPO1411	0.88	0.632	SPO1410	0.81	0.810
SPO1414	1.02	0.856	SPO1414	1.02	0.27	SPO1414	0.89	0.608	SPO1416	0.85	0.279	SPO1413	0.74	0.494	SPO1412	0.60	0.016	SPO1412	1.59	0.171	SPO1411	0.90	0.660
SPO1415	1.44	0.083	SPO1415	1.08	0.185	SPO1415	0.74	0.119	SPO1417	0.94	0.061	SPO1414	1.45	0.082	SPO1413	0.74	0.580	SPO1413	1.04	0.795	SPO1412	1.42	0.231
SPO1416	0.85	0.071	SPO1416	0.86	0.178	SPO1416	0.87	0.081	SPO1418	0.95	0.994	SPO1415	0.85	0.920	SPO1414	1.35	0.034	SPO1414	0.82	0.205	SPO1413	1.01	0.898
SPO1417	0.81	0.094	SPO1417	0.92	0.421	SPO1417	0.9	0.167	SPO1419	0.88	0.014	SPO1416	1.15	0.097	SPO1415	0.85	0.660	SPO1415	0.75	0.012	SPO1414	0.83	0.099
SPO1418	1.27	0.722	SPO1418	1.28	0.736	SPO1418	0.94	0.97	SPO1420	1	0.064	SPO1417	1.31	0.046	SPO1416	1.07	0.234	SPO1416	1.02	0.758	SPO1415	0.72	0.047
SPO1419	2.04	0.015	SPO1419	1.9	0.009	SPO1419	0.9	0.036	SPO1421	0.87	0.874	SPO1418	1.16	0.789	SPO1417	1.29	0.056	SPO1417	1.09	0.139	SPO1416	0.93	0.642
SPO1420	0.77	0.577	SPO1420	0.87	0.501	SPO1420	0.86	0.237	SPO1422	0.74	0.961	SPO1419	0.24	0.008	SPO1418	1.09	0.843	SPO1418	1.02	0.963	SPO1417	1.10	0.171
SPO1421	1.04	0.841	SPO1421	1.03	0.832	SPO1421	0.95	0.155	SPO1423	0.83	0.844	SPO1420	0.86	0.565	SPO1419	0.25	0.000	SPO1419	1.03	0.807	SPO1418	0.96	0.977

SPO1422	1.49	0.018	SPO1422	1.34	0.01	SPO1422	0.79	0.538	SPO1424	0.81	0.632	SPO1421	0.97	0.808	SPO1420	0.74	0.476	SPO1420	0.93	0.722	SPO1419	0.81	0.103
SPO1423	1.94	0.119	SPO1423	1.81	0.007	SPO1423	0.76	0.731	SPO1425	0.56	0.984	SPO1422	1.04	0.664	SPO1421	0.93	0.965	SPO1421	1.05	0.957	SPO1420	0.89	0.509
SPO1424	0.97	0.994	SPO1424	1.05	0.701	SPO1424	0.97	0.834	SPO1426	0.79	0.408	SPO1423	1.07	0.891	SPO1422	1.10	0.216	SPO1422	1.22	0.188	SPO1421	1.03	0.967
SPO1425	0.91	0.914	SPO1425	0.98	0.983	SPO1425	0.93	0.947	SPO1427	0.88	0.608	SPO1424	1.33	0.054	SPO1423	1.16	0.461	SPO1423	1.61	0.386	SPO1422	1.21	0.159
SPO1426	0.62	0.076	SPO1426	0.66	0.009	SPO1426	0.87	0.25	SPO1428	0.84	0.401	SPO1425	1.56	0.349	SPO1424	1.34	0.031	SPO1424	1.11	0.043	SPO1423	1.34	0.080
SPO1427	1.14	0.05	SPO1427	1.1	0.234	SPO1427	0.75	0.154	SPO1429	0.76	0.802	SPO1426	1.41	0.124	SPO1425	1.48	0.355	SPO1425	0.94	0.897	SPO1424	1.06	0.311
SPO1428	1.07	0.719	SPO1428	1.2	0.495	SPO1428	0.87	0.186	SPO1430	0.83	0.785	SPO1427	0.90	0.785	SPO1426	1.31	0.090	SPO1426	1.09	0.708	SPO1425	0.89	0.812
SPO1429	0.83	0.019	SPO1429	0.93	0.124	SPO1429	0.91	0.431	SPO1431	0.91	0.112	SPO1428	1.08	0.937	SPO1427	1.03	0.345	SPO1427	0.83	0.080	SPO1426	1.13	0.586
SPO1430	1.16	0.052	SPO1430	1.02	0.866	SPO1430	0.75	0.56	SPO1432	0.99	0.842	SPO1429	1.04	0.021	SPO1428	1.07	0.981	SPO1428	1.17	0.674	SPO1427	0.83	0.460
SPO1431	0.89	0.679	SPO1431	0.81	0.365	SPO1431	0.76	0.236	SPO1433	0.96	0.59	SPO1430	0.52	0.018	SPO1429	0.93	0.251	SPO1429	1.11	0.103	SPO1428	1.20	0.648
SPO1432	0.75	0.392	SPO1432	0.74	0.271	SPO1432	0.74	0.939	SPO1434	0.94	0.078	SPO1431	1.12	0.354	SPO1430	0.51	0.089	SPO1430	0.91	0.696	SPO1429	1.06	0.149
SPO1433	0.78	0.308	SPO1433	0.81	0.127	SPO1433	0.56	0.732	SPO1435	0.83	0.805	SPO1432	0.81	0.626	SPO1431	1.12	0.332	SPO1431	1.17	0.321	SPO1430	0.92	0.855
SPO1434	0.88	0.575	SPO1434	0.89	0.262	SPO1434	0.97	0.301	SPO1436	0.79	0.403	SPO1433	0.84	0.514	SPO1432	0.81	0.455	SPO1432	1.01	0.950	SPO1431	1.25	0.131
SPO1435	1.22	0.154	SPO1435	1.16	0.292	SPO1435	0.95	0.672	SPO1437	0.71	0.51	SPO1434	1.68	0.123	SPO1433	0.78	0.076	SPO1433	1.00	0.932	SPO1432	1.02	0.820
SPO1436	1.01	0.634	SPO1436	1.09	0.146	SPO1436	0.96	0.439	SPO1438	0.68	0.689	SPO1435	0.61	0.088	SPO1434	1.74	0.008	SPO1434	1.06	0.701	SPO1433	1.05	0.794
SPO1437	1.29	0.362	SPO1437	1.37	0.371	SPO1437	0.89	0.76	SPO1439	0.67	0.972	SPO1436	0.85	0.284	SPO1435	0.62	0.032	SPO1435	0.93	0.714	SPO1434	1.13	0.122
SPO1438	0.61	0.013	SPO1438	0.67	0.021	SPO1438	0.97	0.178	SPO1440	0.49	0.407	SPO1437	0.49	0.162	SPO1436	0.86	0.076	SPO1436	1.31	0.075	SPO1435	1.01	0.999
SPO1439	1.06	0.918	SPO1439	1.04	0.939	SPO1439	0.97	0.958	SPO1441	0.92	0.994	SPO1438	0.74	0.272	SPO1437	0.50	0.163	SPO1437	0.93	0.819	SPO1436	1.16	0.064
SPO1440	1.19	0.511	SPO1440	1.15	0.566	SPO1440	0.86	0.718	SPO1442	0.76	0.041	SPO1439	1.11	0.903	SPO1438	0.72	0.037	SPO1438	0.83	0.159	SPO1437	0.95	0.832
SPO1441	0.59	0.065	SPO1441	0.58	0.012	SPO1441	0.94	0.724	SPO1443	0.67	0.111	SPO1440	0.69	0.074	SPO1439	1.16	0.858	SPO1439	1.05	0.964	SPO1438	0.76	0.015
SPO1442	1.73	0.001	SPO1442	1.54	0.008	SPO1442	0.91	0.141	SPO1444	0.63	0.759	SPO1441	2.01	0.110	SPO1440	0.60	0.282	SPO1440	0.57	0.393	SPO1439	0.97	0.979
SPO1443	0.79	0.18	SPO1443	0.86	0.11	SPO1443	0.9	0.008	SPO1445	0.89	0.088	SPO1442	0.88	0.626	SPO1441	1.77	0.023	SPO1441	0.95	0.372	SPO1440	0.50	0.085
SPO1444	0.69	0.064	SPO1444	0.83	0.29	SPO1444	0.91	0.791	SPO1446	0.66	0.71	SPO1443	2.07	0.007	SPO1442	0.91	0.886	SPO1442	1.34	0.079	SPO1441	1.04	0.808
SPO1445	0.85	0.488	SPO1445	0.86	0.331	SPO1445	0.74	0.667	SPO1447	0.85	0.714	SPO1444	1.46	0.034	SPO1443	1.81	0.008	SPO1443	1.11	0.423	SPO1442	1.12	0.175
SPO1446	0.98	0.84	SPO1446	0.94	0.948	SPO1446	0.87	0.472	SPO1448	0.93	0.397	SPO1445	1.34	0.040	SPO1444	1.28	0.147	SPO1444	1.15	0.340	SPO1443	1.05	0.323
SPO1447	1.11	0.765	SPO1447	0.93	0.958	SPO1447	0.93	0.728	SPO1449	0.83	0.647	SPO1446	1.16	0.225	SPO1445	1.47	0.023	SPO1445	1.08	0.244	SPO1444	1.01	0.988
SPO1448	1.01	0.42	SPO1448	1.06	0.031	SPO1448	0.88	0.5	SPO1450	0.92	0.327	SPO1447	1.01	0.959	SPO1446	1.14	0.291	SPO1446	0.93	0.433	SPO1445	1.16	0.031
SPO1449	0.74	0.06	SPO1449	0.86	0.392	SPO1449	0.88	0.585	SPO1451	0.88	0.475	SPO1448	1.50	0.068	SPO1447	1.13	0.734	SPO1447	1.06	0.890	SPO1446	1.04	0.793
SPO1450	1.12	0.039	SPO1450	1.07	0.648	SPO1450	0.96	0.246	SPO1452	0.85	0.944	SPO1449	1.48	0.058	SPO1448	1.41	0.026	SPO1448	1.08	0.577	SPO1447	1.05	0.933
SPO1451	0.67	0.611	SPO1451	0.72	0.116	SPO1451	0.53	0.982	SPO1453	0.72	0.757	SPO1450	1.21	0.542	SPO1449	1.44	0.103	SPO1449	0.95	0.346	SPO1448	1.14	0.358
SPO1452	0.85	0.509	SPO1452	0.94	0.953	SPO1452	0.92	0.86	SPO1454	0.77	0.63	SPO1451	1.28	0.657	SPO1450	1.17	0.552	SPO1450	1.03	0.901	SPO1449	1.05	0.799
SPO1453	0.86	0.798	SPO1453	0.82	0.759	SPO1453	0.92	0.998	SPO1455	0.78	0.523	SPO1452	1.34	0.304	SPO1451	1.41	0.016	SPO1451	1.01	1.000	SPO1450	1.04	0.808
SPO1454	0.94	0.731	SPO1454	0.91	0.851	SPO1454	0.95	0.656	SPO1456	0.96	0.665	SPO1453	0.98	0.994	SPO1452	1.36	0.261	SPO1452	0.87	0.400	SPO1451	1.05	0.410
SPO1455	1.3	0.054	SPO1455	1.18	0.034	SPO1455	0.9	0.505	SPO1457	0.87	0.591	SPO1454	0.70	0.242	SPO1453	1.02	0.921	SPO1453	1.13	0.759	SPO1452	0.88	0.569
SPO1456	1.11	0.893	SPO1456	0.96	0.999	SPO1456	0.56	0.132	SPO1458	0.9	0.999	SPO1455	0.76	0.232	SPO1454	0.71	0.253	SPO1454	0.88	0.378	SPO1453	1.14	0.814
SPO1457	1.44	0.069	SPO1457	1.26	0.092	SPO1457	0.98	0.396	SPO1459	0.93	0.38	SPO1456	1.03	0.809	SPO1455	0.71	0.089	SPO1455	1.00	0.928	SPO1454	0.91	0.527
SPO1458	1.08	0.795	SPO1458	1.05	0.91	SPO1458	0.93	0.967	SPO1460	0.93	0.952	SPO1457	0.86	0.390	SPO1456	1.00	0.809	SPO1456	1.01	0.989	SPO1455	0.92	0.710
SPO1459	1.09	0.557	SPO1459	0.96	0.922	SPO1459	0.96	0.043	SPO1461	0.86	0.698	SPO1458	0.74	0.806	SPO1457	0.92	0.796	SPO1457	1.09	0.610	SPO1456	0.94	0.431
SPO1460	1.3	0.462	SPO1460	1.22	0.567	SPO1460	0.89	0.991	SPO1462	0.98	0.998	SPO1459	1.48	0.083	SPO1458	0.71	0.765	SPO1458	0.91	0.912	SPO1457	1.11	0.258
SPO1461	1.07	0.635	SPO1461	1.05	0.685	SPO1461	0.92	0.518	SPO1463	0.78	0.041	SPO1460	1.12	0.867	SPO1459	1.45	0.086	SPO1459	1.03	0.937	SPO1458	0.95	0.930
SPO1462	0.95	0.939	SPO1462	0.93	0.692	SPO1462	0.56	0.618	SPO1464	0.79	0.009	SPO1461	1.09	0.547	SPO1460	1.23	0.669	SPO1460	1.37	0.727	SPO1459	1.08	0.745
SPO1463	0.97	0.887	SPO1463	1.07	0.129	SPO1463	0.86	0.058	SPO1465	0.98	0.584	SPO1462	0.85	0.280	SPO1461	1.09	0.648	SPO1461	0.95	0.732	SPO1460	1.24	0.750
SPO1464	0.72	0.017	SPO1464	0.83	0.272	SPO1464	0.93	0.135	SPO1466	0.97	0.289	SPO1463	0.60	0.003	SPO1462	0.93	0.903	SPO1462	1.18	0.311	SPO1461	0.93	0.709
SPO1465	0.62	0.314	SPO1465	0.69	0.382	SPO1465	0.59	0.503	SPO1467	0.88	0.512	SPO1464	0.66	0.010	SPO1463	0.57	0.006	SPO1463	0.90	0.329	SPO1462	1.11	0.203
SPO1466	1.41	0.296	SPO1466	1.22	0.423	SPO1466	0.88	0.381	SPO1468	0.89	0.348	SPO1465	0.85	0.799	SPO1464	0.58	0.042	SPO1464	0.74	0.021	SPO1463	0.88	0.391
SPO1467	1.09	0.323	SPO1467	0.93	0.961	SPO1467	0.94	0.582	SPO1469	0.73	0.926	SPO1466	0.46	0.106	SPO1465	0.82	0.731	SPO1465	0.83	0.551	SPO1464	0.83	0.230
SPO1468	0.93	0.972	SPO1468	0.84	0.309	SPO1468	0.96	0.041	SPO1470	0.76	0.18	SPO1467	0.51	0.055	SPO1466	0.54	0.007	SPO1466	0.83	0.497	SPO1465	0.85	0.636
SPO1469	1.38	0.146	SPO1469	1.4	0.031	SPO1469	0.88	0.811	SPO1471	1	0.14	SPO1468	1.06	0.533	SPO1467	0.72	0.157	SPO1467	0.92	0.708	SPO1466	0.88	0.512
SPO1470	0.72	0.21	SPO1470	0.78	0.274	SPO1470	0.42	0.453	SPO1472	0.78	0.667	SPO1469	1.18	0.778	SPO1468	1.23	0.049	SPO1468	1.28	0.096	SPO1467	0.83	0.062
SPO1471	0.82	0.055	SPO1471	0.83	0.358	SPO1471	1	0.625	SPO1473	0.78	0.84	SPO1470	1.54	0.063	SPO1469	1.26	0.190	SPO1469	1.06	0.934	SPO1468	1.25	0.208
SPO1472	0.72	0.015	SPO1472	0.79	0.014	SPO1472	0.95	0.049	SPO1474	0.76	0.646	SPO1471	1.58	0.069	SPO1470	1.84	0.047	SPO1470	1.04	0.960	SPO1469	1.00	0.940
SPO1473	0.79	0.446	SPO1473	0.92	0.866	SPO1473	0.91	0.663	SPO1475	0.6	0.805	SPO1472	1.71	0.070	SPO1471	1.53	0.081	SPO1471	0.98	0.771	SPO1470	1.02	0.942
SPO1474	0.84	0.58	SPO1474	0.89	0.146	SPO1474	0.97	0.513	SPO1476	0.97	0.674	SPO1473	1.45	0.072	SPO1472	1.73	0.010	SPO1472	1.03	0.823	SPO1471	1.07	0.757
SPO1475	1.1	0.189	SPO1475	1.12	0.305	SPO1475	0.86	0.265	SPO1477	0.94	0.827	SPO1474	1.22	0.305	SPO1473	1.61	0.067	SPO1473	0.98	0.813	SPO1472	1.14	0.436
SPO1476	1	0.912	SPO1476	1.03	0.883	SPO1476	0.79	0.309	SPO1478	0.93	0.568	SPO1475	1.22	0.217	SPO1474	1.30	0.136	SPO1474	1.09	0.742	SPO1473	1.05	0.850
SPO1477	0.93	0.757	SPO1477	0.93	0.899	SPO1477	0.79	0.573	SPO1479	0.82	0.825	SPO1476	1.25	0.364	SPO1475	1.32	0.131	SPO1475	0.93	0.608	SPO1474	1.11	0.554
SPO1478	0.97	0.952	SPO1478	1.2	0.536	SPO1478	0.89	0.411	SPO1480	0.94	0.319	SPO1477	1.10	0.740	SPO1476	1.47	0.282	SPO1476	1.05	0.925	SPO1475	0.94	0.779
SPO1479	1.18	0.345	SPO1479	0.99	0.517	SPO1479	0.89	0.048	SPO1481	1.01	0.526	SPO1478	0.47	0.201	SPO1477	0.99	0.938	SPO1477	0.98	0.852	SPO1476	1.00	0.984
SPO1480	1.11	0.776	SPO1480	1.18	0.526	SPO1480	0.98	0.366	SPO1482	0.94	0.952	SPO1479	0.87	0.609	SPO1478	0.43	0.185	SPO1478	0.45	0.047	SPO1477	0.97	0.909
SPO1481	0.94	0.931	SPO1481	1.07	0.21	SPO1481	0.9	0.581	SPO1483	0.9	0.955	SPO1480	0.81	0.057	SPO1479	0.93	0.831	SPO1479	1.09	0.833	SPO1478	0.51	0.130
SPO1482	0.91	0.965	SPO1482	0.93	0.991	SPO1482	1	0.988	SPO1484	1	0.696	SPO1481	1.02	0.831	SPO1480	0.78	0.354	SPO1480	0.78	0.526	SPO1479	1.01	0.945
SPO1483	1.37	0.459	SPO1483	1.14	0.376	SPO1483	0.88	0.55	SPO1485	0.85	0.7	SPO1482	0.89	0.739	SPO1481	1.20	0.442	SPO1481	0.80	0.469	SPO1480	0.67	0.361
SPO1484	1.29	0.301	SPO1484	0.96	0.909	SPO1484	0.98	0.476	SPO1486	0.91	0.706	SPO1483	1.09	0.709	SPO1482	0.87	0.779	SPO1482	0.99	0.945	SPO1481	0.95	0.227
SPO1485	0.83	0.721	SPO1485	0.85	0.683	SPO1485	0.83	0.742	SPO1487	0.94	0.984	SPO1484	1.06	0.942	SPO1483	1.46	0.525	SPO1483	1.31	0.310	SPO1482	0.96	0.967
SPO1486	0.96	0.753	SPO1486	1.08	0.606	SPO1486	0.86	0.645	SPO1488	0.93	0.973	SPO1485	1.03	0.842	SPO1484	1.19	0.606	SPO1484	1.28	0.226	SPO1483	1.11	0.744
SPO1487	1.14	0.399	SPO1487	1.02	0.73	SPO1487	0.93	0.618	SPO1489	0.88	0.095	SPO1486	1.16	0.528	SPO1485	1.08	0.881	SPO1485	1.64	0.294	SPO1484	1.10	0.769
SPO1488	0.78	0.791	SPO1488	0.84	0.822	SPO1488	0.9	0.973	SPO1490	0.93	0.313	SPO1487	0.83	0.133	SPO1486	1.06	0.941	SPO1486	1.15	0.847	SPO1485	1.27	0.656
SPO1489	0.92	0.979	SPO1489	1.05	0.379	SPO1489	0.93	0.681	SPO1491	0.72	0.178	SPO1488	0.98	0.997	SPO1487	1.02	0.710	SPO1487	0.90	0.740	SPO1486	1.28	0.298
SPO1490	1.28	0.119	SPO1490	0.97	0.813	SPO1490	0.83	0.68	SPO1492	0.91	0.817	SPO1489	1.03	[redacted]	SPO1488	0.94	0.947	SPO1488	1.01	0.998	SPO1487	0.93	0.664
SPO1491	0.99	0.629	SPO1491	0.89	0.288	SPO1491	0.49	0.926	SPO1493	0.94	0.729	SPO1490	1.32	0.530	SPO1489	0.92	0.416	SPO1489	0.50	0.122	SPO1488	0.95	0.940
SPO1492	1.03	0.89	SPO1492	0.82	0.788	SPO1492	0.93	0.682	SPO1494	0.81	0.069	SPO1491	1.04	0.896	SPO1490	1.56	0.218	SPO1490	0.99	0.830	SPO1489	0.85	0.653
SPO1493	1.33	0.466	SPO1493	1.17	0.332	SPO1493	0.98	0.901	SPO1495	0.78	0.499	SPO1492	1.39	0.669	SPO1491	1.06	0.817	SPO1491	1.11	0.696	SPO1490	1.00	0.887
SPO1494	0.87	0.068	SPO1494	0.75	0.017	SPO1494	0.97	0.485	SPO1496	0.52	0.93	SPO1493	0.83	0.221	SPO1492	1.12	0.915	SPO1492	1.30	0.760	SPO1491	0.93	0.446
SPO1495	1.08	0.541	SPO1495	0.97	0.995	SPO1495	0.84	0.467	SPO1497	0.89	0.852	SPO1494	0.96	0.123	SPO1493	0.77	0.437	SPO1493	0.85	0.406	SPO1492	1.10	0.926
SPO1496	0.97	0.98	SPO1496	0.93	0.928	SPO1496	0.95	0.807	SPO1498	0.5	0.895	SPO1495	0.64	0.281	SPO1494	1.17	0.325	SPO1494	1.04	0.917	SPO1493	0.98	0.897
SPO1497	1.05	0.922	SPO1497	1.05	0.939	SPO1497	0.98	0.795	SPO1499	0.81	0.261	SPO1496	0.81	0.648	SPO1495	0.66	0.456	SPO1495	0.85	0.460	SPO1494	1.10	0.548
SPO1498	1.8	0.005	SPO1498	1.47	0.054	SPO1498	0.83	0.067	SPO1500	0.87	0.255	SPO1497	0.42	0.354	SPO1496	0.85	0.720	SPO1496	1.08	0.801	SPO1495	0.92	0.678
SPO1499	0.82	0.474	SPO1499	0.83	0.361	SPO1499	0.68	0.386	SPO1501	0.57	0.8	SPO1498	1.12	0.122	SPO1497	0.43	0.481	SPO1497	0.77	0.707	SPO1496	1.04	0.898
SPO1500	0.33	0.019	SPO1500	0.41	0.227	SPO1500	0.76	0.632	SPO1502	0.81	0.651	SPO1499	0.91	0.499	SPO1498	1.23	0.199	SPO1498	1.07	0.702	SPO1497	0.84	0.861
SPO1501	0.59	0.506	SPO1501	0.66	0.689	SPO1501	0.73	0.744	SPO1503	0.61	0.601	SPO1500	2.28	0.078	SPO1499	0.93	0.390	SPO1499	0.94	0.475	SPO1498	1.02	0.871
SPO1502	0.26	0.023	SPO1502	0.28	0.076	SPO1502	0.82	0.499	SPO1504	0.74	0.004	SPO1501	1.03	0.934	SPO1500	2.55	0.003	SPO1500	1.01	0.959	SPO1499	1.01	0.952
SPO1503	0.33	0.034	SPO1503	0.32	0.025	SPO1503	0.68	0.882	SPO1505	0.95	0.535	SPO1502	5.13	0.003	SPO1501	0.83	0.863	SPO1501	0.81	0.732	SPO1500	1.02	0.837
SPO1504	0.19	0.002	SPO1504	0.19	0.003	SPO1504	0.91	0.162	SPO1506	0.99	0.384	SPO1503	3.66	0.007	SPO1502	4.64	0.003	SPO1502	1.00	0.929	SPO1501	0.79	0.783
SPO1505	0.83	0.686	SPO1505	0.83	0.717	SPO1505	0.88	0.518	SPO1507	0.4	0.741	SPO1504	4.84	0.001	SPO1503	4.12	0.013	SPO1503	0.98	0.938	SPO1502	0.94	0.640
SPO1506	0.61	0.229	SPO1506	0.71	0.086	SPO1506	0.74	0.99	SPO1508	0.93	0.966	SPO1505	2.56	0.088	SPO1504	4.30	0.000	SPO1504	0.70	0.010	SPO1503	0.96	0.867
SPO1507	0.35	0.005	SPO1507	0.37	0.018	SPO1507	0.93	0.684	SPO1509	0.91	0.806	SPO1506	2.50	0.039	SPO1505	2.15	0.090	SPO1505	0.94	0.906	SPO1504	0.56	0.010
SPO1508	0.17	0.098	SPO1508	0.18	0.065	SPO1508	0.85	0.803	SPO1510	0.93	0.984	SPO1507	2.77	0.025	SPO1506	2.53	0.014	SPO1506	1.00	0.987	SPO1505	0.99	0.977
SPO1509	0.79	0.757	SPO1509	0.76	0.607	SPO1509	0.62	0.51	SPO1511	0.97	0.573	SPO1508	4.98	0.108	SPO1507	2.83	0.023	SPO1507	0.93	0.775	SPO1506	1.11	0.563
SPO1510	0.64	0.008	SPO1510	0.63	0.024	SPO1510	0.95	0.947	SPO1512	0.98	0.681	SPO1509	0.81	0.803	SPO1508	5.69	0.078	SPO1508	0.93	0.934	SPO1507	0.86	0.492
SPO1511	0.62	0.13	SPO1511	0.65	0.677	SPO1511	0.86	0.658	SPO1513	0.88	0.118	SPO1510	1.85	0.163	SPO1509	0.73	0.605	SPO1509	0.93	0.864	SPO1508	0.93	0.856
SPO1512	0.5	0.03	SPO1512	0.48	0.013	SPO1512	0.91	0.93	SPO1514	0.67	0.548	SPO1511	1.71	0.269	SPO1510	2.12	0.018	SPO1510	1.26	0.043	SPO1509	0.79	0.662
SPO1513	0.46	0.021	SPO1513	0.5	0.051	SPO1513	0.91	0.096	SPO1515	0.71	0.798	SPO1512	1.83	0.030	SPO1511	1.70	0.324	SPO1511	1.26	0.490	SPO1510	1.08	0.712
SPO1514	0.36	0.002	SPO1514	0.49	0.01	SPO1514	0.92	0.746	SPO1516	0.77	0.959	SPO1513	1.68	0.026	SPO1512	2.12	0.010	SPO1512	1.06	0.883	SPO1511	1.22	0.331
SPO1515	0.12	0.001	SPO1515	0.13	0.001	SPO1515	0.96	0.26	SPO1517	0.84	0.266	SPO1514	3.88	0.003	SPO1513	1.73	0.005	SPO1513	0.90	0.424	SPO1512	1.06	0.800
SPO1516	0.42	0.003	SPO1516	0.46	0.01	SPO1516	0.92	0.285	SPO1518	0.97	0.865	SPO1515	8.48	0.002	SPO1514	4.02	0.004	SPO1514	1.02	0.941	SPO1513	0.92	0.353
SPO1517	0.14	0.003	SPO1517	0.17	0.003	SPO1517	0.94	0.523	SPO1519	0.94	0.419	SPO1516	1.72	0.050	SPO1515	9.30	0.001	SPO1515	1.04	0.727	SPO1514	1.00	0.974
SPO1518	0.36	0.032	SPO1518	0.48	0.153	SPO1518	0.95	0.948	SPO1520	0.96	0.283	SPO1517	5.76	0.003	SPO1516	1.55	0.023	SPO1516	0.89	0.195	SPO1515	1.09	0.581
SPO1519	0.62	0.014	SPO1519	0.59	0.002	SPO1519	0.97	0.385	SPO1521	0.92	0.352	SPO1518	2.25	0.042	SPO1517	5.76	0.004	SPO1517	0.89	0.580	SPO1516	0.96	0.530
SPO1520	0.48	0.024	SPO1520	0.5	0.045	SPO1520	0.89	0.347	SPO1522	0.99	0.757	SPO1519	1.39	0.045	SPO1518	1.99	0.080	SPO1518	0.91	0.596	SPO1517	0.97	0.998
SPO1521	0.39	0.018	SPO1521	0.47	0.014	SPO1521	0.94	0.864	SPO1523	0.83	0.897	SPO1520	1.88	0.011	SPO1519	1.44	0.042	SPO1519	0.88	0.575	SPO1518	0.95	0.799
SPO1522	1.15	0.867	SPO1522	0.82	0.355	SPO1522	0.94	0.822	SPO1524	0.79	0.184	SPO1521	3.38	0.040	SPO1520	1.83	0.005	SPO1520	1.05	0.522	SPO1519	0.90	0.042
SPO1523	0.61	0.185	SPO1523	0.7	0.106	SPO1523	0.99	0.956	SPO1525	0.92	0.969	SPO1522	0.80	0.746	SPO1521	2.73	0.008	SPO1521	1.34	0.382	SPO1520	1.04	0.694
SPO1524	0.41	0.041	SPO1524	0.42	0.017	SPO1524	0.94	0.961	SPO1526	0.9	0.932	SPO1523	1.74	0.049	SPO1522	0.87	0.854	SPO1522	0.93	0.913	SPO1521	1.18	0.505
SPO1525	1.06	0.921	SPO1525	1.17	0.91	SPO1525	0.79	0.971	SPO1527	0.9	0.761	SPO1524	2.20	0.035	SPO1523	1.82	0.055	SPO1523	0.97	0.901	SPO1522	0.94	0.710
SPO1526	1.17	0.518	SPO1526	1.07	0.942	SPO1526	0.74	0.815	SPO1528	0.96	0.165	SPO1525	0.96	0.985	SPO1524	2.12	0.019	SPO1524	0.93	0.421	SPO1523	1.00	0.975
SPO1527	0.85	0.953	SPO1527	0.84	0.917	SPO1527	0.93	0.81	SPO1529	0.84	0.997	SPO1526	0.62	0.439	SPO1525	1.07	0.958	SPO1525	0.94	0.964	SPO1524	0.93	0.446
SPO1528	0.87	0.71	SPO1528	1.03	0.564	SPO1528	0.87	0.669	SPO1530	0.46	0.728	SPO1527	0.50	0.487	SPO1526	0.71	0.805	SPO1526	1.02	0.964	SPO1525	1.02	0.989
SPO1529	1.14	0.676	SPO1529	1.13	0.499	SPO1529	0.95	0.988	SPO1531	0.85	0.858	SPO1528	1.01	[redacted]	SPO1527	0.49	0.230	SPO1527	0.90	0.947	SPO1526	1.11	0.899
SPO1530	1.13	0.741	SPO1530	1.13	0.782	SPO1530	0.76	0.872	SPO1532	0.99	0.944	SPO1529	0.87	0.434	SPO1528	0.90	0.379	SPO1528	0.81	0.211	SPO1527	0.72	0.824
SPO1531	1.02	0.847	SPO1531	1.04	0.612	SPO1531	0.93	0.66	SPO1533	0.76	0.049	SPO1530	0.81	0.671	SPO1529	0.88	0.286	SPO1529	1.10	0.798	SPO1528	1.10	0.641
SPO1532	0.84	0.677	SPO1532	0.83	0.574	SPO1532	0.61	0.965	SPO1534	0.9	0.645	SPO1531	0.96	0.522	SPO1530	0.81	0.625	SPO1530	0.93	0.883	SPO1529	1.06	0.669
SPO1533	0.68	0.114	SPO1533	0.65	0.093	SPO1533	0.98	0.042	SPO1535	0.86	0.961	SPO1532	0.82	0.345	SPO1531	1.19	0.687	SPO1531	1.22	0.498	SPO1530	0.94	0.912
SPO1534	1.48	0.022	SPO1534	1.22	0.069	SPO1534	0.98	0.424	SPO1536	0.68	0.657	SPO1533	2.45	0.030	SPO1532	0.88	0.565	SPO1532	0.98	0.899	SPO1531	1.21	0.533
SPO1535	1.12	0.715	SPO1535	1.17	0.749	SPO1535	0.97	0.971	SPO1537	0.76	0.559	SPO1534	0.66	0.065	SPO1533	2.35	0.018	SPO1533	1.25	0.215	SPO1532	0.95	0.787
SPO1536	0.99	0.965	SPO1536	0.87	0.319	SPO1536	0.96	0.887	SPO1538	0.68	0.634	SPO1535	0.88	0.861	SPO1534	0.65	0.182	SPO1534	1.00	0.962	SPO1533	1.22	0.277
SPO1537	1.1	0.574	SPO1537	1.14	0.209	SPO1537	0.75	0.617	SPO1539	0.78	0.647	SPO1536	0.90	0.947	SPO1535	0.78	0.576	SPO1535	0.95	0.883	SPO1534	1.02	0.955
SPO1538	1.15	0.581	SPO1538	1.05	0.793	SPO1538	0.87	0.689	SPO1540	0.69	0.718	SPO1537	0.90	0.436	SPO1536	0.85	0.375	SPO1536	1.06	0.932	SPO1535	0.98	0.954
SPO1539	1.25	0.018	SPO1539	1.19	0.199	SPO1539	0.85	0.85	SPO1541	0.88	0.987	SPO1538	0.76	0.482	SPO1537	1.13	0.549	SPO1537	1.07	0.829	SPO1536	1.01	0.897
SPO1540	1.38	0.13	SPO1540	1.16	0.136	SPO1540	0.86	0.788	SPO1542	0.99	0.947	SPO1539	0.81	0.286	SPO1538	0.81	0.557	SPO1538	0.81	0.365	SPO1537	1.04	0.911
SPO1541	0.71	0.033	SPO1541	0.8	0.401	SPO1541	0.96	0.91	SPO1543	0.75	0.401	SPO1540	0.78	0.271	SPO1539	0.89	0.132	SPO1539	1.03	0.998	SPO1538	0.89	0.666
SPO1542	0.59	0.431	SPO1542	0.67	0.578	SPO1542	0.97	0.912	SPO1544	0.93	0.69	SPO1541	1.94	0.085	SPO1540	0.78	0.287	SPO1540	0.93	0.597	SPO1539	1.00	0.833
SPO1543	0.81	0.169	SPO1543	0.81	0.361	SPO1543	0.94	0.223	SPO1545	0.9	0.819	SPO1542	1.27	0.654	SPO1541	1.83	0.131	SPO1541	1.13	0.185	SPO1540	1.01	0.998
SPO1544	0.85	0.74	SPO1544	0.88	0.773	SPO1544	0.92	0.657	SPO1546	0.62	0.994	SPO1543	1.88	0.030	SPO1542	1.37	0.644	SPO1542	0.82	0.762	SPO1541	1.07	0.272
SPO1545	1.09	0.861	SPO1545	0.96	0.998	SPO1545	0.93	0.766	SPO1547	0.88	0.915	SPO1544	1.40	0.433	SPO1543	1.72	0.046	SPO1543	0.77	0.308	SPO1542	0.87	0.832
SPO1546	1.04	0.647	SPO1546	0.95	0.979	SPO1546	0.98	0.765	SPO1548	0.83	0.027	SPO1545	0.91	0.953	SPO1544	1.22	0.507	SPO1544	0.79	0.674	SPO1543	0.72	0.141
SPO1547	0.93	0.934	SPO1547	0.85	0.271	SPO1547	0.95	0.714	SPO1549	0.95	0.346	SPO1546	1.51	0.147	SPO1545	0.96	0.989	SPO1545	0.84	0.800	SPO1544	0.81	0.679
SPO1548	0.52	0.135	SPO1548	0.52	0.012	SPO1548	0.97	0.012	SPO1550	0.89	0.754	SPO1547	1.47	0.083	SPO1546	1.68	0.048	SPO1546	0.78	0.255	SPO1545	0.85	0.815
SPO1549	0.81	0.111	SPO1549	0.86	0.587	SPO1549	0.97	0.226	SPO1551	1	0.923	SPO1548	3.80	0.009	SPO1547	1.44	0.042	SPO1547	0.87	0.495	SPO1546	0.84	0.461
SPO1550	1.1	0.847	SPO1550	1.04	0.843	SPO1550	0.74	0.829	SPO1552	0.86	0.947	SPO1549	1.55	0.199	SPO1548	3.30	0.002	SPO1548	1.11	0.137	SPO1547	0.89	0.467
SPO1551	0.74	0.347	SPO1551	0.77	0.578	SPO1551	0.98	0.738	SPO1553	0.97	0.789	SPO1550	1.57	0.379	SPO1549	2.10	0.081	SPO1549	1.19	0.334	SPO1548	1.13	0.375
SPO1552	0.93	0.831	SPO1552	0.93	0.919	SPO1552	0.86	0.976	SPO1554	1	0.779	SPO1551	1.42	0.116	SPO1550	1.78	0.375	SPO1550	1.02	0.988	SPO1549	1.06	0.642
SPO1553	0.85	0.802	SPO1553	0.84	0.884	SPO1553	0.97	0.759	SPO1555	0.91	0.054	SPO1552	1.06	0.851	SPO1551	1.24	0.379	SPO1551	0.85	0.572	SPO1550	1.05	0.953
SPO1554	1	0.614	SPO1554	0.88	0.65	SPO1554	0.98	0.397	SPO1556	0.95	0.001	SPO1553	0.99	0.930	SPO1552	1.01	0.939	SPO1552	0.80	0.514	SPO1551	0.88	0.605
SPO1555	0.15	0.058	SPO1555	0.14	0.029	SPO1555	0.91	0.066	SPO1557	0.94	0.09	SPO1554	1.26	0.477	SPO1553	1.06	0.861	SPO1553	0.95	0.962	SPO1552	0.86	0.612
SPO1556	0.29	0.003	SPO1556	0.32	0.002	SPO1556	0.91	0.011	SPO1558	0.9	0.654	SPO1555	0.25	0.035	SPO1554	1.53	0.090	SPO1554	1.16	0.186	SPO1553	0.93	0.945
SPO1557	1.41	0.186	SPO1557	1.44	0.022	SPO1557	0.96	0.025	SPO1559	0.96	0.172	SPO1556	0.50	0.004	SPO1555	0.23	0.031	SPO1555	0.93	0.932	SPO1554	1.03	0.966
SPO1558	1.12	0.474	SPO1558	1.24	0.447	SPO1558	0.81	0.799	SPO1560	0.99	0.397	SPO1557	0.33	0.005	SPO1556	0.51	0.013	SPO1556	0.98	0.971	SPO1555	0.91	0.819
SPO1559	1.27	0.281	SPO1559	1.29	0.016	SPO1559	0.84	0.009	SPO1561	0.89	0.87	SPO1558	0.78	0.513	SPO1557	0.31	0.001	SPO1557	1.08	0.789	SPO1556	1.01	0.924
SPO1560	1.58	0.169	SPO1560	1.5	0.015	SPO1560	0.93	0.192	SPO1562	0.99	0.429	SPO1559	0.53	0.041	SPO1558	0.71	0.410	SPO1558	0.93	0.678	SPO1557	0.99	0.987

SPO1561	1.07	0.148	SPO1561	1.04	0.722	SPO1561	0.82	0.619	SPO1563	0.97	0.176	SPO1560	1.25	0.025	SPO1559	0.48	0.058	SPO1559	1.09	0.666	SPO1558	0.97	0.944
SPO1562	0.71	0.081	SPO1562	0.73	0.057	SPO1562	0.55	0.74	SPO1564	0.89	0.268	SPO1561	0.95	0.848	SPO1560	1.16	0.145	SPO1560	1.00	0.943	SPO1559	1.11	0.744
SPO1563	0.83	0.19	SPO1563	0.99	0.767	SPO1563	0.93	0.905	SPO1565	0.69	0.365	SPO1562	0.87	0.016	SPO1561	0.97	0.709	SPO1561	1.12	0.711	SPO1560	1.04	0.638
SPO1564	0.42	0.081	SPO1564	0.43	0.024	SPO1564	0.78	0.021	SPO1566	1	0.813	SPO1563	1.14	0.503	SPO1562	0.93	0.322	SPO1562	0.99	0.858	SPO1561	1.09	0.715
SPO1565	0.26	0.001	SPO1565	0.33	0.006	SPO1565	0.91	0.015	SPO1567	0.78	0.532	SPO1564	2.61	0.093	SPO1563	0.94	0.339	SPO1563	1.15	0.179	SPO1562	0.93	0.599
SPO1566	0.83	0.174	SPO1566	0.85	0.666	SPO1566	0.73	0.986	SPO1568	0.96	0.209	SPO1565	4.37	0.003	SPO1564	2.59	0.146	SPO1564	1.35	0.251	SPO1563	1.22	0.055
SPO1567	0.42	0.123	SPO1567	0.51	0.028	SPO1567	0.85	0.604	SPO1569	0.78	0.123	SPO1566	1.12	0.675	SPO1565	3.88	0.006	SPO1565	1.56	0.022	SPO1564	1.32	0.363
SPO1568	0.42	0.022	SPO1568	0.44	0.004	SPO1568	0.81	0.668	SPO1570	0.98	0.048	SPO1567	1.19	0.292	SPO1566	0.93	0.719	SPO1566	0.92	0.562	SPO1565	1.54	0.093
SPO1569	0.31	0.023	SPO1569	0.32	0.021	SPO1569	0.75	0.231	SPO1571	0.66	0.793	SPO1568	1.70	0.064	SPO1567	1.14	0.575	SPO1567	1.04	0.747	SPO1566	0.90	0.630
SPO1570	0.44	0.028	SPO1570	0.53	0.012	SPO1570	0.92	0.172	SPO1572	0.98	0.1	SPO1569	2.22	0.035	SPO1568	1.80	0.013	SPO1568	1.22	0.349	SPO1567	1.18	0.213
SPO1571	0.96	0.756	SPO1571	0.83	0.075	SPO1571	0.95	0.04	SPO1573	0.95	0.053	SPO1570	2.27	0.000	SPO1569	2.14	0.020	SPO1569	1.31	0.172	SPO1568	1.34	0.102
SPO1572	0.93	0.822	SPO1572	0.93	0.845	SPO1572	0.88	0.222	SPO1574	0.99	0.042	SPO1571	1.27	0.168	SPO1570	2.80	0.005	SPO1570	1.20	0.451	SPO1569	1.37	0.099
SPO1573	1.1	0.615	SPO1573	1.28	0.02	SPO1573	0.91	0.16	SPO1575	0.78	0.032	SPO1572	0.74	0.154	SPO1571	1.47	0.049	SPO1571	1.14	0.209	SPO1570	1.38	0.038
SPO1574	0.65	0.033	SPO1574	0.71	0.086	SPO1574	0.88	0.031	SPO1576	0.84	0.892	SPO1573	1.81	0.006	SPO1572	0.70	0.059	SPO1572	1.36	0.069	SPO1571	1.16	0.090
SPO1575	0.53	0.259	SPO1575	0.57	0.038	SPO1575	0.95	0.018	SPO1577	0.82	0.997	SPO1574	1.16	0.165	SPO1573	1.80	0.005	SPO1573	1.25	0.284	SPO1572	1.26	0.176
SPO1576	0.67	0.774	SPO1576	0.73	0.863	SPO1576	0.95	0.814	SPO1578	0.88	0.949	SPO1575	1.85	0.046	SPO1574	1.10	0.075	SPO1574	0.93	0.359	SPO1573	1.08	0.670
SPO1577	0.93	0.313	SPO1577	0.85	0.44	SPO1577	0.88	0.698	SPO1579	0.95	0.382	SPO1576	1.24	0.859	SPO1575	1.84	0.031	SPO1575	1.07	0.740	SPO1574	1.01	0.953
SPO1578	1	0.76	SPO1578	1.04	0.734	SPO1578	0.83	0.937	SPO1580	0.89	0.717	SPO1577	1.30	0.069	SPO1576	1.29	0.745	SPO1576	0.98	0.989	SPO1575	1.16	0.218
SPO1579	0.52	0.149	SPO1579	0.55	0.178	SPO1579	0.77	0.442	SPO1581	0.96	0.324	SPO1578	1.04	0.917	SPO1577	1.63	0.068	SPO1577	1.28	0.258	SPO1576	1.01	0.989
SPO1580	0.61	0.017	SPO1580	0.68	0.037	SPO1580	0.71	0.499	SPO1582	0.96	0.964	SPO1579	1.32	0.265	SPO1578	1.03	0.832	SPO1578	1.07	0.900	SPO1577	1.15	0.626
SPO1581	0.47	0.321	SPO1581	0.75	0.044	SPO1581	0.79	0.688	SPO1583	0.99	0.819	SPO1580	1.12	0.130	SPO1579	1.29	0.252	SPO1579	0.94	0.800	SPO1578	0.89	0.584
SPO1582	0.79	0.723	SPO1582	0.84	0.718	SPO1582	0.85	0.861	SPO1584	0.88	0.904	SPO1581	1.26	0.248	SPO1580	1.05	0.710	SPO1580	0.99	0.910	SPO1579	0.98	0.937
SPO1583	1.47	0.343	SPO1583	1.41	0.274	SPO1583	0.93	0.675	SPO1585	0.98	0.986	SPO1582	0.88	0.805	SPO1581	1.44	0.213	SPO1581	1.03	0.959	SPO1580	0.98	0.775
SPO1584	0.79	0.889	SPO1584	0.84	0.936	SPO1584	0.79	0.925	SPO1586	0.99	0.554	SPO1583	0.98	0.929	SPO1582	0.86	0.608	SPO1582	0.97	0.882	SPO1581	1.00	0.828
SPO1585	1.14	0.908	SPO1585	1.06	0.924	SPO1585	0.89	0.986	SPO1587	0.97	0.428	SPO1584	1.26	0.844	SPO1583	0.92	0.910	SPO1583	1.03	0.951	SPO1582	0.90	0.741
SPO1586	0.9	0.62	SPO1586	0.89	0.83	SPO1586	0.92	0.676	SPO1588	0.96	0.177	SPO1585	0.86	0.935	SPO1584	1.66	0.716	SPO1584	0.91	0.966	SPO1583	0.95	0.929
SPO1587	0.93	0.984	SPO1587	0.9	0.905	SPO1587	0.83	0.623	SPO1589	0.99	0.489	SPO1586	1.02	0.835	SPO1585	0.85	0.939	SPO1585	0.88	0.921	SPO1584	0.92	0.969
SPO1588	1.14	0.273	SPO1588	1.21	0.062	SPO1588	0.75	0.245	SPO1590	0.67	0.836	SPO1587	0.37	0.087	SPO1586	1.13	0.631	SPO1586	0.96	0.274	SPO1585	0.87	0.943
SPO1589	0.75	0.183	SPO1589	0.78	0.162	SPO1589	0.69	0.198	SPO1591	0.79	0.455	SPO1588	1.41	0.421	SPO1587	0.23	0.113	SPO1587	1.06	0.968	SPO1586	1.00	0.902
SPO1590	1.11	0.487	SPO1590	1.06	0.316	SPO1590	0.92	0.948	SPO1592	1	0.545	SPO1589	1.10	0.360	SPO1588	1.84	0.257	SPO1588	1.18	0.710	SPO1587	0.98	0.965
SPO1591	0.92	0.323	SPO1591	0.94	0.917	SPO1591	0.88	0.067	SPO1593	0.89	0.18	SPO1590	1.23	0.474	SPO1589	1.12	0.190	SPO1589	0.95	0.565	SPO1588	1.13	0.325
SPO1592	0.88	0.919	SPO1592	0.89	0.79	SPO1592	0.94	0.781	SPO1594	0.92	0.957	SPO1591	1.36	0.216	SPO1590	1.18	0.136	SPO1590	0.89	0.561	SPO1589	0.93	0.745
SPO1593	0.53	0.159	SPO1593	0.57	0.245	SPO1593	0.96	0.057	SPO1595	0.94	0.352	SPO1592	1.00	0.903	SPO1591	1.23	0.042	SPO1591	1.01	0.943	SPO1590	0.89	0.534
SPO1594	1.19	0.711	SPO1594	1.14	0.812	SPO1594	0.9	0.939	SPO1596	0.97	0.727	SPO1593	5.62	0.028	SPO1592	0.94	0.722	SPO1592	0.89	0.828	SPO1591	1.05	0.734
SPO1595	0.69	0.438	SPO1595	0.64	0.475	SPO1595	0.93	0.14	SPO1597	0.77	0.406	SPO1594	1.14	0.907	SPO1593	5.49	0.085	SPO1593	1.18	0.807	SPO1592	0.92	0.690
SPO1596	0.75	0.528	SPO1596	0.71	0.584	SPO1596	0.83	0.662	SPO1598	0.96	0.518	SPO1595	1.64	0.322	SPO1594	1.21	0.867	SPO1594	0.83	0.809	SPO1593	1.14	0.874
SPO1597	0.94	0.74	SPO1597	0.87	0.187	SPO1597	0.81	0.731	SPO1599	0.78	0.991	SPO1596	1.94	0.026	SPO1595	1.39	0.373	SPO1595	1.32	0.751	SPO1594	0.95	0.935
SPO1598	1.03	0.795	SPO1598	1	0.804	SPO1598	0.86	0.916	SPO1600	0.89	0.875	SPO1597	0.78	0.184	SPO1596	1.57	0.319	SPO1596	1.11	0.402	SPO1595	1.17	0.837
SPO1599	0.69	0.135	SPO1599	0.99	0.969	SPO1599	0.71	0.778	SPO1601	0.93	0.256	SPO1598	0.93	0.830	SPO1597	0.84	0.152	SPO1597	0.89	0.515	SPO1596	0.99	0.984
SPO1600	1.14	0.431	SPO1600	1.05	0.39	SPO1600	0.67	0.855	SPO1602	0.95	0.995	SPO1599	0.73	0.739	SPO1598	0.99	0.851	SPO1598	1.01	0.999	SPO1597	0.94	0.360
SPO1601	1.12	0.688	SPO1601	1.04	0.499	SPO1601	0.59	0.604	SPO1603	0.55	0.481	SPO1600	0.86	0.306	SPO1599	0.57	0.325	SPO1599	0.89	0.417	SPO1598	0.96	0.833
SPO1602	0.9	0.203	SPO1602	0.96	0.907	SPO1602	0.96	0.797	SPO1604	0.75	0.81	SPO1601	0.83	0.184	SPO1600	0.96	0.698	SPO1600	1.11	0.779	SPO1599	0.91	0.765
SPO1603	0.73	0.455	SPO1603	0.79	0.083	SPO1603	0.88	0.828	SPO1605	0.92	0.035	SPO1602	0.96	0.798	SPO1601	0.67	0.063	SPO1601	1.03	0.963	SPO1600	1.07	0.904
SPO1604	1.03	0.924	SPO1604	0.99	0.959	SPO1604	0.86	0.99	SPO1606	0.99	0.387	SPO1603	0.99	0.778	SPO1602	0.97	0.517	SPO1602	0.95	0.744	SPO1601	1.02	0.998
SPO1605	0.68	0.051	SPO1605	0.74	0.038	SPO1605	0.88	0.05	SPO1607	0.69	0.245	SPO1604	0.40	0.286	SPO1603	0.99	0.295	SPO1603	0.90	0.608	SPO1602	0.99	0.911
SPO1606	0.68	0.161	SPO1606	0.74	0.275	SPO1606	0.9	0.731	SPO1608	0.8	0.927	SPO1605	1.46	0.033	SPO1604	0.44	0.347	SPO1604	0.85	0.859	SPO1603	1.10	0.525
SPO1607	0.5	0.09	SPO1607	0.52	0.039	SPO1607	0.78	0.185	SPO1609	0.84	0.901	SPO1606	1.09	0.189	SPO1605	1.49	0.004	SPO1605	1.30	0.217	SPO1604	0.91	0.907
SPO1608	1.09	0.824	SPO1608	0.94	0.998	SPO1608	0.95	0.955	SPO1610	0.7	0.105	SPO1607	1.91	0.092	SPO1606	0.98	0.702	SPO1606	0.99	0.915	SPO1605	1.23	0.092
SPO1609	0.62	0.615	SPO1609	0.64	0.706	SPO1609	0.91	0.993	SPO1611	1	0.961	SPO1608	1.02	0.968	SPO1607	1.90	0.077	SPO1607	1.19	0.482	SPO1606	1.00	0.572
SPO1610	1.16	0.069	SPO1610	1.11	0.128	SPO1610	0.96	0.586	SPO1612	0.97	0.653	SPO1609	1.48	0.426	SPO1608	0.93	0.746	SPO1608	0.98	0.928	SPO1607	1.14	0.327
SPO1611	0.98	0.992	SPO1611	0.98	0.992	SPO1611	0.81	0.938	SPO1613	0.86	0.89	SPO1610	1.19	0.296	SPO1609	1.77	0.461	SPO1609	0.90	0.758	SPO1608	1.01	0.994
SPO1612	0.95	0.825	SPO1612	1.06	0.679	SPO1612	0.66	0.955	SPO1614	0.92	0.978	SPO1611	0.91	0.989	SPO1610	1.50	0.029	SPO1610	1.10	0.793	SPO1609	0.95	0.954
SPO1613	1.26	0.135	SPO1613	1.1	0.643	SPO1613	0.89	0.747	SPO1615	0.85	0.605	SPO1612	1.09	0.994	SPO1611	1.02	0.974	SPO1611	0.85	0.936	SPO1610	1.07	0.653
SPO1614	1.02	0.979	SPO1614	0.93	0.977	SPO1614	0.91	0.983	SPO1616	0.91	0.37	SPO1613	0.97	0.546	SPO1612	1.04	0.735	SPO1612	1.07	0.968	SPO1611	0.86	0.945
SPO1615	1.18	0.338	SPO1615	1.12	0.391	SPO1615	0.85	0.816	SPO1617	0.88	0.673	SPO1614	0.89	0.972	SPO1613	1.00	0.419	SPO1613	0.97	0.882	SPO1612	1.14	0.858
SPO1616	1.28	0.136	SPO1616	1.36	0.179	SPO1616	0.94	0.213	SPO1618	0.83	0.997	SPO1615	1.40	0.040	SPO1614	1.06	0.894	SPO1614	0.89	0.945	SPO1613	0.94	0.597
SPO1617	0.88	0.878	SPO1617	0.98	0.939	SPO1617	0.83	0.673	SPO1619	0.79	0.783	SPO1616	0.85	0.567	SPO1615	1.42	0.050	SPO1615	1.36	0.230	SPO1614	0.93	0.938
SPO1618	0.9	0.854	SPO1618	0.85	0.807	SPO1618	0.83	0.043	SPO1620	0.81	0.438	SPO1617	0.96	0.291	SPO1616	0.86	0.166	SPO1616	0.81	0.410	SPO1615	1.23	0.324
SPO1620	0.82	0.346	SPO1619	1	0.848	SPO1619	0.85	0	SPO1621	0.64	0.831	SPO1618	1.03	0.948	SPO1617	0.76	0.373	SPO1617	0.62	0.173	SPO1616	0.86	0.591
SPO1621	0.86	0.494	SPO1620	0.84	0.649	SPO1620	0.91	0.403	SPO1622	0.81	0.224	SPO1619	0.82	0.468	SPO1618	1.29	0.223	SPO1618	1.06	0.956	SPO1617	0.77	0.417
SPO1622	0.74	0.207	SPO1621	0.92	0.462	SPO1621	0.93	0.823	SPO1623	0.87	0.684	SPO1620	1.41	0.051	SPO1619	1.04	0.751	SPO1620	1.13	0.490	SPO1618	1.02	0.966
SPO1623	1.17	0.099	SPO1622	0.79	0.111	SPO1622	0.96	0.122	SPO1624	0.94	0.53	SPO1621	0.90	0.682	SPO1620	1.55	0.098	SPO1621	1.03	0.799	SPO1619	0.83	[redacted]
SPO1624	1.33	0.187	SPO1623	1.21	0.358	SPO1623	0.9	0.432	SPO1625	0.76	0.893	SPO1622	1.28	0.215	SPO1621	0.93	0.980	SPO1622	1.11	0.589	SPO1620	1.08	0.701
SPO1625	1.14	0.67	SPO1624	1.29	0.027	SPO1624	0.99	0.785	SPO1626	0.91	0.103	SPO1623	0.71	0.219	SPO1622	1.35	0.116	SPO1623	0.99	0.962	SPO1621	0.97	0.955
SPO1626	1.24	0.054	SPO1625	1.1	0.79	SPO1625	0.92	0.861	SPO1627	0.94	0.995	SPO1624	0.88	0.541	SPO1623	0.62	0.027	SPO1624	1.10	0.814	SPO1622	1.09	0.390
SPO1627	0.91	0.81	SPO1626	1.23	0.036	SPO1626	0.93	0.108	SPO1628	0.98	0.545	SPO1625	0.53	0.298	SPO1624	1.02	0.673	SPO1625	0.85	0.812	SPO1623	0.85	0.186
SPO1628	0.57	0.076	SPO1627	0.94	0.94	SPO1627	0.93	0.432	SPO1629	0.78	0.838	SPO1626	0.78	0.089	SPO1625	0.52	0.268	SPO1626	1.22	0.235	SPO1624	1.02	0.915
SPO1629	1.07	0.419	SPO1628	0.58	0.041	SPO1628	0.9	0.659	SPO1630	0.75	0.535	SPO1627	0.91	0.484	SPO1626	0.80	0.309	SPO1627	0.99	0.974	SPO1625	0.85	0.806
SPO1630	1.55	0.036	SPO1629	1.08	0.572	SPO1629	0.81	0.649	SPO1631	0.75	0.51	SPO1628	0.70	0.161	SPO1627	1.01	0.926	SPO1628	0.94	0.646	SPO1626	1.23	0.201
SPO1631	1.09	0.563	SPO1630	1.4	0.063	SPO1630	0.87	0.647	SPO1632	0.97	0.841	SPO1629	0.88	0.451	SPO1628	0.71	0.120	SPO1629	1.00	0.958	SPO1627	0.86	0.800
SPO1632	0.95	0.898	SPO1631	1.16	0.077	SPO1631	0.43	0.213	SPO1633	0.99	0.998	SPO1630	0.76	0.336	SPO1629	0.76	0.298	SPO1630	1.04	0.852	SPO1628	0.98	0.581
SPO1633	0.99	0.744	SPO1632	1.01	0.888	SPO1632	0.83	0.845	SPO1634	0.88	0.866	SPO1631	0.87	0.621	SPO1630	0.73	0.049	SPO1631	1.04	0.818	SPO1629	1.01	0.987
SPO1634	1.27	0.091	SPO1633	1.76	0.069	SPO1633	0.97	0.307	SPO1635	0.95	0.777	SPO1632	1.67	0.026	SPO1631	0.85	0.561	SPO1632	0.83	0.169	SPO1630	1.05	0.774
SPO1635	1.2	0.157	SPO1634	1.37	0.021	SPO1634	0.98	0.875	SPO1636	0.94	0.932	SPO1633	0.53	0.059	SPO1632	1.60	0.101	SPO1633	1.79	0.319	SPO1631	0.93	0.734
SPO1636	1	0.98	SPO1635	1.09	0.382	SPO1635	0.91	0.592	SPO1637	0.93	0.231	SPO1634	1.19	0.300	SPO1633	0.78	0.092	SPO1634	1.17	0.443	SPO1632	0.88	0.742
SPO1637	0.67	0.031	SPO1636	1.01	0.922	SPO1636	0.83	0.848	SPO1638	0.83	0.757	SPO1635	0.76	0.661	SPO1634	1.13	0.049	SPO1635	0.92	0.847	SPO1633	1.31	0.504
SPO1638	1.31	0.152	SPO1637	0.83	0.295	SPO1637	0.94	0.397	SPO1639	0.95	0.695	SPO1636	1.03	0.766	SPO1635	0.68	0.473	SPO1636	0.94	0.949	SPO1634	1.03	0.481
SPO1639	1.55	0.1	SPO1638	1.33	0.1	SPO1638	1	0.431	SPO1640	0.75	0.908	SPO1637	1.26	0.065	SPO1636	0.96	0.901	SPO1637	1.06	0.439	SPO1635	0.88	0.780
SPO1640	1.04	0.593	SPO1639	1.32	0.127	SPO1639	0.76	0.819	SPO1641	0.68	0.54	SPO1638	1.05	0.497	SPO1637	1.18	0.066	SPO1638	0.93	0.784	SPO1636	0.93	0.921
SPO1641	0.76	0.124	SPO1640	1.05	0.14	SPO1640	0.85	0.858	SPO1642	0.54	0.806	SPO1639	1.30	0.058	SPO1638	1.10	0.636	SPO1639	1.10	0.704	SPO1637	1.11	0.376
SPO1642	0.98	0.967	SPO1641	0.83	0.125	SPO1641	0.94	0.084	SPO1643	0.93	0.237	SPO1640	1.30	0.337	SPO1639	1.25	0.106	SPO1640	1.24	0.695	SPO1638	0.83	0.689
SPO1643	0.68	0.35	SPO1642	0.86	0.653	SPO1642	0.87	0.101	SPO1644	0.83	0.903	SPO1641	1.22	0.230	SPO1640	1.44	0.020	SPO1641	1.04	0.853	SPO1639	1.02	0.923
SPO1644	0.87	0.933	SPO1643	0.75	0.257	SPO1643	0.92	0.454	SPO1645	0.83	0.783	SPO1642	1.24	0.440	SPO1641	1.16	0.157	SPO1642	1.25	0.687	SPO1640	1.14	0.567
SPO1645	1.01	0.6	SPO1644	0.93	0.99	SPO1644	0.93	0.893	SPO1646	0.96	0.984	SPO1643	1.17	0.146	SPO1642	1.10	0.527	SPO1643	1.21	0.287	SPO1641	1.18	0.450
SPO1646	0.93	0.966	SPO1645	1.12	0.387	SPO1645	0.92	0.546	SPO1647	0.81	0.911	SPO1644	1.02	0.972	SPO1643	1.16	0.111	SPO1644	0.89	0.868	SPO1642	1.02	0.958
SPO1647	0.93	0.908	SPO1646	0.93	1	SPO1646	0.93	0.93	SPO1648	0.83	0.634	SPO1645	0.94	0.701	SPO1644	0.89	0.862	SPO1645	1.10	0.791	SPO1643	1.33	0.295
SPO1648	1.07	0.708	SPO1647	0.96	0.905	SPO1647	0.96	0.949	SPO1649	0.79	0.422	SPO1646	0.88	0.770	SPO1645	1.08	0.867	SPO1646	0.87	0.727	SPO1644	0.90	0.913
SPO1649	1.26	0.025	SPO1648	1.04	0.746	SPO1648	0.9	0.72	SPO1650	0.61	0.637	SPO1647	1.12	0.735	SPO1646	0.93	0.477	SPO1647	1.09	0.628	SPO1645	1.03	0.987
SPO1650	0.92	0.694	SPO1649	1.32	0.139	SPO1649	0.91	0.827	SPO1651	0.93	0.359	SPO1648	1.04	0.893	SPO1647	1.14	0.499	SPO1648	1.01	0.856	SPO1646	0.86	0.787
SPO1651	1.03	0.766	SPO1650	1.13	0.274	SPO1650	0.86	0.96	SPO1652	0.92	0.326	SPO1649	0.91	0.057	SPO1648	1.07	0.916	SPO1649	1.27	0.150	SPO1647	1.04	0.937
SPO1652	0.83	0.606	SPO1651	1.02	0.513	SPO1651	0.72	0.823	SPO1655	0.89	0.599	SPO1650	0.58	0.009	SPO1649	1.21	0.337	SPO1650	0.69	0.074	SPO1648	0.97	0.820
SPO1655	1.11	0.781	SPO1652	0.78	0.271	SPO1652	0.9	0.434	SPO1656	0.92	0.908	SPO1651	0.73	0.281	SPO1650	0.59	0.130	SPO1651	0.79	0.397	SPO1649	1.05	0.921
SPO1656	0.85	0.28	SPO1655	1.14	0.799	SPO1655	0.94	0.989	SPO1657	0.83	0.394	SPO1652	1.32	0.467	SPO1651	0.79	0.088	SPO1652	1.12	0.869	SPO1650	0.79	0.191
SPO1657	1.11	0.253	SPO1656	0.81	0.307	SPO1656	0.88	0.838	SPO1658	0.8	0.717	SPO1655	0.92	0.825	SPO1652	1.42	0.342	SPO1655	0.84	0.599	SPO1651	0.84	0.483
SPO1658	0.75	0.292	SPO1657	0.96	0.865	SPO1657	0.85	0.061	SPO1659	0.86	0.93	SPO1656	1.42	0.033	SPO1655	0.90	0.762	SPO1656	0.89	0.484	SPO1652	1.44	0.065
SPO1659	0.45	0.021	SPO1658	0.74	0.344	SPO1658	0.83	0.728	SPO1660	0.94	0.937	SPO1657	1.06	0.157	SPO1656	1.40	0.038	SPO1657	0.85	0.121	SPO1655	0.94	0.866
SPO1660	1.21	0.659	SPO1659	0.65	0.036	SPO1659	0.78	0.691	SPO1661	0.9	0.873	SPO1658	2.15	0.108	SPO1657	1.06	0.079	SPO1658	0.96	0.951	SPO1656	0.94	0.642
SPO1661	1.29	0.626	SPO1660	1.22	0.585	SPO1660	0.85	0.892	SPO1662	0.84	0.431	SPO1659	1.15	0.021	SPO1658	2.04	0.126	SPO1659	1.21	0.024	SPO1657	0.88	0.394
SPO1662	0.78	0.268	SPO1661	1.32	0.728	SPO1661	0.81	0.91	SPO1663	0.86	0.594	SPO1660	0.97	0.931	SPO1659	0.99	0.240	SPO1660	1.04	0.987	SPO1658	0.96	0.932
SPO1663	1.09	0.698	SPO1662	0.77	0.619	SPO1662	0.88	0.534	SPO1664	0.97	0.914	SPO1661	0.86	0.898	SPO1660	1.11	0.947	SPO1661	0.93	0.912	SPO1659	1.29	0.018
SPO1664	0.99	0.785	SPO1663	1.04	0.815	SPO1663	0.91	0.687	SPO1665	0.89	0.563	SPO1662	0.67	0.215	SPO1661	0.84	0.875	SPO1662	0.97	0.988	SPO1660	0.96	0.946
SPO1665	1.66	0.037	SPO1664	1.1	0.285	SPO1664	0.79	0.842	SPO1666	0.95	0.364	SPO1663	1.06	0.676	SPO1662	0.65	0.249	SPO1663	1.07	0.793	SPO1661	0.99	0.987
SPO1666	1.5	0.082	SPO1665	1.49	0.045	SPO1665	0.73	0.483	SPO1667	0.98	0.383	SPO1664	0.95	0.162	SPO1663	1.12	0.556	SPO1664	1.01	0.642	SPO1662	0.93	0.860
SPO1667	0.83	0.025	SPO1666	1.28	0.194	SPO1666	0.76	0.113	SPO1668	0.82	0.987	SPO1665	0.92	0.515	SPO1664	0.87	0.722	SPO1665	1.00	0.500	SPO1663	1.03	0.879
SPO1668	1.6	0.567	SPO1667	0.93	0.736	SPO1667	0.97	0.348	SPO1669	0.88	0.619	SPO1666	0.81	0.090	SPO1665	0.98	0.269	SPO1666	0.85	0.281	SPO1664	0.99	0.774
SPO1669	1.78	0.031	SPO1668	1.23	0.823	SPO1668	0.83	0.973	SPO1670	0.43	0.179	SPO1667	2.08	0.007	SPO1666	0.81	0.199	SPO1667	1.01	0.307	SPO1665	0.97	0.956
SPO1670	1.46	0.013	SPO1669	1.37	0.018	SPO1669	0.63	0.872	SPO1671	0.83	0.078	SPO1668	0.78	0.916	SPO1667	2.24	0.007	SPO1668	1.10	0.938	SPO1666	0.92	0.292
SPO1671	1.28	0.048	SPO1670	1.26	0.143	SPO1670	0.98	0.027	SPO1672	0.95	0.453	SPO1669	0.69	0.428	SPO1668	0.70	0.826	SPO1669	0.86	0.777	SPO1667	1.03	0.346
SPO1672	0.89	0.396	SPO1671	1.23	0.052	SPO1671	0.96	0.058	SPO1673	0.94	0.192	SPO1670	0.77	0.079	SPO1669	0.68	0.475	SPO1670	0.95	0.761	SPO1668	1.04	0.940
SPO1673	1.72	0.004	SPO1672	0.79	0.123	SPO1672	0.93	0.263	SPO1674	0.92	0.871	SPO1671	0.84	0.284	SPO1670	0.85	0.652	SPO1671	1.02	0.595	SPO1669	0.70	0.195
SPO1674	1.74	0.317	SPO1673	1.48	0.003	SPO1673	0.71	0.214	SPO1675	0.78	0.447	SPO1672	0.88	0.852	SPO1671	0.85	0.544	SPO1672	1.04	0.714	SPO1670	0.98	0.926
SPO1675	1.3	0.308	SPO1674	1.55	0.533	SPO1674	1	0.952	SPO1676	0.93	0.505	SPO1673	0.76	0.063	SPO1672	1.06	0.462	SPO1673	1.13	0.068	SPO1671	0.94	0.562
SPO1676	1.22	0.216	SPO1675	1.29	0.023	SPO1675	0.88	0.139	SPO1677	0.94	0.171	SPO1674	0.63	0.619	SPO1673	0.78	0.145	SPO1674	0.90	0.903	SPO1672	1.05	0.843
SPO1677	1.06	0.875	SPO1676	1.16	0.064	SPO1676	0.83	0.631	SPO1678	0.65	0.156	SPO1675	1.51	0.013	SPO1674	0.60	0.577	SPO1675	1.13	0.777	SPO1673	1.04	0.322
SPO1678	0.62	0.323	SPO1677	1.14	0.418	SPO1677	0.8	0.253	SPO1679	0.88	0.508	SPO1676	1.03	0.640	SPO1675	1.49	0.024	SPO1676	1.06	0.765	SPO1674	0.86	0.827
SPO1679	0.63	0.096	SPO1678	0.65	0.012	SPO1678	0.96	0.602	SPO1680	0.83	0.866	SPO1677	0.87	0.983	SPO1676	1.09	0.268	SPO1677	0.98	0.998	SPO1675	1.11	0.682
SPO1680	1.01	0.972	SPO1679	0.68	0.496	SPO1679	0.83	0.564	SPO1681	0.98	0.87	SPO1678	0.90	0.307	SPO1677	0.85	0.907	SPO1678	1.24	0.385	SPO1676	1.04	0.857
SPO1681	1.07	0.741	SPO1680	1.03	0.709	SPO1680	0.79	0.823	SPO1682	0.93	0.009	SPO1679	0.27	0.016	SPO1678	0.89	0.121	SPO1679	0.84	0.575	SPO1677	0.95	0.944
SPO1682	0.44	0.007	SPO1681	1.15	0.596	SPO1681	0.93	0.737	SPO1683	0.91	0.674	SPO1680	0.95	0.835	SPO1679	0.36	0.207	SPO1680	0.92	0.822	SPO1678	1.25	0.247
SPO1683	1.24	0.606	SPO1682	0.43	0.011	SPO1682	0.96	0.065	SPO1684	0.95	0.11	SPO1681	1.15	0.599	SPO1680	0.88	0.951	SPO1681	1.17	0.598	SPO1679	0.96	0.959
SPO1684	1.59	0.04	SPO1683	1.1	0.778	SPO1683	0.98	0.688	SPO1685	0.98	0.5	SPO1682	1.92	0.014	SPO1681	1.12	0.733	SPO1682	2.59	0.010	SPO1680	0.93	0.849
SPO1685	1.23	0.007	SPO1684	1.38	0.056	SPO1684	0.81	0.642	SPO1686	0.95	0.64	SPO1683	0.63	0.398	SPO1682	1.99	0.012	SPO1683	1.03	0.916	SPO1681	1.04	0.954
SPO1686	1.33	0.567	SPO1685	1.29	0.008	SPO1685	0.97	0.933	SPO1687	0.81	0.296	SPO1684	0.55	0.084	SPO1683	0.68	0.537	SPO1684	0.86	0.511	SPO1682	2.55	0.009
SPO1687	0.67	0.059	SPO1686	1.31	0.46	SPO1686	0.92	0.823	SPO1688	0.88	0.073	SPO1685	1.10	0.539	SPO1684	0.53	0.001	SPO1685	1.22	0.205	SPO1683	0.99	0.992
SPO1688	1.33	0.012	SPO1687	0.77	0.031	SPO1687	0.93	0.351	SPO1689	0.74	0.021	SPO1686	1.32	0.498	SPO1685	0.99	0.931	SPO1686	1.18	0.729	SPO1684	0.87	0.314
SPO1689	0.98	0.627	SPO1688	1.2	0.013	SPO1688	0.88	0.295	SPO1690	0.96	0.664	SPO1687	1.29	0.093	SPO1686	1.39	0.385	SPO1687	1.03	0.452	SPO1685	1.17	0.139
SPO1690	1.17	0.507	SPO1689	0.93	0.612	SPO1689	0.95	0.574	SPO1691	0.93	0.342	SPO1688	0.79	0.078	SPO1687	1.28	0.014	SPO1688	1.02	0.797	SPO1686	1.12	0.756
SPO1691	0.91	0.323	SPO1690	1.04	0.657	SPO1690	0.72	0.494	SPO1692	0.81	0.547	SPO1689	0.09	0.001	SPO1688	0.84	0.036	SPO1689	1.16	0.195	SPO1687	1.07	0.332
SPO1692	2.09	0.127	SPO1691	1.14	0.471	SPO1691	0.85	0.207	SPO1693	0.88	0.925	SPO1690	0.45	0.068	SPO1689	0.08	0.002	SPO1690	1.16	0.708	SPO1688	0.96	0.513
SPO1693	0.6	0.013	SPO1692	2.01	0.166	SPO1692	0.83	0.591	SPO1694	0.82	0.168	SPO1691	2.13	0.004	SPO1690	0.47	0.024	SPO1691	1.26	0.474	SPO1689	1.14	0.061
SPO1694	0.61	0.088	SPO1693	0.6	0.066	SPO1693	0.88	0.66	SPO1695	0.78	0.738	SPO1692	1.01	0.618	SPO1691	1.93	0.001	SPO1692	1.31	0.490	SPO1690	1.11	0.453
SPO1695	0.71	0.069	SPO1694	0.59	0.035	SPO1694	0.99	0.612	SPO1696	0.92	0.015	SPO1693	1.01	0.428	SPO1692	1.09	0.349	SPO1693	0.87	0.065	SPO1691	1.20	0.267
SPO1696	0.97	0.808	SPO1695	0.83	0.484	SPO1695	0.65	0.883	SPO1697	0.81	0.243	SPO1694	1.54	0.044	SPO1693	1.01	0.383	SPO1694	1.10	0.316	SPO1692	1.09	0.762
SPO1697	0.75	0.324	SPO1696	0.9	0.194	SPO1696	0.9	0.026	SPO1698	0.88	0.662	SPO1695	1.59	0.070	SPO1694	1.54	0.065	SPO1695	1.24	0.493	SPO1693	0.84	0.338
SPO1698	0.85	0.611	SPO1697	0.77	0.295	SPO1697	0.94	0.05	SPO1699	0.88	0.095	SPO1696	1.15	0.048	SPO1695	1.67	0.110	SPO1696	1.10	0.442	SPO1694	1.16	0.128
SPO1699	0.58	0.007	SPO1698	0.9	0.563	SPO1698	0.92	0.722	SPO1700	0.79	0.171	SPO1697	1.38	0.266	SPO1696	1.12	0.287	SPO1697	1.08	0.837	SPO1695	1.29	0.369
SPO1700	0.58	0.016	SPO1699	0.64	0.035	SPO1699	0.96	0.089	SPO1701	0.75	0.481	SPO1698	0.99	0.964	SPO1697	1.20	0.151	SPO1698	1.13	0.637	SPO1696	1.12	0.155
SPO1701	0.63	0.162	SPO1700	0.65	0.036	SPO1700	0.76	0.075	SPO1702	0.7	0.383	SPO1699	1.31	0.022	SPO1698	0.98	0.911	SPO1699	1.05	0.117	SPO1697	1.02	0.948
SPO1702	0.89	0.51	SPO1701	0.73	0.331	SPO1701	0.95	0.75	SPO1703	0.94	0.661	SPO1700	1.20	0.294	SPO1699	1.32	0.193	SPO1700	1.11	0.407	SPO1698	1.15	0.510

SPO1703	0.77	0.715	SPO1702	0.98	0.682	SPO1702	0.85	0.138	SPO1704	0.99	0.957	SPO1701	1.21	0.229	SPO1700	1.19	0.137	SPO1701	1.06	0.757	SPO1699	1.15	0.284
SPO1704	1.05	0.868	SPO1703	0.79	0.674	SPO1703	0.86	0.899	SPO1705	0.68	0.824	SPO1702	0.98	0.590	SPO1701	1.07	0.700	SPO1702	1.10	0.781	SPO1700	1.08	0.518
SPO1705	0.59	0.529	SPO1704	1	0.904	SPO1704	0.93	0.776	SPO1707	0.92	0.934	SPO1703	1.41	0.591	SPO1702	1.06	0.940	SPO1703	0.99	0.962	SPO1701	1.03	0.857
SPO1707	0.95	0.992	SPO1705	0.62	0.479	SPO1705	0.85	0.759	SPO1708	0.95	0.089	SPO1704	1.18	0.806	SPO1703	1.31	0.655	SPO1704	1.04	0.973	SPO1702	1.04	0.725
SPO1708	0.69	0.325	SPO1707	0.9	0.872	SPO1707	0.9	0.908	SPO1709	0.94	0.997	SPO1705	1.35	0.641	SPO1704	1.06	0.995	SPO1705	1.11	0.881	SPO1703	1.19	0.855
SPO1709	0.92	0.977	SPO1708	0.52	0.028	SPO1708	0.94	0.426	SPO1711	0.68	0.43	SPO1707	0.80	0.509	SPO1705	1.19	0.808	SPO1707	0.86	0.645	SPO1704	0.94	0.910
SPO1711	1.03	0	SPO1709	0.94	0.995	SPO1709	0.98	0.951	SPO1712	0.99	0.569	SPO1708	1.54	0.189	SPO1707	0.74	0.345	SPO1708	1.17	0.634	SPO1705	1.13	0.891
SPO1712	0.83	0.094	SPO1711	0.97	0.842	SPO1711	0.93	0.65	SPO1713	0.98	0.262	SPO1709	0.67	0.861	SPO1708	1.47	0.060	SPO1709	0.52	0.702	SPO1707	0.84	0.515
SPO1713	0.74	0.609	SPO1712	0.96	0.907	SPO1712	0.97	0.617	SPO1714	0.66	0.934	SPO1711	0.57	0.243	SPO1709	0.77	0.851	SPO1710	2.30		SPO1708	1.23	0.501
SPO1714	0.77	0.547	SPO1713	0.83	0.825	SPO1713	0.92	0.671	SPO1715	0.69	0.808	SPO1712	0.88	0.183	SPO1710	1.07		SPO1711	0.86	0.695	SPO1709	0.78	0.792
SPO1715	0.85	0.94	SPO1714	0.93	0.985	SPO1714	0.95	0.892	SPO1716	0.89	0.033	SPO1713	0.66	0.548	SPO1711	0.65	0.185	SPO1712	1.15	0.616	SPO1710	1.28	0.430
SPO1716	0.63	0.235	SPO1715	0.95	0.979	SPO1715	0.99	0.979	SPO1717	0.96	0.195	SPO1714	0.97	0.828	SPO1712	0.94	0.446	SPO1713	0.99	0.976	SPO1711	0.79	0.689
SPO1717	1.01	0.652	SPO1716	0.69	0.047	SPO1716	0.98	0.042	SPO1718	0.82	0.128	SPO1715	0.83	0.712	SPO1713	0.63	0.325	SPO1714	1.13	0.912	SPO1712	1.08	0.627
SPO1718	0.71	0.102	SPO1717	0.97	0.334	SPO1717	1.01	0.398	SPO1719	0.78	0.953	SPO1716	1.72	0.191	SPO1714	0.81	0.704	SPO1715	0.99	0.904	SPO1713	1.05	0.841
SPO1719	1.15	0.666	SPO1718	0.75	0.192	SPO1718	0.74	0.039	SPO1720	0.92	0.965	SPO1717	0.95	0.676	SPO1715	0.76	0.415	SPO1716	1.24	0.475	SPO1714	1.03	0.993
SPO1720	1.13	0.849	SPO1719	1.18	0.634	SPO1719	0.93	0.621	SPO1721	0.89	0.401	SPO1718	3.35	0.010	SPO1716	1.47	0.079	SPO1717	1.05	0.968	SPO1715	1.03	0.992
SPO1721	0.83	0.65	SPO1720	1.07	0.899	SPO1720	0.73	0.981	SPO1722	0.92	0.224	SPO1719	1.08	0.970	SPO1717	1.11	0.832	SPO1718	2.00	0.010	SPO1716	1.22	0.601
SPO1722	0.83	0.496	SPO1721	0.86	0.776	SPO1721	0.88	0.453	SPO1723	0.83	0.298	SPO1720	0.96	1.000	SPO1718	2.33	0.022	SPO1719	1.14	0.725	SPO1717	1.15	0.459
SPO1723	0.94	0.818	SPO1722	0.86	0.42	SPO1722	0.99	0.195	SPO1724	0.96	0.98	SPO1721	1.80	0.173	SPO1719	1.19	0.826	SPO1720	0.88	0.890	SPO1718	1.74	0.044
SPO1724	1.11	0.871	SPO1723	0.93	0.832	SPO1723	0.97	0.129	SPO1725	0.98	0.83	SPO1722	2.18	0.003	SPO1720	0.93	0.978	SPO1721	1.01	0.970	SPO1719	1.24	0.785
SPO1725	0.86	0.522	SPO1724	1.19	0.701	SPO1724	0.88	0.935	SPO1727	0.99	0.95	SPO1723	2.08	0.015	SPO1721	1.68	0.212	SPO1722	1.24	0.180	SPO1720	0.98	0.978
SPO1727	0.93	0.643	SPO1725	0.91	0.587	SPO1725	0.63	0.98	SPO1728	0.64	0.742	SPO1724	0.79	0.873	SPO1722	2.48	0.013	SPO1723	1.02	0.746	SPO1721	1.00	0.978
SPO1728	1.2	0.142	SPO1727	0.93	0.661	SPO1727	0.91	0.997	SPO1729	0.85	0.184	SPO1725	1.04	0.267	SPO1723	2.04	0.124	SPO1724	0.89	0.906	SPO1722	1.16	0.551
SPO1729	0.75	0.028	SPO1728	1.19	0.184	SPO1728	0.94	0.774	SPO1732	0.98	0.43	SPO1727	0.98	0.618	SPO1724	0.67	0.569	SPO1725	1.00	0.955	SPO1723	0.98	0.979
SPO1732	1.42	0.022	SPO1729	0.81	0.202	SPO1729	0.87	0.282	SPO1733	0.96	0.652	SPO1728	1.05	0.368	SPO1725	0.99	0.627	SPO1727	1.03	0.608	SPO1724	0.84	0.518
SPO1733	1.66	0.064	SPO1732	1.39	0.071	SPO1732	0.87	0.25	SPO1734	0.77	0.62	SPO1729	1.14	0.169	SPO1727	0.96	0.438	SPO1728	1.09	0.081	SPO1725	0.96	0.939
SPO1734	1.37	0.112	SPO1733	1.35	0.116	SPO1733	0.72	0.046	SPO1735	0.79	0.441	SPO1732	0.95	0.866	SPO1728	1.02	0.481	SPO1729	1.04	0.842	SPO1727	1.07	0.491
SPO1735	0.78	0.27	SPO1734	1.28	0.056	SPO1734	0.86	0.52	SPO1736	0.85	0.089	SPO1733	0.65	0.012	SPO1729	1.16	0.056	SPO1732	1.14	0.702	SPO1728	1.05	0.738
SPO1736	1.14	0.724	SPO1735	0.82	0.286	SPO1735	0.96	0.817	SPO1737	0.89	0.465	SPO1734	1.07	0.494	SPO1732	0.95	0.752	SPO1733	1.17	0.532	SPO1729	1.09	0.520
SPO1737	1.05	0.532	SPO1736	1.19	0.388	SPO1736	0.79	0.541	SPO1738	0.97	0.867	SPO1735	1.01	0.558	SPO1733	0.68	0.101	SPO1734	1.10	0.719	SPO1732	1.09	0.761
SPO1738	0.93	0.957	SPO1737	0.94	0.837	SPO1737	0.76	0.885	SPO1739	0.6	0.018	SPO1736	1.23	0.298	SPO1734	1.06	0.238	SPO1735	1.03	0.879	SPO1733	1.14	0.277
SPO1739	0.8	0.037	SPO1738	0.83	0.775	SPO1738	0.81	0.932	SPO1740	0.89	0.418	SPO1737	1.03	0.579	SPO1735	0.95	0.468	SPO1736	0.81	0.045	SPO1734	1.07	0.726
SPO1740	1.14	0.366	SPO1739	0.85	0.129	SPO1739	0.75	0.02	SPO1741	0.97	0.852	SPO1738	1.01	0.942	SPO1736	1.18	0.132	SPO1737	1.00	0.962	SPO1735	1.11	0.327
SPO1741	0.89	0.724	SPO1740	1.09	0.093	SPO1740	0.67	0.199	SPO1742	0.88	0.361	SPO1739	1.04	0.165	SPO1737	0.99	0.838	SPO1738	1.08	0.865	SPO1736	0.82	0.435
SPO1742	0.66	0.056	SPO1741	0.94	0.925	SPO1741	0.69	0.847	SPO1743	0.74	0.526	SPO1740	0.79	0.194	SPO1738	1.11	0.780	SPO1739	1.40	0.004	SPO1737	1.02	0.620
SPO1743	0.93	0.368	SPO1742	0.71	0.041	SPO1742	0.91	0.32	SPO1744	0.78	0.95	SPO1741	0.70	0.425	SPO1739	0.93	0.267	SPO1740	1.04	0.607	SPO1738	1.21	0.662
SPO1744	0.79	0.757	SPO1743	0.87	0.496	SPO1743	0.87	0.512	SPO1745	1	0.887	SPO1742	0.91	0.996	SPO1740	0.85	0.538	SPO1741	0.84	0.763	SPO1739	1.36	0.059
SPO1745	1.04	0.921	SPO1744	0.82	0.885	SPO1744	0.96	0.989	SPO1746	0.94	0.935	SPO1743	0.57	0.067	SPO1741	0.65	0.438	SPO1742	0.98	0.997	SPO1740	0.94	0.785
SPO1746	0.89	0.674	SPO1745	1	0.922	SPO1745	0.98	0.851	SPO1747	0.84	0.768	SPO1744	0.74	0.837	SPO1742	0.95	0.339	SPO1743	0.97	0.675	SPO1741	0.87	0.747
SPO1747	1.14	0.403	SPO1746	0.93	0.668	SPO1746	0.97	0.95	SPO1748	0.98	0.718	SPO1745	0.67	0.492	SPO1743	0.55	0.108	SPO1744	0.80	0.735	SPO1742	0.94	0.390
SPO1748	1.1	0.156	SPO1747	1.08	0.595	SPO1747	0.95	0.553	SPO1749	0.95	0.304	SPO1746	0.76	0.135	SPO1744	0.75	0.862	SPO1745	0.95	0.945	SPO1743	0.88	0.435
SPO1749	0.7	0.034	SPO1748	1.06	0.246	SPO1748	0.95	0.896	SPO1750	0.99	0.012	SPO1747	0.63	0.068	SPO1745	0.66	0.580	SPO1746	0.91	0.665	SPO1744	0.88	0.870
SPO1750	0.73	0.026	SPO1749	0.76	0.206	SPO1749	0.83	0.564	SPO1751	0.96	0.403	SPO1748	0.93	0.705	SPO1746	0.76	0.015	SPO1747	0.99	0.783	SPO1745	0.96	0.964
SPO1751	1.01	0.939	SPO1750	0.9	0.614	SPO1750	0.96	0.088	SPO1752	0.97	0.667	SPO1749	1.47	0.051	SPO1747	0.63	0.278	SPO1748	0.88	0.306	SPO1746	0.93	0.566
SPO1752	0.87	0.581	SPO1751	1.03	0.103	SPO1751	0.85	0.475	SPO1753	0.96	0.198	SPO1750	1.35	0.022	SPO1748	0.90	0.633	SPO1749	1.15	0.244	SPO1747	1.00	0.996
SPO1753	0.97	0.875	SPO1752	0.99	0.442	SPO1752	0.83	0.929	SPO1754	0.93	0.837	SPO1751	0.53	0.140	SPO1749	1.59	0.006	SPO1750	1.12	0.411	SPO1748	0.83	0.084
SPO1754	1.47	0.521	SPO1753	1.06	0.487	SPO1753	0.96	0.174	SPO1755	0.96	0.341	SPO1752	0.69	0.147	SPO1750	1.20	0.010	SPO1751	1.11	0.698	SPO1749	1.34	0.080
SPO1755	0.96	0.974	SPO1754	1.25	0.759	SPO1754	0.96	0.865	SPO1756	0.83	0.538	SPO1753	1.01	0.098	SPO1751	0.52	0.060	SPO1752	1.07	0.802	SPO1750	1.26	0.186
SPO1756	0.79	0.054	SPO1755	1	0.858	SPO1755	0.89	0.692	SPO1757	0.98	0.016	SPO1754	0.88	0.958	SPO1752	0.64	0.028	SPO1753	0.87	0.206	SPO1751	1.04	0.383
SPO1757	1.08	0.375	SPO1756	0.88	0.352	SPO1756	0.9	0.228	SPO1758	0.7	0.538	SPO1755	2.58	0.090	SPO1753	0.94	0.322	SPO1754	0.97	0.985	SPO1752	1.02	0.837
SPO1758	0.93	0.949	SPO1757	1.01	0.568	SPO1757	0.97	0.163	SPO1759	0.93	0.959	SPO1756	1.37	0.019	SPO1754	0.88	0.968	SPO1755	1.21	0.500	SPO1753	0.91	0.625
SPO1759	1.2	0.303	SPO1758	1.15	0.49	SPO1758	0.74	0.885	SPO1760	0.75	0.957	SPO1757	1.41	0.144	SPO1755	2.73	0.001	SPO1756	0.77	0.166	SPO1754	0.92	0.934
SPO1760	1.23	0.365	SPO1759	1.23	0.182	SPO1759	0.78	0.825	SPO1761	0.85	0.653	SPO1758	0.81	0.144	SPO1756	1.39	0.001	SPO1757	1.02	0.997	SPO1755	1.22	0.406
SPO1761	0.91	0.79	SPO1760	1.35	0.017	SPO1760	0.9	0.911	SPO1762	0.93	0.032	SPO1759	0.83	0.535	SPO1757	1.66	0.187	SPO1758	1.06	0.893	SPO1756	0.82	0.063
SPO1762	0.93	0.586	SPO1761	0.95	0.949	SPO1761	0.83	0.682	SPO1763	0.93	0.495	SPO1760	1.00	0.601	SPO1758	0.92	0.093	SPO1759	1.01	0.900	SPO1757	1.06	0.616
SPO1763	1.53	0.004	SPO1762	0.95	0.946	SPO1762	0.75	0.298	SPO1764	0.85	0.973	SPO1761	0.89	0.960	SPO1759	0.82	0.619	SPO1760	1.03	0.859	SPO1758	0.91	0.713
SPO1764	0.93	0.514	SPO1763	1.55	0.014	SPO1763	0.9	0.137	SPO1765	0.69	0.565	SPO1762	0.94	0.768	SPO1760	0.85	0.243	SPO1761	0.97	0.988	SPO1759	0.99	0.974
SPO1765	1.02	0.861	SPO1764	0.95	0.972	SPO1764	0.92	0.656	SPO1766	0.92	0.174	SPO1763	0.72	0.283	SPO1761	0.87	0.948	SPO1762	1.09	0.380	SPO1760	0.93	0.781
SPO1766	0.75	0.13	SPO1765	1.11	0.089	SPO1765	0.98	0.371	SPO1767	0.96	0.237	SPO1764	0.96	0.568	SPO1762	0.95	0.690	SPO1763	0.97	0.937	SPO1761	0.97	0.986
SPO1767	0.68	0.063	SPO1766	0.67	0.168	SPO1766	0.84	0.173	SPO1769	0.88	0.207	SPO1765	0.45	0.037	SPO1763	0.71	0.326	SPO1764	1.12	0.429	SPO1762	1.18	0.223
SPO1769	0.69	0.274	SPO1767	0.81	0.531	SPO1767	0.88	0.577	SPO1770	0.86	0.074	SPO1766	1.21	0.174	SPO1764	1.04	0.620	SPO1765	0.85	0.683	SPO1763	0.93	0.817
SPO1770	0.94	0.739	SPO1769	0.72	0.092	SPO1769	0.95	0.107	SPO1771	0.75	0.844	SPO1767	0.92	0.304	SPO1765	0.46	0.040	SPO1766	1.42	0.122	SPO1764	1.08	0.661
SPO1771	0.98	0.961	SPO1770	0.85	0.144	SPO1770	0.73	0.331	SPO1772	0.85	0.198	SPO1769	2.18	0.030	SPO1766	1.17	0.157	SPO1767	0.97	0.769	SPO1765	0.85	0.761
SPO1772	0.83	0.391	SPO1771	0.95	0.999	SPO1771	0.97	0.947	SPO1773	0.83	0.369	SPO1770	1.12	0.196	SPO1767	0.82	0.561	SPO1769	0.98	0.964	SPO1766	1.38	0.053
SPO1773	0.51	0.046	SPO1772	0.78	0.101	SPO1772	0.78	0.7	SPO1774	0.77	0.009	SPO1771	0.88	0.518	SPO1769	2.05	0.036	SPO1770	1.32	0.197	SPO1767	0.92	0.508
SPO1774	0.38	0.006	SPO1773	0.55	0.046	SPO1773	0.62	0.869	SPO1775	0.81	0.351	SPO1772	1.29	0.218	SPO1770	1.11	0.280	SPO1771	1.01	0.999	SPO1769	0.98	0.976
SPO1775	1.04	0.752	SPO1774	0.54	0.004	SPO1774	0.64	0.003	SPO1776	0.69	0.318	SPO1773	1.28	0.191	SPO1771	0.89	0.645	SPO1772	0.95	0.939	SPO1770	1.37	0.142
SPO1776	0.53	0.015	SPO1775	0.93	0.873	SPO1775	0.71	0.156	SPO1777	0.61	0.719	SPO1774	1.49	0.108	SPO1772	1.59	0.054	SPO1773	1.01	0.861	SPO1771	1.00	0.978
SPO1777	0.51	0.11	SPO1776	0.56	0.004	SPO1776	0.88	0.326	SPO1779	0.64	0.899	SPO1775	1.04	0.685	SPO1773	1.28	0.052	SPO1774	1.21	0.037	SPO1772	1.00	0.902
SPO1779	1.45	0.008	SPO1777	0.52	0.056	SPO1777	0.98	0.973	SPO1780	0.88	0.038	SPO1776	1.06	0.104	SPO1774	1.26	0.149	SPO1775	1.01	0.979	SPO1773	1.07	0.477
SPO1780	1.86	0.024	SPO1779	1.31	0.151	SPO1779	0.47	0.809	SPO1781	0.98	0.09	SPO1777	0.65	0.242	SPO1775	1.15	0.360	SPO1776	0.97	0.879	SPO1774	1.42	0.034
SPO1781	0.68	0.04	SPO1780	1.69	0.049	SPO1780	1.01	0.473	SPO1782	0.91	0.822	SPO1779	0.67	0.096	SPO1776	0.99	0.210	SPO1777	1.01	0.977	SPO1775	0.94	0.792
SPO1782	0.6	0.18	SPO1781	0.66	0.005	SPO1781	0.9	0.023	SPO1783	0.99	0.813	SPO1780	0.30	0.009	SPO1777	0.63	0.147	SPO1778	1.18	0.840	SPO1776	1.05	0.556
SPO1783	0.49	0.069	SPO1782	0.61	0.332	SPO1782	0.88	0.55	SPO1784	0.91	0.931	SPO1781	0.39	0.003	SPO1779	0.68	0.278	SPO1779	1.00	0.951	SPO1777	1.11	0.650
SPO1784	0.54	0.029	SPO1783	0.59	0.134	SPO1783	0.98	0.808	SPO1785	1	0.215	SPO1782	0.52	0.073	SPO1780	0.31	0.001	SPO1780	1.07	0.802	SPO1778	0.87	0.380
SPO1785	1.01	0.727	SPO1784	0.67	0.072	SPO1784	0.85	0.584	SPO1786	0.97	0.24	SPO1783	0.62	0.008	SPO1781	0.41	0.001	SPO1781	0.93	0.220	SPO1779	0.99	0.989
SPO1786	1.02	0.791	SPO1785	0.93	0.647	SPO1785	0.85	0.908	SPO1787	1.02	0.324	SPO1784	0.75	0.091	SPO1782	0.54	0.139	SPO1782	0.93	0.701	SPO1780	1.00	0.869
SPO1787	0.6	0.089	SPO1786	0.91	0.54	SPO1786	0.77	0.503	SPO1788	0.96	0.667	SPO1785	0.57	0.042	SPO1783	0.62	0.041	SPO1783	0.98	0.926	SPO1781	0.92	0.358
SPO1788	0.78	0.104	SPO1787	0.65	0.236	SPO1787	0.97	0.492	SPO1789	1.01	0.003	SPO1786	0.57	0.080	SPO1784	0.72	0.089	SPO1784	1.05	0.802	SPO1782	0.99	0.987
SPO1789	0.05	0.012	SPO1788	0.76	0.179	SPO1788	0.93	0.738	SPO1790	0.85	0.097	SPO1787	1.11	0.244	SPO1785	0.57	0.005	SPO1785	1.22	0.027	SPO1783	1.02	0.809
SPO1790	0.08	0.02	SPO1789	0.06	0.01	SPO1789	0.84	0.006	SPO1791	0.78	0.029	SPO1788	1.33	0.058	SPO1786	0.60	0.004	SPO1786	0.77	0.272	SPO1784	1.05	0.730
SPO1791	0.09	0.019	SPO1790	0.13	0.107	SPO1790	0.93	0.101	SPO1792	0.79	0.367	SPO1789	2.81	0.005	SPO1787	1.24	0.306	SPO1787	1.01	0.883	SPO1785	1.07	0.177
SPO1792	1.24	0.252	SPO1791	0.17	0.003	SPO1791	0.75	0.016	SPO1793	0.97	0.528	SPO1790	3.54	0.105	SPO1788	1.32	0.040	SPO1788	1.22	0.444	SPO1786	0.85	0.484
SPO1793	0.69	0.097	SPO1792	1.17	0.425	SPO1792	0.93	0.547	SPO1794	0.89	0.208	SPO1791	3.43	0.020	SPO1789	2.87	0.005	SPO1789	0.79	0.058	SPO1787	1.04	0.708
SPO1794	1.04	0.735	SPO1793	0.78	0.246	SPO1793	0.89	0.301	SPO1795	0.92	0.003	SPO1792	0.88	0.555	SPO1790	3.42	0.089	SPO1790	0.91	0.875	SPO1788	1.22	0.181
SPO1795	1.25	0.264	SPO1794	0.96	0.959	SPO1794	0.93	0.532	SPO1796	0.89	0.01	SPO1793	2.95	0.013	SPO1791	3.01	0.041	SPO1791	0.92	0.810	SPO1789	0.82	0.115
SPO1796	0.9	0.135	SPO1795	1.05	0.24	SPO1795	0.82	0.016	SPO1797	0.96	0.082	SPO1794	4.42	0.087	SPO1792	0.88	0.656	SPO1792	0.93	0.753	SPO1790	0.88	0.844
SPO1797	0.71	0.26	SPO1796	0.97	0.965	SPO1796	0.96	0.015	SPO1798	0.93	0.59	SPO1795	12.30	0.003	SPO1793	2.44	0.027	SPO1793	0.98	0.757	SPO1791	0.98	0.917
SPO1798	0.47	0.041	SPO1797	0.81	0.158	SPO1797	0.86	0.024	SPO1799	0.79	0.825	SPO1796	31.30	0.001	SPO1794	4.50	0.039	SPO1794	0.85	0.595	SPO1792	0.90	0.565
SPO1799	0.53	0.035	SPO1798	0.48	0.034	SPO1798	0.78	0.382	SPO1800	0.89	0.816	SPO1797	1.34	0.013	SPO1795	12.60	0.000	SPO1795	0.79	0.123	SPO1793	0.98	0.714
SPO1800	0.44	0.079	SPO1799	0.62	0.013	SPO1799	0.93	0.55	SPO1801	0.85	0.927	SPO1798	2.87	0.015	SPO1796	24.80	0.001	SPO1796	0.93	0.698	SPO1794	0.87	0.393
SPO1801	0.8	0.626	SPO1800	0.54	0.283	SPO1800	0.79	0.935	SPO1802	0.88	0.76	SPO1799	2.88	0.001	SPO1797	1.42	0.063	SPO1797	0.85	0.152	SPO1795	0.86	0.011
SPO1802	0.87	0.135	SPO1801	0.87	0.73	SPO1801	0.91	0.95	SPO1803	0.85	0.651	SPO1800	1.19	0.629	SPO1798	2.72	0.012	SPO1798	0.93	0.712	SPO1796	1.00	0.853
SPO1803	1.06	0.737	SPO1802	0.91	0.432	SPO1802	0.94	0.305	SPO1804	0.89	0.266	SPO1801	0.95	0.942	SPO1799	3.01	0.001	SPO1799	0.88	0.304	SPO1797	0.85	0.600
SPO1804	1.1	0.13	SPO1803	1.11	0.465	SPO1803	1	0.804	SPO1805	0.92	0.816	SPO1802	0.79	0.307	SPO1800	0.99	0.904	SPO1800	0.87	0.451	SPO1798	0.90	0.622
SPO1805	1.36	0.548	SPO1804	1.03	0.806	SPO1804	0.96	0.455	SPO1806	0.82	0.996	SPO1803	0.68	0.175	SPO1801	0.99	0.470	SPO1801	1.00	0.934	SPO1799	0.91	0.469
SPO1806	1.44	0.269	SPO1805	1.24	0.568	SPO1805	0.5	0.839	SPO1807	0.9	0.192	SPO1804	0.99	0.409	SPO1802	0.88	0.625	SPO1802	1.04	0.455	SPO1800	0.84	0.269
SPO1807	0.87	0.283	SPO1806	1.4	0.249	SPO1806	0.96	0.97	SPO1808	0.76	0.007	SPO1805	0.75	0.641	SPO1803	0.58	0.029	SPO1803	1.02	0.818	SPO1801	1.10	0.549
SPO1808	0.94	0.963	SPO1807	0.85	0.337	SPO1807	0.93	0.813	SPO1809	0.95	0.35	SPO1806	1.10	0.564	SPO1804	1.04	0.178	SPO1804	0.94	0.807	SPO1802	1.04	0.361
SPO1809	1.16	0.471	SPO1808	1	0.593	SPO1808	0.81	0.392	SPO1810	0.84	0.923	SPO1807	1.36	0.446	SPO1805	0.77	0.750	SPO1805	0.95	0.961	SPO1803	0.92	0.748
SPO1810	1.02	0.956	SPO1809	1.1	0.148	SPO1809	0.96	0.982	SPO1811	0.54	0.403	SPO1808	1.22	0.006	SPO1806	0.96	0.965	SPO1806	0.93	0.785	SPO1804	0.93	0.668
SPO1811	0.61	0.321	SPO1810	0.99	0.958	SPO1810	0.84	0.919	SPO1812	0.67	0.813	SPO1809	0.69	0.035	SPO1807	1.25	0.213	SPO1807	1.22	0.295	SPO1805	0.92	0.932
SPO1812	1.13	0.783	SPO1811	0.61	0.202	SPO1811	0.85	0.372	SPO1813	0.72	0.048	SPO1810	0.79	0.756	SPO1808	1.08	0.352	SPO1808	1.07	0.112	SPO1806	0.98	0.939
SPO1813	0.81	0.062	SPO1812	1.04	0.918	SPO1812	0.84	0.856	SPO1814	0.91	0.556	SPO1811	1.20	0.403	SPO1809	0.78	0.064	SPO1809	1.16	0.270	SPO1807	1.29	0.374
SPO1814	0.9	0.316	SPO1813	0.86	0.174	SPO1813	0.8	0.205	SPO1815	0.97	0.549	SPO1812	0.61	0.413	SPO1810	0.82	0.778	SPO1810	1.14	0.864	SPO1808	1.06	0.792
SPO1815	1.33	0.358	SPO1814	0.99	0.97	SPO1814	0.67	0.548	SPO1816	1	0.538	SPO1813	0.65	0.032	SPO1811	1.29	0.331	SPO1811	1.20	0.637	SPO1809	1.11	0.291
SPO1816	1.41	0.068	SPO1815	1.19	0.198	SPO1815	0.96	0.643	SPO1817	0.48	0.018	SPO1814	0.82	0.588	SPO1812	0.57	0.423	SPO1812	0.85	0.780	SPO1810	1.18	0.815
SPO1817	1.48	0.022	SPO1816	1.28	0.169	SPO1816	0.87	0.514	SPO1818	0.9	0.251	SPO1815	1.62	0.119	SPO1813	0.65	0.018	SPO1813	1.06	0.506	SPO1811	1.25	0.410
SPO1818	1	0.982	SPO1817	1.48	0.184	SPO1817	1	0.323	SPO1819	1.02	0.958	SPO1816	1.74	0.008	SPO1814	0.75	0.146	SPO1814	0.72	0.045	SPO1812	0.88	0.804
SPO1819	0.92	0.976	SPO1818	0.99	0.929	SPO1818	0.85	0.542	SPO1820	0.93	0.753	SPO1817	0.65	0.390	SPO1815	1.53	0.045	SPO1815	0.82	0.595	SPO1813	1.09	0.517
SPO1820	0.74	0.457	SPO1819	0.93	0.981	SPO1819	0.99	0.983	SPO1821	0.84	0.415	SPO1818	0.87	0.995	SPO1816	1.55	0.045	SPO1816	1.03	0.778	SPO1814	0.83	0.523
SPO1821	1.06	0.669	SPO1820	0.83	0.58	SPO1820	0.97	0.76	SPO1822	0.77	0.824	SPO1819	0.93	0.962	SPO1817	0.61	0.225	SPO1817	0.71	0.301	SPO1815	0.87	0.441
SPO1822	0.86	0.896	SPO1821	0.81	0.586	SPO1821	0.96	0.956	SPO1823	0.75	0.054	SPO1820	1.04	0.980	SPO1818	0.96	0.637	SPO1818	0.98	0.977	SPO1816	1.04	0.493
SPO1823	0.75	0.62	SPO1822	0.85	0.876	SPO1822	0.8	0.726	SPO1824	0.77	0.852	SPO1821	0.75	0.079	SPO1819	0.85	0.862	SPO1819	0.90	0.925	SPO1817	0.76	0.035
SPO1824	0.82	0.643	SPO1823	0.71	0.432	SPO1823	0.85	0.125	SPO1825	0.92	0.938	SPO1822	1.00	0.986	SPO1820	1.21	0.422	SPO1820	1.22	0.632	SPO1818	0.98	0.981
SPO1825	0.72	0.549	SPO1824	1.03	0.894	SPO1824	0.98	0.281	SPO1826	0.83	0.271	SPO1823	2.58	0.207	SPO1821	0.76	0.104	SPO1821	0.56	0.218	SPO1819	0.88	0.887
SPO1826	0.92	0.727	SPO1825	0.69	0.586	SPO1825	0.97	0.604	SPO1828	0.95	0.59	SPO1824	0.92	0.983	SPO1822	0.76	0.755	SPO1822	0.82	0.694	SPO1820	1.19	0.377
SPO1828	1.1	0.587	SPO1826	1.03	0.506	SPO1826	0.78	0.755	SPO1829	0.83	0.642	SPO1825	0.94	0.987	SPO1823	1.97	0.151	SPO1823	1.09	0.929	SPO1821	0.74	0.025
SPO1829	0.72	0.069	SPO1827	0.81	0	SPO1828	0.86	0.393	SPO1830	0.94	0.228	SPO1826	1.37	0.249	SPO1824	0.88	0.871	SPO1824	0.93	0.942	SPO1822	0.91	0.888
SPO1830	0.78	0.174	SPO1828	1.14	0.065	SPO1829	0.69	0.894	SPO1831	0.85	0.378	SPO1827	0.98		SPO1825	0.70	0.715	SPO1825	0.91	0.803	SPO1823	1.16	0.856
SPO1831	1.12	0.614	SPO1829	0.75	0.213	SPO1830	0.82	0.472	SPO1832	0.83	0.819	SPO1828	0.87	0.361	SPO1826	1.37	0.127	SPO1826	0.99	0.719	SPO1824	1.02	0.958
SPO1832	1.04	0.695	SPO1830	0.72	0.014	SPO1831	0.95	0.594	SPO1833	0.96	0.246	SPO1829	1.11	0.128	SPO1827	0.86		SPO1827	1.13		SPO1825	1.01	0.972
SPO1833	0.74	0.416	SPO1831	1.15	0.433	SPO1832	0.93	0.913	SPO1834	0.79	0.569	SPO1830	1.61	0.024	SPO1828	1.10	0.473	SPO1828	1.15	0.686	SPO1826	0.94	0.586
SPO1834	0.91	0.635	SPO1832	0.99	0.856	SPO1833	0.86	0.697	SPO1835	0.98	0.135	SPO1831	1.01	0.944	SPO1829	1.08	0.097	SPO1829	0.93	0.842	SPO1827	0.99	0.740
SPO1835	0.9	0.692	SPO1833	0.76	0.033	SPO1834	0.74	0.695	SPO1836	0.93	0.648	SPO1832	0.68	0.122	SPO1830	1.70	0.002	SPO1830	0.98	0.877	SPO1828	1.04	0.902
SPO1836	0.72	0.143	SPO1834	1.01	0.698	SPO1835	0.97	0.575	SPO1837	0.97	0.682	SPO1833	1.13	0.536	SPO1831	0.97	0.783	SPO1831	0.93	0.524	SPO1829	0.94	0.813
SPO1837	0.93	0.831	SPO1835	0.94	0.843	SPO1836	0.95	0.951	SPO1838	0.85	0.948	SPO1834	0.87	0.565	SPO1832	0.75	0.064	SPO1832	0.70	0.158	SPO1830	1.02	0.728
SPO1838	0.83	0.266	SPO1836	0.75	0.147	SPO1837	0.94	0.496	SPO1839	0.93	0.788	SPO1835	1.17	0.556	SPO1833	1.14	0.081	SPO1833	1.04	0.950	SPO1831	0.89	0.411
SPO1839	0.69	0.149	SPO1837	1.06	0.05	SPO1838	1.01	0.509	SPO1840	0.88	0.112	SPO1836	1.78	0.030	SPO1834	0.95	0.743	SPO1834	1.10	0.801	SPO1832	0.70	0.146
SPO1840	0.35	0.014	SPO1838	0.81	0.283	SPO1839	0.96	0.684	SPO1841	0.7	0.318	SPO1837	1.42	0.125	SPO1835	1.21	0.126	SPO1835	0.95	0.904	SPO1833	1.07	0.686
SPO1841	1.05	0.294	SPO1839	0.68	0.036	SPO1840	0.9	0.135	SPO1842	0.97	0.441	SPO1838	1.58	0.062	SPO1836	1.83	0.021	SPO1836	0.93	0.453	SPO1834	1.00	0.973
SPO1842	0.71	0.36	SPO1840	0.41	0.004	SPO1841	0.94	0.275	SPO1843	0.99	0.658	SPO1839	1.32	0.053	SPO1837	1.22	0.035	SPO1837	0.92	0.421	SPO1835	0.81	0.542
SPO1843	0.93	0.864	SPO1841	1.04	0.253	SPO1842	0.99	0.054	SPO1844	0.97	0.79	SPO1840	2.68	0.013	SPO1838	1.57	0.018	SPO1838	0.76	0.121	SPO1836	1.03	0.776
SPO1844	1.25	0.699	SPO1842	0.79	0.269	SPO1843	0.93	0.485	SPO1845	0.99	0.587	SPO1841	1.27	0.022	SPO1839	1.32	0.059	SPO1839	0.88	0.370	SPO1837	0.85	0.154
SPO1845	0.76	0.588	SPO1843	0.96	0.846	SPO1844	0.91	0.825	SPO1846	0.83	0.466	SPO1842	1.32	0.071	SPO1840	2.76	0.002	SPO1840	0.86	0.182	SPO1838	0.82	0.104
SPO1846	0.85	0.436	SPO1844	1.28	0.78	SPO1845	0.84	0.649	SPO1847	0.55	0.019	SPO1843	1.58	0.093	SPO1841	1.36	0.012	SPO1841	0.93	0.602	SPO1839	0.95	0.894
SPO1847	0.41	0.035	SPO1845	0.84	0.668	SPO1846	0.94	0.311	SPO1848	0.94	0.055	SPO1844	0.71	0.821	SPO1842	1.21	0.370	SPO1842	1.01	0.982	SPO1840	0.99	0.955
SPO1848	0.64	0.022	SPO1846	0.8	0.22	SPO1847	0.97	0.076	SPO1849	1	0.647	SPO1845	2.02	0.113	SPO1843	1.68	0.006	SPO1843	1.05	0.895	SPO1841	0.99	0.837
SPO1849	0.84	0.889	SPO1847	0.46	0.024	SPO1848	0.6	0.071	SPO1850	0.96	0.761	SPO1846	2.24	0.003	SPO1844	0.63	0.698	SPO1844	0.81	0.831	SPO1842	0.95	0.729

SPO1850	0.69	0.445	SPO1848	0.68	0.049	SPO1849	0.94	0.646	SPO1851	0.73	0.201	SPO1847	5.16	0.012	SPO1845	2.07	0.116	SPO1845	0.94	0.895	SPO1843	0.94	0.797
SPO1851	0.93	0.482	SPO1849	0.79	0.682	SPO1850	0.98	0.524	SPO1852	0.96	0.18	SPO1848	4.12	0.016	SPO1846	2.04	0.018	SPO1846	0.97	0.990	SPO1844	0.81	0.774
SPO1852	0.61	0.06	SPO1850	0.68	0.582	SPO1851	0.9	0.026	SPO1853	0.91	0.73	SPO1849	3.10	0.183	SPO1847	5.24	0.001	SPO1847	1.03	0.575	SPO1845	0.91	0.798
SPO1853	0.51	0.05	SPO1851	0.94	0.691	SPO1852	0.74	0.541	SPO1854	0.85	0.786	SPO1850	2.37	0.346	SPO1848	4.44	0.008	SPO1848	1.01	0.859	SPO1846	0.99	0.886
SPO1854	1.07	0.835	SPO1852	0.68	0.068	SPO1853	0.89	0.772	SPO1855	0.81	0.137	SPO1851	3.21	0.000	SPO1849	3.16	0.077	SPO1849	1.09	0.910	SPO1847	1.11	0.306
SPO1855	1.35	0.08	SPO1853	0.57	0.138	SPO1854	1.01	0.648	SPO1856	0.82	0.12	SPO1852	1.54	0.035	SPO1850	2.29	0.388	SPO1850	1.02	0.921	SPO1848	1.06	0.553
SPO1856	1	0.97	SPO1854	0.96	0.997	SPO1855	0.88	0.037	SPO1858	0.9	0.633	SPO1853	1.57	0.144	SPO1851	2.79	0.007	SPO1851	1.03	0.535	SPO1849	1.05	0.915
SPO1858	1.5	0.266	SPO1855	1.25	0.01	SPO1856	0.97	0.308	SPO1859	0.66	0.841	SPO1854	0.55	0.160	SPO1852	1.40	0.002	SPO1852	0.95	0.924	SPO1850	1.07	0.839
SPO1859	1.31	0.521	SPO1856	0.95	0.866	SPO1858	0.85	0.801	SPO1860	0.88	0.573	SPO1855	1.13	0.041	SPO1853	1.63	0.085	SPO1853	1.02	0.941	SPO1851	0.98	0.850
SPO1860	0.88	0.695	SPO1858	1.4	0.179	SPO1859	0.97	0.84	SPO1861	0.85	0.01	SPO1856	0.53	0.239	SPO1854	0.61	0.284	SPO1854	0.99	0.962	SPO1852	0.89	0.566
SPO1861	0.38	0.003	SPO1859	1.19	0.679	SPO1860	0.98	0.957	SPO1862	0.94	0.013	SPO1858	0.94	0.850	SPO1855	1.25	0.003	SPO1855	1.12	0.013	SPO1853	0.99	0.997
SPO1862	0.32	0.054	SPO1860	0.85	0.461	SPO1861	0.93	0.003	SPO1863	0.98	0.06	SPO1859	0.64	0.496	SPO1856	0.50	0.558	SPO1856	0.70	0.397	SPO1854	0.99	0.981
SPO1863	0.45	0.013	SPO1861	0.39	0.01	SPO1862	0.93	0.073	SPO1864	0.95	0.162	SPO1860	3.33	0.031	SPO1858	0.94	0.909	SPO1858	1.12	0.077	SPO1855	1.01	0.369
SPO1864	1.45	0.05	SPO1862	0.37	0.002	SPO1863	0.99	0.026	SPO1865	0.79	0.884	SPO1861	3.06	0.004	SPO1859	0.65	0.335	SPO1859	0.95	0.880	SPO1856	0.76	0.513
SPO1865	1.56	0.505	SPO1863	0.47	0.026	SPO1864	0.98	0.94	SPO1866	0.92	0.293	SPO1862	3.17	0.002	SPO1860	3.92	0.004	SPO1860	1.03	0.875	SPO1858	0.98	0.939
SPO1866	0.85	0.299	SPO1864	1.42	0.047	SPO1865	0.56	0.833	SPO1867	0.94	0.527	SPO1863	2.30	0.018	SPO1861	3.11	0.001	SPO1861	1.51	0.042	SPO1859	0.92	0.807
SPO1867	0.98	0.483	SPO1865	1.48	0.418	SPO1866	0.9	0.621	SPO1868	0.95	0.483	SPO1864	1.27	0.040	SPO1862	3.09	0.004	SPO1862	1.29	0.107	SPO1860	1.09	0.565
SPO1868	1.01	0.993	SPO1866	0.87	0.259	SPO1867	0.86	0.928	SPO1869	0.97	0.213	SPO1865	0.99	0.835	SPO1863	2.14	0.015	SPO1863	1.56	0.033	SPO1861	1.58	0.003
SPO1869	0.9	0.067	SPO1867	1.08	0.793	SPO1868	1	0.623	SPO1870	0.92	0.188	SPO1866	0.81	0.607	SPO1864	1.30	0.011	SPO1864	1.12	0.261	SPO1862	1.42	0.086
SPO1870	0.93	0.783	SPO1868	1.05	0.35	SPO1869	0.88	0.343	SPO1871	0.77	0.285	SPO1867	0.61	0.027	SPO1865	0.97	0.860	SPO1865	1.02	0.944	SPO1863	1.54	0.068
SPO1871	0.66	0.067	SPO1869	0.85	0.171	SPO1870	0.83	0.583	SPO1872	0.84	0.72	SPO1868	0.64	0.155	SPO1866	0.77	0.212	SPO1866	0.90	0.823	SPO1864	1.10	0.225
SPO1872	1.25	0.684	SPO1870	1.09	0.298	SPO1871	0.95	0.609	SPO1873	0.74	0.377	SPO1869	1.02	0.216	SPO1867	0.56	0.243	SPO1867	0.83	0.337	SPO1865	1.01	0.967
SPO1873	1.23	0.335	SPO1871	0.76	0.192	SPO1872	0.99	0.901	SPO1874	0.9	0.967	SPO1870	1.57	0.010	SPO1868	0.65	0.077	SPO1868	1.02	0.827	SPO1866	0.92	0.838
SPO1874	1.4	0.141	SPO1872	1.24	0.525	SPO1873	0.86	0.402	SPO1875	0.82	0.251	SPO1871	0.99	0.511	SPO1869	1.07	0.024	SPO1869	1.05	0.494	SPO1867	0.84	0.431
SPO1875	1.7	0.059	SPO1873	1.13	0.249	SPO1874	1	0.908	SPO1876	0.97	0.185	SPO1872	1.34	0.448	SPO1870	1.56	0.011	SPO1870	1.01	0.764	SPO1868	0.99	0.757
SPO1876	1	0.972	SPO1874	1.25	0.296	SPO1875	0.88	0.625	SPO1877	0.95	0.798	SPO1873	0.42	0.026	SPO1871	1.00	0.110	SPO1871	1.06	0.201	SPO1869	1.10	0.203
SPO1877	1	0.963	SPO1875	1.51	0.065	SPO1876	0.96	0.069	SPO1878	0.92	0.977	SPO1874	1.58	0.150	SPO1872	1.29	0.224	SPO1872	0.95	0.902	SPO1870	1.05	0.516
SPO1878	2.88	0.025	SPO1876	1.04	0.384	SPO1877	0.96	0.886	SPO1879	0.76	0.934	SPO1875	1.14	0.147	SPO1873	0.42	0.034	SPO1873	1.09	0.649	SPO1871	1.06	0.018
SPO1879	1.03	0.94	SPO1877	0.96	0.836	SPO1878	0.83	1	SPO1880	0.76	0.654	SPO1876	0.66	0.029	SPO1874	1.78	0.046	SPO1874	1.13	0.500	SPO1872	0.93	0.727
SPO1880	1.48	0.088	SPO1878	2.62	0.027	SPO1879	0.96	0.871	SPO1881	0.97	0.693	SPO1877	0.71	0.183	SPO1875	1.20	0.170	SPO1875	1.08	0.622	SPO1873	1.01	0.958
SPO1881	1.21	0.066	SPO1879	1.05	0.914	SPO1880	0.87	0.759	SPO1882	0.91	0.777	SPO1878	0.50	0.076	SPO1876	0.67	0.026	SPO1876	0.89	0.379	SPO1874	1.08	0.346
SPO1882	1.01	0.953	SPO1880	1.3	0.095	SPO1881	0.92	0.215	SPO1883	0.99	0.071	SPO1879	0.76	0.691	SPO1877	0.71	0.012	SPO1877	1.10	0.336	SPO1875	1.02	0.699
SPO1883	1.4	0.017	SPO1881	1.21	0.154	SPO1882	0.94	0.736	SPO1884	0.94	0.829	SPO1880	0.64	0.126	SPO1878	0.63	0.066	SPO1878	1.05	0.992	SPO1876	0.93	0.630
SPO1884	0.75	0.079	SPO1882	0.88	0.482	SPO1883	0.88	0.296	SPO1886	0.92	0.853	SPO1881	0.90	0.790	SPO1879	0.75	0.656	SPO1879	0.74	0.728	SPO1877	1.11	0.150
SPO1886	1.07	0.305	SPO1883	1.43	0.031	SPO1884	0.98	0.714	SPO1887	0.92	0.221	SPO1882	0.91	0.913	SPO1880	0.68	0.185	SPO1880	1.03	0.886	SPO1878	1.08	0.855
SPO1887	1.04	0.637	SPO1884	0.76	0.089	SPO1886	0.91	0.991	SPO1888	0.97	0.441	SPO1883	0.68	0.060	SPO1881	0.95	0.807	SPO1881	1.13	0.048	SPO1879	0.75	0.744
SPO1888	2.22	0.001	SPO1886	0.98	0.954	SPO1887	0.69	0.337	SPO1889	0.99	0.221	SPO1884	1.66	0.025	SPO1882	0.90	0.942	SPO1882	1.02	0.906	SPO1880	0.95	0.901
SPO1889	1.39	0.041	SPO1887	1.1	0.545	SPO1888	0.8	0.051	SPO1890	0.88	0.609	SPO1885	0.54	0.237	SPO1883	0.76	0.028	SPO1883	1.07	0.724	SPO1881	1.10	0.577
SPO1890	0.86	0.12	SPO1888	1.91	0.009	SPO1889	0.88	0.013	SPO1891	0.95	0.657	SPO1886	0.50	0.012	SPO1884	1.89	0.007	SPO1884	1.20	0.050	SPO1882	1.00	0.975
SPO1891	0.74	0.127	SPO1889	1.48	0.017	SPO1890	0.63	0.29	SPO1892	0.87	0.306	SPO1887	1.27	0.016	SPO1885	0.51	0.005	SPO1885	0.92	[redacted]	SPO1883	1.02	0.943
SPO1892	1.09	0.142	SPO1890	0.94	0.743	SPO1891	0.69	0.881	SPO1893	0.93	0.529	SPO1888	0.94	0.514	SPO1886	0.53	0.005	SPO1886	1.09	0.243	SPO1884	1.17	0.068
SPO1893	0.96	0.651	SPO1891	0.78	0.23	SPO1892	0.95	0.23	SPO1895	0.98	0.46	SPO1889	1.67	0.005	SPO1887	1.15	0.128	SPO1887	1.08	0.371	SPO1885	0.84	0.788
SPO1895	1.37	0.1	SPO1892	1.1	0.16	SPO1893	0.68	0.775	SPO1896	0.98	0.434	SPO1890	1.40	0.007	SPO1888	0.87	0.403	SPO1888	1.25	0.192	SPO1886	1.05	0.072
SPO1896	1.02	0.898	SPO1893	1.01	0.423	SPO1895	0.97	1	SPO1897	0.74	0.578	SPO1891	0.79	0.585	SPO1889	1.61	0.022	SPO1889	1.17	0.031	SPO1887	1.14	0.123
SPO1897	0.83	0.247	SPO1895	1.12	0.058	SPO1896	0.94	0.777	SPO1898	0.88	0.445	SPO1892	0.98	0.118	SPO1890	1.46	0.173	SPO1890	1.03	0.552	SPO1888	1.15	0.447
SPO1898	1.06	0.438	SPO1896	1	0.978	SPO1897	0.74	0.331	SPO1899	0.94	0.92	SPO1893	1.78	0.000	SPO1891	0.79	0.640	SPO1891	0.95	0.932	SPO1889	1.15	0.413
SPO1899	1.11	0.232	SPO1897	0.81	0.304	SPO1898	0.81	0.071	SPO1900	0.93	0.511	SPO1895	1.07	0.766	SPO1892	0.97	0.053	SPO1892	0.85	0.125	SPO1890	1.12	0.675
SPO1900	1.32	0.163	SPO1898	0.97	0.902	SPO1899	0.89	0.511	SPO1901	0.76	0.522	SPO1896	0.60	0.077	SPO1893	1.78	0.001	SPO1893	0.99	0.881	SPO1891	1.01	0.826
SPO1901	0.88	0.162	SPO1899	0.95	0.791	SPO1900	0.92	0.348	SPO1902	0.91	0.533	SPO1897	0.98	0.966	SPO1895	1.17	0.221	SPO1895	1.25	0.234	SPO1892	0.88	0.207
SPO1902	0.73	0.321	SPO1900	1.18	0.086	SPO1901	0.79	0.206	SPO1903	0.97	0.354	SPO1898	1.07	0.605	SPO1896	0.66	0.316	SPO1896	0.90	0.894	SPO1893	1.06	0.071
SPO1903	0.7	0.147	SPO1901	0.92	0.319	SPO1902	0.98	0.751	SPO1904	0.79	0.751	SPO1899	1.70	0.009	SPO1897	1.05	0.190	SPO1897	0.93	0.730	SPO1895	1.22	0.108
SPO1904	0.81	0.591	SPO1902	0.83	0.605	SPO1903	0.97	0.39	SPO1905	1.01	0.127	SPO1900	1.34	0.222	SPO1898	1.08	0.505	SPO1898	0.97	0.797	SPO1896	0.95	0.944
SPO1905	0.56	0.014	SPO1903	0.77	0.276	SPO1904	0.99	0.695	SPO1906	0.97	0.652	SPO1901	1.16	0.110	SPO1899	1.64	0.022	SPO1899	1.12	0.083	SPO1897	0.97	0.856
SPO1906	1.16	0.343	SPO1904	0.8	0.816	SPO1905	0.88	0.157	SPO1907	0.96	0.534	SPO1902	1.48	0.249	SPO1900	1.35	0.246	SPO1900	0.94	0.640	SPO1898	1.03	0.873
SPO1907	0.63	0.076	SPO1905	0.64	0.063	SPO1906	0.98	0.97	SPO1908	0.88	0.6	SPO1903	1.15	0.366	SPO1901	1.31	0.093	SPO1901	1.04	0.749	SPO1899	1.02	0.723
SPO1908	0.99	0.873	SPO1906	1.12	0.482	SPO1907	1	0.2	SPO1909	0.93	0.971	SPO1904	1.11	0.558	SPO1902	1.50	0.064	SPO1902	1.02	0.955	SPO1900	0.95	0.719
SPO1909	0.95	0.993	SPO1907	0.74	0.13	SPO1908	0.32	0.288	SPO1911	0.87	0.99	SPO1905	1.12	0.249	SPO1903	1.15	0.476	SPO1903	1.06	0.704	SPO1901	1.11	0.677
SPO1911	1.12	0.645	SPO1908	0.98	0.768	SPO1909	0.94	0.946	SPO1912	0.94	0.888	SPO1906	0.58	0.020	SPO1904	1.44	0.602	SPO1904	1.42	0.235	SPO1902	1.10	0.671
SPO1912	0.85	0.482	SPO1909	1.09	0.786	SPO1911	0.85	0.987	SPO1913	0.99	0.092	SPO1907	1.08	0.158	SPO1905	1.08	0.224	SPO1905	1.07	0.443	SPO1903	1.14	0.541
SPO1913	0.81	0.401	SPO1911	0.94	0.996	SPO1912	0.96	0.353	SPO1914	0.9	0.079	SPO1908	1.02	0.863	SPO1906	0.66	0.107	SPO1906	1.11	0.528	SPO1904	1.61	0.141
SPO1914	1	0.84	SPO1912	0.99	0.833	SPO1913	0.92	0.359	SPO1915	0.98	0.055	SPO1909	0.12	0.019	SPO1907	0.83	0.972	SPO1907	1.02	0.331	SPO1905	1.14	0.311
SPO1915	0.68	0.042	SPO1913	0.77	0.075	SPO1914	0.99	0.075	SPO1916	0.98	0.253	SPO1911	0.39	0.036	SPO1908	0.99	0.843	SPO1908	1.05	0.726	SPO1906	0.98	0.940
SPO1916	1.05	0.61	SPO1914	1.05	0.839	SPO1915	0.96	0.025	SPO1917	0.92	0.712	SPO1912	1.03	0.987	SPO1909	0.12	0.009	SPO1909	1.01	0.985	SPO1907	0.99	0.922
SPO1917	0.9	0.922	SPO1915	0.68	0.034	SPO1916	0.79	0.244	SPO1918	0.42	0.451	SPO1913	1.27	0.194	SPO1911	0.40	0.031	SPO1911	0.98	0.845	SPO1908	1.02	0.916
SPO1918	0.81	0.531	SPO1916	0.98	0.894	SPO1917	0.89	0.767	SPO1919	0.82	0.485	SPO1914	1.17	0.003	SPO1912	1.01	0.908	SPO1912	1.03	0.979	SPO1909	1.04	0.877
SPO1919	0.83	0.767	SPO1917	0.83	0.843	SPO1918	1	0.515	SPO1920	0.97	0.391	SPO1915	1.45	0.271	SPO1913	1.30	0.028	SPO1913	1.12	0.452	SPO1911	0.88	0.658
SPO1920	0.99	0.995	SPO1918	0.89	0.732	SPO1919	0.98	0.858	SPO1921	0.83	0.21	SPO1916	0.71	0.418	SPO1914	1.16	0.029	SPO1914	1.23	0.030	SPO1912	1.09	0.626
SPO1921	1.16	0.047	SPO1919	0.84	0.756	SPO1920	0.84	0.439	SPO1922	0.92	0.964	SPO1917	0.93	0.897	SPO1915	1.48	0.103	SPO1915	1.46	0.198	SPO1913	1.18	0.466
SPO1922	1.09	0.531	SPO1920	0.99	0.935	SPO1921	0.85	0.043	SPO1923	0.88	0.418	SPO1918	0.96	0.836	SPO1916	0.88	0.985	SPO1916	1.05	0.765	SPO1914	1.18	0.151
SPO1923	0.9	0.361	SPO1921	1.04	0.541	SPO1922	0.65	0.935	SPO1925	0.98	0.623	SPO1919	0.76	0.886	SPO1917	0.96	0.912	SPO1917	0.93	0.826	SPO1915	1.40	0.271
SPO1925	0.64	0.148	SPO1922	1.1	0.398	SPO1923	0.85	0.748	SPO1926	0.95	0.863	SPO1920	1.89	0.114	SPO1918	0.92	0.959	SPO1918	0.76	0.319	SPO1916	1.08	0.073
SPO1926	0.6	0.259	SPO1923	1.01	0.843	SPO1925	0.74	0.702	SPO1927	0.84	0.08	SPO1921	0.81	0.358	SPO1919	0.66	0.570	SPO1919	0.97	1.000	SPO1917	0.91	0.829
SPO1927	1.01	0.786	SPO1925	0.72	0.395	SPO1926	0.93	0.937	SPO1928	0.98	0.134	SPO1922	1.16	0.315	SPO1920	1.78	0.171	SPO1920	1.41	0.231	SPO1918	0.75	0.251
SPO1928	1.54	0.043	SPO1926	0.63	0.356	SPO1927	0.93	0.057	SPO1929	0.99	0.009	SPO1923	1.09	0.426	SPO1921	0.81	0.627	SPO1921	1.05	0.631	SPO1919	0.93	0.933
SPO1929	0.4	0.007	SPO1927	1.01	0.688	SPO1928	0.99	0.193	SPO1930	0.9	0.411	SPO1925	1.26	0.042	SPO1922	1.15	0.098	SPO1922	1.14	0.452	SPO1920	1.34	0.374
SPO1930	0.76	0.057	SPO1928	1.13	0.182	SPO1929	0.91	0.027	SPO1931	0.95	0.64	SPO1926	1.38	0.254	SPO1923	1.01	0.386	SPO1923	1.16	0.722	SPO1921	0.98	0.973
SPO1931	1.48	0.013	SPO1929	0.47	0.055	SPO1930	0.92	0.719	SPO1932	0.95	0.867	SPO1927	0.83	0.398	SPO1925	1.27	0.075	SPO1925	1.00	0.942	SPO1922	1.07	0.309
SPO1932	1.64	0.369	SPO1930	0.88	0.516	SPO1931	0.99	0.167	SPO1933	0.97	0.214	SPO1928	0.84	0.726	SPO1926	1.33	0.488	SPO1926	1.03	0.961	SPO1923	1.17	0.514
SPO1933	1.53	0.007	SPO1931	1.68	0.004	SPO1932	0.84	0.927	SPO1934	0.86	0.009	SPO1929	1.43	0.005	SPO1927	0.87	0.313	SPO1927	0.85	0.237	SPO1925	1.00	0.830
SPO1934	0.74	0.044	SPO1932	1.62	0.018	SPO1933	0.95	0.144	SPO1935	0.88	0.222	SPO1930	1.13	0.283	SPO1928	0.79	0.055	SPO1928	0.82	0.022	SPO1926	0.99	0.993
SPO1935	1.64	0.322	SPO1933	1.26	0.028	SPO1934	0.96	0.248	SPO1936	0.86	0.669	SPO1931	1.05	0.158	SPO1929	1.22	0.134	SPO1929	1.12	0.057	SPO1927	1.01	0.870
SPO1936	1.2	0.473	SPO1934	0.79	0.089	SPO1935	0.87	0.343	SPO1937	0.86	0.864	SPO1932	1.18	0.611	SPO1930	0.93	0.929	SPO1930	1.05	0.788	SPO1928	0.85	0.005
SPO1937	1.12	0.475	SPO1935	1.53	0.018	SPO1936	0.63	0.84	SPO1938	0.99	0.612	SPO1933	0.72	0.021	SPO1931	1.02	0.074	SPO1931	0.98	1.000	SPO1929	1.17	0.160
SPO1938	1.1	0.339	SPO1936	1.07	0.596	SPO1937	0.63	0.91	SPO1939	1.02	0.095	SPO1934	1.40	0.006	SPO1932	1.26	0.326	SPO1932	1.22	0.590	SPO1930	1.11	0.667
SPO1939	0.64	0.046	SPO1937	1.15	0.388	SPO1938	0.6	0.912	SPO1940	0.75	0.827	SPO1935	1.59	0.095	SPO1933	0.72	0.032	SPO1933	1.19	0.031	SPO1931	0.89	0.490
SPO1940	0.81	0.632	SPO1938	1.14	0.222	SPO1939	0.64	0.209	SPO1941	1	0.013	SPO1936	2.42	0.078	SPO1934	1.36	0.009	SPO1934	1.03	0.805	SPO1932	1.14	0.619
SPO1941	0.8	0.098	SPO1939	0.54	0.034	SPO1940	1	0.823	SPO1942	0.73	0.474	SPO1937	2.55	0.047	SPO1935	1.71	0.028	SPO1935	0.91	0.441	SPO1933	1.06	0.194
SPO1942	0.95	0.659	SPO1940	0.79	0.599	SPO1941	0.98	0.479	SPO1943	0.75	0.862	SPO1938	3.90	0.009	SPO1936	2.49	0.040	SPO1936	1.00	0.967	SPO1934	1.09	0.053
SPO1943	1.24	0.485	SPO1941	0.88	0.378	SPO1942	0.96	0.864	SPO1944	0.88	0.597	SPO1939	1.50	0.057	SPO1937	2.10	0.096	SPO1937	1.07	0.424	SPO1935	0.96	0.799
SPO1944	0.81	0.243	SPO1942	1.07	0.166	SPO1943	0.41	0.786	SPO1945	0.98	0.11	SPO1940	0.72	0.067	SPO1938	3.90	0.001	SPO1938	1.04	0.488	SPO1936	1.01	0.925
SPO1945	0.69	0.038	SPO1943	1.26	0.315	SPO1944	0.95	0.687	SPO1946	0.74	0.475	SPO1941	0.86	0.334	SPO1939	1.58	0.088	SPO1939	1.18	0.228	SPO1937	1.14	0.276
SPO1946	0.82	0.52	SPO1944	0.88	0.769	SPO1945	0.9	0.026	SPO1947	0.96	0.796	SPO1942	0.62	0.027	SPO1940	0.74	0.208	SPO1940	0.83	0.463	SPO1938	1.03	0.639
SPO1947	1.09	0.192	SPO1945	0.72	0.006	SPO1946	0.67	0.655	SPO1948	0.76	0.179	SPO1943	0.36	0.022	SPO1941	0.91	0.913	SPO1941	0.97	0.919	SPO1939	1.16	0.185
SPO1948	1.5	0.084	SPO1946	0.9	0.753	SPO1947	0.92	0.683	SPO1949	0.94	0.835	SPO1944	1.08	0.636	SPO1942	0.60	0.017	SPO1942	1.02	0.361	SPO1940	0.79	0.575
SPO1949	0.87	0.459	SPO1947	1.06	0.362	SPO1948	0.89	0.326	SPO1950	0.91	0.808	SPO1945	1.30	0.090	SPO1943	0.37	0.014	SPO1943	0.68	0.100	SPO1941	0.97	0.837
SPO1950	1.03	0.924	SPO1948	1.38	0.142	SPO1949	0.56	0.569	SPO1951	0.89	0.953	SPO1946	0.71	0.168	SPO1944	1.11	0.669	SPO1944	0.97	0.871	SPO1942	1.02	0.418
SPO1951	0.78	0.302	SPO1949	0.93	0.891	SPO1950	0.95	0.707	SPO1952	0.78	0.986	SPO1947	1.17	0.092	SPO1945	1.31	0.043	SPO1945	1.10	0.502	SPO1943	0.71	0.092
SPO1952	1.27	0.126	SPO1950	0.97	0.968	SPO1951	0.93	0.827	SPO1953	0.97	0.12	SPO1948	0.60	0.067	SPO1946	0.72	0.268	SPO1946	0.92	0.691	SPO1944	1.06	0.660
SPO1953	1.45	0.036	SPO1951	0.89	0.688	SPO1952	0.83	0.841	SPO1954	0.95	0.457	SPO1949	1.03	0.496	SPO1947	1.03	0.899	SPO1947	1.15	0.571	SPO1945	1.09	0.176
SPO1954	0.87	0.172	SPO1952	1.25	0.173	SPO1953	0.78	0.174	SPO1955	0.93	0.741	SPO1950	0.93	0.844	SPO1948	0.61	0.050	SPO1948	1.01	0.893	SPO1946	1.03	0.620
SPO1955	1.01	0.877	SPO1953	1.44	0.009	SPO1954	0.68	0.193	SPO1956	0.99	0.826	SPO1951	0.71	0.278	SPO1949	1.11	0.604	SPO1949	1.10	0.796	SPO1947	1.09	0.740
SPO1956	1.15	0.36	SPO1954	1.01	0.199	SPO1955	0.68	0.661	SPO1957	0.88	0.915	SPO1952	0.83	0.448	SPO1950	0.96	0.878	SPO1950	1.25	0.723	SPO1948	1.09	0.532
SPO1957	0.63	0.006	SPO1955	1.04	0.788	SPO1956	0.81	0.935	SPO1958	0.37	0.659	SPO1953	0.75	0.050	SPO1951	0.68	0.130	SPO1951	0.91	0.618	SPO1949	1.19	0.708
SPO1958	1.56	0.043	SPO1956	1.01	0.816	SPO1957	0.67	0.813	SPO1959	1	0.92	SPO1954	1.81	0.006	SPO1952	0.88	0.462	SPO1952	1.20	0.509	SPO1950	1.17	0.128
SPO1959	1.18	0.284	SPO1957	0.58	0.173	SPO1958	1	0.828	SPO1960	0.85	0.615	SPO1955	1.10	0.611	SPO1953	0.78	0.009	SPO1953	1.18	0.163	SPO1951	0.99	0.943
SPO1960	0.65	0.006	SPO1958	1.48	0.079	SPO1959	0.94	0.673	SPO1961	0.92	0.676	SPO1956	0.76	0.352	SPO1954	1.67	0.007	SPO1954	1.03	0.665	SPO1952	1.14	0.578
SPO1961	1.06	0.681	SPO1959	1.12	0.284	SPO1960	0.98	0.641	SPO1962	0.99	0.851	SPO1957	1.14	0.259	SPO1955	1.15	0.559	SPO1955	0.79	0.108	SPO1953	1.19	0.050
SPO1962	0.96	0.96	SPO1960	0.69	0.013	SPO1961	1	0.631	SPO1963	1.01	0.017	SPO1958	0.84	0.476	SPO1956	0.81	0.242	SPO1956	0.89	0.572	SPO1954	1.05	0.291
SPO1963	0.7	0.104	SPO1961	0.99	0.8	SPO1962	0.74	0.66	SPO1964	0.95	0.264	SPO1959	1.01	0.607	SPO1957	1.11	0.257	SPO1957	15.90	0.005	SPO1955	0.73	0.185
SPO1964	1.04	0.887	SPO1962	0.93	0.777	SPO1963	0.96	0.068	SPO1965	0.78	0.052	SPO1960	1.24	0.229	SPO1958	0.90	0.355	SPO1958	0.99	0.826	SPO1956	0.94	0.734
SPO1965	0.76	0.129	SPO1963	0.74	0.359	SPO1964	0.83	0.706	SPO1966	0.9	0.31	SPO1961	1.48	0.253	SPO1959	0.97	0.884	SPO1959	0.94	0.635	SPO1957	15.70	0.002
SPO1966	0.83	0.61	SPO1964	0.94	0.941	SPO1965	0.96	0.249	SPO1967	0.93	0.149	SPO1962	1.13	0.500	SPO1960	1.25	0.089	SPO1960	0.96	0.855	SPO1958	1.00	0.938
SPO1967	0.66	0.412	SPO1965	0.79	0.145	SPO1966	0.81	0.229	SPO1968	0.93	0.146	SPO1963	2.78	0.002	SPO1961	1.65	0.118	SPO1961	0.98	0.900	SPO1959	0.96	0.831
SPO1968	0.9	0.555	SPO1966	0.88	0.479	SPO1967	0.68	0.268	SPO1969	0.95	0.958	SPO1964	1.59	0.239	SPO1962	1.09	0.289	SPO1962	0.91	0.560	SPO1960	1.00	0.993
SPO1969	0.88	0.689	SPO1967	0.71	0.043	SPO1968	0.99	0.383	SPO1970	0.95	0.849	SPO1965	1.72	0.068	SPO1963	2.55	0.001	SPO1963	1.05	0.779	SPO1961	0.97	0.925
SPO1970	0.93	0.865	SPO1968	0.88	0.044	SPO1969	0.67	0.576	SPO1971	0.83	0.685	SPO1966	1.77	0.193	SPO1964	1.64	0.030	SPO1964	1.01	0.987	SPO1962	0.88	0.550
SPO1971	0.76	0.539	SPO1969	0.91	0.804	SPO1970	0.93	0.95	SPO1972	0.68	0.384	SPO1967	2.23	0.026	SPO1965	1.76	0.006	SPO1965	0.94	0.510	SPO1963	1.08	0.368
SPO1972	0.71	0.303	SPO1970	0.88	0.857	SPO1971	0.9	0.645	SPO1973	0.83	0.238	SPO1968	1.69	0.043	SPO1966	1.70	0.070	SPO1966	0.94	0.896	SPO1964	0.93	0.684
SPO1973	0.7	0.311	SPO1971	0.84	0.686	SPO1972	0.87	0.512	SPO1974	0.79	0.369	SPO1969	1.35	0.126	SPO1967	2.23	0.036	SPO1967	0.88	0.299	SPO1965	1.02	0.863
SPO1974	0.64	0.284	SPO1972	0.75	0.046	SPO1973	0.75	0.322	SPO1975	0.86	0.022	SPO1970	0.72	0.719	SPO1968	1.83	0.003	SPO1968	0.84	0.053	SPO1966	0.96	0.910
SPO1975	2.69	0.007	SPO1973	0.7	0.187	SPO1974	0.92	0.527	SPO1976	0.89	0.907	SPO1971	3.58	0.082	SPO1969	1.28	0.299	SPO1969	0.88	0.794	SPO1967	0.85	0.068
SPO1976	1.35	0.321	SPO1974	0.71	0.27	SPO1975	0.91	0.034	SPO1977	0.98	0.007	SPO1972	2.22	0.049	SPO1970	0.65	0.427	SPO1970	0.83	0.667	SPO1968	0.85	0.250
SPO1977	0.5	0.016	SPO1975	2.38	0.015	SPO1976	0.95	0.958	SPO1978	0.94	0.01	SPO1973	2.22	0.061	SPO1971	2.93	0.062	SPO1971	1.01	0.996	SPO1969	0.93	0.801
SPO1978	0.62	0.006	SPO1976	1.36	0.452	SPO1977	0.86	0.002	SPO1979	0.98	0.253	SPO1974	2.05	0.004	SPO1972	2.08	0.012	SPO1972	0.87	0.816	SPO1970	0.90	0.791
SPO1979	1.36	0.445	SPO1977	0.52	0.027	SPO1978	0.97	0.022	SPO1980	0.93	0.986	SPO1975	0.78	0.440	SPO1973	2.12	0.040	SPO1973	1.62	0.235	SPO1971	0.95	0.870
SPO1980	1.7	0.197	SPO1978	0.66	0.016	SPO1979	0.81	0.718	SPO1981	0.79	0.99	SPO1976	1.06	0.291	SPO1974	1.96	0.005	SPO1974	1.40	0.008	SPO1972	0.91	0.795
SPO1981	1.03	0.814	SPO1979	1.18	0.374	SPO1980	0.95	0.789	SPO1982	1	0.392	SPO1977	1.61	0.026	SPO1975	0.69	0.145	SPO1975	0.92	0.779	SPO1973	1.66	0.148
SPO1982	0.85	0.506	SPO1980	1.61	0.026	SPO1981	1.01	0.874	SPO1983	0.96	0.642	SPO1978	1.36	0.058	SPO1976	0.93	0.669	SPO1976	1.01	0.862	SPO1974	1.44	0.027
SPO1983	0.96	0.946	SPO1981	1.09	0.378	SPO1982	1	0.654	SPO1984	0.84	0.548	SPO1979	0.69	0.154	SPO1977	1.93	0.002	SPO1977	2.19	0.003	SPO1975	0.76	0.202
SPO1984	1.2	0.144	SPO1982	1.05	0.451	SPO1983	0.91	0.535	SPO1985	0.65	0.093	SPO1980	1.16	0.371	SPO1978	1.51	0.011	SPO1978	1.77	0.082	SPO1976	1.04	0.667
SPO1985	1.15	0.135	SPO1983	1.12	0.233	SPO1984	0.95	0.86	SPO1986	0.67	0.777	SPO1981	0.97	0.896	SPO1979	0.65	0.200	SPO1979	0.72	0.055	SPO1977	2.15	0.018
SPO1986	1.29	0.341	SPO1984	1.17	0.086	SPO1985	0.99	0.2	SPO1987	0.61	0.653	SPO1982	0.73	0.220	SPO1980	1.14	0.578	SPO1980	1.12	0.839	SPO1978	1.77	0.009
SPO1987	0.88	0.215	SPO1985	1.18	0.071	SPO1986	0.88	0.943	SPO1988	0.58	0.811	SPO1983	0.26	0.003	SPO1981	0.93	0.948	SPO1981	0.90	0.614	SPO1979	0.77	0.362
SPO1988	0.83	0.555	SPO1986	1.35	0.023	SPO1987	0.92	0.282	SPO1989	0.91	0.058	SPO1984	0.91	0.806	SPO1982	0.69	0.070	SPO1982	1.05	0.799	SPO1980	0.98	0.793
SPO1989	1.6	0.043	SPO1987	0.86	0.263	SPO1988	0.98	0.864	SPO1990	0.99	0.259	SPO1985	1.44	0.030	SPO1983	0.23	0.002	SPO1983	0.83	0.278	SPO1981	0.88	0.569
SPO1990	1.37	0.055	SPO1988	0.83	0.504	SPO1989	0.57	0.138	SPO1991	0.4	0.827	SPO1986	1.09	0.156	SPO1984	0.94	0.648	SPO1984	1.11	0.273	SPO1982	1.05	0.709
SPO1991	1.01	0.86	SPO1989	1.73	0.064	SPO1990	0.54	0.171	SPO1992	0.93	0.7	SPO1987	0.88	0.931	SPO1985	1.41	0.008	SPO1985	1.14	0.167	SPO1983	0.85	0.507
SPO1992	1.03	0.529	SPO1990	1.21	0.087	SPO1991	0.9	0.402	SPO1994	0.69	0.901	SPO1988	0.99	0.659	SPO1986	1.13	0.055	SPO1986	1.36	0.062	SPO1984	1.10	0.279
SPO1994	0.93	0.865	SPO1991	0.97	0.916	SPO1992	0.98	0.898	SPO1995	0.91	0.304	SPO1989	0.92	0.539	SPO1987	0.93	0.802	SPO1987	1.06	0.493	SPO1985	1.15	0.061

SPO1995	0.82	0.021	SPO1992	0.96	0.833	SPO1994	0.78	0.929	SPO1996	0.91	0.048	SPO1990	1.29	0.031	SPO1988	1.01	0.554	SPO1988	1.11	0.653	SPO1986	1.27	0.292
SPO1996	0.58	0.002	SPO1994	0.96	0.993	SPO1995	0.84	0.25	SPO1997	0.38	0.874	SPO1991	1.18	0.256	SPO1989	0.77	0.666	SPO1989	1.12	0.280	SPO1987	1.19	0.172
SPO1997	0.66	0.156	SPO1995	0.74	0.201	SPO1996	0.88	0.016	SPO1998	0.86	0.082	SPO1992	0.83	0.167	SPO1990	1.30	0.066	SPO1990	0.98	0.873	SPO1988	1.12	0.566
SPO1998	0.68	0.112	SPO1996	0.58	0.002	SPO1997	0.89	0.72	SPO1999	0.94	0.391	SPO1994	0.88	0.560	SPO1991	1.26	0.122	SPO1991	1.13	0.346	SPO1989	1.15	0.243
SPO1999	0.83	0.609	SPO1997	0.66	0.217	SPO1998	0.93	0.17	SPO2000	0.85	0.832	SPO1995	1.04	0.583	SPO1992	0.88	0.715	SPO1992	0.87	0.065	SPO1990	1.04	0.211
SPO2000	1.22	0.512	SPO1998	0.74	0.075	SPO1999	0.95	0.134	SPO2001	0.8	0.268	SPO1996	1.05	0.032	SPO1994	0.80	0.185	SPO1994	1.31	0.175	SPO1991	1.01	0.940
SPO2001	0.63	0.294	SPO1999	0.8	0.628	SPO2000	0.86	0.765	SPO2002	0.67	0.998	SPO1997	0.79	0.525	SPO1995	1.10	0.321	SPO1995	1.36	0.464	SPO1992	0.83	0.212
SPO2002	0.96	0.98	SPO2000	1.04	0.855	SPO2001	0.73	0.653	SPO2003	0.59	0.553	SPO1998	1.42	0.131	SPO1996	1.08	0.107	SPO1996	1.26	0.068	SPO1994	1.17	0.300
SPO2003	0.83	0.694	SPO2001	0.61	0.026	SPO2002	0.66	0.937	SPO2004	0.74	0.657	SPO1999	1.71	0.371	SPO1997	0.76	0.597	SPO1997	0.95	0.773	SPO1995	1.43	0.421
SPO2004	1.06	0.283	SPO2002	0.95	0.993	SPO2003	0.78	0.267	SPO2005	0.6	0.11	SPO2000	0.72	0.560	SPO1998	1.56	0.059	SPO1998	1.20	0.648	SPO1996	1.35	0.043
SPO2005	1.04	0.212	SPO2003	0.88	0.715	SPO2004	0.95	0.468	SPO2006	0.99	0.884	SPO2001	1.44	0.262	SPO1999	1.60	0.148	SPO1999	2.29	0.040	SPO1997	1.00	0.910
SPO2006	0.79	0.45	SPO2004	1.05	0.572	SPO2005	0.99	0.043	SPO2007	0.94	0.697	SPO2002	0.93	0.826	SPO2000	0.81	0.834	SPO2000	0.97	0.981	SPO1998	1.33	0.283
SPO2007	0.6	0.24	SPO2005	1.11	0.328	SPO2006	0.93	0.852	SPO2008	0.91	0.613	SPO2003	1.01	0.919	SPO2001	1.20	0.332	SPO2001	0.85	0.696	SPO1999	1.81	0.097
SPO2008	1.09	0.514	SPO2006	0.85	0.854	SPO2007	1.1	0.395	SPO2009	0.93	0.069	SPO2004	0.97	0.846	SPO2002	0.89	0.880	SPO2002	0.72	0.287	SPO2000	0.95	0.936
SPO2009	1.19	0.3	SPO2007	0.68	0.118	SPO2008	1.04	0.836	SPO2010	0.87	0.113	SPO2005	0.95	0.652	SPO2003	1.30	0.414	SPO2003	0.99	0.924	SPO2001	0.89	0.817
SPO2010	0.55	0.001	SPO2008	0.95	0.878	SPO2009	1.16	0.296	SPO2013	0.99	0.985	SPO2006	1.11	0.498	SPO2004	1.24	0.445	SPO2004	0.97	0.585	SPO2002	0.82	0.796
SPO2013	0.99	0.888	SPO2009	1.04	0.548	SPO2010	1.23	0.023	SPO2014	0.74	0.174	SPO2007	1.23	0.470	SPO2005	0.81	0.192	SPO2005	0.97	0.556	SPO2003	0.82	0.645
SPO2014	1.28	0.064	SPO2010	0.6	0.136	SPO2013	1.03	0.839	SPO2015	0.91	0.115	SPO2008	1.01	0.788	SPO2006	1.31	0.637	SPO2006	0.97	0.753	SPO2004	0.84	0.302
SPO2015	1.32	0.224	SPO2013	1.12	0.347	SPO2014	1.14	0.118	SPO2016	0.9	0.019	SPO2009	1.04	0.968	SPO2007	1.22	0.263	SPO2007	0.83	0.536	SPO2005	0.87	0.276
SPO2016	1.51	0.004	SPO2014	1.15	0.168	SPO2015	1.06	0.245	SPO2017	1.01	0.057	SPO2010	1.85	0.008	SPO2008	0.95	0.423	SPO2008	1.02	0.960	SPO2006	0.88	0.741
SPO2017	1.23	0.406	SPO2015	1.41	0.042	SPO2016	1.1	0.035	SPO2018	0.78	0.009	SPO2013	0.83	0.279	SPO2009	0.95	0.373	SPO2009	0.84	0.452	SPO2007	0.86	0.553
SPO2018	0.9	0.16	SPO2016	1.63	0.039	SPO2017	1.1	0.348	SPO2019	0.7	0.759	SPO2014	0.64	0.074	SPO2010	2.19	0.008	SPO2010	1.23	0.216	SPO2008	0.97	0.552
SPO2019	0.89	0.34	SPO2017	1.25	0.387	SPO2018	1.17	0.007	SPO2020	0.91	0.221	SPO2015	0.84	0.569	SPO2013	0.85	0.279	SPO2013	0.98	0.747	SPO2009	0.93	0.531
SPO2020	1.55	0.434	SPO2018	0.92	0.316	SPO2019	1.07	0.548	SPO2021	0.62	0.178	SPO2016	0.63	0.020	SPO2014	0.63	0.062	SPO2014	0.65	0.118	SPO2010	1.27	0.136
SPO2021	1.31	0.106	SPO2019	0.73	0.127	SPO2020	1.02	0.087	SPO2022	0.86	0.029	SPO2017	0.56	0.257	SPO2015	0.82	0.466	SPO2015	0.62	0.027	SPO2013	1.00	0.989
SPO2022	1.49	0.044	SPO2020	1.44	0.165	SPO2021	1.19	0.243	SPO2023	0.85	0.108	SPO2018	0.53	0.008	SPO2016	0.61	0.054	SPO2016	0.53	0.017	SPO2014	0.64	0.112
SPO2023	1.32	0.175	SPO2021	1.26	0.097	SPO2022	1.33	0.028	SPO2025	0.83	0.114	SPO2019	1.08	0.309	SPO2017	0.50	0.042	SPO2017	0.41	0.013	SPO2015	0.62	0.058
SPO2025	1.47	0.06	SPO2022	1.45	0.027	SPO2023	1.17	0.157	SPO2026	0.73	0.852	SPO2020	0.42	0.039	SPO2018	0.53	0.004	SPO2018	0.43	0.006	SPO2016	0.52	0.004
SPO2026	0.99	0.907	SPO2023	1.26	0.241	SPO2025	1.21	0.087	SPO2027	0.94	0.733	SPO2021	0.38	0.009	SPO2019	1.09	0.115	SPO2019	0.63	0.141	SPO2017	0.46	0.010
SPO2027	1.36	0.083	SPO2025	1.23	0.02	SPO2026	1.08	0.992	SPO2028	0.79	0.946	SPO2022	0.33	0.005	SPO2020	0.41	0.070	SPO2020	0.53	0.073	SPO2018	0.47	0.002
SPO2028	1.35	0.017	SPO2026	1.01	0.728	SPO2027	1.01	0.872	SPO2029	0.93	0.609	SPO2023	0.22	0.008	SPO2021	0.34	0.010	SPO2021	0.42	0.003	SPO2019	0.71	0.100
SPO2029	0.82	0.689	SPO2027	1.36	0.024	SPO2028	1.2	0.898	SPO2030	0.97	0.583	SPO2025	1.34	0.216	SPO2022	0.34	0.005	SPO2022	0.42	0.017	SPO2020	0.58	0.290
SPO2030	0.88	0.597	SPO2028	1.26	0.341	SPO2029	1.06	0.662	SPO2031	0.92	0.013	SPO2026	0.73	0.277	SPO2023	0.24	0.013	SPO2023	0.43	0.024	SPO2021	0.44	0.004
SPO2031	1.08	0.64	SPO2029	0.77	0.563	SPO2030	1.19	0.662	SPO2032	1	0.766	SPO2027	0.83	0.564	SPO2025	1.48	0.059	SPO2025	0.38	0.021	SPO2022	0.45	0.006
SPO2032	1.17	0.268	SPO2030	0.95	0.957	SPO2031	1.03	0.053	SPO2033	0.75	0.769	SPO2028	1.03	0.783	SPO2026	0.72	0.416	SPO2026	0.97	0.915	SPO2023	0.43	0.034
SPO2033	1	0.854	SPO2031	1.2	0.041	SPO2032	1.04	0.845	SPO2034	0.95	0.558	SPO2029	1.75	0.248	SPO2027	0.80	0.343	SPO2027	1.07	0.448	SPO2025	0.40	0.017
SPO2034	0.84	0.575	SPO2032	1.11	0.42	SPO2033	1.04	0.886	SPO2035	0.98	0.711	SPO2030	1.12	0.557	SPO2028	1.17	0.690	SPO2028	1.13	0.320	SPO2026	0.96	0.957
SPO2035	0.85	0.826	SPO2033	1.18	0.218	SPO2034	1.16	0.318	SPO2036	0.95	0.903	SPO2031	1.63	0.006	SPO2029	1.78	0.140	SPO2029	1.05	0.901	SPO2027	1.07	0.272
SPO2036	1.15	0.591	SPO2034	0.83	0.541	SPO2035	1.21	0.802	SPO2037	0.99	0.126	SPO2032	0.98	0.425	SPO2030	1.07	0.643	SPO2030	0.96	0.909	SPO2028	1.07	0.894
SPO2037	1.16	0.042	SPO2035	0.84	0.801	SPO2036	1.12	0.98	SPO2038	0.93	0.878	SPO2033	1.06	0.040	SPO2031	1.66	0.007	SPO2031	1.16	0.747	SPO2029	1.03	0.912
SPO2038	1.46	0.561	SPO2036	1.09	0.714	SPO2037	1.01	0.416	SPO2039	0.95	0.235	SPO2034	0.55	0.180	SPO2032	0.98	0.571	SPO2032	1.03	0.741	SPO2030	0.98	0.932
SPO2039	1.52	0.005	SPO2037	1.32	0.006	SPO2038	1.32	0.828	SPO2040	0.95	0.412	SPO2035	1.29	0.615	SPO2033	1.08	0.020	SPO2033	0.96	0.979	SPO2031	1.07	0.790
SPO2040	0.75	0.023	SPO2038	1.42	0.465	SPO2039	1.16	0.913	SPO2041	0.9	0.298	SPO2036	0.64	0.138	SPO2034	0.56	0.206	SPO2034	1.62	0.362	SPO2032	1.02	0.854
SPO2041	1.12	0.198	SPO2039	1.45	0.157	SPO2040	1.06	0.236	SPO2042	0.96	0.212	SPO2037	1.46	0.070	SPO2035	1.30	0.533	SPO2035	1.20	0.745	SPO2033	1.00	0.486
SPO2042	0.79	0.227	SPO2040	0.78	0.319	SPO2041	1.04	0.752	SPO2044	0.95	0.813	SPO2038	1.05	0.813	SPO2036	0.63	0.151	SPO2036	0.88	0.210	SPO2034	1.37	0.542
SPO2044	0.79	0.373	SPO2041	1.02	0.135	SPO2042	1.06	0.687	SPO2045	0.6	0.898	SPO2039	0.79	0.133	SPO2037	1.54	0.011	SPO2037	1.22	0.331	SPO2035	1.22	0.710
SPO2045	1.07	0.778	SPO2042	0.76	0.083	SPO2044	1.08	0.957	SPO2046	0.63	0.623	SPO2040	1.38	0.277	SPO2038	1.04	0.844	SPO2038	1.16	0.698	SPO2036	0.83	0.158
SPO2046	2.09	0.016	SPO2044	0.99	0.888	SPO2045	0.98	0.594	SPO2047	0.92	0.744	SPO2041	1.01	0.221	SPO2039	0.82	0.144	SPO2039	1.05	0.434	SPO2037	1.23	0.244
SPO2047	1.54	0.067	SPO2045	0.97	0.996	SPO2046	1.08	0.334	SPO2048	0.96	0.952	SPO2042	1.11	0.270	SPO2040	1.45	0.062	SPO2040	0.97	0.848	SPO2038	1.16	0.697
SPO2048	2.15	0.007	SPO2046	1.85	0.07	SPO2047	1	0.484	SPO2049	0.77	0.153	SPO2044	0.76	0.215	SPO2041	1.01	0.327	SPO2041	1.04	0.506	SPO2039	1.00	0.865
SPO2049	0.83	0.529	SPO2047	1.51	0.079	SPO2048	1.16	0.876	SPO2050	0.87	0.254	SPO2045	0.92	0.997	SPO2042	1.16	0.061	SPO2042	0.99	0.987	SPO2040	1.01	0.999
SPO2050	0.98	0.842	SPO2048	2.07	0.018	SPO2049	1.11	0.358	SPO2051	0.92	0.867	SPO2046	0.40	0.018	SPO2044	0.63	0.226	SPO2044	0.99	0.978	SPO2041	1.08	0.176
SPO2051	1.44	0.07	SPO2049	0.79	0.206	SPO2050	0.99	0.069	SPO2052	0.77	0.727	SPO2047	0.54	0.070	SPO2045	0.90	0.935	SPO2045	0.96	0.912	SPO2042	1.06	0.326
SPO2052	1.01	0.633	SPO2050	1.1	0.51	SPO2051	1.02	0.507	SPO2053	0.91	0.665	SPO2048	0.41	0.028	SPO2046	0.37	0.007	SPO2046	0.93	0.555	SPO2044	1.01	0.776
SPO2053	1.5	0.126	SPO2051	1.31	0.087	SPO2052	1.28	0.809	SPO2054	0.98	0.883	SPO2049	0.93	0.910	SPO2047	0.52	0.072	SPO2047	0.95	0.854	SPO2045	0.99	0.988
SPO2054	1.32	0.165	SPO2052	1.06	0.606	SPO2053	1.1	0.801	SPO2055	0.88	0.095	SPO2050	0.72	0.058	SPO2048	0.42	0.032	SPO2048	1.05	0.806	SPO2046	0.90	0.517
SPO2055	1.37	0.294	SPO2053	1.23	0.374	SPO2054	1.27	0.628	SPO2056	0.74	0.681	SPO2051	1.03	0.197	SPO2049	0.97	0.966	SPO2049	1.23	0.626	SPO2047	0.98	0.967
SPO2056	1.49	0.405	SPO2054	1.16	0.329	SPO2055	1.06	0.834	SPO2057	0.66	0.046	SPO2052	0.64	0.047	SPO2050	0.70	0.172	SPO2050	0.93	0.199	SPO2048	1.03	0.797
SPO2057	1.5	0.089	SPO2055	1.36	0.007	SPO2056	1.33	0.664	SPO2058	0.77	0.789	SPO2053	0.85	0.656	SPO2051	1.03	0.274	SPO2051	1.14	0.702	SPO2049	1.13	0.253
SPO2058	0.85	0.244	SPO2056	1.32	0.622	SPO2057	1.12	0.047	SPO2059	0.97	0.15	SPO2054	0.86	0.542	SPO2052	0.68	0.071	SPO2052	1.08	0.434	SPO2050	0.89	0.724
SPO2059	0.55	0.026	SPO2057	1.1	0.039	SPO2058	1.17	0.821	SPO2060	0.94	0.173	SPO2055	1.11	0.121	SPO2053	1.05	0.570	SPO2053	1.09	0.663	SPO2051	1.09	0.840
SPO2060	0.98	0.992	SPO2058	0.92	0.804	SPO2059	1	0.156	SPO2061	0.99	0.442	SPO2056	0.97	0.909	SPO2054	0.77	0.414	SPO2054	1.05	0.780	SPO2052	1.04	0.587
SPO2061	1.16	0.36	SPO2059	0.57	0.103	SPO2060	1.21	0.223	SPO2062	1.02	0.941	SPO2057	0.55	0.032	SPO2055	1.21	0.057	SPO2055	1.21	0.201	SPO2053	1.06	0.698
SPO2062	0.92	0.708	SPO2060	1.02	0.535	SPO2061	0.99	0.162	SPO2063	1	0.213	SPO2058	0.81	0.632	SPO2056	1.00	0.854	SPO2056	1.02	0.915	SPO2054	1.00	0.893
SPO2063	1.65	0.092	SPO2061	1.2	0.253	SPO2062	1.05	0.553	SPO2064	1.1	0.452	SPO2059	1.79	0.022	SPO2057	0.55	0.018	SPO2057	0.92	0.565	SPO2055	1.28	0.033
SPO2064	0.99	0.978	SPO2062	0.94	0.888	SPO2063	1.1	0.084	SPO2065	1.23	0.278	SPO2060	1.50	0.018	SPO2058	0.84	0.750	SPO2058	0.89	0.768	SPO2056	0.98	0.996
SPO2065	0.78	0.1	SPO2063	1.38	0.061	SPO2064	1.08	0.357	SPO2066	1.09	0.132	SPO2061	1.41	0.205	SPO2059	1.70	0.082	SPO2059	1.25	0.046	SPO2057	0.83	0.237
SPO2066	0.92	0.684	SPO2064	0.98	0.983	SPO2065	1.17	0.297	SPO2067	1.1	0.009	SPO2062	0.85	0.720	SPO2060	1.46	0.040	SPO2060	1.22	0.279	SPO2058	0.95	0.649
SPO2067	0.94	0.974	SPO2065	0.83	0.134	SPO2066	1.2	0.309	SPO2068	1.04	0.477	SPO2063	0.83	0.297	SPO2061	1.44	0.080	SPO2061	1.21	0.387	SPO2059	1.39	0.118
SPO2068	1.99	0.004	SPO2066	0.88	0.479	SPO2067	1.04	0.092	SPO2069	1.07	0.545	SPO2064	0.97	0.795	SPO2062	0.94	0.756	SPO2062	1.09	0.614	SPO2060	1.28	0.137
SPO2069	0.88	0.343	SPO2067	1.01	0.488	SPO2068	1.03	0.607	SPO2070	1.09	0.885	SPO2065	0.66	0.054	SPO2063	0.93	0.737	SPO2063	1.36	0.235	SPO2061	1.17	0.526
SPO2070	0.76	0.278	SPO2068	1.88	0.017	SPO2069	1.19	0.735	SPO2071	1.12	0.012	SPO2066	2.09	0.028	SPO2064	0.95	0.844	SPO2064	0.95	0.888	SPO2062	1.12	0.371
SPO2071	1.53	0.016	SPO2069	0.96	0.999	SPO2070	1.19	0.882	SPO2072	1.23	0.504	SPO2067	0.53	0.063	SPO2065	0.65	0.164	SPO2065	0.94	0.586	SPO2063	1.19	0.301
SPO2072	0.81	0.197	SPO2070	0.88	0.769	SPO2071	1.09	0.06	SPO2073	1.07	0.705	SPO2068	0.88	0.566	SPO2066	2.38	0.020	SPO2066	0.92	0.612	SPO2064	0.93	0.653
SPO2073	1.2	0.104	SPO2071	1.38	0.001	SPO2072	1.16	0.483	SPO2074	1.19	0.815	SPO2069	1.13	0.346	SPO2067	0.61	0.003	SPO2067	0.98	0.811	SPO2065	0.91	0.439
SPO2074	1.31	0.073	SPO2072	0.85	0.203	SPO2073	1.29	0.597	SPO2075	1.35	0.782	SPO2070	0.88	0.883	SPO2068	0.83	0.385	SPO2068	1.27	0.225	SPO2066	0.97	0.821
SPO2075	1.2	0.471	SPO2073	1.13	0.209	SPO2074	1	0.703	SPO2076	1.19	0.528	SPO2071	1.52	0.129	SPO2069	1.09	0.470	SPO2069	1.09	0.342	SPO2067	0.90	0.488
SPO2076	0.9	0.567	SPO2074	1.33	0.063	SPO2075	1.22	0.59	SPO2077	1.14	0.052	SPO2072	0.73	0.034	SPO2070	0.89	0.964	SPO2070	1.04	0.910	SPO2068	1.10	0.666
SPO2077	1	0.383	SPO2075	1.23	0.283	SPO2076	1.15	0.812	SPO2078	1.1	0.178	SPO2073	0.87	0.119	SPO2071	1.72	0.007	SPO2071	1.19	0.202	SPO2069	1.05	0.535
SPO2078	1	0.981	SPO2076	0.93	0.694	SPO2077	1.15	0.011	SPO2079	1.04	0.422	SPO2074	1.75	0.019	SPO2072	0.72	0.219	SPO2072	1.11	0.540	SPO2070	1.04	0.921
SPO2079	1.79	0.005	SPO2077	1.05	0.719	SPO2078	1.2	0.324	SPO2080	1.19	0.153	SPO2075	1.09	0.521	SPO2073	0.86	0.312	SPO2073	1.04	0.871	SPO2071	1.15	0.052
SPO2080	1	0.879	SPO2078	0.93	0.676	SPO2079	1.08	0.638	SPO2081	1.13	0.504	SPO2076	0.97	0.588	SPO2074	1.95	0.009	SPO2074	1.08	0.629	SPO2072	1.13	0.119
SPO2081	0.53	0.023	SPO2079	1.66	0.008	SPO2080	1.06	0.116	SPO2082	1.06	0.407	SPO2077	1.26	0.027	SPO2075	1.13	0.386	SPO2075	1.05	0.847	SPO2073	1.03	0.550
SPO2082	1.23	0.414	SPO2080	1.08	0.055	SPO2081	1.28	0.828	SPO2083	1.23	0.03	SPO2078	1.29	0.016	SPO2076	0.93	0.854	SPO2076	0.88	0.423	SPO2074	1.10	0.417
SPO2083	1.33	0.142	SPO2081	0.65	0.03	SPO2082	1.38	0.874	SPO2084	1.07	0.332	SPO2079	1.28	0.030	SPO2077	1.26	0.040	SPO2077	0.87	0.472	SPO2075	1.01	0.883
SPO2084	1.35	0.148	SPO2082	0.95	0.956	SPO2083	1.01	0.418	SPO2085	1.18	0.136	SPO2080	2.68	0.009	SPO2078	1.38	0.022	SPO2078	0.81	0.145	SPO2076	0.93	0.545
SPO2085	0.89	0.14	SPO2083	1.33	0.008	SPO2084	1.12	0.307	SPO2086	1.02	0.193	SPO2081	0.79	0.587	SPO2079	1.43	0.053	SPO2079	1.08	0.600	SPO2077	0.88	0.315
SPO2086	0.82	0.177	SPO2084	1.38	0.154	SPO2085	1.12	0.287	SPO2087	1.17	0.384	SPO2082	1.01	0.585	SPO2080	2.43	0.003	SPO2080	1.25	0.300	SPO2078	0.84	0.113
SPO2087	0.98	0.96	SPO2085	0.89	0.33	SPO2086	1.05	0.257	SPO2088	1.22	0.118	SPO2083	0.87	0.661	SPO2081	0.77	0.645	SPO2081	0.90	0.358	SPO2079	1.06	0.666
SPO2088	1.19	0.254	SPO2086	0.82	0.333	SPO2087	1.04	0.342	SPO2089	1.12	0.718	SPO2084	0.54	0.052	SPO2082	1.03	0.499	SPO2082	0.93	0.567	SPO2080	1.14	0.355
SPO2089	1.44	0.425	SPO2087	0.82	0.071	SPO2088	1.06	0.214	SPO2090	1.05	0.228	SPO2085	1.23	0.127	SPO2083	0.92	0.976	SPO2083	0.99	0.940	SPO2081	0.91	0.207
SPO2090	1.15	0.737	SPO2088	1.1	0.074	SPO2089	0.99	0.761	SPO2091	1.24	0.847	SPO2086	1.62	0.004	SPO2084	0.65	0.034	SPO2084	1.29	0.500	SPO2082	0.95	0.720
SPO2091	1.04	0.866	SPO2089	1.22	0.651	SPO2090	1.11	0.633	SPO2092	1.13	0.579	SPO2087	0.83	0.458	SPO2085	1.32	0.311	SPO2085	1.02	0.835	SPO2083	0.96	0.831
SPO2092	1.22	0.207	SPO2090	1.11	0.07	SPO2091	1.05	0.835	SPO2093	1.08	0.181	SPO2088	0.81	0.139	SPO2086	1.65	0.012	SPO2086	1.02	0.742	SPO2084	1.17	0.510
SPO2093	0.74	0.614	SPO2091	1.07	0.864	SPO2092	1.07	0.512	SPO2094	1.03	0.157	SPO2089	0.67	0.509	SPO2087	0.85	0.246	SPO2087	0.81	0.210	SPO2085	0.96	0.850
SPO2094	1.38	0.07	SPO2092	1.11	0.212	SPO2093	1.05	0.19	SPO2095	1.05	0.547	SPO2090	0.92	0.677	SPO2088	0.87	0.042	SPO2088	0.94	0.180	SPO2086	1.00	0.945
SPO2095	1.13	0.219	SPO2093	0.65	0.403	SPO2094	1.1	0.145	SPO2096	1.02	0.885	SPO2091	1.05	0.775	SPO2089	0.63	0.411	SPO2089	1.02	0.991	SPO2087	0.83	0.291
SPO2096	1.75	0.043	SPO2094	1.19	0.045	SPO2095	1.07	0.46	SPO2097	1.04	0.071	SPO2092	0.97	0.936	SPO2090	1.03	0.623	SPO2090	1.20	0.489	SPO2088	1.14	0.389
SPO2097	1.42	0.352	SPO2095	1.09	0.273	SPO2096	1.03	0.824	SPO2098	1.04	0.989	SPO2093	2.76	0.200	SPO2091	1.08	0.773	SPO2091	1.06	0.799	SPO2089	0.82	0.654
SPO2098	1.19	0.781	SPO2096	1.53	0.071	SPO2097	1.04	0.92	SPO2099	1.17	0.651	SPO2094	0.72	0.082	SPO2092	1.16	0.169	SPO2092	1.19	0.211	SPO2090	1.13	0.266
SPO2099	0.93	0.899	SPO2097	1.43	0.008	SPO2098	1.11	0.974	SPO2100	1.14	0.843	SPO2095	0.92	0.513	SPO2093	1.79	0.361	SPO2093	1.14	0.882	SPO2091	1.07	0.802
SPO2100	0.64	0.203	SPO2098	1.1	0.878	SPO2099	1.21	0.613	SPO2101	1.02	0.858	SPO2096	1.18	0.104	SPO2094	0.75	0.066	SPO2094	1.05	0.846	SPO2092	1.12	0.429
SPO2101	1.5	0.055	SPO2099	0.84	0.737	SPO2100	1.07	0.909	SPO2102	1.18	0.582	SPO2097	0.95	0.663	SPO2095	0.96	0.837	SPO2095	1.13	0.667	SPO2093	1.32	0.593
SPO2102	1.03	0.516	SPO2100	0.71	0.072	SPO2101	1.02	0.908	SPO2103	1.08	0.836	SPO2098	0.78	0.781	SPO2096	1.12	0.271	SPO2096	0.98	0.878	SPO2094	0.88	0.389
SPO2103	1.33	0.29	SPO2101	1.37	0.361	SPO2102	1.21	0.093	SPO2104	1.39	0.521	SPO2099	1.23	0.575	SPO2097	0.99	0.072	SPO2097	0.95	0.615	SPO2095	0.99	0.960
SPO2104	0.77	0.287	SPO2102	1.05	0.23	SPO2103	0.99	0.626	SPO2105	1.02	0.801	SPO2100	1.77	0.032	SPO2098	0.83	0.837	SPO2098	0.89	0.870	SPO2096	1.00	0.955
SPO2105	0.86	0.468	SPO2103	1.32	0.209	SPO2104	1.3	0.767	SPO2106	1.31	0.726	SPO2101	0.38	0.068	SPO2099	1.34	0.388	SPO2099	1.15	0.803	SPO2097	0.88	0.059
SPO2106	1.24	0.444	SPO2104	0.85	0.306	SPO2105	1.13	0.322	SPO2107	1.13	0.269	SPO2102	0.24	0.005	SPO2100	1.74	0.028	SPO2100	0.94	0.793	SPO2098	0.93	0.943
SPO2107	2.55	0.054	SPO2105	0.93	0.312	SPO2106	1.25	0.436	SPO2108	1.2	0.06	SPO2103	0.76	0.440	SPO2101	0.40	0.041	SPO2101	1.00	0.958	SPO2099	0.99	0.995
SPO2108	1.1	0.228	SPO2106	1.41	0.464	SPO2107	1.73	0	SPO2109	1.2	0.032	SPO2104	1.25	0.127	SPO2102	0.21	0.002	SPO2102	0.98	0.987	SPO2100	0.91	0.537
SPO2109	0.97	0.84	SPO2107	2.2	0.06	SPO2108	3.45	0.352	SPO2110	1.01	0.923	SPO2105	0.74	0.279	SPO2103	0.82	0.854	SPO2103	1.03	0.827	SPO2101	0.99	0.951
SPO2110	0.85	0.855	SPO2108	1	0.134	SPO2109	1.02	0.036	SPO2111	1.13	0.733	SPO2106	0.23	0.032	SPO2104	1.11	0.382	SPO2104	1.06	0.848	SPO2102	0.99	0.829
SPO2111	0.9	0.792	SPO2109	0.99	0.806	SPO2110	2.53	0.91	SPO2112	1.07	0.946	SPO2107	0.39	0.028	SPO2105	0.81	0.457	SPO2105	1.03	0.925	SPO2103	0.98	0.993
SPO2112	1.02	0.966	SPO2110	0.88	0.928	SPO2111	1.62	0.882	SPO2113	1.03	0.246	SPO2108	0.88	0.388	SPO2106	0.23	0.037	SPO2106	0.76	0.146	SPO2104	1.09	0.603
SPO2113	0.88	0.479	SPO2111	1.08	0.584	SPO2112	1.19	0.799	SPO2116	1.04	0.732	SPO2109	2.39	0.018	SPO2107	0.37	0.011	SPO2107	0.85	0.404	SPO2105	1.09	0.776
SPO2116	1.17	0.671	SPO2112	1.07	0.899	SPO2113	1.11	0.069	SPO2117	1.21	0.696	SPO2110	1.49	0.653	SPO2108	0.85	0.060	SPO2108	0.68	0.132	SPO2106	0.81	0.384
SPO2117	1.22	0.367	SPO2113	0.84	0.012	SPO2116	1.06	0.875	SPO2118	1.32	0.932	SPO2111	0.73	0.335	SPO2109	2.31	0.006	SPO2109	1.08	0.329	SPO2107	1.05	0.915
SPO2118	1.06	0.909	SPO2116	1.12	0.66	SPO2117	1.06	0.303	SPO2119	1.02	0.166	SPO2112	0.63	0.109	SPO2110	1.48	0.656	SPO2110	1.05	0.946	SPO2108	0.71	0.024
SPO2119	0.95	0	SPO2117	0.91	0.732	SPO2118	1.21	0.875	SPO2120	1.12	0.75	SPO2113	0.96	0.632	SPO2111	0.74	0.394	SPO2111	0.72	0.312	SPO2109	1.13	0.289
SPO2120	0.8	0.827	SPO2118	1.06	0.931	SPO2119	1.14	0.674	SPO2121	1.17	0.033	SPO2116	1.00	0.571	SPO2112	0.85	0.975	SPO2112	0.91	0.865	SPO2110	1.08	0.920
SPO2121	1.21	0.224	SPO2119	1.05	0	SPO2120	1.13	0.395	SPO2122	1.13	0.104	SPO2117	0.46	0.216	SPO2113	1.03	0.232	SPO2113	0.86	0.384	SPO2111	0.80	0.474
SPO2122	1.13	0.084	SPO2120	1.03	0.618	SPO2121	1.18	0.356	SPO2123	1.11	0.949	SPO2118	0.71	0.740	SPO2116	1.02	0.331	SPO2116	0.86	0.455	SPO2112	1.00	0.992
SPO2123	0.83	0.593	SPO2121	1.15	0.265	SPO2122	1.12	0.117	SPO2124	1.19	0.638	SPO2119	1.03	0.854	SPO2117	0.45	0.054	SPO2117	0.68	0.647	SPO2113	0.97	0.871
SPO2124	1.27	0.195	SPO2122	1.18	0.01	SPO2123	1.18	0.971	SPO2125	1.33	0.623	SPO2120	0.83	0.272	SPO2118	0.72	0.785	SPO2118	0.91	0.904	SPO2116	0.92	0.645
SPO2125	2.1	0.028	SPO2123	0.83	0.693	SPO2124	1.09	0.517	SPO2126	1.26	0.408	SPO2121	0.51	0.068	SPO2119	1.09	0.761	SPO2119	1.66	0.047	SPO2117	0.68	0.555
SPO2126	1.63	0.025	SPO2124	1.26	0.162	SPO2125	1.02	0.534	SPO2127	1.03	0.272	SPO2122	1.26	0.078	SPO2120	0.86	0.400	SPO2120	1.10	0.677	SPO2118	0.90	0.931
SPO2127	1.04	0.847	SPO2125	1.7	0.082	SPO2126	1.1	0.778	SPO2128	1.22	0.6	SPO2123	0.63	0.351	SPO2121	0.57	0.004	SPO2121	1.10	0.618	SPO2119	1.18	0.373
SPO2128	1.01	0.982	SPO2126	1.52	0.009	SPO2127	1.1	0.517	SPO2129	1.15	0.883	SPO2124	1.74	0.036	SPO2122	1.34	0.111	SPO2122	1.15	0.496	SPO2120	1.03	0.943
SPO2129	1.7	0.15	SPO2127	1.04	0.725	SPO2128	1.14	0.401	SPO2130	1.05	0.788	SPO2125	1.32	0.197	SPO2123	0.58	0.398	SPO2123	0.99	0.991	SPO2121	1.07	0.719
SPO2130	1.79	0.118	SPO2128	0.99	0.984	SPO2129	1.24	0.695	SPO2131	1.25	0.059	SPO2126	0.79	0.306	SPO2124	1.74	0.052	SPO2124	1.14	0.390	SPO2122	1.01	0.964
SPO2131	0.95	0.705	SPO2129	1.71	0.619	SPO2130	1.22	0.635	SPO2132	1.35	0.5	SPO2127	0.72	0.310	SPO2125	1.31	0.134	SPO2125	1.16	0.238	SPO2123	0.94	0.891
SPO2132	1.63	0.13	SPO2130	1.72	0.074	SPO2131	0.99	0.071	SPO2133	1.17	0.509	SPO2128	0.93	0.475	SPO2126	0.79	0.106	SPO2126	1.07	0.217	SPO2124	1.10	0.553
SPO2133	1.42	0.143	SPO2131	1.04	0.558	SPO2132	1.19	0.18	SPO2134	1.08	0.107	SPO2129	0.42	0.134	SPO2127	0.65	0.044	SPO2127	0.78	0.338	SPO2125	1.23	0.403
SPO2134	0.54	0.19	SPO2132	1.55	0.128	SPO2133	1.38	0.39	SPO2135	1.06	0.207	SPO2130	0.15	0.008	SPO2128	0.97	0.320	SPO2128	0.79	0.153	SPO2126	0.99	0.937
SPO2135	1.32	0.079	SPO2133	1.28	0.106	SPO2134	1.33	0.322	SPO2136	1.06	0.073	SPO2131	0.12	0.001	SPO2129	0.41	0.085	SPO2129	1.20	0.723	SPO2127	0.83	0.487
SPO2136	1.01	0.981	SPO2134	0.54	0.09	SPO2135	1.24	0.023	SPO2137	1.1	0.082	SPO2132	1.05	0.680	SPO2130	0.15	0.010	SPO2130	1.07	0.830	SPO2128	0.93	0.912
SPO2137	0.95	0.902	SPO2135	1.09	0.631	SPO2136	1.15	0.012	SPO2139	0.99	0.428	SPO2133	2.76	0.001	SPO2131	0.12	0.001	SPO2131	1.13	0.224	SPO2129	1.13	0.810
SPO2139	0.93	0.54	SPO2136	1.01	0.568	SPO2137	1.13	0.422	SPO2140	1.1	0.323	SPO2134	2.20	0.174	SPO2132	1.05	0.736	SPO2132	1.09	0.730	SPO2130	0.95	0.885
SPO2140	1.25	0.417	SPO2137	0.97	0.947	SPO2139	1.08	0.01	SPO2141	1.19	0.118	SPO2135	7.14	0.000	SPO2133	2.66	0.002	SPO2133	1.02	0.139	SPO2131	1.10	0.111

SPO2141	1.1	0.528	SPO2139	0.98	0.839	SPO2140	1	0.252	SPO2142	1.03	0.349	SPO2136	2.46	0.008	SPO2134	1.97	0.012	SPO2134	1.57	0.365	SPO2132	1.13	0.453
SPO2142	0.95	0.848	SPO2140	1.2	0.03	SPO2141	1.13	0.058	SPO2143	1.26	0.734	SPO2137	0.86	0.717	SPO2135	5.86	0.004	SPO2135	1.06	0.117	SPO2133	0.79	0.190
SPO2143	1.01	1	SPO2141	0.97	0.992	SPO2142	1.09	0.568	SPO2144	1.12	0.042	SPO2139	1.42	0.214	SPO2136	2.30	0.004	SPO2136	0.96	0.981	SPO2134	1.32	0.118
SPO2144	1.38	0.026	SPO2142	0.97	0.957	SPO2143	1.04	0.874	SPO2145	1.02	0.552	SPO2140	1.17	0.385	SPO2137	0.85	0.285	SPO2137	0.88	0.747	SPO2135	0.83	0.406
SPO2145	0.98	0.766	SPO2143	1.05	0.81	SPO2144	1.02	0.201	SPO2146	1.04	0.296	SPO2141	0.62	0.156	SPO2139	1.42	0.033	SPO2139	0.96	0.911	SPO2136	0.90	0.463
SPO2146	1.11	0.378	SPO2144	1.29	0.067	SPO2145	1.01	0.04	SPO2147	1.04	0.409	SPO2142	1.10	0.260	SPO2140	1.20	0.100	SPO2140	1.06	0.847	SPO2137	0.92	0.612
SPO2147	1.32	0.022	SPO2145	1.03	0.723	SPO2146	1.29	0.379	SPO2148	1.24	0.914	SPO2143	1.07	0.546	SPO2141	0.65	0.416	SPO2141	0.83	0.493	SPO2139	0.94	0.827
SPO2148	1.04	0.375	SPO2146	1.13	0.199	SPO2147	1.03	0.102	SPO2149	1	0.394	SPO2144	1.12	0.042	SPO2142	1.10	0.353	SPO2142	1.11	0.488	SPO2140	1.03	0.853
SPO2149	0.97	0.916	SPO2147	1.33	0.079	SPO2148	1.02	0.906	SPO2150	1.05	0.554	SPO2145	0.92	0.782	SPO2143	1.12	0.409	SPO2143	1.06	0.731	SPO2141	0.87	0.668
SPO2150	1	0.712	SPO2148	1	0.881	SPO2149	1.11	0.266	SPO2151	1.16	0.049	SPO2146	1.37	0.196	SPO2144	1.14	0.011	SPO2144	1.13	0.190	SPO2142	1.14	0.339
SPO2151	0.6	0.007	SPO2149	1.02	0.255	SPO2150	0.99	0.079	SPO2152	1.11	0.053	SPO2147	1.71	0.054	SPO2145	0.89	0.442	SPO2145	1.04	0.676	SPO2143	1.14	0.559
SPO2152	1.14	0.319	SPO2150	1.01	0.771	SPO2151	1.02	0.052	SPO2153	0.98	0.545	SPO2148	1.00	0.319	SPO2146	1.38	0.019	SPO2146	1.15	0.459	SPO2144	1.05	0.011
SPO2153	1.15	0.555	SPO2151	0.68	0.035	SPO2152	1.11	0.323	SPO2154	1.48	0.348	SPO2149	0.78	0.307	SPO2147	1.59	0.020	SPO2147	1.11	0.402	SPO2145	1.06	0.437
SPO2154	0.43	0.196	SPO2152	1.02	0.736	SPO2153	1.12	0.964	SPO2155	1.16	0.489	SPO2150	0.85	0.283	SPO2148	0.94	0.813	SPO2148	0.94	0.380	SPO2146	1.14	0.172
SPO2155	0.95	0.824	SPO2153	1.08	0.228	SPO2154	1.07	0.253	SPO2156	1.22	0.933	SPO2151	1.54	0.008	SPO2149	0.76	0.057	SPO2149	0.93	0.645	SPO2147	1.23	0.195
SPO2156	1.55	0.558	SPO2154	0.41	0.144	SPO2155	1.11	0.772	SPO2157	1.76	0.466	SPO2152	1.08	0.115	SPO2150	0.91	0.981	SPO2150	0.89	0.577	SPO2148	0.95	0.245
SPO2157	1.65	0.027	SPO2155	0.99	0.579	SPO2156	1.04	0.923	SPO2158	3.83	0.046	SPO2153	1.32	0.309	SPO2151	1.52	0.018	SPO2151	1.06	0.447	SPO2149	0.91	0.664
SPO2158	1.47	0.155	SPO2156	1.43	0.603	SPO2157	1.13	0.39	SPO2159	2.69	0.08	SPO2154	2.45	0.158	SPO2152	1.06	0.071	SPO2152	1.05	0.570	SPO2150	0.89	0.428
SPO2159	0.6	0.127	SPO2157	1.54	0.037	SPO2158	1.08	0.092	SPO2160	1.59	0.254	SPO2155	0.83	0.466	SPO2153	1.47	0.037	SPO2153	1.19	0.696	SPO2151	1.11	0.093
SPO2160	0.52	0.289	SPO2158	1.32	0.072	SPO2159	1.12	0.245	SPO2161	1.17	0.269	SPO2156	0.63	0.674	SPO2154	2.79	0.066	SPO2154	2.01	0.197	SPO2152	1.05	0.528
SPO2161	0.79	0.106	SPO2159	0.56	0.025	SPO2160	1.32	0.274	SPO2162	1.05	0.651	SPO2157	0.42	0.028	SPO2155	0.78	0.492	SPO2155	0.93	0.809	SPO2153	1.04	0.681
SPO2162	0.73	0.142	SPO2160	0.5	0.097	SPO2161	1.01	0.883	SPO2163	1.09	0.566	SPO2158	0.48	0.021	SPO2156	0.66	0.765	SPO2156	0.97	0.992	SPO2154	1.82	0.266
SPO2163	0.76	0.35	SPO2161	0.83	0.279	SPO2162	1.1	0.686	SPO2164	1.05	0.387	SPO2159	2.26	0.051	SPO2157	0.40	0.039	SPO2157	0.96	0.986	SPO2155	1.03	0.867
SPO2164	1.17	0.338	SPO2162	0.81	0.088	SPO2163	1.02	0.993	SPO2165	1.04	0.143	SPO2160	2.71	0.046	SPO2158	0.49	0.028	SPO2158	1.00	0.956	SPO2156	0.95	0.965
SPO2165	1.22	0.474	SPO2163	0.99	0.776	SPO2164	1.32	0.595	SPO2166	1.29	0.163	SPO2161	1.84	0.032	SPO2159	2.52	0.025	SPO2159	1.92	0.088	SPO2157	0.98	0.982
SPO2166	1.53	0.024	SPO2164	1.25	0.282	SPO2165	1.03	0.357	SPO2167	1.11	0.142	SPO2162	0.68	0.026	SPO2160	2.63	0.048	SPO2160	1.50	0.221	SPO2158	0.94	0.698
SPO2167	0.92	0.575	SPO2165	1.18	0.432	SPO2166	1.08	0.334	SPO2168	1.05	0.543	SPO2163	0.62	0.103	SPO2161	1.94	0.016	SPO2161	0.86	0.540	SPO2159	1.87	0.041
SPO2168	1.72	0.077	SPO2166	1.39	0.034	SPO2167	1.09	0.193	SPO2169	1.2	0.032	SPO2164	0.97	0.676	SPO2162	0.65	0.021	SPO2162	0.83	0.437	SPO2160	1.46	0.405
SPO2169	1.62	0.005	SPO2167	0.89	0.293	SPO2168	1.18	0.528	SPO2170	1.03	0.326	SPO2165	0.68	0.084	SPO2163	0.60	0.071	SPO2163	0.62	0.144	SPO2161	0.95	0.762
SPO2170	0.46	0.17	SPO2168	1.7	0.396	SPO2169	1.22	0.19	SPO2171	1.19	0.612	SPO2166	0.63	0.004	SPO2164	1.16	0.607	SPO2164	1.05	0.977	SPO2162	0.76	0.198
SPO2171	0.85	0.699	SPO2169	1.51	0.012	SPO2170	1.07	0.588	SPO2173	1.04	0.973	SPO2167	1.56	0.006	SPO2165	0.65	0.037	SPO2165	0.97	0.897	SPO2163	0.61	0.018
SPO2173	1.02	0.422	SPO2170	0.51	0.261	SPO2171	1.47	0.771	SPO2174	1.03	0.814	SPO2168	1.47	0.118	SPO2166	0.64	0.039	SPO2166	0.97	0.772	SPO2164	1.01	0.932
SPO2174	1.08	0.264	SPO2171	0.81	0.372	SPO2173	1.06	0.799	SPO2176	1.03	0.643	SPO2169	1.03	0.581	SPO2167	1.63	0.012	SPO2167	1.01	0.794	SPO2165	0.93	0.287
SPO2176	0.96	0.958	SPO2173	0.93	0.826	SPO2174	1	0.641	SPO2177	1.12	0.976	SPO2170	2.04	0.142	SPO2168	1.39	0.107	SPO2168	1.19	0.671	SPO2166	0.84	0.185
SPO2177	1.15	0.92	SPO2174	1.09	0.135	SPO2176	1.24	0.787	SPO2178	1.08	0.991	SPO2171	1.88	0.075	SPO2169	1.07	0.138	SPO2169	1.19	0.491	SPO2167	1.04	0.326
SPO2178	1.15	0.622	SPO2176	0.88	0.254	SPO2177	1.1	0.987	SPO2179	1.08	0.137	SPO2173	0.83	0.471	SPO2170	1.82	0.250	SPO2170	1.23	0.360	SPO2168	1.19	0.410
SPO2179	1.04	0.712	SPO2177	1.08	0.949	SPO2178	1.06	0.76	SPO2180	1.29	0.47	SPO2174	1.35	0.162	SPO2171	1.89	0.006	SPO2171	1.26	0.759	SPO2169	1.16	0.036
SPO2180	0.73	0.135	SPO2178	1.09	0.71	SPO2179	1.07	0.162	SPO2181	1.27	0.164	SPO2176	0.82	0.208	SPO2173	0.91	0.402	SPO2173	1.05	0.550	SPO2170	1.39	0.038
SPO2181	1.18	0.087	SPO2179	1	0.77	SPO2180	1.07	0.66	SPO2182	1.05	0.544	SPO2177	0.91	0.970	SPO2174	1.26	0.289	SPO2174	1.08	0.781	SPO2171	1.12	0.317
SPO2182	1.03	0.589	SPO2180	0.73	0.098	SPO2181	0.99	0.861	SPO2183	1.16	0.84	SPO2178	0.94	0.863	SPO2176	0.97	0.778	SPO2176	1.02	0.792	SPO2173	1.01	0.941
SPO2183	1.04	0.924	SPO2181	1.07	0.268	SPO2182	0.99	0.301	SPO2184	1.34	0.004	SPO2179	0.63	0.089	SPO2177	0.88	0.964	SPO2177	0.92	0.959	SPO2174	1.03	0.547
SPO2184	0.71	0.154	SPO2182	1.05	0.603	SPO2183	1.25	0.889	SPO2185	0.99	0.757	SPO2180	0.72	0.263	SPO2178	0.96	0.821	SPO2178	0.95	0.879	SPO2176	1.05	0.554
SPO2185	0.82	0.167	SPO2183	0.98	0.968	SPO2184	1.03	0.058	SPO2186	1.33	0.649	SPO2181	0.81	0.277	SPO2179	0.58	0.077	SPO2179	0.95	0.892	SPO2177	0.93	0.962
SPO2186	0.79	0.303	SPO2184	0.65	0.065	SPO2185	1.1	0.876	SPO2187	1.26	0.033	SPO2182	0.82	0.309	SPO2180	0.73	0.339	SPO2180	1.57	0.091	SPO2178	0.93	0.851
SPO2187	0.78	0.035	SPO2185	0.82	0.106	SPO2186	1.27	0.825	SPO2188	1.19	0.99	SPO2183	0.78	0.759	SPO2181	0.85	0.534	SPO2181	0.92	0.571	SPO2179	0.93	0.713
SPO2188	1.26	0.601	SPO2186	0.73	0.252	SPO2187	1.04	0.133	SPO2189	1.08	0.137	SPO2184	1.70	0.010	SPO2182	0.79	0.301	SPO2182	1.00	0.888	SPO2180	1.54	0.079
SPO2189	1.27	0.006	SPO2187	0.71	0.015	SPO2188	1.19	0.979	SPO2190	1.03	0.902	SPO2185	1.74	0.036	SPO2183	0.80	0.799	SPO2183	0.84	0.813	SPO2181	0.99	0.948
SPO2190	0.91	0.643	SPO2188	1.25	0.603	SPO2189	1.03	0.393	SPO2191	1.06	0.842	SPO2186	1.87	0.017	SPO2184	2.01	0.001	SPO2184	1.51	0.054	SPO2182	1.01	0.990
SPO2191	0.88	0.892	SPO2189	1.29	0.049	SPO2190	1.1	0.957	SPO2192	1.18	0.861	SPO2187	1.13	0.063	SPO2185	1.85	0.014	SPO2185	1.12	0.586	SPO2183	0.83	0.838
SPO2192	0.82	0.792	SPO2190	1.04	0.646	SPO2191	1.17	0.824	SPO2193	1.11	0.913	SPO2188	1.17	0.759	SPO2186	1.98	0.002	SPO2186	0.97	0.995	SPO2184	1.45	0.028
SPO2193	0.87	0.377	SPO2191	0.93	0.984	SPO2192	1.03	0.826	SPO2194	1.05	0.378	SPO2189	1.12	0.340	SPO2187	1.18	0.005	SPO2187	1.07	0.181	SPO2185	1.10	0.067
SPO2194	1.07	0.636	SPO2192	0.85	0.71	SPO2193	1.08	0.998	SPO2195	1.28	0.481	SPO2190	1.07	0.384	SPO2188	1.14	0.800	SPO2188	1.10	0.904	SPO2186	1.07	0.579
SPO2195	0.91	0.89	SPO2193	0.81	0.219	SPO2194	1.19	0.897	SPO2196	1.1	0.823	SPO2191	0.97	0.924	SPO2189	1.16	0.035	SPO2189	1.00	0.970	SPO2187	1.07	0.090
SPO2196	1.12	0.717	SPO2194	1.03	0.387	SPO2195	1.05	0.691	SPO2197	1.03	0.598	SPO2192	1.16	0.540	SPO2190	0.99	0.932	SPO2190	0.96	0.808	SPO2188	1.07	0.914
SPO2197	1.24	0.203	SPO2195	1.04	0.069	SPO2196	1.41	0.852	SPO2198	1.19	0.035	SPO2193	1.04	0.661	SPO2191	0.83	0.785	SPO2191	0.89	0.604	SPO2189	1.12	0.326
SPO2198	0.58	0.147	SPO2196	1.12	0.711	SPO2197	1	0.992	SPO2199	1.14	0.097	SPO2194	1.68	0.051	SPO2192	1.06	0.801	SPO2192	0.99	0.970	SPO2190	1.01	0.990
SPO2199	1.88	0.037	SPO2197	1.11	0.564	SPO2198	1.13	0.068	SPO2200	1.07	0.585	SPO2195	0.60	0.017	SPO2193	0.98	0.976	SPO2193	0.93	0.567	SPO2191	0.91	0.787
SPO2200	1.27	0.557	SPO2198	0.54	0.042	SPO2199	1.07	0.211	SPO2201	1.06	0.447	SPO2196	0.59	0.257	SPO2194	1.76	0.058	SPO2194	1.16	0.638	SPO2192	0.93	0.693
SPO2201	0.79	0.013	SPO2199	1.56	0.06	SPO2200	1.1	0.759	SPO2202	1.03	0.771	SPO2197	0.58	0.222	SPO2195	0.62	0.038	SPO2195	0.90	0.504	SPO2193	0.94	0.803
SPO2202	1.14	0.681	SPO2200	1.12	0.723	SPO2201	1.02	0.321	SPO2203	1.14	0.81	SPO2198	2.14	0.068	SPO2196	0.61	0.333	SPO2196	0.94	0.882	SPO2194	1.10	0.676
SPO2203	0.91	0.445	SPO2201	0.87	0.236	SPO2202	1.16	0.831	SPO2204	1.13	0.073	SPO2199	0.65	0.165	SPO2197	0.54	0.059	SPO2197	0.89	0.702	SPO2195	0.87	0.088
SPO2204	0.68	0.06	SPO2202	1.07	0.689	SPO2203	1.16	0.136	SPO2205	1.16	0.723	SPO2200	0.82	0.819	SPO2198	2.24	0.083	SPO2198	0.93	0.795	SPO2196	0.94	0.888
SPO2205	0.79	0.344	SPO2203	0.91	0.895	SPO2204	1.04	0.103	SPO2206	1.3	0.76	SPO2201	0.49	0.015	SPO2199	0.64	0.102	SPO2199	0.81	0.314	SPO2197	0.95	0.885
SPO2206	1	0.963	SPO2204	0.76	0.021	SPO2205	1.17	0.683	SPO2207	1.18	0.188	SPO2202	0.92	0.890	SPO2200	0.87	0.954	SPO2200	0.89	0.832	SPO2198	0.92	0.347
SPO2207	0.55	0.092	SPO2205	0.81	0.144	SPO2206	1.12	0.464	SPO2208	0.99	0.992	SPO2203	0.89	0.975	SPO2201	0.47	0.026	SPO2201	0.90	0.499	SPO2199	0.80	0.362
SPO2208	1.33	0.2	SPO2206	0.85	0.589	SPO2207	1.56	0.169	SPO2209	1.35	0.146	SPO2204	1.55	0.140	SPO2202	0.96	0.974	SPO2202	0.92	0.814	SPO2200	0.89	0.766
SPO2209	0.63	0.09	SPO2207	0.55	0.089	SPO2208	1.33	0.71	SPO2210	1.09	0.045	SPO2205	0.83	0.550	SPO2203	0.91	0.926	SPO2203	0.88	0.777	SPO2201	0.85	0.236
SPO2210	0.84	0.094	SPO2208	1.26	0.094	SPO2209	1.2	0.493	SPO2211	1.04	0.642	SPO2206	0.95	0.975	SPO2204	1.35	0.261	SPO2204	1.16	0.401	SPO2202	0.89	0.763
SPO2211	1.02	0.873	SPO2209	0.69	0.199	SPO2210	1.08	0.02	SPO2212	1.04	0.934	SPO2207	2.03	0.071	SPO2205	0.79	0.206	SPO2205	1.00	0.976	SPO2203	0.89	0.513
SPO2212	1.23	0.764	SPO2210	0.71	0.036	SPO2211	0.98	0.869	SPO2213	1.1	0.659	SPO2208	1.06	0.816	SPO2206	1.11	0.746	SPO2206	1.20	0.223	SPO2204	1.19	0.236
SPO2213	1.2	0.17	SPO2211	0.96	0.958	SPO2212	1.26	0.957	SPO2214	1.17	0.895	SPO2209	0.75	0.567	SPO2207	2.02	0.078	SPO2207	1.02	0.875	SPO2205	0.96	0.797
SPO2214	0.89	0.87	SPO2212	1.27	0.699	SPO2213	1	0.824	SPO2215	1.12	0.677	SPO2210	0.45	0.004	SPO2208	1.05	0.712	SPO2208	1.11	0.472	SPO2206	1.01	0.906
SPO2215	0.89	0.659	SPO2213	0.96	0.934	SPO2214	1.21	0.708	SPO2216	1.24	0.962	SPO2211	1.16	0.698	SPO2209	0.63	0.145	SPO2209	0.90	0.725	SPO2207	0.97	0.986
SPO2216	0.8	0.492	SPO2214	0.83	0.691	SPO2215	1.08	0.467	SPO2217	1.17	0.951	SPO2212	1.47	0.669	SPO2210	0.43	0.022	SPO2210	0.98	0.860	SPO2208	1.04	0.832
SPO2217	0.93	0.967	SPO2215	0.91	0.704	SPO2216	1.01	0.94	SPO2218	1.45	0.891	SPO2213	1.47	0.098	SPO2211	1.25	0.268	SPO2211	0.99	0.961	SPO2209	0.91	0.528
SPO2218	0.91	0.739	SPO2216	0.94	0.953	SPO2217	1.15	0.921	SPO2219	1.15	0.732	SPO2214	0.77	0.363	SPO2212	1.75	0.454	SPO2212	1.07	0.964	SPO2210	0.95	0.862
SPO2219	0.85	0.897	SPO2217	0.96	0.983	SPO2218	0.99	0.828	SPO2220	1.04	0.954	SPO2215	1.25	0.256	SPO2213	1.45	0.088	SPO2213	1.19	0.466	SPO2211	0.99	0.921
SPO2220	0.93	0.916	SPO2218	0.92	0.858	SPO2219	1.08	0.764	SPO2221	1.16	0.202	SPO2216	1.00	0.937	SPO2214	0.76	0.605	SPO2214	1.04	0.965	SPO2212	1.05	0.974
SPO2221	0.85	0.429	SPO2219	0.89	0.93	SPO2220	1.02	0.832	SPO2222	1.15	0.519	SPO2217	0.98	0.977	SPO2215	1.24	0.178	SPO2215	1.09	0.500	SPO2213	1.08	0.317
SPO2222	0.97	0.917	SPO2220	0.88	0.746	SPO2221	1.37	0.392	SPO2223	1.05	0.24	SPO2218	0.87	0.920	SPO2216	0.84	0.673	SPO2216	0.96	0.848	SPO2214	1.03	0.970
SPO2223	1.01	0.858	SPO2221	0.84	0.182	SPO2222	1.01	0.45	SPO2224	1.12	0.651	SPO2219	1.66	0.640	SPO2217	0.99	0.975	SPO2217	1.11	0.854	SPO2215	1.01	0.974
SPO2224	0.97	0.268	SPO2222	0.93	0.75	SPO2223	1.18	0.831	SPO2225	1.05	0.749	SPO2220	0.72	0.276	SPO2218	0.85	0.940	SPO2218	1.12	0.498	SPO2216	0.95	0.819
SPO2225	1.09	0.698	SPO2223	1.04	0.134	SPO2224	1.25	0.836	SPO2226	1.06	0.944	SPO2221	0.96	0.717	SPO2219	1.61	0.608	SPO2219	0.84	0.878	SPO2217	0.99	0.964
SPO2226	1.89	0.447	SPO2224	0.95	0.576	SPO2225	1.08	0.982	SPO2227	1.03	0.805	SPO2222	0.16	0.017	SPO2220	0.71	0.257	SPO2220	1.01	0.994	SPO2218	1.05	0.757
SPO2227	1.11	0.665	SPO2225	1.04	0.799	SPO2226	1.06	0.994	SPO2228	1.38	0.278	SPO2223	0.66	0.035	SPO2221	1.02	0.926	SPO2221	1.37	0.202	SPO2219	1.00	0.995
SPO2228	0.62	0.094	SPO2226	2.12	0.24	SPO2227	1.14	0.774	SPO2229	1.01	0.2	SPO2224	0.68	0.096	SPO2222	0.18	0.006	SPO2222	1.00	0.950	SPO2220	1.00	0.964
SPO2229	0.79	0.301	SPO2227	1.02	0.776	SPO2228	1.3	0.109	SPO2230	1.17	0.136	SPO2225	1.02	0.824	SPO2223	0.65	0.010	SPO2223	1.11	0.331	SPO2221	1.47	0.089
SPO2230	0.58	0.019	SPO2228	0.74	0.13	SPO2229	1.08	0.336	SPO2231	1.33	0.357	SPO2226	1.42	0.705	SPO2224	0.65	0.207	SPO2224	1.05	0.764	SPO2222	0.95	0.892
SPO2231	0.88	0.187	SPO2229	0.76	0.322	SPO2230	1.34	0.221	SPO2232	1	0.465	SPO2227	1.53	0.255	SPO2225	1.05	0.846	SPO2225	0.85	0.576	SPO2223	1.08	0.164
SPO2232	0.93	0.983	SPO2230	0.67	0.118	SPO2231	1.36	0.632	SPO2233	1.14	0.358	SPO2228	1.18	0.148	SPO2226	1.21	0.840	SPO2226	1.19	0.829	SPO2224	1.11	0.698
SPO2233	1.63	0.003	SPO2231	1.01	0.922	SPO2232	1.18	0.541	SPO2234	1.09	0.215	SPO2229	1.76	0.131	SPO2227	1.70	0.137	SPO2227	0.91	0.703	SPO2225	0.93	0.753
SPO2234	0.64	0.071	SPO2232	0.99	0.503	SPO2233	1.12	0.398	SPO2235	1.1	0.741	SPO2230	1.23	0.072	SPO2228	1.12	0.357	SPO2228	1.10	0.627	SPO2226	1.00	0.983
SPO2235	1.19	0.7	SPO2233	1.29	0.256	SPO2234	1.2	0.113	SPO2236	1.04	0	SPO2231	0.86	0.744	SPO2229	1.85	0.036	SPO2229	1.05	0.857	SPO2227	0.99	0.970
SPO2236	1	0	SPO2234	0.7	0.066	SPO2235	1.27	0.988	SPO2237	1.06	0.391	SPO2232	0.53	0.027	SPO2230	1.20	0.035	SPO2230	0.95	0.989	SPO2228	1.14	0.549
SPO2237	0.92	0.733	SPO2235	1.02	0.904	SPO2236	1.29	0.742	SPO2238	1.2	0.399	SPO2233	0.56	0.035	SPO2231	0.85	0.457	SPO2231	0.97	0.604	SPO2229	1.15	0.479
SPO2238	1.09	0.533	SPO2236	1.05	0.668	SPO2237	1.34	0.334	SPO2239	1	0.345	SPO2234	1.09	0.071	SPO2232	0.62	0.008	SPO2232	1.03	0.967	SPO2230	0.99	0.705
SPO2239	1.16	0.575	SPO2237	0.9	0.78	SPO2238	1.16	0.808	SPO2240	1.56	0.568	SPO2235	0.48	0.264	SPO2233	0.57	0.019	SPO2233	0.87	0.005	SPO2231	0.95	0.872
SPO2240	0.48	0.128	SPO2238	1.07	0.72	SPO2239	1.24	0.261	SPO2241	1.1	0.175	SPO2236	1.60	0.347	SPO2234	0.95	0.275	SPO2234	1.15	0.076	SPO2232	0.96	0.432
SPO2241	0.67	0.044	SPO2239	0.99	0.842	SPO2240	1.08	0.765	SPO2242	1.1	0.309	SPO2237	0.93	0.472	SPO2235	0.39	0.182	SPO2235	0.79	0.687	SPO2233	0.87	0.056
SPO2242	0.79	0.135	SPO2240	0.54	0.139	SPO2241	1.05	0.522	SPO2243	1.14	0.074	SPO2238	1.07	0.725	SPO2236	2.15	[redacted]	SPO2236	2.01	[redacted]	SPO2234	1.07	0.534
SPO2243	0.87	0.249	SPO2241	0.69	0.058	SPO2242	1.09	0.139	SPO2244	1.34	0.823	SPO2239	1.41	0.244	SPO2237	0.88	0.461	SPO2237	1.46	0.116	SPO2235	0.79	0.365
SPO2244	0.76	0.503	SPO2242	0.79	0.063	SPO2243	1.26	0.08	SPO2245	1.33	0.515	SPO2240	0.23	0.035	SPO2238	0.96	0.566	SPO2238	1.16	0.064	SPO2236	1.65	[redacted]
SPO2245	0.57	0.139	SPO2243	0.8	0.037	SPO2244	1.17	0.433	SPO2246	1.2	0.174	SPO2241	0.24	0.003	SPO2239	1.32	0.080	SPO2239	1.07	0.827	SPO2237	1.24	0.524
SPO2246	1.25	0.222	SPO2244	0.77	0.298	SPO2245	1.09	0.793	SPO2247	0.98	0.043	SPO2242	0.28	0.019	SPO2240	0.24	0.006	SPO2240	1.29	0.694	SPO2238	1.22	0.399
SPO2247	0.84	0.077	SPO2245	0.63	0.217	SPO2246	1.02	0.314	SPO2248	1.09	0.507	SPO2243	1.69	0.026	SPO2241	0.21	0.002	SPO2241	1.03	0.675	SPO2239	1.07	0.538
SPO2248	0.88	0.77	SPO2246	1.36	0.1	SPO2247	1.23	0.109	SPO2249	1.59	0.846	SPO2244	0.98	0.811	SPO2242	0.31	0.006	SPO2242	1.22	0.453	SPO2240	1.17	0.399
SPO2249	1.84	0.08	SPO2247	0.88	0.079	SPO2248	1.01	0.61	SPO2250	1.22	0.564	SPO2245	0.72	0.212	SPO2243	1.73	0.012	SPO2243	1.35	0.074	SPO2241	1.15	0.315
SPO2250	0.99	0.869	SPO2248	0.93	0.91	SPO2249	1.02	0.339	SPO2251	1.3	0.857	SPO2246	0.12	0.001	SPO2244	1.23	0.461	SPO2244	1.04	0.980	SPO2242	1.28	0.032
SPO2251	2.11	0.091	SPO2249	1.58	0.06	SPO2250	1.04	0.582	SPO2252	1.08	0.449	SPO2247	0.27	0.001	SPO2245	0.68	0.176	SPO2245	1.07	0.800	SPO2243	1.30	0.056
SPO2252	5.5	0.018	SPO2250	0.88	0.784	SPO2251	1.15	0.67	SPO2253	0.99	0.165	SPO2248	0.86	0.447	SPO2246	0.10	0.005	SPO2246	0.93	0.865	SPO2244	0.94	0.639
SPO2253	2.5	0.084	SPO2251	1.98	0.333	SPO2252	1.15	0.348	SPO2255	1.17	0.801	SPO2249	0.85	0.470	SPO2247	0.28	0.001	SPO2247	1.01	0.700	SPO2245	1.05	0.869
SPO2255	2.82	0.108	SPO2252	4.02	0.009	SPO2253	1.2	0.933	SPO2256	1.02	0.751	SPO2250	0.93	0.840	SPO2248	0.96	0.593	SPO2248	1.14	0.684	SPO2246	0.99	0.894
SPO2256	1.45	0.342	SPO2253	2.06	0.035	SPO2255	1.17	0.644	SPO2257	1.21	0.267	SPO2251	0.42	0.220	SPO2249	0.94	0.480	SPO2249	1.23	0.612	SPO2247	1.01	0.346
SPO2257	4.47	0.002	SPO2255	2.18	0.069	SPO2256	1.04	0.909	SPO2258	1.03	0.955	SPO2252	0.38	0.026	SPO2250	0.97	0.928	SPO2250	1.12	0.706	SPO2248	1.01	0.981
SPO2258	1.79	0.714	SPO2256	1.14	0.605	SPO2257	1.16	0.726	SPO2259	1.03	0.922	SPO2253	0.51	0.248	SPO2251	0.49	0.335	SPO2251	0.65	0.451	SPO2249	1.01	0.925
SPO2259	2.03	0.368	SPO2257	4.82	0.004	SPO2258	1.17	0.96	SPO2260	1.08	0.858	SPO2255	0.51	0.184	SPO2252	0.50	0.042	SPO2252	0.91	0.540	SPO2250	1.15	0.574
SPO2260	1.96	0.111	SPO2258	1.39	0.857	SPO2259	1.14	0.959	SPO2261	1	0.068	SPO2256	0.58	0.285	SPO2253	0.57	0.017	SPO2253	1.04	0.994	SPO2251	0.80	0.706
SPO2261	9.77	0.004	SPO2259	1.57	0.601	SPO2260	1.15	0.832	SPO2262	1.13	0.719	SPO2257	0.29	0.022	SPO2255	0.56	0.091	SPO2255	0.99	0.937	SPO2252	0.81	0.030
SPO2262	6.77	0.018	SPO2260	1.84	0.214	SPO2261	1.06	0.318	SPO2263	0.99	0.805	SPO2258	0.47	0.649	SPO2256	0.64	0.052	SPO2256	0.81	0.555	SPO2253	0.94	0.779
SPO2263	4.95	0.117	SPO2261	7.11	0.002	SPO2262	1.36	0.905	SPO2264	1.06	0.266	SPO2259	0.48	0.369	SPO2257	0.29	0.001	SPO2257	0.71	0.205	SPO2255	1.02	0.920
SPO2264	15.8	0.018	SPO2262	7.69	0.002	SPO2263	1.08	0.891	SPO2266	1.32	0.255	SPO2260	0.49	0.519	SPO2258	0.51	0.764	SPO2258	0.96	0.972	SPO2256	0.85	0.269
SPO2266	1.37	0.46	SPO2263	3.07	0.192	SPO2264	1.1	0.9	SPO2267	1.01	0.163	SPO2261	0.08	0.000	SPO2259	0.53	0.497	SPO2259	0.72	0.557	SPO2257	0.80	0.242
SPO2267	1.53	0	SPO2264	11.4	0.003	SPO2266	1.04	0.853	SPO2268	1.17	0.377	SPO2262	0.12	0.006	SPO2260	0.51	0.232	SPO2260	0.94	0.922	SPO2258	0.95	0.976
SPO2268	1.04	0.635	SPO2266	0.94	0.948	SPO2267	1.1	0.453	SPO2269	1.3	0.448	SPO2263	0.34	0.006	SPO2261	0.09	0.004	SPO2261	0.81	0.241	SPO2259	0.80	0.766
SPO2269	1.22	0.068	SPO2267	0.92	0	SPO2268	1.16	0.798	SPO2270	1.12	0.239	SPO2264	0.11	0.003	SPO2262	0.13	0.005	SPO2262	0.87	0.234	SPO2260	1.02	0.991
SPO2270	1.38	0.02	SPO2268	1.02	0.42	SPO2269	1.39	0.635	SPO2271	1.08	0.158	SPO2266	0.69	0.271	SPO2263	0.35	0.002	SPO2263	0.91	0.649	SPO2261	0.87	0.569
SPO2271	1.32	0.041	SPO2269	1.3	0.079	SPO2270	1.04	0.187	SPO2272	1.12	0.922	SPO2267	1.12	0.969	SPO2264	0.12	0.002	SPO2264	0.50	0.180	SPO2262	0.84	0.418
SPO2272	1.18	0.309	SPO2270	1.45	0.105	SPO2271	1.23	0.736	SPO2273	1.3	0.018	SPO2268	0.93	0.588	SPO2266	0.66	0.359	SPO2266	0.92	0.861	SPO2263	0.91	0.850
SPO2273	1.27	0.011	SPO2271	1.18	0.049	SPO2272	1.04	0.933	SPO2274	1.18	0.932	SPO2269	0.68	0.094	SPO2267	0.98	0.535	SPO2267	1.17	[redacted]	SPO2264	0.43	0.004
SPO2274	1.33	0.025	SPO2272	1.11	0.094	SPO2273	1.3	0.108	SPO2275	1.36	0.007	SPO2270	1.51	0.016	SPO2268	1.06	0.485	SPO2268	1.06	0.701	SPO2266	1.04	0.927
SPO2275	1	0.872	SPO2273	1.17	0.014	SPO2274	1.39	0.35	SPO2276	1.31	0.037	SPO2271	1.09	0.035	SPO2269	0.76	0.025	SPO2269	0.90	0.438	SPO2267	1.02	0.948
SPO2276	0.88	0.07	SPO2274	1.16	0.066	SPO2275	1.45	0.071	SPO2277	1.21	0.565	SPO2272	0.48	0.027	SPO2270	1.43	0.007	SPO2270	0.95	0.869	SPO2268	1.03	0.851
SPO2277	0.71	0.161	SPO2275	0.99	0.823	SPO2276	1.08	0.066	SPO2278	1.12	0.471	SPO2273	0.98	0.035	SPO2271	1.09	0.125	SPO2271	1.05	0.277	SPO2269	0.88	0.434
SPO2278	0.49	0.078	SPO2276	0.93	0.517	SPO2277	1.27	0.06	SPO2279	1.12	0.294	SPO2274	0.92	0.256	SPO2272	0.46	0.013	SPO2272	0.98	0.774	SPO2270	0.98	0.981
SPO2279	0.52	0.059	SPO2277	0.8	0.464	SPO2278	1.15	0.614	SPO2280	1.3	0.388	SPO2275	1.24	0.021	SPO2273	1.00	0.061	SPO2273	0.81	0.005	SPO2271	1.05	0.531
SPO2280	0.87	0.173	SPO2278	0.53	0.094	SPO2279	1.21	0.418	SPO2281	1.33	0.037	SPO2276	1.85	0.037	SPO2274	0.97	0.073	SPO2274	1.11	0.183	SPO2272	1.01	0.949
SPO2281	0.93	0.33	SPO2279	0.49	0.024	SPO2280	1.03	0.079	SPO2282	1.32	0.036	SPO2277	1.50	0.008	SPO2275	1.26	0.012	SPO2275	1.19	0.245	SPO2273	0.79	0.016
SPO2282	1.08	0.133	SPO2280	0.88	0.599	SPO2281	1.09	0.423	SPO2283	1.07	0.345	SPO2278	1.38	0.264	SPO2276	1.74	0.000	SPO2276	1.15	0.387	SPO2274	1.01	0.609
SPO2283	2.23	0.074	SPO2281	1.08	0.639	SPO2282	1.07	0.006	SPO2284	1.11	0.732	SPO2279	1.80	0.027	SPO2277	1.35	0.281	SPO2277	1.13	0.704	SPO2275	1.23	0.046

SPO2284	1.37	0.061	SPO2282	1.32	0.078	SPO2283	1.01	0.219	SPO2285	1.23	0.044	SPO2280	0.81	0.335	SPO2278	1.31	0.245	SPO2278	1.31	0.281	SPO2276	1.20	0.033
SPO2285	0.81	0.034	SPO2283	1.95	0.102	SPO2284	1.18	0.476	SPO2286	1.15	0.732	SPO2281	1.69	0.006	SPO2279	1.69	0.051	SPO2279	1.14	0.422	SPO2277	1.10	0.564
SPO2286	0.79	0.716	SPO2284	1.26	0.03	SPO2285	1.1	0.063	SPO2287	1.11	0.607	SPO2282	1.98	0.002	SPO2280	0.76	0.361	SPO2280	0.85	0.290	SPO2278	1.30	0.250
SPO2287	0.59	0.016	SPO2285	0.83	0.062	SPO2286	1.16	0.791	SPO2288	1.18	0.252	SPO2283	0.81	0.840	SPO2281	1.51	0.019	SPO2281	1.04	0.420	SPO2279	1.17	0.098
SPO2288	2.03	0.063	SPO2286	0.83	0.772	SPO2287	1.28	0.669	SPO2289	1.22	0.791	SPO2284	1.35	0.133	SPO2282	1.69	0.019	SPO2282	1.02	0.679	SPO2280	0.83	0.327
SPO2289	0.31	0.168	SPO2287	0.74	0.202	SPO2288	1.01	0.384	SPO2290	0.99	0.167	SPO2285	0.52	0.010	SPO2283	0.70	0.589	SPO2283	1.01	0.883	SPO2281	1.12	0.237
SPO2290	0.58	0.03	SPO2288	1.91	0.066	SPO2289	1.08	0.676	SPO2292	1.19	0.472	SPO2286	0.75	0.764	SPO2284	1.37	0.032	SPO2284	0.85	0.460	SPO2282	1.07	0.536
SPO2292	0.96	0.841	SPO2289	0.38	0.245	SPO2290	1.11	0.193	SPO2293	1.04	0.887	SPO2287	0.42	0.012	SPO2285	0.51	0.001	SPO2285	0.94	0.715	SPO2283	0.84	0.743
SPO2293	0.91	0.426	SPO2290	0.79	0.56	SPO2292	1.05	0.324	SPO2294	1.29	0.606	SPO2288	0.88	0.957	SPO2286	0.65	0.585	SPO2286	0.93	0.952	SPO2284	0.83	0.421
SPO2294	0.75	0.028	SPO2292	0.94	0.71	SPO2293	1.11	0.861	SPO2295	1.08	0.245	SPO2289	4.11	0.085	SPO2287	0.35	0.029	SPO2287	0.98	0.408	SPO2285	0.93	0.330
SPO2295	1.66	0.252	SPO2293	0.98	0.903	SPO2294	1.01	0.811	SPO2296	1.05	0.008	SPO2290	0.75	0.038	SPO2288	0.85	0.898	SPO2288	1.00	0.904	SPO2286	1.00	0.975
SPO2296	0.51	0.03	SPO2294	0.84	0.082	SPO2295	1.05	0.52	SPO2297	1.06	0.043	SPO2292	1.87	0.066	SPO2289	3.72	0.127	SPO2289	1.39	0.597	SPO2287	0.83	0.363
SPO2297	0.9	0.289	SPO2295	1.46	0.215	SPO2296	1.17	0.124	SPO2298	1	0.141	SPO2293	1.01	0.854	SPO2290	0.80	0.138	SPO2290	1.06	0.892	SPO2288	0.90	0.684
SPO2298	1.04	0.894	SPO2296	0.54	0.062	SPO2297	1.19	0.24	SPO2299	1.14	0.571	SPO2294	0.54	0.006	SPO2292	1.91	0.022	SPO2292	0.90	0.273	SPO2289	1.48	0.535
SPO2299	0.63	0.474	SPO2297	1.04	0.655	SPO2298	1.08	0.218	SPO2300	1.01	0.922	SPO2295	0.24	0.048	SPO2293	0.97	0.955	SPO2293	1.05	0.846	SPO2290	1.22	0.161
SPO2300	0.89	0.907	SPO2298	0.88	0.638	SPO2299	1.43	0.768	SPO2301	1.13	0.813	SPO2296	1.32	0.126	SPO2294	0.51	0.003	SPO2294	1.03	0.155	SPO2292	1.04	0.722
SPO2301	0.67	0.055	SPO2299	0.72	0.136	SPO2300	1.08	0.956	SPO2302	1.29	0.485	SPO2297	0.61	0.030	SPO2295	0.25	0.017	SPO2295	1.04	0.876	SPO2293	1.01	0.913
SPO2302	0.88	0.499	SPO2300	0.97	0.905	SPO2301	1.2	0.892	SPO2303	1.17	0.82	SPO2298	1.56	0.125	SPO2296	1.34	0.121	SPO2296	1.04	0.798	SPO2294	1.07	0.327
SPO2303	1.07	0.577	SPO2301	0.81	0.111	SPO2302	1.09	0.265	SPO2304	1.02	0.331	SPO2299	0.77	0.241	SPO2297	0.56	0.048	SPO2297	0.78	0.071	SPO2295	0.98	1.000
SPO2304	1.1	0.515	SPO2302	0.95	0.236	SPO2303	1.01	0.857	SPO2305	1.18	0.604	SPO2300	0.61	0.162	SPO2298	1.93	0.030	SPO2298	1.02	0.868	SPO2296	1.09	0.441
SPO2305	1.17	0.141	SPO2303	1.05	0.694	SPO2304	1.04	0.114	SPO2306	1.18	0.602	SPO2301	0.53	0.026	SPO2299	0.80	0.139	SPO2299	0.77	0.552	SPO2297	0.82	0.051
SPO2306	0.73	0.14	SPO2304	1.05	0.163	SPO2305	1.18	0.371	SPO2307	1.17	0.667	SPO2302	0.93	0.284	SPO2300	0.58	0.024	SPO2300	0.96	0.353	SPO2298	1.03	0.757
SPO2307	1.01	0.636	SPO2305	1.23	0.111	SPO2306	1.22	0.285	SPO2308	1.23	0.217	SPO2303	1.24	0.015	SPO2301	0.49	0.032	SPO2301	1.04	0.850	SPO2299	1.05	0.921
SPO2308	1	0.691	SPO2306	0.86	0.414	SPO2307	1.22	0.79	SPO2309	1.11	0.876	SPO2304	1.05	0.643	SPO2302	0.98	0.070	SPO2302	1.11	0.470	SPO2300	1.11	0.585
SPO2309	1.26	0.524	SPO2307	1	0.597	SPO2308	1.17	0.154	SPO2310	1.47	0.339	SPO2305	1.24	0.099	SPO2303	1.43	0.097	SPO2303	1.09	0.320	SPO2301	1.02	0.813
SPO2310	1.26	0.299	SPO2308	1	0.451	SPO2309	1.02	0.65	SPO2311	1.11	0.697	SPO2306	0.59	0.115	SPO2304	1.04	0.452	SPO2304	0.89	0.633	SPO2302	1.12	0.032
SPO2311	1.07	0.22	SPO2309	1.28	0.789	SPO2310	1.14	0.377	SPO2312	1.11	0.128	SPO2307	0.76	0.020	SPO2305	1.28	0.063	SPO2305	1.16	0.134	SPO2303	1.03	0.873
SPO2312	1.49	0.046	SPO2310	1.24	0.015	SPO2311	1.03	0.331	SPO2313	1.13	0.461	SPO2308	0.74	0.141	SPO2306	0.61	0.144	SPO2306	0.75	0.126	SPO2304	0.93	0.811
SPO2313	1.22	0.417	SPO2311	1.1	0.209	SPO2312	1.11	0.09	SPO2314	1.18	0.892	SPO2309	0.92	0.751	SPO2307	0.75	0.036	SPO2307	0.91	0.149	SPO2305	1.16	0.220
SPO2314	1.31	0.414	SPO2312	1.44	0.089	SPO2313	1.14	0.416	SPO2315	1.17	0.953	SPO2310	0.74	0.081	SPO2308	0.93	0.085	SPO2308	1.07	0.830	SPO2306	0.77	0.137
SPO2315	1.52	0.071	SPO2313	1.33	0.218	SPO2314	1.15	0.813	SPO2316	1.35	0.862	SPO2311	0.57	0.157	SPO2309	0.79	0.755	SPO2309	0.88	0.364	SPO2307	0.86	0.054
SPO2316	1.19	0.781	SPO2314	1.26	0.373	SPO2315	1.12	0.547	SPO2317	1.16	0.52	SPO2312	0.74	0.263	SPO2310	0.74	0.009	SPO2310	0.83	0.194	SPO2308	1.16	0.586
SPO2317	1.38	0.389	SPO2315	1.38	0.057	SPO2316	1.07	0.94	SPO2318	1.22	0.943	SPO2313	0.59	0.022	SPO2311	0.61	0.017	SPO2311	1.24	0.361	SPO2309	0.90	0.864
SPO2318	1.43	0.142	SPO2316	1.11	0.876	SPO2317	1.14	0.707	SPO2319	1.38	0.739	SPO2314	1.01	0.625	SPO2312	0.75	0.501	SPO2312	1.13	0.450	SPO2310	0.81	0.281
SPO2319	1.31	0.57	SPO2317	1.28	0.274	SPO2318	1.11	0.889	SPO2320	1.49	0.544	SPO2315	0.93	0.881	SPO2313	0.57	0.226	SPO2313	0.95	0.738	SPO2311	1.30	0.293
SPO2320	1.87	0.052	SPO2318	1.37	0.162	SPO2319	1.22	0.809	SPO2321	1.07	0.568	SPO2316	1.02	0.925	SPO2314	1.09	0.570	SPO2314	1.09	0.719	SPO2312	1.03	0.743
SPO2321	1.12	0.131	SPO2319	1.07	0.837	SPO2320	1.1	0.375	SPO2322	1.27	0.328	SPO2317	0.71	0.214	SPO2315	0.92	0.738	SPO2315	1.10	0.640	SPO2313	0.94	0.772
SPO2322	0.89	0.148	SPO2320	1.66	0.014	SPO2321	1.11	0.891	SPO2323	1.11	0.883	SPO2318	1.04	0.908	SPO2316	1.00	0.940	SPO2316	0.96	0.948	SPO2314	1.06	0.879
SPO2323	0.68	0.618	SPO2321	1.29	0.038	SPO2322	1.1	0.16	SPO2324	1.21	0.365	SPO2319	0.76	0.739	SPO2317	0.69	0.256	SPO2317	0.79	0.259	SPO2315	1.07	0.344
SPO2324	0.91	0.721	SPO2322	0.96	0.869	SPO2323	1.22	0.898	SPO2325	1.16	0.514	SPO2320	0.66	0.057	SPO2318	0.89	0.668	SPO2318	1.11	0.848	SPO2316	0.98	0.988
SPO2325	1	0.995	SPO2323	0.79	0.73	SPO2324	1.17	0.103	SPO2326	1.03	0.248	SPO2321	1.52	0.008	SPO2319	0.69	0.445	SPO2319	0.88	0.814	SPO2317	0.84	0.383
SPO2326	0.66	0.063	SPO2324	1.06	0.742	SPO2325	1.13	0.449	SPO2327	1.01	0.033	SPO2322	1.25	0.004	SPO2320	0.71	0.217	SPO2320	0.96	0.907	SPO2318	1.05	0.908
SPO2327	0.95	0.655	SPO2325	0.91	0.815	SPO2326	1.19	0.234	SPO2328	1.09	0.582	SPO2323	0.89	0.905	SPO2321	1.52	0.003	SPO2321	1.04	0.623	SPO2319	0.98	0.987
SPO2328	0.99	0.935	SPO2326	0.7	0.096	SPO2327	1.39	0.018	SPO2329	1.01	0.414	SPO2324	0.33	0.042	SPO2322	1.19	0.005	SPO2322	0.94	0.887	SPO2320	0.95	0.909
SPO2329	1.49	0.159	SPO2327	1.06	0.557	SPO2328	1.21	0.892	SPO2330	1.25	0.816	SPO2325	1.09	0.501	SPO2323	0.83	0.857	SPO2323	0.83	0.838	SPO2321	1.08	0.224
SPO2330	1.28	0.402	SPO2328	0.94	0.832	SPO2329	1.09	0.42	SPO2331	1.11	0.016	SPO2326	1.22	0.120	SPO2324	0.32	0.032	SPO2324	0.91	0.423	SPO2322	0.96	0.960
SPO2331	2.14	0.027	SPO2329	1.37	0.213	SPO2330	1.17	0.755	SPO2332	1.36	0.04	SPO2327	0.51	0.027	SPO2325	1.05	0.592	SPO2325	0.93	0.862	SPO2323	0.81	0.744
SPO2332	1.52	0.043	SPO2330	1.29	0.447	SPO2331	1.07	0.008	SPO2333	1.34	0.373	SPO2328	1.47	0.024	SPO2326	1.31	0.074	SPO2326	1.34	0.079	SPO2324	0.81	0.487
SPO2333	1.38	0.179	SPO2331	2.06	0.005	SPO2332	1.08	0.008	SPO2334	1.01	0.947	SPO2329	0.70	0.276	SPO2327	0.46	0.028	SPO2327	1.01	0.836	SPO2325	0.97	0.966
SPO2334	1.11	0.909	SPO2332	1.7	0.064	SPO2333	1.23	0.193	SPO2335	1.07	0.644	SPO2330	0.92	0.929	SPO2328	1.42	0.004	SPO2328	1.18	0.117	SPO2326	1.26	0.208
SPO2335	1.42	0.04	SPO2333	1.42	0.063	SPO2334	1.03	0.95	SPO2336	1.08	0.734	SPO2331	0.37	0.009	SPO2329	0.70	0.375	SPO2329	1.10	0.582	SPO2327	0.97	0.957
SPO2336	0.99	0.971	SPO2334	1.04	0.957	SPO2335	1.04	0.467	SPO2337	1.1	0.957	SPO2332	0.51	0.041	SPO2330	0.89	0.961	SPO2330	1.02	0.910	SPO2328	1.27	0.062
SPO2337	1.1	0.05	SPO2335	1.44	0.288	SPO2336	1.11	0.652	SPO2338	1.11	0.764	SPO2333	0.99	0.860	SPO2331	0.35	0.015	SPO2331	0.92	0.763	SPO2329	0.99	0.942
SPO2338	1.54	0.243	SPO2336	1.04	0.365	SPO2337	1.06	0.816	SPO2339	1.11	0.719	SPO2334	0.89	0.961	SPO2332	0.53	0.006	SPO2332	1.00	0.706	SPO2330	0.99	0.969
SPO2339	1.34	0.493	SPO2337	1.17	0.188	SPO2338	1.04	0.784	SPO2340	1.08	0.545	SPO2335	4.09	0.007	SPO2333	1.09	0.506	SPO2333	0.91	0.789	SPO2331	0.80	0.339
SPO2340	1.65	0.056	SPO2338	1.39	0.494	SPO2339	1.31	0.697	SPO2341	1.18	0.493	SPO2336	0.99	0.645	SPO2334	1.03	0.931	SPO2334	0.88	0.921	SPO2332	0.99	0.816
SPO2341	1.36	0.07	SPO2339	1.22	0.652	SPO2340	1.15	0.539	SPO2342	1.14	0.073	SPO2337	1.10	0.404	SPO2335	3.91	0.010	SPO2335	1.20	0.538	SPO2333	0.94	0.797
SPO2342	0.59	0.001	SPO2340	1.37	0.285	SPO2341	1.04	0.68	SPO2343	1.06	0.215	SPO2338	0.85	0.776	SPO2336	0.95	0.776	SPO2336	1.05	0.720	SPO2334	1.00	0.997
SPO2343	0.55	0.025	SPO2341	1.32	0.201	SPO2342	1.14	0.004	SPO2344	0.97	0.116	SPO2339	0.61	0.483	SPO2337	1.06	0.279	SPO2337	0.99	0.983	SPO2335	1.12	0.316
SPO2344	0.57	0.08	SPO2342	0.74	0.01	SPO2343	1.15	0.346	SPO2345	1.42	0.045	SPO2340	0.50	0.209	SPO2338	0.88	0.873	SPO2338	1.02	0.976	SPO2336	1.01	0.849
SPO2345	0.62	0.033	SPO2343	0.63	0.038	SPO2344	1.03	0.138	SPO2346	1.06	0.429	SPO2341	0.94	0.912	SPO2339	0.63	0.502	SPO2339	0.97	0.989	SPO2337	1.07	0.588
SPO2346	0.85	0.478	SPO2344	0.63	0.111	SPO2345	1.1	0.014	SPO2347	1.12	0.571	SPO2342	1.10	0.006	SPO2340	0.51	0.132	SPO2340	1.18	0.721	SPO2338	0.99	0.976
SPO2347	0.85	0.402	SPO2345	0.64	0.022	SPO2346	1.1	0.157	SPO2348	1.07	0.374	SPO2343	1.08	0.273	SPO2341	0.99	0.937	SPO2341	1.12	0.519	SPO2339	0.97	0.986
SPO2348	0.89	0.31	SPO2346	0.86	0.228	SPO2347	1.06	0.687	SPO2349	0.98	0.009	SPO2344	0.51	0.086	SPO2342	0.91	0.343	SPO2342	0.85	0.184	SPO2340	1.14	0.631
SPO2349	1.21	0.37	SPO2347	0.88	0.257	SPO2348	1.11	0.05	SPO2350	1.09	0.09	SPO2345	0.56	0.044	SPO2343	1.04	0.331	SPO2343	0.87	0.374	SPO2341	1.13	0.350
SPO2350	1.21	0.029	SPO2348	0.81	0.085	SPO2349	1.06	0.079	SPO2351	1.05	0.904	SPO2346	0.34	0.019	SPO2344	0.54	0.056	SPO2344	1.03	0.774	SPO2342	0.83	0.100
SPO2351	1.25	0.023	SPO2349	0.88	0.343	SPO2350	1.46	0.19	SPO2352	1.22	0.967	SPO2347	0.47	0.014	SPO2345	0.58	0.037	SPO2345	1.10	0.488	SPO2343	0.90	0.617
SPO2352	1.39	0.253	SPO2350	1.13	0.041	SPO2351	1.06	0.633	SPO2353	1.03	0.123	SPO2348	0.36	0.012	SPO2346	0.32	0.005	SPO2346	1.02	0.896	SPO2344	1.25	0.222
SPO2353	1.01	0.569	SPO2351	1.16	0.012	SPO2352	1.33	0.884	SPO2354	1.22	0.72	SPO2349	2.27	0.024	SPO2347	0.44	0.016	SPO2347	1.07	0.793	SPO2345	1.14	0.298
SPO2354	1.61	0.02	SPO2352	1.31	0.211	SPO2353	1.07	0.656	SPO2355	1.18	0.576	SPO2350	0.83	0.444	SPO2348	0.37	0.013	SPO2348	1.05	0.731	SPO2346	1.01	0.913
SPO2355	1.37	0.083	SPO2353	1.08	0.476	SPO2354	1.16	0.859	SPO2356	1.15	0.543	SPO2351	0.88	0.619	SPO2349	1.73	0.283	SPO2349	0.93	0.852	SPO2347	1.05	0.777
SPO2356	1.23	0.258	SPO2354	1.41	0.006	SPO2355	1.07	0.783	SPO2357	0.99	0.809	SPO2352	0.93	0.682	SPO2350	0.84	0.753	SPO2350	0.76	0.005	SPO2348	1.05	0.729
SPO2357	1.01	0.846	SPO2355	1.29	0.096	SPO2356	1.08	0.258	SPO2358	1.24	0.851	SPO2353	1.11	0.656	SPO2351	0.92	0.424	SPO2351	1.15	0.398	SPO2349	1.05	0.575
SPO2358	0.85	0.924	SPO2356	1.14	0.549	SPO2357	1.15	0.899	SPO2359	1.02	0.783	SPO2354	0.72	0.054	SPO2352	1.00	0.591	SPO2352	1.08	0.851	SPO2350	0.77	0.032
SPO2359	1.08	0.759	SPO2357	1.09	0.221	SPO2358	1.01	0.859	SPO2361	1.15	0.511	SPO2355	1.00	0.755	SPO2353	1.16	0.361	SPO2353	1.11	0.799	SPO2351	1.12	0.009
SPO2361	0.93	0.938	SPO2358	0.8	0.913	SPO2359	1.2	0.983	SPO2362	1.23	0.765	SPO2356	0.96	0.898	SPO2354	0.79	0.153	SPO2354	1.03	0.730	SPO2352	1.15	0.586
SPO2362	1	0.317	SPO2359	1.17	0.751	SPO2361	1.01	0.719	SPO2363	1.16	0.217	SPO2357	1.03	0.944	SPO2355	1.07	0.331	SPO2355	1.16	0.396	SPO2353	0.95	0.783
SPO2363	0.93	0.967	SPO2361	0.83	0.162	SPO2362	1.04	0.573	SPO2365	1.04	0.506	SPO2358	1.48	0.814	SPO2356	0.93	0.773	SPO2356	1.04	0.953	SPO2354	0.94	0.502
SPO2364	0.83	0	SPO2362	0.91	0.281	SPO2363	1.01	0.928	SPO2366	1.07	0	SPO2359	1.04	0.936	SPO2357	0.89	0.391	SPO2357	0.90	0.715	SPO2355	1.09	0.091
SPO2365	0.97	0	SPO2363	0.95	1	SPO2364	1.05	0	SPO2367	1.15	0.959	SPO2361	1.21	0.352	SPO2358	1.33	0.853	SPO2358	0.93	0.972	SPO2356	0.98	0.954
SPO2366	0.82	0.726	SPO2364	0.98	0	SPO2365	1	0.276	SPO2369	1.03	0.417	SPO2362	1.05	0.695	SPO2359	0.90	0.748	SPO2359	0.95	0.779	SPO2357	0.88	0.656
SPO2367	0.92	0.983	SPO2365	0.93	0.983	SPO2366	1.16	0.914	SPO2370	1.2	0.563	SPO2363	0.79	0.755	SPO2361	1.37	0.006	SPO2361	1.05	0.827	SPO2358	0.94	0.975
SPO2369	1.13	0.689	SPO2366	0.8	0	SPO2367	1.32	0.984	SPO2371	1.13	0.048	SPO2364	1.22	0.849	SPO2362	1.14	0.090	SPO2362	1.07	0.757	SPO2359	0.84	0.695
SPO2370	1.3	0.254	SPO2367	1	0.976	SPO2369	1.41	0.875	SPO2372	1	0.773	SPO2365	0.84	0.147	SPO2363	0.73	0.674	SPO2363	0.74	0.436	SPO2361	1.06	0.900
SPO2371	0.38	0.001	SPO2369	1.11	0.513	SPO2370	1.1	0.4	SPO2373	1.09	0.901	SPO2366	1.02	[redacted]	SPO2364	0.77	[redacted]	SPO2365	1.05	0.999	SPO2362	1.08	0.480
SPO2372	1.04	0.618	SPO2370	0.98	0.984	SPO2371	1.1	0.048	SPO2374	1.11	0.077	SPO2367	1.90	0.722	SPO2365	0.69	0.211	SPO2366	0.77	0.661	SPO2363	0.85	0.392
SPO2373	1.15	0.189	SPO2371	0.43	0.013	SPO2372	1.01	0.817	SPO2376	1.14	0.646	SPO2368	1.04	1.000	SPO2366	0.75	0.063	SPO2367	1.15	0.939	SPO2365	0.79	0.575
SPO2374	1.48	0.01	SPO2372	1.09	0.54	SPO2373	1.29	0.851	SPO2377	1.03	0.087	SPO2369	1.17	0.433	SPO2367	1.41	0.811	SPO2369	1.14	0.348	SPO2366	0.88	0.656
SPO2376	0.87	0.709	SPO2373	1.13	0.103	SPO2374	1.16	0.359	SPO2378	1.25	0.734	SPO2370	0.29	0.038	SPO2369	1.21	0.508	SPO2370	0.92	0.599	SPO2367	0.98	0.985
SPO2377	0.84	0.531	SPO2374	1.56	0.084	SPO2376	1	0.77	SPO2380	1.15	0.7	SPO2371	0.27	0.009	SPO2370	0.25	0.031	SPO2371	1.38	0.034	SPO2368	0.97	[redacted]
SPO2378	0.75	0.148	SPO2376	0.95	0.983	SPO2377	0.99	0.793	SPO2381	1.23	0.979	SPO2372	1.72	0.036	SPO2371	0.26	0.009	SPO2372	0.97	0.814	SPO2369	1.17	0.453
SPO2380	0.97	0.936	SPO2377	0.85	0.393	SPO2378	1.12	0.511	SPO2382	1.52	0.601	SPO2373	1.33	0.022	SPO2372	1.55	0.044	SPO2373	1.14	0.036	SPO2370	0.86	0.508
SPO2381	0.81	0.82	SPO2378	0.88	0.586	SPO2380	1.04	0.514	SPO2383	1.22	0.171	SPO2374	0.82	0.089	SPO2373	1.28	0.039	SPO2374	0.88	0.035	SPO2371	1.48	0.054
SPO2382	0.71	0.362	SPO2380	0.97	0.931	SPO2381	1.02	0.955	SPO2384	1.07	0.147	SPO2376	1.50	0.165	SPO2374	0.85	0.092	SPO2376	0.98	0.714	SPO2372	0.93	0.583
SPO2383	1.43	0.203	SPO2381	0.82	0.916	SPO2382	1.02	0.585	SPO2385	1.21	0.914	SPO2377	1.39	0.207	SPO2376	1.46	0.198	SPO2377	0.84	0.574	SPO2373	1.11	0.160
SPO2384	1.03	0.85	SPO2382	0.72	0.22	SPO2383	1.02	0.562	SPO2386	1.04	0.615	SPO2378	1.57	0.085	SPO2377	1.82	0.021	SPO2378	1.04	0.824	SPO2374	0.87	0.183
SPO2385	0.83	0.521	SPO2383	1.26	0.04	SPO2384	1.02	0.618	SPO2387	1.19	0.93	SPO2380	1.59	0.287	SPO2378	1.62	0.227	SPO2380	1.03	0.994	SPO2376	0.93	0.482
SPO2386	0.83	0.301	SPO2384	0.96	0.811	SPO2385	1.07	0.958	SPO2388	1.05	0.925	SPO2381	1.34	0.734	SPO2380	1.35	0.390	SPO2381	0.97	0.944	SPO2377	1.08	0.704
SPO2387	0.91	0.963	SPO2385	0.83	0.268	SPO2386	1.2	0.952	SPO2389	1.05	0.359	SPO2382	1.66	0.172	SPO2381	1.39	0.791	SPO2382	0.95	0.847	SPO2378	1.08	0.880
SPO2388	1	0.73	SPO2386	0.85	0.081	SPO2387	1.03	0.852	SPO2390	1.04	0.029	SPO2383	1.02	0.927	SPO2382	1.66	0.157	SPO2383	0.99	0.946	SPO2380	1.00	0.974
SPO2389	0.77	0.392	SPO2387	1.1	0.83	SPO2388	1.15	0.595	SPO2393	1.15	0.836	SPO2384	1.11	0.930	SPO2383	1.03	0.803	SPO2384	1.35	0.502	SPO2381	1.04	0.971
SPO2390	1.28	0.158	SPO2388	0.89	0.755	SPO2389	1.09	0.722	SPO2394	1.35	0.819	SPO2385	1.14	0.625	SPO2384	0.82	0.190	SPO2385	0.99	0.856	SPO2382	1.03	0.930
SPO2393	0.58	0.379	SPO2389	0.85	0.318	SPO2390	1.03	0.407	SPO2395	1.16	0.254	SPO2386	1.44	0.412	SPO2385	1.22	0.345	SPO2386	1.13	0.425	SPO2383	0.96	0.744
SPO2394	0.54	0.171	SPO2390	1.02	0.772	SPO2393	1.13	0.801	SPO2396	1.04	0.071	SPO2387	1.20	0.861	SPO2386	1.45	0.065	SPO2387	0.85	0.333	SPO2384	1.24	0.350
SPO2395	0.57	0.042	SPO2393	0.72	0.797	SPO2394	1.13	0.395	SPO2397	1.07	0.441	SPO2388	1.13	0.887	SPO2387	0.93	0.819	SPO2388	0.93	0.672	SPO2385	1.01	0.953
SPO2396	0.32	0.019	SPO2394	0.63	0.048	SPO2395	1.22	0.079	SPO2398	1.18	0.001	SPO2389	0.66	0.135	SPO2388	1.07	0.774	SPO2389	0.89	0.709	SPO2386	1.06	0.686
SPO2397	0.29	0.082	SPO2395	0.55	0.166	SPO2396	1.1	0.182	SPO2399	1.01	0.013	SPO2390	0.57	0.024	SPO2389	0.61	0.037	SPO2390	0.58	0.363	SPO2387	1.05	0.931
SPO2398	0.05	0	SPO2396	0.33	0.007	SPO2397	1.09	0.461	SPO2400	1.05	0.656	SPO2393	0.88	0.932	SPO2390	0.41	0.069	SPO2393	0.87	0.881	SPO2388	0.88	0.241
SPO2399	0.06	0.002	SPO2397	0.34	0.063	SPO2398	1	0.004	SPO2401	1.13	0.179	SPO2394	1.61	0.092	SPO2393	0.84	0.871	SPO2394	1.15	0.523	SPO2389	0.86	0.293
SPO2400	1	0.932	SPO2398	0.07	0.001	SPO2399	1.25	0.043	SPO2406	1.22	0.627	SPO2395	1.41	0.222	SPO2394	1.38	0.239	SPO2395	1.23	0.111	SPO2390	0.57	0.048
SPO2401	1.02	0.815	SPO2399	0.07	0.021	SPO2400	1.04	0.355	SPO2408	1.07	0.955	SPO2396	1.90	0.013	SPO2395	1.24	0.406	SPO2396	1.77	0.034	SPO2393	1.00	0.986
SPO2406	0.95	0.952	SPO2400	1.01	0.888	SPO2401	1.02	0.11	SPO2409	1.45	0.217	SPO2397	2.16	0.131	SPO2396	2.02	0.075	SPO2397	1.77	0.246	SPO2394	1.13	0.868
SPO2408	0.93	0.998	SPO2401	0.96	0.865	SPO2406	1.45	0.645	SPO2410	1.43	0.881	SPO2398	6.98	0.007	SPO2397	2.18	0.087	SPO2398	3.29	0.013	SPO2395	1.18	0.569
SPO2409	1.19	0.443	SPO2406	0.99	0.504	SPO2408	1.06	0.983	SPO2411	1.09	0.277	SPO2399	7.56	0.002	SPO2398	5.74	0.000	SPO2399	3.26	0.018	SPO2396	1.84	0.103
SPO2410	1.06	0.64	SPO2408	0.97	0.984	SPO2409	1.04	0.844	SPO2412	1.11	0.755	SPO2400	0.81	0.619	SPO2399	8.18	0.009	SPO2400	0.84	0.704	SPO2397	1.80	0.161
SPO2411	0.94	0.89	SPO2409	1.17	0.137	SPO2410	1.07	0.669	SPO2413	1.08	0.305	SPO2401	1.61	0.144	SPO2400	0.84	0.713	SPO2401	1.28	0.270	SPO2398	3.47	0.004
SPO2412	1.41	0.037	SPO2410	1.01	0.529	SPO2411	1.56	0.012	SPO2414	1.02	0.504	SPO2406	1.42	0.051	SPO2401	1.43	0.054	SPO2406	1.32	0.297	SPO2399	3.62	0.063
SPO2413	1.17	0.226	SPO2411	1.03	0.517	SPO2412	1.08	0.449	SPO2415	1.25	0.926	SPO2407	0.78	[redacted]	SPO2406	1.41	0.006	SPO2408	0.78	0.850	SPO2400	0.87	0.774
SPO2414	0.95	0.985	SPO2412	1.29	0.042	SPO2413	1.01	0.646	SPO2416	1.04	0.314	SPO2408	0.85	0.886	SPO2408	0.84	0.860	SPO2409	1.09	0.892	SPO2401	1.20	0.409
SPO2415	1.07	0.655	SPO2413	1.22	0.101	SPO2414	1.07	0.923	SPO2417	1.17	0.945	SPO2409	0.58	0.037	SPO2409	0.61	0.005	SPO2410	0.80	0.456	SPO2406	1.19	0.172
SPO2416	0.87	0.657	SPO2414	1.01	0.231	SPO2415	1.04	0.761	SPO2418	1.05	0.309	SPO2410	0.50	0.028	SPO2410	0.56	0.019	SPO2411	1.01	0.937	SPO2407	1.55	[redacted]
SPO2417	0.81	0.888	SPO2415	0.97	0.942	SPO2416	1.1	0.346	SPO2419	1.04	0.947	SPO2411	0.95	0.436	SPO2411	0.95	0.659	SPO2412	1.03	0.946	SPO2408	0.95	0.957
SPO2418	1.1	0.176	SPO2416	0.99	0.71	SPO2417	1.21	0.893	SPO2420	1.13	0.622	SPO2412	0.86	0.181	SPO2412	0.85	0.336	SPO2413	1.01	0.893	SPO2409	1.03	0.873
SPO2419	0.93	0.957	SPO2417	1.18	0.904	SPO2418	1.16	0.568	SPO2421	1.33	0.069	SPO2413	1.05	0.917	SPO2413	0.96	0.175	SPO2414	0.81	0.205	SPO2410	0.87	0.361
SPO2420	0.85	0.867	SPO2418	1.07	0.245	SPO2419	1.15	0.992	SPO2422	1.38	0.851	SPO2414	0.79	0.275	SPO2414	0.85	0.442	SPO2415	1.04	0.976	SPO2411	1.09	0.825
SPO2421	0.93	0.995	SPO2419	0.95	0.948	SPO2420	1.08	0.919	SPO2423	1.06	0.42	SPO2415	0.78	0.194	SPO2415	0.81	0.329	SPO2416	0.88	0.514	SPO2412	1.02	0.944
SPO2422	1.11	0.411	SPO2420	0.89	0.751	SPO2421	1.07	0.064	SPO2424	1.19	0.58	SPO2416	0.71	0.118	SPO2416	0.90	0.186	SPO2417	0.90	0.939	SPO2413	0.95	0.755
SPO2423	0.91	0.918	SPO2421	0.93	0.88	SPO2422	1.02	0.357	SPO2425	1.16	0.25	SPO2417	0.62	0.720	SPO2417	0.59	0.739	SPO2418	0.85	0.351	SPO2414	0.85	0.178
SPO2424	1.17	0.542	SPO2422	1.2	0.511	SPO2423	1	0.671	SPO2426	1.3	0.914	SPO2418	0.76	0.031	SPO2418	0.73	0.052	SPO2419	0.82	0.582	SPO2415	1.03	0.974
SPO2425	1.42	0.204	SPO2423	1.02	0.649	SPO2424	1.18	0.611	SPO2427	1.1	0.213	SPO2419	0.67	0.440	SPO2419	0.67	0.150	SPO2420	0.79	0.500	SPO2416	0.95	0.477
SPO2426	1.17	0.283	SPO2424	1.31	0.041	SPO2425	1.16	0.915	SPO2428	1.03	0.574	SPO2420	0.79	0.526	SPO2420	0.83	0.191	SPO2421	0.92	0.638	SPO2417	0.88	0.915
SPO2427	0.9	0.759	SPO2425	1.51	0.021	SPO2426	1.04	0.653	SPO2429	1.07	0.792	SPO2421	0.67	0.088	SPO2421	0.65	0.021	SPO2422	0.85	0.270	SPO2418	0.85	0.336
SPO2428	1.03	0.797	SPO2426	1.1	0.586	SPO2427	1.08	0.089	SPO2430	1.05	0.588	SPO2422	0.60	0.141	SPO2422	0.72	0.302	SPO2423	1.13	0.744	SPO2419	0.92	0.778
SPO2429	1.12	0.67	SPO2427	0.91	0.744	SPO2428	1.14	0.629	SPO2431	1.06	0.401	SPO2423	0.99	0.715	SPO2423	1.08	0.997	SPO2424	0.85	0.394	SPO2420	0.79	0.217
SPO2430	1.05	0.565	SPO2428	0.96	0.971	SPO2429	1.03	0.717	SPO2432	1.06	0.364	SPO2424	0.88	0.846	SPO2424	0.80	0.172	SPO2425	1.01	0.921	SPO2421	0.94	0.149
SPO2431	1.2	0.125	SPO2429	1.35	0.041	SPO2430	1.1	0.815	SPO2433	1.02	0.723	SPO2425	0.68	0.093	SPO2425	0.73	0.042	SPO2426	0.96	0.848	SPO2422	0.91	0.760
SPO2432	1.31	0.334	SPO2430	0.98	0.8	SPO2431	1.11	0.694	SPO2434	1.07	0.059	SPO2426	1.27	0.481	SPO2426	1.09	0.842	SPO2427	0.95	0.837	SPO2423	1.12	0.683
SPO2433	0.85	0.678	SPO2431	1.11	0.443	SPO2432	1.12	0.321	SPO2435	1.05	0.158	SPO2427	1.11	0.684	SPO2427	1.14	0.448	SPO2428	1.06	0.842	SPO2424	0.90	0.695
SPO2434	0.6	0.024	SPO2432	1.36	0.341	SPO2433	1.03	0.556	SPO2436	1.35	0.952	SPO2428	1.10	0.791	SPO2428	1.18	0.747	SPO2429	0.91	0.681	SPO2425	0.94	0.364

SPO2435	0.85	0.701	SPO2433	0.85	0.58	SPO2434	1.14	0.015	SPO2437	1.2	0.915	SPO2429	1.01	0.602	SPO2429	0.97	0.474	SPO2430	1.11	0.809	SPO2426	0.95	0.615
SPO2436	1.2	0.707	SPO2434	0.69	0.041	SPO2435	1.04	0.243	SPO2438	1.06	0.324	SPO2430	1.00	0.573	SPO2430	1.24	0.565	SPO2431	1.00	0.959	SPO2427	0.96	0.789
SPO2437	0.96	0.963	SPO2435	0.93	0.561	SPO2436	1.02	0.891	SPO2439	1.12	0.713	SPO2431	0.83	0.264	SPO2431	0.72	0.065	SPO2432	0.97	0.760	SPO2428	0.99	0.961
SPO2438	0.7	0.284	SPO2436	1.08	0.888	SPO2437	1.15	0.975	SPO2440	1.14	0.685	SPO2432	1.25	0.228	SPO2432	1.32	0.501	SPO2433	1.09	0.919	SPO2429	0.75	0.349
SPO2439	0.89	0.297	SPO2437	1	0.876	SPO2438	1.03	0.151	SPO2441	1.32	0.68	SPO2433	1.09	[redacted]	SPO2433	1.38	0.284	SPO2434	1.01	0.934	SPO2430	1.00	0.932
SPO2440	0.86	0.7	SPO2438	0.72	0.405	SPO2439	1.09	0.779	SPO2442	1	0.785	SPO2434	1.75	0.027	SPO2434	1.71	0.018	SPO2435	0.96	0.766	SPO2431	0.98	0.813
SPO2441	0.88	0.318	SPO2439	0.89	0.66	SPO2440	1.07	0.941	SPO2443	1.03	0.293	SPO2435	0.94	0.340	SPO2435	0.97	0.379	SPO2436	0.95	0.849	SPO2432	0.97	0.829
SPO2442	0.88	0.907	SPO2440	0.86	0.198	SPO2441	1.09	0.419	SPO2444	1.33	0.545	SPO2436	0.90	0.932	SPO2436	1.06	0.989	SPO2437	1.05	0.980	SPO2433	1.08	0.789
SPO2443	0.85	0.759	SPO2441	1.02	0.383	SPO2442	1.02	0.858	SPO2445	1.08	0.937	SPO2437	1.50	0.306	SPO2437	1.75	0.515	SPO2438	1.14	0.783	SPO2434	1.11	0.383
SPO2444	1.32	0.039	SPO2442	1.01	0.645	SPO2443	1.15	0.197	SPO2446	1.05	0.349	SPO2438	1.69	0.068	SPO2438	1.57	0.133	SPO2439	1.13	0.585	SPO2435	0.97	0.946
SPO2445	1.23	0.254	SPO2443	0.78	0.305	SPO2444	1.07	0.644	SPO2447	1.54	0.987	SPO2439	1.56	0.204	SPO2439	1.28	0.187	SPO2440	1.02	0.991	SPO2436	0.93	0.904
SPO2446	1.26	0.093	SPO2444	1.51	0.014	SPO2445	1.1	1	SPO2448	1.08	0.941	SPO2440	1.24	0.088	SPO2440	1.19	0.139	SPO2441	0.89	0.767	SPO2437	1.20	0.770
SPO2447	1.05	0.799	SPO2445	0.92	0.882	SPO2446	1.06	0.247	SPO2449	1.02	0.619	SPO2441	1.53	0.043	SPO2441	1.41	0.005	SPO2442	0.86	0.770	SPO2438	1.17	0.578
SPO2448	1.25	0.736	SPO2446	1.36	0.028	SPO2447	1	0.878	SPO2450	1.08	0.058	SPO2442	0.96	0.952	SPO2442	0.72	0.156	SPO2443	1.14	0.393	SPO2439	1.08	0.566
SPO2449	1.09	0.423	SPO2447	1.22	0.464	SPO2448	1.12	0.956	SPO2451	1.48	0.84	SPO2443	2.54	0.048	SPO2443	2.31	0.014	SPO2444	1.07	0.550	SPO2440	1.02	0.922
SPO2450	0.96	0.998	SPO2448	1.24	0.819	SPO2449	1.18	0.109	SPO2452	1	0.842	SPO2444	0.73	0.163	SPO2444	0.70	0.214	SPO2445	0.97	0.888	SPO2441	0.93	0.796
SPO2451	1.03	0.976	SPO2449	1.06	0.676	SPO2450	1.18	0.287	SPO2453	1.09	0.181	SPO2445	0.93	0.735	SPO2445	0.85	0.458	SPO2446	1.19	0.055	SPO2442	0.95	0.460
SPO2452	1.38	0.467	SPO2450	0.7	0.432	SPO2451	1.15	0.96	SPO2454	1.07	0.183	SPO2446	1.40	0.068	SPO2446	1.47	0.007	SPO2447	0.93	0.705	SPO2443	1.01	0.932
SPO2453	0.93	0.425	SPO2451	0.97	0.916	SPO2452	1.27	0.994	SPO2455	1.21	0.828	SPO2447	1.20	0.482	SPO2447	1.18	0.539	SPO2448	0.90	0.930	SPO2444	1.01	0.844
SPO2454	1.33	0.038	SPO2452	1.26	0.649	SPO2453	1.1	0.35	SPO2456	1.16	0.131	SPO2448	1.10	0.769	SPO2448	1.07	0.866	SPO2449	1.05	0.693	SPO2445	1.00	0.984
SPO2455	0.79	0.336	SPO2453	0.93	0.542	SPO2454	1.08	0.205	SPO2457	1.15	0.48	SPO2449	0.50	0.022	SPO2449	0.57	0.021	SPO2450	1.05	0.817	SPO2446	1.09	0.144
SPO2456	1.15	0.223	SPO2454	1.3	0.09	SPO2455	1.03	0.61	SPO2458	1.06	0.982	SPO2450	2.88	0.095	SPO2450	4.49	0.010	SPO2451	1.15	0.894	SPO2447	1.06	0.830
SPO2457	1.1	0.326	SPO2455	0.83	0.484	SPO2456	1.08	0.186	SPO2459	1.09	0.027	SPO2451	0.78	0.924	SPO2451	0.63	0.421	SPO2452	0.98	0.988	SPO2448	0.97	0.991
SPO2458	1.37	0.656	SPO2456	1.15	0.293	SPO2457	1.38	0.163	SPO2460	1.07	0.467	SPO2452	0.88	0.953	SPO2452	0.76	0.820	SPO2453	0.99	0.863	SPO2449	1.07	0.561
SPO2459	0.67	0.009	SPO2457	1.1	0.228	SPO2458	1	0.976	SPO2461	1.1	0.907	SPO2453	1.47	0.009	SPO2453	1.45	0.004	SPO2454	1.07	0.511	SPO2450	1.18	0.349
SPO2460	2.02	0.009	SPO2458	1.26	0.783	SPO2459	1.14	0.601	SPO2462	1.01	0.792	SPO2454	0.92	0.937	SPO2454	0.91	0.841	SPO2455	1.00	0.915	SPO2451	1.05	0.896
SPO2461	1.64	0.005	SPO2459	0.71	0.016	SPO2460	1.01	0.815	SPO2463	1.09	0.926	SPO2455	1.00	0.657	SPO2455	1.02	0.487	SPO2456	0.85	0.479	SPO2452	0.91	0.876
SPO2462	1.03	0.652	SPO2460	1.77	0.01	SPO2461	1.17	0.995	SPO2464	1.17	0.669	SPO2456	0.70	0.249	SPO2456	0.65	0.035	SPO2457	0.93	0.723	SPO2453	1.00	0.451
SPO2463	1.2	0.409	SPO2461	1.55	0.052	SPO2462	1.05	0.667	SPO2465	1	0.726	SPO2457	1.10	0.513	SPO2457	1.08	0.024	SPO2458	0.99	0.989	SPO2454	0.98	0.948
SPO2464	1.08	0.668	SPO2462	0.95	0.957	SPO2463	1.12	0.752	SPO2466	1.08	0.245	SPO2458	0.76	0.830	SPO2458	0.74	0.808	SPO2459	1.00	0.819	SPO2455	0.99	0.935
SPO2465	1.38	0.118	SPO2463	1.21	0.587	SPO2464	1.11	0.832	SPO2467	1.12	0.928	SPO2459	2.56	0.015	SPO2459	2.70	0.003	SPO2460	1.32	0.243	SPO2456	0.78	0.050
SPO2466	0.59	0.125	SPO2464	1.01	0.808	SPO2465	1.23	0.643	SPO2468	1.05	0.541	SPO2460	0.99	0.924	SPO2460	0.99	0.790	SPO2461	1.32	0.098	SPO2457	0.96	0.883
SPO2467	0.87	0.794	SPO2465	1.16	0.7	SPO2466	1.21	0.176	SPO2469	1.13	0.433	SPO2461	1.21	0.132	SPO2461	1.23	0.153	SPO2462	0.86	0.451	SPO2458	0.94	0.947
SPO2468	0.73	0.022	SPO2466	0.63	0.029	SPO2467	1.29	0.763	SPO2470	1.1	0.589	SPO2462	0.71	0.215	SPO2462	0.69	0.206	SPO2463	1.01	0.931	SPO2459	1.15	0.661
SPO2469	0.97	0.899	SPO2467	1.02	0.896	SPO2468	1.72	0.685	SPO2471	1.16	0.353	SPO2463	1.23	0.291	SPO2463	1.37	0.492	SPO2464	0.96	0.860	SPO2460	1.10	0.226
SPO2470	0.78	0.39	SPO2468	0.82	0.173	SPO2469	1.42	0.666	SPO2472	1.22	0.195	SPO2464	0.97	0.867	SPO2464	1.04	0.713	SPO2465	1.02	0.998	SPO2461	1.19	0.053
SPO2471	0.85	0.465	SPO2469	0.97	0.879	SPO2470	1.44	0.476	SPO2473	1.06	0.283	SPO2465	0.71	0.360	SPO2465	0.83	0.515	SPO2466	1.05	0.350	SPO2462	0.90	0.573
SPO2472	1.15	0.357	SPO2470	0.83	0.654	SPO2471	1.46	0.007	SPO2474	1.13	0.122	SPO2466	0.61	0.017	SPO2466	0.66	0.021	SPO2467	0.83	0.710	SPO2463	1.10	0.839
SPO2473	1.97	0.005	SPO2471	0.84	0.419	SPO2472	1.25	0.719	SPO2475	1.06	0.203	SPO2467	1.01	0.842	SPO2467	1.06	0.777	SPO2468	0.93	0.734	SPO2464	0.98	0.966
SPO2474	1.87	0.016	SPO2472	0.98	0.709	SPO2473	1.11	0.843	SPO2476	1.03	0.521	SPO2468	1.12	0.019	SPO2468	1.19	0.087	SPO2469	0.98	0.705	SPO2465	0.95	0.884
SPO2475	1.3	0.019	SPO2473	1.62	0.009	SPO2474	1.01	0.289	SPO2477	1.2	0.01	SPO2469	0.70	0.011	SPO2469	0.72	0.009	SPO2470	1.03	0.916	SPO2466	1.16	0.331
SPO2476	0.77	0.167	SPO2474	1.66	0.006	SPO2475	1.16	0.936	SPO2479	1.07	0.611	SPO2470	0.99	0.743	SPO2470	0.93	0.939	SPO2471	1.15	0.563	SPO2467	0.85	0.761
SPO2477	1.12	0.412	SPO2475	1.29	0.081	SPO2476	1.2	0.092	SPO2480	1.19	0.413	SPO2471	1.07	0.456	SPO2471	1.10	0.281	SPO2472	1.31	0.450	SPO2468	0.99	0.880
SPO2479	1.29	0.474	SPO2476	0.79	0.327	SPO2477	1.09	0.021	SPO2481	1.09	0.998	SPO2472	1.32	0.628	SPO2472	1.42	0.097	SPO2473	1.07	0.174	SPO2469	0.98	0.901
SPO2480	0.82	0.083	SPO2477	1.1	0.702	SPO2479	1.15	0.862	SPO2482	1.19	0.053	SPO2473	0.75	0.007	SPO2473	0.80	0.097	SPO2474	1.09	0.085	SPO2470	1.09	0.851
SPO2481	1.02	0.927	SPO2479	1.18	0.783	SPO2480	1.28	0.489	SPO2483	1.1	0.914	SPO2474	0.61	0.043	SPO2474	0.57	0.007	SPO2475	1.38	0.143	SPO2471	1.10	0.718
SPO2482	1.01	0.671	SPO2480	0.82	0.22	SPO2481	1.15	0.981	SPO2484	1.06	0.689	SPO2475	0.60	0.009	SPO2475	0.62	0.005	SPO2476	0.91	0.230	SPO2472	1.18	0.592
SPO2483	1.17	0.344	SPO2481	0.88	0.95	SPO2482	1.22	0.255	SPO2485	1.05	0.614	SPO2476	1.15	0.297	SPO2476	1.19	0.160	SPO2477	1.03	0.711	SPO2473	1.04	0.722
SPO2484	1.19	0.575	SPO2482	0.98	0.918	SPO2483	1.06	0.887	SPO2486	1.09	0.734	SPO2477	0.95	0.694	SPO2477	0.94	0.466	SPO2479	1.40	0.350	SPO2474	1.04	0.486
SPO2485	0.88	0.75	SPO2483	1.1	0.355	SPO2484	1.19	0.602	SPO2487	1.13	0.963	SPO2479	0.71	0.133	SPO2479	0.77	0.519	SPO2480	1.12	0.125	SPO2475	1.34	0.099
SPO2486	1.22	0.507	SPO2484	1.16	0.593	SPO2485	1.16	0.273	SPO2488	1.03	0.537	SPO2480	1.12	0.169	SPO2480	1.19	0.350	SPO2481	0.79	0.549	SPO2476	0.94	0.728
SPO2487	1.53	0.317	SPO2485	0.86	0.874	SPO2486	1.32	0.392	SPO2489	1.15	0.544	SPO2481	0.92	0.948	SPO2481	0.82	0.870	SPO2482	0.97	0.915	SPO2477	1.06	0.045
SPO2488	1.01	0.791	SPO2486	1.13	0.875	SPO2487	1.03	0.965	SPO2490	1.26	0.866	SPO2482	1.43	0.058	SPO2482	1.24	0.131	SPO2483	0.88	0.687	SPO2479	1.13	0.697
SPO2489	1.05	0.887	SPO2487	1.38	0.431	SPO2488	1.17	0.486	SPO2491	1.15	0.209	SPO2483	0.83	0.377	SPO2483	0.80	0.227	SPO2484	1.02	0.885	SPO2480	1.15	0.368
SPO2490	0.97	0.819	SPO2488	1.04	0.78	SPO2489	1.05	0.52	SPO2492	1.3	0.518	SPO2484	0.88	0.947	SPO2484	0.86	0.946	SPO2485	0.85	0.762	SPO2481	0.88	0.883
SPO2491	0.83	0.76	SPO2489	1.12	0.8	SPO2490	1.03	0.479	SPO2493	1.16	0.77	SPO2485	0.83	0.915	SPO2485	0.81	0.892	SPO2486	0.35	0.382	SPO2482	1.07	0.421
SPO2492	1.02	0.944	SPO2490	1.01	0.674	SPO2491	1.04	0.578	SPO2494	1.11	0.954	SPO2486	0.38	0.148	SPO2486	0.30	0.152	SPO2487	0.99	0.970	SPO2483	1.05	0.777
SPO2493	1.35	0.276	SPO2491	0.93	0.761	SPO2492	1.12	0.532	SPO2495	1	0.124	SPO2487	1.26	0.394	SPO2487	1.34	0.403	SPO2488	1.38	0.233	SPO2484	0.98	0.988
SPO2494	1.38	0.023	SPO2492	1.09	0.268	SPO2493	1.19	0.939	SPO2496	1.09	0.359	SPO2488	1.98	0.059	SPO2488	1.98	0.088	SPO2489	0.87	0.850	SPO2485	0.84	0.610
SPO2495	1.11	0.488	SPO2493	1.52	0.14	SPO2494	1.01	0.859	SPO2498	1.43	0.908	SPO2489	0.36	0.181	SPO2489	0.35	0.179	SPO2490	0.97	0.967	SPO2486	0.31	0.417
SPO2496	0.9	0.788	SPO2494	1.32	0.095	SPO2495	1.09	0.029	SPO2499	1.05	0.793	SPO2490	0.93	0.560	SPO2490	0.91	0.507	SPO2491	1.24	0.791	SPO2487	0.98	0.967
SPO2498	1.31	0.261	SPO2495	1.06	0.578	SPO2496	1.09	0.35	SPO2500	1.05	0.238	SPO2491	1.95	0.207	SPO2491	2.05	0.015	SPO2492	0.98	0.709	SPO2488	1.23	0.523
SPO2499	0.67	0.004	SPO2496	0.92	0.589	SPO2498	1.01	0.445	SPO2501	1	0.06	SPO2492	1.24	0.019	SPO2492	1.23	0.041	SPO2493	0.95	0.938	SPO2489	0.89	0.881
SPO2500	0.81	0.5	SPO2498	1.32	0.061	SPO2499	1.02	0.216	SPO2502	1.09	0.432	SPO2493	1.73	0.076	SPO2493	1.74	0.098	SPO2494	1.06	0.653	SPO2490	0.95	0.856
SPO2501	0.71	0.017	SPO2499	0.8	0.396	SPO2500	1.22	0.734	SPO2503	1.04	0.547	SPO2494	1.35	0.056	SPO2494	1.36	0.020	SPO2495	0.82	0.393	SPO2491	1.13	0.667
SPO2502	1.05	0.668	SPO2500	0.83	0.483	SPO2501	1.29	0.019	SPO2504	1.05	0.879	SPO2495	0.56	0.034	SPO2495	0.63	0.008	SPO2496	0.94	0.959	SPO2492	0.98	0.842
SPO2503	0.83	0.376	SPO2501	0.72	0.006	SPO2502	1.01	0.118	SPO2505	1.14	0.497	SPO2496	0.89	0.918	SPO2496	0.85	0.959	SPO2498	1.39	0.056	SPO2493	0.93	0.854
SPO2504	1.29	0.114	SPO2502	1.06	0.227	SPO2503	1.27	0.377	SPO2506	1.03	0.237	SPO2498	1.02	0.692	SPO2498	1.20	0.101	SPO2499	0.84	0.160	SPO2494	1.03	0.741
SPO2505	0.96	0.698	SPO2503	1.06	0.612	SPO2504	1.15	0.838	SPO2507	1.17	0.032	SPO2499	0.98	0.216	SPO2499	0.93	0.113	SPO2500	0.99	0.980	SPO2495	0.81	0.192
SPO2506	1.57	0.067	SPO2504	1.32	0.207	SPO2505	1.1	0.32	SPO2508	1.1	0.208	SPO2500	2.08	0.289	SPO2500	2.28	0.048	SPO2501	1.02	0.885	SPO2496	0.95	0.959
SPO2507	0.71	0.068	SPO2505	1.09	0.5	SPO2506	1.07	0.177	SPO2509	1.01	0.963	SPO2501	2.88	0.017	SPO2501	2.99	0.011	SPO2502	1.02	0.774	SPO2498	1.21	0.192
SPO2508	0.62	0.147	SPO2506	1.29	0.097	SPO2507	1	0.063	SPO2510	1.21	0.901	SPO2502	2.19	0.017	SPO2502	2.09	0.059	SPO2503	0.89	0.479	SPO2499	0.90	0.354
SPO2509	1.02	0.923	SPO2507	0.74	0.008	SPO2508	1.13	0.029	SPO2511	1.19	0.532	SPO2503	1.68	0.022	SPO2503	1.35	0.041	SPO2504	1.01	0.903	SPO2500	1.01	0.889
SPO2510	1.14	0.892	SPO2508	0.68	0.049	SPO2509	1.23	0.947	SPO2512	1.44	0.457	SPO2504	0.94	0.890	SPO2504	0.93	0.901	SPO2505	0.94	0.899	SPO2501	1.00	0.751
SPO2511	1.29	0.05	SPO2509	0.99	0.951	SPO2510	1.07	0.952	SPO2513	1.73	0.101	SPO2505	0.93	0.698	SPO2505	0.86	0.752	SPO2506	0.93	0.794	SPO2502	0.97	0.972
SPO2512	0.82	0.389	SPO2510	1.52	0.712	SPO2511	1.26	0.587	SPO2514	1.37	0.935	SPO2506	0.43	0.025	SPO2506	0.38	0.013	SPO2507	1.04	0.528	SPO2503	0.77	0.194
SPO2513	0.82	0.007	SPO2511	1.37	0.032	SPO2512	1.3	0.761	SPO2515	1.4	0.887	SPO2507	0.44	0.010	SPO2507	0.43	0.008	SPO2508	0.78	0.311	SPO2504	0.97	0.977
SPO2514	1.27	0.09	SPO2512	0.83	0.316	SPO2513	1.25	0.178	SPO2516	1.55	0.399	SPO2508	0.10	0.001	SPO2508	0.10	0.001	SPO2509	0.95	0.877	SPO2505	0.95	0.904
SPO2515	1.3	0.129	SPO2513	0.85	0.037	SPO2514	1.39	0.833	SPO2517	1.25	0.469	SPO2509	0.67	0.441	SPO2509	0.66	0.411	SPO2510	1.08	0.947	SPO2506	0.92	0.769
SPO2516	0.93	0.783	SPO2514	1.17	0.116	SPO2515	1.19	0.064	SPO2518	1.12	0.112	SPO2510	0.85	0.910	SPO2510	0.99	0.995	SPO2511	0.99	0.730	SPO2507	1.20	0.389
SPO2517	0.96	0.926	SPO2515	1.27	0.2	SPO2516	1.18	0.786	SPO2519	1.01	0.849	SPO2511	1.21	0.020	SPO2511	1.07	0.035	SPO2512	1.05	0.793	SPO2508	0.87	0.328
SPO2518	0.97	0.947	SPO2516	0.89	0.442	SPO2517	1.29	0.499	SPO2520	1.16	0.063	SPO2512	0.88	0.849	SPO2512	0.83	0.506	SPO2513	1.09	0.454	SPO2509	0.97	0.952
SPO2519	1.57	0.25	SPO2517	0.99	0.898	SPO2518	1.13	0.256	SPO2521	1.14	0.746	SPO2513	1.07	0.137	SPO2513	1.12	0.025	SPO2514	1.03	0.853	SPO2510	0.99	0.986
SPO2520	1.91	0.066	SPO2518	0.98	0.617	SPO2519	1.41	0.7	SPO2522	1.12	0.356	SPO2514	1.07	0.600	SPO2514	0.90	0.922	SPO2515	1.11	0.569	SPO2511	0.92	0.474
SPO2521	0.81	0.161	SPO2519	1.66	0.023	SPO2520	1.03	0.63	SPO2523	1.08	0.415	SPO2515	1.02	0.626	SPO2515	1.06	0.320	SPO2516	0.75	0.562	SPO2512	1.05	0.648
SPO2522	0.88	0.818	SPO2520	1.51	0.088	SPO2521	1.06	0.851	SPO2524	1.26	0.438	SPO2516	4.83	0.013	SPO2516	4.56	0.007	SPO2517	1.07	0.838	SPO2513	1.09	0.044
SPO2523	1.18	0.497	SPO2521	0.79	0.215	SPO2522	1.24	0.443	SPO2525	1.21	0.694	SPO2517	0.62	0.190	SPO2517	0.65	0.299	SPO2518	1.25	0.258	SPO2514	1.04	0.794
SPO2524	0.83	0.248	SPO2522	0.96	0.984	SPO2523	1.35	0.826	SPO2526	1.18	0.369	SPO2518	1.18	0.040	SPO2518	1.30	0.023	SPO2519	1.10	0.258	SPO2515	1.06	0.500
SPO2525	1.09	0.862	SPO2523	1.05	0.735	SPO2524	1.73	0.646	SPO2527	1.05	0.882	SPO2519	1.78	0.084	SPO2519	1.90	0.033	SPO2520	1.11	0.606	SPO2516	0.68	0.030
SPO2526	1.08	0.499	SPO2524	1.02	0.933	SPO2525	1.12	0.967	SPO2528	1.17	0.257	SPO2520	1.07	0.511	SPO2520	1.02	0.505	SPO2521	0.83	0.399	SPO2517	1.05	0.839
SPO2527	1.07	0.452	SPO2525	1.03	0.857	SPO2526	1.12	0.894	SPO2529	1.22	0.024	SPO2521	0.83	0.753	SPO2521	0.81	0.765	SPO2522	1.01	0.987	SPO2518	1.18	0.151
SPO2528	0.69	0.222	SPO2526	1.07	0.324	SPO2527	1.19	0.665	SPO2530	1.22	0.857	SPO2522	1.13	0.558	SPO2522	1.04	0.731	SPO2523	1.19	0.401	SPO2519	1.05	0.754
SPO2529	0.88	0.507	SPO2527	1.07	0.643	SPO2528	1.23	0.513	SPO2531	1.03	0.914	SPO2523	0.97	0.995	SPO2523	1.11	0.490	SPO2524	0.94	0.891	SPO2520	1.08	0.227
SPO2530	1.04	0.726	SPO2528	0.79	0.479	SPO2529	1.06	0.458	SPO2532	1.1	0.742	SPO2524	0.60	0.447	SPO2524	0.51	0.247	SPO2525	0.85	0.898	SPO2521	0.79	0.198
SPO2531	1.08	0	SPO2529	0.91	0.909	SPO2530	1.01	0.997	SPO2534	1.11	0.28	SPO2525	0.48	0.424	SPO2525	0.52	0.042	SPO2526	0.78	0.668	SPO2522	1.02	0.937
SPO2532	0.99	0.398	SPO2530	1.07	0.858	SPO2531	2.15	0.148	SPO2535	1.24	0.635	SPO2526	0.91	0.466	SPO2526	0.86	0.141	SPO2527	0.94	0.329	SPO2523	1.22	0.580
SPO2533	1.24	0.348	SPO2531	0.99	0.589	SPO2532	1.49	0.267	SPO2536	1.03	0.418	SPO2527	0.96	0.756	SPO2527	0.96	0.811	SPO2528	0.96	0.280	SPO2524	0.93	0.862
SPO2534	0.71	0.112	SPO2532	1.13	0.149	SPO2534	2.02	0.208	SPO2537	1.11	0.802	SPO2528	1.41	0.278	SPO2528	1.15	0.861	SPO2529	1.11	0.672	SPO2525	0.81	0.350
SPO2535	0.83	0.614	SPO2534	0.71	0.522	SPO2535	1.26	0.362	SPO2538	1.13	0.84	SPO2529	1.32	0.467	SPO2529	1.43	0.021	SPO2530	0.92	0.856	SPO2526	0.91	0.709
SPO2536	1.08	0.376	SPO2535	0.74	0.394	SPO2536	1	0.615	SPO2539	1.03	0.671	SPO2530	1.02	0.993	SPO2530	0.85	0.710	SPO2531	0.36	0.374	SPO2527	0.92	0.648
SPO2537	0.78	0.17	SPO2536	0.98	0.855	SPO2537	1.18	0.932	SPO2540	1.2	0.806	SPO2531	0.88	0.384	SPO2531	0.97	0.196	SPO2532	1.00	0.859	SPO2528	1.00	0.929
SPO2538	1.01	0.899	SPO2537	0.99	0.825	SPO2538	1.02	0.996	SPO2541	1.18	0.411	SPO2532	1.12	0.923	SPO2532	1.12	0.913	SPO2533	0.95	0.725	SPO2529	1.07	0.810
SPO2539	1.03	0.586	SPO2538	1.13	0.522	SPO2539	1.03	0.414	SPO2542	1.02	0.75	SPO2534	2.53	0.079	SPO2534	2.19	0.071	SPO2534	1.14	0.344	SPO2530	0.91	0.839
SPO2540	0.71	0.417	SPO2539	0.98	0.292	SPO2540	1.24	0.724	SPO2543	1.22	0.191	SPO2535	1.09	0.911	SPO2535	0.97	0.537	SPO2535	0.83	0.675	SPO2531	1.00	0.822
SPO2541	0.81	0.612	SPO2540	1.03	0.912	SPO2541	1.41	0.432	SPO2544	1.12	0.918	SPO2536	1.62	0.303	SPO2536	1.53	0.164	SPO2536	1.62	0.118	SPO2532	1.09	0.709
SPO2542	0.69	0.128	SPO2541	0.8	0.154	SPO2542	1.19	0.82	SPO2545	1.09	0.809	SPO2537	1.19	0.760	SPO2537	1.39	0.331	SPO2537	0.94	0.834	SPO2533	1.00	0.683
SPO2543	1.09	0.386	SPO2542	0.87	0.56	SPO2543	1.17	0.068	SPO2546	1.05	0.58	SPO2538	1.00	0.848	SPO2538	0.99	0.767	SPO2538	0.84	0.602	SPO2534	1.18	0.169
SPO2544	1.04	0.937	SPO2543	1.09	0.193	SPO2544	1.24	0.89	SPO2547	1.08	0.879	SPO2539	0.92	0.761	SPO2539	0.84	0.384	SPO2539	0.81	0.595	SPO2535	0.90	0.499
SPO2545	0.79	0.81	SPO2544	1.27	0.813	SPO2545	1.15	0.813	SPO2548	1.02	0.327	SPO2540	0.81	0.666	SPO2540	0.74	0.685	SPO2540	0.87	0.741	SPO2536	1.25	0.597
SPO2546	0.89	0.819	SPO2545	0.81	0.904	SPO2546	1.02	0.919	SPO2549	1.24	0.941	SPO2541	1.03	0.948	SPO2541	0.94	0.182	SPO2541	0.99	0.748	SPO2537	0.93	0.507
SPO2547	1.06	0.796	SPO2546	0.91	0.782	SPO2547	1.11	0.868	SPO2550	1.31	0.268	SPO2542	1.59	0.183	SPO2542	1.48	0.044	SPO2542	0.92	0.372	SPO2538	0.83	0.590
SPO2548	0.79	0.279	SPO2547	1.1	0.898	SPO2548	1.1	0.159	SPO2551	1.04	0.949	SPO2543	0.79	0.166	SPO2543	0.84	0.496	SPO2543	0.93	0.631	SPO2539	0.99	0.741
SPO2549	1.07	0.83	SPO2548	0.65	0.207	SPO2549	1.08	0.951	SPO2552	1.28	0.256	SPO2544	0.85	0.863	SPO2544	0.71	0.836	SPO2544	0.98	0.961	SPO2540	0.85	0.802
SPO2550	0.98	0.819	SPO2549	1.11	0.645	SPO2550	1.24	0.506	SPO2553	1.28	0.974	SPO2545	2.18	0.462	SPO2545	2.40	0.443	SPO2545	1.12	0.879	SPO2541	0.96	0.826
SPO2551	1	0.976	SPO2550	1.04	0.303	SPO2551	1.05	0.954	SPO2554	1.21	0.968	SPO2546	1.08	0.955	SPO2546	0.90	0.205	SPO2546	1.01	0.793	SPO2542	0.98	0.802
SPO2552	1.16	0.439	SPO2551	1.03	0.947	SPO2552	1.04	0.236	SPO2555	1.37	0.938	SPO2547	0.76	0.522	SPO2547	0.68	0.531	SPO2547	0.75	0.475	SPO2543	0.85	0.489
SPO2553	1.08	0.93	SPO2552	1.1	0.195	SPO2553	1.12	0.966	SPO2556	1.13	0.419	SPO2548	1.64	0.016	SPO2548	1.84	0.079	SPO2548	1.22	0.446	SPO2544	0.92	0.901
SPO2554	0.96	0.995	SPO2553	0.99	0.984	SPO2554	1.12	1	SPO2559	1.25	0.955	SPO2549	0.87	0.710	SPO2549	0.96	0.772	SPO2549	0.85	0.767	SPO2545	1.04	0.948
SPO2555	1.01	0.336	SPO2554	1	0.956	SPO2555	1	0.382	SPO2560	1.3	0.826	SPO2550	1.56	0.056	SPO2550	1.48	0.038	SPO2550	1.01	0.997	SPO2546	0.83	0.285
SPO2556	0.87	0.698	SPO2555	1.06	0.44	SPO2556	1.06	0.7	SPO2561	1.16	0.867	SPO2551	1.00	0.994	SPO2551	0.97	0.996	SPO2551	0.82	0.853	SPO2547	0.60	0.709
SPO2559	1.04	0.884	SPO2556	0.93	0.983	SPO2559	1.24	0.924	SPO2562	1.38	0.125	SPO2552	0.70	0.132	SPO2552	0.85	0.175	SPO2552	0.66	0.108	SPO2548	1.18	0.625
SPO2560	0.65	0.014	SPO2559	0.91	0.865	SPO2560	1.05	0.762	SPO2563	1.08	0.295	SPO2553	0.71	0.825	SPO2553	0.71	0.826	SPO2553	0.93	0.952	SPO2549	0.93	0.889
SPO2561	0.75	0.064	SPO2560	0.69	0.021	SPO2561	1.41	0.872	SPO2564	1.09	0.674	SPO2554	1.20	0.879	SPO2554	1.07	0.949	SPO2554	0.84	0.864	SPO2550	0.99	0.925
SPO2562	0.76	0.102	SPO2561	0.76	0.18	SPO2562	1.03	0.232	SPO2565	1.21	0.939	SPO2555	1.11	0.949	SPO2555	1.12	0.979	SPO2555	0.97	0.782	SPO2551	0.93	0.949
SPO2563	0.66	0.029	SPO2562	0.72	0.134	SPO2563	0.99	0.119	SPO2566	1.25	0.45	SPO2556	0.78	0.615	SPO2556	0.78	0.207	SPO2556	0.46	0.622	SPO2552	0.75	0.057
SPO2564	1.06	0.747	SPO2563	0.68	0.049	SPO2564	1.25	0.913	SPO2567	1.77	0.041	SPO2559	0.81	0.653	SPO2559	0.83	0.734	SPO2559	0.98	0.969	SPO2553	0.88	0.932
SPO2565	1.03	0.889	SPO2564	1.1	0.769	SPO2565	1.16	0.954	SPO2568	1.09	0.008	SPO2560	0.97	0.934	SPO2560	1.11	0.299	SPO2560	0.97	0.316	SPO2554	0.90	0.913
SPO2566	1.33	0.013	SPO2565	0.99	0.928	SPO2566	1.24	0.342	SPO2569	1.15	0.672	SPO2561	1.23	0.164	SPO2561	1.31	0.016	SPO2561	1.02	0.961	SPO2555	0.98	0.880
SPO2567	0.85	0.29	SPO2566	1.24	0.023	SPO2567	1.03	0.021	SPO2570	1.11	0.117	SPO2562	1.14	0.139	SPO2562	1.09	0.138	SPO2562	1.13	0.557	SPO2556	0.76	0.671
SPO2568	1.62	0.037	SPO2567	0.84	0.398	SPO2568	1.08	0.005	SPO2571	1.37	0.88	SPO2563	0.93	0.871	SPO2563	0.92	0.630	SPO2563	0.84	0.485	SPO2559	0.95	0.927
SPO2569	1.05	0.815	SPO2568	1.49	0.058	SPO2569	1.05	0.418	SPO2572	1	0.602	SPO2564	0.75	0.495	SPO2564	0.65	0.083	SPO2564	0.84	0.141	SPO2560	0.93	0.669
SPO2570	1.3	0.076	SPO2569	0.98	0.953	SPO2570	1.04	0.183	SPO2573	2.33	0.094	SPO2565	1.28	0.660	SPO2565	1.15	0.871	SPO2565	1.34	0.695	SPO2561	0.98	0.855
SPO2571	0.83	0.106	SPO2570	1.21	0.135	SPO2571	1.12	0.906	SPO2574	1.71	0.254	SPO2566	0.99	0.844	SPO2566	0.98	0.531	SPO2566	1.49	0.050	SPO2562	1.18	0.230
SPO2572	0.68	0.173	SPO2571	0.95	0.644	SPO2572	1.35	0.534	SPO2575	2.14	0.798	SPO2567	0.22	0.012	SPO2567	0.23	0.009	SPO2567	0.93	0.893	SPO2563	0.79	0.255
SPO2573	0.49	0.046	SPO2572	0.67	0.007	SPO2573	1.06	0.007	SPO2576	1.34	0.057	SPO2568	0.28	0.002	SPO2568	0.26	0.001	SPO2568	1.22	0.631	SPO2564	0.87	0.782
SPO2574	0.78	0.131	SPO2573	0.58	0.049	SPO2574	1.13	0.056	SPO2577	1.07	0.015	SPO2569	0.86	0.820	SPO2569	0.93	0.933	SPO2569	1.18	0.586	SPO2565	1.28	0.735
SPO2575	0.93	0.947	SPO2574	0.76	0.042	SPO2575	1.28	0.845	SPO2578	1.19	0.228	SPO2570	1.04	0.239	SPO2570	1.05	0.226	SPO2570	1.03	0.851	SPO2566	1.19	0.198
SPO2576	0.45	0.083	SPO2575	0.87	0.908	SPO2576	1.21	0.094	SPO2579	1.05	0.027	SPO2571	0.65	0.392	SPO2571	0.61	0.019	SPO2571	1.04	0.665	SPO2567	1.08	0.436
SPO2577	0.52	0.081	SPO2576	0.45	0.097	SPO2577	1.32	0.015	SPO2580	0.98	0.093	SPO2572	0.79	0.627	SPO2572	0.76	0.818	SPO2572	1.13	0.170	SPO2568	1.04	0.824

SPO2578	1.11	0.557	SPO2577	0.46	0.064	SPO2578	1.28	0.054	SPO2581	1.14	0.616	SPO2573	1.38	0.002	SPO2573	1.02	0.268	SPO2573	1.53	0.069	SPO2569	1.06	0.842
SPO2579	1.74	0.367	SPO2578	1.02	0.752	SPO2579	1.42	0.222	SPO2582	1.38	0.292	SPO2574	1.49	0.100	SPO2574	1.44	0.055	SPO2574	1.09	0.601	SPO2570	1.06	0.394
SPO2580	1.51	0.093	SPO2579	1.43	0.129	SPO2580	1.03	0.15	SPO2583	1.24	0.267	SPO2575	0.88	0.936	SPO2575	1.26	0.741	SPO2575	1.17	0.872	SPO2571	1.02	0.702
SPO2581	1.15	0.071	SPO2580	1.36	0.037	SPO2581	1.01	0.553	SPO2584	0.98	0.735	SPO2576	1.78	0.093	SPO2576	1.66	0.109	SPO2576	1.95	0.098	SPO2572	1.22	0.117
SPO2582	1.11	0.507	SPO2581	1.09	0.344	SPO2582	1.07	0.448	SPO2585	1.28	0.871	SPO2577	1.59	0.018	SPO2577	1.54	0.059	SPO2577	2.33	0.021	SPO2573	1.55	0.013
SPO2583	0.92	0.389	SPO2582	1.04	0.52	SPO2583	1.04	0.993	SPO2586	1.03	0.667	SPO2578	1.12	0.286	SPO2578	1.13	0.174	SPO2578	1.01	0.866	SPO2574	1.10	0.660
SPO2584	1.08	0.838	SPO2583	0.91	0.26	SPO2584	1.01	0.641	SPO2587	1.22	0.339	SPO2579	0.83	0.432	SPO2579	0.87	0.447	SPO2579	1.03	0.546	SPO2575	1.14	0.883
SPO2585	1.42	0.169	SPO2584	0.99	0.935	SPO2585	1.02	0.656	SPO2588	1.21	0.871	SPO2580	0.25	0.004	SPO2580	0.24	0.003	SPO2580	0.72	0.044	SPO2576	1.91	0.082
SPO2586	1.45	0.15	SPO2585	1.39	0.122	SPO2586	1.17	0.197	SPO2589	1.12	0.768	SPO2581	1.49	0.087	SPO2581	1.50	0.167	SPO2581	0.82	0.613	SPO2577	2.39	0.005
SPO2587	1.58	0.028	SPO2586	1.34	0.101	SPO2587	1.07	0.376	SPO2590	1.21	0.646	SPO2582	0.76	0.130	SPO2582	0.74	0.206	SPO2582	0.92	0.572	SPO2578	1.00	0.918
SPO2588	1.22	0.237	SPO2587	1.41	0.053	SPO2588	1.06	0.721	SPO2591	1.02	0.326	SPO2583	0.83	0.386	SPO2583	0.75	0.024	SPO2583	1.08	0.574	SPO2579	0.90	0.346
SPO2589	1.07	0.35	SPO2588	1.18	0.284	SPO2589	1.09	0.184	SPO2592	1.4	0.898	SPO2584	0.85	0.790	SPO2584	0.95	0.931	SPO2584	0.85	0.748	SPO2580	0.68	0.082
SPO2590	0.69	0.014	SPO2589	1.17	0.335	SPO2590	1.17	0.395	SPO2593	1.09	0.704	SPO2585	1.07	0.205	SPO2585	1.11	0.015	SPO2585	0.93	0.625	SPO2581	0.81	0.504
SPO2591	0.85	0.008	SPO2590	0.78	0.331	SPO2591	1.42	0.102	SPO2594	1.11	0.578	SPO2586	1.14	0.096	SPO2586	1.23	0.018	SPO2586	0.93	0.683	SPO2582	0.90	0.550
SPO2592	1.43	0.518	SPO2591	0.88	0.732	SPO2592	1.17	0.904	SPO2595	1.05	0.8	SPO2587	0.72	0.296	SPO2587	0.68	0.250	SPO2587	0.98	0.967	SPO2583	1.00	0.951
SPO2593	1.04	0.742	SPO2592	1.33	0.584	SPO2593	1.38	0.549	SPO2596	1	0.1	SPO2588	1.12	0.202	SPO2588	1.19	0.284	SPO2588	1.05	0.789	SPO2584	0.89	0.842
SPO2594	1.34	0.132	SPO2593	0.99	0.774	SPO2594	1.03	0.262	SPO2597	1.03	0.049	SPO2589	1.21	0.137	SPO2589	1.26	0.419	SPO2589	1.06	0.782	SPO2585	0.98	0.951
SPO2595	1.39	0.759	SPO2594	1.3	0.041	SPO2595	1.11	0.992	SPO2598	1.19	0.958	SPO2590	1.16	0.035	SPO2590	0.97	0.532	SPO2590	0.96	0.939	SPO2586	0.92	0.515
SPO2596	1.5	0.043	SPO2595	1.96	0.471	SPO2596	1	0.726	SPO2601	1.05	0.73	SPO2591	0.88	0.962	SPO2591	0.77	0.434	SPO2591	1.00	0.943	SPO2587	0.93	0.711
SPO2597	1.09	0.518	SPO2596	1.41	0.018	SPO2597	1.14	0.304	SPO2602	1.46	0.353	SPO2592	0.88	0.781	SPO2592	0.96	0.921	SPO2592	0.96	0.920	SPO2588	0.98	0.945
SPO2598	1.24	0.196	SPO2597	0.99	0.89	SPO2598	1.06	0.882	SPO2603	1.07	0.512	SPO2593	0.43	0.051	SPO2593	0.72	0.484	SPO2593	1.49	0.518	SPO2589	1.05	0.919
SPO2601	0.91	0.894	SPO2598	1.26	0.347	SPO2601	1.14	0.988	SPO2604	1.19	0.571	SPO2594	0.65	0.028	SPO2594	0.68	0.024	SPO2594	0.80	0.172	SPO2590	1.10	0.722
SPO2602	1.12	0.59	SPO2601	0.96	0.897	SPO2602	1.02	0.639	SPO2605	1.16	0.586	SPO2595	0.41	0.299	SPO2595	0.48	0.452	SPO2595	1.96	0.672	SPO2591	1.02	0.793
SPO2603	0.9	0.948	SPO2602	1.1	0.327	SPO2603	1.18	0.898	SPO2606	1.11	0.017	SPO2596	0.61	0.012	SPO2596	0.59	0.023	SPO2596	1.04	0.535	SPO2592	1.00	0.989
SPO2604	0.93	0.868	SPO2603	1.09	0.216	SPO2604	1.23	0.12	SPO2607	1.03	0.143	SPO2597	0.84	0.211	SPO2597	0.86	0.576	SPO2597	0.94	0.734	SPO2593	1.47	0.426
SPO2605	0.76	0.499	SPO2604	1	0.756	SPO2605	1.06	0.656	SPO2608	1.11	0.025	SPO2598	1.11	0.429	SPO2598	1.14	0.540	SPO2598	1.07	0.367	SPO2594	0.92	0.521
SPO2606	0.69	0.189	SPO2605	0.8	0.601	SPO2606	1.08	0.019	SPO2609	1.26	0.691	SPO2601	1.29	0.100	SPO2601	1.39	0.134	SPO2601	0.96	0.809	SPO2595	1.21	0.949
SPO2607	0.62	0.006	SPO2606	0.65	0.054	SPO2607	1.12	0.272	SPO2610	1.38	0.136	SPO2602	1.09	0.859	SPO2602	1.32	0.123	SPO2602	1.09	0.858	SPO2596	0.99	0.929
SPO2608	0.62	0.019	SPO2607	0.66	0.074	SPO2608	1.05	0.045	SPO2612	1.06	0.759	SPO2603	1.52	0.033	SPO2603	1.37	0.100	SPO2603	1.20	0.572	SPO2597	0.93	0.561
SPO2609	0.69	0.086	SPO2608	0.71	0.047	SPO2609	1.04	0.517	SPO2613	1.08	0.704	SPO2604	1.31	0.227	SPO2604	1.07	0.770	SPO2604	1.05	0.855	SPO2598	1.05	0.846
SPO2610	0.68	0.025	SPO2609	0.77	0.319	SPO2610	1.02	0.127	SPO2614	1.27	0.222	SPO2605	1.32	0.383	SPO2605	1.26	0.485	SPO2605	1.06	0.848	SPO2601	1.07	0.398
SPO2612	0.69	0.022	SPO2610	0.77	0.168	SPO2612	1.03	0.868	SPO2615	1.21	0.6	SPO2606	2.53	0.004	SPO2606	2.63	0.000	SPO2606	1.18	0.149	SPO2602	1.07	0.565
SPO2613	1.13	0.465	SPO2612	0.75	0.021	SPO2613	1.04	0.857	SPO2616	1.31	0.222	SPO2607	1.45	0.106	SPO2607	1.49	0.081	SPO2607	1.06	0.323	SPO2603	0.95	0.888
SPO2614	1.1	0.061	SPO2613	1.13	0.631	SPO2614	1.22	0.905	SPO2617	1.29	0.249	SPO2608	1.39	0.146	SPO2608	1.21	0.065	SPO2608	1.08	0.770	SPO2604	0.99	0.749
SPO2615	1.18	0.523	SPO2614	1.11	0.34	SPO2615	1.17	0.359	SPO2618	1.42	0.033	SPO2609	0.88	0.799	SPO2609	0.79	0.571	SPO2609	0.93	0.785	SPO2605	0.99	0.954
SPO2616	2.36	0.013	SPO2615	1.12	0.452	SPO2616	1.22	0.223	SPO2619	1.14	0.938	SPO2610	1.87	0.003	SPO2610	1.96	0.002	SPO2610	1.02	0.376	SPO2606	1.21	0.035
SPO2617	0.81	0.274	SPO2616	1.86	0.018	SPO2617	1.06	0.111	SPO2620	1.02	0.429	SPO2612	1.46	0.013	SPO2612	1.49	0.032	SPO2612	0.93	0.644	SPO2607	1.08	0.417
SPO2618	0.79	0.418	SPO2617	0.87	0.322	SPO2618	1.15	0.219	SPO2621	1.03	0.829	SPO2613	0.76	0.518	SPO2613	0.68	0.443	SPO2613	1.11	0.623	SPO2608	1.18	0.209
SPO2619	1.15	0.663	SPO2618	0.92	0.874	SPO2619	1.03	0.672	SPO2622	1.04	0.151	SPO2614	0.06	0.001	SPO2614	0.06	0.001	SPO2614	1.28	0.063	SPO2609	0.95	0.747
SPO2620	0.81	0.45	SPO2619	1.27	0.135	SPO2620	1.2	0.863	SPO2623	1.09	0.788	SPO2615	0.06	0.002	SPO2615	0.05	0.003	SPO2615	1.35	0.444	SPO2610	1.05	0.132
SPO2621	1.5	0.523	SPO2620	0.85	0.095	SPO2621	1.01	0.879	SPO2624	1.22	0.543	SPO2616	0.84	0.052	SPO2616	0.98	0.517	SPO2616	1.18	0.326	SPO2612	0.94	0.668
SPO2622	0.93	0.883	SPO2621	1.27	0.535	SPO2622	1.21	0.48	SPO2625	1.04	0.671	SPO2617	0.42	0.059	SPO2617	0.38	0.040	SPO2617	1.28	0.511	SPO2613	1.00	0.952
SPO2623	0.85	0.875	SPO2622	0.88	0.701	SPO2623	1.07	0.752	SPO2626	1.13	0.022	SPO2618	0.50	0.007	SPO2618	0.42	0.012	SPO2618	1.36	0.167	SPO2614	1.42	0.106
SPO2624	1.28	0.203	SPO2623	0.72	0.481	SPO2624	1.11	0.625	SPO2627	1.21	0.894	SPO2619	0.24	0.017	SPO2619	0.23	0.015	SPO2619	1.29	0.587	SPO2615	1.36	0.282
SPO2625	1.16	0.89	SPO2624	1.26	0.392	SPO2625	1.1	0.725	SPO2628	1.18	0.003	SPO2620	0.52	0.179	SPO2620	0.52	0.006	SPO2620	1.12	0.724	SPO2616	1.06	0.780
SPO2626	1.07	0.53	SPO2625	1.14	0.888	SPO2626	1.16	0.013	SPO2629	1.42	0.198	SPO2621	0.69	0.584	SPO2621	0.56	0.513	SPO2621	0.98	0.979	SPO2617	1.43	0.261
SPO2627	0.46	0.002	SPO2626	1	0.854	SPO2627	1.13	0.196	SPO2630	1.24	0.408	SPO2622	1.69	0.073	SPO2622	1.51	0.020	SPO2622	1.11	0.706	SPO2618	1.47	0.034
SPO2628	0.33	0.001	SPO2627	0.53	0.056	SPO2628	1.05	0.002	SPO2631	1.35	0.295	SPO2623	1.03	0.972	SPO2623	0.90	0.612	SPO2623	0.74	0.432	SPO2619	1.32	0.144
SPO2629	1.79	0.014	SPO2628	0.26	0.001	SPO2629	1.11	0.263	SPO2632	1.13	0.102	SPO2624	1.01	0.998	SPO2624	1.02	0.989	SPO2624	0.96	0.649	SPO2620	1.13	0.037
SPO2630	1.81	0.083	SPO2629	1.65	0.02	SPO2630	1.08	0.301	SPO2633	1	0.335	SPO2625	0.81	0.871	SPO2625	0.85	0.879	SPO2625	0.96	0.960	SPO2621	0.96	0.939
SPO2631	1.59	0.095	SPO2630	1.63	0.165	SPO2631	1.03	0.18	SPO2634	1.11	0.377	SPO2626	1.51	0.003	SPO2626	1.56	0.006	SPO2626	0.80	0.140	SPO2622	1.17	0.468
SPO2632	1.93	0.004	SPO2631	1.55	0.037	SPO2632	1.24	0.11	SPO2635	1.11	0.106	SPO2627	3.03	0.001	SPO2627	2.89	0.004	SPO2627	0.90	0.735	SPO2623	0.77	0.651
SPO2633	1.68	0.029	SPO2632	1.92	0.055	SPO2633	1.15	0.365	SPO2636	1.1	0.913	SPO2628	3.77	0.000	SPO2628	3.47	0.000	SPO2628	1.24	0.278	SPO2624	0.88	0.575
SPO2634	2.43	0.011	SPO2633	1.67	0.021	SPO2634	1.09	0.046	SPO2637	1.05	0.73	SPO2629	0.48	0.037	SPO2629	0.50	0.031	SPO2629	0.85	0.253	SPO2625	0.88	0.863
SPO2635	1.27	0.075	SPO2634	2.43	0.013	SPO2635	1.02	0.317	SPO2638	1.26	0.1	SPO2630	0.42	0.025	SPO2630	0.45	0.036	SPO2630	0.83	0.402	SPO2626	0.78	0.041
SPO2636	2.23	0.322	SPO2635	1.37	0.096	SPO2636	1.07	0.941	SPO2639	1.2	0.827	SPO2631	0.24	0.015	SPO2631	0.26	0.017	SPO2631	0.94	0.639	SPO2627	0.94	0.919
SPO2637	1.54	0.006	SPO2636	2.22	0.371	SPO2637	1.12	0.179	SPO2640	1.02	0.8	SPO2632	0.12	0.000	SPO2632	0.11	0.005	SPO2632	0.92	0.693	SPO2628	1.15	0.035
SPO2638	1.46	0.029	SPO2637	1.59	0.044	SPO2638	1.04	0.162	SPO2641	1.02	0.786	SPO2633	0.12	0.001	SPO2633	0.12	0.001	SPO2633	0.95	0.910	SPO2629	0.87	0.195
SPO2639	1.01	0.889	SPO2638	1.61	0.097	SPO2639	1.5	0.629	SPO2642	1.03	0.592	SPO2634	0.10	0.001	SPO2634	0.09	0.002	SPO2634	1.06	0.517	SPO2630	0.86	0.656
SPO2640	0.76	0.212	SPO2639	0.93	0.959	SPO2640	1.13	0.807	SPO2643	1.01	0.29	SPO2635	0.24	0.005	SPO2635	0.21	0.006	SPO2635	1.05	0.513	SPO2631	0.89	0.662
SPO2641	1.2	0.465	SPO2640	0.78	0.032	SPO2641	1.16	0.862	SPO2644	1.05	0.382	SPO2636	0.13	0.060	SPO2636	0.12	0.077	SPO2636	1.11	0.872	SPO2632	0.93	0.618
SPO2642	1.02	0.978	SPO2641	0.95	0.969	SPO2642	1.2	0.326	SPO2645	0.98	0.004	SPO2637	0.18	0.002	SPO2637	0.18	0.001	SPO2637	1.00	0.813	SPO2633	0.94	0.855
SPO2643	0.67	0.602	SPO2642	1.02	0.801	SPO2643	1.16	0.21	SPO2646	1.04	0.247	SPO2638	0.54	0.099	SPO2638	0.52	0.074	SPO2638	1.09	0.395	SPO2634	1.01	0.542
SPO2644	0.61	0.031	SPO2643	0.93	0.643	SPO2644	1.27	0.692	SPO2647	1.24	0.945	SPO2639	0.89	0.765	SPO2639	0.86	0.822	SPO2639	0.93	0.593	SPO2635	0.97	0.972
SPO2645	0.5	0.012	SPO2644	0.57	0.033	SPO2645	1	0.078	SPO2648	1.1	0.507	SPO2640	0.93	0.978	SPO2640	0.92	0.999	SPO2640	1.14	0.774	SPO2636	1.05	0.921
SPO2646	0.75	0.09	SPO2645	0.57	0.001	SPO2646	1.01	0.427	SPO2649	1.1	0.272	SPO2641	0.87	0.479	SPO2641	0.92	0.621	SPO2641	0.67	0.379	SPO2637	0.98	0.796
SPO2647	0.84	0.733	SPO2646	0.76	0.399	SPO2647	1.33	0.958	SPO2650	1.13	0.854	SPO2642	0.78	0.429	SPO2642	0.76	0.648	SPO2642	0.74	0.045	SPO2638	0.95	0.839
SPO2648	0.79	0.171	SPO2647	0.88	0.809	SPO2648	1.07	0.895	SPO2651	1.14	0.682	SPO2643	1.20	0.392	SPO2643	1.24	0.330	SPO2643	0.96	0.821	SPO2639	0.97	0.855
SPO2649	0.84	0.273	SPO2648	0.87	0.295	SPO2649	1.15	0.983	SPO2652	1.02	0.943	SPO2644	2.30	0.043	SPO2644	2.31	0.005	SPO2644	1.08	0.745	SPO2640	1.03	0.719
SPO2650	1.37	0.504	SPO2649	0.84	0.186	SPO2650	1.01	0.952	SPO2653	1.16	0.119	SPO2645	1.14	0.430	SPO2645	1.05	0.194	SPO2645	1.87	0.078	SPO2641	0.83	0.654
SPO2651	0.95	0.94	SPO2650	1.16	0.289	SPO2651	1.02	0.888	SPO2654	1.09	0.226	SPO2646	1.13	0.030	SPO2646	1.20	0.139	SPO2646	1.17	0.273	SPO2642	0.75	0.069
SPO2652	0.79	0.806	SPO2651	0.92	0.908	SPO2652	1.04	0.922	SPO2655	1.24	0.257	SPO2647	1.78	0.175	SPO2647	1.66	0.229	SPO2647	0.93	0.903	SPO2643	0.90	0.541
SPO2653	0.88	0.532	SPO2652	0.93	0.906	SPO2653	1.06	0.047	SPO2656	1.14	0.325	SPO2648	1.71	0.028	SPO2648	1.66	0.020	SPO2648	1.01	0.903	SPO2644	1.09	0.484
SPO2654	1.51	0.245	SPO2653	0.83	0.055	SPO2654	1.15	0.435	SPO2657	1.06	0.959	SPO2649	1.62	0.034	SPO2649	1.67	0.049	SPO2649	0.91	0.355	SPO2645	1.74	0.034
SPO2655	1.07	0.313	SPO2654	1.38	0.017	SPO2655	1.1	0.491	SPO2658	1.08	0.129	SPO2650	1.18	0.372	SPO2650	1.20	0.198	SPO2650	1.01	0.947	SPO2646	1.15	0.284
SPO2656	1.01	0.769	SPO2655	1.02	0.487	SPO2656	1.22	0.185	SPO2659	1.02	0.591	SPO2651	1.24	0.366	SPO2651	1.35	0.403	SPO2651	1.06	0.757	SPO2647	0.88	0.770
SPO2657	0.58	0.461	SPO2656	0.86	0.487	SPO2657	1.17	0.964	SPO2660	1.24	0.962	SPO2652	1.18	0.646	SPO2652	1.12	0.725	SPO2652	0.84	0.776	SPO2648	1.04	0.616
SPO2658	0.65	0.192	SPO2657	0.71	0.424	SPO2658	1.11	0.437	SPO2661	1.14	0.957	SPO2653	1.25	0.090	SPO2653	1.35	0.024	SPO2653	1.11	0.228	SPO2649	0.94	0.303
SPO2659	0.88	0.686	SPO2658	0.69	0.208	SPO2659	1.01	0.344	SPO2662	1.12	0.618	SPO2654	0.99	0.828	SPO2654	1.05	0.653	SPO2654	1.26	0.629	SPO2650	0.93	0.829
SPO2660	0.89	0.772	SPO2659	0.87	0.51	SPO2660	1.08	0.772	SPO2663	1.13	0.745	SPO2655	1.40	0.093	SPO2655	1.45	0.031	SPO2655	1.05	0.572	SPO2651	1.05	0.883
SPO2661	1.15	0.367	SPO2660	0.95	0.939	SPO2661	1	0.771	SPO2664	1.11	0.977	SPO2656	1.47	0.133	SPO2656	1.21	0.066	SPO2656	1.04	0.809	SPO2652	0.89	0.868
SPO2662	0.97	0.798	SPO2661	1.02	0.585	SPO2662	1.16	0.791	SPO2665	1.08	0.051	SPO2657	1.33	0.785	SPO2657	1.13	0.897	SPO2657	0.89	0.788	SPO2653	1.18	0.169
SPO2663	0.85	0.74	SPO2662	0.95	0.736	SPO2663	1.16	0.75	SPO2666	1.03	0.842	SPO2658	1.68	0.071	SPO2658	1.62	0.037	SPO2658	1.16	0.248	SPO2654	1.14	0.635
SPO2664	0.83	0.812	SPO2663	0.8	0.746	SPO2664	1.11	0.989	SPO2667	1.27	0.455	SPO2659	1.51	0.049	SPO2659	1.27	0.425	SPO2659	1.12	0.896	SPO2655	0.97	0.819
SPO2665	1.09	0.37	SPO2664	0.93	0.986	SPO2665	1.95	0.271	SPO2668	1.03	0.934	SPO2660	1.15	0.790	SPO2660	1.19	0.694	SPO2660	1.18	0.370	SPO2656	1.13	0.565
SPO2666	0.83	0.887	SPO2665	1.18	0.252	SPO2666	1.1	0.918	SPO2669	1.13	0.214	SPO2661	0.90	0.028	SPO2661	1.01	0.492	SPO2661	0.96	0.805	SPO2657	0.89	0.745
SPO2667	1.01	0.772	SPO2666	0.93	0.989	SPO2667	1.13	0.411	SPO2670	1.09	0.798	SPO2662	1.28	0.550	SPO2662	1.32	0.126	SPO2662	1.10	0.846	SPO2658	1.22	0.148
SPO2668	1.18	0.275	SPO2667	0.82	0.507	SPO2668	1.03	0.962	SPO2671	1.03	0.997	SPO2663	0.83	0.436	SPO2663	0.86	0.528	SPO2663	0.58	0.117	SPO2659	1.26	0.396
SPO2669	0.57	0.065	SPO2668	1.15	0.655	SPO2669	1.06	0.174	SPO2672	1.15	0.871	SPO2664	0.99	0.963	SPO2664	0.99	0.937	SPO2664	0.91	0.866	SPO2660	1.11	0.796
SPO2670	1.01	0.822	SPO2669	0.61	0.299	SPO2670	1.38	0.885	SPO2673	1.16	0.698	SPO2665	0.81	0.153	SPO2665	0.65	0.161	SPO2665	1.00	0.842	SPO2661	0.86	0.355
SPO2671	1.52	0.1	SPO2670	1.06	0.396	SPO2671	1.04	0.759	SPO2674	1.53	0.371	SPO2666	0.80	0.680	SPO2666	0.63	0.523	SPO2666	0.74	0.785	SPO2662	1.09	0.917
SPO2672	0.92	0.868	SPO2671	1.31	0.39	SPO2672	1	0.887	SPO2675	1.11	0.959	SPO2667	1.23	0.668	SPO2667	1.46	0.458	SPO2667	0.88	0.535	SPO2663	0.71	0.565
SPO2673	0.86	0.232	SPO2672	1.06	0.863	SPO2673	1.05	0.831	SPO2676	1.24	0.578	SPO2668	0.58	0.073	SPO2668	0.62	0.057	SPO2668	1.19	0.478	SPO2664	0.94	0.902
SPO2674	0.97	0.939	SPO2673	1.01	0.459	SPO2674	1.2	0.714	SPO2677	1.03	0.877	SPO2669	2.17	0.064	SPO2669	1.89	0.178	SPO2669	1.11	0.706	SPO2665	0.72	0.301
SPO2675	1.01	0.968	SPO2674	1.01	0.212	SPO2675	1.6	0.13	SPO2678	1.23	0.54	SPO2670	1.20	0.174	SPO2670	1.15	0.076	SPO2670	0.96	0.912	SPO2666	0.91	0.869
SPO2676	1.23	0.709	SPO2675	1.16	0.09	SPO2676	1.05	0.552	SPO2679	1.13	0.413	SPO2671	1.01	0.418	SPO2671	1.13	0.403	SPO2671	0.98	0.964	SPO2667	1.04	0.807
SPO2677	1.24	0.634	SPO2676	1.16	0.792	SPO2677	1.15	0.974	SPO2680	1.16	0.921	SPO2672	1.66	0.256	SPO2672	1.52	0.316	SPO2672	1.09	0.860	SPO2668	0.97	0.820
SPO2678	1.45	0.445	SPO2677	1.22	0.083	SPO2678	0.99	0.602	SPO2681	1.08	0.348	SPO2673	1.06	0.516	SPO2673	1.06	0.472	SPO2673	0.98	0.918	SPO2669	1.13	0.596
SPO2679	1.66	0.122	SPO2678	1.49	0.398	SPO2679	1.77	0.647	SPO2682	1.04	0.113	SPO2674	0.95	0.809	SPO2674	0.83	0.163	SPO2674	0.89	0.481	SPO2670	0.95	0.748
SPO2680	1.14	0.436	SPO2679	1.8	0.243	SPO2680	1.04	0.345	SPO2683	1.19	0.82	SPO2675	0.80	0.192	SPO2675	0.79	0.100	SPO2675	0.92	0.498	SPO2671	1.03	0.851
SPO2681	1.38	0.085	SPO2680	1.03	0.462	SPO2681	1.36	0.687	SPO2684	1.11	0.581	SPO2676	0.53	0.363	SPO2676	0.56	0.451	SPO2676	0.97	0.934	SPO2672	1.00	0.973
SPO2682	0.76	0.078	SPO2681	1.29	0.167	SPO2682	1.03	0.036	SPO2685	1.21	0.793	SPO2677	0.76	0.666	SPO2677	0.79	0.513	SPO2677	1.06	0.823	SPO2673	1.06	0.704
SPO2683	1.05	0.802	SPO2682	1.02	0.617	SPO2683	1.06	0.551	SPO2686	1.04	0.002	SPO2678	1.45	0.014	SPO2678	1.45	0.102	SPO2678	0.82	0.022	SPO2674	0.93	0.531
SPO2684	0.79	0.05	SPO2683	1.11	0.508	SPO2684	1.05	0.516	SPO2687	1.09	0.183	SPO2679	0.99	0.180	SPO2679	0.89	0.526	SPO2679	1.16	0.043	SPO2675	0.96	0.902
SPO2685	0.94	0.975	SPO2684	0.75	0.275	SPO2685	1.01	0.681	SPO2688	1.02	0.507	SPO2680	0.97	0.715	SPO2680	0.98	0.402	SPO2680	1.12	0.335	SPO2676	0.89	0.858
SPO2686	0.7	0.012	SPO2685	0.98	0.985	SPO2686	1.08	0.003	SPO2689	1.07	0.352	SPO2681	1.40	0.035	SPO2681	1.44	0.035	SPO2681	1.19	0.215	SPO2677	1.08	0.599
SPO2687	0.68	0.005	SPO2686	0.63	0.005	SPO2687	1.04	0.376	SPO2690	1.17	0.695	SPO2682	1.54	0.013	SPO2682	1.40	0.008	SPO2682	1.11	0.244	SPO2678	0.85	0.120
SPO2688	1.12	0.312	SPO2687	0.78	0.011	SPO2688	1.1	0.176	SPO2691	1	0.925	SPO2683	1.12	0.062	SPO2683	1.14	0.022	SPO2683	0.88	0.667	SPO2679	1.13	0.241
SPO2689	1.9	0.03	SPO2688	1.03	0.392	SPO2689	1.29	0.071	SPO2692	1.15	0.77	SPO2684	0.58	0.051	SPO2684	0.56	0.011	SPO2684	1.11	0.508	SPO2680	1.10	0.080
SPO2690	1.53	0.039	SPO2689	1.74	0.097	SPO2690	1.6	0.18	SPO2693	1.13	0.36	SPO2685	1.73	0.602	SPO2685	1.54	0.748	SPO2685	1.06	0.962	SPO2681	1.19	0.188
SPO2691	1.16	0.246	SPO2690	1.4	0.095	SPO2691	1.01	0.828	SPO2694	1.11	0.24	SPO2686	5.87	0.001	SPO2686	5.84	0.001	SPO2686	1.17	0.017	SPO2682	1.16	0.122
SPO2692	0.85	0.126	SPO2691	1.13	0.695	SPO2692	1.04	0.544	SPO2695	1.02	0.069	SPO2687	1.16	0.049	SPO2687	1.04	0.041	SPO2687	1.04	0.809	SPO2683	0.98	0.881
SPO2693	1.03	0.763	SPO2692	0.88	0.452	SPO2693	1.08	0.131	SPO2696	1.07	0.954	SPO2688	1.16	0.152	SPO2688	1.23	0.061	SPO2688	0.97	0.947	SPO2684	1.16	0.306
SPO2694	0.65	0.05	SPO2693	1.09	0.437	SPO2694	1.05	0.755	SPO2697	1.15	0.965	SPO2689	0.57	0.113	SPO2689	0.56	0.002	SPO2689	1.31	0.677	SPO2685	1.20	0.896
SPO2695	1.33	0.017	SPO2694	0.68	0.143	SPO2695	1.07	0.053	SPO2698	1.16	0.497	SPO2690	0.66	0.027	SPO2690	0.69	0.056	SPO2690	1.11	0.304	SPO2686	1.22	0.074
SPO2696	0.99	0.726	SPO2695	1.36	0.018	SPO2696	1.36	0.746	SPO2699	1.09	0.686	SPO2691	0.88	0.421	SPO2691	0.93	0.827	SPO2691	0.99	0.979	SPO2687	0.95	0.881
SPO2697	0.9	0.917	SPO2696	1.11	0	SPO2697	1.14	0.947	SPO2700	1.02	0.947	SPO2692	0.83	0.322	SPO2692	0.85	0.557	SPO2692	0.99	0.967	SPO2688	0.93	0.636
SPO2698	1.1	0.377	SPO2697	0.87	0.946	SPO2698	1.13	0.095	SPO2701	2.02	0.674	SPO2693	0.81	0.491	SPO2693	0.80	0.234	SPO2693	0.91	0.735	SPO2689	1.12	0.647
SPO2699	1	0.945	SPO2698	0.91	0.873	SPO2699	1.2	0.243	SPO2702	1.09	0.064	SPO2694	0.82	0.432	SPO2694	0.83	0.306	SPO2694	1.04	0.770	SPO2690	1.11	0.180
SPO2700	1.15	0.899	SPO2699	1.12	0.795	SPO2700	1.01	0.874	SPO2703	1.18	0.482	SPO2695	1.66	0.024	SPO2695	1.77	0.016	SPO2695	1.14	0.311	SPO2691	0.99	0.950
SPO2701	1	0.815	SPO2700	1.12	0.931	SPO2701	1.25	0.886	SPO2704	1.05	0.954	SPO2696	0.98	0.670	SPO2696	0.75	0.115	SPO2696	0.85	0.662	SPO2692	0.99	0.981
SPO2702	0.72	0.078	SPO2701	1.04	0.661	SPO2702	1	0.155	SPO2705	1.01	0.732	SPO2697	1.06	0.959	SPO2697	1.00	0.987	SPO2697	0.94	0.942	SPO2693	0.85	0.679
SPO2703	0.96	0.928	SPO2702	0.78	0.434	SPO2703	1.05	0.438	SPO2706	1.5	0.003	SPO2698	1.05	0.845	SPO2698	1.26	0.412	SPO2698	1.06	0.955	SPO2694	1.11	0.387
SPO2704	1.23	0.104	SPO2703	0.77	0.708	SPO2704	1.06	0.056	SPO2707	1.07	0.938	SPO2699	0.61	0.473	SPO2699	0.51	0.233	SPO2699	0.68	0.601	SPO2695	1.09	0.233
SPO2705	0.92	0.861	SPO2704	1.17	0.334	SPO2705	1.19	0.978	SPO2708	0.98	0.58	SPO2700	0.74	0.840	SPO2700	0.76	0.852	SPO2700	0.93	0.944	SPO2696	0.83	0.568
SPO2706	0.51	0.146	SPO2705	1.01	0.771	SPO2706	1.06	0.049	SPO2709	1.04	0.943	SPO2701	1.56	0.148	SPO2701	1.40	0.327	SPO2701	1.09	0.764	SPO2697	0.97	0.961
SPO2707	0.79	0.446	SPO2706	0.58	0.061	SPO2707	1.03	0.962	SPO2710	1.19	0.911	SPO2702	3.22	0.027	SPO2702	2.21	0.051	SPO2702	1.33	0.400	SPO2698	1.00	0.896
SPO2708	0.63	0.214	SPO2707	0.92	0.881	SPO2708	1.09	0.519	SPO2711	1	0.424	SPO2703	2.05	0.235	SPO2703	0.90	0.630	SPO2703	0.63	0.586	SPO2699	0.66	0.564
SPO2709	1.1	0.89	SPO2708	0.7	0.292	SPO2709	1.01	0.933	SPO2712	1.56	0.691	SPO2704	1.24	0.045	SPO2704	1.26	0.151	SPO2704	1.18	0.071	SPO2700	0.82	0.883
SPO2710	0.81	0.393	SPO2709	0.98	0.98	SPO2710	1.03	0.924	SPO2713	1.2	0.902	SPO2705	1.21	0.176	SPO2705	1.54	0.060	SPO2705	1.01	0.932	SPO2701	1.01	0.966
SPO2711	0.88	0.825	SPO2710	0.88	0.777	SPO2711	0.99	0.57	SPO2714	1	0.823	SPO2706	14.60	0.002	SPO2706	14.50	0.000	SPO2706	0.99	0.945	SPO2702	1.25	0.529
SPO2712	0.61	0.232	SPO2711	0.89	0.767	SPO2712	1.23	0.997	SPO2715	1.98	0.792	SPO2707	0.90	0.650	SPO2707	0.76	0.388	SPO2707	1.00	0.934	SPO2703	1.06	0.940
SPO2713	1.01	0.749	SPO2712	0.74	0.649	SPO2713	1.14	0.237	SPO2716	1.27	0.13	SPO2708	1.12	0.497	SPO2708	1.22	0.460	SPO2708	0.88	0.442	SPO2704	1.05	0.743
SPO2714	0.85	0.497	SPO2713	0.99	0.689	SPO2714	1.04	0.743	SPO2717	1.01	0.201	SPO2709	0.91	0.906	SPO2709	0.98	0.955	SPO2709	0.93	0.918	SPO2705	1.04	0.964
SPO2715	1.06	0.861	SPO2714	0.89	0.491	SPO2715	1.12	0.865	SPO2718	1.07	0.555	SPO2710	0.99	0.680	SPO2710	1.15	0.403	SPO2710	0.98	0.788	SPO2706	1.18	0.105
SPO2716	1.39	0.048	SPO2715	1.06	0.818	SPO2716	1.19	0.68	SPO2719	1.09	0.095	SPO2711	0.95	0.692	SPO2711	0.93	0.384	SPO2711	1.12	0.897	SPO2707	0.99	0.947
SPO2717	1.1	0.851	SPO2716	1.2	0.052	SPO2717	1.1	0.118	SPO2720	1.11	0.939	SPO2712	1.23	0.561	SPO2712	1.24	0.428	SPO2712	0.97	0.799	SPO2708	0.93	0.643
SPO2718	1.65	0.477	SPO2717	1.04	0.9	SPO2718	1.01	0.607	SPO2721	1.26	0.005	SPO2713	1.83	0.181	SPO2713	1.79	0.040	SPO2713	1.10	0.837	SPO2709	0.98	0.965
SPO2719	1.04	0.319	SPO2718	1.5	0.464	SPO2719	1.16	0.547	SPO2722	1.43	0.044	SPO2714	1.47	0.061	SPO2714	1.48	0.041	SPO2714	0.79	0.192	SPO2710	0.88	0.061

SPO2720	0.74	0.766	SPO2719	0.98	0.669	SPO2720	1.17	0.857	SPO2723	0.99	0.622	SPO2715	1.14	0.650	SPO2715	1.05	0.840	SPO2715	0.91	0.850	SPO2711	0.88	0.746
SPO2721	0.76	0.254	SPO2720	0.73	0.746	SPO2721	1.09	0.039	SPO2724	1	0.498	SPO2716	0.85	0.431	SPO2716	0.89	0.536	SPO2716	0.89	0.511	SPO2712	1.00	0.992
SPO2722	0.98	0.954	SPO2721	0.88	0.614	SPO2722	1.23	0.022	SPO2725	1.11	0.278	SPO2717	1.37	0.551	SPO2717	1.32	0.585	SPO2717	1.10	0.874	SPO2713	1.01	0.972
SPO2723	0.65	0.161	SPO2722	0.94	0.887	SPO2723	1.21	0.445	SPO2726	0.99	0.907	SPO2718	1.05	0.925	SPO2718	1.02	0.987	SPO2718	0.93	0.872	SPO2714	0.81	0.224
SPO2724	0.74	0.118	SPO2723	0.67	0.223	SPO2724	1.3	0.724	SPO2729	1.05	0.995	SPO2719	1.07	0.080	SPO2719	1.10	0.035	SPO2719	0.88	0.025	SPO2715	0.85	0.739
SPO2725	1.05	0.634	SPO2724	0.79	0.188	SPO2725	1.77	0.543	SPO2730	1.38	0.662	SPO2720	0.75	0.669	SPO2720	0.99	0.912	SPO2720	1.03	0.999	SPO2716	0.88	0.389
SPO2726	0.71	0.52	SPO2725	1.17	0.433	SPO2726	1.15	0.898	SPO2731	1.11	0.01	SPO2721	0.44	0.043	SPO2721	0.38	0.011	SPO2721	0.88	0.672	SPO2717	1.06	0.923
SPO2729	0.79	0.761	SPO2726	0.98	0.947	SPO2729	0.99	0.983	SPO2733	1.01	0.757	SPO2722	0.59	0.090	SPO2722	0.53	0.113	SPO2722	0.85	0.671	SPO2718	0.86	0.804
SPO2730	0.91	0.7	SPO2729	0.8	0.913	SPO2730	1.15	0.874	SPO2734	1.07	0.836	SPO2723	1.11	0.492	SPO2723	1.08	0.495	SPO2723	0.91	0.771	SPO2719	0.85	0.084
SPO2731	1.17	0.424	SPO2730	0.93	0.991	SPO2731	1.01	0.035	SPO2735	1.2	0.902	SPO2724	1.41	0.035	SPO2724	1.35	0.122	SPO2724	0.91	0.571	SPO2720	1.06	0.977
SPO2733	1.22	0.111	SPO2731	1.4	0.017	SPO2733	0.99	0.939	SPO2736	1.04	0.791	SPO2725	0.44	0.087	SPO2725	0.52	0.046	SPO2725	0.83	0.578	SPO2721	0.90	0.261
SPO2734	1.04	0.858	SPO2733	1.1	0.626	SPO2734	1.03	0.834	SPO2738	1.17	0.081	SPO2726	0.83	0.886	SPO2726	0.69	0.700	SPO2726	0.76	0.871	SPO2722	0.85	0.591
SPO2735	1.08	0.637	SPO2734	1.04	0.686	SPO2735	1.11	0.54	SPO2739	1.02	0.541	SPO2729	1.28	0.882	SPO2729	1.19	0.925	SPO2729	0.41	0.686	SPO2723	0.92	0.839
SPO2736	1.67	0.018	SPO2735	1.03	0.649	SPO2736	1.29	0.466	SPO2740	1.11	0.564	SPO2730	0.86	0.519	SPO2730	0.92	0.139	SPO2730	0.85	0.483	SPO2724	0.99	0.914
SPO2738	0.69	0.012	SPO2736	1.44	0.018	SPO2738	1.26	0.015	SPO2741	1.06	0.711	SPO2731	0.52	0.112	SPO2731	0.38	0.004	SPO2731	0.69	0.290	SPO2725	0.72	0.112
SPO2739	1.08	0.399	SPO2738	0.73	0.039	SPO2739	1.2	0.7	SPO2742	1.23	0.96	SPO2733	0.95	0.912	SPO2733	0.93	0.965	SPO2733	1.02	0.836	SPO2726	0.87	0.900
SPO2740	1.11	0.14	SPO2739	1.07	0.827	SPO2740	1.07	0.345	SPO2743	1.17	0.365	SPO2734	1.07	0.519	SPO2734	1.10	0.454	SPO2734	1.06	0.909	SPO2729	0.92	0.958
SPO2741	0.84	0.634	SPO2740	1.04	0.93	SPO2741	1.02	0.769	SPO2744	1.18	0.702	SPO2735	1.07	0.463	SPO2735	1.10	0.359	SPO2735	0.92	0.422	SPO2730	0.83	0.447
SPO2742	1.13	0.629	SPO2741	0.95	0.961	SPO2742	1.01	0.848	SPO2745	1.14	0.933	SPO2736	1.34	0.062	SPO2736	1.39	0.116	SPO2736	1.21	0.450	SPO2731	0.66	0.009
SPO2743	1.35	0.106	SPO2742	1.26	0.31	SPO2743	1.03	0.21	SPO2746	1.11	0.166	SPO2738	1.43	0.040	SPO2738	1.35	0.013	SPO2738	1.00	0.622	SPO2733	1.03	0.869
SPO2744	1.34	0.026	SPO2743	1.31	0.211	SPO2744	1.15	0.906	SPO2747	1	0.992	SPO2739	0.86	0.979	SPO2739	0.76	0.505	SPO2739	0.83	0.253	SPO2734	1.01	0.957
SPO2745	1.28	0.83	SPO2744	1.3	0.03	SPO2745	0.99	0.958	SPO2748	1.04	0.889	SPO2740	0.89	0.861	SPO2740	0.92	0.396	SPO2740	0.98	0.926	SPO2735	1.00	0.960
SPO2746	0.66	0.005	SPO2745	1.31	0.726	SPO2746	1.01	0.211	SPO2749	1.22	0.558	SPO2741	1.86	0.232	SPO2741	1.67	0.282	SPO2741	1.08	0.790	SPO2736	1.21	0.110
SPO2747	0.84	0.473	SPO2746	0.7	0.475	SPO2747	1.25	0.117	SPO2750	1.03	0.275	SPO2742	0.93	0.907	SPO2742	0.91	0.890	SPO2742	0.96	0.972	SPO2738	1.06	0.595
SPO2748	1.17	0.508	SPO2747	0.86	0.723	SPO2748	1.17	0.618	SPO2751	0.99	0.957	SPO2743	1.46	0.153	SPO2743	1.33	0.235	SPO2743	1.16	0.625	SPO2739	0.82	0.221
SPO2749	0.88	0.69	SPO2748	1.17	0.488	SPO2749	1.11	0.877	SPO2752	1.16	0.971	SPO2744	1.45	0.021	SPO2744	1.43	0.008	SPO2744	0.99	0.810	SPO2740	0.95	0.693
SPO2750	0.66	0.178	SPO2749	0.96	0.995	SPO2750	1.13	0.526	SPO2753	1.18	0.713	SPO2745	0.76	0.646	SPO2745	0.66	0.598	SPO2745	1.08	0.952	SPO2741	1.12	0.774
SPO2751	1.13	0.849	SPO2750	0.66	0.071	SPO2751	1.13	0.996	SPO2754	1.14	0.744	SPO2746	0.85	0.929	SPO2746	0.88	0.278	SPO2746	1.23	0.074	SPO2742	0.96	0.956
SPO2752	1.08	0.442	SPO2751	1.09	0.911	SPO2752	1.13	0.604	SPO2755	1.15	0.478	SPO2747	0.76	0.394	SPO2747	0.76	0.039	SPO2747	0.97	0.914	SPO2743	1.15	0.609
SPO2753	1.24	0.298	SPO2752	1.15	0.235	SPO2753	1.07	0.561	SPO2756	1.16	0.952	SPO2748	0.47	0.108	SPO2748	0.51	0.086	SPO2748	1.04	0.893	SPO2744	0.97	0.701
SPO2754	1.25	0.432	SPO2753	1.11	0.27	SPO2754	1.05	0.737	SPO2757	1.09	0.014	SPO2749	1.10	0.272	SPO2749	1.16	0.069	SPO2749	0.89	0.113	SPO2745	0.99	0.989
SPO2755	0.79	0.68	SPO2754	1.25	0.386	SPO2755	1.01	0.705	SPO2758	1.26	1	SPO2750	0.56	0.057	SPO2750	0.60	0.071	SPO2750	0.81	0.191	SPO2746	1.22	0.070
SPO2756	0.99	0.939	SPO2755	0.73	0.548	SPO2756	1.16	0.913	SPO2759	1.29	0.368	SPO2751	0.85	0.954	SPO2751	0.80	0.917	SPO2751	0.95	0.975	SPO2747	0.97	0.906
SPO2757	0.52	0.021	SPO2756	1.08	0.779	SPO2757	1.2	0.002	SPO2760	1.21	0.744	SPO2752	1.36	0.102	SPO2752	1.49	0.003	SPO2752	1.05	0.756	SPO2748	1.00	0.994
SPO2758	1.07	0.736	SPO2757	0.71	0.432	SPO2758	1.18	0.927	SPO2761	1.94	0.237	SPO2753	0.34	0.007	SPO2753	0.36	0.007	SPO2753	0.84	0.277	SPO2749	0.92	0.480
SPO2759	1.28	0.136	SPO2758	1.08	0.308	SPO2759	1.01	0.512	SPO2762	1.23	0.762	SPO2754	0.78	0.363	SPO2754	0.78	0.345	SPO2754	0.94	0.728	SPO2750	0.87	0.124
SPO2760	1.08	0.499	SPO2759	1.18	0.232	SPO2760	1.34	0.237	SPO2763	1.03	0.112	SPO2755	1.40	0.413	SPO2755	1.91	0.115	SPO2755	1.07	0.900	SPO2751	0.96	0.982
SPO2761	1.03	0.663	SPO2760	1.13	0.148	SPO2761	1	0.345	SPO2764	1.18	0.166	SPO2756	1.18	0.814	SPO2756	1.19	0.808	SPO2756	1.00	0.969	SPO2752	1.12	0.052
SPO2762	1.12	0.741	SPO2761	1.01	0.756	SPO2762	1.18	0.808	SPO2765	1	0.21	SPO2757	1.63	0.073	SPO2757	2.08	0.056	SPO2757	1.34	0.004	SPO2753	0.85	0.650
SPO2763	1.27	0.103	SPO2762	1.09	0.78	SPO2763	1.18	0.024	SPO2766	1	0.965	SPO2758	0.81	0.745	SPO2758	0.81	0.623	SPO2758	1.21	0.573	SPO2754	0.94	0.807
SPO2764	1.3	0.147	SPO2763	1.08	0.213	SPO2764	1.11	0.754	SPO2767	1.04	0.649	SPO2759	0.76	0.284	SPO2759	0.86	0.544	SPO2759	1.07	0.534	SPO2755	1.12	0.600
SPO2765	1.17	0.043	SPO2764	1.34	0.018	SPO2765	1.02	0.53	SPO2768	1.16	0.299	SPO2760	1.70	0.015	SPO2760	1.61	0.034	SPO2760	0.95	0.641	SPO2756	1.08	0.912
SPO2766	1.14	0.776	SPO2765	1.17	0.069	SPO2766	1.24	0.945	SPO2769	1.26	0.004	SPO2761	1.90	0.046	SPO2761	1.99	0.036	SPO2761	1.16	0.387	SPO2757	1.58	0.003
SPO2767	1.13	0.14	SPO2766	1.17	0.588	SPO2767	1.02	0.015	SPO2770	1.32	0.036	SPO2762	2.19	0.087	SPO2762	2.21	0.128	SPO2762	1.05	0.876	SPO2758	1.16	0.186
SPO2768	1.08	0.045	SPO2767	1.17	0.263	SPO2768	1.67	0.004	SPO2771	1.02	0.569	SPO2763	1.31	0.056	SPO2763	1.39	0.022	SPO2763	1.18	0.017	SPO2759	0.97	0.857
SPO2769	1.08	0.46	SPO2768	1.14	0.196	SPO2769	1.02	0.129	SPO2772	1.04	0.412	SPO2764	1.16	0.060	SPO2764	1.10	0.116	SPO2764	1.04	0.627	SPO2760	0.94	0.809
SPO2770	0.94	0.469	SPO2769	1.12	0.123	SPO2770	1.12	0.127	SPO2773	1.03	0.827	SPO2765	1.67	0.004	SPO2765	1.52	0.006	SPO2765	1.02	0.178	SPO2761	1.12	0.425
SPO2771	1.07	0.414	SPO2770	1.09	0.023	SPO2771	1.14	0.088	SPO2774	1.14	0.014	SPO2766	1.42	0.302	SPO2766	1.34	0.363	SPO2766	0.88	0.867	SPO2762	1.11	0.778
SPO2772	1.2	0.637	SPO2771	1.16	0.322	SPO2772	1.06	0.336	SPO2775	1.17	0.264	SPO2767	1.29	0.074	SPO2767	1.28	0.019	SPO2767	0.86	0.488	SPO2763	1.16	0.190
SPO2773	0.94	0.937	SPO2772	1.18	0.182	SPO2773	1.33	0.9	SPO2776	1.07	0.264	SPO2768	1.36	0.015	SPO2768	1.50	0.025	SPO2768	0.90	0.564	SPO2764	1.03	0.707
SPO2774	0.98	0.793	SPO2773	0.85	0.879	SPO2774	1.01	0.08	SPO2777	1.09	0.506	SPO2769	1.40	0.031	SPO2769	1.38	0.008	SPO2769	1.01	0.898	SPO2765	1.00	0.727
SPO2775	1.24	0.059	SPO2774	0.88	0.547	SPO2775	0.99	0.2	SPO2778	1.08	0.417	SPO2770	1.73	0.015	SPO2770	1.71	0.006	SPO2770	0.95	0.926	SPO2766	0.94	0.957
SPO2776	1.22	0.112	SPO2775	1.14	0.147	SPO2776	0.97	0.388	SPO2779	1.07	0.132	SPO2771	2.03	0.006	SPO2771	1.86	0.008	SPO2771	0.97	0.945	SPO2767	0.88	0.277
SPO2777	0.94	0.474	SPO2776	1.12	0.104	SPO2777	1.1	0.687	SPO2780	0.99	0.666	SPO2772	1.97	0.024	SPO2772	1.88	0.096	SPO2772	0.98	0.990	SPO2768	0.93	0.472
SPO2778	0.88	0.068	SPO2777	0.95	0.757	SPO2778	1.01	0.789	SPO2781	1.03	0.222	SPO2773	0.86	0.993	SPO2773	0.91	0.928	SPO2773	0.85	0.899	SPO2769	1.04	0.743
SPO2779	1.02	0.886	SPO2778	0.98	0.984	SPO2779	1.13	0.502	SPO2782	1.24	0.88	SPO2774	1.99	0.000	SPO2774	2.12	0.042	SPO2774	1.04	0.328	SPO2770	1.01	0.308
SPO2780	1.04	0.757	SPO2779	1.08	0.352	SPO2780	1.07	0.251	SPO2783	1.16	0.487	SPO2775	1.58	0.015	SPO2775	1.58	0.009	SPO2775	0.98	0.942	SPO2771	0.98	0.950
SPO2781	1	0.839	SPO2780	1.08	0.302	SPO2781	1.18	0.811	SPO2784	1.11	0.744	SPO2776	1.50	0.117	SPO2776	1.62	0.008	SPO2776	1.09	0.472	SPO2772	1.05	0.862
SPO2782	1.19	0.671	SPO2781	1.03	0.11	SPO2782	1.06	0.803	SPO2785	1.12	0.568	SPO2777	1.20	0.081	SPO2777	1.20	0.024	SPO2777	0.98	0.958	SPO2773	0.89	0.918
SPO2783	1.01	0.848	SPO2782	1.18	0.072	SPO2783	1.12	0.502	SPO2786	1.11	0.065	SPO2778	2.43	0.003	SPO2778	2.45	0.001	SPO2778	0.93	0.575	SPO2774	1.08	0.286
SPO2784	1.18	0.531	SPO2783	1.14	0.178	SPO2784	1.06	0.26	SPO2787	1.12	0.932	SPO2779	2.06	0.090	SPO2779	1.96	0.011	SPO2779	1.15	0.756	SPO2775	1.03	0.696
SPO2785	1.2	0.094	SPO2784	1.27	0.035	SPO2785	1.13	0.058	SPO2788	1.04	0.28	SPO2780	1.54	0.008	SPO2780	1.53	0.040	SPO2780	0.87	0.438	SPO2776	1.11	0.250
SPO2786	0.99	0.786	SPO2785	1.08	0.477	SPO2786	1.06	0.309	SPO2789	1.1	0.464	SPO2781	1.09	0.052	SPO2781	1.06	0.071	SPO2781	0.92	0.616	SPO2777	1.02	0.640
SPO2787	1.07	0.856	SPO2786	1.08	0.371	SPO2787	1.44	0.772	SPO2790	1.12	0.063	SPO2782	1.22	0.209	SPO2782	1.33	0.151	SPO2782	1.02	0.647	SPO2778	0.99	0.304
SPO2788	0.67	0.01	SPO2787	0.89	0.619	SPO2788	1.44	0.058	SPO2791	1.11	0.882	SPO2783	2.52	0.011	SPO2783	2.94	0.083	SPO2783	1.02	0.776	SPO2779	1.02	0.901
SPO2789	0.88	0.431	SPO2788	0.65	0.058	SPO2789	1.39	0.579	SPO2792	1.21	0.991	SPO2784	2.02	0.075	SPO2784	1.92	0.004	SPO2784	1.06	0.758	SPO2780	0.95	0.885
SPO2790	0.85	0.508	SPO2789	0.92	0.691	SPO2790	1.22	0.315	SPO2793	1.06	0.931	SPO2785	1.42	0.005	SPO2785	1.39	0.009	SPO2785	0.96	0.959	SPO2781	0.99	0.415
SPO2791	0.9	0.927	SPO2790	0.81	0.312	SPO2791	1.06	0.797	SPO2794	1.42	0.487	SPO2786	1.61	0.007	SPO2786	1.56	0.001	SPO2786	0.93	0.527	SPO2782	1.07	0.514
SPO2792	1	0.948	SPO2791	0.85	0.621	SPO2792	1.06	0.991	SPO2795	1.04	0.856	SPO2787	1.14	0.801	SPO2787	1.05	0.349	SPO2787	1.30	0.689	SPO2783	1.04	0.269
SPO2793	0.86	0.78	SPO2792	1.07	0.882	SPO2793	1.22	0.886	SPO2796	1.02	0.964	SPO2788	0.70	0.116	SPO2788	0.75	0.106	SPO2788	1.20	0.420	SPO2784	1.10	0.508
SPO2794	0.63	0.341	SPO2793	0.88	0.883	SPO2794	1.12	0.482	SPO2797	1.22	0.091	SPO2789	0.97	0.997	SPO2789	1.04	0.669	SPO2789	1.02	0.731	SPO2785	0.95	0.777
SPO2795	1.05	0.794	SPO2794	0.65	0.437	SPO2795	1.41	0.848	SPO2798	1.23	0.299	SPO2790	1.59	0.045	SPO2790	1.71	0.012	SPO2790	1.40	0.375	SPO2786	1.01	0.114
SPO2796	1.55	0.199	SPO2795	0.97	0.972	SPO2796	1.19	0.474	SPO2799	1.11	0.954	SPO2791	1.23	0.199	SPO2791	1.43	0.323	SPO2791	0.88	0.353	SPO2787	1.08	0.459
SPO2797	0.91	0.863	SPO2796	1.27	0.629	SPO2797	1.03	0.466	SPO2800	1.08	0.107	SPO2792	1.13	0.933	SPO2792	1.05	0.984	SPO2792	0.90	0.900	SPO2788	1.25	0.292
SPO2798	1.3	0.016	SPO2797	0.95	0.773	SPO2798	1.12	0.03	SPO2801	1.05	0.848	SPO2793	0.68	0.514	SPO2793	0.71	0.564	SPO2793	1.01	0.985	SPO2789	1.14	0.439
SPO2799	0.87	0.449	SPO2798	1.31	0.022	SPO2799	1.23	0.689	SPO2802	1.34	0.951	SPO2794	0.84	0.700	SPO2794	1.00	0.989	SPO2794	0.74	0.577	SPO2790	1.35	0.189
SPO2800	0.85	0.491	SPO2799	0.89	0.6	SPO2800	1.05	0.435	SPO2803	1.13	0.64	SPO2795	0.81	0.745	SPO2795	0.81	0.781	SPO2795	0.96	0.902	SPO2791	0.99	0.931
SPO2801	1.31	0.211	SPO2800	0.91	0.71	SPO2801	1.01	0.479	SPO2804	1.71	0.509	SPO2796	0.75	0.406	SPO2796	0.75	0.652	SPO2796	0.99	0.972	SPO2792	1.04	0.981
SPO2802	0.52	0.027	SPO2801	1.27	0.103	SPO2802	1.11	0.119	SPO2805	1.11	0.767	SPO2797	1.53	0.272	SPO2797	1.46	0.029	SPO2797	1.20	0.570	SPO2793	0.96	0.937
SPO2803	0.76	0.528	SPO2802	0.51	0.031	SPO2803	0.99	0.855	SPO2806	1.11	0.755	SPO2798	1.07	0.222	SPO2798	1.08	0.122	SPO2798	1.16	0.046	SPO2794	0.79	0.349
SPO2804	0.88	0.325	SPO2803	0.76	0.362	SPO2804	1.05	0.43	SPO2807	1.19	0.335	SPO2799	0.82	0.584	SPO2799	0.81	0.634	SPO2799	1.03	0.929	SPO2795	0.94	0.804
SPO2805	0.91	0.805	SPO2804	0.97	0.812	SPO2805	1.21	0.69	SPO2808	1.35	0.469	SPO2800	1.74	0.028	SPO2800	1.79	0.013	SPO2800	1.23	0.302	SPO2796	1.01	0.981
SPO2806	0.85	0.714	SPO2805	0.95	0.978	SPO2806	1.02	0.777	SPO2809	1.02	0.091	SPO2801	0.57	0.226	SPO2801	0.60	0.257	SPO2801	1.06	0.739	SPO2797	1.21	0.005
SPO2807	1.25	0.203	SPO2806	0.84	0.637	SPO2807	1.22	0.701	SPO2810	1.02	0.255	SPO2802	0.31	0.004	SPO2802	0.32	0.002	SPO2802	1.01	0.551	SPO2798	1.21	0.317
SPO2808	0.98	0.448	SPO2807	1.61	0.229	SPO2808	1.01	0.553	SPO2811	1.08	0.74	SPO2803	0.44	0.009	SPO2803	0.44	0.017	SPO2803	0.93	0.218	SPO2799	0.98	0.997
SPO2809	0.64	0.119	SPO2808	0.81	0.131	SPO2809	1.16	0.114	SPO2812	1.14	0.71	SPO2804	0.30	0.010	SPO2804	0.33	0.012	SPO2804	1.04	0.942	SPO2800	1.26	0.062
SPO2810	0.58	0.002	SPO2809	0.7	0.155	SPO2810	1.03	0.014	SPO2813	1.01	0.361	SPO2805	0.42	0.003	SPO2805	0.41	0.028	SPO2805	0.77	0.574	SPO2801	1.00	0.966
SPO2811	0.68	0.134	SPO2810	0.65	0.012	SPO2811	1.1	0.689	SPO2814	1.21	0.006	SPO2806	0.44	0.041	SPO2806	0.45	0.053	SPO2806	0.96	0.895	SPO2802	1.05	0.271
SPO2812	0.77	0.048	SPO2811	0.75	0.192	SPO2812	1.08	0.809	SPO2815	1.09	0.182	SPO2807	0.45	0.008	SPO2807	0.57	0.041	SPO2807	1.47	0.091	SPO2803	0.99	0.982
SPO2813	0.7	0.071	SPO2812	0.78	0.197	SPO2813	1.31	0.075	SPO2816	1.21	0.565	SPO2808	0.93	0.293	SPO2808	1.06	0.026	SPO2808	1.05	0.100	SPO2804	1.01	0.986
SPO2814	0.56	0.012	SPO2813	0.71	0.04	SPO2814	1.3	0.174	SPO2817	1.11	0.072	SPO2809	1.15	0.293	SPO2809	1.16	0.149	SPO2809	0.98	0.971	SPO2805	0.76	0.455
SPO2815	0.65	0.161	SPO2814	0.63	0.065	SPO2815	1.27	0.624	SPO2818	1.22	0.134	SPO2810	1.56	0.154	SPO2810	1.44	0.033	SPO2810	1.11	0.683	SPO2806	0.93	0.884
SPO2816	1.48	0.069	SPO2815	0.65	0.106	SPO2816	1.26	0.168	SPO2819	1.01	0.535	SPO2811	1.46	0.088	SPO2811	1.47	0.094	SPO2811	0.93	0.654	SPO2807	1.31	0.326
SPO2817	1.44	0.04	SPO2816	1.19	0.213	SPO2817	1.04	0.035	SPO2820	1.4	0.532	SPO2812	1.20	0.024	SPO2812	1.23	0.092	SPO2812	0.89	0.543	SPO2808	1.02	0.383
SPO2818	1.23	0.497	SPO2817	1.7	0.036	SPO2818	1.06	0.171	SPO2821	1.04	0.562	SPO2813	1.16	0.095	SPO2813	1.13	0.071	SPO2813	1.14	0.066	SPO2809	1.06	0.623
SPO2819	1.95	0.069	SPO2818	1.14	0.303	SPO2819	1.09	0.459	SPO2822	1.42	0.471	SPO2814	1.39	0.008	SPO2814	1.33	0.001	SPO2814	0.99	0.292	SPO2810	1.04	0.850
SPO2820	1.33	0.003	SPO2819	1.67	0.058	SPO2820	1.18	0.391	SPO2823	1.38	0.348	SPO2815	1.10	0.344	SPO2815	1.01	0.232	SPO2815	0.96	0.986	SPO2811	0.88	0.632
SPO2821	1.63	0.015	SPO2820	1.22	0.026	SPO2821	1.18	0.903	SPO2824	1.27	0.911	SPO2816	0.57	0.068	SPO2816	0.54	0.250	SPO2816	0.88	0.689	SPO2812	0.91	0.262
SPO2822	0.88	0.848	SPO2821	1.54	0.005	SPO2822	1.24	0.321	SPO2825	1.11	0.04	SPO2817	0.23	0.007	SPO2817	0.22	0.000	SPO2817	0.98	0.974	SPO2813	1.07	0.387
SPO2823	0.53	0.006	SPO2822	0.95	0.97	SPO2823	1.14	0.421	SPO2826	1.05	0.297	SPO2818	0.36	0.061	SPO2818	0.41	0.032	SPO2818	1.68	0.449	SPO2814	1.02	0.193
SPO2824	1.46	0.451	SPO2823	0.61	0.053	SPO2824	1.1	0.913	SPO2827	1.2	0.03	SPO2819	0.85	0.580	SPO2819	0.88	0.828	SPO2819	1.20	0.420	SPO2815	1.03	0.743
SPO2825	1	0.859	SPO2824	1.37	0.468	SPO2825	1.16	0.052	SPO2828	1.12	0.479	SPO2820	0.74	0.235	SPO2820	0.80	0.408	SPO2820	0.85	0.287	SPO2816	0.78	0.626
SPO2826	0.85	0.71	SPO2825	1	0.71	SPO2826	1.11	0.1	SPO2829	1	0.989	SPO2821	1.01	0.509	SPO2821	0.98	0.204	SPO2821	1.05	0.456	SPO2817	0.96	0.895
SPO2827	1.13	0.22	SPO2826	0.84	0.618	SPO2827	1.23	0.061	SPO2830	1.53	0.576	SPO2822	0.85	0.566	SPO2822	0.83	0.084	SPO2822	0.85	0.682	SPO2818	1.38	0.451
SPO2828	1.12	0.819	SPO2827	0.98	0.859	SPO2828	1.02	0.343	SPO2831	1.32	0.59	SPO2823	0.94	0.814	SPO2823	0.83	0.411	SPO2823	0.98	0.921	SPO2819	1.05	0.799
SPO2829	1	0.647	SPO2828	1.09	0.727	SPO2829	1.06	0.215	SPO2832	1.02	0.938	SPO2824	0.90	0.868	SPO2824	0.88	0.818	SPO2824	0.94	0.909	SPO2820	0.90	0.587
SPO2830	0.81	0.618	SPO2829	0.96	0.94	SPO2830	1.15	0.605	SPO2833	1.02	0.244	SPO2825	0.90	0.359	SPO2825	0.90	0.744	SPO2825	0.79	0.062	SPO2821	1.08	0.243
SPO2831	0.95	0.912	SPO2830	0.85	0.738	SPO2831	1.22	0.355	SPO2834	1.15	0.42	SPO2826	1.91	0.168	SPO2826	1.88	0.157	SPO2826	0.69	0.457	SPO2822	0.91	0.338
SPO2832	0.85	0.798	SPO2831	0.99	0.89	SPO2832	1.09	0.914	SPO2835	1.38	0.589	SPO2827	2.40	0.020	SPO2827	2.32	0.020	SPO2827	0.71	0.154	SPO2823	0.97	0.903
SPO2833	1.12	0.178	SPO2832	0.81	0.825	SPO2833	1.2	0.04	SPO2836	1.07	0.047	SPO2828	1.27	0.598	SPO2828	1.15	0.708	SPO2828	0.97	0.924	SPO2824	0.93	0.915
SPO2834	1.22	0.383	SPO2833	1.22	0.106	SPO2834	1.17	0.921	SPO2837	1.13	0.423	SPO2829	0.94	0.695	SPO2829	0.89	0.669	SPO2829	1.03	0.968	SPO2825	0.79	0.049
SPO2835	1.12	0.746	SPO2834	0.75	0.42	SPO2835	1.26	0.726	SPO2838	1.31	0.851	SPO2830	0.66	0.294	SPO2830	0.59	0.158	SPO2830	0.76	0.144	SPO2826	0.79	0.709
SPO2836	1.43	0.132	SPO2835	0.99	0.845	SPO2836	1.32	0.18	SPO2839	1.01	0.049	SPO2831	0.73	0.331	SPO2831	0.77	0.194	SPO2831	0.82	0.543	SPO2827	0.83	0.289
SPO2837	0.81	0.123	SPO2836	1.34	0.09	SPO2837	1	0.212	SPO2840	1.04	0.391	SPO2832	1.27	0.729	SPO2832	1.19	0.859	SPO2832	0.81	0.792	SPO2828	0.96	0.925
SPO2838	1.37	0.668	SPO2837	0.83	0.102	SPO2838	1.05	0.916	SPO2841	1.11	0.925	SPO2833	0.89	0.607	SPO2833	0.75	0.100	SPO2833	0.98	0.651	SPO2829	1.05	0.705
SPO2839	1.61	0.071	SPO2838	1.54	0.289	SPO2839	1.08	0.005	SPO2842	1.31	0.869	SPO2834	1.05	1.000	SPO2834	1.27	0.422	SPO2834	0.68	0.257	SPO2830	0.81	0.186
SPO2840	0.83	0.58	SPO2839	1.67	0.048	SPO2840	1.29	0.52	SPO2843	1.22	0.329	SPO2835	1.43	0.463	SPO2835	1.66	0.024	SPO2835	1.10	0.736	SPO2831	0.87	0.233
SPO2841	0.98	0.957	SPO2840	0.78	0.566	SPO2841	1	0.95	SPO2844	1.01	0.825	SPO2836	1.04	0.854	SPO2836	1.19	0.065	SPO2836	1.01	0.844	SPO2832	0.93	0.894
SPO2842	1.01	0.803	SPO2841	0.93	0.834	SPO2842	1.17	0.993	SPO2845	1.14	0.408	SPO2837	0.96	0.533	SPO2837	1.01	0.067	SPO2837	0.88	0.568	SPO2833	0.87	0.477
SPO2843	0.67	0.151	SPO2842	1.01	0.868	SPO2843	1.1	0.742	SPO2846	1.08	0.396	SPO2838	0.50	0.580	SPO2838	0.50	0.514	SPO2838	0.95	0.968	SPO2834	0.93	0.642
SPO2844	0.81	0.711	SPO2843	0.84	0.059	SPO2844	1.09	0.662	SPO2847	1	0.848	SPO2839	0.20	0.010	SPO2839	0.20	0.007	SPO2839	1.14	0.242	SPO2835	1.03	0.972
SPO2845	1.07	0.842	SPO2844	0.75	0.769	SPO2845	1.01	0.576	SPO2848	1.02	0.242	SPO2840	0.95	0.436	SPO2840	1.05	0.977	SPO2840	1.07	0.865	SPO2836	0.93	0.207
SPO2846	0.79	0.168	SPO2845	1.02	0.744	SPO2846	1.1	0.303	SPO2849	1.01	0.928	SPO2841	0.47	0.264	SPO2841	0.40	0.043	SPO2841	0.91	0.847	SPO2837	0.95	0.860
SPO2847	1.81	0.244	SPO2846	0.76	0.296	SPO2847	1.01	0.995	SPO2850	1.43	0.233	SPO2842	0.92	0.787	SPO2842	0.88	0.237	SPO2842	0.96	0.800	SPO2838	0.99	0.996
SPO2848	0.79	0.198	SPO2847	1.56	0.325	SPO2848	1.05	0.174	SPO2851	1.32	0.817	SPO2843	0.83	0.257	SPO2843	0.64	0.038	SPO2843	0.67	0.235	SPO2839	1.07	0.761
SPO2849	1.04	0.732	SPO2848	0.85	0.133	SPO2849	1.12	0.984	SPO2852	1.28	0.889	SPO2844	0.97	0.833	SPO2844	0.93	0.852	SPO2844	0.91	0.265	SPO2840	1.08	0.502
SPO2850	0.84	0.108	SPO2849	1.16	0.775	SPO2850	1.1	0.042	SPO2853	1.39	0.325	SPO2845	1.05	0.727	SPO2845	1.04	0.425	SPO2845	1.02	0.956	SPO2841	0.93	0.780
SPO2851	1.1	0.873	SPO2850	0.99	0.782	SPO2851	1.07	0.962	SPO2854	1.17	0.446	SPO2846	0.25	0.002	SPO2846	0.27	0.009	SPO2846	1.20	0.500	SPO2842	0.97	0.924
SPO2852	0.83	0.546	SPO2851	1.11	0.841	SPO2852	1.08	0.22	SPO2855	1.04	0.825	SPO2847	0.68	0.536	SPO2847	0.71	0.623	SPO2847	1.00	0.957	SPO2843	0.75	0.482
SPO2853	1.17	0.552	SPO2852	0.93	0.989	SPO2853	1.09	0.345	SPO2856	1.13	0.862	SPO2848	1.64	0.007	SPO2848	1.73	0.037	SPO2848	0.96	0.954	SPO2844	0.98	0.936
SPO2854	1.14	0.038	SPO2853	1.06	0.346	SPO2854	1.02	0.548	SPO2857	1.19	0.873	SPO2849	0.92	0.995	SPO2849	0.98	0.839	SPO2849	0.83	0.360	SPO2845	0.91	0.774
SPO2855	1.08	0.545	SPO2854	1.03	0.506	SPO2855	1.09	0.925	SPO2858	1.02	0.511	SPO2850	0.77	0.222	SPO2850	0.69	0.106	SPO2850	0.88	0.078	SPO2846	1.24	0.323
SPO2856	0.75	0.03	SPO2855	1.05	0.528	SPO2856	1.14	0.824	SPO2859	1.44	0.444	SPO2851	0.93	0.940	SPO2851	0.88	0.854	SPO2851	0.97	0.947	SPO2847	0.96	0.974
SPO2857	0.78	0.557	SPO2856	0.79	0.27	SPO2857	1.01	0.852	SPO2860	1.04	0.922	SPO2852	1.16	0.703	SPO2852	1.41	0.308	SPO2852	0.88	0.468	SPO2848	1.09	0.170
SPO2858	1.13	0.26	SPO2857	0.85	0.815	SPO2858	1.07	0.15	SPO2861	1.1	0.029	SPO2853	0.58	0.045	SPO2853	0.61	0.053	SPO2853	1.00	0.558	SPO2849	0.79	0.135
SPO2859	0.84	0.33	SPO2858	1.09	0.357	SPO2859	1.24	0.624	SPO2862	1.05	0.018	SPO2854	1.17	0.181	SPO2854	1.20	0.096	SPO2854	1.10	0.518	SPO2850	0.90	0.486
SPO2860	0.81	0.888	SPO2859	0.85	0.423	SPO2860	1.17	0.922	SPO2863	1.02	0.807	SPO2855	0.88	0.740	SPO2855	0.88	0.796	SPO2855	1.12	0.397	SPO2851	0.87	0.817
SPO2861	0.87	0.102	SPO2860	1.01	0.963	SPO2861	1.24	0.095	SPO2864	1.02	0.022	SPO2856	1.09	0.145	SPO2856	1.07	0.095	SPO2856	1.03	0.850	SPO2852	1.02	0.985
SPO2862	1.08	0.452	SPO2861	0.93	0.407	SPO2862	1.04	0.014	SPO2865	1.15	0.13	SPO2857	1.02	0.686	SPO2857	0.99	0.719	SPO2857	1.07	0.884	SPO2853	0.93	0.683

SPO2863	1.23	0.537	SPO2862	1.06	0.691	SPO2863	1.04	0.729	SPO2866	1.07	0.06	SPO2858	0.86	0.643	SPO2858	0.88	0.896	SPO2858	1.02	0.838	SPO2854	1.19	0.500
SPO2864	0.78	0.061	SPO2863	1.19	0.339	SPO2864	1.01	0.085	SPO2867	1.21	0.377	SPO2859	1.42	0.139	SPO2859	1.51	0.086	SPO2859	0.99	0.921	SPO2855	0.98	0.997
SPO2865	0.85	0.261	SPO2864	0.92	0.125	SPO2865	1.26	0.077	SPO2868	1.04	0.605	SPO2860	1.06	0.932	SPO2860	1.11	0.903	SPO2860	0.86	0.862	SPO2856	1.01	0.570
SPO2866	1.23	0.506	SPO2865	0.86	0.293	SPO2866	1.19	0.137	SPO2869	1.23	0.975	SPO2861	2.92	0.003	SPO2861	2.74	0.000	SPO2861	1.12	0.299	SPO2857	0.94	0.892
SPO2867	0.81	0.6	SPO2866	1.05	0.786	SPO2867	1.08	0.383	SPO2870	1.04	0.354	SPO2862	2.15	0.023	SPO2862	2.22	0.005	SPO2862	1.38	0.079	SPO2858	0.93	0.841
SPO2868	1	0.851	SPO2867	0.85	0.834	SPO2868	1.02	0.57	SPO2871	1.14	0.097	SPO2863	1.25	0.548	SPO2863	1.15	0.574	SPO2863	0.93	0.862	SPO2859	1.00	0.968
SPO2869	1.24	0.531	SPO2868	1.18	0.08	SPO2869	1.1	0.922	SPO2872	1.26	0.044	SPO2864	3.35	0.010	SPO2864	2.99	0.003	SPO2864	1.25	0.055	SPO2860	0.86	0.880
SPO2870	1.03	0.79	SPO2869	1.12	0.751	SPO2870	1.03	0.227	SPO2873	1.53	0.669	SPO2865	1.98	0.083	SPO2865	1.82	0.102	SPO2865	1.15	0.474	SPO2861	1.27	0.029
SPO2871	1.01	0.844	SPO2870	1.06	0.636	SPO2871	1.2	0.098	SPO2874	1.07	0.053	SPO2866	2.34	0.007	SPO2866	2.80	0.032	SPO2866	1.30	0.235	SPO2862	1.38	0.012
SPO2872	1.16	0.562	SPO2871	1.04	0.561	SPO2872	1	0.122	SPO2875	1.03	0.111	SPO2867	6.38	0.094	SPO2867	6.69	0.106	SPO2867	1.11	0.812	SPO2863	0.95	0.930
SPO2873	1.03	0.84	SPO2872	1.1	0.454	SPO2873	1.09	0.651	SPO2876	1.06	0.393	SPO2868	1.29	0.086	SPO2868	1.33	0.062	SPO2868	1.30	0.081	SPO2864	1.36	0.108
SPO2874	1.11	0.453	SPO2873	1.09	0.749	SPO2874	1.04	0.032	SPO2877	1.2	0.974	SPO2869	1.02	0.856	SPO2869	0.99	0.882	SPO2869	0.96	0.955	SPO2865	1.23	0.276
SPO2875	0.59	0.057	SPO2874	1.06	0.133	SPO2875	1.03	0.334	SPO2878	1.04	0.188	SPO2870	2.22	0.034	SPO2870	2.23	0.031	SPO2870	1.22	0.302	SPO2866	1.28	0.349
SPO2876	0.66	0.125	SPO2875	0.6	0.004	SPO2876	1.02	0.958	SPO2879	1.01	0.205	SPO2871	3.29	0.011	SPO2871	3.00	0.011	SPO2871	1.31	0.130	SPO2867	1.10	0.845
SPO2877	1.12	0.205	SPO2876	0.75	0.361	SPO2877	1.18	0.705	SPO2880	1.07	0.875	SPO2872	3.24	0.038	SPO2872	3.12	0.007	SPO2872	1.21	0.741	SPO2868	1.26	0.112
SPO2878	1.6	0.006	SPO2877	1.07	0.475	SPO2878	1.01	0.806	SPO2881	1.14	0.808	SPO2873	1.51	0.514	SPO2873	1.19	0.623	SPO2873	1.08	0.816	SPO2869	0.98	0.999
SPO2879	1.18	0.313	SPO2878	1.5	0.019	SPO2879	1.05	0.571	SPO2882	1.02	0.938	SPO2874	2.59	0.012	SPO2874	2.67	0.011	SPO2874	1.27	0.100	SPO2870	1.22	0.417
SPO2880	1.06	0.878	SPO2879	1.19	0.152	SPO2880	1.02	0.851	SPO2883	1.17	0.843	SPO2875	2.06	0.003	SPO2875	2.05	0.001	SPO2875	1.13	0.179	SPO2871	1.31	0.218
SPO2881	0.78	0.43	SPO2880	0.93	0.993	SPO2881	1	0.798	SPO2884	1.1	0.528	SPO2876	4.55	0.010	SPO2876	3.88	0.018	SPO2876	1.40	0.127	SPO2872	1.27	0.219
SPO2882	0.78	0.813	SPO2881	0.83	0.54	SPO2882	1.04	0.876	SPO2885	1.12	0.395	SPO2877	1.98	0.185	SPO2877	1.82	0.163	SPO2877	1.10	0.193	SPO2873	1.06	0.593
SPO2883	1.01	0.696	SPO2882	0.76	0.801	SPO2883	1.03	0.618	SPO2886	1.2	0.688	SPO2878	0.75	0.058	SPO2878	0.73	0.059	SPO2878	1.16	0.157	SPO2874	1.32	0.028
SPO2884	0.42	0.199	SPO2883	0.93	0.61	SPO2884	1.02	0.559	SPO2887	1.01	0.052	SPO2879	0.99	0.892	SPO2879	0.91	0.736	SPO2879	0.96	0.819	SPO2875	1.09	0.239
SPO2885	0.82	0.256	SPO2884	0.53	0.148	SPO2885	1.26	0.89	SPO2888	1.13	0.208	SPO2880	0.81	0.789	SPO2880	0.89	0.870	SPO2880	0.90	0.867	SPO2876	1.39	0.075
SPO2886	0.91	0.501	SPO2885	0.8	0.04	SPO2886	1.18	0.856	SPO2889	1.02	0.051	SPO2881	0.99	0.689	SPO2881	1.03	0.425	SPO2881	0.78	0.597	SPO2877	1.05	0.087
SPO2887	0.88	0.008	SPO2886	0.97	0.98	SPO2887	1.12	0.081	SPO2890	1.15	0.272	SPO2882	0.93	0.899	SPO2882	0.85	0.790	SPO2882	0.92	0.832	SPO2878	1.08	0.356
SPO2888	1.5	0.098	SPO2887	1.01	0.54	SPO2888	1.06	0.221	SPO2891	1.22	0.881	SPO2883	0.61	0.044	SPO2883	0.67	0.016	SPO2883	0.99	0.842	SPO2879	1.02	0.879
SPO2889	1.03	0.914	SPO2888	1.38	0.035	SPO2889	1.1	0.296	SPO2892	1.18	0.785	SPO2884	0.97	0.929	SPO2884	0.98	0.934	SPO2884	1.03	0.985	SPO2880	1.01	0.994
SPO2890	0.74	0.207	SPO2889	1.06	0.238	SPO2890	1.27	0.572	SPO2893	1.21	0.411	SPO2885	0.61	0.049	SPO2885	0.67	0.013	SPO2885	0.98	0.784	SPO2881	1.03	0.990
SPO2891	0.88	0.931	SPO2890	0.59	0.031	SPO2891	1.08	0.849	SPO2894	1.23	0.433	SPO2886	0.54	0.015	SPO2886	0.53	0.016	SPO2886	0.88	0.309	SPO2882	1.00	0.989
SPO2892	1.14	0.207	SPO2891	0.98	0.996	SPO2892	1.14	0.792	SPO2895	1.19	0.546	SPO2887	1.60	0.002	SPO2887	1.53	0.005	SPO2887	1.07	0.432	SPO2883	0.97	0.874
SPO2893	0.89	0.314	SPO2892	1.07	0.827	SPO2893	1.12	0.396	SPO2896	1.03	0.651	SPO2888	1.65	0.021	SPO2888	1.60	0.035	SPO2888	0.98	0.999	SPO2884	1.08	0.865
SPO2894	1.43	0.181	SPO2893	0.92	0.492	SPO2894	1.04	0.308	SPO2897	1.01	0.286	SPO2889	2.55	0.043	SPO2889	2.50	0.005	SPO2889	1.12	0.837	SPO2885	1.05	0.705
SPO2895	0.96	0.885	SPO2894	1.25	0.216	SPO2895	1.15	0.964	SPO2898	1.1	0.267	SPO2890	1.35	0.457	SPO2890	1.24	0.077	SPO2890	0.74	0.349	SPO2886	0.91	0.440
SPO2896	0.96	0.839	SPO2895	1.01	0.853	SPO2896	1.14	0.989	SPO2899	1.03	0.594	SPO2891	1.57	0.728	SPO2891	1.61	0.727	SPO2891	0.77	0.854	SPO2887	0.95	0.743
SPO2897	0.72	0.29	SPO2896	0.92	0.61	SPO2897	1.01	0.304	SPO2900	1.18	0.569	SPO2892	0.62	0.285	SPO2892	0.61	0.391	SPO2892	0.87	0.621	SPO2888	0.97	0.953
SPO2898	0.52	0.315	SPO2897	0.75	0.002	SPO2898	1.12	0.198	SPO2901	1.01	0.414	SPO2893	0.91	0.819	SPO2893	0.93	0.638	SPO2893	0.94	0.784	SPO2889	1.14	0.248
SPO2899	1.28	0.472	SPO2898	0.7	0.056	SPO2899	1.2	0.785	SPO2902	1.04	0.366	SPO2894	0.72	0.450	SPO2894	0.74	0.557	SPO2894	0.94	0.851	SPO2890	0.88	0.826
SPO2900	1.38	0.081	SPO2899	1.25	0.366	SPO2900	1.05	0.511	SPO2903	1.31	0.906	SPO2895	1.09	0.314	SPO2895	1.03	0.479	SPO2895	1.01	0.831	SPO2891	0.87	0.937
SPO2901	0.89	0.795	SPO2900	1.34	0.085	SPO2901	1.05	0.474	SPO2904	1.13	0.387	SPO2896	0.89	0.949	SPO2896	0.99	0.427	SPO2896	0.99	0.938	SPO2892	0.92	0.862
SPO2902	0.63	0.203	SPO2901	0.87	0.532	SPO2902	1	0.559	SPO2905	1.05	0.902	SPO2897	0.90	0.994	SPO2897	0.90	0.863	SPO2897	0.93	0.681	SPO2893	0.96	0.804
SPO2903	1.34	0.709	SPO2902	0.71	0.074	SPO2903	1.08	0.888	SPO2906	1.04	0.524	SPO2898	1.26	0.052	SPO2898	1.30	0.042	SPO2898	0.96	0.888	SPO2894	1.00	0.966
SPO2904	0.88	0.325	SPO2903	1.22	0.776	SPO2904	1.03	0.215	SPO2907	1.18	0.146	SPO2899	0.78	0.411	SPO2899	0.83	0.573	SPO2899	0.98	0.938	SPO2895	0.99	0.949
SPO2905	1.12	0.433	SPO2904	0.84	0.207	SPO2905	1.11	0.882	SPO2908	1.29	0.967	SPO2900	1.30	0.119	SPO2900	1.39	0.044	SPO2900	1.16	0.222	SPO2896	1.02	0.786
SPO2906	1.33	0.025	SPO2905	1.06	0.64	SPO2906	1.08	0.934	SPO2909	1.07	0.829	SPO2901	0.88	0.694	SPO2901	0.95	0.936	SPO2901	1.06	0.392	SPO2897	0.99	0.941
SPO2907	1.5	0.073	SPO2906	1.36	0.018	SPO2907	1.1	0.445	SPO2910	1.04	0.064	SPO2902	0.93	0.256	SPO2902	0.90	0.270	SPO2902	1.11	0.375	SPO2898	1.04	0.667
SPO2908	1.4	0.577	SPO2907	1.26	0.146	SPO2908	1.02	0.936	SPO2911	1.05	0.908	SPO2903	0.67	0.624	SPO2903	0.70	0.716	SPO2903	1.34	0.826	SPO2899	0.93	0.843
SPO2909	1.73	0.358	SPO2908	1.47	0.61	SPO2909	1.09	0.901	SPO2912	1.14	0.584	SPO2904	0.98	0.251	SPO2904	1.02	0.295	SPO2904	0.90	0.388	SPO2900	1.17	0.237
SPO2910	0.88	0.264	SPO2909	1.57	0.361	SPO2910	1.06	0.071	SPO2913	1.07	0.825	SPO2905	1.02	0.634	SPO2905	0.98	0.770	SPO2905	1.00	0.900	SPO2901	1.03	0.795
SPO2911	1.03	0.749	SPO2910	0.93	0.69	SPO2911	1.03	0.718	SPO2914	1.1	0.97	SPO2906	1.23	0.120	SPO2906	1.20	0.089	SPO2906	1.01	0.855	SPO2902	1.17	0.271
SPO2912	0.79	0.015	SPO2911	1.05	0.496	SPO2912	1.33	0.428	SPO2915	1.31	0.32	SPO2907	1.21	0.297	SPO2907	1.30	0.033	SPO2907	1.17	0.395	SPO2903	1.08	0.959
SPO2913	1.06	0.915	SPO2912	0.79	0.007	SPO2913	1.32	0.689	SPO2916	1.02	0.288	SPO2908	0.81	0.898	SPO2908	0.85	0.891	SPO2908	0.96	0.977	SPO2904	0.90	0.548
SPO2914	0.68	0.536	SPO2913	0.97	0.961	SPO2914	1.06	0.815	SPO2917	1.06	0.324	SPO2909	0.70	0.437	SPO2909	0.78	0.617	SPO2909	1.01	1.000	SPO2905	1.02	0.567
SPO2915	0.68	0.119	SPO2914	0.68	0.408	SPO2915	1.06	0.117	SPO2918	1.13	0.73	SPO2910	1.22	0.167	SPO2910	1.24	0.051	SPO2910	1.14	0.164	SPO2906	0.96	0.933
SPO2916	0.86	0.272	SPO2915	0.74	0.091	SPO2916	1.16	0.089	SPO2919	1	0.878	SPO2911	0.74	0.155	SPO2911	0.78	0.081	SPO2911	0.95	0.434	SPO2907	1.14	0.465
SPO2917	0.66	0.072	SPO2916	0.96	0.951	SPO2917	1.22	0.107	SPO2920	1.11	0.325	SPO2912	0.72	0.033	SPO2912	0.79	0.099	SPO2912	0.99	0.704	SPO2908	0.96	0.963
SPO2918	0.95	0.879	SPO2917	0.7	0.029	SPO2918	1.03	0.83	SPO2921	1.12	0.013	SPO2913	0.57	0.188	SPO2913	0.53	0.234	SPO2913	0.99	0.986	SPO2909	1.00	0.990
SPO2919	0.69	0.011	SPO2918	0.86	0.479	SPO2919	1.08	0.643	SPO2922	1.01	0.217	SPO2914	0.77	0.564	SPO2914	0.78	0.613	SPO2914	0.88	0.742	SPO2910	1.17	0.191
SPO2920	0.92	0.829	SPO2919	0.71	0.139	SPO2920	1.54	0.317	SPO2923	1.13	0.168	SPO2915	0.52	0.039	SPO2915	0.53	0.010	SPO2915	0.88	0.638	SPO2911	0.96	0.784
SPO2921	1.39	0.189	SPO2920	0.93	0.862	SPO2921	1.17	0.022	SPO2924	1.03	0.172	SPO2916	0.58	0.134	SPO2916	0.54	0.114	SPO2916	0.75	0.182	SPO2912	0.98	0.857
SPO2922	1.25	0.469	SPO2921	1.38	0.047	SPO2922	1.26	0.199	SPO2925	1.15	0.929	SPO2917	0.92	0.758	SPO2917	0.85	0.105	SPO2917	0.84	0.022	SPO2913	0.96	0.961
SPO2923	1.15	0.518	SPO2922	1.15	0.163	SPO2923	1.08	0.664	SPO2926	1.1	0.559	SPO2918	0.79	0.369	SPO2918	0.79	0.243	SPO2918	0.85	0.557	SPO2914	0.91	0.893
SPO2924	0.99	0.973	SPO2923	0.95	0.987	SPO2924	1.03	0.371	SPO2927	1.14	0.429	SPO2919	1.31	0.054	SPO2919	1.30	0.006	SPO2919	0.79	0.461	SPO2915	0.91	0.181
SPO2925	0.96	0.55	SPO2924	1.14	0.025	SPO2925	1.07	0.965	SPO2928	1.31	0.461	SPO2920	0.72	0.393	SPO2920	0.70	0.279	SPO2920	0.80	0.190	SPO2916	0.83	0.199
SPO2926	0.85	0.312	SPO2925	1.33	0.083	SPO2926	1.15	0.9	SPO2929	1.03	0.083	SPO2921	0.40	0.010	SPO2921	0.39	0.012	SPO2921	0.99	0.914	SPO2917	0.96	0.487
SPO2927	0.71	0.325	SPO2926	0.8	0.094	SPO2927	1.03	0.575	SPO2930	1.12	0.262	SPO2922	0.68	0.012	SPO2922	0.69	0.018	SPO2922	0.93	0.499	SPO2918	0.95	0.771
SPO2928	0.91	0.76	SPO2927	0.72	0.14	SPO2928	1.13	1	SPO2931	1.02	0.138	SPO2923	1.27	0.328	SPO2923	1.23	0.207	SPO2923	1.60	0.460	SPO2919	0.88	0.429
SPO2929	1.11	0.635	SPO2928	0.88	0.704	SPO2929	1.03	0.791	SPO2932	1.03	0.428	SPO2924	1.23	0.012	SPO2924	1.15	0.042	SPO2924	0.89	0.328	SPO2920	0.78	0.357
SPO2930	1.13	0.674	SPO2929	1.14	0.098	SPO2930	1.09	0.197	SPO2933	1.19	0.581	SPO2925	0.68	0.231	SPO2925	0.87	0.061	SPO2925	1.91	0.156	SPO2921	0.90	0.214
SPO2931	0.64	0.046	SPO2930	1.05	0.194	SPO2931	1.05	0.258	SPO2934	1.04	0.012	SPO2926	0.36	0.007	SPO2926	0.40	0.000	SPO2926	0.93	0.323	SPO2922	0.93	0.404
SPO2932	1.07	0.381	SPO2931	0.65	0.018	SPO2932	1.25	0.05	SPO2935	1.12	0.019	SPO2927	0.54	0.056	SPO2927	0.60	0.044	SPO2927	1.07	0.720	SPO2923	1.06	0.736
SPO2933	0.76	0.056	SPO2932	1.1	0.251	SPO2933	1.02	0.461	SPO2936	1.03	0.449	SPO2928	0.51	0.032	SPO2928	0.53	0.009	SPO2928	1.01	0.964	SPO2924	0.84	0.041
SPO2934	0.99	0.916	SPO2933	0.8	0.222	SPO2934	1.1	0.092	SPO2937	1.11	0.978	SPO2929	0.36	0.089	SPO2929	0.38	0.050	SPO2929	0.94	0.938	SPO2925	1.36	0.194
SPO2935	0.44	0.023	SPO2934	1.01	0.085	SPO2935	1.01	0.39	SPO2938	1.27	0.618	SPO2930	0.24	0.011	SPO2930	0.28	0.010	SPO2930	1.13	0.703	SPO2926	0.97	0.915
SPO2936	1	0.976	SPO2935	0.51	0.205	SPO2936	1.01	0.583	SPO2939	1.29	0.816	SPO2931	1.05	0.481	SPO2931	1.03	0.070	SPO2931	1.01	0.488	SPO2927	1.09	0.564
SPO2937	0.95	0.935	SPO2936	1.03	0.945	SPO2937	1.05	0.974	SPO2941	1.15	0.095	SPO2932	0.24	0.005	SPO2932	0.26	0.002	SPO2932	0.93	0.779	SPO2928	0.96	0.842
SPO2938	0.81	0.166	SPO2937	0.86	0.763	SPO2938	1.12	0.416	SPO2942	1.07	0.982	SPO2933	0.99	0.643	SPO2933	0.92	0.873	SPO2933	0.93	0.770	SPO2929	0.99	0.997
SPO2939	1.26	0.051	SPO2938	0.85	0.598	SPO2939	1.1	0.043	SPO2943	1.17	0.159	SPO2934	1.34	0.053	SPO2934	1.38	0.009	SPO2934	1.22	0.192	SPO2930	0.99	0.985
SPO2941	1.59	0.068	SPO2939	1.2	0.045	SPO2941	1.13	0.605	SPO2944	0.99	0.071	SPO2935	0.99	0.751	SPO2935	1.00	0.864	SPO2935	1.12	0.298	SPO2931	1.06	0.581
SPO2942	0.98	0.974	SPO2941	1.42	0.134	SPO2942	1.11	0.99	SPO2945	1.22	0.709	SPO2936	0.48	0.405	SPO2936	0.43	0.299	SPO2936	0.85	0.519	SPO2932	0.90	0.359
SPO2943	1.28	0.376	SPO2942	0.93	0.959	SPO2943	1.03	0.592	SPO2946	1.13	0.683	SPO2937	0.69	0.324	SPO2937	0.77	0.448	SPO2937	1.20	0.503	SPO2933	0.92	0.629
SPO2944	1.28	0.129	SPO2943	1.09	0.738	SPO2944	1.11	0.066	SPO2947	1.09	0.133	SPO2938	0.72	0.222	SPO2938	0.68	0.144	SPO2938	0.93	0.271	SPO2934	1.31	0.019
SPO2945	1.08	0.63	SPO2944	1.16	0.068	SPO2945	1	0.601	SPO2948	1.57	0.283	SPO2939	1.18	0.474	SPO2939	1.20	0.072	SPO2939	1.34	0.138	SPO2935	1.16	0.358
SPO2946	0.82	0.374	SPO2945	0.98	0.875	SPO2946	1.08	0.618	SPO2949	1.04	0.851	SPO2941	1.20	0.246	SPO2941	1.15	0.695	SPO2941	1.30	0.231	SPO2936	0.82	0.676
SPO2947	1.04	0.297	SPO2946	0.81	0.63	SPO2947	0.99	0.2	SPO2950	1.3	0.947	SPO2942	0.67	0.791	SPO2942	0.76	0.933	SPO2942	0.83	0.816	SPO2937	1.03	0.962
SPO2948	0.61	0.087	SPO2947	0.94	0.979	SPO2948	1.15	0.192	SPO2951	1.04	0.903	SPO2943	0.61	0.467	SPO2943	0.52	0.029	SPO2943	0.89	0.854	SPO2938	0.93	0.350
SPO2949	1.36	0.115	SPO2948	0.59	0.261	SPO2949	1.01	0.683	SPO2952	1.05	0.687	SPO2944	0.67	0.015	SPO2944	0.68	0.063	SPO2944	0.89	0.576	SPO2939	1.10	0.293
SPO2950	0.86	0.37	SPO2949	1.18	0.203	SPO2950	1.18	0.912	SPO2953	1.1	0.977	SPO2945	0.66	0.015	SPO2945	0.70	0.346	SPO2945	0.89	0.715	SPO2941	1.31	0.158
SPO2951	0.68	0.028	SPO2950	0.89	0.297	SPO2951	1.14	0.886	SPO2954	1.02	0.949	SPO2946	1.06	0.940	SPO2946	0.99	0.946	SPO2946	1.02	0.996	SPO2942	0.88	0.892
SPO2952	1.1	0.631	SPO2951	0.74	0.093	SPO2952	1.14	0.531	SPO2955	1.13	0.755	SPO2947	1.79	0.056	SPO2947	1.54	0.063	SPO2947	1.22	0.564	SPO2943	0.85	0.192
SPO2953	1.68	0.06	SPO2952	1.01	0.71	SPO2953	1.31	0.663	SPO2956	1.17	0.183	SPO2948	1.46	0.418	SPO2948	1.77	0.228	SPO2948	1.13	0.454	SPO2944	0.89	0.289
SPO2954	1.42	0.529	SPO2953	1.41	0.223	SPO2954	0.99	0.97	SPO2957	1.05	0.411	SPO2949	0.66	0.196	SPO2949	0.69	0.319	SPO2949	0.99	0.970	SPO2945	0.83	0.282
SPO2955	1.25	0.058	SPO2954	1.24	0.682	SPO2955	1.23	0.246	SPO2958	1.02	0.204	SPO2950	1.28	0.233	SPO2950	1.34	0.107	SPO2950	1.04	0.866	SPO2946	1.17	0.652
SPO2956	1.11	0.043	SPO2955	1.15	0.157	SPO2956	1.09	0.87	SPO2959	1.26	0.01	SPO2951	0.60	0.040	SPO2951	0.56	0.007	SPO2951	0.99	0.954	SPO2947	1.20	0.197
SPO2957	1.28	0.327	SPO2956	1.14	0.12	SPO2957	1.12	0.096	SPO2960	1.09	0.804	SPO2952	0.98	0.934	SPO2952	0.97	0.934	SPO2952	0.90	0.824	SPO2948	1.11	0.708
SPO2958	1.07	0.573	SPO2957	1.08	0.628	SPO2958	1.01	0.354	SPO2961	1.13	0.505	SPO2953	0.88	0.866	SPO2953	0.96	0.775	SPO2953	1.18	0.587	SPO2949	1.07	0.696
SPO2959	0.76	0.149	SPO2958	1.06	0.666	SPO2959	0.98	0.11	SPO2962	1.1	0.835	SPO2954	0.81	0.785	SPO2954	0.79	0.739	SPO2954	1.08	0.915	SPO2950	0.96	0.871
SPO2960	0.87	0.451	SPO2959	0.66	0.047	SPO2960	1.11	0.762	SPO2963	1.09	0.058	SPO2955	0.78	0.052	SPO2955	0.76	0.414	SPO2955	1.01	0.871	SPO2951	1.02	0.632
SPO2961	0.89	0.047	SPO2960	0.94	0.931	SPO2961	1	0.722	SPO2964	1.13	0.225	SPO2956	1.18	0.233	SPO2956	1.10	0.109	SPO2956	1.07	0.741	SPO2952	0.92	0.794
SPO2962	0.5	0.01	SPO2961	0.93	0.765	SPO2962	1.04	0.471	SPO2965	1	0.185	SPO2957	0.87	0.230	SPO2957	0.98	0.804	SPO2957	0.97	0.303	SPO2953	1.06	0.862
SPO2963	1.06	0.849	SPO2962	0.54	0.027	SPO2963	1.18	0.142	SPO2967	1.19	0.676	SPO2958	0.75	0.218	SPO2958	0.74	0.153	SPO2958	0.94	0.917	SPO2954	1.04	0.941
SPO2964	0.99	0.783	SPO2963	1	0.974	SPO2964	1.22	0.11	SPO2968	1.2	0.866	SPO2959	0.70	0.125	SPO2959	0.70	0.038	SPO2959	1.02	0.230	SPO2955	1.02	0.881
SPO2965	2.31	0.004	SPO2964	0.94	0.558	SPO2965	1.14	0.053	SPO2969	1.21	0.035	SPO2960	1.28	0.104	SPO2960	1.25	0.376	SPO2960	0.93	0.861	SPO2956	1.05	0.777
SPO2967	1.23	0.207	SPO2965	1.84	0.007	SPO2967	1.06	0.992	SPO2970	1.06	0.645	SPO2961	0.58	0.080	SPO2961	0.52	0.008	SPO2961	1.12	0.416	SPO2957	0.95	0.436
SPO2968	0.92	0.523	SPO2967	1.2	0.188	SPO2968	1.16	0.851	SPO2971	1.22	0.987	SPO2962	0.10	0.005	SPO2962	0.09	0.000	SPO2962	1.15	0.425	SPO2958	0.86	0.071
SPO2969	1.08	0.011	SPO2968	1.04	0.62	SPO2969	1.14	0.212	SPO2972	1.1	0.565	SPO2963	0.40	0.045	SPO2963	0.43	0.029	SPO2963	1.03	0.627	SPO2959	0.98	0.833
SPO2970	1.38	0.013	SPO2969	1.12	0.014	SPO2970	1.09	0.589	SPO2974	1.01	0.455	SPO2964	0.56	0.032	SPO2964	0.52	0.054	SPO2964	1.01	0.741	SPO2960	1.01	0.942
SPO2971	1.12	0.171	SPO2970	1.27	0.034	SPO2971	1.21	0.806	SPO2975	1.02	0.818	SPO2965	0.79	0.242	SPO2965	0.79	0.204	SPO2965	1.25	0.090	SPO2961	1.01	0.738
SPO2972	1.27	0.172	SPO2971	1.07	0.521	SPO2972	2.26	0.897	SPO2976	1.2	0.528	SPO2967	2.12	0.028	SPO2967	2.05	0.023	SPO2967	1.00	0.990	SPO2962	1.25	0.132
SPO2974	1.1	0.253	SPO2972	1.19	0.341	SPO2974	1.86	0.528	SPO2977	1.16	0.856	SPO2968	1.15	0.057	SPO2968	1.13	0.287	SPO2968	0.96	0.922	SPO2963	0.99	0.802
SPO2975	1.2	0.67	SPO2974	1.11	0.003	SPO2975	1.77	0.856	SPO2978	1.16	0.927	SPO2969	1.03	0.052	SPO2969	1.08	0.006	SPO2969	1.08	0.195	SPO2964	0.97	0.995
SPO2976	0.76	0.112	SPO2975	1.08	0.67	SPO2976	1.1	0.886	SPO2979	1.05	0.759	SPO2970	0.70	0.021	SPO2970	0.71	0.132	SPO2970	0.94	0.793	SPO2965	0.94	0.699
SPO2977	0.98	0.969	SPO2976	0.77	0.077	SPO2977	1.03	0.552	SPO2980	1.22	0.764	SPO2971	1.04	0.910	SPO2971	0.99	0.887	SPO2971	0.93	0.756	SPO2967	0.96	0.839
SPO2978	0.9	0.892	SPO2977	1	0.857	SPO2978	1.02	0.88	SPO2981	1.17	0.136	SPO2972	1.03	0.794	SPO2972	1.15	0.496	SPO2972	1.67	0.021	SPO2968	0.97	0.992
SPO2979	0.86	0.477	SPO2978	0.9	0.907	SPO2979	1.07	0.214	SPO2982	1.07	0.786	SPO2974	0.70	0.013	SPO2974	0.79	0.042	SPO2974	0.85	0.118	SPO2969	1.10	0.036
SPO2980	1.08	0.716	SPO2979	0.88	0.599	SPO2980	0.99	0.685	SPO2983	1.05	0.986	SPO2975	1.18	0.713	SPO2975	1.15	0.125	SPO2975	0.95	0.951	SPO2970	0.94	0.615
SPO2981	1.17	0.232	SPO2980	1.06	0.9	SPO2981	1.1	0.007	SPO2984	1.01	0.35	SPO2976	0.90	0.833	SPO2976	0.94	0.753	SPO2976	1.02	0.718	SPO2971	0.93	0.827
SPO2982	0.99	0.882	SPO2981	1.19	0.077	SPO2982	1	0.632	SPO2985	1.11	0.164	SPO2977	0.97	0.993	SPO2977	1.00	0.946	SPO2977	1.00	0.995	SPO2972	1.07	0.790
SPO2983	1	0.993	SPO2982	1.03	0.639	SPO2983	1.05	0.967	SPO2986	1.1	0.695	SPO2978	0.81	0.577	SPO2978	0.81	0.591	SPO2978	0.84	0.538	SPO2974	0.87	0.070
SPO2984	0.93	0.849	SPO2983	0.96	0.998	SPO2984	1.09	0.981	SPO2987	1.16	0.024	SPO2979	1.36	0.033	SPO2979	1.38	0.124	SPO2979	1.19	0.286	SPO2975	0.90	0.667
SPO2985	0.73	0.359	SPO2984	1.03	0.755	SPO2985	1.38	0.591	SPO2988	1.11	0.315	SPO2980	0.65	0.462	SPO2980	0.65	0.532	SPO2980	0.75	0.348	SPO2976	0.93	0.634
SPO2986	0.71	0.255	SPO2985	0.8	0.29	SPO2986	1.12	0.681	SPO2989	1.25	0.308	SPO2981	0.76	0.046	SPO2981	0.79	0.021	SPO2981	0.85	0.262	SPO2977	0.93	0.896
SPO2987	0.66	0.013	SPO2986	0.74	0.342	SPO2987	1.1	0.023	SPO2990	2.13	0.214	SPO2982	0.99	0.835	SPO2982	1.03	0.768	SPO2982	0.87	0.545	SPO2978	0.90	0.746
SPO2988	0.99	0.993	SPO2987	0.71	0.116	SPO2988	1.08	0.395	SPO2991	1.95	0.071	SPO2983	0.83	0.958	SPO2983	0.83	0.967	SPO2983	0.83	0.932	SPO2979	1.17	0.374
SPO2989	0.95	0.495	SPO2988	1	0.871	SPO2989	1.07	0.162	SPO2992	1.7	0.65	SPO2984	1.81	0.034	SPO2984	1.73	0.009	SPO2984	1.08	0.704	SPO2980	0.81	0.127
SPO2990	0.96	0.911	SPO2989	1.03	0.093	SPO2990	1.01	0.218	SPO2993	1.07	0.958	SPO2985	1.13	0.444	SPO2985	1.15	0.222	SPO2985	0.94	0.840	SPO2981	0.79	0.135
SPO2991	0.75	0.23	SPO2990	0.88	0.386	SPO2991	1.07	0.417	SPO2994	1.08	0.075	SPO2986	1.15	0.349	SPO2986	1.15	0.319	SPO2986	1.00	0.922	SPO2982	0.93	0.744
SPO2992	0.95	0.701	SPO2991	0.77	0.233	SPO2992	1.06	0.475	SPO2995	1.08	0.895	SPO2987	1.79	0.039	SPO2987	1.86	0.003	SPO2987	1.18	0.354	SPO2983	0.85	0.938
SPO2993	1.21	0.812	SPO2992	0.95	0.908	SPO2993	1.09	0.954	SPO2996	1.16	0.875	SPO2988	0.91	0.988	SPO2988	0.88	0.866	SPO2988	1.01	0.913	SPO2984	1.17	0.272
SPO2994	0.43	0.017	SPO2993	1.03	0.945	SPO2994	1.21	0.073	SPO2997	1	0.955	SPO2989	1.04	0.189	SPO2989	1.02	0.133	SPO2989	0.93	0.581	SPO2985	0.94	0.324
SPO2995	0.63	0.345	SPO2994	0.49	0.424	SPO2995	1.05	0.716	SPO2998	1.1	0.675	SPO2990	1.51	0.044	SPO2990	1.72	0.022	SPO2990	1.21	0.087	SPO2986	1.06	0.806
SPO2996	0.79	0.606	SPO2995	0.66	0.159	SPO2996	1.16	0.884	SPO2999	1.06	0.322	SPO2991	1.31	0.091	SPO2991	1.27	0.024	SPO2991	0.95	0.808	SPO2987	1.24	0.181
SPO2997	0.82	0.22	SPO2996	0.85	0.759	SPO2997	1.4	0.823	SPO3000	1.16	0.984	SPO2992	1.35	0.025	SPO2992	1.46	0.037	SPO2992	1.09	0.405	SPO2988	0.98	0.969
SPO2998	1.23	0.075	SPO2997	0.83	0.499	SPO2998	1.02	0.498	SPO3001	0.98	0.982	SPO2993	1.13	0.796	SPO2993	1.07	0.884	SPO2993	0.87	0.774	SPO2989	0.93	0.222
SPO2999	1.16	0.576	SPO2998	1.13	0.564	SPO2999	1.12	0.353	SPO3002	1.51	0.969	SPO2994	1.47	0.064	SPO2994	1.41	0.127	SPO2994	0.86	0.123	SPO2990	1.23	0.241
SPO3000	0.67	0.262	SPO2999	1.11	0.569	SPO3000	1.02	0.58	SPO3003	1.06	0.795	SPO2995	1.64	0.043	SPO2995	1.52	0.005	SPO2995	0.85	0.676	SPO2991	0.98	0.921
SPO3001	0.98	0.997	SPO3000	0.75	0.323	SPO3001	1	0.929	SPO3004	1.18	0.104	SPO2996	1.74	0.323	SPO2996	1.57	0.264	SPO2996	0.82	0.660	SPO2992	1.07	0.348
SPO3002	1.22	0.552	SPO3001	0.86	0.93	SPO3002	1.07	0.791	SPO3005	1.04	0.873	SPO2997	1.54	0.216	SPO2997	1.48	0.229	SPO2997	0.85	0.496	SPO2993	0.88	0.872
SPO3003	0.69	0.492	SPO3002	1.02	0.637	SPO3003	1.03	0.791	SPO3008	1.19	0.707	SPO2998	1.37	0.004	SPO2998	1.39	0.170	SPO2998	1.05	0.110	SPO2994	0.88	0.625
SPO3004	0.51	0.062	SPO3003	0.71	0.548	SPO3004	1.07	0.126	SPO3009	1.2	0.584	SPO2999	0.95	0.801	SPO2999	1.13	0.698	SPO2999	1.02	0.991	SPO2995	0.88	0.245

SPO3005	1.12	0.889	SPO3004	0.52	0.101	SPO3005	1.06	0.815	SPO3010	1.13	0.896	SPO3000	0.66	0.294	SPO3000	0.56	0.063	SPO3000	0.86	0.412	SPO2996	0.86	0.686
SPO3008	0.82	0.333	SPO3005	1.1	0.89	SPO3008	1.14	0.846	SPO3011	1.04	0.512	SPO3001	0.62	0.599	SPO3001	0.63	0.697	SPO3001	1.04	0.939	SPO2997	0.93	0.754
SPO3009	0.95	0.951	SPO3008	0.76	0.213	SPO3009	1.03	0.85	SPO3012	1.02	0.342	SPO3002	1.38	0.045	SPO3002	1.46	0.061	SPO3002	1.05	0.801	SPO2998	0.93	0.887
SPO3010	1.08	0.33	SPO3009	1.02	0.139	SPO3010	1.07	0.858	SPO3013	1.05	0.721	SPO3003	1.61	0.362	SPO3003	1.64	0.352	SPO3003	0.93	0.906	SPO2999	0.93	0.503
SPO3011	0.97	0.927	SPO3010	0.94	0.953	SPO3011	1.24	0.738	SPO3014	1.1	0.01	SPO3004	2.06	0.071	SPO3004	2.12	0.049	SPO3004	0.96	0.973	SPO3000	0.87	0.512
SPO3012	1.62	0.075	SPO3011	0.94	0.889	SPO3012	1.02	0.551	SPO3015	1.32	0.245	SPO3005	0.66	0.808	SPO3005	0.71	0.896	SPO3005	0.90	0.938	SPO3001	1.04	0.955
SPO3013	0.71	0.402	SPO3012	1.5	0.091	SPO3013	1.12	0.796	SPO3016	1.08	0.568	SPO3008	0.53	0.079	SPO3008	0.51	0.038	SPO3008	0.95	0.712	SPO3002	1.03	0.706
SPO3014	1.74	0.018	SPO3013	0.66	0.372	SPO3014	1.07	0.003	SPO3017	1.12	0.054	SPO3009	2.15	0.027	SPO3009	1.97	0.038	SPO3009	1.24	0.320	SPO3003	0.96	0.966
SPO3015	1.19	0.243	SPO3014	1.38	0.003	SPO3015	1.19	0.329	SPO3018	1.53	0.627	SPO3010	1.12	0.835	SPO3010	1.21	0.057	SPO3010	0.95	0.820	SPO3004	0.97	0.990
SPO3016	0.52	0.027	SPO3015	1.02	0.495	SPO3016	1.02	0.304	SPO3019	1.08	0.479	SPO3011	0.65	0.176	SPO3011	0.65	0.053	SPO3011	0.94	0.602	SPO3005	0.85	0.891
SPO3017	0.46	0.045	SPO3016	0.46	0.004	SPO3017	0.99	0.209	SPO3020	1.1	0	SPO3012	0.66	0.266	SPO3012	0.60	0.083	SPO3012	1.62	0.194	SPO3008	0.94	0.783
SPO3018	0.93	0.594	SPO3017	0.46	0.058	SPO3018	1.17	0.975	SPO3021	1.1	0.81	SPO3013	0.77	0.503	SPO3013	0.79	0.626	SPO3013	1.01	0.974	SPO3009	1.21	0.479
SPO3019	1.02	0.75	SPO3018	0.89	0.462	SPO3019	1.06	0.377	SPO3022	1.19	0.892	SPO3014	0.16	0.001	SPO3014	0.14	0.003	SPO3014	2.36	0.028	SPO3010	0.94	0.778
SPO3020	0.85	0	SPO3019	0.97	0.962	SPO3020	1.13	0.902	SPO3023	1.07	0.943	SPO3015	1.25	0.249	SPO3015	1.48	0.012	SPO3015	1.38	0.139	SPO3011	0.93	0.697
SPO3021	0.75	0.674	SPO3021	0.75	0.83	SPO3021	1.1	0.965	SPO3024	1.1	0.875	SPO3016	1.97	0.004	SPO3016	1.99	0.001	SPO3016	1.28	0.054	SPO3012	1.26	0.590
SPO3022	1.36	0.388	SPO3022	1.27	0.154	SPO3022	1.07	0.726	SPO3025	1.16	0.376	SPO3017	3.89	0.003	SPO3017	3.74	0.006	SPO3017	1.58	0.019	SPO3013	1.01	0.951
SPO3023	0.94	0.858	SPO3023	1.03	0.586	SPO3023	1.27	0.824	SPO3026	1.02	0.93	SPO3018	0.69	0.105	SPO3018	0.71	0.036	SPO3018	0.95	0.668	SPO3014	2.11	0.024
SPO3024	0.68	0.384	SPO3024	0.81	0.307	SPO3024	0.99	0.655	SPO3027	1.11	0.004	SPO3019	0.60	0.019	SPO3019	0.60	0.004	SPO3019	0.88	0.145	SPO3015	1.32	0.194
SPO3025	0.85	0.123	SPO3025	0.94	0.955	SPO3025	1.41	0.51	SPO3028	1.12	0.743	SPO3020	0.98	0.835	SPO3020	0.94	0.172	SPO3020	0.82	0.547	SPO3016	1.07	0.110
SPO3026	1.03	0.81	SPO3026	0.99	0.897	SPO3026	1.14	0.684	SPO3029	0.99	0.971	SPO3021	1.41	0.592	SPO3021	1.21	0.875	SPO3021	1.07	0.948	SPO3017	1.44	0.079
SPO3027	0.81	0.394	SPO3027	0.75	0.355	SPO3027	1.08	0.027	SPO3030	1.07	0.675	SPO3022	0.65	0.075	SPO3022	0.67	0.097	SPO3022	0.93	0.789	SPO3018	0.94	0.514
SPO3028	1.69	0.019	SPO3028	1.64	0.145	SPO3028	1.15	0.947	SPO3031	1.07	0.976	SPO3023	0.84	0.357	SPO3023	0.96	0.970	SPO3023	1.18	0.103	SPO3019	0.85	0.081
SPO3029	0.93	0.209	SPO3029	0.92	0.346	SPO3029	1.02	0.826	SPO3032	1.22	0.809	SPO3024	1.11	0.925	SPO3024	1.38	0.078	SPO3024	1.42	0.381	SPO3020	0.64	0.151
SPO3030	1.1	0.428	SPO3030	1.2	0.6	SPO3030	1.1	0.5	SPO3033	1	0.696	SPO3025	0.63	0.094	SPO3025	0.58	0.033	SPO3025	0.75	0.064	SPO3021	1.02	1.000
SPO3031	2.67	0.36	SPO3031	2.09	0.64	SPO3031	1.08	0.993	SPO3034	1.02	0.557	SPO3026	1.03	0.371	SPO3026	1.10	0.290	SPO3026	1.06	0.522	SPO3022	1.02	0.871
SPO3032	1.74	0.019	SPO3032	1.87	0.163	SPO3032	1.04	0.873	SPO3035	0.99	0.398	SPO3027	6.75	0.006	SPO3027	7.61	0.000	SPO3027	0.93	0.821	SPO3023	1.14	0.425
SPO3033	2.26	0.094	SPO3033	2.29	0.244	SPO3033	1.06	0.796	SPO3036	1.13	0.053	SPO3028	0.72	0.030	SPO3028	0.76	0.463	SPO3028	1.11	0.730	SPO3024	1.14	0.484
SPO3034	1.65	0.029	SPO3034	1.18	0.292	SPO3034	1.25	0.313	SPO3037	1.04	0.448	SPO3029	0.57	0.089	SPO3029	0.56	0.046	SPO3029	0.89	0.596	SPO3025	0.71	0.230
SPO3035	1.37	0.042	SPO3035	1.45	0.065	SPO3035	1.04	0.298	SPO3038	1.14	0.757	SPO3030	0.81	0.321	SPO3030	0.81	0.465	SPO3030	0.89	0.213	SPO3026	1.09	0.589
SPO3036	0.92	0.658	SPO3036	0.9	0.187	SPO3036	1.12	0.245	SPO3039	1.03	0.935	SPO3031	0.33	0.510	SPO3031	0.28	0.488	SPO3031	0.94	0.980	SPO3027	0.99	0.846
SPO3037	0.82	0.188	SPO3037	0.87	0.489	SPO3037	1.06	0.79	SPO3040	1.09	0.991	SPO3032	0.26	0.034	SPO3032	0.24	0.057	SPO3032	0.95	0.762	SPO3028	0.95	0.903
SPO3038	0.93	0.981	SPO3038	1	0.873	SPO3038	1.03	0.542	SPO3041	1.16	0.862	SPO3033	0.25	0.025	SPO3033	0.28	0.073	SPO3033	1.21	0.422	SPO3029	0.91	0.637
SPO3039	0.79	0.581	SPO3039	0.81	0.664	SPO3039	1.08	0.659	SPO3042	1.06	0.432	SPO3034	0.55	0.009	SPO3034	0.60	0.169	SPO3034	0.97	0.818	SPO3030	0.89	0.703
SPO3040	0.91	0.951	SPO3040	0.94	0.984	SPO3040	1.05	0.908	SPO3043	1.25	0.221	SPO3035	0.90	0.912	SPO3035	0.95	0.658	SPO3035	0.97	0.899	SPO3031	0.96	0.987
SPO3041	0.91	0.955	SPO3041	0.77	0.686	SPO3041	1.61	0.549	SPO3044	1.01	0.812	SPO3036	0.74	0.103	SPO3036	0.74	0.382	SPO3036	0.97	0.944	SPO3032	0.99	0.969
SPO3042	0.92	0.923	SPO3042	1.05	0.403	SPO3042	1	0.888	SPO3045	1.34	0.357	SPO3037	1.44	0.137	SPO3037	1.38	0.050	SPO3037	1.03	0.789	SPO3033	1.20	0.610
SPO3043	0.81	0.771	SPO3043	0.81	0.738	SPO3043	1.04	0.591	SPO3046	1.13	0.409	SPO3038	1.11	0.889	SPO3038	1.11	0.902	SPO3038	1.08	0.820	SPO3034	1.00	0.988
SPO3044	1.11	0.726	SPO3044	1.12	0.665	SPO3044	1.03	0.816	SPO3047	1.07	0.182	SPO3039	0.92	0.819	SPO3039	1.00	0.951	SPO3039	0.94	0.851	SPO3035	0.96	0.857
SPO3045	0.72	0.5	SPO3045	0.78	0.593	SPO3045	1.03	0.461	SPO3048	1.15	0.706	SPO3040	1.21	0.769	SPO3040	1.05	0.905	SPO3040	1.04	0.988	SPO3036	0.92	0.538
SPO3046	0.86	0.388	SPO3046	0.83	0.093	SPO3046	0.99	0.645	SPO3049	1.08	0.55	SPO3041	0.78	0.377	SPO3041	0.82	0.792	SPO3041	0.82	0.340	SPO3037	1.04	0.762
SPO3047	1.14	0.554	SPO3047	1.13	0.542	SPO3047	1	0.351	SPO3050	1.11	0.197	SPO3042	0.76	0.345	SPO3042	0.74	0.062	SPO3042	0.80	0.143	SPO3038	0.94	0.885
SPO3048	1.22	0.824	SPO3048	1.25	0.805	SPO3048	1.2	0.747	SPO3051	1.1	0.092	SPO3043	1.51	0.277	SPO3043	1.34	0.716	SPO3043	1.05	0.938	SPO3039	0.96	0.881
SPO3049	0.97	0.836	SPO3049	0.9	0.871	SPO3049	1.07	0.66	SPO3052	1.08	0.066	SPO3044	1.05	0.977	SPO3044	0.85	0.677	SPO3044	0.91	0.807	SPO3040	1.00	0.948
SPO3050	1.43	0.13	SPO3050	1.45	0.085	SPO3050	1.41	0.136	SPO3053	1.04	0.822	SPO3045	1.46	0.387	SPO3045	1.49	0.301	SPO3045	1.24	0.605	SPO3041	0.92	0.705
SPO3051	1.2	0.22	SPO3051	1.15	0.31	SPO3051	1.32	0.289	SPO3054	1.28	0.576	SPO3046	1.37	0.112	SPO3046	1.41	0.009	SPO3046	0.90	0.624	SPO3042	0.88	0.461
SPO3052	0.89	0.068	SPO3052	0.95	0.388	SPO3052	1.02	0.069	SPO3055	1.02	0.541	SPO3047	0.83	0.445	SPO3047	0.81	0.197	SPO3047	0.86	0.530	SPO3043	1.17	0.646
SPO3053	1.26	0.41	SPO3053	1.18	0.705	SPO3053	1.04	0.84	SPO3056	1.1	0.376	SPO3048	0.86	0.848	SPO3048	0.77	0.743	SPO3048	0.81	0.833	SPO3044	0.87	0.706
SPO3054	1.11	0.119	SPO3054	1.09	0.303	SPO3054	1.12	0.389	SPO3057	1.05	0.615	SPO3049	1.38	0.395	SPO3049	1.45	0.394	SPO3049	1.44	0.334	SPO3045	1.25	0.549
SPO3055	1.91	0.02	SPO3055	1.7	0.048	SPO3055	1.14	0.052	SPO3058	1.03	0.878	SPO3050	0.68	0.184	SPO3050	0.65	0.103	SPO3050	0.93	0.378	SPO3046	0.96	0.611
SPO3056	0.76	0.178	SPO3056	0.79	0.23	SPO3056	1.35	0.439	SPO3059	1	0.835	SPO3051	0.65	0.057	SPO3051	0.65	0.012	SPO3051	1.01	0.854	SPO3047	0.88	0.479
SPO3057	1.18	0.162	SPO3057	1.02	0.45	SPO3057	1.03	0.594	SPO3060	1.03	0.395	SPO3052	0.74	0.095	SPO3052	0.77	0.214	SPO3052	0.95	0.373	SPO3048	0.81	0.814
SPO3058	1.42	0.472	SPO3058	1.41	0.425	SPO3058	1.04	0.833	SPO3062	1.11	0.124	SPO3053	0.43	0.076	SPO3053	0.42	0.093	SPO3053	0.99	0.963	SPO3049	1.39	0.500
SPO3059	0.81	0.397	SPO3059	0.86	0.419	SPO3059	1.25	0.842	SPO3063	1	0.249	SPO3054	0.44	0.002	SPO3054	0.45	0.013	SPO3054	1.15	0.595	SPO3050	0.85	0.371
SPO3060	0.79	0.021	SPO3060	0.83	0.195	SPO3060	1.04	0.908	SPO3064	1.11	0.042	SPO3055	0.69	0.095	SPO3055	0.68	0.021	SPO3055	1.11	0.684	SPO3051	1.02	0.569
SPO3062	1.26	0.04	SPO3062	1.22	0.016	SPO3062	1.02	0.031	SPO3065	1.75	0.755	SPO3056	1.00	0.652	SPO3056	0.95	0.509	SPO3056	0.98	0.997	SPO3052	0.91	0.337
SPO3063	1.16	0.241	SPO3063	1.02	0.564	SPO3063	1.02	0.295	SPO3066	1.07	0.233	SPO3057	0.85	0.474	SPO3057	0.88	0.609	SPO3057	0.98	0.938	SPO3053	0.94	0.896
SPO3064	0.85	0.248	SPO3064	0.82	0.197	SPO3064	1.03	0.049	SPO3067	1.18	0.965	SPO3058	0.79	0.719	SPO3058	0.69	0.521	SPO3058	1.10	0.795	SPO3054	1.08	0.637
SPO3065	0.73	0.345	SPO3065	0.87	0.223	SPO3065	0.99	0.483	SPO3068	1	0.7	SPO3059	0.50	0.014	SPO3059	0.53	0.014	SPO3059	1.21	0.747	SPO3055	1.02	0.909
SPO3066	1.39	0.07	SPO3066	1.28	0.193	SPO3066	1.01	0.187	SPO3069	1.01	0.911	SPO3060	0.47	0.009	SPO3060	0.46	0.003	SPO3060	1.13	0.230	SPO3056	1.05	0.670
SPO3067	1.12	0.38	SPO3067	1.21	0.186	SPO3067	1	0.691	SPO3070	1.06	0.006	SPO3062	0.90	0.724	SPO3062	0.82	0.036	SPO3062	1.08	0.817	SPO3057	1.09	0.519
SPO3068	1.15	0.613	SPO3068	1.08	0.765	SPO3068	0.99	0.516	SPO3071	1.06	0.007	SPO3063	0.71	0.061	SPO3063	0.69	0.011	SPO3063	0.97	0.824	SPO3058	1.09	0.761
SPO3069	1.47	0.143	SPO3069	1.26	0.443	SPO3069	1.01	0.945	SPO3072	1.1	0.263	SPO3064	1.45	0.040	SPO3064	1.49	0.018	SPO3064	1.00	0.967	SPO3059	1.19	0.441
SPO3070	1.15	0.19	SPO3070	1.17	0.021	SPO3070	1.32	0.043	SPO3073	1.07	0.099	SPO3065	1.96	0.009	SPO3065	1.69	0.057	SPO3065	1.14	0.600	SPO3060	1.07	0.357
SPO3071	0.96	0.387	SPO3071	0.93	0.375	SPO3071	1.06	0.106	SPO3074	1.54	0.762	SPO3066	1.10	0.227	SPO3066	1.15	0.155	SPO3066	1.22	0.095	SPO3062	0.93	0.383
SPO3072	1.22	0.169	SPO3072	1.18	0.053	SPO3072	1.48	0.224	SPO3075	1.21	0.264	SPO3067	1.01	0.705	SPO3067	1.02	0.791	SPO3067	1.09	0.606	SPO3063	0.94	0.614
SPO3073	0.77	0.141	SPO3073	0.87	0.295	SPO3073	1.39	0.937	SPO3076	1.07	0.831	SPO3068	0.69	0.379	SPO3068	0.71	0.372	SPO3068	0.95	0.859	SPO3064	0.85	0.100
SPO3074	0.7	0.642	SPO3074	0.79	0.529	SPO3074	1.1	0.731	SPO3077	1.09	0.626	SPO3069	1.17	0.552	SPO3069	1.19	0.267	SPO3069	0.92	0.642	SPO3065	1.12	0.706
SPO3075	1.47	0.087	SPO3075	1.48	0.049	SPO3075	1.12	0.162	SPO3078	1.07	0.258	SPO3070	1.43	0.112	SPO3070	1.44	0.004	SPO3070	1.21	0.378	SPO3066	1.14	0.139
SPO3076	1.21	0.606	SPO3076	1.12	0.619	SPO3076	1.18	0.723	SPO3079	1.39	0.918	SPO3071	0.91	0.802	SPO3071	0.97	0.418	SPO3071	1.22	0.069	SPO3067	1.07	0.613
SPO3077	1.15	0.474	SPO3077	1.08	0.635	SPO3077	1.31	0.579	SPO3080	1.04	0.908	SPO3072	0.95	0.685	SPO3072	0.99	0.400	SPO3072	1.19	0.334	SPO3068	0.85	0.661
SPO3078	1.01	0.67	SPO3078	1.06	0.782	SPO3078	1.17	0.53	SPO3081	1.08	0.023	SPO3073	1.41	0.014	SPO3073	1.58	0.008	SPO3073	0.97	0.587	SPO3069	0.93	0.708
SPO3079	0.91	0.739	SPO3079	1.01	0.923	SPO3079	1.65	0.837	SPO3082	1.16	0.257	SPO3074	2.60	0.052	SPO3074	2.58	0.090	SPO3074	1.08	0.623	SPO3070	1.23	0.041
SPO3080	1.04	0.963	SPO3080	1.16	0.903	SPO3080	1.04	0.904	SPO3083	0.99	0.858	SPO3075	1.83	0.035	SPO3075	1.87	0.016	SPO3075	0.90	0.756	SPO3071	1.26	0.206
SPO3081	0.67	0.075	SPO3081	0.65	0.114	SPO3081	1.03	0.021	SPO3084	1.06	0.801	SPO3076	0.88	0.877	SPO3076	0.93	0.685	SPO3076	0.93	0.950	SPO3072	1.16	0.153
SPO3082	0.56	0.07	SPO3082	0.65	0.093	SPO3082	1.05	0.555	SPO3085	1.07	0.827	SPO3077	0.75	0.038	SPO3077	0.75	0.225	SPO3077	1.00	0.970	SPO3073	1.09	0.050
SPO3083	0.98	0.862	SPO3083	0.95	0.8	SPO3083	1.04	0.679	SPO3086	1	0.842	SPO3078	0.27	0.013	SPO3078	0.27	0.004	SPO3078	0.84	0.320	SPO3074	1.15	0.687
SPO3084	0.93	0.62	SPO3084	0.83	0.184	SPO3084	1.14	0.811	SPO3087	1.08	0.506	SPO3079	2.04	0.151	SPO3079	1.88	0.284	SPO3079	1.06	0.828	SPO3075	0.88	0.496
SPO3085	0.71	0.06	SPO3085	0.75	0.113	SPO3085	1.07	0.351	SPO3088	1.05	0.038	SPO3080	1.97	0.624	SPO3080	1.95	0.615	SPO3080	0.81	0.898	SPO3076	0.93	0.915
SPO3086	0.93	0.552	SPO3086	0.96	0.936	SPO3086	1.05	0.871	SPO3089	1.01	0.93	SPO3081	4.39	0.007	SPO3081	4.35	0.009	SPO3081	1.16	0.531	SPO3077	0.98	0.982
SPO3087	1.05	0.807	SPO3087	1.05	0.166	SPO3087	1.03	0.07	SPO3090	1.38	0.567	SPO3082	1.34	0.099	SPO3082	1.31	0.064	SPO3082	1.20	0.340	SPO3078	0.89	0.351
SPO3088	0.84	0.223	SPO3088	0.79	0.054	SPO3088	1.12	0.218	SPO3091	1.06	0.17	SPO3083	0.96	0.423	SPO3083	0.93	0.632	SPO3083	1.28	0.174	SPO3079	1.05	0.873
SPO3089	0.77	0.585	SPO3089	0.82	0.773	SPO3089	1.15	0.75	SPO3092	1.48	0.461	SPO3084	1.47	0.044	SPO3084	1.54	0.011	SPO3084	0.73	0.083	SPO3080	0.88	0.931
SPO3090	0.73	0.119	SPO3090	0.82	0.423	SPO3090	1.17	0.893	SPO3093	1.42	0.033	SPO3085	0.88	0.276	SPO3085	0.75	0.920	SPO3085	0.65	0.022	SPO3081	1.27	0.186
SPO3091	0.67	0.052	SPO3091	0.7	0.126	SPO3091	1.14	0.304	SPO3094	1.05	0.036	SPO3086	0.83	0.901	SPO3086	1.04	0.232	SPO3086	0.89	0.744	SPO3082	1.31	0.036
SPO3092	0.86	0.509	SPO3092	0.92	0.722	SPO3092	1.17	0.318	SPO3095	1	0.057	SPO3087	1.29	0.051	SPO3087	1.26	0.033	SPO3087	0.94	0.956	SPO3083	1.19	0.386
SPO3093	0.54	0.024	SPO3093	0.61	0.245	SPO3093	1.12	0.105	SPO3096	1.14	0.037	SPO3088	1.86	0.015	SPO3088	1.88	0.006	SPO3088	0.92	0.727	SPO3084	0.75	0.031
SPO3094	0.71	0.03	SPO3094	0.78	0.06	SPO3094	1.15	0.03	SPO3097	1.26	0.073	SPO3089	1.17	0.241	SPO3089	1.25	0.191	SPO3089	0.88	0.470	SPO3085	0.59	0.026
SPO3095	0.89	0.728	SPO3095	0.89	0.323	SPO3095	1.05	0.142	SPO3098	1.17	0.618	SPO3090	1.16	0.288	SPO3090	1.14	0.326	SPO3090	0.94	0.870	SPO3086	0.94	0.836
SPO3096	0.81	0.578	SPO3096	0.85	0.299	SPO3096	1.03	0.235	SPO3099	1.46	0.988	SPO3091	1.06	0.081	SPO3091	1.00	0.274	SPO3091	0.87	0.418	SPO3087	0.89	0.490
SPO3097	0.71	0.035	SPO3097	0.77	0.116	SPO3097	1.03	0.022	SPO3100	1.09	0.074	SPO3092	0.78	0.556	SPO3092	0.72	0.287	SPO3092	0.91	0.544	SPO3088	1.01	0.556
SPO3098	0.71	0.228	SPO3098	0.73	0.025	SPO3098	1.31	0.796	SPO3103	1.02	0.304	SPO3093	2.67	0.000	SPO3093	2.41	0.004	SPO3093	0.85	0.133	SPO3089	0.93	0.639
SPO3099	1.02	0.883	SPO3099	1.11	0.8	SPO3099	1.02	0.186	SPO3104	1.11	0.935	SPO3094	2.83	0.002	SPO3094	2.68	0.003	SPO3094	0.93	0.531	SPO3090	0.99	0.962
SPO3100	1.45	0.048	SPO3100	1.49	0.047	SPO3100	1.11	0.023	SPO3105	1.07	0.101	SPO3095	3.45	0.021	SPO3095	3.50	0.003	SPO3095	1.01	0.897	SPO3091	0.88	0.442
SPO3103	1.44	0.145	SPO3103	1.47	0.31	SPO3103	1.15	0.063	SPO3106	0.98	0.594	SPO3096	2.20	0.034	SPO3096	2.21	0.007	SPO3096	0.99	0.967	SPO3092	0.85	0.066
SPO3104	0.93	0.904	SPO3104	0.99	0.945	SPO3104	1.05	0.891	SPO3107	1.15	0.152	SPO3097	3.62	0.007	SPO3097	2.90	0.006	SPO3097	1.27	0.282	SPO3093	0.85	0.138
SPO3105	0.85	0.025	SPO3105	0.98	0.851	SPO3105	1.11	0.098	SPO3108	1.18	0.016	SPO3098	1.24	0.443	SPO3098	1.11	0.462	SPO3098	1.00	0.975	SPO3094	0.93	0.429
SPO3106	1.08	0.235	SPO3106	1.11	0.059	SPO3106	1.05	0.518	SPO3109	1.24	0.215	SPO3099	1.33	0.310	SPO3099	1.44	0.258	SPO3099	1.37	0.151	SPO3095	1.08	0.217
SPO3107	1.12	0.581	SPO3107	1.21	0.154	SPO3107	1.32	0.363	SPO3110	1.16	0.274	SPO3100	1.06	0.386	SPO3100	1.13	0.262	SPO3100	1.09	0.544	SPO3096	0.98	0.939
SPO3108	0.6	0.002	SPO3108	0.68	0.053	SPO3108	1.12	0.006	SPO3111	1.11	0.329	SPO3103	0.33	0.031	SPO3103	0.30	0.021	SPO3103	1.03	0.790	SPO3097	1.21	0.252
SPO3109	1.02	0.84	SPO3109	0.94	0.131	SPO3109	1.08	0.113	SPO3112	1.23	0.371	SPO3104	0.83	0.857	SPO3104	0.82	0.774	SPO3104	1.09	0.875	SPO3098	1.09	0.704
SPO3110	0.79	0.383	SPO3110	0.76	0.097	SPO3110	1.02	0.438	SPO3113	1.14	0.226	SPO3105	0.56	0.017	SPO3105	0.57	0.002	SPO3105	1.06	0.188	SPO3099	1.37	0.417
SPO3111	1.32	0.075	SPO3111	1.26	0.199	SPO3111	1.03	0.111	SPO3114	1.08	0.911	SPO3106	1.46	0.018	SPO3106	1.62	0.017	SPO3106	1.21	0.315	SPO3100	1.09	0.589
SPO3112	1.59	0.049	SPO3112	1.44	0.044	SPO3112	1.17	0.305	SPO3115	1.16	0.96	SPO3107	1.39	0.062	SPO3107	1.24	0.034	SPO3107	0.97	0.984	SPO3103	0.96	0.873
SPO3113	1.29	0.126	SPO3113	1.21	0.149	SPO3113	1.12	0.179	SPO3116	1.02	0.983	SPO3108	2.58	0.003	SPO3108	2.65	0.003	SPO3108	1.03	0.391	SPO3104	1.04	0.901
SPO3114	1.3	0.6	SPO3114	1.16	0.714	SPO3114	1.42	0.782	SPO3117	1.26	0.547	SPO3109	1.93	0.002	SPO3109	2.04	0.001	SPO3109	0.91	0.181	SPO3105	1.02	0.284
SPO3115	1.03	0.843	SPO3115	0.93	0.859	SPO3115	1.18	0.598	SPO3118	1.06	0.06	SPO3110	2.31	0.062	SPO3110	2.64	0.014	SPO3110	0.89	0.821	SPO3106	1.05	0.753
SPO3116	1.12	0.456	SPO3116	0.93	0.438	SPO3116	1.44	0.977	SPO3119	1	0.176	SPO3111	1.66	0.066	SPO3111	1.57	0.036	SPO3111	0.90	0.760	SPO3107	0.95	0.949
SPO3117	0.68	0.43	SPO3117	0.65	0.144	SPO3117	0.99	0.442	SPO3120	1.07	0.917	SPO3112	1.38	0.022	SPO3112	1.32	0.016	SPO3112	0.85	0.264	SPO3108	1.00	0.670
SPO3118	0.96	0.991	SPO3118	1.08	0.25	SPO3118	1.05	0.177	SPO3121	1.08	0.596	SPO3113	0.88	0.716	SPO3113	0.93	0.890	SPO3113	0.90	0.587	SPO3109	0.89	0.433
SPO3119	1.48	0.084	SPO3119	1.24	0.089	SPO3119	1.12	0.185	SPO3122	1.1	0.46	SPO3114	1.26	0.545	SPO3114	1.33	0.539	SPO3114	1.31	0.628	SPO3110	0.91	0.812
SPO3120	1.48	0.012	SPO3120	1.38	0.011	SPO3120	1.01	0.833	SPO3123	1.11	0.996	SPO3115	1.42	0.136	SPO3115	1.43	0.103	SPO3115	1.19	0.508	SPO3111	0.88	0.494
SPO3121	1.42	0.022	SPO3121	1.32	0.053	SPO3121	1.09	0.8	SPO3124	1.1	0.949	SPO3116	0.89	0.954	SPO3116	0.96	0.376	SPO3116	1.08	0.510	SPO3112	0.74	0.122
SPO3122	1.14	0.699	SPO3122	1.12	0.48	SPO3122	1.15	0.754	SPO3125	1.16	0.886	SPO3117	1.49	0.087	SPO3117	1.66	0.017	SPO3117	1.28	0.074	SPO3113	0.85	0.359
SPO3123	1.02	0.641	SPO3123	1.04	0.644	SPO3123	1.76	0.799	SPO3126	1.11	0.203	SPO3118	0.17	0.001	SPO3118	0.16	0.001	SPO3118	0.75	0.325	SPO3114	1.39	0.653
SPO3124	1.07	0.174	SPO3124	1.21	0.177	SPO3124	0.99	0.526	SPO3127	1.12	0.366	SPO3119	0.56	0.018	SPO3119	0.63	0.043	SPO3119	1.06	0.224	SPO3115	1.09	0.698
SPO3125	0.81	0.835	SPO3125	0.93	0.972	SPO3125	1.05	0.815	SPO3128	1.03	0.453	SPO3120	0.88	0.364	SPO3120	0.88	0.220	SPO3120	1.14	0.288	SPO3116	1.03	0.342
SPO3126	1.11	0.033	SPO3126	1.07	0.425	SPO3126	1.16	0.27	SPO3129	1.1	0.997	SPO3121	1.03	0.967	SPO3121	1.04	0.937	SPO3121	1.17	0.540	SPO3117	1.29	0.045
SPO3127	1.19	0.021	SPO3127	1.19	0.045	SPO3127	1.15	0.583	SPO3130	1.19	0.64	SPO3122	1.22	0.349	SPO3122	1.12	0.425	SPO3122	1.15	0.328	SPO3118	0.72	0.200
SPO3128	1.39	0.082	SPO3128	1.3	0.054	SPO3128	1.05	0.549	SPO3131	1.1	0.693	SPO3123	1.03	0.702	SPO3123	1.24	0.648	SPO3123	0.95	0.727	SPO3119	1.06	0.328
SPO3129	1.32	0.23	SPO3129	1.33	0.083	SPO3129	1.16	0.934	SPO3132	1.05	0.99	SPO3124	1.05	0.910	SPO3124	1.07	0.805	SPO3124	1.09	0.843	SPO3120	1.03	0.498
SPO3130	1.5	0.12	SPO3130	1.46	0.033	SPO3130	1.03	0.743	SPO3133	1.09	0.088	SPO3125	0.79	0.817	SPO3125	0.81	0.877	SPO3125	0.91	0.916	SPO3121	1.11	0.630
SPO3131	1.13	0.53	SPO3131	1.14	0.355	SPO3131	1.11	0.98	SPO3134	1.41	0.223	SPO3126	0.84	0.261	SPO3126	0.90	0.117	SPO3126	1.01	0.831	SPO3122	1.14	0.417
SPO3132	1.06	0.802	SPO3132	1	0.949	SPO3132	1.12	0.915	SPO3135	1.16	0.796	SPO3127	1.10	0.612	SPO3127	1.31	0.125	SPO3127	1.71	0.091	SPO3123	0.85	0.389
SPO3133	0.99	0.926	SPO3133	1.03	0.414	SPO3133	1.02	0.269	SPO3136	1.51	0.843	SPO3128	0.85	0.598	SPO3128	0.92	0.583	SPO3128	1.01	0.860	SPO3124	1.11	0.705
SPO3134	0.74	0.04	SPO3134	0.78	0.029	SPO3134	1.05	0.272	SPO3137	1.03	0.781	SPO3129	1.93	0.029	SPO3129	1.95	0.039	SPO3129	1.03	0.818	SPO3125	0.81	0.856
SPO3135	1.29	0.134	SPO3135	1.44	0.024	SPO3135	1.01	0.701	SPO3138	1.1	0.9	SPO3130	2.38	0.041	SPO3130	2.54	0.012	SPO3130	0.93	0.788	SPO3126	0.88	0.174
SPO3136	1.51	0.016	SPO3136	1.49	0.01	SPO3136	1.12	0.922	SPO3139	1.07	0.855	SPO3131	1.05	0.544	SPO3131	1.02	0.535	SPO3131	1.04	0.551	SPO3127	1.27	0.171
SPO3137	0.96	0.804	SPO3137	1.02	0.847	SPO3137	1.03	0.924	SPO3140	1.08	0.28	SPO3132	1.03	0.938	SPO3132	1.09	0.867	SPO3132	1.08	0.872	SPO3128	1.02	0.486
SPO3138	1.17	0.854	SPO3138	1.39	0.727	SPO3138	1.04	0.996	SPO3141	1.16	0.333	SPO3133	0.71	0.205	SPO3133	0.70	0.197	SPO3133	1.02	0.682	SPO3129	1.04	0.771
SPO3139	0.69	0.408	SPO3139	0.83	0.842	SPO3139	1.06	0.826	SPO3142	1.74	0.228	SPO3134	1.12	0.280	SPO3134	1.08	0.154	SPO3134	0.93	0.231	SPO3130	0.90	0.501
SPO3140	1.29	0.028	SPO3140	1.27	0.121	SPO3140	1.01	0.249	SPO3143	1.13	0.496	SPO3135	1.53	0.089	SPO3135	1.55	0.084	SPO3135	0.96	0.858	SPO3131	1.12	0.487
SPO3141	1.2	0.094	SPO3141	1.15	0.508	SPO3141	1.81	0.092	SPO3144	1.11	0.321	SPO3136	1.07	0.269	SPO3136	1.12	0.091	SPO3136	1.15	0.489	SPO3132	1.17	0.712
SPO3142	1.21	0.149	SPO3142	1.1	0.062	SPO3142	1.3	0.284	SPO3145	1.28	0.937	SPO3137	1.20	0.099	SPO3137	1.08	0.294	SPO3137	1.12	0.593	SPO3133	0.91	0.150
SPO3143	1.3	0.428	SPO3143	1.33	0.15	SPO3143	1.12	0.815	SPO3146	1	0.807	SPO3138	0.64	0.694	SPO3138	0.69	0.731	SPO3138	0.96	0.970	SPO3134	0.97	0.802
SPO3144	0.9	0.507	SPO3144	0.93	0.595	SPO3144	1.1	0.393	SPO3147	1.04	0.424	SPO3139	0.30	0.073	SPO3139	0.30	0.176	SPO3139	0.89	0.864	SPO3135	1.04	0.925
SPO3145	0.92	0.625	SPO3145	1	0.713	SPO3145	1.04	0.951	SPO3148	1.06	0.845	SPO3140	0.69	0.140	SPO3140	0.64	0.119	SPO3140	1.20	0.368	SPO3136	1.15	0.349
SPO3146	1.06	0.044	SPO3146	1.04	0.056	SPO3146	1.11	0.969	SPO3149	1.17	0.808	SPO3141	0.81	0.111	SPO3141	0.83	0.822	SPO3141	1.05	0.777	SPO3137	1.21	0.277
SPO3147	1.41	0.07	SPO3147	1.47	0.016	SPO3147	1.03	0.402	SPO3150	1.09	0.922	SPO3142	0.93	0.798	SPO3142	0.89	0.557	SPO3142	1.02	0.634	SPO3138	0.93	0.948
SPO3148	1.13	0.527	SPO3148	1.06	0.514	SPO3148	1.02	0.495	SPO3151	1.05	0.048	SPO3143	1.59	0.198	SPO3143	1.66	0.089	SPO3143	1.15	0.775	SPO3139	0.98	0.988

SPO3149	0.69	0.028	SPO3149	0.65	0.519	SPO3149	1.03	0.611	SPO3152	1.13	0.5	SPO3144	0.62	0.008	SPO3144	0.70	0.304	SPO3144	0.87	0.253	SPO3140	1.07	0.806
SPO3150	1.14	0.899	SPO3150	1.19	0.9	SPO3150	1.04	0.936	SPO3153	0.98	0.963	SPO3145	1.30	0.122	SPO3145	1.26	0.103	SPO3145	1.04	0.924	SPO3141	1.01	0.780
SPO3151	0.87	0.21	SPO3151	0.96	0.957	SPO3151	1.22	0.125	SPO3154	0.99	0.691	SPO3146	1.63	0.064	SPO3146	1.72	0.005	SPO3146	1.20	0.166	SPO3142	0.97	0.848
SPO3152	0.93	0.796	SPO3152	0.98	0.954	SPO3152	1.02	0.195	SPO3155	1	0.213	SPO3147	0.93	0.336	SPO3147	0.85	0.542	SPO3147	1.15	0.354	SPO3143	1.23	0.201
SPO3153	0.81	0.807	SPO3153	0.85	0.867	SPO3153	0.99	0.867	SPO3156	1.14	0.336	SPO3148	0.86	0.554	SPO3148	0.93	0.594	SPO3148	0.92	0.611	SPO3144	0.88	0.132
SPO3154	1.29	0.368	SPO3154	1.3	0.152	SPO3154	1	0.901	SPO3157	1.06	0.451	SPO3149	0.97	0.906	SPO3149	1.03	0.961	SPO3149	1.06	0.933	SPO3145	1.04	0.700
SPO3155	0.95	0.823	SPO3155	0.95	0.962	SPO3155	1.08	0.268	SPO3158	1.1	0.913	SPO3150	0.76	0.882	SPO3150	0.76	0.883	SPO3150	0.92	0.946	SPO3146	1.09	0.692
SPO3156	1.42	0.063	SPO3156	1.38	0.189	SPO3156	0.99	0.941	SPO3159	1.05	0.513	SPO3151	1.34	0.015	SPO3151	1.30	0.007	SPO3151	1.13	0.226	SPO3147	1.10	0.508
SPO3157	0.9	0.554	SPO3157	1.02	0.633	SPO3157	1.08	0.91	SPO3160	1.72	0.228	SPO3152	1.47	0.084	SPO3152	1.39	0.191	SPO3152	0.90	0.755	SPO3148	0.90	0.373
SPO3158	0.85	0.357	SPO3158	0.87	0.677	SPO3158	1.07	0.953	SPO3161	1.39	0.035	SPO3153	0.93	0.675	SPO3153	0.63	0.437	SPO3153	0.79	0.753	SPO3149	1.08	0.890
SPO3159	1.34	0.299	SPO3159	1.28	0.491	SPO3159	1.01	0.519	SPO3162	1.2	0.727	SPO3154	1.16	0.380	SPO3154	1.13	0.108	SPO3154	1.17	0.168	SPO3150	0.90	0.943
SPO3160	1.48	0.19	SPO3160	1.36	0.043	SPO3160	1.16	0.067	SPO3163	1.14	0.606	SPO3155	1.40	0.086	SPO3155	1.48	0.074	SPO3155	1.03	0.664	SPO3151	1.17	0.093
SPO3161	3.08	0.002	SPO3161	2.23	0.002	SPO3161	1.3	0.006	SPO3164	1.07	0.638	SPO3156	0.61	0.009	SPO3156	0.62	0.078	SPO3156	0.97	0.810	SPO3152	1.00	0.966
SPO3162	1.22	0.161	SPO3162	1.12	0.195	SPO3162	1.18	0.808	SPO3165	1.08	0.044	SPO3157	0.89	0.878	SPO3157	0.81	0.206	SPO3157	0.93	0.679	SPO3153	0.93	0.896
SPO3163	1.07	0.703	SPO3163	1.08	0.71	SPO3163	1.15	0.619	SPO3166	1.07	0.514	SPO3158	0.68	0.267	SPO3158	0.68	0.447	SPO3158	0.92	0.840	SPO3154	1.08	0.628
SPO3164	1.13	0.188	SPO3164	1.01	0.791	SPO3164	1.27	0.138	SPO3167	1.01	0.042	SPO3159	1.17	0.547	SPO3159	1.10	0.695	SPO3159	1.09	0.747	SPO3155	1.05	0.691
SPO3165	0.86	0.089	SPO3165	0.92	0.529	SPO3165	1.15	0.015	SPO3168	1.22	0.804	SPO3160	1.06	0.473	SPO3160	1.03	0.490	SPO3160	0.92	0.778	SPO3156	0.91	0.233
SPO3166	0.61	0.054	SPO3166	0.71	0.101	SPO3166	1.11	0.162	SPO3169	1.06	0.084	SPO3161	0.74	0.210	SPO3161	0.77	0.309	SPO3161	1.24	0.148	SPO3157	0.88	0.504
SPO3167	1.01	0.266	SPO3167	1.17	0.304	SPO3167	1.11	0.089	SPO3170	1.05	0.061	SPO3162	1.07	0.083	SPO3162	1.03	0.190	SPO3162	1.02	0.552	SPO3158	0.92	0.835
SPO3168	0.67	0.007	SPO3168	0.74	0.514	SPO3168	1.05	0.581	SPO3171	1.09	0.312	SPO3163	1.45	0.119	SPO3163	1.33	0.141	SPO3163	1.09	0.558	SPO3159	1.05	0.827
SPO3169	0.99	0.82	SPO3169	0.91	0.55	SPO3169	1.04	0.044	SPO3172	0.97	0.256	SPO3164	1.30	0.006	SPO3164	1.30	0.002	SPO3164	1.08	0.227	SPO3160	1.01	0.951
SPO3170	1.28	0.078	SPO3170	1.26	0.232	SPO3170	1.45	0.084	SPO3173	1.08	0.967	SPO3165	1.88	0.007	SPO3165	1.77	0.008	SPO3165	1.27	0.254	SPO3161	1.04	0.601
SPO3171	1.15	0.401	SPO3171	1.03	0.701	SPO3171	1.04	0.074	SPO3174	1.18	0.695	SPO3166	0.80	0.614	SPO3166	0.79	0.805	SPO3166	0.78	0.229	SPO3162	1.06	0.028
SPO3172	1.62	0.17	SPO3172	1.4	0.059	SPO3172	1.13	0.346	SPO3175	1.09	0.895	SPO3167	0.77	0.426	SPO3167	0.78	0.064	SPO3167	1.01	0.996	SPO3163	1.13	0.411
SPO3173	1.42	0.051	SPO3173	1.23	0.782	SPO3173	1.2	0.141	SPO3176	1.02	0.015	SPO3168	0.79	0.074	SPO3168	0.85	0.913	SPO3168	0.89	0.118	SPO3164	1.15	0.050
SPO3174	0.81	0.075	SPO3174	0.87	0.768	SPO3174	0.99	0.541	SPO3177	1.31	0.89	SPO3169	0.40	0.048	SPO3169	0.42	0.003	SPO3169	1.03	0.623	SPO3165	1.36	0.214
SPO3175	0.97	0.99	SPO3175	0.96	0.956	SPO3175	1.16	0.536	SPO3178	1.13	0.772	SPO3170	0.82	0.217	SPO3170	0.86	0.181	SPO3170	1.00	0.941	SPO3166	0.85	0.342
SPO3176	0.95	0.634	SPO3176	1.01	0.327	SPO3176	1.3	0.009	SPO3179	1.09	0.883	SPO3171	0.57	0.066	SPO3171	0.60	0.055	SPO3171	0.82	0.517	SPO3167	1.06	0.718
SPO3177	1.24	0.503	SPO3177	1.26	0.123	SPO3177	1.34	0.941	SPO3180	1.15	0.815	SPO3172	0.63	0.207	SPO3172	0.65	0.070	SPO3172	0.92	0.850	SPO3168	0.88	0.794
SPO3178	0.53	0.424	SPO3178	0.9	0.936	SPO3178	1.23	0.611	SPO3181	1.07	0.267	SPO3173	0.63	0.096	SPO3173	0.75	0.819	SPO3173	1.02	0.986	SPO3169	1.07	0.194
SPO3179	0.93	0.825	SPO3179	1.13	0.107	SPO3179	0.99	0.462	SPO3182	1.15	0.05	SPO3174	0.52	0.275	SPO3174	0.55	0.423	SPO3174	0.77	0.445	SPO3170	0.88	0.330
SPO3180	1.18	0.221	SPO3180	1.3	0.031	SPO3180	1.3	0.602	SPO3183	1.09	0.472	SPO3175	1.09	0.418	SPO3175	1.00	0.782	SPO3175	0.99	0.987	SPO3171	0.82	0.356
SPO3181	1.66	0.094	SPO3181	1.71	0.063	SPO3181	1.05	0.148	SPO3184	1.09	0.997	SPO3176	1.60	0.026	SPO3176	1.64	0.039	SPO3176	1.35	0.009	SPO3172	0.88	0.383
SPO3182	1.5	0.028	SPO3182	1.34	0.049	SPO3182	1.01	0.098	SPO3185	1.13	0.544	SPO3177	0.98	0.830	SPO3177	0.93	0.901	SPO3177	0.99	0.990	SPO3173	0.96	0.956
SPO3183	1.01	0.807	SPO3183	1.05	0.584	SPO3183	1.32	0.501	SPO3186	1.24	0.467	SPO3178	0.79	0.537	SPO3178	0.74	0.604	SPO3178	0.80	0.610	SPO3174	0.85	0.442
SPO3184	1	0.92	SPO3184	1.05	0.828	SPO3184	1.32	0.991	SPO3187	1.33	0.989	SPO3179	1.01	0.938	SPO3179	0.99	0.654	SPO3179	1.00	0.923	SPO3175	1.03	0.783
SPO3185	0.83	0.36	SPO3185	0.78	0.332	SPO3185	1.02	0.847	SPO3188	1.06	0.815	SPO3180	1.07	0.226	SPO3180	1.05	0.020	SPO3180	1.07	0.591	SPO3176	1.48	0.010
SPO3186	1.01	0.891	SPO3186	0.91	0.738	SPO3186	1.28	0.216	SPO3189	1.11	0.956	SPO3181	0.60	0.118	SPO3181	0.50	0.061	SPO3181	0.95	0.922	SPO3177	1.01	0.934
SPO3187	0.88	0.847	SPO3187	0.88	0.801	SPO3187	1.02	0.952	SPO3190	1.23	0.272	SPO3182	1.22	0.032	SPO3182	1.19	0.060	SPO3182	0.92	0.571	SPO3178	1.00	0.965
SPO3188	0.79	0.831	SPO3188	0.92	0.963	SPO3188	1.14	0.78	SPO3191	1.05	0.552	SPO3183	0.80	0.171	SPO3183	0.85	0.292	SPO3183	0.85	0.329	SPO3179	1.02	0.947
SPO3189	0.92	0.948	SPO3189	1.01	0.917	SPO3189	1.25	0.739	SPO3192	1.19	0.664	SPO3184	1.04	0.994	SPO3184	1.02	0.936	SPO3184	1.16	0.759	SPO3180	1.02	0.818
SPO3190	0.61	0.14	SPO3190	0.72	0.131	SPO3190	1.02	0.503	SPO3193	1.45	0.018	SPO3185	1.14	0.301	SPO3185	0.91	0.991	SPO3185	0.89	0.661	SPO3181	0.89	0.634
SPO3191	0.6	0.21	SPO3191	0.68	0.236	SPO3191	1.29	0.369	SPO3194	0.98	0.651	SPO3186	0.93	0.920	SPO3186	0.89	0.773	SPO3186	0.79	0.172	SPO3182	0.96	0.914
SPO3192	1.34	0.047	SPO3192	1.12	0.198	SPO3192	1.16	0.646	SPO3195	1.27	0.709	SPO3187	1.25	0.571	SPO3187	1.43	0.252	SPO3187	1.06	0.961	SPO3183	0.86	0.658
SPO3193	1.12	0.076	SPO3193	1.05	0.206	SPO3193	1.02	0.017	SPO3196	1.24	0.724	SPO3188	1.68	0.586	SPO3188	1.63	0.632	SPO3188	0.88	0.914	SPO3184	1.07	0.937
SPO3194	1.21	0.689	SPO3194	1.01	0.905	SPO3194	1.19	0.641	SPO3197	1.14	0.599	SPO3189	1.10	0.884	SPO3189	1.04	0.995	SPO3189	0.85	0.768	SPO3185	0.93	0.714
SPO3195	0.89	0.756	SPO3195	0.85	0.681	SPO3195	1.08	0.723	SPO3198	1.42	0.226	SPO3190	1.48	0.091	SPO3190	1.60	0.028	SPO3190	0.99	0.864	SPO3186	0.78	0.097
SPO3196	0.78	0.584	SPO3196	0.96	0.949	SPO3196	1.07	0.437	SPO3199	0.98	0.298	SPO3191	1.36	0.243	SPO3191	1.89	0.388	SPO3191	0.93	0.745	SPO3187	1.09	0.884
SPO3197	1.64	0.124	SPO3197	1.29	0.504	SPO3197	1.09	0.74	SPO3200	1.35	0.146	SPO3192	1.17	0.655	SPO3192	1.17	0.617	SPO3192	1.11	0.545	SPO3188	0.91	0.935
SPO3198	1.91	0.018	SPO3198	1.7	0.029	SPO3198	1.01	0.87	SPO3201	1.39	0.262	SPO3193	0.72	0.070	SPO3193	0.71	0.040	SPO3193	0.83	0.231	SPO3189	0.92	0.868
SPO3199	1.18	0.325	SPO3199	1.22	0.027	SPO3199	1.13	0.573	SPO3202	1.01	0.306	SPO3194	0.88	0.931	SPO3194	0.94	0.903	SPO3194	1.07	0.837	SPO3190	1.00	0.915
SPO3200	0.87	0.098	SPO3200	0.92	0.236	SPO3200	1.12	0.441	SPO3203	1.22	0.367	SPO3195	0.62	0.370	SPO3195	0.61	0.339	SPO3195	0.88	0.717	SPO3191	1.01	0.988
SPO3201	0.95	0.506	SPO3201	1.08	0.201	SPO3201	1	0.6	SPO3204	1.17	0.112	SPO3196	0.75	0.154	SPO3196	0.52	0.153	SPO3196	0.77	0.651	SPO3192	1.17	0.374
SPO3202	0.91	0.43	SPO3202	0.98	0.924	SPO3202	0.98	0.595	SPO3205	1.13	0.721	SPO3197	0.65	0.538	SPO3197	0.60	0.464	SPO3197	0.96	0.869	SPO3193	0.83	0.076
SPO3203	1.06	0.154	SPO3203	1.05	0.193	SPO3203	1.08	0.039	SPO3206	1.05	0.892	SPO3198	1.37	0.059	SPO3198	1.53	0.167	SPO3198	1.07	0.461	SPO3194	1.11	0.695
SPO3204	0.87	0.072	SPO3204	1	0.967	SPO3204	1.31	0.008	SPO3207	1.15	0.977	SPO3199	1.62	0.029	SPO3199	1.55	0.018	SPO3199	0.99	0.866	SPO3195	0.95	0.885
SPO3205	0.76	0.413	SPO3205	0.8	0.225	SPO3205	1.23	0.556	SPO3208	1.11	0.964	SPO3200	1.03	0.081	SPO3200	0.97	0.041	SPO3200	0.95	0.757	SPO3196	0.82	0.165
SPO3206	0.66	0.072	SPO3206	0.69	0.167	SPO3206	1.2	0.796	SPO3209	1.13	0.294	SPO3201	0.72	0.003	SPO3201	0.65	0.070	SPO3201	0.97	0.799	SPO3197	0.98	0.985
SPO3207	1.31	0.339	SPO3207	1.2	0.107	SPO3207	1.1	0.781	SPO3210	1.06	0.891	SPO3202	1.93	0.021	SPO3202	1.79	0.026	SPO3202	1.01	0.881	SPO3198	1.05	0.392
SPO3208	1.68	0.318	SPO3208	1.46	0.013	SPO3208	2.04	0.553	SPO3211	1.01	0.898	SPO3203	1.24	0.012	SPO3203	1.21	0.050	SPO3203	0.91	0.127	SPO3199	0.96	0.956
SPO3209	0.78	0.245	SPO3209	0.76	0.139	SPO3209	1.81	0.838	SPO3212	1.14	0.725	SPO3204	0.82	0.851	SPO3204	0.72	0.375	SPO3204	0.86	0.048	SPO3200	1.12	0.090
SPO3210	0.94	0.746	SPO3210	0.95	0.915	SPO3210	1.2	0.655	SPO3213	1.02	0.817	SPO3205	1.52	0.120	SPO3205	1.57	0.025	SPO3205	1.22	0.157	SPO3201	0.93	0.107
SPO3211	0.93	0.458	SPO3211	0.98	0.932	SPO3211	1.09	0.796	SPO3214	1.16	0.806	SPO3206	1.57	0.019	SPO3206	1.41	0.061	SPO3206	1.01	0.756	SPO3202	0.98	0.993
SPO3212	1.34	0.087	SPO3212	1.24	0.156	SPO3212	1.04	0.705	SPO3215	1.1	0.485	SPO3207	0.59	0.092	SPO3207	0.62	0.067	SPO3207	1.03	0.739	SPO3203	0.95	0.836
SPO3213	0.98	0.957	SPO3213	1.02	0.831	SPO3213	1.11	0.884	SPO3216	0.98	0.522	SPO3208	1.03	0.736	SPO3208	0.93	0.695	SPO3208	1.27	0.063	SPO3204	0.79	0.227
SPO3214	1.4	0.085	SPO3214	1.17	0.205	SPO3214	1.24	0.51	SPO3217	0.97	0.735	SPO3209	0.71	0.159	SPO3209	0.76	0.025	SPO3209	0.89	0.269	SPO3205	1.18	0.207
SPO3215	0.95	0.927	SPO3215	1.18	0.196	SPO3215	1.29	0.275	SPO3218	1.1	0.827	SPO3210	0.92	0.936	SPO3210	0.90	0.963	SPO3210	1.07	0.813	SPO3206	1.00	0.709
SPO3216	1.5	0.007	SPO3216	1.42	0.002	SPO3216	1.05	0.207	SPO3219	1.43	0.73	SPO3211	1.32	0.016	SPO3211	1.29	0.065	SPO3211	1.07	0.490	SPO3207	1.10	0.175
SPO3217	1.22	0.035	SPO3217	1.24	0.134	SPO3217	1.13	0.639	SPO3220	1.24	0.496	SPO3212	1.11	0.224	SPO3212	1.24	0.039	SPO3212	1.06	0.698	SPO3208	1.29	0.139
SPO3218	1.2	0.305	SPO3218	1.23	0.115	SPO3218	1.18	0.766	SPO3221	1.22	0.544	SPO3213	0.62	0.496	SPO3213	0.51	0.026	SPO3213	0.84	0.582	SPO3209	1.07	0.466
SPO3219	1.32	0.192	SPO3219	1.29	0.137	SPO3219	1.12	0.907	SPO3222	1.07	0.991	SPO3214	0.67	0.127	SPO3214	0.62	0.140	SPO3214	0.79	0.482	SPO3210	1.06	0.830
SPO3220	0.65	0.004	SPO3220	0.67	0.044	SPO3220	1.02	0.85	SPO3223	2.24	0.344	SPO3215	0.77	0.535	SPO3215	0.72	0.296	SPO3215	1.00	0.965	SPO3211	1.02	0.763
SPO3221	0.63	0.031	SPO3221	0.69	0.039	SPO3221	1.02	0.449	SPO3224	1.79	0.929	SPO3216	0.80	0.549	SPO3216	0.81	0.383	SPO3216	1.13	0.711	SPO3212	1.09	0.504
SPO3222	0.61	0.342	SPO3222	0.74	0.839	SPO3222	1.53	0.934	SPO3225	1.18	0.436	SPO3217	1.16	0.309	SPO3217	1.18	0.340	SPO3217	1.13	0.649	SPO3213	0.81	0.589
SPO3223	0.97	0.998	SPO3223	0.95	0.978	SPO3223	1	0.347	SPO3226	1.1	0.108	SPO3218	1.10	0.395	SPO3218	1.12	0.063	SPO3218	1.04	0.521	SPO3214	0.86	0.704
SPO3224	1.38	0.181	SPO3224	1.26	0.574	SPO3224	1.02	0.863	SPO3227	1.02	0.323	SPO3219	1.07	0.442	SPO3219	1.17	0.023	SPO3219	1.17	0.144	SPO3215	0.95	0.898
SPO3225	1.41	0.061	SPO3225	1.4	0.005	SPO3225	1.19	0.215	SPO3228	1.14	0.141	SPO3220	0.71	0.060	SPO3220	0.71	0.080	SPO3220	1.04	0.187	SPO3216	1.00	0.932
SPO3226	0.68	0.112	SPO3226	0.67	0.124	SPO3226	1.2	0.128	SPO3229	1.23	0.753	SPO3221	0.89	0.474	SPO3221	0.87	0.505	SPO3221	0.90	0.524	SPO3217	1.15	0.256
SPO3227	1.11	0.728	SPO3227	1.01	0.833	SPO3227	1.05	0.243	SPO3230	1.21	0.972	SPO3222	1.19	0.504	SPO3222	0.97	0.982	SPO3222	0.94	0.773	SPO3218	1.08	0.118
SPO3228	1.4	0.174	SPO3228	1.2	0.25	SPO3228	1.17	0.141	SPO3231	1.13	0.994	SPO3223	0.51	0.080	SPO3223	0.56	0.023	SPO3223	0.87	0.526	SPO3219	1.17	0.110
SPO3229	1.16	0.459	SPO3229	1.14	0.108	SPO3229	1.17	0.551	SPO3232	1.17	0.484	SPO3224	0.80	0.698	SPO3224	0.89	0.915	SPO3224	1.04	0.845	SPO3220	1.04	0.362
SPO3230	0.98	0.998	SPO3230	0.99	0.969	SPO3230	1.16	0.859	SPO3233	1.15	0.165	SPO3225	1.05	0.776	SPO3225	1.05	0.731	SPO3225	1.12	0.495	SPO3221	0.86	0.258
SPO3231	0.79	0.585	SPO3231	0.85	0.747	SPO3231	1.14	0.95	SPO3234	1.2	0.027	SPO3226	2.06	0.044	SPO3226	2.27	0.000	SPO3226	1.43	0.085	SPO3222	1.07	0.937
SPO3232	1.38	0.184	SPO3232	1.26	0.23	SPO3232	1.35	0.335	SPO3235	1	0.277	SPO3227	0.55	0.020	SPO3227	0.52	0.008	SPO3227	0.97	0.932	SPO3223	0.89	0.500
SPO3233	1.74	0.054	SPO3233	1.87	0.062	SPO3233	1.16	0.117	SPO3236	1.04	0.285	SPO3228	1.09	0.617	SPO3228	1.11	0.463	SPO3228	1.05	0.787	SPO3224	0.99	0.998
SPO3234	2.08	0.005	SPO3234	1.73	0.003	SPO3234	1.27	0.081	SPO3237	1.46	0.375	SPO3229	0.36	0.044	SPO3229	0.38	0.009	SPO3229	0.78	0.405	SPO3225	0.99	0.650
SPO3235	2.18	0.015	SPO3235	1.78	0.023	SPO3235	1.01	0.215	SPO3238	1.15	0.998	SPO3230	0.25	0.085	SPO3230	0.23	0.076	SPO3230	0.98	0.988	SPO3226	1.48	0.080
SPO3236	1.15	0.291	SPO3236	1.23	0.15	SPO3236	1.05	0.102	SPO3239	1.03	0.882	SPO3231	0.96	0.895	SPO3231	0.92	0.977	SPO3231	0.93	0.870	SPO3227	0.91	0.796
SPO3237	0.88	0.552	SPO3237	0.88	0.653	SPO3237	1.02	0.506	SPO3240	1.08	0.988	SPO3232	0.68	0.190	SPO3232	0.69	0.261	SPO3232	0.96	0.904	SPO3228	0.87	0.534
SPO3238	1.1	0.385	SPO3238	1.07	0.582	SPO3238	1.09	0.987	SPO3241	1.12	0.167	SPO3233	0.88	0.586	SPO3233	0.85	0.550	SPO3233	1.10	0.395	SPO3229	0.86	0.177
SPO3239	1.29	0.521	SPO3239	1.15	0.791	SPO3239	1.02	0.786	SPO3242	1.14	0.609	SPO3234	0.75	0.308	SPO3234	0.83	0.422	SPO3234	1.01	0.447	SPO3230	0.88	0.876
SPO3240	1.16	0.409	SPO3240	1.08	0.573	SPO3240	1.19	0.862	SPO3243	1.06	0.568	SPO3235	0.88	0.274	SPO3235	0.73	0.688	SPO3235	1.06	0.244	SPO3231	0.93	0.875
SPO3241	0.68	0.14	SPO3241	0.71	0.007	SPO3241	1.04	0.88	SPO3244	1.01	0.991	SPO3236	1.16	0.011	SPO3236	1.14	0.060	SPO3236	1.01	0.341	SPO3232	0.93	0.773
SPO3242	1.2	0.106	SPO3242	1.19	0.298	SPO3242	2.81	0.513	SPO3245	1.25	0.721	SPO3237	2.17	0.066	SPO3237	2.28	0.071	SPO3237	1.04	0.756	SPO3233	1.04	0.480
SPO3243	1.06	0.875	SPO3243	1.15	0.397	SPO3243	1.16	0.704	SPO3246	1.23	0.555	SPO3238	0.88	0.735	SPO3238	0.80	0.504	SPO3238	1.12	0.660	SPO3234	1.00	0.415
SPO3244	0.87	0.88	SPO3244	0.97	0.994	SPO3244	1.01	0.884	SPO3247	1.42	0.057	SPO3239	1.07	0.803	SPO3239	1.05	0.898	SPO3239	0.96	0.932	SPO3235	1.03	0.067
SPO3245	1.08	0.709	SPO3245	1.14	0.559	SPO3245	1.01	0.831	SPO3248	1.03	0.904	SPO3240	1.23	0.230	SPO3240	1.17	0.458	SPO3240	1.12	0.622	SPO3236	0.96	0.956
SPO3246	1.05	0.68	SPO3246	1.19	0.111	SPO3246	1.05	0.399	SPO3249	1.57	0.204	SPO3241	0.79	0.443	SPO3241	0.87	0.680	SPO3241	0.84	0.290	SPO3237	1.22	0.439
SPO3247	1.84	0.008	SPO3247	1.55	0.066	SPO3247	1.11	0.439	SPO3250	1.22	0.629	SPO3242	1.01	0.634	SPO3242	1.04	0.467	SPO3242	0.96	0.730	SPO3238	1.21	0.540
SPO3248	1.38	0.441	SPO3248	1.53	0.272	SPO3248	1.06	0.799	SPO3251	1.19	0.677	SPO3243	1.66	0.063	SPO3243	1.54	0.059	SPO3243	1.19	0.421	SPO3239	0.99	0.988
SPO3249	1.77	0.001	SPO3249	1.66	0.002	SPO3249	1.19	0.161	SPO3252	1.03	0.023	SPO3244	1.48	0.695	SPO3244	1.22	0.791	SPO3244	1.04	0.949	SPO3240	1.01	0.933
SPO3250	1.81	0.265	SPO3250	1.74	0.108	SPO3250	1.01	0.82	SPO3253	1.09	0.281	SPO3245	2.40	0.038	SPO3245	2.31	0.039	SPO3245	1.31	0.351	SPO3241	0.98	0.971
SPO3251	1.29	0.151	SPO3251	1.17	0.068	SPO3251	1.3	0.873	SPO3254	1.02	0.692	SPO3246	0.96	0.660	SPO3246	0.88	0.885	SPO3246	1.02	0.774	SPO3242	0.93	0.840
SPO3252	0.98	0.766	SPO3252	1.01	0.599	SPO3252	1.15	0.019	SPO3255	1.08	0.744	SPO3247	0.85	0.322	SPO3247	0.88	0.426	SPO3247	1.17	0.366	SPO3243	1.14	0.439
SPO3253	1.3	0.014	SPO3253	1.37	0.033	SPO3253	1.19	0.161	SPO3256	1.16	0.026	SPO3248	1.50	0.430	SPO3248	1.47	0.394	SPO3248	1.00	0.991	SPO3244	1.03	0.961
SPO3254	1.85	0.014	SPO3254	1.47	0.015	SPO3254	1.13	0.949	SPO3257	1.1	0.357	SPO3249	1.20	0.085	SPO3249	1.28	0.022	SPO3249	1.04	0.777	SPO3245	1.32	0.248
SPO3255	1.58	0.172	SPO3255	1.49	0.226	SPO3255	1.03	0.801	SPO3258	1.07	0.144	SPO3250	1.00	0.934	SPO3250	1.12	0.597	SPO3250	1.04	0.911	SPO3246	1.00	0.895
SPO3256	2.13	0.002	SPO3256	1.8	0.013	SPO3256	0.98	0.022	SPO3259	3.42	0.73	SPO3251	1.19	0.160	SPO3251	1.11	0.142	SPO3251	1.03	0.820	SPO3247	1.21	0.175
SPO3257	0.9	0.077	SPO3257	0.96	0.436	SPO3257	1	0.045	SPO3260	1.02	0.112	SPO3252	2.48	0.015	SPO3252	2.53	0.002	SPO3252	1.11	0.252	SPO3248	1.01	0.971
SPO3258	1.15	0.346	SPO3258	1.07	0.53	SPO3258	1.05	0.244	SPO3261	1.03	0.004	SPO3253	1.11	0.055	SPO3253	1.09	0.005	SPO3253	0.89	0.277	SPO3249	1.05	0.224
SPO3259	1.2	0.164	SPO3259	1.21	0.353	SPO3259	1.05	0.753	SPO3262	1.04	0.742	SPO3254	1.41	0.087	SPO3254	1.34	0.044	SPO3254	1.12	0.312	SPO3250	0.98	0.881
SPO3260	1	0.824	SPO3260	1.02	0.543	SPO3260	1.05	0.361	SPO3263	1.13	0.607	SPO3255	1.10	0.680	SPO3255	1.21	0.329	SPO3255	1.05	0.912	SPO3251	1.12	0.304
SPO3261	1.13	0.165	SPO3261	1.08	0.187	SPO3261	1.09	0.025	SPO3270	1.01	0.588	SPO3256	0.63	0.008	SPO3256	0.70	0.081	SPO3256	1.01	0.688	SPO3252	1.15	0.037
SPO3262	0.79	0.138	SPO3262	0.88	0.554	SPO3262	1.12	0.274	SPO3271	1.11	0.683	SPO3257	1.50	0.005	SPO3257	1.51	0.004	SPO3257	1.06	0.217	SPO3253	0.90	0.269
SPO3263	1.35	0.463	SPO3263	1.3	0.218	SPO3263	1.02	0.064	SPO3272	1.11	0.461	SPO3258	1.60	0.061	SPO3258	1.78	0.018	SPO3258	1.37	0.206	SPO3254	1.09	0.270
SPO3270	1.35	0.127	SPO3270	1.31	0.144	SPO3270	1.05	0.371	SPO3273	1.17	0.56	SPO3259	0.67	0.488	SPO3259	0.61	0.350	SPO3259	0.85	0.490	SPO3255	1.06	0.860
SPO3271	1.08	0.538	SPO3271	0.96	0.973	SPO3271	1.26	0.805	SPO3274	1.32	0.93	SPO3260	1.06	0.246	SPO3260	1.08	0.148	SPO3260	1.04	0.365	SPO3256	0.81	0.136
SPO3272	0.74	0.017	SPO3272	0.78	0.035	SPO3272	1.02	0.91	SPO3275	1.06	0.695	SPO3261	1.32	0.164	SPO3261	1.42	0.006	SPO3261	0.91	0.784	SPO3257	1.11	0.110
SPO3273	1.03	0.567	SPO3273	1.05	0.746	SPO3273	1.56	0.277	SPO3276	1.18	0.235	SPO3262	1.43	0.118	SPO3262	1.39	0.072	SPO3262	0.93	0.348	SPO3258	1.32	0.201
SPO3274	0.79	0.424	SPO3274	0.86	0.816	SPO3274	1.01	0.366	SPO3277	1.05	0.229	SPO3263	0.75	0.129	SPO3263	0.66	0.235	SPO3263	0.92	0.244	SPO3259	0.79	0.483
SPO3275	0.81	0.88	SPO3275	0.84	0.93	SPO3275	1.45	0.706	SPO3278	1.02	0.797	SPO3270	0.78	0.306	SPO3270	0.66	0.070	SPO3270	0.94	0.744	SPO3260	1.06	0.562
SPO3276	1.34	0.317	SPO3276	1.23	0.115	SPO3276	1.08	0.143	SPO3279	1.06	0.815	SPO3271	0.51	0.057	SPO3271	0.49	0.113	SPO3271	0.92	0.658	SPO3261	0.95	0.591
SPO3277	0.99	0.982	SPO3277	0.94	0.677	SPO3277	1.07	0.174	SPO3280	1.04	0.667	SPO3272	0.59	0.029	SPO3272	0.58	0.040	SPO3272	0.76	0.035	SPO3262	0.89	0.375
SPO3278	1.12	0.156	SPO3278	1.18	0.119	SPO3278	1.03	0.634	SPO3281	1.03	0.252	SPO3273	0.81	0.497	SPO3273	0.80	0.481	SPO3273	0.89	0.214	SPO3263	0.88	0.768
SPO3279	1.16	0.262	SPO3279	1.09	0.501	SPO3279	1	0.878	SPO3282	1.1	0.408	SPO3274	1.37	0.355	SPO3274	1.40	0.231	SPO3274	1.06	0.872	SPO3270	0.99	0.932
SPO3280	1.15	0.33	SPO3280	1.11	0.347	SPO3280	1.46	0.351	SPO3284	1.17	0.016	SPO3275	4.24	0.339	SPO3275	4.23	0.370	SPO3275	0.84	0.911	SPO3271	0.88	0.513
SPO3281	0.83	0.442	SPO3281	0.88	0.593	SPO3281	1.31	0.148	SPO3285	1.05	0.737	SPO3276	0.79	0.436	SPO3276	0.78	0.227	SPO3276	1.09	0.571	SPO3272	0.83	0.189
SPO3282	1.25	0.181	SPO3282	1.17	0.084	SPO3282	1.09	0.501	SPO3286	1.06	0.998	SPO3277	0.87	0.540	SPO3277	0.81	0.136	SPO3277	0.96	0.822	SPO3273	0.81	0.457
SPO3284	2.67	0.003	SPO3284	2.01	0.01	SPO3284	1.1	0.11	SPO3287	1.09	0.019	SPO3278	1.74	0.017	SPO3278	1.56	0.038	SPO3278	1.12	0.264	SPO3274	1.32	0.518
SPO3285	0.7	0.413	SPO3285	0.73	0.441	SPO3285	1.32	0.718	SPO3288	1.09	0.272	SPO3279	1.02	0.979	SPO3279	1.29	0.487	SPO3279	1.04	0.830	SPO3275	0.96	0.989
SPO3286	0.76	0.463	SPO3286	0.79	0.695	SPO3286	0.99	0.835	SPO3289	1.12	0.044	SPO3280	0.97	0.985	SPO3280	0.95	0.882	SPO3280	0.94	0.731	SPO3276	1.03	0.857
SPO3287	1.07	0.515	SPO3287	1.24	0.053	SPO3287	1.07	0.067	SPO3290	1.01	0.598	SPO3281	1.51	0.054	SPO3281	1.71	0.097	SPO3281	1.10	0.722	SPO3277	0.85	0.282
SPO3288	1.74	0.093	SPO3288	1.46	0.077	SPO3288	1.05	0.61	SPO3291	1.57	0.237	SPO3282	0.80	0.138	SPO3282	0.77	0.009	SPO3282	0.96	0.592	SPO3278	1.10	0.286
SPO3289	1.03	0.449	SPO3289	1.12	0.438	SPO3289	1.12	0.732	SPO3292	1.45	0.751	SPO3284	1.06	0.155	SPO3284	1.11	0.050	SPO3284	1.32	0.176	SPO3279	0.97	0.845
SPO3290	1.21	0.505	SPO3290	1.24	0.257	SPO3290	1.05	0.513	SPO3293	1.05	0.767	SPO3285	1.56	0.272	SPO3285	1.50	0.274	SPO3285	0.95	0.927	SPO3280	0.87	0.667
SPO3291	1.14	0.009	SPO3291	1.14	0.259	SPO3291	1.17	0.251	SPO3294	1.09	0.958	SPO3286	1.27	0.632	SPO3286	1.36	0.508	SPO3286	0.91	0.636	SPO3281	1.06	0.887
SPO3292	0.93	0.946	SPO3292	0.79	0.856	SPO3292	0.99	0.791	SPO3295	1.1	0.649	SPO3287	0.02	0.006	SPO3287	0.02	0.001	SPO3287	0.50	0.039	SPO3282	0.98	0.907
SPO3293	1.11	0.325	SPO3293	1.13	0.179	SPO3293	1.28	0.749	SPO3296	1.03	0.873	SPO3288	0.26	0.029	SPO3288	0.26	0.014	SPO3288	1.16	0.615	SPO3284	1.07	0.106
SPO3294	1.05	0.417	SPO3294	1.09	0.61	SPO3294	1	0.567	SPO3297	1.43	0.407	SPO3289	1.72	0.108	SPO3289	1.62	0.017	SPO3289	0.99	0.958	SPO3285	1.01	0.971

SPO3295	1.18	0.341	SPO3295	1.2	0.196	SPO3295	1.07	0.265	SPO3298	1.24	0.249	SPO3290	1.36	0.182	SPO3290	1.29	0.208	SPO3290	0.81	0.478	SPO3286	0.97	0.937
SPO3296	1.15	0.852	SPO3296	1.12	0.872	SPO3296	1.09	0.921	SPO3299	1	0.52	SPO3291	1.92	0.108	SPO3291	1.85	0.101	SPO3291	1.06	0.472	SPO3287	0.51	0.014
SPO3297	1	0.927	SPO3297	0.97	0.827	SPO3297	1.1	0.704	SPO3300	1.05	0.978	SPO3292	0.97	0.957	SPO3292	1.04	0.908	SPO3292	1.00	0.984	SPO3288	1.14	0.454
SPO3298	0.82	0.68	SPO3298	0.96	0.957	SPO3298	1.11	0.74	SPO3301	1.12	0.472	SPO3293	1.53	0.002	SPO3293	1.58	0.010	SPO3293	0.93	0.723	SPO3289	1.10	0.695
SPO3299	1.28	0.107	SPO3299	1.33	0.068	SPO3299	1.03	0.446	SPO3302	1.14	0.534	SPO3294	1.50	0.196	SPO3294	1.63	0.270	SPO3294	1.08	0.532	SPO3290	0.84	0.403
SPO3300	0.97	0.986	SPO3300	0.96	0.934	SPO3300	1.08	0.996	SPO3303	1.33	0.726	SPO3295	1.56	0.005	SPO3295	1.61	0.024	SPO3295	1.00	0.936	SPO3291	1.04	0.532
SPO3301	1.36	0.087	SPO3301	1.32	0.329	SPO3301	1.13	0.205	SPO3304	1	0.862	SPO3296	1.38	0.773	SPO3296	1.37	0.795	SPO3296	0.95	0.950	SPO3292	1.05	0.945
SPO3302	0.57	0.042	SPO3302	0.68	0.113	SPO3302	1.07	0.555	SPO3305	1.15	0.895	SPO3297	1.45	0.337	SPO3297	1.24	0.183	SPO3297	1.23	0.790	SPO3293	0.90	0.581
SPO3303	0.88	0.585	SPO3303	0.85	0.296	SPO3303	1.18	0.519	SPO3306	1.08	0.224	SPO3298	1.42	0.016	SPO3298	1.34	0.102	SPO3298	1.09	0.328	SPO3294	1.07	0.882
SPO3304	1.18	0.078	SPO3304	1.13	0.114	SPO3304	1.28	0.698	SPO3307	1.11	0.292	SPO3299	1.21	0.498	SPO3299	1.62	0.210	SPO3299	1.02	0.993	SPO3295	1.08	0.756
SPO3305	1.24	0.441	SPO3305	1.34	0.416	SPO3305	1.13	0.892	SPO3308	1	0.099	SPO3300	1.21	0.640	SPO3300	1.12	0.127	SPO3300	1.02	0.964	SPO3296	0.95	0.947
SPO3306	0.76	0.082	SPO3306	0.87	0.129	SPO3306	1.03	0.6	SPO3309	1.02	0.253	SPO3301	0.65	0.247	SPO3301	0.61	0.085	SPO3301	1.08	0.776	SPO3297	1.09	0.399
SPO3307	0.83	0.201	SPO3307	0.88	0.448	SPO3307	1.2	0.688	SPO3310	1.2	0.356	SPO3302	0.73	0.218	SPO3302	0.70	0.123	SPO3302	1.08	0.816	SPO3298	1.01	0.998
SPO3308	0.98	0.995	SPO3308	0.92	0.692	SPO3308	1.05	0.461	SPO3311	0.98	0.06	SPO3303	1.11	0.400	SPO3303	1.20	0.052	SPO3303	0.99	0.964	SPO3299	1.12	0.671
SPO3309	0.81	0.34	SPO3309	0.87	0.403	SPO3309	1.07	0.138	SPO3312	1.4	0.214	SPO3304	0.88	0.856	SPO3304	0.93	0.822	SPO3304	0.91	0.463	SPO3300	1.03	0.861
SPO3310	0.78	0.417	SPO3310	0.76	0.003	SPO3310	1.13	0.297	SPO3313	1.1	0.504	SPO3305	1.02	0.798	SPO3305	0.96	0.909	SPO3305	1.09	0.799	SPO3301	1.16	0.652
SPO3311	0.53	0	SPO3311	0.6	0.06	SPO3311	1.03	0.023	SPO3314	1.19	0.765	SPO3306	1.14	0.047	SPO3306	1.07	0.117	SPO3306	1.07	0.178	SPO3302	1.09	0.626
SPO3312	0.72	0.154	SPO3312	0.77	0.048	SPO3312	1.04	0.177	SPO3315	1.04	0.87	SPO3307	1.02	0.516	SPO3307	0.95	0.880	SPO3307	0.96	0.857	SPO3303	1.02	0.387
SPO3313	0.78	0.365	SPO3313	0.88	0.683	SPO3313	1.13	0.19	SPO3316	1.1	0.688	SPO3308	1.05	0.581	SPO3308	0.98	0.199	SPO3308	0.95	0.918	SPO3304	0.88	0.493
SPO3314	1.51	0.368	SPO3314	1.38	0.381	SPO3314	1.04	0.76	SPO3317	1.03	0.163	SPO3309	1.25	0.139	SPO3309	1.24	0.094	SPO3309	1.09	0.449	SPO3305	1.05	0.826
SPO3315	1.1	0.507	SPO3315	0.99	0.961	SPO3315	1.09	0.617	SPO3318	1.08	0.706	SPO3310	2.59	0.140	SPO3310	2.27	0.023	SPO3310	1.34	0.462	SPO3306	1.10	0.290
SPO3316	1.47	0.377	SPO3316	1.37	0.707	SPO3316	1.91	0.679	SPO3319	1.1	0.68	SPO3311	1.81	0.011	SPO3311	1.90	0.019	SPO3311	1.14	0.139	SPO3307	1.00	0.853
SPO3317	1.17	0.427	SPO3317	1.24	0.012	SPO3317	2.11	0.131	SPO3320	1.06	0.052	SPO3312	1.18	0.024	SPO3312	1.37	0.050	SPO3312	1.14	0.600	SPO3308	1.01	0.869
SPO3318	0.8	0.466	SPO3318	0.81	0.104	SPO3318	1.17	0.317	SPO3321	1.04	0.197	SPO3313	0.57	0.160	SPO3313	0.44	0.097	SPO3313	0.72	0.322	SPO3309	1.18	0.272
SPO3319	0.91	0.867	SPO3319	0.92	0.932	SPO3319	1.32	0.737	SPO3322	1.11	0.454	SPO3314	0.36	0.031	SPO3314	0.37	0.078	SPO3314	1.24	0.772	SPO3310	1.36	0.268
SPO3320	1.29	0.077	SPO3320	1.13	0.134	SPO3320	1.02	0.104	SPO3323	1.22	0.821	SPO3315	0.78	0.428	SPO3315	0.81	0.654	SPO3315	0.83	0.263	SPO3311	1.24	0.147
SPO3321	0.67	0.011	SPO3321	0.85	0.106	SPO3321	2.3	0.047	SPO3324	1.03	0.611	SPO3316	0.66	0.460	SPO3316	0.58	0.324	SPO3316	0.76	0.567	SPO3312	1.16	0.549
SPO3322	0.98	0.93	SPO3322	0.94	0.763	SPO3322	2.38	0.226	SPO3325	1.17	0.333	SPO3317	1.09	0.588	SPO3317	1.03	0.897	SPO3317	0.93	0.733	SPO3313	0.81	0.518
SPO3323	0.86	0.552	SPO3323	0.86	0.494	SPO3323	1.46	0.464	SPO3326	1.09	0.127	SPO3318	1.22	0.030	SPO3318	1.27	0.108	SPO3318	1.06	0.599	SPO3314	1.23	0.752
SPO3324	1.06	0.559	SPO3324	0.93	0.693	SPO3324	1.77	0.981	SPO3327	1.09	0.814	SPO3319	2.13	0.338	SPO3319	2.12	0.341	SPO3319	0.96	0.971	SPO3315	0.81	0.407
SPO3325	0.84	0.226	SPO3325	0.87	0.212	SPO3325	1.08	0.152	SPO3328	1.19	0.894	SPO3320	0.68	0.103	SPO3320	0.68	0.069	SPO3320	0.93	0.836	SPO3316	0.79	0.527
SPO3326	1.05	0.757	SPO3326	1.11	0.548	SPO3326	1.07	0.157	SPO3329	1.08	0.088	SPO3321	1.11	0.295	SPO3321	1.03	0.423	SPO3321	1.12	0.253	SPO3317	0.95	0.510
SPO3327	1.23	0.605	SPO3327	1.18	0.846	SPO3327	1	0.783	SPO3330	1.21	0.237	SPO3322	0.88	0.667	SPO3322	1.00	0.365	SPO3322	1.04	0.584	SPO3318	1.02	0.735
SPO3328	1.04	0.766	SPO3328	0.86	0.452	SPO3328	1.26	0.631	SPO3331	1.05	0.995	SPO3323	0.82	0.714	SPO3323	0.83	0.683	SPO3323	1.01	0.942	SPO3319	0.98	0.996
SPO3329	1.3	0.307	SPO3329	1.56	0.033	SPO3329	1.12	0.521	SPO3332	1.03	0.058	SPO3324	0.98	0.575	SPO3324	1.06	0.173	SPO3324	1.17	0.059	SPO3320	0.93	0.719
SPO3330	1.18	0.212	SPO3330	1.11	0.371	SPO3330	1.25	0.107	SPO3333	1.23	0.273	SPO3325	0.69	0.085	SPO3325	0.67	0.081	SPO3325	0.93	0.097	SPO3321	1.14	0.260
SPO3331	1	0.989	SPO3331	0.95	0.994	SPO3331	1.17	0.949	SPO3334	1.03	0.135	SPO3326	0.76	0.157	SPO3326	0.76	0.085	SPO3326	0.83	0.105	SPO3322	1.02	0.793
SPO3332	1.74	0.017	SPO3332	1.52	0.044	SPO3332	1.06	0.039	SPO3335	1.1	0.192	SPO3327	0.85	0.788	SPO3327	0.81	0.781	SPO3327	0.85	0.645	SPO3323	1.09	0.596
SPO3333	0.76	0.631	SPO3333	0.81	0.576	SPO3333	1.15	0.41	SPO3336	1.27	0.754	SPO3328	0.62	0.188	SPO3328	0.61	0.086	SPO3328	1.03	0.746	SPO3324	1.25	0.128
SPO3334	0.76	0.15	SPO3334	0.79	0.396	SPO3334	1.14	0.157	SPO3337	1.09	0.186	SPO3329	0.29	0.003	SPO3329	0.31	0.001	SPO3329	1.13	0.550	SPO3325	1.03	0.620
SPO3335	1.99	0.031	SPO3335	1.93	0.029	SPO3335	1.1	0.223	SPO3338	1.65	0.95	SPO3330	1.37	0.165	SPO3330	1.41	0.184	SPO3330	1.01	0.966	SPO3326	0.86	0.605
SPO3336	1.5	0.28	SPO3336	1.44	0.505	SPO3336	1.09	0.529	SPO3339	2.27	0.613	SPO3331	0.62	0.820	SPO3331	0.63	0.827	SPO3331	0.88	0.941	SPO3327	0.83	0.675
SPO3337	1.5	0.069	SPO3337	1.44	0.018	SPO3337	1.04	0.394	SPO3340	1.15	0.271	SPO3332	0.63	0.158	SPO3332	0.68	0.041	SPO3332	1.01	0.935	SPO3328	1.03	0.721
SPO3338	1.15	0.792	SPO3338	1.18	0.635	SPO3338	1.07	0.863	SPO3341	1.33	0.792	SPO3333	3.16	0.034	SPO3333	2.87	0.037	SPO3333	0.97	0.972	SPO3329	1.08	0.646
SPO3339	1.11	0.359	SPO3339	0.98	0.751	SPO3339	1	0.353	SPO3342	1.05	0.532	SPO3334	3.26	0.015	SPO3334	2.73	0.012	SPO3334	0.95	0.897	SPO3330	0.98	0.950
SPO3340	1.6	0.015	SPO3340	1.46	0.044	SPO3340	1.13	0.014	SPO3343	2.4	0.943	SPO3335	0.84	0.237	SPO3335	0.93	0.413	SPO3335	0.89	0.436	SPO3331	0.87	0.938
SPO3341	1.1	0.596	SPO3341	0.97	0.943	SPO3341	1.05	0.586	SPO3344	2.35	0.948	SPO3336	0.48	0.206	SPO3336	0.42	0.400	SPO3336	0.66	0.376	SPO3332	0.94	0.453
SPO3342	1.37	0.155	SPO3342	1.27	0.13	SPO3342	1	0.787	SPO3345	1.42	0.547	SPO3337	0.58	0.043	SPO3337	0.63	0.098	SPO3337	0.86	0.106	SPO3333	0.99	0.982
SPO3343	0.67	0.45	SPO3343	0.69	0.548	SPO3343	1.08	0.905	SPO3346	1.82	0.389	SPO3338	0.71	0.699	SPO3338	0.71	0.666	SPO3338	0.99	0.961	SPO3334	0.94	0.828
SPO3344	1.24	0.327	SPO3344	1.14	0.261	SPO3344	1.07	0.658	SPO3347	1.13	0.918	SPO3339	0.81	0.315	SPO3339	0.79	0.495	SPO3339	1.03	0.929	SPO3335	0.79	0.223
SPO3345	1.38	0.111	SPO3345	1.17	0.122	SPO3345	1.6	0.373	SPO3348	1.1	0.517	SPO3340	0.96	0.832	SPO3340	0.98	0.705	SPO3340	1.07	0.766	SPO3336	0.71	0.658
SPO3346	1.19	0.223	SPO3346	1.2	0.1	SPO3346	1.53	0.522	SPO3349	1.09	0.251	SPO3341	0.76	0.717	SPO3341	0.78	0.104	SPO3341	0.93	0.853	SPO3337	0.91	0.627
SPO3347	1.58	0.565	SPO3347	1.37	0.616	SPO3347	1.12	0.96	SPO3350	1.19	0.508	SPO3342	1.60	0.011	SPO3342	1.82	0.030	SPO3342	1.12	0.170	SPO3338	0.99	0.965
SPO3348	1.32	0.024	SPO3348	1.35	0.286	SPO3348	1.2	0.555	SPO3351	1.04	0.642	SPO3343	1.24	0.624	SPO3343	1.37	0.521	SPO3343	0.84	0.725	SPO3339	0.93	0.702
SPO3349	1.11	0.135	SPO3349	1.11	0.054	SPO3349	1.4	0.452	SPO3352	1.14	0.88	SPO3344	0.85	0.766	SPO3344	0.87	0.760	SPO3344	1.01	0.969	SPO3340	0.96	0.841
SPO3350	1.32	0.383	SPO3350	1.15	0.588	SPO3350	1.12	0.453	SPO3353	1.19	0.88	SPO3345	0.56	0.051	SPO3345	0.58	0.050	SPO3345	0.98	0.946	SPO3341	0.88	0.211
SPO3351	0.83	0.723	SPO3351	0.9	0.588	SPO3351	1.31	0.39	SPO3354	1.03	0.105	SPO3346	1.15	0.311	SPO3346	1.17	0.068	SPO3346	0.96	0.833	SPO3342	1.17	0.065
SPO3352	0.77	0.362	SPO3352	0.84	0.686	SPO3352	1.16	0.766	SPO3355	1.1	0.815	SPO3347	0.80	0.905	SPO3347	0.74	0.840	SPO3347	0.89	0.923	SPO3343	0.85	0.738
SPO3353	1.33	0.523	SPO3353	1.36	0.447	SPO3353	1.16	0.589	SPO3356	1.32	0.113	SPO3348	0.85	0.908	SPO3348	0.87	0.435	SPO3348	0.96	0.979	SPO3344	1.08	0.741
SPO3354	1.12	0.332	SPO3354	1.21	0.041	SPO3354	1.07	0.008	SPO3357	1.15	0.25	SPO3349	1.43	0.031	SPO3349	1.60	0.012	SPO3349	1.18	0.282	SPO3345	0.98	0.971
SPO3355	2	0.284	SPO3355	1.86	0.358	SPO3355	1.08	0.49	SPO3358	1.17	0.526	SPO3350	0.59	0.253	SPO3350	0.60	0.234	SPO3350	1.10	0.820	SPO3346	1.02	0.849
SPO3356	1.02	0.842	SPO3356	0.72	0.016	SPO3356	1.39	0.029	SPO3359	1.02	0.163	SPO3351	1.04	0.338	SPO3351	0.98	0.686	SPO3351	0.95	0.844	SPO3347	0.85	0.823
SPO3357	1.08	0.48	SPO3357	1.06	0.43	SPO3357	1.17	0.492	SPO3360	1.1	0.034	SPO3352	1.21	0.627	SPO3352	1.08	0.817	SPO3352	0.97	0.873	SPO3348	0.96	0.945
SPO3358	0.98	0.924	SPO3358	1.09	0.165	SPO3358	1.03	0.555	SPO3361	1.06	0.387	SPO3353	0.61	0.336	SPO3353	0.57	0.319	SPO3353	1.04	0.948	SPO3349	1.14	0.167
SPO3359	0.75	0.099	SPO3359	0.79	0.036	SPO3359	1.04	0.135	SPO3362	1.17	0.368	SPO3354	0.28	0.007	SPO3354	0.27	0.001	SPO3354	1.09	0.273	SPO3350	1.08	0.804
SPO3360	0.6	0.078	SPO3360	0.58	0.041	SPO3360	1.14	0.018	SPO3363	1.17	0.001	SPO3355	0.18	0.015	SPO3355	0.19	0.015	SPO3355	1.28	0.458	SPO3351	0.97	0.943
SPO3361	0.88	0.436	SPO3361	0.88	0.625	SPO3361	0.99	0.757	SPO3364	1.04	0.016	SPO3356	0.85	0.275	SPO3356	0.83	0.128	SPO3356	1.00	0.962	SPO3352	1.03	0.919
SPO3362	1.23	0.365	SPO3362	1.1	0.447	SPO3362	1	0.513	SPO3365	1.17	0.003	SPO3357	1.26	0.239	SPO3357	1.55	0.064	SPO3357	1.08	0.695	SPO3353	1.01	0.976
SPO3363	3.7	0.002	SPO3363	3.87	0.01	SPO3363	1.01	0	SPO3366	1.21	0.003	SPO3358	0.88	0.527	SPO3358	0.96	0.925	SPO3358	0.95	0.588	SPO3354	1.10	0.239
SPO3364	2.25	0.13	SPO3364	1.68	0.093	SPO3364	1.01	0.014	SPO3367	1.62	0.343	SPO3359	0.06	0.002	SPO3359	0.06	0.002	SPO3359	1.99	0.034	SPO3355	1.15	0.592
SPO3365	3.79	0.018	SPO3365	3.35	0.02	SPO3365	1.03	0.003	SPO3368	1.47	0.103	SPO3360	0.08	0.003	SPO3360	0.08	0.001	SPO3360	1.95	0.088	SPO3356	1.04	0.854
SPO3366	2.73	0.001	SPO3366	2.75	0.005	SPO3366	1.09	0.003	SPO3369	1.05	0.649	SPO3361	1.75	0.060	SPO3361	1.70	0.008	SPO3361	1.16	0.536	SPO3357	1.13	0.059
SPO3367	0.81	0.065	SPO3367	0.77	0.433	SPO3367	1.01	0.221	SPO3370	1.2	0.019	SPO3362	1.40	0.076	SPO3362	1.47	0.101	SPO3362	1.04	0.830	SPO3358	0.90	0.364
SPO3368	0.85	0.559	SPO3368	0.86	0.298	SPO3368	1.13	0.139	SPO3371	1.36	0.201	SPO3363	4.27	0.070	SPO3363	4.59	0.000	SPO3363	1.31	0.492	SPO3359	1.93	0.044
SPO3369	0.92	0.909	SPO3369	0.94	0.972	SPO3369	1.11	0.119	SPO3372	1.17	0.917	SPO3364	1.72	0.289	SPO3364	1.61	0.220	SPO3364	1.08	0.881	SPO3360	2.02	0.043
SPO3370	1.22	0.085	SPO3370	1.17	0.147	SPO3370	1.02	0.075	SPO3373	1.35	0.103	SPO3365	4.87	0.004	SPO3365	3.58	0.010	SPO3365	1.20	0.414	SPO3361	1.15	0.538
SPO3371	1.11	0.731	SPO3371	1.1	0.715	SPO3371	1.08	0.53	SPO3374	1.2	0.906	SPO3366	3.66	0.006	SPO3366	3.85	0.002	SPO3366	1.13	0.386	SPO3362	0.98	0.955
SPO3372	1.08	0.131	SPO3372	1.03	0.274	SPO3372	1.03	0.214	SPO3375	1.25	0.114	SPO3367	0.66	0.037	SPO3367	0.68	0.175	SPO3367	0.98	0.906	SPO3363	1.23	0.249
SPO3373	1.43	0.003	SPO3373	1.39	0.126	SPO3373	1.12	0.026	SPO3376	1.12	0.248	SPO3368	0.60	0.064	SPO3368	0.60	0.036	SPO3368	0.91	0.258	SPO3364	1.03	0.847
SPO3374	1.67	0.01	SPO3374	1.42	0.018	SPO3374	1.83	0.646	SPO3377	1.02	0.61	SPO3369	0.73	0.087	SPO3369	0.84	0.169	SPO3369	0.95	0.419	SPO3365	1.15	0.417
SPO3375	0.81	0.277	SPO3375	0.82	0.066	SPO3375	1.02	0.262	SPO3378	1.55	0.524	SPO3370	0.53	0.016	SPO3370	0.54	0.006	SPO3370	0.81	0.129	SPO3366	1.10	0.234
SPO3376	1.11	0.594	SPO3376	1.1	0.8	SPO3376	1.09	0.794	SPO3379	1.12	0.942	SPO3371	0.57	0.234	SPO3371	0.59	0.067	SPO3371	0.90	0.841	SPO3367	1.04	0.807
SPO3377	0.93	0.626	SPO3377	1.05	0.477	SPO3377	1.1	0.961	SPO3380	1.08	0.771	SPO3372	0.86	0.608	SPO3372	0.99	0.206	SPO3372	1.11	0.242	SPO3368	0.90	0.644
SPO3378	1.15	0.78	SPO3378	0.81	0.714	SPO3378	1.1	0.795	SPO3381	1.09	0.852	SPO3373	1.45	0.073	SPO3373	1.41	0.089	SPO3373	1.14	0.135	SPO3369	0.94	0.524
SPO3379	1	0.968	SPO3379	1.1	0.894	SPO3379	1.08	0.993	SPO3382	0.99	0.067	SPO3374	1.03	0.348	SPO3374	1.03	0.230	SPO3374	1.14	0.136	SPO3370	0.84	0.218
SPO3380	0.87	0.213	SPO3380	0.84	0.451	SPO3380	1.14	0.746	SPO3383	1.17	0.179	SPO3375	1.70	0.089	SPO3375	1.97	0.001	SPO3375	0.98	0.963	SPO3371	0.95	0.919
SPO3381	0.88	0.965	SPO3381	0.93	0.987	SPO3381	1.12	0.871	SPO3384	0.99	0.257	SPO3376	0.62	0.154	SPO3376	0.70	0.587	SPO3376	0.86	0.560	SPO3372	1.03	0.104
SPO3382	1.05	0.684	SPO3382	1	0.734	SPO3382	1.07	0.263	SPO3385	1.07	0.267	SPO3377	1.45	0.012	SPO3377	1.43	0.046	SPO3377	1.08	0.335	SPO3373	1.07	0.477
SPO3383	1.03	0.875	SPO3383	0.97	0.931	SPO3383	1.06	0.744	SPO3386	1.08	0.553	SPO3378	0.89	0.961	SPO3378	0.99	0.813	SPO3378	0.82	0.754	SPO3374	1.01	0.856
SPO3384	1.58	0.115	SPO3384	1.38	0.059	SPO3384	1.3	0.39	SPO3387	1.35	0.874	SPO3379	0.83	0.868	SPO3379	0.74	0.812	SPO3379	0.78	0.754	SPO3375	1.03	0.726
SPO3385	1.27	0.074	SPO3385	1.19	0.043	SPO3385	1.11	0.123	SPO3388	1.23	0.881	SPO3380	1.17	0.478	SPO3380	1.18	0.616	SPO3380	0.96	0.477	SPO3376	0.85	0.480
SPO3386	1.02	0.73	SPO3386	1.05	0.249	SPO3386	1.15	0.18	SPO3389	1	0.863	SPO3381	3.80	0.545	SPO3381	3.98	0.561	SPO3381	0.86	0.563	SPO3377	1.05	0.696
SPO3387	1.15	0.56	SPO3387	1.11	0.767	SPO3387	1.47	0.571	SPO3390	1.01	0.326	SPO3382	0.61	0.078	SPO3382	0.68	0.028	SPO3382	0.88	0.367	SPO3378	0.85	0.586
SPO3388	1.15	0.246	SPO3388	1.12	0.402	SPO3388	1.22	0.305	SPO3391	1.02	0.362	SPO3383	1.05	0.175	SPO3383	1.01	0.062	SPO3383	1.11	0.330	SPO3379	0.75	0.700
SPO3389	1.8	0.305	SPO3389	1.67	0.467	SPO3389	1.04	0.778	SPO3392	1.89	0.251	SPO3384	0.66	0.199	SPO3384	0.65	0.021	SPO3384	0.97	0.953	SPO3380	1.02	0.977
SPO3390	0.85	0.499	SPO3390	0.96	0.934	SPO3390	1.1	0.438	SPO3393	0.99	0.402	SPO3385	0.87	0.683	SPO3385	1.03	0.045	SPO3385	1.10	0.586	SPO3381	0.84	0.950
SPO3391	1.66	0.003	SPO3391	1.59	0.024	SPO3391	1.09	0.223	SPO3394	1.07	0.887	SPO3386	1.20	0.437	SPO3386	1.12	0.735	SPO3386	1.07	0.857	SPO3382	0.88	0.089
SPO3392	1.53	0.031	SPO3392	1.36	0.109	SPO3392	1.03	0.044	SPO3395	1.11	0.031	SPO3387	1.14	0.690	SPO3387	1.00	0.902	SPO3387	0.96	0.705	SPO3383	1.10	0.079
SPO3393	1	0.823	SPO3393	1	0.845	SPO3393	1.07	0.372	SPO3396	1	0.271	SPO3388	1.25	0.507	SPO3388	1.25	0.418	SPO3388	1.03	0.917	SPO3384	1.04	0.637
SPO3394	1.01	0.948	SPO3394	1.04	0.938	SPO3394	1.06	0.845	SPO3397	1.05	0.767	SPO3389	1.00	0.770	SPO3389	0.90	0.882	SPO3389	1.04	0.881	SPO3385	1.00	0.984
SPO3395	1.66	0.031	SPO3395	1.59	0.009	SPO3395	1.04	0.29	SPO3398	1.02	0.043	SPO3390	0.79	0.404	SPO3390	0.76	0.225	SPO3390	1.18	0.550	SPO3386	1.16	0.635
SPO3396	1.15	0.118	SPO3396	1.19	0.213	SPO3396	1.11	0.47	SPO3399	1.12	0.466	SPO3391	0.95	0.680	SPO3391	1.02	0.868	SPO3391	1.17	0.444	SPO3387	1.06	0.868
SPO3397	1.03	0.801	SPO3397	0.96	0.962	SPO3397	1.06	0.796	SPO3400	1.11	0.941	SPO3392	1.24	0.257	SPO3392	1.25	0.076	SPO3392	1.30	0.081	SPO3388	1.00	0.943
SPO3398	1.3	0.239	SPO3398	1.22	0.029	SPO3398	2.42	0.115	SPO3401	1.11	0.351	SPO3393	0.65	0.157	SPO3393	0.65	0.120	SPO3393	0.85	0.216	SPO3389	1.06	0.835
SPO3399	1.05	0.884	SPO3399	1.05	0.903	SPO3399	1.99	0.597	SPO3402	1.04	0.78	SPO3394	0.89	0.920	SPO3394	0.97	0.988	SPO3394	0.82	0.824	SPO3390	1.07	0.795
SPO3400	1.17	0.713	SPO3400	1.13	0.873	SPO3400	1.21	0.926	SPO3403	1.02	0.074	SPO3395	0.63	0.051	SPO3395	0.72	0.013	SPO3395	1.15	0.568	SPO3391	1.01	0.887
SPO3401	0.76	0.387	SPO3401	0.78	0.258	SPO3401	1.05	0.451	SPO3404	1.26	0.245	SPO3396	0.83	0.126	SPO3396	0.88	0.237	SPO3396	1.11	0.598	SPO3392	1.03	0.780
SPO3402	1.11	0.638	SPO3402	1.16	0.63	SPO3402	1.31	0.738	SPO3405	1.35	0.908	SPO3397	0.97	0.875	SPO3397	0.91	0.712	SPO3397	0.89	0.705	SPO3393	0.86	0.567
SPO3403	1.1	0.112	SPO3403	1.05	0.221	SPO3403	1.06	0.003	SPO3406	1.12	0.848	SPO3398	0.93	0.250	SPO3398	1.08	0.711	SPO3398	0.93	0.522	SPO3394	0.82	0.836
SPO3404	2.14	0.039	SPO3404	1.9	0.022	SPO3404	1.8	0.096	SPO3407	1.1	0.829	SPO3399	0.52	0.475	SPO3399	0.45	0.380	SPO3399	0.81	0.493	SPO3395	0.93	0.389
SPO3405	1.47	0.102	SPO3405	1.51	0.626	SPO3405	1.1	0.888	SPO3408	1.01	0.793	SPO3400	1.06	0.916	SPO3400	1.13	0.869	SPO3400	0.95	0.755	SPO3396	1.10	0.623
SPO3406	1.13	0.409	SPO3406	1.14	0.377	SPO3406	1.06	0.872	SPO3409	1.07	0.289	SPO3401	1.38	0.065	SPO3401	1.08	0.973	SPO3401	1.10	0.798	SPO3397	0.95	0.851
SPO3407	1.03	0.609	SPO3407	1.15	0.177	SPO3407	1.06	0.771	SPO3410	1.05	0.35	SPO3402	0.71	0.651	SPO3402	0.75	0.648	SPO3402	0.77	0.636	SPO3398	0.89	0.362
SPO3408	1.54	0.054	SPO3408	1.36	0.138	SPO3408	1.06	0.901	SPO3411	1.02	0.813	SPO3403	1.20	0.527	SPO3403	1.12	0.661	SPO3403	1.04	0.936	SPO3399	0.86	0.817
SPO3409	1.29	0.208	SPO3409	1.45	0.027	SPO3409	1	0.027	SPO3412	1.02	0.005	SPO3404	0.83	0.145	SPO3404	0.91	0.379	SPO3404	1.15	0.701	SPO3400	1.01	0.996
SPO3410	1.26	0.117	SPO3410	1.16	0.03	SPO3410	1.04	0.747	SPO3413	1.12	0.115	SPO3405	0.70	0.580	SPO3405	0.75	0.550	SPO3405	1.13	0.473	SPO3401	1.12	0.362
SPO3411	1.01	0.746	SPO3411	1.01	0.687	SPO3411	1.12	0.942	SPO3414	1.14	0.894	SPO3406	1.55	0.020	SPO3406	1.70	0.028	SPO3406	1.03	0.881	SPO3402	0.75	0.660
SPO3412	0.96	0.324	SPO3412	0.96	0.798	SPO3412	1.04	0.023	SPO3415	1.07	0.119	SPO3407	1.34	0.116	SPO3407	1.35	0.270	SPO3407	1.02	0.989	SPO3403	1.06	0.822
SPO3413	1.12	0.154	SPO3413	1.15	0.329	SPO3413	1.14	0.04	SPO3416	2.73	0.153	SPO3408	0.68	0.370	SPO3408	0.67	0.352	SPO3408	1.01	0.838	SPO3404	1.11	0.798
SPO3414	1.01	0.943	SPO3414	1.08	0.521	SPO3414	1	0.952	SPO3417	2.21	0.517	SPO3409	0.16	0.002	SPO3409	0.19	0.003	SPO3409	1.04	0.981	SPO3405	1.09	0.864
SPO3415	0.95	0.254	SPO3415	1.02	0.299	SPO3415	1.08	0.086	SPO3418	1.18	0.81	SPO3410	0.25	0.008	SPO3410	0.25	0.003	SPO3410	1.01	0.876	SPO3406	1.01	0.971
SPO3416	1	0.994	SPO3416	0.91	0.49	SPO3416	1.1	0.136	SPO3419	1.04	0.87	SPO3411	0.61	0.069	SPO3411	0.60	0.006	SPO3411	0.92	0.509	SPO3407	1.10	0.627
SPO3417	0.85	0.419	SPO3417	0.86	0.542	SPO3417	1.03	0.444	SPO3420	1.46	0.15	SPO3412	0.83	0.481	SPO3412	0.86	0.833	SPO3412	0.98	0.886	SPO3408	1.03	0.685
SPO3418	0.75	0.012	SPO3418	0.84	0.443	SPO3418	1.13	0.283	SPO3421	1.12	0.857	SPO3413	0.93	0.504	SPO3413	0.97	0.636	SPO3413	1.05	0.637	SPO3409	0.97	0.732
SPO3419	1.1	0.14	SPO3419	1.25	0.014	SPO3419	0.99	0.555	SPO3422	1.88	0.174	SPO3414	1.37	0.040	SPO3414	1.37	0.032	SPO3414	0.92	0.359	SPO3410	0.94	0.709
SPO3420	1.12	0.335	SPO3420	1.13	0.256	SPO3420	1.04	0.831	SPO3423	1.08	0.029	SPO3415	1.00	0.007	SPO3415	1.01	0.022	SPO3415	1.07	0.497	SPO3411	0.92	0.505
SPO3421	1.28	0.105	SPO3421	1.18	0.699	SPO3421	1.15	0.732	SPO3424	1.02	0.53	SPO3416	1.71	0.019	SPO3416	1.71	0.025	SPO3416	1.01	0.717	SPO3412	0.99	0.732
SPO3422	0.87	0.346	SPO3422	0.94	0.702	SPO3422	1.19	0.307	SPO3425	1.11	0.217	SPO3417	1.64	0.094	SPO3417	1.72	0.092	SPO3417	0.93	0.847	SPO3413	1.08	0.275
SPO3423	1.25	0.026	SPO3423	1.18	0.005	SPO3423	1	0.059	SPO3426	0.99	0.871	SPO3418	0.99	0.573	SPO3418	0.94	0.802	SPO3418	1.10	0.835	SPO3414	0.94	0.920
SPO3424	0.91	0.818	SPO3424	0.9	0.498	SPO3424	1.15	0.935	SPO3427	1.04	0.072	SPO3419	0.96	0.768	SPO3419	0.99	0.692	SPO3419	1.03	0.674	SPO3415	1.02	0.269
SPO3425	0.87	0.351	SPO3425	0.77	0.095	SPO3425	1.17	0.257	SPO3428	1.09	0.962	SPO3420	1.62	0.013	SPO3420	1.83	0.084	SPO3420	1.22	0.156	SPO3416	0.96	0.904
SPO3426	0.57	0.069	SPO3426	0.64	0.047	SPO3426	1.04	0.591	SPO3429	1.04	0.369	SPO3421	0.68	0.116	SPO3421	0.68	0.451	SPO3421	1.01	0.966	SPO3417	0.91	0.741
SPO3427	1.13	0.151	SPO3427	1.13	0.153	SPO3427	1.06	0.3	SPO3430	1.03	0.265	SPO3422	1.32	0.101	SPO3422	1.24	0.023	SPO3422	1.06	0.480	SPO3418	1.07	0.791
SPO3428	1.22	0.28	SPO3428	1.02	0.929	SPO3428	1.07	0.972	SPO3431	1.14	0.384	SPO3423	0.61	0.059	SPO3423	0.64	0.017	SPO3423	1.07	0.358	SPO3419	0.99	0.983
SPO3429	1.1	0.732	SPO3429	1.09	0.702	SPO3429	1.2	0.647	SPO3432	1.1	0.58	SPO3424	0.94	0.616	SPO3424	0.87	0.304	SPO3424	0.96	0.830	SPO3420	1.24	0.038
SPO3430	1.47	0.313	SPO3430	1.15	0.664	SPO3430	1.08	0.696	SPO3433	1.02	0.784	SPO3425	1.21	0.045	SPO3425	1.22	0.002	SPO3425	0.99	0.916	SPO3421	0.93	0.900
SPO3431	1.23	0.015	SPO3431	1.2	0.083	SPO3431	1.06	0.225	SPO3434	1.02	0.665	SPO3426	0.43	0.016	SPO3426	0.44	0.004	SPO3426	1.03	0.640	SPO3422	1.13	0.331
SPO3432	1.35	0.307	SPO3432	1.29	0.335	SPO3432	1.08	0.726	SPO3435	1.17	0.584	SPO3427	0.88	0.135	SPO3427	0.96	0.896	SPO3427	0.99	0.921	SPO3423	1.03	0.394
SPO3433	1.37	0.434	SPO3433	1.28	0.587	SPO3433	1.06	0.772	SPO3436	1.01	0.148	SPO3428	0.98	0.984	SPO3428	0.97	0.982	SPO3428	1.20	0.692	SPO3424	0.91	0.563

SPO3434	1.11	0.575	SPO3434	1.13	0.551	SPO3434	1.07	0.513	SPO3437	1.1	0.875	SPO3429	0.64	0.445	SPO3429	0.60	0.448	SPO3429	0.85	0.650	SPO3425	1.04	0.733
SPO3435	0.94	0.843	SPO3435	0.83	0.537	SPO3435	1.04	0.561	SPO3438	1.15	0.904	SPO3430	0.93	0.529	SPO3430	0.70	0.795	SPO3430	1.08	0.581	SPO3426	1.08	0.191
SPO3436	1.61	0.106	SPO3436	1.36	0.154	SPO3436	1.11	0.629	SPO3439	0.99	0.795	SPO3431	0.90	0.771	SPO3431	0.91	0.706	SPO3431	0.92	0.577	SPO3427	0.95	0.598
SPO3437	1.3	0.23	SPO3437	1.25	0.305	SPO3437	1.31	0.651	SPO3440	1.18	0.168	SPO3432	1.00	0.712	SPO3432	1.09	0.013	SPO3432	1.14	0.562	SPO3428	1.15	0.789
SPO3438	0.83	0.904	SPO3438	0.97	0.992	SPO3438	1.07	0.976	SPO3441	1.09	0.263	SPO3433	0.88	0.923	SPO3433	0.90	0.972	SPO3433	0.93	0.887	SPO3429	0.84	0.452
SPO3439	1.48	0.234	SPO3439	1.5	0.019	SPO3439	1.06	0.501	SPO3442	1.05	0.657	SPO3434	1.08	0.677	SPO3434	1.05	0.741	SPO3434	0.91	0.739	SPO3430	0.76	0.454
SPO3440	1.09	0.246	SPO3440	1.04	0.448	SPO3440	1	0.095	SPO3443	1.05	0.91	SPO3435	0.48	0.078	SPO3435	0.48	0.064	SPO3435	0.96	0.958	SPO3431	0.93	0.736
SPO3441	0.68	0.102	SPO3441	0.75	0.082	SPO3441	1.27	0.492	SPO3444	1.04	0.668	SPO3436	1.05	0.571	SPO3436	1.14	0.279	SPO3436	0.93	0.249	SPO3432	1.13	0.518
SPO3442	1.39	0.41	SPO3442	1.21	0.538	SPO3442	1.24	0.773	SPO3445	1.08	0.016	SPO3437	1.45	0.179	SPO3437	1.45	0.342	SPO3437	1.14	0.302	SPO3433	0.91	0.872
SPO3443	1.12	0.745	SPO3443	1.14	0.76	SPO3443	1.49	0.977	SPO3446	1.03	0.05	SPO3438	0.86	0.929	SPO3438	0.74	0.815	SPO3438	0.85	0.899	SPO3434	0.89	0.682
SPO3444	1.13	0.756	SPO3444	1.13	0.441	SPO3444	1.11	0.761	SPO3447	1.08	0.168	SPO3439	1.51	0.046	SPO3439	1.52	0.071	SPO3439	1.22	0.162	SPO3435	0.95	0.900
SPO3445	0.75	0.029	SPO3445	0.85	0.126	SPO3445	1.05	0.011	SPO3448	1.03	0.788	SPO3440	1.33	0.013	SPO3440	1.37	0.052	SPO3440	1.13	0.170	SPO3436	1.11	0.651
SPO3446	1.34	0.04	SPO3446	1.41	0.024	SPO3446	1	0.044	SPO3449	1.01	0.863	SPO3441	1.00	0.288	SPO3441	0.98	0.154	SPO3441	1.26	0.005	SPO3437	1.04	0.816
SPO3447	0.52	0.195	SPO3447	0.62	0.011	SPO3447	1.15	0.021	SPO3450	1.01	0.139	SPO3442	0.79	0.634	SPO3442	0.80	0.758	SPO3442	1.02	0.867	SPO3438	0.91	0.931
SPO3448	0.81	0.295	SPO3448	0.89	0.502	SPO3448	1.06	0.93	SPO3451	1.04	0.376	SPO3443	0.96	0.975	SPO3443	0.93	0.979	SPO3443	0.99	0.988	SPO3439	1.19	0.164
SPO3449	0.71	0.682	SPO3449	0.88	0.78	SPO3449	1.45	0.913	SPO3452	1.11	0.015	SPO3444	1.02	0.861	SPO3444	0.95	0.841	SPO3444	0.97	0.953	SPO3440	1.10	0.216
SPO3450	1.27	0.078	SPO3450	1.23	0.023	SPO3450	2.04	0.366	SPO3453	1.24	0.797	SPO3445	7.72	0.020	SPO3445	7.42	0.004	SPO3445	0.83	0.463	SPO3441	1.32	0.139
SPO3451	0.78	0.223	SPO3451	0.8	0.189	SPO3451	1.69	0.393	SPO3454	1.08	0.152	SPO3446	0.57	0.003	SPO3446	0.53	0.008	SPO3446	0.96	0.946	SPO3442	0.99	0.958
SPO3452	0.74	0.154	SPO3452	0.85	0.389	SPO3452	1.4	0.423	SPO3455	1.26	0.676	SPO3447	1.16	0.151	SPO3447	1.27	0.040	SPO3447	1.08	0.666	SPO3443	0.97	0.959
SPO3453	0.88	0.113	SPO3453	0.88	0.803	SPO3453	1.16	0.574	SPO3456	1.22	0.855	SPO3448	1.26	0.242	SPO3448	1.27	0.175	SPO3448	1.10	0.551	SPO3444	1.05	0.845
SPO3454	1.12	0.031	SPO3454	1.16	0.014	SPO3454	1.21	0.333	SPO3457	1.3	0.51	SPO3449	1.07	0.746	SPO3449	1.02	0.799	SPO3449	1.01	0.947	SPO3445	0.93	0.885
SPO3455	0.95	0.902	SPO3455	0.94	0.845	SPO3455	1.05	0.344	SPO3458	1.54	0.562	SPO3450	0.62	0.013	SPO3450	0.70	0.096	SPO3450	1.17	0.257	SPO3446	0.94	0.689
SPO3456	1.17	0.717	SPO3456	1.34	0.747	SPO3456	1.4	0.855	SPO3459	1.16	0.834	SPO3451	1.97	0.033	SPO3451	1.82	0.062	SPO3451	1.11	0.557	SPO3447	1.04	0.748
SPO3457	1.09	0.359	SPO3457	1.02	0.78	SPO3457	1.29	0.494	SPO3460	1.1	0.042	SPO3452	1.82	0.033	SPO3452	1.94	0.016	SPO3452	1.26	0.299	SPO3448	1.12	0.597
SPO3458	1.04	0.326	SPO3458	1.19	0.19	SPO3458	1.1	0.709	SPO3461	1.06	0.859	SPO3453	0.81	0.226	SPO3453	0.81	0.638	SPO3453	0.92	0.767	SPO3449	1.03	0.923
SPO3459	1.57	0.077	SPO3459	1.34	0.017	SPO3459	1.05	0.969	SPO3462	1.44	0.142	SPO3454	0.92	0.185	SPO3454	0.92	0.389	SPO3454	0.94	0.500	SPO3450	1.09	0.417
SPO3460	0.78	0.232	SPO3460	0.79	0.154	SPO3460	1	0.265	SPO3463	1.81	0.979	SPO3455	0.37	0.019	SPO3455	0.38	0.024	SPO3455	1.00	0.918	SPO3451	1.07	0.572
SPO3461	0.74	0.638	SPO3461	0.81	0.72	SPO3461	1.17	0.789	SPO3464	1.7	0.665	SPO3456	0.37	0.189	SPO3456	0.45	0.409	SPO3456	0.93	0.871	SPO3452	1.16	0.171
SPO3462	0.78	0.236	SPO3462	0.81	0.119	SPO3462	1.01	0.632	SPO3465	1.36	0.443	SPO3457	0.33	0.066	SPO3457	0.33	0.011	SPO3457	0.98	0.829	SPO3453	0.88	0.702
SPO3463	1.04	0.849	SPO3463	1.05	0.792	SPO3463	1	0.602	SPO3466	1.14	0.73	SPO3458	0.33	0.011	SPO3458	0.44	0.020	SPO3458	0.94	0.809	SPO3454	0.95	0.084
SPO3464	0.92	0.735	SPO3464	0.99	0.843	SPO3464	1.44	0.873	SPO3467	1.03	0.983	SPO3459	0.19	0.003	SPO3459	0.21	0.005	SPO3459	1.13	0.461	SPO3455	1.00	0.952
SPO3465	1.15	0.18	SPO3465	1.02	0.509	SPO3465	1.02	0.861	SPO3468	1.47	0.847	SPO3460	0.25	0.002	SPO3460	0.26	0.000	SPO3460	1.05	0.912	SPO3456	1.00	0.982
SPO3466	1.22	0.717	SPO3466	1.11	0.828	SPO3466	1.15	0.761	SPO3469	1.41	0.483	SPO3461	0.20	0.028	SPO3461	0.24	0.016	SPO3461	0.98	0.901	SPO3457	0.95	0.858
SPO3467	0.76	0.012	SPO3467	0.82	0.211	SPO3467	1.14	0.617	SPO3470	1.11	0.507	SPO3462	0.75	0.107	SPO3462	0.75	0.171	SPO3462	1.01	0.967	SPO3458	1.04	0.945
SPO3468	0.69	0.505	SPO3468	0.7	0.148	SPO3468	1	0.938	SPO3471	1.05	0.746	SPO3463	0.56	0.081	SPO3463	0.54	0.116	SPO3463	0.95	0.896	SPO3459	1.11	0.724
SPO3469	0.56	0.039	SPO3469	0.59	0.082	SPO3469	1.03	0.515	SPO3472	1.06	0.561	SPO3464	1.37	0.114	SPO3464	1.44	0.057	SPO3464	1.11	0.748	SPO3460	1.13	0.489
SPO3470	0.85	0.57	SPO3470	0.89	0.698	SPO3470	1.16	0.334	SPO3473	1.2	0.357	SPO3465	1.23	0.083	SPO3465	1.19	0.222	SPO3465	1.12	0.620	SPO3461	0.94	0.731
SPO3471	0.81	0.64	SPO3471	0.88	0.765	SPO3471	1.03	0.818	SPO3474	1.11	0.633	SPO3466	0.99	0.892	SPO3466	0.97	0.905	SPO3466	0.88	0.849	SPO3462	0.96	0.711
SPO3472	0.61	0.034	SPO3472	0.7	0.031	SPO3472	1.12	0.706	SPO3475	1.04	0.486	SPO3467	1.44	0.005	SPO3467	1.37	0.014	SPO3467	1.00	0.847	SPO3463	0.93	0.831
SPO3473	0.83	0.391	SPO3473	0.83	0.648	SPO3473	1.16	0.922	SPO3476	1.41	0.54	SPO3468	1.53	0.071	SPO3468	1.65	0.042	SPO3468	0.95	0.899	SPO3464	1.05	0.874
SPO3474	0.83	0.36	SPO3474	0.88	0.216	SPO3474	1.03	0.385	SPO3477	1.18	0.802	SPO3469	1.58	0.073	SPO3469	1.50	0.079	SPO3469	1.03	0.827	SPO3465	0.99	0.926
SPO3475	0.95	0.25	SPO3475	0.9	0.439	SPO3475	1.06	0.274	SPO3478	1.02	0.892	SPO3470	0.76	0.325	SPO3470	0.79	0.383	SPO3470	0.92	0.795	SPO3466	0.88	0.817
SPO3476	0.89	0.695	SPO3476	0.88	0.548	SPO3476	1.02	0.681	SPO3479	1.16	0.454	SPO3471	0.86	0.870	SPO3471	0.81	0.743	SPO3471	1.02	0.954	SPO3467	0.99	0.997
SPO3477	1.04	0.646	SPO3477	1.04	0.473	SPO3477	1.11	0.598	SPO3480	1.04	0.585	SPO3472	0.99	0.370	SPO3472	0.89	0.369	SPO3472	0.96	0.967	SPO3468	0.98	0.966
SPO3478	1.15	0.845	SPO3478	1.05	0.897	SPO3478	1.13	0.942	SPO3481	1.17	0.11	SPO3473	2.05	0.091	SPO3473	1.58	0.020	SPO3473	1.16	0.136	SPO3469	1.02	0.763
SPO3479	1.18	0.264	SPO3479	1.17	0.176	SPO3479	1.04	0.447	SPO3482	1.13	0.054	SPO3474	0.93	0.741	SPO3474	0.85	0.673	SPO3474	0.90	0.895	SPO3470	0.99	0.983
SPO3480	1.24	0.143	SPO3480	1.27	0.067	SPO3480	1.03	0.381	SPO3483	1.1	0.153	SPO3475	0.81	0.589	SPO3475	0.85	0.700	SPO3475	0.78	0.066	SPO3471	1.01	0.950
SPO3481	1.24	0.378	SPO3481	1.17	0.052	SPO3481	1.03	0.116	SPO3484	1	0.664	SPO3476	0.62	0.040	SPO3476	0.63	0.024	SPO3476	0.99	0.891	SPO3472	1.00	0.860
SPO3482	1.33	0.084	SPO3482	1.36	0.204	SPO3482	1.08	0.04	SPO3485	1.25	0.219	SPO3477	0.84	0.299	SPO3477	0.82	0.191	SPO3477	1.05	0.705	SPO3473	1.16	0.429
SPO3483	1.37	0.043	SPO3483	1.26	0.091	SPO3483	1.12	0.012	SPO3486	1.03	0.073	SPO3478	0.82	0.757	SPO3478	0.77	0.699	SPO3478	0.85	0.802	SPO3474	0.90	0.673
SPO3484	1.29	0.675	SPO3484	1.09	0.86	SPO3484	1.3	0.683	SPO3487	1.08	0.893	SPO3479	0.75	0.159	SPO3479	0.78	0.296	SPO3479	0.73	0.269	SPO3475	0.83	0.161
SPO3485	1.2	0.228	SPO3485	1.08	0.37	SPO3485	1.02	0.418	SPO3488	1.15	0.907	SPO3480	0.71	0.025	SPO3480	0.74	0.211	SPO3480	0.64	0.109	SPO3476	0.99	0.897
SPO3486	0.96	0.867	SPO3486	1.02	0.601	SPO3486	1	0.661	SPO3489	1.12	0.199	SPO3481	0.81	0.044	SPO3481	0.85	0.172	SPO3481	0.93	0.426	SPO3477	1.10	0.375
SPO3487	1.16	0.436	SPO3487	1.08	0.678	SPO3487	1.09	0.919	SPO3490	1.09	0.245	SPO3482	0.68	0.115	SPO3482	0.55	0.084	SPO3482	0.83	0.377	SPO3478	0.81	0.762
SPO3488	0.97	0.954	SPO3488	1	0.53	SPO3488	1.15	0.634	SPO3491	1.03	0.252	SPO3483	1.00	0.961	SPO3483	1.10	0.523	SPO3483	1.30	0.175	SPO3479	0.75	0.039
SPO3489	1.57	0.008	SPO3489	1.44	0.014	SPO3489	1.09	0.661	SPO3492	1.05	0.903	SPO3484	0.21	0.125	SPO3484	0.22	0.155	SPO3484	1.02	0.952	SPO3480	0.71	0.161
SPO3490	1.37	0.318	SPO3490	1.49	0.204	SPO3490	1.23	0.344	SPO3493	1.09	0.918	SPO3485	0.63	0.190	SPO3485	0.71	0.015	SPO3485	0.94	0.746	SPO3481	0.98	0.863
SPO3491	0.71	0.06	SPO3491	0.79	0.164	SPO3491	1.04	0.623	SPO3494	1.09	0.214	SPO3486	0.60	0.374	SPO3486	0.60	0.265	SPO3486	0.69	0.551	SPO3482	0.83	0.316
SPO3492	0.73	0.038	SPO3492	0.75	0.134	SPO3492	1	0.708	SPO3495	1.29	0.229	SPO3487	0.98	0.616	SPO3487	0.91	0.780	SPO3487	1.27	0.411	SPO3483	1.11	0.186
SPO3493	1.08	0.702	SPO3493	0.98	0.905	SPO3493	1.06	0.906	SPO3496	1.08	0.009	SPO3488	1.82	0.056	SPO3488	2.11	0.010	SPO3488	1.20	0.496	SPO3484	1.07	0.882
SPO3494	0.68	0.089	SPO3494	0.71	0.009	SPO3494	1.06	0.143	SPO3499	1.15	0.905	SPO3489	0.81	0.120	SPO3489	0.76	0.009	SPO3489	0.91	0.452	SPO3485	0.91	0.324
SPO3495	0.92	0.102	SPO3495	1.05	0.447	SPO3495	1.01	0.042	SPO3500	1.15	0.032	SPO3490	0.86	0.197	SPO3490	0.99	0.560	SPO3490	0.89	0.447	SPO3486	0.72	0.321
SPO3496	0.87	0.798	SPO3496	0.98	0.347	SPO3496	1.05	0.049	SPO3501	1.13	0.553	SPO3491	1.45	0.090	SPO3491	1.48	0.008	SPO3491	0.99	0.866	SPO3487	1.09	0.919
SPO3499	1.15	0.465	SPO3499	1.47	0.232	SPO3499	1.12	0.18	SPO3502	1.18	0.843	SPO3492	0.95	0.601	SPO3492	0.96	0.587	SPO3492	0.87	0.313	SPO3488	0.98	0.960
SPO3500	0.76	0.011	SPO3500	0.84	0.013	SPO3500	1.14	0.038	SPO3503	1.04	0.333	SPO3493	0.60	0.336	SPO3493	0.62	0.045	SPO3493	0.97	0.950	SPO3489	0.90	0.138
SPO3501	1.08	0.724	SPO3501	1.11	0.484	SPO3501	1.26	0.631	SPO3504	1.1	0.953	SPO3494	0.61	0.041	SPO3494	0.60	0.009	SPO3494	0.85	0.385	SPO3490	0.89	0.758
SPO3502	1.14	0.808	SPO3502	1.07	0.799	SPO3502	1.19	0.915	SPO3505	1.12	0.044	SPO3495	2.62	0.012	SPO3495	2.41	0.005	SPO3495	0.83	0.315	SPO3491	1.10	0.573
SPO3503	0.84	0.168	SPO3503	0.91	0.383	SPO3503	1.03	0.144	SPO3506	1.02	0.876	SPO3496	2.71	0.007	SPO3496	2.54	0.004	SPO3496	0.92	0.650	SPO3492	0.88	0.379
SPO3504	1.39	0.053	SPO3504	1.22	0.408	SPO3504	1.08	0.608	SPO3507	1	0.027	SPO3499	1.25	0.027	SPO3499	0.93	0.439	SPO3499	1.09	0.099	SPO3493	1.04	0.926
SPO3505	1.04	0.094	SPO3505	0.79	0.19	SPO3505	1.24	0.429	SPO3508	1.1	0.18	SPO3500	2.14	0.002	SPO3500	1.98	0.004	SPO3500	1.13	0.026	SPO3494	0.92	0.201
SPO3506	0.89	0.51	SPO3506	0.83	0.119	SPO3506	1.68	0.3	SPO3509	1.03	0.139	SPO3501	1.65	0.013	SPO3501	1.62	0.021	SPO3501	1.05	0.328	SPO3495	0.80	0.159
SPO3507	2.05	0.015	SPO3507	1.84	0.013	SPO3507	1.2	0.025	SPO3510	1.11	0.024	SPO3502	0.97	0.938	SPO3502	0.97	0.895	SPO3502	0.95	0.939	SPO3496	0.90	0.408
SPO3508	1.18	0.13	SPO3508	1.18	0.089	SPO3508	1.09	0.316	SPO3511	1.22	0.545	SPO3503	1.24	0.250	SPO3503	1.05	0.404	SPO3503	1.04	0.784	SPO3499	1.23	0.034
SPO3509	3.67	0.002	SPO3509	2.4	0.016	SPO3509	1.02	0.115	SPO3512	1.09	0.604	SPO3504	1.05	0.598	SPO3504	1.05	0.796	SPO3504	1.16	0.248	SPO3500	1.19	0.027
SPO3510	1.04	0.869	SPO3510	0.93	0.506	SPO3510	1	0.068	SPO3513	1.05	0.369	SPO3505	0.98	0.741	SPO3505	1.10	0.788	SPO3505	1.01	0.910	SPO3501	1.07	0.449
SPO3511	1.5	0.086	SPO3511	1.22	0.089	SPO3511	1.3	0.068	SPO3514	1.03	0.11	SPO3506	0.72	0.132	SPO3506	0.79	0.134	SPO3506	1.00	0.978	SPO3502	1.02	0.952
SPO3512	0.92	0.921	SPO3512	0.92	0.527	SPO3512	1.14	0.533	SPO3515	1.36	0.294	SPO3507	0.65	0.031	SPO3507	0.68	0.108	SPO3507	0.88	0.084	SPO3503	0.97	0.912
SPO3513	2.49	0.074	SPO3513	2.09	0.051	SPO3513	1.17	0.507	SPO3516	1.8	0.227	SPO3508	1.56	0.052	SPO3508	1.45	0.018	SPO3508	1.08	0.665	SPO3504	1.02	0.964
SPO3514	1.79	0.003	SPO3514	1.58	0.005	SPO3514	1.12	0.124	SPO3517	1.14	0.042	SPO3509	0.88	0.835	SPO3509	0.89	0.632	SPO3509	0.97	0.906	SPO3505	1.06	0.580
SPO3515	1.26	0.744	SPO3515	1.69	0.356	SPO3515	1.29	0.689	SPO3518	1.14	0.474	SPO3510	2.38	0.004	SPO3510	2.30	0.002	SPO3510	1.41	0.357	SPO3506	0.96	0.758
SPO3516	1.67	0.079	SPO3516	1.54	0.018	SPO3516	1	0.268	SPO3519	1.04	0.721	SPO3511	0.76	0.170	SPO3511	0.79	0.202	SPO3511	0.93	0.781	SPO3507	0.91	0.405
SPO3517	1.56	0.005	SPO3517	1.5	0.03	SPO3517	1.06	0.038	SPO3520	1.41	0.091	SPO3512	1.01	0.363	SPO3512	0.93	0.695	SPO3512	0.86	0.438	SPO3508	1.12	0.563
SPO3518	0.93	0.574	SPO3518	0.92	0.479	SPO3518	1.03	0.223	SPO3521	1.21	0.629	SPO3513	0.82	0.753	SPO3513	0.80	0.740	SPO3513	1.08	0.699	SPO3509	0.96	0.951
SPO3519	0.87	0.465	SPO3519	0.91	0.578	SPO3519	1.2	0.873	SPO3522	1.11	0.28	SPO3514	0.93	0.197	SPO3514	1.00	0.102	SPO3514	0.98	0.651	SPO3510	1.32	0.009
SPO3520	0.74	0.491	SPO3520	0.79	0.128	SPO3520	1.2	0.027	SPO3523	1.08	0.147	SPO3515	0.40	0.123	SPO3515	0.42	0.254	SPO3515	0.82	0.503	SPO3511	0.92	0.811
SPO3521	0.74	0.173	SPO3521	0.8	0.314	SPO3521	1.04	0.359	SPO3524	1.48	0.049	SPO3516	0.88	0.935	SPO3516	0.99	0.571	SPO3516	1.10	0.775	SPO3512	0.93	0.409
SPO3522	0.54	0.058	SPO3522	0.6	0.053	SPO3522	1.07	0.072	SPO3525	1.07	0.114	SPO3517	0.68	0.017	SPO3517	0.69	0.046	SPO3517	1.09	0.167	SPO3513	0.99	0.947
SPO3523	0.85	0.128	SPO3523	0.85	0.168	SPO3523	1.02	0.224	SPO3526	1.01	0.04	SPO3518	0.99	0.575	SPO3518	1.04	0.580	SPO3518	1.06	0.167	SPO3514	0.95	0.815
SPO3524	0.77	0.089	SPO3524	0.77	0.171	SPO3524	1	0.176	SPO3527	1.01	0.147	SPO3519	0.93	0.962	SPO3519	0.88	0.936	SPO3519	0.88	0.662	SPO3515	0.99	0.952
SPO3525	0.71	0.069	SPO3525	0.76	0.141	SPO3525	1.12	0.015	SPO3528	1.26	0.201	SPO3520	2.93	0.022	SPO3520	2.30	0.011	SPO3520	1.38	0.020	SPO3516	1.02	0.804
SPO3526	0.85	0.235	SPO3526	0.74	0.156	SPO3526	1.02	0.115	SPO3529	1.23	0.846	SPO3521	2.55	0.006	SPO3521	2.59	0.010	SPO3521	1.08	0.623	SPO3517	1.01	0.565
SPO3527	0.5	0.027	SPO3527	0.52	0.02	SPO3527	1.21	0.154	SPO3530	1.1	0.985	SPO3522	2.49	0.057	SPO3522	2.54	0.032	SPO3522	0.95	0.888	SPO3518	1.07	0.221
SPO3528	0.91	0.108	SPO3528	0.85	0.487	SPO3528	1.12	0.661	SPO3531	1.06	0.119	SPO3523	6.21	0.002	SPO3523	5.68	0.001	SPO3523	1.15	0.224	SPO3519	0.86	0.366
SPO3529	0.85	0.487	SPO3529	0.88	0.565	SPO3529	1.08	0.801	SPO3532	1	0.124	SPO3524	7.48	0.001	SPO3524	6.68	0.001	SPO3524	1.06	0.573	SPO3520	1.36	0.058
SPO3530	1.06	0.814	SPO3530	0.92	0.923	SPO3530	1.47	0.323	SPO3533	1.02	0.047	SPO3525	8.39	0.001	SPO3525	8.25	0.000	SPO3525	1.17	0.303	SPO3521	0.99	0.971
SPO3531	1.44	0.04	SPO3531	1.32	0.018	SPO3531	1.29	0.4	SPO3534	1.1	0.673	SPO3526	6.83	0.002	SPO3526	6.66	0.001	SPO3526	1.10	0.132	SPO3522	1.04	0.770
SPO3532	0.69	0.032	SPO3532	0.67	0.02	SPO3532	1.23	0.004	SPO3535	1.01	0.554	SPO3527	4.65	0.006	SPO3527	4.95	0.003	SPO3527	1.21	0.010	SPO3523	1.09	0.412
SPO3533	0.97	0.914	SPO3533	0.88	0.304	SPO3533	1	0.039	SPO3536	1.11	0.671	SPO3528	0.68	0.069	SPO3528	0.67	0.010	SPO3528	1.05	0.458	SPO3524	1.12	0.193
SPO3534	1.38	0.082	SPO3534	1.18	0.126	SPO3534	1	0.949	SPO3537	1.12	0.762	SPO3529	0.16	0.002	SPO3529	0.17	0.000	SPO3529	0.94	0.425	SPO3525	1.20	0.034
SPO3535	1.37	0.129	SPO3535	1.23	0.176	SPO3535	1.06	0.434	SPO3538	1.02	0.523	SPO3530	0.88	0.840	SPO3530	0.79	0.618	SPO3530	1.11	0.834	SPO3526	1.20	0.052
SPO3536	1.02	0.916	SPO3536	0.97	0.995	SPO3536	1.02	0.862	SPO3539	1.34	0.408	SPO3531	0.60	0.021	SPO3531	0.62	0.021	SPO3531	1.02	0.575	SPO3527	1.30	0.176
SPO3537	1	0.967	SPO3537	1.01	0.897	SPO3537	1.06	0.746	SPO3540	1.3	0.44	SPO3532	6.07	0.004	SPO3532	4.93	0.003	SPO3532	1.30	0.045	SPO3528	1.07	0.057
SPO3538	1.35	0.387	SPO3538	1.31	0.361	SPO3538	1.1	0.564	SPO3541	1.5	0.526	SPO3533	0.34	0.006	SPO3533	0.36	0.010	SPO3533	0.88	0.745	SPO3529	0.88	0.390
SPO3539	1.31	0.126	SPO3539	1.27	0.084	SPO3539	1.02	0.454	SPO3542	0.99	0.978	SPO3534	0.82	0.152	SPO3534	0.88	0.222	SPO3534	1.05	0.824	SPO3530	1.00	0.983
SPO3540	2.3	0.113	SPO3540	2.09	0.046	SPO3540	1.1	0.098	SPO3543	1.06	0.576	SPO3535	0.98	0.843	SPO3535	1.07	0.164	SPO3535	0.99	0.991	SPO3531	0.99	0.957
SPO3541	1.1	0.597	SPO3541	1.15	0.419	SPO3541	1.06	0.638	SPO3544	1.09	0.857	SPO3536	1.33	0.353	SPO3536	1.30	0.186	SPO3536	0.98	0.966	SPO3532	1.28	0.108
SPO3542	1.04	0.874	SPO3542	1.02	0.787	SPO3542	1.17	0.89	SPO3545	1.06	0.891	SPO3537	0.87	0.867	SPO3537	0.88	0.940	SPO3537	0.95	0.949	SPO3533	0.87	0.636
SPO3543	1.57	0.444	SPO3543	1.55	0.426	SPO3543	1.23	0.548	SPO3546	1.08	0.792	SPO3538	0.58	0.260	SPO3538	0.56	0.338	SPO3538	0.98	0.980	SPO3534	1.01	0.972
SPO3544	0.92	0.977	SPO3544	0.84	0.804	SPO3544	1.08	0.733	SPO3547	1.05	0.043	SPO3539	1.20	0.085	SPO3539	1.24	0.070	SPO3539	0.95	0.912	SPO3535	1.03	0.711
SPO3545	1.05	0.903	SPO3545	1.05	0.917	SPO3545	1.09	0.852	SPO3548	1.18	0.782	SPO3540	0.71	0.043	SPO3540	0.75	0.098	SPO3540	1.33	0.438	SPO3536	1.06	0.731
SPO3546	1.01	0.899	SPO3546	1.02	0.713	SPO3546	1.01	0.985	SPO3549	1.26	0.528	SPO3541	1.13	0.399	SPO3541	1.04	0.596	SPO3541	0.96	0.732	SPO3537	0.96	0.955
SPO3547	0.5	0.025	SPO3547	0.56	0.018	SPO3547	1.03	0.094	SPO3550	1.09	0.543	SPO3542	0.97	0.864	SPO3542	1.03	0.403	SPO3542	0.81	0.466	SPO3538	0.94	0.906
SPO3548	1.22	0.819	SPO3548	1.07	0.935	SPO3548	1.12	0.748	SPO3551	1.05	0.974	SPO3543	0.66	0.332	SPO3543	0.88	0.747	SPO3543	0.53	0.480	SPO3539	1.02	0.927
SPO3549	0.97	0.932	SPO3549	1.03	0.689	SPO3549	1.08	0.377	SPO3552	1.03	0.693	SPO3544	1.10	0.964	SPO3544	0.96	0.380	SPO3544	0.99	0.883	SPO3540	1.08	0.789
SPO3550	1.09	0.834	SPO3550	1.01	0.9	SPO3550	1.07	0.668	SPO3553	1.03	0.285	SPO3545	0.98	0.991	SPO3545	1.02	0.980	SPO3545	0.78	0.749	SPO3541	0.91	0.410
SPO3551	1.12	0.8	SPO3551	1.21	0.43	SPO3551	1.1	0.977	SPO3554	1.05	0.297	SPO3546	0.71	0.179	SPO3546	0.70	0.258	SPO3546	1.03	0.868	SPO3542	0.85	0.354
SPO3552	1.22	0.316	SPO3552	1.21	0.097	SPO3552	1.2	0.646	SPO3555	1.08	0.107	SPO3547	8.61	0.001	SPO3547	8.45	0.002	SPO3547	1.26	0.196	SPO3543	0.65	0.628
SPO3553	1.36	0.195	SPO3553	1.19	0.382	SPO3553	1.37	0.743	SPO3556	1.01	0.567	SPO3548	0.55	0.665	SPO3548	0.57	0.654	SPO3548	0.85	0.896	SPO3544	1.02	0.912
SPO3554	1.35	0.283	SPO3554	1.15	0.566	SPO3554	1.06	0.511	SPO3557	1.13	0.991	SPO3549	1.07	0.767	SPO3549	1.17	0.582	SPO3549	1.08	0.871	SPO3545	0.87	0.838
SPO3555	0.94	0.797	SPO3555	0.89	0.248	SPO3555	1	0.055	SPO3558	1.19	0.037	SPO3550	0.68	0.434	SPO3550	0.80	0.550	SPO3550	0.99	0.996	SPO3546	0.99	0.987
SPO3556	1.54	0.205	SPO3556	1.46	0.369	SPO3556	1.12	0.191	SPO3559	1.01	0.108	SPO3551	1.08	0.818	SPO3551	1.05	0.841	SPO3551	1.07	0.914	SPO3547	1.25	0.038
SPO3557	1.08	0.56	SPO3557	0.97	0.925	SPO3557	1.09	0.566	SPO3560	0.99	0.778	SPO3552	1.07	0.803	SPO3552	1.13	0.283	SPO3552	1.20	0.722	SPO3548	0.87	0.893
SPO3558	0.74	0.333	SPO3558	0.74	0.221	SPO3558	1.06	0.168	SPO3561	1	0.832	SPO3553	0.86	0.450	SPO3553	1.11	0.214	SPO3553	1.03	0.878	SPO3549	1.09	0.579
SPO3559	0.78	0.187	SPO3559	0.79	0.14	SPO3559	1.06	0.143	SPO3562	1.26	0.55	SPO3554	0.72	0.403	SPO3554	0.72	0.080	SPO3554	0.93	0.828	SPO3550	0.87	0.774
SPO3560	0.93	0.977	SPO3560	1.25	0.545	SPO3560	1.02	0.672	SPO3563	1.07	0.67	SPO3555	0.90	0.568	SPO3555	0.90	0.496	SPO3555	0.92	0.445	SPO3551	1.03	0.922
SPO3561	1.05	0.886	SPO3561	1.15	0.806	SPO3561	1.17	0.817	SPO3564	1.07	0.416	SPO3556	0.59	0.313	SPO3556	0.59	0.418	SPO3556	0.89	0.706	SPO3552	1.15	0.443
SPO3562	1.16	0.19	SPO3562	1.03	0.653	SPO3562	0.99	0.949	SPO3565	1.05	0.713	SPO3557	1.11	0.761	SPO3557	1.13	0.751	SPO3557	1.05	0.876	SPO3553	1.02	0.924
SPO3563	0.9	0.849	SPO3563	1.02	0.598	SPO3563	1.14	0.683	SPO3566	1.16	0.16	SPO3558	1.66	0.155	SPO3558	1.91	0.057	SPO3558	1.36	0.168	SPO3554	0.98	0.930
SPO3564	0.81	0.274	SPO3564	0.77	0.477	SPO3564	1.17	0.915	SPO3567	1.02	0.763	SPO3559	2.24	0.075	SPO3559	1.84	0.023	SPO3559	1.05	0.918	SPO3555	0.93	0.115
SPO3565	1.52	0.02	SPO3565	1.34	0.069	SPO3565	1.15	0.954	SPO3568	1.05	0.244	SPO3560	0.96	0.678	SPO3560	1.00	0.639	SPO3560	0.58	0.119	SPO3556	0.82	0.649
SPO3566	0.9	0.62	SPO3566	1.08	0.33	SPO3566	1.15	0.093	SPO3569	1.09	0.412	SPO3561	0.75	0.696	SPO3561	0.71	0.632	SPO3561	0.88	0.811	SPO3557	0.92	0.678
SPO3567	1.01	0.727	SPO3567	0.94	0.899	SPO3567	1.12	0.971	SPO3570	1.18	0.72	SPO3562	1.16	0.585	SPO3562	1.12	0.782	SPO3562	0.98	0.825	SPO3558	1.24	0.315
SPO3568	0.93	0.766	SPO3568	0.94	0.622	SPO3568	1.04	0.158	SPO3571	1.04	0.509	SPO3563	1.01	0.973	SPO3563	1.10	0.705	SPO3563	0.98	0.119	SPO3559	1.24	0.060
SPO3569	1.57	0.052	SPO3569	1.39	0.183	SPO3569	1.01	0.18	SPO3572	1.01	0.731	SPO3564	0.88	0.930	SPO3564	0.93	0.348	SPO3564	0.93	0.834	SPO3560	0.83	0.648
SPO3570	1.32	0.347	SPO3570	1.32	0.114	SPO3570	1.05	0.729	SPO3573	1.11	0.437	SPO3565	0.80	0.847	SPO3565	0.66	0.569	SPO3565	0.85	0.623	SPO3561	0.86	0.829
SPO3571	1.5	0.052	SPO3571	1.43	0.02	SPO3571	1.05	0.646	SPO3574	1.13	0.386	SPO3566	2.19	0.004	SPO3566	2.10	0.017	SPO3566	0.92	0.595	SPO3562	1.00	0.928
SPO3572	0.93	0.98	SPO3572	0.93	0.992	SPO3572	1.37	0.972	SPO3575	1.02	0.57	SPO3567	0.81	0.749	SPO3567	0.75	0.566	SPO3567	0.94	0.796	SPO3563	0.99	0.892
SPO3573	0.74	0.065	SPO3573	0.77	0.163	SPO3573	1.44	0.783	SPO3576	1.16	0.627	SPO3568	0.85	0.720	SPO3568	0.88	0.950	SPO3568	1.02	0.763	SPO3564	1.02	0.898
SPO3574	0.9	0.314	SPO3574	0.92	0.698	SPO3574	1.43	0.258	SPO3577	1.07	0.989	SPO3569	0.88	0.939	SPO3569	0.79	0.774	SPO3569	0.89	0.723	SPO3565	0.88	0.518

SPO3575	1.21	0.554	SPO3575	1.13	0.728	SPO3575	1.22	0.855	SPO3578	1.11	0.741	SPO3570	1.86	0.047	SPO3570	1.97	0.005	SPO3570	1.12	0.575	SPO3566	0.97	0.967
SPO3576	0.86	0.424	SPO3576	0.99	0.955	SPO3576	1.24	0.725	SPO3579	1.13	0.953	SPO3571	1.23	0.247	SPO3571	1.43	0.049	SPO3571	1.29	0.417	SPO3567	1.00	0.961
SPO3577	0.97	0.901	SPO3577	0.95	0.945	SPO3577	1.13	0.321	SPO3580	1.22	0.03	SPO3572	0.85	0.781	SPO3572	0.78	0.510	SPO3572	0.93	0.819	SPO3568	1.05	0.702
SPO3578	0.91	0.404	SPO3578	0.99	0.887	SPO3578	1.11	0.235	SPO3581	1.17	0.278	SPO3573	1.37	0.110	SPO3573	1.38	0.020	SPO3573	1.15	0.332	SPO3569	0.86	0.463
SPO3579	0.94	0.944	SPO3579	1.03	0.674	SPO3579	1.11	0.617	SPO3582	1.14	0.447	SPO3574	1.55	0.005	SPO3574	1.70	0.060	SPO3574	1.11	0.754	SPO3570	1.14	0.195
SPO3580	1.09	0.023	SPO3580	0.81	0.081	SPO3580	1.27	0.555	SPO3583	1.12	0.319	SPO3575	0.91	0.879	SPO3575	0.83	0.720	SPO3575	0.76	0.090	SPO3571	1.20	0.457
SPO3581	1.08	0.944	SPO3581	1.04	0.387	SPO3581	1.12	0.76	SPO3584	1.04	0.557	SPO3576	1.38	0.087	SPO3576	1.31	0.079	SPO3576	1.15	0.438	SPO3572	0.95	0.808
SPO3582	1.39	0.036	SPO3582	1.37	0.021	SPO3582	1.15	0.937	SPO3585	1.36	0.805	SPO3577	1.00	0.938	SPO3577	0.99	0.725	SPO3577	0.99	0.865	SPO3573	1.20	0.108
SPO3583	1.02	0.692	SPO3583	1.08	0.269	SPO3583	1.13	0.2	SPO3586	1.47	0.361	SPO3578	0.68	0.041	SPO3578	0.68	0.014	SPO3578	0.89	0.334	SPO3574	0.97	0.916
SPO3584	1.45	0.063	SPO3584	1.44	0.087	SPO3584	1.12	0.364	SPO3587	1.56	0.036	SPO3579	1.47	0.115	SPO3579	1.38	0.072	SPO3579	1.04	0.868	SPO3575	0.80	0.155
SPO3585	0.97	0.936	SPO3585	0.98	0.94	SPO3585	1.02	0.78	SPO3588	1.19	0.591	SPO3580	1.13	0.611	SPO3580	1.99	0.025	SPO3580	1.14	0.539	SPO3576	1.09	0.424
SPO3586	0.75	0.716	SPO3586	0.85	0.618	SPO3586	1.18	0.552	SPO3589	1.28	0.478	SPO3581	1.43	0.336	SPO3581	1.24	0.176	SPO3581	1.12	0.766	SPO3577	1.02	0.989
SPO3587	0.89	0.232	SPO3587	0.86	0.284	SPO3587	1.02	0.245	SPO3590	1.14	0.147	SPO3582	1.00	0.369	SPO3582	0.96	0.149	SPO3582	1.00	0.971	SPO3578	0.90	0.796
SPO3588	1.12	0.525	SPO3588	0.83	0.664	SPO3588	1.31	0.477	SPO3591	1.12	0.114	SPO3583	0.96	0.873	SPO3583	1.13	0.293	SPO3583	1.00	0.930	SPO3579	1.00	0.790
SPO3589	1	0.697	SPO3589	1.19	0.093	SPO3589	1.13	0.787	SPO3592	1.12	0.118	SPO3584	0.88	0.580	SPO3584	1.00	0.563	SPO3584	1.00	0.805	SPO3580	1.26	0.277
SPO3590	0.58	0.019	SPO3590	0.67	0.016	SPO3590	1.04	0.103	SPO3593	1.37	0.591	SPO3585	1.07	0.552	SPO3585	1.02	0.564	SPO3585	0.91	0.719	SPO3581	1.07	0.430
SPO3591	1.36	0.06	SPO3591	1.17	0.036	SPO3591	1.15	0.155	SPO3594	1.14	0.942	SPO3586	1.03	0.707	SPO3586	0.96	0.811	SPO3586	1.00	0.931	SPO3582	1.08	0.634
SPO3592	0.88	0.252	SPO3592	0.93	0.662	SPO3592	0.98	0.138	SPO3595	1.17	0.179	SPO3587	1.07	0.030	SPO3587	1.13	0.023	SPO3587	1.16	0.113	SPO3583	1.05	0.796
SPO3593	0.69	0.474	SPO3593	0.75	0.133	SPO3593	1.07	0.885	SPO3596	1.15	0.059	SPO3588	0.83	0.408	SPO3588	0.95	0.516	SPO3588	0.92	0.642	SPO3584	1.02	0.990
SPO3594	1.46	0.526	SPO3594	1.38	0.422	SPO3594	1.19	0.958	SPO3597	1.15	0.037	SPO3589	0.67	0.070	SPO3589	0.71	0.108	SPO3589	0.53	0.091	SPO3585	0.95	0.855
SPO3595	1.04	0.432	SPO3595	1.11	0.385	SPO3595	1.2	0.087	SPO3598	1.12	0.351	SPO3590	0.76	0.185	SPO3590	0.68	0.030	SPO3590	1.06	0.596	SPO3586	1.04	0.749
SPO3596	0.71	0.492	SPO3596	0.76	0.616	SPO3596	1.57	0.03	SPO3599	0.99	0.089	SPO3591	0.57	0.068	SPO3591	0.58	0.001	SPO3591	0.93	0.488	SPO3587	1.29	0.018
SPO3597	1.36	0.379	SPO3597	1.18	0.427	SPO3597	1.06	0.053	SPO3600	1.21	0.141	SPO3592	0.95	0.568	SPO3592	1.00	0.279	SPO3592	1.17	0.560	SPO3588	1.09	0.878
SPO3598	1.25	0.358	SPO3598	1.39	0.003	SPO3598	1.17	0.123	SPO3601	1.09	0.906	SPO3593	0.83	0.467	SPO3593	0.79	0.324	SPO3593	0.90	0.490	SPO3589	0.63	0.400
SPO3599	0.99	0.939	SPO3599	1.28	0.238	SPO3599	1.12	0.601	SPO3602	1.13	0.432	SPO3594	0.92	0.976	SPO3594	0.92	0.958	SPO3594	0.98	0.987	SPO3590	1.08	0.605
SPO3600	3.01	0.035	SPO3600	2.87	0.048	SPO3600	1.11	0.133	SPO3603	1.1	0.94	SPO3595	0.97	0.763	SPO3595	1.03	0.828	SPO3595	0.88	0.267	SPO3591	0.97	0.835
SPO3601	1.01	0.927	SPO3601	1.03	0.655	SPO3601	1.26	0.653	SPO3604	1.06	0.328	SPO3596	0.62	0.551	SPO3596	0.61	0.495	SPO3596	0.86	0.822	SPO3592	1.19	0.348
SPO3602	0.79	0.286	SPO3602	0.85	0.501	SPO3602	1.02	0.68	SPO3605	1.08	0.11	SPO3597	0.56	0.168	SPO3597	0.60	0.066	SPO3597	0.93	0.581	SPO3593	0.92	0.216
SPO3603	0.89	0.766	SPO3603	0.98	0.998	SPO3603	1.63	0.591	SPO3606	1.08	0.849	SPO3598	0.88	0.628	SPO3598	0.89	0.589	SPO3598	0.87	0.755	SPO3594	1.02	0.942
SPO3604	1.29	0.141	SPO3604	1.11	0.358	SPO3604	1.3	0.711	SPO3607	1.14	0.837	SPO3599	1.02	0.180	SPO3599	0.82	0.967	SPO3599	0.88	0.408	SPO3595	1.01	0.992
SPO3605	1.01	0.58	SPO3605	1.05	0.165	SPO3605	1.03	0.018	SPO3608	1.02	0.357	SPO3600	0.26	0.034	SPO3600	0.25	0.027	SPO3600	1.42	0.069	SPO3596	0.87	0.729
SPO3606	1.22	0.129	SPO3606	1.21	0.438	SPO3606	1.05	0.683	SPO3609	1.14	0.867	SPO3601	1.25	0.376	SPO3601	1.12	0.442	SPO3601	0.98	0.909	SPO3597	0.88	0.488
SPO3607	0.56	0.642	SPO3607	0.68	0.789	SPO3607	1.24	0.874	SPO3610	1.54	0.948	SPO3602	1.63	0.028	SPO3602	1.52	0.010	SPO3602	1.02	0.861	SPO3598	0.86	0.350
SPO3608	0.88	0.541	SPO3608	0.85	0.283	SPO3608	1.19	0.263	SPO3611	1.05	0.229	SPO3603	0.90	0.993	SPO3603	0.85	0.982	SPO3603	0.99	0.989	SPO3599	0.95	0.884
SPO3609	1.78	0.025	SPO3609	1.4	0.042	SPO3609	1	0.656	SPO3612	1.11	0.394	SPO3604	0.29	0.014	SPO3604	0.31	0.014	SPO3604	1.15	0.205	SPO3600	1.47	0.138
SPO3610	1.26	0.859	SPO3610	1.16	0.907	SPO3610	1.06	0.95	SPO3613	1.1	0.059	SPO3605	0.42	0.006	SPO3605	0.38	0.010	SPO3605	1.25	0.187	SPO3601	0.90	0.483
SPO3611	0.77	0.402	SPO3611	0.82	0.104	SPO3611	1.01	0.351	SPO3614	1.19	0.244	SPO3606	0.19	0.005	SPO3606	0.19	0.006	SPO3606	0.99	0.989	SPO3602	1.05	0.563
SPO3612	1.36	0.216	SPO3612	1.33	0.051	SPO3612	1.06	0.195	SPO3615	1.25	0.04	SPO3607	0.25	0.523	SPO3607	0.24	0.495	SPO3607	1.75	0.658	SPO3603	1.06	0.894
SPO3613	1.19	0.44	SPO3613	0.99	0.433	SPO3613	1.21	0.768	SPO3616	1	0.514	SPO3608	2.06	0.032	SPO3608	2.05	0.013	SPO3608	1.06	0.495	SPO3604	1.12	0.318
SPO3614	1.02	0.597	SPO3614	1.02	0.425	SPO3614	1	0.288	SPO3617	1.02	0.227	SPO3609	1.67	0.059	SPO3609	1.69	0.008	SPO3609	1.25	0.165	SPO3605	1.25	0.110
SPO3615	0.87	0.591	SPO3615	0.89	0.765	SPO3615	1.02	0.062	SPO3618	1.72	0.996	SPO3610	0.61	0.742	SPO3610	0.67	0.811	SPO3610	0.95	0.971	SPO3606	0.99	0.974
SPO3616	1.62	0.021	SPO3616	1.52	0.026	SPO3616	1	0.468	SPO3619	1.35	0.991	SPO3611	1.46	0.296	SPO3611	1.47	0.042	SPO3611	1.01	0.955	SPO3607	1.65	0.664
SPO3617	1.11	0.174	SPO3617	1.04	0.318	SPO3617	1.2	0.406	SPO3620	1.07	0.659	SPO3612	2.00	0.048	SPO3612	2.10	0.004	SPO3612	0.82	0.301	SPO3608	1.10	0.485
SPO3618	1.41	0.255	SPO3618	1.2	0.611	SPO3618	1.12	0.74	SPO3621	1.18	0.445	SPO3613	0.15	0.006	SPO3613	0.18	0.004	SPO3613	1.05	0.974	SPO3609	1.20	0.132
SPO3619	1.34	0.01	SPO3619	1.12	0.152	SPO3619	1.34	0.755	SPO3622	1.09	0.192	SPO3614	1.05	0.966	SPO3614	1.01	0.771	SPO3614	1.01	0.940	SPO3610	0.88	0.932
SPO3620	0.99	0.963	SPO3620	1	0.846	SPO3620	1.17	0.525	SPO3623	1.02	0.32	SPO3615	0.93	0.879	SPO3615	0.90	0.759	SPO3615	1.01	0.978	SPO3611	0.92	0.805
SPO3621	0.8	0.015	SPO3621	0.94	0.426	SPO3621	1.1	0.526	SPO3625	1.07	0.053	SPO3616	0.69	0.073	SPO3616	0.69	0.031	SPO3616	1.04	0.629	SPO3612	0.85	0.276
SPO3622	1.34	0.018	SPO3622	1.25	0.044	SPO3622	1.01	0.065	SPO3626	1.01	0.913	SPO3617	2.12	0.003	SPO3617	2.23	0.000	SPO3617	0.93	0.470	SPO3613	0.98	0.676
SPO3623	1.7	0.039	SPO3623	1.64	0.08	SPO3623	1.12	0.859	SPO3627	1.26	0.914	SPO3618	1.35	0.369	SPO3618	1.45	0.332	SPO3618	1.04	0.876	SPO3614	1.03	0.986
SPO3625	1.12	0.083	SPO3625	0.98	0.916	SPO3625	1.14	0.017	SPO3628	1.03	0.891	SPO3619	1.07	0.154	SPO3619	1.00	0.171	SPO3619	1.00	0.774	SPO3615	0.92	0.609
SPO3626	1.12	0.748	SPO3626	0.98	0.997	SPO3626	1.19	0.822	SPO3629	1.15	0.599	SPO3620	0.97	0.544	SPO3620	0.97	0.427	SPO3620	0.97	0.974	SPO3616	0.99	0.847
SPO3627	1.23	0.597	SPO3627	1.29	0.815	SPO3627	1.03	0.926	SPO3630	1.19	0.47	SPO3621	1.48	0.040	SPO3621	1.51	0.005	SPO3621	1.02	0.852	SPO3617	0.87	0.094
SPO3628	1.32	0.047	SPO3628	1.25	0.132	SPO3628	1.03	0.282	SPO3631	1.19	0.672	SPO3622	1.06	0.173	SPO3622	1.20	0.138	SPO3622	1.08	0.496	SPO3618	1.06	0.895
SPO3629	1.23	0.227	SPO3629	1.11	0.078	SPO3629	1.02	0.329	SPO3632	1.34	0.337	SPO3623	1.18	0.031	SPO3623	1.19	0.076	SPO3623	1.31	0.035	SPO3619	0.99	0.872
SPO3630	1.11	0.293	SPO3630	1.18	0.178	SPO3630	1.02	0.464	SPO3633	1.15	0.662	SPO3625	1.24	0.064	SPO3625	1.14	0.052	SPO3625	1.17	0.296	SPO3620	0.91	0.646
SPO3631	0.96	0.831	SPO3631	1.12	0.32	SPO3631	1.26	0.251	SPO3634	1.18	0.434	SPO3626	0.85	0.865	SPO3626	0.92	0.908	SPO3626	1.01	0.913	SPO3621	0.96	0.835
SPO3632	1.32	0.037	SPO3632	1.25	0.049	SPO3632	1.32	0.037	SPO3635	1.01	0.418	SPO3627	0.70	0.460	SPO3627	0.57	0.708	SPO3627	0.97	0.948	SPO3622	1.05	0.735
SPO3633	1.57	0.253	SPO3633	1.38	0.042	SPO3633	1.4	0.928	SPO3636	1.03	0.928	SPO3628	1.00	0.723	SPO3628	1.02	0.435	SPO3628	1.32	0.093	SPO3623	1.15	0.077
SPO3634	1.53	0.235	SPO3634	1.41	0.141	SPO3634	1	0.727	SPO3637	1.2	0.973	SPO3629	1.15	0.052	SPO3629	1.22	0.025	SPO3629	1.14	0.375	SPO3625	1.07	0.625
SPO3635	1.27	0.067	SPO3635	1.3	0.063	SPO3635	1.07	0.525	SPO3638	1.18	0.292	SPO3630	0.93	0.837	SPO3630	0.89	0.632	SPO3630	0.99	0.979	SPO3626	1.05	0.852
SPO3636	0.86	0.614	SPO3636	0.85	0.49	SPO3636	1.24	0.926	SPO3639	1.09	0.086	SPO3631	1.17	0.062	SPO3631	1.01	0.507	SPO3631	0.81	0.358	SPO3627	0.99	0.996
SPO3637	0.98	0.995	SPO3637	1.04	0.47	SPO3637	1.49	0.959	SPO3640	1.14	0.553	SPO3632	0.86	0.442	SPO3632	0.96	0.141	SPO3632	0.93	0.559	SPO3628	1.22	0.300
SPO3638	1.29	0.351	SPO3638	1.28	0.399	SPO3638	1.11	0.35	SPO3641	1.11	0.818	SPO3633	1.05	0.876	SPO3633	1.00	0.982	SPO3633	1.20	0.770	SPO3629	1.21	0.287
SPO3639	1.51	0.119	SPO3639	1.33	0.04	SPO3639	1.46	0.103	SPO3642	1.05	0.938	SPO3634	0.66	0.467	SPO3634	0.67	0.335	SPO3634	0.89	0.824	SPO3630	1.02	0.875
SPO3640	1.45	0.431	SPO3640	1.39	0.388	SPO3640	1.49	0.053	SPO3643	1.3	0.308	SPO3635	1.11	0.111	SPO3635	1.06	0.187	SPO3635	1.02	0.813	SPO3631	0.76	0.286
SPO3641	1.14	0.343	SPO3641	1.1	0.606	SPO3641	1.25	0.447	SPO3644	1.28	0.395	SPO3636	1.08	0.656	SPO3636	1.15	0.328	SPO3636	0.92	0.715	SPO3632	0.88	0.284
SPO3642	0.84	0.457	SPO3642	0.92	0.733	SPO3642	1.27	0.76	SPO3645	1.5	0.447	SPO3637	1.07	0.624	SPO3637	1.11	0.251	SPO3637	1.17	0.238	SPO3633	1.02	0.885
SPO3643	1.49	0.385	SPO3643	1.32	0.094	SPO3643	1.1	0.915	SPO3646	0.98	0.372	SPO3638	1.04	0.721	SPO3638	0.99	0.825	SPO3638	1.04	0.821	SPO3634	0.93	0.848
SPO3644	0.97	0.769	SPO3644	1.1	0.379	SPO3644	1.11	0.106	SPO3647	0.98	0.878	SPO3639	1.05	0.112	SPO3639	1.10	0.073	SPO3639	1.02	0.814	SPO3635	0.95	0.768
SPO3645	1.1	0.409	SPO3645	1.11	0.105	SPO3645	1.14	0.212	SPO3648	1.13	0.757	SPO3640	1.09	0.592	SPO3640	1.16	0.572	SPO3640	1.14	0.550	SPO3636	0.86	0.466
SPO3646	0.88	0.377	SPO3646	0.96	0.837	SPO3646	1.07	0.529	SPO3649	1.59	0.798	SPO3641	0.65	0.201	SPO3641	0.69	0.168	SPO3641	0.91	0.630	SPO3637	1.07	0.705
SPO3647	0.68	0.257	SPO3647	0.78	0.137	SPO3647	1.07	0.305	SPO3650	1.1	0.504	SPO3642	0.86	0.667	SPO3642	0.93	0.983	SPO3642	0.96	0.883	SPO3638	0.98	0.948
SPO3648	1.22	0.377	SPO3648	1.28	0.204	SPO3648	1.33	0.805	SPO3651	1.4	0.177	SPO3643	0.85	0.620	SPO3643	0.81	0.232	SPO3643	1.08	0.769	SPO3639	0.97	0.888
SPO3649	1.32	0.07	SPO3649	1.2	0.131	SPO3649	1.35	0.727	SPO3652	1.54	0.863	SPO3644	1.05	0.980	SPO3644	0.87	0.217	SPO3644	0.89	0.483	SPO3640	1.09	0.883
SPO3650	0.81	0.543	SPO3650	0.91	0.61	SPO3650	1.15	0.373	SPO3653	1.19	0.467	SPO3645	1.02	0.512	SPO3645	1.23	0.173	SPO3645	0.92	0.512	SPO3641	0.93	0.711
SPO3651	0.77	0.246	SPO3651	0.8	0.729	SPO3651	1.15	0.838	SPO3654	1.25	0.794	SPO3646	0.61	0.022	SPO3646	0.60	0.053	SPO3646	0.90	0.550	SPO3642	0.94	0.875
SPO3652	1.16	0.322	SPO3652	1.07	0.268	SPO3652	1.29	0.282	SPO3655	1.05	0.571	SPO3647	0.97	0.885	SPO3647	0.82	0.191	SPO3647	1.05	0.870	SPO3643	0.99	0.940
SPO3653	1.52	0.073	SPO3653	1.22	0.172	SPO3653	1.04	0.769	SPO3656	1.18	0.135	SPO3648	0.85	0.672	SPO3648	0.85	0.704	SPO3648	1.08	0.709	SPO3644	0.81	0.276
SPO3654	1.19	0.247	SPO3654	1.28	0.117	SPO3654	1.53	0.878	SPO3657	1.05	0.44	SPO3649	1.15	0.276	SPO3649	1.17	0.195	SPO3649	1.15	0.595	SPO3645	0.96	0.842
SPO3655	1.23	0.456	SPO3655	1.16	0.799	SPO3655	1.21	0.783	SPO3658	1.15	0.611	SPO3650	0.71	0.243	SPO3650	0.65	0.007	SPO3650	0.78	0.297	SPO3646	0.91	0.587
SPO3656	1.17	0.164	SPO3656	1.18	0.066	SPO3656	1.11	0.316	SPO3659	1.03	0.741	SPO3651	0.50	0.001	SPO3651	0.52	0.005	SPO3651	1.02	0.975	SPO3647	1.02	0.942
SPO3657	1.12	0.451	SPO3657	1.03	0.785	SPO3657	1.08	0.554	SPO3660	1.04	0.084	SPO3652	0.61	0.141	SPO3652	0.64	0.215	SPO3652	1.06	0.675	SPO3648	1.09	0.750
SPO3658	0.92	0.62	SPO3658	0.89	0.7	SPO3658	1.04	0.829	SPO3661	1.25	0.966	SPO3653	0.68	0.185	SPO3653	0.71	0.188	SPO3653	1.02	0.901	SPO3649	1.09	0.582
SPO3659	1.41	0.016	SPO3659	1.17	0.098	SPO3659	1.06	0.817	SPO3662	1.33	0.382	SPO3654	0.81	0.888	SPO3654	0.84	0.820	SPO3654	1.01	0.783	SPO3650	0.84	0.088
SPO3660	1.02	0.523	SPO3660	1.02	0.246	SPO3660	1.21	0.745	SPO3663	1.15	0.997	SPO3655	0.87	0.777	SPO3655	0.86	0.817	SPO3655	0.93	0.827	SPO3651	0.97	0.806
SPO3661	1.22	0.166	SPO3661	1.22	0.019	SPO3661	1.23	0.462	SPO3664	1.13	0.966	SPO3656	0.94	0.949	SPO3656	0.89	0.237	SPO3656	0.98	0.932	SPO3652	1.03	0.875
SPO3662	1.24	0.139	SPO3662	1.28	0.203	SPO3662	1.06	0.412	SPO3665	1.03	0.942	SPO3657	0.78	0.221	SPO3657	0.90	0.766	SPO3657	0.96	0.584	SPO3653	1.03	0.848
SPO3663	1.31	0.555	SPO3663	1.24	0.734	SPO3663	1.07	0.977	SPO3666	1.07	0.578	SPO3658	1.63	0.062	SPO3658	1.80	0.015	SPO3658	0.84	0.362	SPO3654	1.00	0.952
SPO3664	1.13	0.079	SPO3664	1.24	0.096	SPO3664	1.07	0.923	SPO3667	1.53	0.085	SPO3659	1.02	0.503	SPO3659	1.00	0.929	SPO3659	1.18	0.360	SPO3655	0.88	0.656
SPO3665	0.85	0.093	SPO3665	0.95	0.819	SPO3665	1.09	0.995	SPO3668	1.12	0.612	SPO3660	1.43	0.069	SPO3660	1.50	0.016	SPO3660	1.13	0.692	SPO3656	1.01	0.908
SPO3666	1.54	0.011	SPO3666	1.53	0.015	SPO3666	1.14	0.843	SPO3670	1.13	0.75	SPO3661	1.03	0.931	SPO3661	1.09	0.633	SPO3661	1.01	0.925	SPO3657	0.89	0.358
SPO3667	0.82	0.427	SPO3667	0.95	0.852	SPO3667	1.19	0.375	SPO3671	1.16	0.018	SPO3662	1.34	0.274	SPO3662	1.23	0.403	SPO3662	1.12	0.662	SPO3658	0.73	0.080
SPO3668	1.17	0.628	SPO3668	1.15	0.493	SPO3668	1.11	0.555	SPO3672	1.07	0.85	SPO3663	0.93	0.967	SPO3663	0.91	0.978	SPO3663	1.09	0.780	SPO3659	1.17	0.135
SPO3670	1	0.679	SPO3670	1.08	0.548	SPO3670	1.02	0.67	SPO3673	1.12	0.01	SPO3664	1.45	0.093	SPO3664	1.34	0.004	SPO3664	1.12	0.329	SPO3660	1.23	0.366
SPO3671	0.38	0.009	SPO3671	0.44	0.005	SPO3671	1.05	0.012	SPO3675	1.19	0.47	SPO3665	1.69	0.057	SPO3665	1.65	0.016	SPO3665	1.01	0.759	SPO3661	1.09	0.494
SPO3672	0.72	0.555	SPO3672	0.67	0.465	SPO3672	1.03	0.827	SPO3676	1.27	0.472	SPO3666	0.95	0.594	SPO3666	1.13	0.648	SPO3666	1.18	0.387	SPO3662	1.20	0.042
SPO3673	0.92	0.082	SPO3673	0.95	0.64	SPO3673	1.01	0.018	SPO3677	1.08	0.232	SPO3667	0.84	0.096	SPO3667	0.88	0.040	SPO3667	0.97	0.768	SPO3663	1.13	0.776
SPO3675	1.02	0.71	SPO3675	1.06	0.645	SPO3675	1.15	0.585	SPO3678	1	0.839	SPO3668	1.04	0.979	SPO3668	0.95	0.716	SPO3668	0.94	0.781	SPO3664	1.09	0.175
SPO3676	1.3	0.281	SPO3676	1.04	0.24	SPO3676	1.23	0.112	SPO3679	1	0.641	SPO3670	0.73	0.208	SPO3670	0.86	0.315	SPO3670	1.58	0.280	SPO3665	1.05	0.612
SPO3677	0.82	0.345	SPO3677	0.83	0.12	SPO3677	1.08	0.43	SPO3680	1.07	0.425	SPO3671	1.31	0.070	SPO3671	1.26	0.032	SPO3671	1.12	0.067	SPO3666	1.14	0.467
SPO3678	0.96	0.995	SPO3678	0.98	0.948	SPO3678	1.04	0.83	SPO3681	1.15	0.686	SPO3672	1.03	0.733	SPO3672	0.93	0.979	SPO3672	1.07	0.865	SPO3667	0.86	0.292
SPO3679	0.7	0.144	SPO3679	0.79	0.281	SPO3679	1.21	0.905	SPO3682	1.07	0.853	SPO3673	1.70	0.009	SPO3673	1.70	0.024	SPO3673	1.06	0.213	SPO3668	0.97	0.937
SPO3680	0.96	0.977	SPO3680	0.93	0.885	SPO3680	1.36	0.474	SPO3684	1.19	0.054	SPO3675	0.48	0.088	SPO3675	0.45	0.042	SPO3675	1.04	0.911	SPO3670	1.21	0.716
SPO3681	0.62	0.169	SPO3681	0.69	0.132	SPO3681	1.17	0.817	SPO3685	1.17	0.088	SPO3676	1.07	0.996	SPO3676	1.19	0.280	SPO3676	1.24	0.115	SPO3671	1.16	0.329
SPO3682	0.83	0.35	SPO3682	0.81	0.344	SPO3682	1.15	0.763	SPO3686	1.02	0.181	SPO3677	2.22	0.031	SPO3677	1.67	0.047	SPO3677	1.18	0.337	SPO3672	1.06	0.873
SPO3684	1.06	0.635	SPO3684	1.15	0.136	SPO3684	1.27	0.397	SPO3687	1.17	0.632	SPO3678	0.93	0.921	SPO3678	1.02	0.951	SPO3678	1.00	0.990	SPO3673	1.14	0.068
SPO3685	1.06	0.744	SPO3685	1.06	0.7	SPO3685	1.29	0.321	SPO3688	1.18	0.922	SPO3679	1.16	0.449	SPO3679	1.06	0.477	SPO3679	0.95	0.309	SPO3675	1.09	0.542
SPO3686	0.76	0.017	SPO3686	0.76	0.399	SPO3686	1.32	0.419	SPO3689	1.05	0.986	SPO3680	0.65	0.174	SPO3680	0.68	0.090	SPO3680	0.83	0.189	SPO3676	1.06	0.732
SPO3687	0.8	0.121	SPO3687	0.78	0.082	SPO3687	1.08	0.698	SPO3690	1.06	0.158	SPO3681	0.86	0.605	SPO3681	0.83	0.328	SPO3681	0.88	0.360	SPO3677	1.12	0.485
SPO3688	0.93	0.959	SPO3688	0.92	0.953	SPO3688	1.16	0.818	SPO3691	1.28	0.361	SPO3682	1.49	0.063	SPO3682	1.42	0.150	SPO3682	1.04	0.973	SPO3678	0.93	0.877
SPO3689	0.88	0.332	SPO3689	0.97	0.978	SPO3689	1	0.958	SPO3692	1.55	0.32	SPO3684	0.56	0.014	SPO3684	0.57	0.016	SPO3684	0.96	0.526	SPO3679	0.97	0.836
SPO3690	0.56	0.04	SPO3690	0.63	0.018	SPO3690	1.13	0.562	SPO3693	1.03	0.089	SPO3685	1.10	0.502	SPO3685	1.10	0.213	SPO3685	1.60	0.304	SPO3680	0.87	0.534
SPO3691	0.92	0.677	SPO3691	0.87	0.265	SPO3691	1.08	0.86	SPO3694	1.04	0.229	SPO3686	1.05	0.141	SPO3686	1.07	0.150	SPO3686	0.98	0.960	SPO3681	0.89	0.508
SPO3692	0.76	0.175	SPO3692	0.82	0.179	SPO3692	1.09	0.119	SPO3695	1.01	0.963	SPO3687	1.03	0.736	SPO3687	1.16	0.167	SPO3687	1.07	0.324	SPO3682	1.08	0.834
SPO3693	0.6	0.014	SPO3693	0.67	0.024	SPO3693	1.17	0.002	SPO3696	1.17	0.65	SPO3688	1.13	0.768	SPO3688	1.16	0.758	SPO3688	1.01	0.992	SPO3684	0.92	0.226
SPO3694	1.01	0.771	SPO3694	0.97	0.993	SPO3694	1.13	0.236	SPO3697	1.4	0.127	SPO3689	1.19	0.218	SPO3689	1.06	0.097	SPO3689	1.10	0.635	SPO3685	1.63	0.105
SPO3695	1.06	0.892	SPO3695	1.04	0.866	SPO3695	1.15	0.917	SPO3698	1.25	0.247	SPO3690	1.62	0.011	SPO3690	1.60	0.002	SPO3690	0.97	0.952	SPO3686	1.06	0.598
SPO3696	0.6	0.207	SPO3696	0.72	0.322	SPO3696	1.09	0.206	SPO3699	1.24	0.025	SPO3691	1.22	0.043	SPO3691	1.19	0.081	SPO3691	1.06	0.115	SPO3687	1.08	0.523
SPO3697	0.72	0.153	SPO3697	0.78	0.237	SPO3697	1.04	0.171	SPO3700	1.16	0.015	SPO3692	2.00	0.037	SPO3692	1.97	0.029	SPO3692	1.03	0.790	SPO3688	0.94	0.902
SPO3698	0.85	0.245	SPO3698	0.86	0.335	SPO3698	1.09	0.273	SPO3701	1.13	0.317	SPO3693	2.33	0.004	SPO3693	2.22	0.018	SPO3693	0.96	0.982	SPO3689	1.00	0.953
SPO3699	0.65	0.046	SPO3699	0.67	0.013	SPO3699	1	0.126	SPO3702	1.01	0.686	SPO3694	1.83	0.013	SPO3694	1.79	0.026	SPO3694	0.93	0.575	SPO3690	0.97	0.837
SPO3700	0.57	0.066	SPO3700	0.65	0.043	SPO3700	1.08	0.032	SPO3703	1.12	0.939	SPO3695	1.10	0.751	SPO3695	1.05	0.779	SPO3695	0.86	0.814	SPO3691	1.04	0.447
SPO3701	0.69	0.388	SPO3701	0.69	0.374	SPO3701	1.52	0.138	SPO3704	1	0.296	SPO3696	1.74	0.137	SPO3696	1.64	0.157	SPO3696	0.95	0.808	SPO3692	1.04	0.783
SPO3702	0.76	0.502	SPO3702	0.89	0.745	SPO3702	0.98	0.47	SPO3705	1.08	0.054	SPO3697	2.39	0.014	SPO3697	2.27	0.005	SPO3697	0.96	0.800	SPO3693	0.91	0.714
SPO3703	0.81	0.865	SPO3703	0.97	0.981	SPO3703	1.1	0.898	SPO3706	1.18	0.948	SPO3698	1.61	0.170	SPO3698	1.66	0.152	SPO3698	0.97	0.908	SPO3694	0.93	0.547
SPO3704	1.1	0.552	SPO3704	1.1	0.44	SPO3704	1.33	0.286	SPO3707	1.05	0.798	SPO3699	2.53	0.020	SPO3699	2.26	0.004	SPO3699	1.10	0.463	SPO3695	0.88	0.772
SPO3705	0.56	0.018	SPO3705	0.62	0.091	SPO3705	1.07	0.497	SPO3708	1.14	0.755	SPO3700	4.33	0.009	SPO3700	4.09	0.002	SPO3700	0.91	0.529	SPO3696	0.96	0.887
SPO3706	1.04	0.474	SPO3706	1.07	0.756	SPO3706	1.24	0.437	SPO3709	1.12	0.997	SPO3701	3.19	0.056	SPO3701	3.33	0.072	SPO3701	1.05	0.898	SPO3697	0.96	0.836
SPO3707	0.67	0.561	SPO3707	0.68	0.523	SPO3707	1.22	0.99	SPO3710	1.09	0.594	SPO3702	0.48	0.075	SPO3702	0.43	0.077	SPO3702	0.88	0.841	SPO3698	0.96	0.890
SPO3708	1.07	0.658	SPO3708	1.03	0.769	SPO3708	1.07	0.765	SPO3711	1.1	0.252	SPO3703	0.58	0.293	SPO3703	0.56	0.288	SPO3703	0.96	0.958	SPO3699	1.04	0.788
SPO3709	1.04	0.765	SPO3709	0.97	0.991	SPO3709	1.01	0.981	SPO3712	1.57	0.413	SPO3704	0.80	0.395	SPO3704	0.83	0.103	SPO3704	0.91	0.735	SPO3700	1.01	0.906
SPO3710	0.84	0.561	SPO3710	1.01	0.5	SPO3710	1.21	0.436	SPO3713	0.98	0.184	SPO3705	1.13	0.458	SPO3705	1.05	0.369	SPO3705	0.92	0.687	SPO3701	1.11	0.783
SPO3711	1.14	0.313	SPO3711	1.17	0.023	SPO3711	1.31	0.647	SPO3714	1.16	0.819	SPO3706	1.73	0.068	SPO3706	1.71	0.023	SPO3706	0.97	0.853	SPO3702	0.91	0.812
SPO3712	1.49	0.073	SPO3712	1.43	0.04	SPO3712	1.11	0.217	SPO3715	1.28	0.84	SPO3707	1.41	0.476	SPO3707	1.42	0.183	SPO3707	1.31	0.683	SPO3703	0.93	0.778
SPO3713	0.88	0.069	SPO3713	0.79	0.036	SPO3713	1.02	0.729	SPO3716	1.03	0.736	SPO3708	0.98	0.901	SPO3708	0.79	0.389	SPO3708	0.92	0.773	SPO3704	0.99	0.909
SPO3714	1.64	0.003	SPO3714	1.82	0.002	SPO3714	1.07	0.854	SPO3717	1.24	0.864	SPO3709	0.92	0.969	SPO3709	0.83	0.917	SPO3709	0.87	0.925	SPO3705	0.93	0.449
SPO3715	1.22	0.194	SPO3715	1.25	0.282	SPO3715	1.11	0.866	SPO3718	1.13	0.079	SPO3710	0.91	0.550	SPO3710	0.87	0.378	SPO3710	0.93	0.281	SPO3706	0.94	0.719
SPO3716	0.87	0.851	SPO3716	1.32	0.165	SPO3716	1.3	0.817	SPO3719	1.11	0.961	SPO3711	0.90	0.192	SPO3711	0.87	0.318	SPO3711	0.95	0.823	SPO3707	1.23	0.729
SPO3717	0.92	0.738	SPO3717	0.88	0.616	SPO3717	1.08	0.979	SPO3720	1.25	0.175	SPO3712	0.94	0.681	SPO3712	0.93	0.621	SPO3712	1.06	0.608	SPO3708	0.92	0.789

SPO3718	1.18	0.293	SPO3718	1.19	0.057	SPO3718	1.1	0.249	SPO3721	1.34	0.202	SPO3713	1.58	0.005	SPO3713	1.57	0.005	SPO3713	1.06	0.127	SPO3709	0.88	0.934
SPO3719	0.91	0.705	SPO3719	0.99	0.942	SPO3719	1.16	0.948	SPO3722	1.12	0.56	SPO3714	0.60	0.007	SPO3714	0.59	0.007	SPO3714	1.46	0.044	SPO3710	1.00	0.952
SPO3720	1.38	0.055	SPO3720	1.48	0.015	SPO3720	1.09	0.173	SPO3723	0.99	0.416	SPO3715	0.88	0.988	SPO3715	0.83	0.883	SPO3715	1.08	0.737	SPO3711	0.96	0.771
SPO3721	1.43	0.111	SPO3721	1.49	0.147	SPO3721	1.09	0.565	SPO3724	1.04	0.58	SPO3716	1.06	0.906	SPO3716	1.08	0.991	SPO3716	1.21	0.293	SPO3712	1.01	0.782
SPO3722	0.85	0.522	SPO3722	0.9	0.681	SPO3722	1.1	0.766	SPO3725	1.1	0.768	SPO3717	0.88	0.586	SPO3717	0.87	0.599	SPO3717	0.97	0.846	SPO3713	1.08	0.421
SPO3723	1.06	0.336	SPO3723	0.9	0.686	SPO3723	1	0.342	SPO3726	1.11	0.997	SPO3718	0.57	0.087	SPO3718	0.53	0.004	SPO3718	0.74	0.015	SPO3714	1.46	0.071
SPO3724	0.94	0.846	SPO3724	1.06	0.552	SPO3724	1.22	0.751	SPO3727	1.32	0.064	SPO3719	0.96	0.517	SPO3719	0.94	0.264	SPO3719	1.00	0.747	SPO3715	1.07	0.737
SPO3725	0.98	0.969	SPO3725	0.98	0.952	SPO3725	1.09	0.732	SPO3728	1.19	0.685	SPO3720	0.58	0.018	SPO3720	0.54	0.009	SPO3720	1.00	0.733	SPO3716	1.07	0.779
SPO3726	1.07	0.714	SPO3726	1.09	0.71	SPO3726	1.05	0.783	SPO3729	1.08	0.041	SPO3721	0.15	0.002	SPO3721	0.14	0.001	SPO3721	0.93	0.679	SPO3717	1.04	0.817
SPO3727	0.86	0.333	SPO3727	0.94	0.813	SPO3727	1.06	0.346	SPO3730	1.08	0.063	SPO3722	0.19	0.001	SPO3722	0.19	0.007	SPO3722	0.99	0.850	SPO3718	0.74	0.113
SPO3728	0.99	0.951	SPO3728	0.97	0.838	SPO3728	1.25	0.811	SPO3731	1.17	0.728	SPO3723	0.44	0.026	SPO3723	0.41	0.021	SPO3723	0.97	0.660	SPO3719	1.04	0.790
SPO3729	1.05	0.704	SPO3729	0.96	0.918	SPO3729	1.05	0.252	SPO3732	1.12	0.757	SPO3724	0.45	0.007	SPO3724	0.52	0.016	SPO3724	1.00	0.826	SPO3720	1.01	0.783
SPO3730	1.61	0.102	SPO3730	1.5	0.075	SPO3730	1.5	0.481	SPO3733	1.01	0.4	SPO3725	1.04	0.566	SPO3725	1.07	0.460	SPO3725	0.88	0.583	SPO3721	1.03	0.937
SPO3731	1.02	0.601	SPO3731	1.05	0.279	SPO3731	1.39	0.278	SPO3734	1.24	0.019	SPO3726	0.94	0.694	SPO3726	0.95	0.460	SPO3726	1.06	0.734	SPO3722	0.96	0.672
SPO3732	1.02	0.651	SPO3732	1.04	0.226	SPO3732	1.14	0.334	SPO3736	1.06	0.941	SPO3727	1.65	0.050	SPO3727	1.55	0.013	SPO3727	1.05	0.600	SPO3723	1.02	0.994
SPO3733	1.1	0.309	SPO3733	1.09	0.221	SPO3733	1.14	0.038	SPO3737	1.05	0.546	SPO3728	1.39	0.020	SPO3728	1.44	0.011	SPO3728	0.88	0.237	SPO3724	1.15	0.734
SPO3734	0.99	0.926	SPO3734	1.06	0.316	SPO3734	1.18	0.432	SPO3738	1.06	0.203	SPO3729	1.43	0.046	SPO3729	1.53	0.022	SPO3729	1.00	0.882	SPO3725	0.91	0.707
SPO3735	1.16	0.399	SPO3735	0.99	0	SPO3735	1.02	0.058	SPO3739	1.22	0.888	SPO3730	0.54	0.037	SPO3730	0.61	0.375	SPO3730	1.16	0.119	SPO3726	1.09	0.626
SPO3736	0.99	0.93	SPO3736	1.05	0.665	SPO3736	1.22	0.936	SPO3740	1.05	0.28	SPO3731	2.05	0.046	SPO3731	1.95	0.012	SPO3731	0.95	0.160	SPO3727	1.16	0.063
SPO3737	1.26	0.224	SPO3737	1.25	0.037	SPO3737	1.34	0.2	SPO3741	1.33	0.235	SPO3732	1.05	0.328	SPO3732	1.04	0.349	SPO3732	0.99	0.902	SPO3728	0.92	0.560
SPO3738	1.32	0.069	SPO3738	1.35	0.01	SPO3738	1.31	0.514	SPO3742	1.39	0.771	SPO3733	0.73	0.070	SPO3733	0.73	0.166	SPO3733	1.15	0.157	SPO3729	1.04	0.527
SPO3739	0.79	0.263	SPO3739	0.85	0.835	SPO3739	1.15	0.663	SPO3743	1.23	0.47	SPO3734	1.11	0.718	SPO3734	1.08	0.654	SPO3734	0.96	0.912	SPO3730	1.09	0.249
SPO3740	0.79	0.127	SPO3740	0.75	0.134	SPO3740	1.13	0.307	SPO3744	1.13	0.81	SPO3735	0.88		SPO3735	0.73	0.086	SPO3735	1.20	0.483	SPO3731	0.98	0.932
SPO3741	0.59	0.092	SPO3741	0.6	0.033	SPO3741	1.42	0.282	SPO3745	1.05	0.379	SPO3736	0.76	0.397	SPO3736	0.74	0.227	SPO3736	1.02	0.868	SPO3732	1.07	0.463
SPO3742	0.74	0.13	SPO3742	0.81	0.274	SPO3742	1.3	0.914	SPO3746	1.13	0.121	SPO3737	0.85	0.437	SPO3737	0.88	0.577	SPO3737	1.08	0.790	SPO3733	1.11	0.434
SPO3743	1.21	0.219	SPO3743	1.18	0.119	SPO3743	1.27	0.578	SPO3747	1.37	0.692	SPO3738	1.46	0.128	SPO3738	1.71	0.001	SPO3738	1.11	0.662	SPO3734	0.94	0.670
SPO3744	0.94	0.853	SPO3744	0.96	0.95	SPO3744	1.23	0.721	SPO3748	1.34	0.791	SPO3739	0.72	0.395	SPO3739	0.66	0.499	SPO3739	0.97	0.952	SPO3735	0.85	0.483
SPO3745	0.97	0.724	SPO3745	1.01	0.723	SPO3745	1.15	0.123	SPO3749	1.22	0.786	SPO3740	0.46	0.005	SPO3740	0.44	0.006	SPO3740	0.97	0.984	SPO3736	1.02	0.816
SPO3746	0.84	0.065	SPO3746	0.88	0.317	SPO3746	1.13	0.005	SPO3750	1.02	0.205	SPO3741	0.55	0.132	SPO3741	0.57	0.036	SPO3741	0.98	0.992	SPO3737	1.05	0.337
SPO3747	0.9	0.194	SPO3747	0.85	0.139	SPO3747	1.04	0.103	SPO3751	1.42	0.238	SPO3742	0.71	0.110	SPO3742	0.76	0.025	SPO3742	0.91	0.397	SPO3738	1.15	0.029
SPO3748	0.75	0.082	SPO3748	0.71	0.029	SPO3748	1.06	0.64	SPO3752	1.18	0.554	SPO3743	0.89	0.706	SPO3743	0.88	0.548	SPO3743	1.05	0.491	SPO3739	0.97	0.943
SPO3749	0.75	0.426	SPO3749	0.68	0.641	SPO3749	1.09	0.671	SPO3753	1.33	0.358	SPO3744	0.77	0.845	SPO3744	0.82	0.998	SPO3744	0.86	0.829	SPO3740	1.03	0.138
SPO3750	0.56	0.082	SPO3750	0.68	0.149	SPO3750	1.05	0.568	SPO3754	1.22	0.301	SPO3745	2.67	0.003	SPO3745	1.73	0.020	SPO3745	1.09	0.453	SPO3741	1.06	0.796
SPO3751	1.5	0.007	SPO3751	1.53	0.025	SPO3751	1.07	0.558	SPO3755	1.03	0.179	SPO3746	1.93	0.015	SPO3746	1.80	0.023	SPO3746	1.00	0.872	SPO3742	0.87	0.171
SPO3752	1.46	0.272	SPO3752	1.53	0.06	SPO3752	1.28	0.574	SPO3756	1.2	0.29	SPO3747	0.88	0.380	SPO3747	0.96	0.906	SPO3747	0.96	0.276	SPO3743	1.01	0.856
SPO3753	1.74	0.138	SPO3753	1.71	0.045	SPO3753	1.11	0.583	SPO3757	1.04	0.622	SPO3748	0.80	0.744	SPO3748	0.75	0.631	SPO3748	0.74	0.504	SPO3744	0.96	0.991
SPO3754	0.71	0.004	SPO3754	0.66	0.005	SPO3754	1.12	0.837	SPO3758	1.11	0.333	SPO3749	0.99	0.938	SPO3749	0.96	0.977	SPO3749	0.99	0.989	SPO3745	0.97	0.917
SPO3755	0.86	0.168	SPO3755	0.91	0.444	SPO3755	1.03	0.05	SPO3759	1.05	0.985	SPO3750	1.43	0.162	SPO3750	1.44	0.068	SPO3750	1.20	0.398	SPO3746	1.02	0.716
SPO3756	1.4	0.383	SPO3756	1.32	0.256	SPO3756	1.12	0.396	SPO3760	1.1	0.357	SPO3751	0.59	0.017	SPO3751	0.60	0.106	SPO3751	1.08	0.825	SPO3747	0.99	0.982
SPO3757	0.9	0.253	SPO3757	0.89	0.444	SPO3757	16.3	0.639	SPO3761	1.1	0.934	SPO3752	0.66	0.027	SPO3752	0.75	0.112	SPO3752	1.06	0.823	SPO3748	0.78	0.206
SPO3758	0.8	0.141	SPO3758	0.85	0.375	SPO3758	7.12	0.229	SPO3762	1.12	0.619	SPO3753	0.55	0.086	SPO3753	0.55	0.017	SPO3753	1.14	0.546	SPO3749	1.00	0.992
SPO3759	1.61	0.128	SPO3759	1.55	0.028	SPO3759	20.8	0.271	SPO3763	1.25	0.968	SPO3754	0.90	0.366	SPO3754	1.00	0.867	SPO3754	1.09	0.351	SPO3750	1.24	0.244
SPO3760	0.97	0.98	SPO3760	1	0.794	SPO3760	9.92	0.308	SPO3764	1.1	0.807	SPO3755	1.29	0.121	SPO3755	1.28	0.172	SPO3755	1.08	0.653	SPO3751	1.21	0.559
SPO3761	1.14	0.335	SPO3761	1.08	0.378	SPO3761	1.33	0.872	SPO3765	1.13	0.556	SPO3756	1.03	0.701	SPO3756	1.08	0.038	SPO3756	1.07	0.755	SPO3752	1.06	0.811
SPO3762	1.65	0.087	SPO3762	1.53	0.028	SPO3762	1.34	0.708	SPO3766	1.07	0.652	SPO3757	0.91	0.763	SPO3757	0.93	0.136	SPO3757	0.91	0.646	SPO3753	1.07	0.674
SPO3763	1.51	0.031	SPO3763	1.56	0.033	SPO3763	1.02	0.904	SPO3767	1.18	0.024	SPO3758	1.29	0.074	SPO3758	1.22	0.027	SPO3758	0.95	0.953	SPO3754	1.04	0.556
SPO3764	1.25	0.135	SPO3764	1.16	0.083	SPO3764	1.01	0.541	SPO3768	14.7	0.021	SPO3759	1.00	0.549	SPO3759	0.98	0.484	SPO3759	1.11	0.318	SPO3755	1.07	0.533
SPO3765	0.75	0.167	SPO3765	0.75	0.311	SPO3765	1.03	0.381	SPO3769	6.08	0.733	SPO3760	1.48	0.322	SPO3760	1.42	0.302	SPO3760	1.18	0.543	SPO3756	1.07	0.336
SPO3766	1.21	0.522	SPO3766	1.21	0.058	SPO3766	1.28	0.614	SPO3770	16.4	0.514	SPO3761	1.16	0.064	SPO3761	1.23	0.014	SPO3761	1.05	0.498	SPO3757	0.91	0.351
SPO3767	0.65	0.012	SPO3767	0.65	0.017	SPO3767	1.17	0.01	SPO3771	7.7	0.865	SPO3762	2.73	0.016	SPO3762	2.69	0.024	SPO3762	1.27	0.160	SPO3758	0.99	0.863
SPO3768	2.29	0.005	SPO3768	1.97	0.002	SPO3768	1.21	0.019	SPO3772	1.25	0.252	SPO3763	1.27	0.047	SPO3763	1.32	0.106	SPO3763	0.96	0.804	SPO3759	1.07	0.456
SPO3769	1.27	0.615	SPO3769	1.28	0.694	SPO3769	1.1	0.685	SPO3774	1.34	0.394	SPO3764	1.04	0.351	SPO3764	1.10	0.208	SPO3764	0.93	0.709	SPO3760	1.20	0.519
SPO3770	1.61	0.114	SPO3770	1.56	0.067	SPO3770	1.11	0.549	SPO3775	1.01	0.725	SPO3765	0.84	0.789	SPO3765	0.75	0.392	SPO3765	0.81	0.538	SPO3761	1.07	0.360
SPO3771	0.88	0.729	SPO3771	1.11	0.868	SPO3771	1.07	0.958	SPO3776	1	0.663	SPO3766	0.96	0.902	SPO3766	0.94	0.776	SPO3766	1.04	0.942	SPO3762	1.26	0.097
SPO3772	1.73	0.02	SPO3772	1.65	0.043	SPO3772	1.17	0.404	SPO3777	1.1	0.943	SPO3767	4.19	0.006	SPO3767	4.19	0.005	SPO3767	1.23	0.045	SPO3763	0.88	0.386
SPO3774	0.88	0.61	SPO3774	0.88	0.505	SPO3774	1.35	0.429	SPO3778	1.08	0.44	SPO3768	0.21	0.001	SPO3768	0.21	0.002	SPO3768	1.12	0.201	SPO3764	0.94	0.428
SPO3775	0.96	0.918	SPO3775	0.93	0.899	SPO3775	1.14	0.324	SPO3779	1.08	0.361	SPO3769	0.59	0.601	SPO3769	0.55	0.521	SPO3769	1.16	0.801	SPO3765	0.85	0.354
SPO3776	1.15	0.706	SPO3776	1.03	0.846	SPO3776	1.21	0.46	SPO3780	1.04	0.173	SPO3770	0.19	0.032	SPO3770	0.19	0.026	SPO3770	1.05	0.823	SPO3766	1.03	0.872
SPO3777	0.89	0.79	SPO3777	0.97	0.886	SPO3777	1.18	0.854	SPO3781	1.35	0.298	SPO3771	1.16	0.505	SPO3771	1.22	0.352	SPO3771	1.02	0.881	SPO3767	1.26	0.122
SPO3778	0.85	0.263	SPO3778	0.98	0.79	SPO3778	1.19	0.374	SPO3782	1.17	0.823	SPO3772	0.99	0.403	SPO3772	0.97	0.267	SPO3772	1.04	0.687	SPO3768	1.05	0.676
SPO3779	1.68	0.099	SPO3779	1.57	0.32	SPO3779	1.08	0.87	SPO3783	1.14	0.449	SPO3774	1.93	0.064	SPO3774	1.96	0.037	SPO3774	0.55	0.040	SPO3769	1.15	0.830
SPO3780	1.56	0.09	SPO3780	1.44	0.076	SPO3780	1.08	0.123	SPO3784	1.21	0.949	SPO3775	1.11	0.546	SPO3775	1.13	0.451	SPO3775	0.78	0.122	SPO3770	1.08	0.718
SPO3781	0.63	0.616	SPO3781	0.67	0.626	SPO3781	1.24	0.416	SPO3785	1.04	0.029	SPO3776	0.83	0.673	SPO3776	0.79	0.592	SPO3776	0.73	0.477	SPO3771	1.08	0.724
SPO3782	1.08	0.755	SPO3782	0.93	0.972	SPO3782	1.5	0.952	SPO3786	1.02	0.608	SPO3777	1.22	0.401	SPO3777	1.19	0.426	SPO3777	0.77	0.348	SPO3772	1.08	0.394
SPO3783	1.11	0.499	SPO3783	1.18	0.433	SPO3783	1.05	0.459	SPO3787	1.12	0.146	SPO3778	0.91	0.824	SPO3778	0.81	0.419	SPO3778	0.70	0.245	SPO3774	0.55	0.045
SPO3784	1.29	0.662	SPO3784	1.19	0.701	SPO3784	1.23	0.939	SPO3788	1.31	0.787	SPO3779	0.89	0.660	SPO3779	0.85	0.446	SPO3779	0.97	0.495	SPO3775	0.83	0.074
SPO3785	1.14	0.255	SPO3785	1.11	0.138	SPO3785	1.21	0.101	SPO3789	1.14	0.48	SPO3780	0.64	0.163	SPO3780	0.61	0.121	SPO3780	0.93	0.830	SPO3776	0.77	0.503
SPO3786	1.09	0.236	SPO3786	1.01	0.776	SPO3786	1.2	0.928	SPO3790	1.3	0.929	SPO3781	4.86	0.216	SPO3781	4.46	0.191	SPO3781	1.05	0.955	SPO3777	0.85	0.306
SPO3787	1.69	0.05	SPO3787	1.63	0.169	SPO3787	1.11	0.164	SPO3791	1.18	0.275	SPO3782	1.28	0.615	SPO3782	1.26	0.594	SPO3782	1.14	0.759	SPO3778	0.79	0.310
SPO3788	1.18	0.69	SPO3788	1.12	0.548	SPO3788	1.05	0.219	SPO3792	1.22	0.824	SPO3783	1.17	0.831	SPO3783	1.46	0.162	SPO3783	1.13	0.698	SPO3779	0.96	0.747
SPO3789	1.21	0.486	SPO3789	1.18	0.576	SPO3789	0.99	0.83	SPO3794	1.15	0.686	SPO3784	1.05	0.990	SPO3784	1.26	0.824	SPO3784	1.10	0.911	SPO3780	0.92	0.754
SPO3790	1.26	0.714	SPO3790	1.18	0.712	SPO3790	1.19	0.819	SPO3795	1.15	0.726	SPO3785	1.00	0.580	SPO3785	0.91	0.146	SPO3785	0.94	0.752	SPO3781	1.07	0.860
SPO3791	1.04	0.539	SPO3791	1.02	0.467	SPO3791	1.03	0.294	SPO3802	1.21	0.705	SPO3786	1.08	0.816	SPO3786	1.01	0.823	SPO3786	1.08	0.771	SPO3782	1.11	0.817
SPO3792	1.02	0.693	SPO3792	1.08	0.308	SPO3792	1.02	0.988	SPO3803	1.62	0.419	SPO3787	0.67	0.222	SPO3787	0.73	0.051	SPO3787	0.97	0.731	SPO3783	1.00	0.936
SPO3794	0.76	0.734	SPO3794	0.77	0.817	SPO3793	1.41	0	SPO3804	1.05	0.865	SPO3788	1.06	0.906	SPO3788	1.11	0.475	SPO3788	0.92	0.753	SPO3784	0.95	0.908
SPO3795	0.79	0.629	SPO3795	0.81	0.82	SPO3794	0.99	0.803	SPO3805	1.23	0.045	SPO3789	0.94	0.684	SPO3789	1.21	0.473	SPO3789	1.01	0.898	SPO3785	0.94	0.581
SPO3802	0.92	0.928	SPO3802	0.92	0.932	SPO3795	1.12	0.809	SPO3806	1.32	0.24	SPO3790	0.87	0.828	SPO3790	1.00	0.907	SPO3790	0.87	0.819	SPO3786	1.09	0.807
SPO3803	1.46	0.493	SPO3803	1.22	0.443	SPO3802	1.1	0.746	SPO3807	1.26	0.444	SPO3791	1.27	0.122	SPO3791	1.33	0.248	SPO3791	1.06	0.914	SPO3787	1.12	0.632
SPO3804	0.9	0.866	SPO3804	0.91	0.894	SPO3803	1.26	0.575	SPO3808	1.11	0.987	SPO3792	1.39	0.600	SPO3792	1.17	0.734	SPO3792	1.16	0.416	SPO3788	0.96	0.843
SPO3805	0.73	0.081	SPO3805	0.85	0.122	SPO3804	1.04	0.847	SPO3809	1.07	0.921	SPO3793	1.07		SPO3793	0.93		SPO3794	0.65	0.623	SPO3789	1.07	0.569
SPO3806	1.22	0.428	SPO3806	1.2	0.335	SPO3805	1.11	0.057	SPO3810	1.07	0.368	SPO3794	0.82	0.851	SPO3794	0.65	0.710	SPO3795	0.88	0.825	SPO3790	0.93	0.904
SPO3807	1.01	0.904	SPO3807	0.89	0.668	SPO3806	1.01	0.384	SPO3811	1.09	0.621	SPO3795	1.72	0.486	SPO3795	1.82	0.525	SPO3802	1.04	0.969	SPO3791	1.10	0.569
SPO3808	0.92	0.881	SPO3808	0.95	0.979	SPO3807	1.22	0.253	SPO3812	1.12	0.63	SPO3802	0.71	0.400	SPO3802	0.81	0.565	SPO3803	0.76	0.515	SPO3792	1.22	0.421
SPO3809	0.93	0.958	SPO3809	0.97	0.991	SPO3808	1.16	0.942	SPO3813	1.05	0.216	SPO3803	0.65	0.277	SPO3803	0.64	0.107	SPO3804	0.96	0.960	SPO3793	1.00	
SPO3810	0.67	0.044	SPO3810	0.78	0.166	SPO3809	1.11	0.856	SPO3814	1.35	0.116	SPO3804	0.91	0.973	SPO3804	0.85	0.904	SPO3805	1.01	0.901	SPO3794	0.72	0.705
SPO3811	0.89	0.681	SPO3811	0.98	0.893	SPO3810	1.07	0.719	SPO3815	1.03	0.422	SPO3805	1.83	0.051	SPO3805	1.67	0.015	SPO3806	1.04	0.718	SPO3795	0.96	0.950
SPO3812	1.23	0.516	SPO3812	1.14	0.677	SPO3811	1.14	0.453	SPO3816	1.17	0.257	SPO3806	1.38	0.015	SPO3806	1.52	0.007	SPO3807	0.95	0.882	SPO3802	0.95	0.905
SPO3813	1.27	0.021	SPO3813	1.15	0.058	SPO3812	1.19	0.692	SPO3817	1.02	0.286	SPO3807	0.89	0.823	SPO3807	0.85	0.732	SPO3808	0.87	0.655	SPO3803	0.78	0.475
SPO3814	1.05	0.563	SPO3814	1.11	0.216	SPO3813	1.17	0.253	SPO3818	1.08	0.018	SPO3808	0.76	0.754	SPO3808	0.68	0.336	SPO3809	0.83	0.846	SPO3804	1.02	0.960
SPO3815	1.21	0.559	SPO3815	1.17	0.452	SPO3814	1.03	0.49	SPO3819	1.24	0.521	SPO3809	0.85	0.917	SPO3809	0.81	0.900	SPO3810	0.95	0.921	SPO3805	1.16	0.186
SPO3816	1.1	0.116	SPO3816	1.13	0.089	SPO3815	1.13	0.383	SPO3820	1.07	0.909	SPO3810	2.32	0.025	SPO3810	2.08	0.019	SPO3811	0.92	0.746	SPO3806	1.07	0.426
SPO3817	1.07	0.465	SPO3817	1.13	0.123	SPO3816	1.02	0.296	SPO3821	1	0.895	SPO3811	1.68	0.026	SPO3811	1.54	0.070	SPO3812	0.97	0.991	SPO3807	0.88	0.732
SPO3818	1.17	0.187	SPO3818	1.12	0.086	SPO3817	1.1	0.899	SPO3822	1.15	0.584	SPO3812	0.83	0.842	SPO3812	0.79	0.762	SPO3813	0.93	0.502	SPO3808	0.95	0.919
SPO3819	1.38	0.153	SPO3819	1.36	0.205	SPO3818	1.18	0.251	SPO3823	1.37	0.176	SPO3813	0.89	0.572	SPO3813	0.94	0.938	SPO3814	0.92	0.282	SPO3809	0.89	0.915
SPO3820	0.99	0.978	SPO3820	1.02	0.923	SPO3819	1.13	0.244	SPO3824	1.73	0.218	SPO3814	1.31	0.022	SPO3814	1.23	0.034	SPO3815	1.11	0.621	SPO3810	1.08	0.555
SPO3821	0.74	0.489	SPO3821	0.78	0.573	SPO3820	1.11	0.901	SPO3825	1.08	0.937	SPO3815	0.63	0.333	SPO3815	0.65	0.346	SPO3816	0.98	0.898	SPO3811	0.95	0.877
SPO3822	0.84	0.032	SPO3822	0.83	0.089	SPO3821	1.09	0.783	SPO3826	1.1	0.476	SPO3816	0.62	0.013	SPO3816	0.61	0.023	SPO3817	0.98	0.833	SPO3812	0.86	0.738
SPO3823	2.21	0.011	SPO3823	2.03	0.012	SPO3822	1.16	0.163	SPO3827	1.17	0.843	SPO3817	1.01	0.190	SPO3817	0.97	0.187	SPO3818	1.29	0.121	SPO3813	0.95	0.788
SPO3824	1.74	0.008	SPO3824	1.6	0.01	SPO3823	1.15	0.105	SPO3828	1.15	0.393	SPO3818	1.73	0.070	SPO3818	1.88	0.003	SPO3819	0.96	0.785	SPO3814	0.90	0.069
SPO3825	1.16	0.248	SPO3825	1.37	0.185	SPO3824	1.05	0.158	SPO3829	1.16	0.793	SPO3819	1.29	0.190	SPO3819	1.35	0.117	SPO3820	0.94	0.918	SPO3815	1.04	0.864
SPO3826	1.16	0.198	SPO3826	1.27	0.166	SPO3825	1.06	0.828	SPO3830	1.18	0.884	SPO3820	0.64	0.420	SPO3820	0.65	0.390	SPO3821	1.11	0.726	SPO3816	1.08	0.662
SPO3827	1.34	0.505	SPO3827	1.4	0.746	SPO3826	1.02	0.749	SPO3831	1.16	0.374	SPO3821	0.87	0.868	SPO3821	0.85	0.839	SPO3822	1.05	0.607	SPO3817	1.04	0.237
SPO3828	0.98	0.966	SPO3828	1.01	0.621	SPO3827	1.17	0.914	SPO3832	1.06	0.677	SPO3822	0.80	0.407	SPO3822	0.85	0.486	SPO3823	1.50	0.030	SPO3818	1.34	0.051
SPO3829	0.84	0.331	SPO3829	0.94	0.871	SPO3828	1.06	0.974	SPO3833	1.11	0.302	SPO3823	1.30	0.059	SPO3823	1.42	0.035	SPO3824	1.11	0.384	SPO3819	1.07	0.520
SPO3830	0.86	0.326	SPO3830	0.91	0.131	SPO3829	1.02	0.943	SPO3834	1.29	0.039	SPO3824	1.31	0.002	SPO3824	1.27	0.001	SPO3825	1.08	0.187	SPO3820	1.01	0.982
SPO3831	0.83	0.466	SPO3831	0.86	0.201	SPO3830	1.27	0.991	SPO3835	1.18	0.567	SPO3825	1.71	0.044	SPO3825	1.50	0.039	SPO3826	1.01	0.453	SPO3821	1.12	0.794
SPO3832	1.07	0.439	SPO3832	1.13	0.116	SPO3831	0.99	0.386	SPO3836	1.1	0.228	SPO3826	1.67	0.003	SPO3826	1.72	0.004	SPO3827	0.88	0.907	SPO3822	1.11	0.060
SPO3833	1.18	0.36	SPO3833	1.29	0.052	SPO3832	1.01	0.712	SPO3837	1.12	0.239	SPO3827	0.80	0.871	SPO3827	0.75	0.830	SPO3828	1.14	0.585	SPO3823	1.49	0.109
SPO3834	2.3	0.013	SPO3834	1.69	0.021	SPO3833	1.14	0.756	SPO3838	1.1	0.48	SPO3828	1.10	0.587	SPO3828	1.10	0.425	SPO3829	1.03	0.832	SPO3824	0.98	0.260
SPO3835	1.38	0.032	SPO3835	1.33	0.015	SPO3834	1.15	0.305	SPO3839	1.2	0.043	SPO3829	1.01	0.311	SPO3829	0.96	0.260	SPO3830	0.93	0.861	SPO3825	1.17	0.050
SPO3836	1.36	0.008	SPO3836	1.39	0.029	SPO3835	1.07	0.148	SPO3840	1.15	0.809	SPO3830	0.79	0.327	SPO3830	0.79	0.336	SPO3831	0.97	0.874	SPO3826	1.09	0.101
SPO3837	1.55	0.17	SPO3837	1.6	0.017	SPO3836	1.05	0.258	SPO3841	1.06	0.045	SPO3831	1.07	0.375	SPO3831	1.39	0.225	SPO3832	1.13	0.539	SPO3827	0.88	0.883
SPO3838	1.26	0.225	SPO3838	1.35	0.036	SPO3837	1.04	0.552	SPO3842	1.07	0.077	SPO3832	0.99	0.774	SPO3832	0.93	0.537	SPO3833	1.11	0.673	SPO3828	1.15	0.512
SPO3839	1.06	0.357	SPO3839	1.17	0.347	SPO3838	1.18	0.69	SPO3843	1.19	0.38	SPO3833	1.35	0.258	SPO3833	1.46	0.099	SPO3834	0.85	0.343	SPO3829	1.06	0.721
SPO3840	2.07	0.007	SPO3840	1.88	0.094	SPO3839	1.07	0.151	SPO3844	1.01	0.922	SPO3834	0.72	0.158	SPO3834	0.75	0.060	SPO3835	1.08	0.189	SPO3830	0.91	0.787
SPO3841	1.11	0.017	SPO3841	1.15	0.099	SPO3840	1.41	0.714	SPO3845	0.99	0.123	SPO3835	0.77	0.046	SPO3835	0.77	0.140	SPO3836	1.01	0.851	SPO3831	1.06	0.446
SPO3842	1.36	0.085	SPO3842	1.19	0.131	SPO3841	1.27	0.075	SPO3846	1.14	0.22	SPO3836	0.91	0.710	SPO3836	0.88	0.494	SPO3837	1.12	0.660	SPO3832	1.02	0.897
SPO3843	1.59	0.099	SPO3843	1.43	0.043	SPO3842	1.4	0.308	SPO3847	0.97	0.524	SPO3837	1.15	0.062	SPO3837	1.17	0.150	SPO3838	1.07	0.532	SPO3833	1.15	0.357
SPO3844	1.32	0.11	SPO3844	1.26	0.308	SPO3843	1.16	0.075	SPO3848	1.2	0.607	SPO3838	1.27	0.025	SPO3838	1.29	0.035	SPO3839	0.73	0.179	SPO3834	0.88	0.161
SPO3845	1.95	0.121	SPO3845	1.71	0.087	SPO3844	1.18	0.998	SPO3849	1.07	0.84	SPO3839	0.53	0.067	SPO3839	0.49	0.028	SPO3840	0.85	0.434	SPO3835	1.10	0.298
SPO3846	1.25	0.139	SPO3846	1.19	0.082	SPO3845	1.04	0.218	SPO3850	1.1	0.993	SPO3840	0.79	0.798	SPO3840	0.82	0.950	SPO3841	0.88	0.264	SPO3836	0.98	0.857
SPO3847	1.34	0.432	SPO3847	1.05	0.038	SPO3846	1.22	0.047	SPO3851	1.06	0.724	SPO3841	0.73	0.035	SPO3841	0.72	0.031	SPO3842	0.07	0.001	SPO3837	1.04	0.861
SPO3848	0.68	0.246	SPO3848	0.71	0.191	SPO3847	1.07	0.921	SPO3852	1.09	0.375	SPO3842	1.55	0.088	SPO3842	1.65	0.052	SPO3843	0.53	0.163	SPO3838	1.10	0.353
SPO3849	0.94	0.992	SPO3849	1.04	0.695	SPO3848	1.04	0.552	SPO3853	1.09	0.744	SPO3843	0.74	0.365	SPO3843	0.65	0.079	SPO3844	1.01	0.976	SPO3839	0.88	0.312
SPO3850	0.91	0.869	SPO3850	0.91	0.883	SPO3849	1.15	0.491	SPO3854	1.1	0.419	SPO3844	0.80	0.638	SPO3844	0.79	0.617	SPO3845	1.00	0.947	SPO3840	0.83	0.447
SPO3851	0.99	0.962	SPO3851	0.93	0.467	SPO3850	1.1	0.932	SPO3855	1.16	0.823	SPO3845	0.50	0.102	SPO3845	0.48	0.054	SPO3846	0.90	0.216	SPO3841	0.84	0.068
SPO3852	1.14	0.058	SPO3852	1.13	0.088	SPO3851	0.98	0.606	SPO3856	1.51	0.825	SPO3846	0.45	0.017	SPO3846	0.47	0.005	SPO3847	0.99	0.996	SPO3842	0.08	0.002
SPO3853	0.93	0.821	SPO3853	0.92	0.809	SPO3852	1.06	0.974	SPO3857	1.21	0.115	SPO3847	1.09	0.147	SPO3847	1.16	0.013	SPO3848	0.95	0.800	SPO3843	0.51	0.118
SPO3854	1.63	0.017	SPO3854	1.48	0.408	SPO3853	1.07	0.726	SPO3858	1.32	0.215	SPO3848	0.88	0.582	SPO3848	0.87	0.416	SPO3849	1.00	0.916	SPO3844	0.92	0.756
SPO3855	0.84	0.847	SPO3855	0.88	0.223	SPO3854	1.42	0.341	SPO3859	1.17	0.237	SPO3849	0.90	0.078	SPO3849	0.85	0.126	SPO3850	1.00	0.957	SPO3845	0.99	0.948
SPO3856	0.93	0.2	SPO3856	1.01	0.945	SPO3855	1.38	0.263	SPO3860	1.2	0.065	SPO3850	0.67	0.614	SPO3850	0.60	0.521	SPO3851	0.91	0.510	SPO3846	0.84	0.160
SPO3857	1.7	0.145	SPO3857	1.42	0.063	SPO3856	1.15	0.374	SPO3861	1.07	0.594	SPO3851	0.89	0.903	SPO3851	0.91	0.312	SPO3852	0.96	0.862	SPO3847	0.96	0.530
SPO3858	1.1	0.45	SPO3858	1	0.665	SPO3857	1.09	0.239	SPO3862	1.28	0.915	SPO3852	0.81	0.467	SPO3852	0.79	0.306	SPO3853	1.11	0.510	SPO3848	0.97	0.858
SPO3859	1.2	0.199	SPO3859	1.02	0.772	SPO3858	1.15	0.247	SPO3863	1.03	0.927	SPO3853	1.35	0.146	SPO3853	1.44	0.131	SPO3854	1.05	0.940	SPO3849	1.02	0.996
SPO3860	0.7	0.391	SPO3860	0.78	0.554	SPO3859	1.15	0.109	SPO3864	1.04	0.27	SPO3854	0.90	0.512	SPO3854	0.91	0.786	SPO3855	0.89	0.783	SPO3850	0.88	0.854
SPO3861	1.49	0.277	SPO3861	1.43	0.219	SPO3860	1.08	0.282	SPO3865	1.14	0.155	SPO3855	1.41	0.052	SPO3855	1.47	0.008	SPO3856	0.81	0.608	SPO3851	0.85	0.209
SPO3862	0.74	0.847	SPO3862	0.63	0.807	SPO3861	1.23	0.506	SPO3866	1.08	0.339	SPO3856	0.89	0.963	SPO3856	0.88	0.945	SPO3857	1.00	0.970	SPO3852	0.95	0.882
SPO3863	1.42	0.318	SPO3863	1.31	0.597	SPO3862	1.19	0.873	SPO3867	1.06	0.37	SPO3857	0.70	0.309	SPO3857	0.67	0.044	SPO3858	0.83	0.051	SPO3853	1.13	0.675
SPO3864	1.06	0.39	SPO3864	1.06	0.172	SPO3863	1.08	0.752	SPO3868	1.09	0.198	SPO3858	1.06	0.106	SPO3858	1.06	0.069	SPO3859	0.95	0.896	SPO3854	0.93	0.842

SPO3865	0.88	0.071	SPO3865	0.93	0.087	SPO3864	1.12	0.001	SPO3869	1.01	0.903	SPO3859	1.53	0.086	SPO3859	1.36	0.071	SPO3860	0.89	0.688	SPO3855	0.88	0.375
SPO3866	1.2	0.124	SPO3866	1.08	0.416	SPO3865	1.04	0.135	SPO3870	1.03	0.856	SPO3860	0.79	0.483	SPO3860	0.75	0.058	SPO3861	0.93	0.867	SPO3856	0.85	0.528
SPO3867	1.07	0.725	SPO3867	1.11	0.047	SPO3866	1.08	0.39	SPO3871	1.38	0.945	SPO3861	0.72	0.395	SPO3861	0.68	0.330	SPO3862	0.79	0.878	SPO3857	0.90	0.676
SPO3868	0.67	0.215	SPO3868	0.72	0.385	SPO3867	1.47	0.291	SPO3872	1.43	0.787	SPO3862	0.91	0.998	SPO3862	0.85	0.978	SPO3863	1.03	0.834	SPO3858	0.85	0.117
SPO3869	0.83	0.446	SPO3869	0.89	0.784	SPO3868	1.01	0.292	SPO3873	1.15	0.692	SPO3863	0.90	0.749	SPO3863	0.98	0.976	SPO3864	0.99	0.971	SPO3859	0.74	0.286
SPO3870	1.24	0.107	SPO3870	1.14	0.213	SPO3869	1.16	0.965	SPO3874	1.14	0.083	SPO3864	0.92	0.939	SPO3864	0.91	0.986	SPO3865	1.01	0.772	SPO3860	0.93	0.589
SPO3871	1.02	0.801	SPO3871	1.1	0.59	SPO3870	1.08	0.569	SPO3875	1.26	0.037	SPO3865	0.98	0.223	SPO3865	1.04	0.467	SPO3866	1.07	0.705	SPO3861	0.93	0.874
SPO3872	1.02	0.924	SPO3872	1.02	0.4	SPO3871	1.26	0.474	SPO3876	1.2	0.127	SPO3866	0.79	0.403	SPO3866	0.86	0.454	SPO3867	1.02	0.971	SPO3862	0.85	0.896
SPO3873	0.79	0.052	SPO3873	0.94	0.939	SPO3872	1.06	0.515	SPO3877	1.7	0.912	SPO3867	0.79	0.432	SPO3867	0.85	0.130	SPO3868	0.87	0.278	SPO3863	0.97	0.971
SPO3874	1.62	0.027	SPO3874	1.37	0.147	SPO3873	1.12	0.789	SPO3878	1.3	0.073	SPO3868	0.33	0.034	SPO3868	0.37	0.034	SPO3869	0.98	0.982	SPO3864	0.93	0.364
SPO3875	1.02	0.574	SPO3875	1.03	0.219	SPO3874	1.13	0.067	SPO3879	1.29	0.529	SPO3869	1.09	0.582	SPO3869	1.14	0.219	SPO3870	1.20	0.011	SPO3865	1.01	0.341
SPO3876	0.91	0.828	SPO3876	0.95	0.974	SPO3875	1.35	0.058	SPO3880	1.09	0.54	SPO3870	0.93	0.385	SPO3870	0.99	0.976	SPO3871	1.10	0.475	SPO3866	1.13	0.534
SPO3877	1.02	0.28	SPO3877	1.04	0.362	SPO3876	1.14	0.035	SPO3881	1.09	0.839	SPO3871	1.16	0.291	SPO3871	1.23	0.267	SPO3872	0.93	0.271	SPO3867	0.93	0.543
SPO3878	1.41	0.037	SPO3878	1.16	0.387	SPO3877	1	0.975	SPO3882	1.02	0.009	SPO3872	1.18	0.109	SPO3872	1.22	0.066	SPO3873	0.93	0.331	SPO3868	0.89	0.506
SPO3879	0.79	0.868	SPO3879	0.93	0.486	SPO3878	1.42	0.193	SPO3883	1.13	0.318	SPO3873	0.99	0.929	SPO3873	0.88	0.570	SPO3874	0.85	0.290	SPO3869	1.02	0.900
SPO3880	1.36	0.493	SPO3880	1.34	0.348	SPO3879	1.22	0.594	SPO3884	1.44	0.394	SPO3874	0.49	0.013	SPO3874	0.49	0.067	SPO3875	0.91	0.290	SPO3870	1.11	0.441
SPO3881	0.92	0.762	SPO3881	0.87	0.573	SPO3880	1.24	0.532	SPO3885	1.09	0.975	SPO3875	1.03	0.571	SPO3875	1.16	0.098	SPO3876	0.95	0.413	SPO3871	1.07	0.792
SPO3882	0.78	0.013	SPO3882	0.87	0.173	SPO3881	1.05	0.358	SPO3886	1.08	0.076	SPO3876	1.20	0.370	SPO3876	1.22	0.293	SPO3877	1.13	0.526	SPO3872	0.88	0.263
SPO3883	1.65	0.221	SPO3883	1.68	0.177	SPO3882	1.16	0.004	SPO3887	1.1	0.012	SPO3877	1.39	0.314	SPO3877	1.16	0.089	SPO3878	1.00	0.938	SPO3873	0.97	0.754
SPO3884	1.31	0.104	SPO3884	1.27	0.155	SPO3883	1.21	0.494	SPO3888	1.27	0.124	SPO3878	1.14	0.431	SPO3878	1.14	0.549	SPO3879	0.78	0.135	SPO3874	0.74	0.327
SPO3885	1.28	0.559	SPO3885	1.15	0.514	SPO3884	1.22	0.335	SPO3889	1.07	0.34	SPO3879	0.57	0.003	SPO3879	0.60	0.198	SPO3880	1.10	0.713	SPO3875	0.92	0.065
SPO3886	1.13	0.724	SPO3886	1.15	0.568	SPO3885	1.29	0.993	SPO3890	1.15	0.978	SPO3880	0.68	0.350	SPO3880	0.70	0.518	SPO3881	0.99	0.920	SPO3876	0.97	0.726
SPO3887	1.29	0.029	SPO3887	1.1	0.084	SPO3886	1.09	0.437	SPO3891	1.01	0.564	SPO3881	0.64	0.121	SPO3881	0.73	0.042	SPO3882	0.76	0.039	SPO3877	1.15	0.163
SPO3888	0.71	0.006	SPO3888	0.88	0.113	SPO3887	1.12	0.01	SPO3892	1.47	0.159	SPO3882	4.49	0.004	SPO3882	3.93	0.001	SPO3883	1.11	0.514	SPO3878	1.03	0.969
SPO3889	1.14	0.446	SPO3889	1.15	0.429	SPO3888	1.08	0.293	SPO3893	1.13	0.082	SPO3883	0.73	0.373	SPO3883	0.69	0.239	SPO3884	1.11	0.893	SPO3879	0.85	0.688
SPO3890	1.07	0.668	SPO3890	1.07	0.077	SPO3889	1.03	0.444	SPO3894	1.06	0.272	SPO3884	0.87	0.514	SPO3884	0.88	0.624	SPO3885	1.03	0.936	SPO3880	1.05	0.859
SPO3891	1.37	0.137	SPO3891	1.2	0.237	SPO3890	1.01	0.552	SPO3895	1.35	0.793	SPO3885	1.26	0.589	SPO3885	1.45	0.530	SPO3886	1.02	0.904	SPO3881	0.99	0.725
SPO3892	1.17	0.184	SPO3892	1.23	0.042	SPO3891	1.38	0.594	SPO3896	1.1	0.536	SPO3886	0.67	0.451	SPO3886	0.63	0.044	SPO3887	1.01	0.837	SPO3882	0.88	0.208
SPO3893	0.93	0.754	SPO3893	0.79	0.096	SPO3892	1.08	0.182	SPO3897	1.22	0.68	SPO3887	0.47	0.012	SPO3887	0.48	0.005	SPO3888	1.00	0.122	SPO3883	1.06	0.719
SPO3894	1.44	0.042	SPO3894	1.29	0.084	SPO3893	1.05	0.206	SPO3898	1.01	0.167	SPO3888	1.05	0.011	SPO3888	1.03	0.005	SPO3889	0.99	0.814	SPO3884	1.08	0.298
SPO3895	1.27	0.158	SPO3895	1.28	0.132	SPO3894	1.03	0.415	SPO3899	1.14	0.419	SPO3889	0.79	0.081	SPO3889	0.74	0.087	SPO3890	1.07	0.821	SPO3885	1.04	0.914
SPO3896	0.92	0.55	SPO3896	0.88	0.513	SPO3895	1.04	0.908	SPO3900	1.2	0.27	SPO3890	1.27	0.176	SPO3890	1.36	0.102	SPO3891	1.16	0.198	SPO3886	1.00	0.827
SPO3897	0.76	0.475	SPO3897	0.78	0.554	SPO3896	1.03	0.79	SPO3901	1.22	0.969	SPO3891	0.74	0.034	SPO3891	0.71	0.077	SPO3892	0.84	0.346	SPO3887	1.03	0.320
SPO3898	0.9	0.896	SPO3898	1.08	0.324	SPO3897	1	0.559	SPO3902	1.33	0.224	SPO3892	0.79	0.290	SPO3892	0.76	0.294	SPO3893	1.03	0.929	SPO3888	1.01	0.205
SPO3899	0.68	0.286	SPO3899	0.83	0.715	SPO3898	1.3	0.062	SPO3903	1.12	0.676	SPO3893	1.36	0.311	SPO3893	1.42	0.024	SPO3894	0.86	0.260	SPO3889	0.87	0.433
SPO3900	0.98	0.684	SPO3900	0.93	0.915	SPO3899	1.11	0.257	SPOA0001	1.12	0.459	SPO3894	1.87	0.017	SPO3894	1.80	0.003	SPO3895	0.92	0.702	SPO3890	1.06	0.819
SPO3901	1.11	0.925	SPO3901	1.16	0.897	SPO3900	1.07	0.183	SPOA0002	1.17	0.105	SPO3895	1.15	0.219	SPO3895	1.19	0.300	SPO3896	0.92	0.569	SPO3891	1.07	0.356
SPO3902	0.69	0.007	SPO3902	0.78	0.139	SPO3901	1.16	0.994	SPOA0003	1.3	0.212	SPO3896	1.06	0.200	SPO3896	1.11	0.349	SPO3897	1.31	0.356	SPO3892	0.88	0.461
SPO3903	1.79	0.003	SPO3903	1.67	0.011	SPO3902	1.25	0.242	SPOA0004	1.08	0.034	SPO3897	1.74	0.196	SPO3897	1.71	0.167	SPO3898	1.15	0.584	SPO3893	1.01	0.689
SPOA0001	0.94	0.934	SPOA0001	0.95	0.984	SPO3903	1.03	0.047	SPOA0005	1.06	0.015	SPO3898	0.92	0.516	SPO3898	1.00	0.970	SPO3899	1.09	0.625	SPO3894	0.86	0.088
SPOA0002	1.42	0.147	SPOA0002	1.3	0.067	SPOA0001	1.25	0.555	SPOA0006	1.16	0.065	SPO3899	1.96	0.013	SPO3899	2.03	0.027	SPO3900	1.04	0.720	SPO3895	0.96	0.842
SPOA0003	0.81	0.43	SPOA0003	0.77	0.097	SPOA0002	3.98	0.165	SPOA0007	1.16	0.107	SPO3900	1.03	0.784	SPO3900	1.17	0.346	SPO3901	0.97	0.988	SPO3896	0.97	0.927
SPOA0004	0.98	0.846	SPOA0004	1.03	0.486	SPOA0003	2.46	0.341	SPOA0008	1.09	0.795	SPO3901	0.66	0.842	SPO3901	0.46	0.623	SPO3902	0.94	0.771	SPO3897	1.28	0.574
SPOA0005	1.11	0.662	SPOA0005	1.14	0.042	SPOA0004	1.24	0.017	SPOA0009	1.22	0.219	SPO3902	1.09	0.083	SPO3902	1.02	0.378	SPO3903	1.10	0.703	SPO3898	1.06	0.797
SPOA0006	0.99	0.917	SPOA0006	0.94	0.868	SPOA0005	1.16	0.01	SPOA0010	1.15	0.698	SPO3903	0.52	0.043	SPO3903	0.56	0.008	SPOA0001	0.92	0.670	SPO3899	1.15	0.570
SPOA0007	1.51	0.012	SPOA0007	1.47	0.003	SPOA0006	1.18	0.162	SPOA0011	1.16	0.018	SPOA0001	0.90	0.752	SPOA0001	0.92	0.417	SPOA0002	1.10	0.579	SPO3900	1.14	0.317
SPOA0008	0.72	0.281	SPOA0008	0.8	0.322	SPOA0007	1.11	0.099	SPOA0012	1.25	0.102	SPOA0002	0.69	0.219	SPOA0002	0.75	0.042	SPOA0003	1.03	0.907	SPO3901	0.99	0.997
SPOA0009	1.18	0.014	SPOA0009	1.2	0.018	SPOA0008	1.22	0.847	SPOA0013	1.17	0.609	SPOA0003	0.53	0.070	SPOA0003	0.53	0.002	SPOA0004	0.92	0.674	SPO3902	0.93	0.239
SPOA0010	1.17	0.37	SPOA0010	1.1	0.109	SPOA0009	1.25	0.162	SPOA0014	1.05	0.126	SPOA0004	0.37	0.009	SPOA0004	0.37	0.008	SPOA0005	1.21	0.076	SPO3903	1.09	0.771
SPOA0011	1.13	0.046	SPOA0011	1.21	0.046	SPOA0010	1.14	0.158	SPOA0015	1.2	0.943	SPOA0005	0.39	0.002	SPOA0005	0.39	0.001	SPOA0006	1.04	0.723	SPOA0001	0.91	0.327
SPOA0012	1.29	0.086	SPOA0012	1.27	0.183	SPOA0011	1.46	0.032	SPOA0017	3.97	0.966	SPOA0006	0.65	0.125	SPOA0006	0.64	0.142	SPOA0007	0.93	0.503	SPOA0002	0.95	0.749
SPOA0013	0.81	0.29	SPOA0013	0.83	0.079	SPOA0012	2.05	0.369	SPOA0018	2.66	0.447	SPOA0007	0.80	0.171	SPOA0007	0.75	0.080	SPOA0008	0.98	0.948	SPOA0003	0.97	0.813
SPOA0014	1.09	0.749	SPOA0014	0.88	0.524	SPOA0013	1.06	0.374	SPOA0019	1.24	0.409	SPOA0008	1.95	0.072	SPOA0008	1.91	0.071	SPOA0009	0.89	0.301	SPOA0004	0.97	0.976
SPOA0015	1.46	0.027	SPOA0015	1.59	0.022	SPOA0014	1.1	0.28	SPOA0020	1.27	0.138	SPOA0009	0.84	0.039	SPOA0009	0.81	0.045	SPOA0010	1.04	0.864	SPOA0005	1.04	0.391
SPOA0017	1.64	0.045	SPOA0017	1.41	0.083	SPOA0015	1.03	0.759	SPOA0021	1.02	0.319	SPOA0010	1.13	0.373	SPOA0010	1.20	0.091	SPOA0011	0.79	0.051	SPOA0006	0.95	0.834
SPOA0018	0.93	0.944	SPOA0018	0.94	0.998	SPOA0017	1.11	0.965	SPOA0022	1.07	0.413	SPOA0011	0.37	0.001	SPOA0011	0.38	0.000	SPOA0012	0.94	0.522	SPOA0007	0.85	0.409
SPOA0019	1.3	0.364	SPOA0019	1.25	0.266	SPOA0018	1.04	0.602	SPOA0023	1.2	0.271	SPOA0012	0.71	0.043	SPOA0012	0.69	0.059	SPOA0013	0.93	0.270	SPOA0008	1.02	0.905
SPOA0020	0.81	0.407	SPOA0020	0.8	0.732	SPOA0019	1.18	0.307	SPOA0024	1.08	0.447	SPOA0013	0.78	0.029	SPOA0013	0.86	0.280	SPOA0014	0.91	0.861	SPOA0009	0.88	0.246
SPOA0021	1	0.491	SPOA0021	1.08	0.305	SPOA0020	1.05	0.576	SPOA0025	1.17	0.755	SPOA0014	1.69	0.146	SPOA0014	1.77	0.105	SPOA0015	1.07	0.565	SPOA0010	1.09	0.608
SPOA0022	0.78	0.383	SPOA0022	0.77	0.192	SPOA0021	1.09	0.164	SPOA0026	1.12	0.429	SPOA0015	0.71	0.202	SPOA0015	0.67	0.031	SPOA0017	0.92	0.612	SPOA0011	0.81	0.007
SPOA0023	0.99	0.714	SPOA0023	0.96	0.819	SPOA0022	1.11	0.558	SPOA0027	1.32	0.983	SPOA0017	0.90	0.960	SPOA0017	0.88	0.867	SPOA0018	0.86	0.321	SPOA0012	0.89	0.354
SPOA0024	0.76	0.312	SPOA0024	0.76	0.44	SPOA0023	1.04	0.976	SPOA0028	1.34	0.891	SPOA0018	0.96	0.771	SPOA0018	0.98	0.842	SPOA0019	0.93	0.670	SPOA0013	0.94	0.770
SPOA0025	0.7	0.089	SPOA0025	0.76	0.083	SPOA0024	1.11	0.571	SPOA0029	2.05	0.774	SPOA0019	0.91	0.691	SPOA0019	0.81	0.244	SPOA0020	0.60	0.423	SPOA0014	0.97	0.988
SPOA0026	0.84	0.668	SPOA0026	0.79	0.124	SPOA0025	1.23	0.85	SPOA0030	1.08	0.073	SPOA0020	0.63	0.603	SPOA0020	0.58	0.677	SPOA0021	0.86	0.457	SPOA0015	1.09	0.558
SPOA0027	0.74	0.173	SPOA0027	0.85	0.097	SPOA0026	1.02	0.58	SPOA0031	1	0.457	SPOA0021	1.16	0.459	SPOA0021	1.02	0.992	SPOA0022	0.93	0.732	SPOA0017	0.93	0.847
SPOA0028	1.34	0.595	SPOA0028	1.17	0.643	SPOA0027	1.1	0.899	SPOA0032	1.02	0.636	SPOA0022	0.99	0.647	SPOA0022	0.94	0.689	SPOA0023	1.14	0.331	SPOA0018	0.87	0.620
SPOA0029	1.4	0.059	SPOA0029	1.28	0.147	SPOA0028	1.08	0.901	SPOA0033	1.09	0.739	SPOA0023	1.18	0.518	SPOA0023	1.21	0.354	SPOA0024	1.14	0.546	SPOA0019	0.87	0.645
SPOA0030	1.05	0.296	SPOA0030	1	0.674	SPOA0029	1	0.869	SPOA0034	1.04	0.052	SPOA0024	1.51	0.113	SPOA0024	1.57	0.121	SPOA0025	1.16	0.036	SPOA0020	0.71	0.108
SPOA0031	1.21	0.432	SPOA0031	1.19	0.317	SPOA0030	1.25	0.176	SPOA0035	1.19	0.591	SPOA0025	1.45	0.048	SPOA0025	1.39	0.045	SPOA0026	0.93	0.617	SPOA0021	0.88	0.122
SPOA0032	1.23	0.314	SPOA0032	1.33	0.207	SPOA0031	1.29	0.34	SPOA0036	1.13	0.774	SPOA0026	0.94	0.985	SPOA0026	0.91	0.951	SPOA0027	1.05	0.953	SPOA0022	1.02	0.834
SPOA0033	1.7	0.094	SPOA0033	1.5	0.123	SPOA0032	1.23	0.863	SPOA0037	1.06	0.363	SPOA0027	1.30	0.175	SPOA0027	1.20	0.520	SPOA0028	1.10	0.814	SPOA0023	1.08	0.799
SPOA0034	0.75	0.05	SPOA0034	0.8	0.005	SPOA0033	1.11	0.967	SPOA0038	1.15	0.329	SPOA0028	1.33	0.420	SPOA0028	1.34	0.401	SPOA0029	1.05	0.418	SPOA0024	1.17	0.545
SPOA0035	1.24	0.058	SPOA0035	1.13	0.034	SPOA0034	1.04	0.676	SPOA0039	1.06	0.037	SPOA0029	1.05	0.178	SPOA0029	1.07	0.256	SPOA0030	1.13	0.352	SPOA0025	1.10	0.601
SPOA0036	1.17	0.345	SPOA0036	1.33	0.273	SPOA0035	1.01	0.28	SPOA0040	1.13	0.347	SPOA0030	1.27	0.001	SPOA0030	1.36	0.054	SPOA0031	1.10	0.702	SPOA0026	0.92	0.629
SPOA0037	1.67	0.06	SPOA0037	1.28	0.065	SPOA0036	1.13	0.785	SPOA0041	1.16	0.307	SPOA0031	1.17	0.187	SPOA0031	1.18	0.161	SPOA0032	0.95	0.940	SPOA0027	1.03	0.979
SPOA0038	1.21	0.52	SPOA0038	1.18	0.583	SPOA0037	1.2	0.154	SPOA0042	1.07	0.929	SPOA0032	0.87	0.966	SPOA0032	0.84	0.852	SPOA0033	1.22	0.519	SPOA0028	1.14	0.787
SPOA0039	0.51	0.019	SPOA0039	0.55	0.023	SPOA0038	1.06	0.266	SPOA0043	1.14	0.365	SPOA0033	0.83	0.635	SPOA0033	0.83	0.666	SPOA0034	1.15	0.453	SPOA0029	1.00	0.892
SPOA0040	1.07	0.316	SPOA0040	1.18	0.109	SPOA0039	1.04	0.055	SPOA0044	1.11	0.766	SPOA0034	0.93	0.624	SPOA0034	0.78	0.083	SPOA0035	1.15	0.359	SPOA0030	1.11	0.360
SPOA0041	1.61	0.016	SPOA0041	1.5	0.029	SPOA0040	1.26	0.833	SPOA0045	1.01	0.695	SPOA0035	1.89	0.018	SPOA0035	2.18	0.022	SPOA0036	0.97	0.909	SPOA0031	1.10	0.386
SPOA0042	1.02	0.952	SPOA0042	0.94	0.991	SPOA0041	1.04	0.158	SPOA0046	1.23	0.749	SPOA0036	0.92	0.872	SPOA0036	0.94	0.931	SPOA0037	0.88	0.713	SPOA0032	1.02	0.723
SPOA0043	0.5	0.041	SPOA0043	0.55	0.031	SPOA0042	1.04	0.958	SPOA0047	1.32	0.13	SPOA0037	0.34	0.023	SPOA0037	0.33	0.025	SPOA0038	0.67	0.358	SPOA0033	1.15	0.491
SPOA0044	0.58	0.055	SPOA0044	0.62	0.175	SPOA0043	1.03	0.351	SPOA0048	1.33	0.324	SPOA0038	0.52	0.108	SPOA0038	0.57	0.201	SPOA0039	1.51	0.048	SPOA0034	1.06	0.594
SPOA0045	0.74	0.637	SPOA0045	0.79	0.67	SPOA0044	1.1	0.335	SPOA0049	1.05	0.3	SPOA0039	0.91	0.748	SPOA0039	0.90	0.593	SPOA0040	1.01	0.947	SPOA0035	1.30	0.044
SPOA0046	0.83	0.323	SPOA0046	0.78	0.134	SPOA0045	1.1	0.69	SPOA0050	0.99	0.949	SPOA0040	0.71	0.060	SPOA0040	0.70	0.038	SPOA0041	1.24	0.381	SPOA0036	0.95	0.809
SPOA0047	1.52	0.283	SPOA0047	1.48	0.141	SPOA0046	1.07	0.833	SPOA0051	1.2	0	SPOA0041	1.06	0.916	SPOA0041	1.19	0.410	SPOA0042	0.85	0.876	SPOA0037	0.90	0.792
SPOA0048	0.65	0.266	SPOA0048	0.54	0.254	SPOA0047	0.98	0.401	SPOA0052	1.17	0.411	SPOA0042	0.69	0.695	SPOA0042	0.79	0.799	SPOA0043	0.95	0.779	SPOA0038	0.66	0.323
SPOA0049	1.14	0.848	SPOA0049	1.09	0.747	SPOA0048	1.03	0.198	SPOA0053	1.11	0.768	SPOA0043	1.37	0.223	SPOA0043	1.26	0.034	SPOA0044	0.86	0.363	SPOA0039	1.42	0.011
SPOA0050	0.76	0.843	SPOA0050	0.74	0.872	SPOA0049	1.06	0.636	SPOA0054	1.09	0.643	SPOA0044	1.15	0.571	SPOA0044	1.24	0.148	SPOA0045	0.88	0.820	SPOA0040	1.03	0.915
SPOA0051	0.86	0.801	SPOA0052	0.88	0.687	SPOA0050	1.13	0.906	SPOA0055	1.07	0.7	SPOA0045	1.02	0.965	SPOA0045	0.98	0.984	SPOA0046	1.04	0.793	SPOA0041	1.08	0.832
SPOA0052	0.92	0.947	SPOA0053	1.35	0.317	SPOA0051	1.02	0	SPOA0056	1.13	0.534	SPOA0046	1.22	0.191	SPOA0046	1.41	0.098	SPOA0047	0.99	0.821	SPOA0042	0.89	0.914
SPOA0053	1.68	0.126	SPOA0054	0.89	0.892	SPOA0052	1.01	0.47	SPOA0057	1.11	0.522	SPOA0047	1.19	0.584	SPOA0047	1.11	0.552	SPOA0048	1.03	0.993	SPOA0043	0.94	0.847
SPOA0054	1.04	0.348	SPOA0055	0.71	0.082	SPOA0053	1.12	0.551	SPOA0058	1.1	0.018	SPOA0048	1.31	0.451	SPOA0048	1.11	0.794	SPOA0049	0.85	0.486	SPOA0044	0.92	0.498
SPOA0055	0.6	0.023	SPOA0056	0.85	0.372	SPOA0054	1.22	0.569	SPOA0059	1.18	0.341	SPOA0049	0.79	0.489	SPOA0049	0.61	0.147	SPOA0050	0.94	0.953	SPOA0045	0.93	0.877
SPOA0056	0.71	0.025	SPOA0057	1.51	0.262	SPOA0055	1.08	0.744	SPOA0060	1.11	0.959	SPOA0050	1.49	0.569	SPOA0050	1.51	0.707	SPOA0051	1.23		SPOA0046	1.00	0.874
SPOA0057	1.43	0.243	SPOA0058	1.17	0.076	SPOA0056	1.16	0.407	SPOA0061	1.09	0.086	SPOA0051	1.15		SPOA0051	0.83	0.242	SPOA0052	0.83	0.365	SPOA0047	0.88	0.099
SPOA0058	1.05	0.465	SPOA0059	1.55	0.029	SPOA0057	1.08	0.75	SPOA0062	1.03	0.887	SPOA0052	0.80	0.042	SPOA0052	0.80	0.009	SPOA0053	1.00	0.439	SPOA0048	1.00	0.882
SPOA0059	1.7	0.017	SPOA0060	1.61	0.5	SPOA0058	1.21	0.124	SPOA0063	1.11	0.339	SPOA0053	0.48	0.009	SPOA0053	0.57	0.021	SPOA0054	0.58	0.074	SPOA0049	0.88	0.909
SPOA0060	1.84	0.302	SPOA0061	0.57	0.013	SPOA0059	1.06	0.143	SPOA0064	1.01	0.936	SPOA0054	0.88	0.509	SPOA0054	0.92	0.112	SPOA0055	1.38	0.198	SPOA0050	1.05	0.980
SPOA0061	0.52	0.006	SPOA0062	0.83	0.219	SPOA0060	1.12	0.957	SPOA0065	1	0.872	SPOA0055	1.19	0.420	SPOA0055	1.26	0.217	SPOA0056	1.09	0.759	SPOA0051	0.94	0.335
SPOA0062	0.78	0.399	SPOA0063	0.7	0.058	SPOA0061	1.01	0.049	SPOA0066	1.03	0.5	SPOA0056	0.35	0.007	SPOA0056	0.32	0.002	SPOA0057	0.93	0.664	SPOA0052	0.90	0.142
SPOA0063	0.6	0.391	SPOA0064	1.03	0.593	SPOA0062	1.04	0.824	SPOA0067	1.04	0.845	SPOA0057	0.23	0.022	SPOA0057	0.22	0.012	SPOA0058	0.92	0.240	SPOA0053	1.04	0.874
SPOA0064	1.11	0.204	SPOA0065	0.93	0.882	SPOA0063	1.19	0.891	SPOA0068	1.06	0.198	SPOA0058	0.33	0.003	SPOA0058	0.36	0.001	SPOA0059	0.79	0.135	SPOA0054	0.99	0.818
SPOA0065	0.93	0.297	SPOA0066	1.09	0.374	SPOA0064	1.03	0.792	SPOA0069	1.16	0.399	SPOA0059	0.28	0.014	SPOA0059	0.31	0.001	SPOA0060	0.98	0.972	SPOA0055	1.46	0.026
SPOA0066	1.06	0.807	SPOA0067	0.88	0.859	SPOA0065	1.21	0.896	SPOA0070	1.1	0.975	SPOA0060	0.44	0.213	SPOA0060	0.45	0.227	SPOA0061	1.17	0.164	SPOA0056	1.01	0.958
SPOA0067	0.78	0.658	SPOA0068	0.69	0.023	SPOA0066	1.02	0.633	SPOA0071	1.1	0.939	SPOA0061	0.17	0.000	SPOA0061	0.16	0.002	SPOA0062	0.93	0.728	SPOA0057	0.88	0.493
SPOA0068	0.63	0.025	SPOA0069	0.86	0.399	SPOA0067	1.08	0.813	SPOA0072	1.1	0.816	SPOA0062	0.86	0.156	SPOA0062	0.85	0.202	SPOA0063	1.25	0.384	SPOA0058	1.09	0.182
SPOA0069	0.88	0.394	SPOA0070	1.32	0.005	SPOA0068	1.09	0.291	SPOA0073	1.1	0.582	SPOA0063	1.19	0.674	SPOA0063	1.23	0.065	SPOA0064	0.81	0.326	SPOA0059	0.78	0.279
SPOA0070	1.38	0.148	SPOA0071	1	0.737	SPOA0069	1.09	0.635	SPOA0074	1.19	0.38	SPOA0064	0.73	0.017	SPOA0064	0.76	0.182	SPOA0065	1.09	0.910	SPOA0060	1.00	0.995
SPOA0071	1.19	0.315	SPOA0072	0.85	0.146	SPOA0070	1.15	0.715	SPOA0075	1.03	0.401	SPOA0065	1.20	0.701	SPOA0065	1.35	0.249	SPOA0066	0.95	0.426	SPOA0061	1.14	0.153
SPOA0072	0.85	0.097	SPOA0073	0.83	0.492	SPOA0071	0.99	0.968	SPOA0076	1.08	0.575	SPOA0066	0.79	0.225	SPOA0066	0.88	0.315	SPOA0067	0.95	0.841	SPOA0062	1.00	0.992
SPOA0073	0.75	0.283	SPOA0074	0.97	0.989	SPOA0072	1.01	0.063	SPOA0077	1.01	0.121	SPOA0067	0.59	0.535	SPOA0067	0.53	0.292	SPOA0068	1.06	0.794	SPOA0063	1.15	0.708
SPOA0074	0.93	0.486	SPOA0075	0.9	0.67	SPOA0073	1.12	0.717	SPOA0078	1.07	0.85	SPOA0068	1.83	0.066	SPOA0068	1.93	0.033	SPOA0069	1.05	0.525	SPOA0064	0.83	0.385
SPOA0075	0.76	0.074	SPOA0076	1.03	0.238	SPOA0074	1	0.542	SPOA0079	1.04	0.715	SPOA0069	2.19	0.011	SPOA0069	2.28	0.005	SPOA0070	0.96	0.631	SPOA0065	1.14	0.495
SPOA0076	1.11	0.193	SPOA0077	1.33	0.022	SPOA0075	1.12	0.017	SPOA0081	1.13	0.755	SPOA0070	1.14	0.303	SPOA0070	1.24	0.708	SPOA0071	0.91	0.746	SPOA0066	1.00	0.838
SPOA0077	1.37	0.008	SPOA0078	1.16	0.158	SPOA0076	1.07	0.327	SPOA0082	1.04	0.813	SPOA0071	0.82	0.674	SPOA0071	0.83	0.678	SPOA0072	0.89	0.697	SPOA0067	0.97	0.959
SPOA0078	1.03	0.59	SPOA0079	1.32	0.354	SPOA0077	1.09	0.04	SPOA0083	1.25	0.805	SPOA0072	1.19	0.209	SPOA0072	1.24	0.017	SPOA0073	0.91	0.835	SPOA0068	1.12	0.606
SPOA0079	1.24	0.454	SPOA0081	0.85	0.817	SPOA0078	1.08	0.694	SPOA0084	1.09	0.358	SPOA0073	1.55	0.113	SPOA0073	1.54	0.045	SPOA0074	1.01	0.795	SPOA0069	1.05	0.601
SPOA0081	0.79	0.741	SPOA0082	0.67	0.017	SPOA0079	1.04	0.69	SPOA0085	1.08	0.057	SPOA0074	1.71	0.018	SPOA0074	1.52	0.002	SPOA0075	1.08	0.597	SPOA0070	1.10	0.758
SPOA0082	0.65	0.082	SPOA0083	0.67	0.147	SPOA0081	1.11	0.799	SPOA0086	1.18	0.245	SPOA0075	2.03	0.055	SPOA0075	2.12	0.011	SPOA0076	1.32	0.008	SPOA0071	0.98	0.967
SPOA0083	0.58	0.058	SPOA0084	0.69	0.432	SPOA0082	1.06	0.53	SPOA0087	1.14	0.398	SPOA0076	1.74	0.032	SPOA0076	1.90	0.021	SPOA0077	0.96	0.906	SPOA0072	0.99	0.940
SPOA0084	0.74	0.469	SPOA0085	1.15	0.019	SPOA0083	1.16	0.716	SPOA0088	1.21	0.359	SPOA0077	1.22	0.054	SPOA0077	1.17	0.034	SPOA0078	1.14	0.350	SPOA0073	0.92	0.705
SPOA0085	1.21	0.126	SPOA0086	1.01	0.471	SPOA0084	1.14	0.077	SPOA0089	1.03	0.818	SPOA0078	2.23	0.004	SPOA0078	2.01	0.009	SPOA0079	1.14	0.643	SPOA0074	1.01	0.704
SPOA0086	1.04	0.736	SPOA0087	0.86	0.792	SPOA0085	1.15	0.19	SPOA0091	1.11	0.752	SPOA0079	1.85	0.140	SPOA0079	1.96	0.153	SPOA0081	1.03	0.934	SPOA0075	1.07	0.732
SPOA0087	0.84	0.117	SPOA0088	0.68	0.057	SPOA0086	1.02	0.409	SPOA0093	1.16	0.92	SPOA0081	1.13	0.745	SPOA0081	1.15	0.719	SPOA0082	0.94	0.580	SPOA0076	1.20	0.180
SPOA0088	0.65	0.08	SPOA0089	1.34	0	SPOA0087	1.1	0.335	SPOA0094	1.17	0.751	SPOA0082	1.38	0.107	SPOA0082	1.49	0.018	SPOA0083	0.87	0.525	SPOA0077	0.92	0.351
SPOA0089	1.47	0	SPOA0091	0.82	0.411	SPOA0088	1.17	0.433	SPOA0095	1.07	0.924	SPOA0083	1.18	0.292	SPOA0083	1.12	0.328	SPOA0084	1.14	0.366	SPOA0078	1.10	0.487
SPOA0091	0.85	0.805	SPOA0093	0.78	0.347	SPOA0089	1.11	0.854	SPOA0096	1.03	0.294	SPOA0084	1.05	0.930	SPOA0084	1.00	0.930	SPOA0085	1.05	0.921	SPOA0079	1.16	0.605
SPOA0093	0.75	0.396	SPOA0094	0.94	0.901	SPOA0091	1.23	0.836	SPOA0097	1.06	0.967	SPOA0085	1.31	0.099	SPOA0085	1.28	0.264	SPOA0086	0.96	0.799	SPOA0081	0.93	0.862
SPOA0094	0.95	0.812	SPOA0095	0.99	0.965	SPOA0093	1.09	0.888	SPOA0098	1.48	0.947	SPOA0086	1.10	0.391	SPOA0086	1.09	0.765	SPOA0087	0.89	0.583	SPOA0082	1.14	0.181
SPOA0095	1.05	0.927	SPOA0096	0.88	0.898	SPOA0094	1.11	0.47	SPOA0099	1.03	0.675	SPOA0087	0.89	0.671	SPOA0087	0.77	0.520	SPOA0088	1.05	0.578	SPOA0083	0.89	0.268
SPOA0096	0.83	0.053	SPOA0097	0.93	0.985	SPOA0095	1.23	0.898	SPOA0100	1.17	0.079	SPOA0088	1.05	0.432	SPOA0088	0.95	0.675	SPOA0089	0.75		SPOA0084	1.12	0.372
SPOA0097	1.04	0.96	SPOA0098	1.07	0.941	SPOA0096	1.06	0.136	SPOA0101	1.23	0.873	SPOA0089	0.68	0.805	SPOA0089	0.37		SPOA0091	0.69	0.480	SPOA0085	0.97	0.638
SPOA0098	1.1	0.932	SPOA0099	0.97	0.94	SPOA0097	0.99	0.993	SPOA0102	1	0.58	SPOA0091	0.95	0.694	SPOA0091	1.13	0.734	SPOA0093	0.93	0.649	SPOA0086	0.96	0.754
SPOA0099	0.88	0.719	SPOA0100	0.97	0.786	SPOA0098	1.02	0.956	SPOA0103	1.09	0.488	SPOA0093	0.97	0.901	SPOA0093	0.85	0.720	SPOA0094	1.03	0.736	SPOA0087	0.92	0.534
SPOA0100	1.06	0.207	SPOA0101	0.93	0.987	SPOA0099	1.1	0.868	SPOA0104	1.08	0.753	SPOA0094	0.74	0.209	SPOA0094	0.76	0.235	SPOA0095	1.07	0.944	SPOA0088	0.95	0.770
SPOA0101	0.81	0.651	SPOA0102	0.81	0.408	SPOA0100	1.08	0.768	SPOA0105	1.09	0.567	SPOA0095	0.95	0.978	SPOA0095	0.95	0.980	SPOA0096	0.85	0.350	SPOA0089	0.64	0.779
SPOA0102	0.72	0.331	SPOA0103	0.63	0.124	SPOA0101	1.12	0.584	SPOA0106	1.15	0.924	SPOA0096	0.78	0.042	SPOA0096	0.82	0.299	SPOA0097	0.86	0.905	SPOA0091	0.78	0.601
SPOA0103	0.57	0.213	SPOA0104	1.1	0.821	SPOA0102	1.15	0.674	SPOA0107	1.04	0.977	SPOA0097	0.99	0.990	SPOA0097	0.89	0.946	SPOA0098	0.85	0.916	SPOA0093	0.94	0.800
SPOA0104	1.06	0.846	SPOA0105	0.97	0.546	SPOA0103	1.12	0.512	SPOA0108	1.12	0.929	SPOA0098	0.79	0.885	SPOA0098	0.83	0.185	SPOA0099	0.65	0.225	SPOA0094	0.99	0.956

SPOA0105	0.88	0.496	SPOA0106	0.83	0.887	SPOA0104	1.31	0.449	SPOA0109	1.14	0.157	SPOA0099	0.84	0.583	SPOA0099	0.74	0.257	SPOA0100	0.88	0.398	SPOA0095	1.09	0.901
SPOA0106	0.92	0.95	SPOA0107	1.05	0.872	SPOA0105	1.04	0.567	SPOA0110	0.98	0.967	SPOA0100	0.88	0.481	SPOA0100	0.74	0.050	SPOA0101	0.81	0.476	SPOA0096	0.91	0.640
SPOA0107	1.05	0.874	SPOA0108	1.09	0.894	SPOA0106	1.21	0.862	SPOA0111	1.01	0.968	SPOA0101	0.99	0.825	SPOA0101	1.02	0.790	SPOA0102	0.86	0.369	SPOA0097	0.88	0.927
SPOA0108	1.07	0.85	SPOA0109	0.67	0.153	SPOA0107	1.07	0.968	SPOA0112	1.01	0.774	SPOA0102	0.81	0.362	SPOA0102	0.83	0.206	SPOA0103	1.13	0.866	SPOA0098	0.98	0.981
SPOA0109	0.6	0.039	SPOA0110	1	0.922	SPOA0108	1.43	0.897	SPOA0113	1	0.983	SPOA0103	1.67	0.159	SPOA0103	1.63	0.195	SPOA0104	0.56	0.552	SPOA0099	0.84	0.413
SPOA0110	0.93	0.982	SPOA0111	0.93	0.978	SPOA0109	1.01	0.366	SPOA0114	1.03	0.321	SPOA0104	0.54	0.509	SPOA0104	0.46	0.324	SPOA0105	0.93	0.778	SPOA0100	0.76	0.454
SPOA0111	0.75	0.125	SPOA0112	0.81	0.781	SPOA0110	1.17	0.799	SPOA0115	1.06	0.506	SPOA0105	1.33	0.046	SPOA0105	1.07	0.598	SPOA0106	0.88	0.846	SPOA0101	0.90	0.235
SPOA0112	0.82	0.818	SPOA0113	0.81	0.801	SPOA0111	1.07	0.811	SPOA0116	1.11	0.287	SPOA0106	0.97	0.987	SPOA0106	1.33	0.751	SPOA0107	1.01	0.986	SPOA0102	0.85	0.419
SPOA0113	0.84	0.896	SPOA0114	0.76	0.212	SPOA0112	1.18	0.81	SPOA0117	1.18	0.524	SPOA0107	1.80	0.426	SPOA0107	1.68	0.427	SPOA0108	0.79	0.765	SPOA0103	1.30	0.479
SPOA0114	0.71	0.111	SPOA0115	0.8	0.172	SPOA0113	1.18	0.983	SPOA0118	1.06	0.947	SPOA0108	0.81	0.751	SPOA0108	0.85	0.786	SPOA0109	1.12	0.626	SPOA0104	0.61	0.525
SPOA0115	0.69	0.322	SPOA0116	0.76	0.037	SPOA0114	1.14	0.866	SPOA0119	1.19	0.985	SPOA0109	2.09	0.051	SPOA0109	2.07	0.044	SPOA0110	0.81	0.744	SPOA0105	0.93	0.771
SPOA0116	0.67	0.186	SPOA0117	0.87	0.43	SPOA0115	1.03	0.91	SPOA0120	1.2	0.366	SPOA0110	0.89	0.775	SPOA0110	0.79	0.668	SPOA0111	0.90	0.360	SPOA0106	0.87	0.894
SPOA0117	0.93	0.912	SPOA0118	0.83	0.867	SPOA0116	1.18	0.435	SPOA0121	1.28	0.979	SPOA0111	0.90	0.411	SPOA0111	0.88	0.452	SPOA0112	0.93	0.805	SPOA0107	0.94	0.922
SPOA0118	0.9	0.949	SPOA0119	0.86	0.694	SPOA0117	1.16	0.295	SPOA0122	1.37	0.532	SPOA0112	1.24	0.544	SPOA0112	0.96	0.709	SPOA0113	0.97	0.851	SPOA0108	0.84	0.833
SPOA0119	0.95	0.996	SPOA0120	0.76	0.026	SPOA0118	1.36	0.986	SPOA0123	1.24	0.954	SPOA0113	1.28	0.559	SPOA0113	1.05	0.932	SPOA0114	1.13	0.525	SPOA0109	1.21	0.272
SPOA0120	0.72	0.315	SPOA0121	0.99	0.783	SPOA0119	1.1	0.691	SPOA0124	1.28	0.868	SPOA0114	1.58	0.141	SPOA0114	1.25	0.204	SPOA0115	0.88	0.645	SPOA0110	0.78	0.688
SPOA0121	0.96	0.926	SPOA0122	0.88	0.369	SPOA0120	1.23	0.433	SPOA0125	1.11	0.788	SPOA0115	0.93	0.436	SPOA0115	0.85	0.543	SPOA0116	0.96	0.653	SPOA0111	0.76	0.343
SPOA0122	0.71	0.464	SPOA0123	0.88	0.883	SPOA0121	1.22	0.761	SPOA0126	1.44	0.99	SPOA0116	1.45	0.029	SPOA0116	1.60	0.032	SPOA0117	0.96	0.875	SPOA0112	0.96	0.874
SPOA0123	0.9	0.927	SPOA0124	0.81	0.649	SPOA0122	1.18	0.339	SPOA0127	1.04	0.667	SPOA0117	0.88	0.533	SPOA0117	0.86	0.669	SPOA0118	0.97	0.960	SPOA0113	0.95	0.861
SPOA0124	0.74	0.391	SPOA0125	0.68	0.315	SPOA0123	1.13	0.988	SPOA0128	1.11	0.489	SPOA0118	0.99	0.985	SPOA0118	1.01	1.000	SPOA0119	1.01	0.949	SPOA0114	1.14	0.437
SPOA0125	0.64	0.451	SPOA0126	0.93	0.988	SPOA0124	1.16	0.746	SPOA0129	1.03	0.679	SPOA0119	1.30	0.349	SPOA0119	1.36	0.381	SPOA0120	1.04	0.601	SPOA0115	1.01	0.992
SPOA0126	0.82	0.919	SPOA0127	1.02	0.837	SPOA0125	1.21	0.942	SPOA0130	1.15	0.964	SPOA0120	2.70	0.047	SPOA0120	2.38	0.017	SPOA0121	0.96	0.866	SPOA0116	1.06	0.384
SPOA0127	1.01	0.863	SPOA0128	0.45	0.581	SPOA0126	1.1	0.992	SPOA0131	1.31	0.395	SPOA0121	1.37	0.436	SPOA0121	1.31	0.231	SPOA0122	0.85	0.657	SPOA0117	0.88	0.163
SPOA0128	0.58	0.677	SPOA0129	0.84	0.478	SPOA0127	1.24	0.723	SPOA0132	1.09	0.722	SPOA0122	0.71	0.391	SPOA0122	0.53	0.164	SPOA0123	1.01	0.954	SPOA0118	0.96	0.960
SPOA0129	0.74	0.442	SPOA0130	0.94	0.977	SPOA0128	1.13	0.713	SPOA0133	1.13	0.631	SPOA0123	1.05	0.798	SPOA0123	1.08	0.759	SPOA0124	0.91	0.728	SPOA0119	0.98	0.780
SPOA0130	0.87	0.86	SPOA0131	0.88	0.846	SPOA0129	1.01	0.449	SPOA0134	1.27	0.022	SPOA0124	1.15	0.366	SPOA0124	1.06	0.434	SPOA0125	0.94	0.904	SPOA0120	1.04	0.487
SPOA0131	0.96	0.943	SPOA0132	0.81	0.271	SPOA0130	1.11	0.772	SPOA0136	1	0.889	SPOA0125	1.27	0.457	SPOA0125	1.26	0.316	SPOA0126	0.84	0.917	SPOA0121	1.03	0.942
SPOA0132	0.76	0.065	SPOA0133	0.81	0.316	SPOA0131	1.07	0.967	SPOA0137	1.13	0.95	SPOA0126	0.75	0.893	SPOA0126	0.69	0.870	SPOA0127	1.00	0.947	SPOA0122	0.85	0.182
SPOA0133	0.75	0	SPOA0134	1.45	0.059	SPOA0132	1.07	0.608	SPOA0138	1.07	0.715	SPOA0127	0.98	0.916	SPOA0127	1.01	0.954	SPOA0128	1.09	0.962	SPOA0123	0.99	0.985
SPOA0134	1.43	0.025	SPOA0136	0.93	0.693	SPOA0133	1.1	0.498	SPOA0139	1.22	0.942	SPOA0128	1.26	0.853	SPOA0128	1.42	0.737	SPOA0129	1.04	0.955	SPOA0124	0.93	0.724
SPOA0136	0.81	0.026	SPOA0137	1.02	0.676	SPOA0134	1.02	0.038	SPOA0140	1.11	0.585	SPOA0129	1.12	0.954	SPOA0129	1.04	0.876	SPOA0130	1.15	0.650	SPOA0125	0.97	0.960
SPOA0137	1.01	0.696	SPOA0138	1.35	0.124	SPOA0136	0.98	0.732	SPOA0141	1.1	0.017	SPOA0130	1.61	0.134	SPOA0130	1.46	0.210	SPOA0131	1.06	0.987	SPOA0126	0.93	0.964
SPOA0138	1.62	0.093	SPOA0139	1.3	0.779	SPOA0137	1.14	0.891	SPOA0142	1.21	0.261	SPOA0131	1.33	0.492	SPOA0131	1.52	0.257	SPOA0132	0.78	0.489	SPOA0127	0.93	0.781
SPOA0139	1.35	0.716	SPOA0140	1.36	0.134	SPOA0138	1.01	0.693	SPOA0143	1.19	0.356	SPOA0132	1.11	0.567	SPOA0132	1.12	0.452	SPOA0133	0.90	0.555	SPOA0128	1.17	0.898
SPOA0140	1.29	0.392	SPOA0141	1.32	0.032	SPOA0139	1.02	0.991	SPOA0144	0.98	0.134	SPOA0133	1.45		SPOA0133	1.42	0.004	SPOA0134	0.68	0.105	SPOA0129	0.91	0.799
SPOA0141	1.57	0.016	SPOA0142	1.18	0.29	SPOA0140	1	0.907	SPOA0145	1.06	0.179	SPOA0134	0.53	0.028	SPOA0134	0.37	0.003	SPOA0136	0.80	0.224	SPOA0130	0.97	0.687
SPOA0142	1.12	0.409	SPOA0143	1.3	0.055	SPOA0141	1.15	0.015	SPOA0146	1.06	0.945	SPOA0136	1.47	0.037	SPOA0136	1.43	0.146	SPOA0137	0.88	0.224	SPOA0131	1.08	0.892
SPOA0143	1.33	0.352	SPOA0144	0.95	0.902	SPOA0142	1.11	0.102	SPOA0147	0.99	0.967	SPOA0137	1.11	0.251	SPOA0137	0.83	0.875	SPOA0138	0.97	0.925	SPOA0132	0.85	0.527
SPOA0144	0.88	0.705	SPOA0145	0.71	0.108	SPOA0143	1.15	0.597	SPOA0148	1.12	0.972	SPOA0138	0.93	0.883	SPOA0138	0.98	0.466	SPOA0139	0.93	0.947	SPOA0133	0.99	0.827
SPOA0145	0.7	0.077	SPOA0146	0.93	0.976	SPOA0144	1.13	0.312	SPOA0149	1.03	0.293	SPOA0139	1.06	0.913	SPOA0139	1.06	0.903	SPOA0140	0.87	0.615	SPOA0134	0.64	0.026
SPOA0146	0.87	0.838	SPOA0147	0.97	0.905	SPOA0145	1.03	0.604	SPOA0150	0.98	0.142	SPOA0140	0.85	0.732	SPOA0140	0.78	0.375	SPOA0141	0.88	0.398	SPOA0136	0.85	0.701
SPOA0147	1.04	0.382	SPOA0148	0.89	0.849	SPOA0146	1.56	0.976	SPOA0151	1.24	0.176	SPOA0141	0.57	0.036	SPOA0141	0.54	0.015	SPOA0142	0.91	0.551	SPOA0137	0.89	0.573
SPOA0148	1.13	0.253	SPOA0149	1.34	0.137	SPOA0147	1.12	0.651	SPOA0152	1	0.056	SPOA0142	1.26	0.241	SPOA0142	1.21	0.156	SPOA0143	1.07	0.831	SPOA0138	1.02	0.728
SPOA0149	1.29	0.124	SPOA0150	1.21	0.11	SPOA0148	1.22	0.331	SPOA0154	0.99	0.878	SPOA0143	1.07	0.846	SPOA0143	1.14	0.614	SPOA0144	0.81	0.474	SPOA0139	0.91	0.928
SPOA0150	1.19	0.151	SPOA0151	1.19	0.169	SPOA0149	1.14	0.096	SPOA0155	1.05	0.105	SPOA0144	0.56	0.050	SPOA0144	0.53	0.016	SPOA0145	0.93	0.668	SPOA0140	0.84	0.522
SPOA0151	1.23	0.08	SPOA0154	0.97	0.937	SPOA0150	1	0.869	SPOA0156	1.13	0.994	SPOA0145	1.00	0.912	SPOA0145	0.92	0.239	SPOA0146	1.01	0.987	SPOA0141	0.85	0.149
SPOA0153	0.83	0	SPOA0155	1.87	0.042	SPOA0151	1.38	0.289	SPOA0157	1.07	0.952	SPOA0146	0.68	0.406	SPOA0146	0.70	0.394	SPOA0147	0.88	0.540	SPOA0142	0.83	0.352
SPOA0154	0.91	0.949	SPOA0156	0.85	0.705	SPOA0152	1.25	0	SPOA0158	1.18	0.942	SPOA0147	0.73	0.177	SPOA0147	0.76	0.050	SPOA0148	0.80	0.367	SPOA0143	1.00	0.961
SPOA0155	2.02	0.026	SPOA0157	0.99	0.979	SPOA0154	1.01	0.935	SPOA0159	1.11	0.695	SPOA0148	0.59	0.130	SPOA0148	0.55	0.094	SPOA0149	0.90	0.426	SPOA0144	0.77	0.189
SPOA0156	0.85	0.857	SPOA0158	0.77	0.183	SPOA0155	1.14	0.254	SPOA0160	1.68	0.319	SPOA0149	0.89	0.676	SPOA0149	0.92	0.348	SPOA0150	0.97	0.733	SPOA0145	1.02	0.931
SPOA0157	0.91	0.965	SPOA0159	1.12	0.715	SPOA0156	1.16	0.911	SPOA0161	1.1	0.909	SPOA0150	0.99	0.859	SPOA0150	0.94	0.219	SPOA0151	0.95	0.263	SPOA0146	0.96	0.930
SPOA0158	0.79	0.285	SPOA0160	1.21	0.393	SPOA0157	1.05	0.977	SPOA0162	1.32	0.892	SPOA0151	0.93	0.467	SPOA0151	0.93	0.519	SPOA0152	0.65	0.423	SPOA0147	0.91	0.800
SPOA0159	1.23	0.331	SPOA0161	1.02	0.941	SPOA0158	1.01	0.737	SPOA0163	1.16	0.925	SPOA0152	0.64	0.048	SPOA0152	0.68	0.087	SPOA0154	0.85	0.689	SPOA0148	0.93	0.864
SPOA0160	1.14	0.615	SPOA0162	0.83	0.719	SPOA0159	1.01	0.52	SPOA0164	1.03	0.748	SPOA0154	0.91	0.843	SPOA0153	1.21		SPOA0155	1.51	0.124	SPOA0149	0.88	0.464
SPOA0161	1.03	0.945	SPOA0163	1.04	0.578	SPOA0160	1.24	0.681	SPOA0165	1.39	0.769	SPOA0155	1.16	0.173	SPOA0154	0.85	0.623	SPOA0156	1.08	0.861	SPOA0150	0.85	0.425
SPOA0162	0.87	0.831	SPOA0164	1.15	0.772	SPOA0161	1.11	0.936	SPOA0166	1.3	0.969	SPOA0156	1.96	0.111	SPOA0155	1.18	0.507	SPOA0157	0.79	0.892	SPOA0151	0.88	0.301
SPOA0163	0.95	0.804	SPOA0165	1.05	0.838	SPOA0162	1.25	0.65	SPOA0167	1.09	0.333	SPOA0157	0.84	0.934	SPOA0156	1.91	0.091	SPOA0158	0.93	0.748	SPOA0152	0.60	0.210
SPOA0164	1.22	0.676	SPOA0166	0.93	0.978	SPOA0163	1.18	0.823	SPOA0168	1.02	0.005	SPOA0158	1.06	0.612	SPOA0157	0.69	0.829	SPOA0159	0.89	0.658	SPOA0153	1.27	0.165
SPOA0165	1.15	0.763	SPOA0167	1.03	0.698	SPOA0164	1.19	0.555	SPOA0169	1.02	0.901	SPOA0159	0.89	0.717	SPOA0158	1.03	0.611	SPOA0160	0.84	0.404	SPOA0154	0.80	0.681
SPOA0166	0.89	0.922	SPOA0168	1.06	0.052	SPOA0165	1.36	0.703	SPOA0170	1.04	0.539	SPOA0160	0.96	0.549	SPOA0159	0.81	0.557	SPOA0161	0.79	0.875	SPOA0155	1.44	0.113
SPOA0167	0.86	0.909	SPOA0169	0.81	0.667	SPOA0166	1.2	0.954	SPOA0171	1.12	0.62	SPOA0161	0.82	0.873	SPOA0160	0.63	0.198	SPOA0162	0.70	0.307	SPOA0156	1.09	0.726
SPOA0168	1.28	0.221	SPOA0170	0.93	0.618	SPOA0167	1.09	0.361	SPOA0172	1.18	0.999	SPOA0162	0.92	0.644	SPOA0161	0.72	0.736	SPOA0163	0.24	0.483	SPOA0157	0.88	0.942
SPOA0169	0.74	0.559	SPOA0171	0.84	0.629	SPOA0168	1.19	0.105	SPOA0173	1.11	0.186	SPOA0163	1.11	0.985	SPOA0162	0.85	0.628	SPOA0164	0.76	0.646	SPOA0158	0.97	0.927
SPOA0170	0.93	0.701	SPOA0172	0.92	0.879	SPOA0169	1.14	0.844	SPOA0174	1.29	0.233	SPOA0164	0.94	0.905	SPOA0163	1.04	0.862	SPOA0165	1.00	0.983	SPOA0159	0.96	0.852
SPOA0171	1.07	0.659	SPOA0173	0.82	0.028	SPOA0170	1.18	0.989	SPOA0175	1.17	0.757	SPOA0165	1.06	0.860	SPOA0164	0.93	0.873	SPOA0166	0.98	0.947	SPOA0160	0.96	0.720
SPOA0172	0.69	0.388	SPOA0174	0.89	0.496	SPOA0171	1.01	0.549	SPOA0176	1.36	0.351	SPOA0166	1.02	0.939	SPOA0165	0.99	0.965	SPOA0167	0.88	0.674	SPOA0161	0.79	0.838
SPOA0173	0.83	0.596	SPOA0175	1.06	0.671	SPOA0172	1.05	0.276	SPOA0177	1.25	0	SPOA0167	0.87	0.700	SPOA0166	1.12	0.927	SPOA0168	0.99	0.890	SPOA0162	0.72	0.377
SPOA0174	0.81	0.214	SPOA0176	0.92	0.875	SPOA0173	1.04	0.74	SPOA0180	1.14	0.936	SPOA0168	0.75	0.011	SPOA0167	0.81	0.265	SPOA0169	0.96	0.905	SPOA0163	0.81	0.331
SPOA0175	0.9	0.842	SPOA0177	0.88	0.857	SPOA0174	1.89	0.524	SPOA0181	1.16	0.772	SPOA0169	0.99	0.902	SPOA0168	0.73	0.056	SPOA0170	0.96	0.616	SPOA0164	0.81	0.769
SPOA0176	1.01	0.832	SPOA0180	1.15	0.242	SPOA0175	1.34	0.576	SPOA0182	1.09	0.113	SPOA0170	0.91	0.463	SPOA0169	0.85	0.800	SPOA0171	0.94	0.707	SPOA0165	0.90	0.860
SPOA0177	1.14	0.922	SPOA0181	0.92	0.961	SPOA0176	1.29	0.375	SPOA0183	1.15	0.681	SPOA0171	0.91	0.751	SPOA0170	0.97	0.873	SPOA0172	0.74	0.693	SPOA0166	1.06	0.933
SPOA0180	1.29	0.14	SPOA0182	0.67	0.199	SPOA0177	1.43	0	SPOA0184	1.04	0.985	SPOA0172	0.49	0.054	SPOA0171	0.93	0.813	SPOA0173	0.96	0.787	SPOA0167	0.87	0.427
SPOA0181	0.78	0.578	SPOA0183	0.85	0.257	SPOA0180	1.24	0.966	SPOA0185	1.03	0.25	SPOA0173	1.16	0.566	SPOA0172	0.41	0.056	SPOA0174	1.02	0.930	SPOA0168	0.85	0.102
SPOA0182	0.76	0.256	SPOA0184	0.99	0.877	SPOA0181	1.04	0.847	SPOA0186	1.9	0.037	SPOA0174	1.22	0.045	SPOA0173	1.17	0.310	SPOA0175	0.87	0.709	SPOA0169	0.97	0.968
SPOA0183	0.98	0.946	SPOA0185	0.63	0.098	SPOA0182	1.27	0.188	SPOA0187	1.37	0.702	SPOA0175	0.93	0.792	SPOA0174	1.15	0.269	SPOA0176	1.16	0.262	SPOA0170	0.93	0.253
SPOA0184	1.13	0.53	SPOA0186	0.9	0.608	SPOA0183	1.1	0.641	SPOA0188	1.27	0.709	SPOA0176	1.06	0.905	SPOA0175	0.93	0.670	SPOA0177	0.65	0.828	SPOA0171	0.83	0.352
SPOA0185	0.55	0.065	SPOA0187	0.99	0.621	SPOA0184	1	0.798	SPOA0189	1.47	0.885	SPOA0177	0.69		SPOA0176	0.94	0.138	SPOA0180	1.28	0.240	SPOA0172	0.75	0.577
SPOA0186	0.96	0.878	SPOA0188	0.69	0.184	SPOA0185	1.44	0.053	SPOA0190	1.29	0.966	SPOA0180	0.68	0.088	SPOA0177	0.62	0.643	SPOA0181	1.12	0.799	SPOA0173	0.94	0.173
SPOA0187	0.96	0	SPOA0189	0.9	0.958	SPOA0186	1.48	0.027	SPOA0191	1.03	0.093	SPOA0181	0.80	0.412	SPOA0180	0.87	0.179	SPOA0182	0.84	0.659	SPOA0174	1.03	0.872
SPOA0188	0.73	0.332	SPOA0190	0.93	0.951	SPOA0187	1.24	0.822	SPOA0192	1.29	0.327	SPOA0182	0.87	0.357	SPOA0181	0.86	0.250	SPOA0183	0.63	0.204	SPOA0175	1.03	0.961
SPOA0189	0.98	0.948	SPOA0191	1.07	0.47	SPOA0188	1.05	0.385	SPOA0193	1.13	0.892	SPOA0183	0.55	0.171	SPOA0182	0.75	0.044	SPOA0184	0.90	0.674	SPOA0176	1.07	0.757
SPOA0190	1.05	0.1	SPOA0192	0.68	0.327	SPOA0189	1.22	0.965	SPOA0194	0.99	0.841	SPOA0184	0.42	0.081	SPOA0183	0.47	0.019	SPOA0185	0.92	0.751	SPOA0177	0.92	0.930
SPOA0191	1.06	0.632	SPOA0193	0.94	0.989	SPOA0190	1.11	0.373	SPOA0195	1.43	0.782	SPOA0185	0.60	0.147	SPOA0184	0.47	0.052	SPOA0186	0.93	0.461	SPOA0180	1.07	0.737
SPOA0192	0.77	0.506	SPOA0194	0.9	0.75	SPOA0191	1.01	0.232	SPOA0196	1.43	0.68	SPOA0186	0.29	0.005	SPOA0185	0.66	0.030	SPOA0187	0.87	0.542	SPOA0181	1.09	0.761
SPOA0193	0.94	0.977	SPOA0195	1.12	0.779	SPOA0192	1.32	0.077	SPOA0197	1.21	0.678	SPOA0187	0.62	0.004	SPOA0186	0.30	0.000	SPOA0188	0.99	0.750	SPOA0182	0.99	0.910
SPOA0194	0.93	0.953	SPOA0196	1.01	0.767	SPOA0193	1.01	0.955	SPOA0198	1.2	0.969	SPOA0188	0.72	0.540	SPOA0187	0.68	0.069	SPOA0189	1.06	0.962	SPOA0183	0.70	0.072
SPOA0195	0.97	0.951	SPOA0197	0.74	0.707	SPOA0194	1.15	0.555	SPOA0199	1.1	0.775	SPOA0189	0.91	0.946	SPOA0188	0.62	0.172	SPOA0190	1.08	0.810	SPOA0184	0.87	0.607
SPOA0196	0.98	0.938	SPOA0198	0.86	0.946	SPOA0195	1.22	0.639	SPOA0200	1.29	0.671	SPOA0190	0.61	0.030	SPOA0189	0.93	0.940	SPOA0191	0.85	0.229	SPOA0185	1.09	0.725
SPOA0197	0.68	0.658	SPOA0199	0.98	0.698	SPOA0196	1.16	0.947	SPOA0201	1.07	0.769	SPOA0191	0.48	0.019	SPOA0190	0.70	0.042	SPOA0192	0.96	0.880	SPOA0186	0.98	0.507
SPOA0198	0.58	0	SPOA0200	0.95	0.983	SPOA0197	1.17	0.637	SPOA0202	1.19	0.874	SPOA0192	0.94	0.591	SPOA0191	0.46	0.015	SPOA0193	0.88	0.725	SPOA0187	0.88	0.386
SPOA0199	0.99	0.749	SPOA0201	1.19	0.704	SPOA0198	1.78	0.926	SPOA0203	1.12	0.791	SPOA0193	0.74	0.259	SPOA0192	0.83	0.148	SPOA0194	0.90	0.643	SPOA0188	0.93	0.891
SPOA0200	1.11	0.658	SPOA0202	1.28	0.077	SPOA0199	1.38	0.856	SPOA0204	1.22	0.683	SPOA0194	1.02	0.923	SPOA0193	0.68	0.313	SPOA0195	0.61	0.539	SPOA0189	1.02	0.991
SPOA0201	1.06	0.914	SPOA0203	1.01	0.878	SPOA0200	1.38	0.688	SPOA0205	1.14	0.117	SPOA0195	0.54	0.099	SPOA0194	0.95	0.642	SPOA0196	1.10	0.872	SPOA0190	1.03	0.989
SPOA0202	1.22	0.063	SPOA0204	0.98	0.959	SPOA0201	1.23	0.663	SPOA0206	1.64	0.594	SPOA0196	0.94	0.851	SPOA0195	0.48	0.336	SPOA0197	0.81	0.790	SPOA0191	0.86	0.022
SPOA0203	1.07	0.859	SPOA0205	0.84	0.593	SPOA0202	1.04	0.183	SPOA0207	1.5	0.113	SPOA0197	0.85	0.849	SPOA0196	0.75	0.166	SPOA0198	0.91	0.951	SPOA0192	1.15	0.770
SPOA0204	0.88	0.686	SPOA0206	1.21	0.365	SPOA0203	1.13	0.743	SPOA0208	1.44	0.084	SPOA0198	1.01	0.946	SPOA0197	0.81	0.734	SPOA0199	0.53	0.381	SPOA0193	0.95	0.865
SPOA0205	0.92	0.734	SPOA0207	0.95	0.935	SPOA0204	1.06	0.745	SPOA0209	1.34	0.924	SPOA0199	0.98	0.701	SPOA0198	0.81	0.799	SPOA0200	0.89	0.690	SPOA0194	0.90	0.788
SPOA0206	1.4	0.379	SPOA0208	0.65	0.009	SPOA0205	1.36	0.275	SPOA0210	1.05	0.273	SPOA0200	0.80	0.732	SPOA0199	1.17	0.855	SPOA0201	0.89	0.763	SPOA0195	0.78	0.744
SPOA0207	0.95	0.727	SPOA0209	0.9	0.917	SPOA0206	1.25	0.177	SPOA0211	1.14	0.091	SPOA0201	0.80	0.616	SPOA0200	0.76	0.641	SPOA0202	1.08	0.325	SPOA0196	0.92	0.622
SPOA0208	0.61	0.014	SPOA0210	1.27	0.075	SPOA0207	1.12	0.736	SPOA0212	1.05	0.969	SPOA0202	1.02	0.335	SPOA0201	0.65	0.318	SPOA0203	1.17	0.772	SPOA0197	0.88	0.728
SPOA0209	0.86	0.803	SPOA0211	1.04	0.399	SPOA0208	1.01	0.489	SPOA0213	1.27	0.17	SPOA0203	1.13	0.620	SPOA0202	1.03	0.220	SPOA0204	1.16	0.353	SPOA0198	0.93	0.924
SPOA0210	1.21	0.346	SPOA0212	0.96	0.995	SPOA0209	1.07	0.835	SPOA0214	1.29	0.497	SPOA0204	1.37	0.223	SPOA0203	1.04	0.844	SPOA0205	1.36	0.290	SPOA0199	0.78	0.416
SPOA0211	1.02	0.653	SPOA0213	1.21	0.308	SPOA0210	1.21	0.389	SPOA0215	1.11	0.899	SPOA0205	1.02	0.573	SPOA0204	1.37	0.245	SPOA0206	0.98	0.847	SPOA0200	0.81	0.685
SPOA0212	1.05	0.946	SPOA0214	1.06	0.77	SPOA0211	1.33	0.135	SPOA0216	1.01	0.758	SPOA0206	0.87	0.238	SPOA0205	1.10	0.339	SPOA0207	1.26	0.336	SPOA0201	0.79	0.633
SPOA0213	1.14	0.05	SPOA0215	0.9	0.832	SPOA0212	1.14	0.997	SPOA0217	1.01	0.869	SPOA0207	1.32	0.024	SPOA0206	0.86	0.584	SPOA0208	1.14	0.040	SPOA0202	1.06	0.662
SPOA0214	1.02	0.875	SPOA0216	0.95	0.886	SPOA0213	1.07	0.152	SPOA0218	1.07	0.088	SPOA0208	1.18	0.005	SPOA0207	1.30	0.033	SPOA0209	1.06	0.948	SPOA0203	1.04	0.919
SPOA0215	1	0.638	SPOA0217	0.69	0.226	SPOA0214	1.04	0.249	SPOA0219	1.22	0.27	SPOA0209	0.58	0.065	SPOA0208	1.19	0.002	SPOA0210	1.00	0.960	SPOA0204	1.15	0.506
SPOA0216	0.97	0.675	SPOA0218	1	0.453	SPOA0215	1	0.331	SPOA0220	1.37	0.816	SPOA0210	0.93	0.792	SPOA0209	0.57	0.460	SPOA0211	1.09	0.701	SPOA0205	1.36	0.165
SPOA0217	0.75	0.204	SPOA0219	1.17	0.12	SPOA0216	1.05	0.576	SPOA0221	1.09	0.251	SPOA0211	1.25	0.089	SPOA0210	0.88	0.237	SPOA0212	0.94	0.957	SPOA0206	0.95	0.862
SPOA0218	1.22	0.074	SPOA0220	0.83	0.669	SPOA0217	1.1	0.995	SPOA0222	1.15	0.844	SPOA0212	0.79	0.867	SPOA0211	1.21	0.188	SPOA0213	0.69	0.012	SPOA0207	1.22	0.128
SPOA0219	1.17	0.17	SPOA0221	0.95	0.927	SPOA0218	1.25	0.18	SPOA0223	1.11	0.274	SPOA0213	0.60	0.115	SPOA0212	0.81	0.893	SPOA0214	0.71	0.214	SPOA0208	1.06	0.015
SPOA0220	0.93	0.991	SPOA0222	0.94	0.997	SPOA0219	1.59	0.782	SPOA0224	1.06	0.183	SPOA0214	0.93	0.777	SPOA0213	0.53	0.060	SPOA0215	1.05	0.928	SPOA0209	1.08	0.903
SPOA0221	0.93	0.979	SPOA0223	1.13	0.688	SPOA0220	1.03	0.975	SPOA0225	1.14	0.349	SPOA0215	1.02	0.936	SPOA0214	0.70	0.252	SPOA0216	0.71	0.212	SPOA0210	0.91	0.671
SPOA0222	0.94	0.999	SPOA0224	0.64	0.648	SPOA0221	1.21	0.426	SPOA0226	1.36	0.963	SPOA0216	0.79	0.077	SPOA0215	1.03	0.842	SPOA0217	0.88	0.580	SPOA0211	0.93	0.636
SPOA0223	1.03	0.873	SPOA0225	1.11	0.294	SPOA0222	1.04	0.685	SPOA0227	1.54	0.822	SPOA0217	0.88		SPOA0216	0.82	0.288	SPOA0218	0.78	0.258	SPOA0212	0.95	0.971
SPOA0224	0.68	0.522	SPOA0226	1.04	0.81	SPOA0223	1.09	0.596	SPOA0228	1.08	0	SPOA0218	0.50	0.008	SPOA0217	0.93	0.350	SPOA0219	0.97	0.594	SPOA0213	0.68	0.039
SPOA0225	0.94	0.893	SPOA0227	0.96	0.963	SPOA0224	1.19	0.063	SPOA0229	1.19	0.944	SPOA0219	0.91	0.371	SPOA0218	0.51	0.029	SPOA0220	1.13	0.852	SPOA0214	0.65	0.175
SPOA0226	0.83	0.36	SPOA0228	1.19	0	SPOA0225	1.02	0.107	SPOA0230	1.09	0.7	SPOA0220	0.98	0.834	SPOA0219	0.78	0.084	SPOA0221	1.04	0.977	SPOA0215	0.93	0.757
SPOA0227	0.88	0.747	SPOA0229	1.15	0.203	SPOA0226	1.24	0.874	SPOA0231	1.03	0.343	SPOA0221	1.02	0.772	SPOA0220	1.10	0.879	SPOA0222	0.76	0.572	SPOA0216	0.81	0.223
SPOA0228	1.24	0.151	SPOA0230	0.93	0.954	SPOA0227	1.34	0.79	SPOA0232	1.21	0.944	SPOA0222	0.83	0.588	SPOA0221	0.89	0.231	SPOA0223	1.10	0.874	SPOA0217	0.88	0.595
SPOA0229	1.06	0.828	SPOA0231	0.71	0.111	SPOA0228	1.13	0	SPOA0233	1.02	0.723	SPOA0223	0.95	0.617	SPOA0222	0.76	0.619	SPOA0224	1.20	0.927	SPOA0218	0.83	0.248
SPOA0230	1.01	0.875	SPOA0232	0.95	0.992	SPOA0229	1.07	0.887	SPOA0234	1.42	0.998	SPOA0224	0.26	0.073	SPOA0223	0.89	0.423	SPOA0225	0.36	0.293	SPOA0219	0.96	0.701
SPOA0231	0.68	0.287	SPOA0233	1.15	0.885	SPOA0230	1.23	0.595	SPOA0235	1.18	0.936	SPOA0225	1.11		SPOA0224	0.41	0.247	SPOA0226	1.19	0.679	SPOA0220	1.18	0.873
SPOA0232	0.97	0.952	SPOA0234	0.78	0.878	SPOA0231	1.04	0.731	SPOA0236	1.07	0.586	SPOA0226	1.08	0.952	SPOA0225	0.85	0.466	SPOA0227	0.81	0.652	SPOA0221	0.77	0.287
SPOA0233	1.27	0.787	SPOA0235	0.98	0.806	SPOA0232	1.01	0.91	SPOA0237	1.03	0.848	SPOA0227	0.92	0.536	SPOA0226	1.06	0.852	SPOA0228	0.93		SPOA0222	0.78	0.739
SPOA0234	0.74	0.781	SPOA0236	1.16	0.148	SPOA0233	1.11	0.255	SPOA0238	1.08	0.528	SPOA0228	0.90		SPOA0227	0.91	0.501	SPOA0229	0.79	0.503	SPOA0223	1.03	0.979
SPOA0235	0.88	0.711	SPOA0237	1.1	0.749	SPOA0234	1.04	0.998	SPOA0239	1.05	0.253	SPOA0229	0.71	0.576	SPOA0228	0.74	0.119	SPOA0230	0.97	0.814	SPOA0224	1.20	0.869
SPOA0236	1.21	0.239	SPOA0238	1	0.683	SPOA0235	1.11	0.798	SPOA0240	1.03	0.323	SPOA0230	1.38	0.364	SPOA0229	0.63	0.055	SPOA0231	1.16	0.691	SPOA0225	0.64	0.197
SPOA0237	1.14	0.196	SPOA0239	1.1	0.451	SPOA0236	1.03	0.364	SPOA0241	1.09	0.773	SPOA0231	1.37	0.274	SPOA0230	1.41	0.299	SPOA0232	1.13	0.876	SPOA0226	1.07	0.794
SPOA0238	0.95	0.621	SPOA0240	1.27	0.03	SPOA0237	1.15	0.797	SPOA0242	1.18	0.838	SPOA0232	1.04	0.995	SPOA0231	1.28	0.398	SPOA0233	0.98	0.906	SPOA0227	0.89	0.813
SPOA0239	1.35	0.078	SPOA0241	1.11	0.395	SPOA0238	1.37	0.38	SPOA0243	1.04	0.597	SPOA0233	1.06		SPOA0232	1.40	0.757	SPOA0234	0.85	0.843	SPOA0228	1.09	
SPOA0240	1.42	0.045	SPOA0242	0.73	0.483	SPOA0239	1.09	0.115	SPOA0244	1.32	0.437	SPOA0234	1.00	0.995	SPOA0233	0.96	0.911	SPOA0235	0.94	0.835	SPOA0229	0.83	0.259
SPOA0241	0.97	0.944	SPOA0243	1.14	0.046	SPOA0240	1.14	0.312	SPOA0245	1.14	0.748	SPOA0235	1.10	0.904	SPOA0234	0.91	0.909	SPOA0236	1.06	0.854	SPOA0230	1.02	0.978
SPOA0242	0.69	0.383	SPOA0244	0.94	0.889	SPOA0241	1.08	0.45	SPOA0246	1.16	0.909	SPOA0236	1.09	0.553	SPOA0235	0.86	0.270	SPOA0237	1.01	0.898	SPOA0231	1.15	0.179
SPOA0243	1.12	0.176	SPOA0245	1.08	0.908	SPOA0242	1.07	0.998	SPOA0247	1.04	0.246	SPOA0237	0.81	0.509	SPOA0236	1.04	0.289	SPOA0238	0.81	0.309	SPOA0232	1.03	0.980
SPOA0244	0.97	0.737	SPOA0246	0.83	0.498	SPOA0243	1.21	0.876	SPOA0248	1.36	0.319	SPOA0238	0.87	0.923	SPOA0237	0.76	0.630	SPOA0239	0.82	0.283	SPOA0233	0.87	0.857
SPOA0245	1.2	0.478	SPOA0247	0.77	0.316	SPOA0244	1.12	0.987	SPOA0249	1.15	0.373	SPOA0239	1.64	0.021	SPOA0238	0.91	0.740	SPOA0240	1.04	0.470	SPOA0234	0.93	0.919
SPOA0246	0.81	0.6	SPOA0248	0.89	0.917	SPOA0245	1.11	0.685	SPOA0250	1.2	0.234	SPOA0240	1.77	0.011	SPOA0239	1.59	0.111	SPOA0241	1.15	0.474	SPOA0235	1.04	0.891
SPOA0247	0.79	0.432	SPOA0249	0.89	0.749	SPOA0246	1.13	0.235	SPOA0251	1.14	0.877	SPOA0241	1.59	0.161	SPOA0240	1.65	0.034	SPOA0242	0.93	0.857	SPOA0236	1.02	0.936

SPOA0248	0.77	0.502	SPOA0250	0.57	0.286	SPOA0247	1.31	0.629	SPOA0252	1.47	0.189	SPOA0242	1.32	0.585	SPOA0241	1.45	0.176	SPOA0243	1.09	0.083	SPOA0237	1.07	0.918
SPOA0249	0.84	0.464	SPOA0251	0.89	0.83	SPOA0248	1.03	0.342	SPOA0253	1.03	0.926	SPOA0243	1.07	0.708	SPOA0242	1.34	0.436	SPOA0244	1.05	0.898	SPOA0238	0.82	0.276
SPOA0250	0.58	0.348	SPOA0252	0.75	0.065	SPOA0249	1.08	0.596	SPOA0254	1.06	0.995	SPOA0244	1.13	0.538	SPOA0243	1.07	0.446	SPOA0245	0.60	0.489	SPOA0239	0.89	0.662
SPOA0251	0.9	0.689	SPOA0253	1.09	0.882	SPOA0250	1.1	0.559	SPOA0255	1.08	0.907	SPOA0245	0.55	0.501	SPOA0244	1.16	0.422	SPOA0246	1.21	0.274	SPOA0240	1.04	0.534
SPOA0252	0.7	0.007	SPOA0254	1.07	0.864	SPOA0251	1.23	0.841	SPOA0256	1.15	0.985	SPOA0246	1.91	0.079	SPOA0245	0.55	0.637	SPOA0247	1.19	0.706	SPOA0241	1.11	0.467
SPOA0253	0.97	0.959	SPOA0255	1.2	0.547	SPOA0252	1.09	0.537	SPOA0257	1.09	0.925	SPOA0247	1.62	0.127	SPOA0246	1.72	0.108	SPOA0248	1.12	0.819	SPOA0242	0.95	0.868
SPOA0254	1.36	0.576	SPOA0256	1.1	0.76	SPOA0253	1.13	0.949	SPOA0258	1.09	0.635	SPOA0248	1.57	0.414	SPOA0247	1.28	0.458	SPOA0249	1.05	0.891	SPOA0243	1.02	0.876
SPOA0255	0.98	0.799	SPOA0257	0.93	0.978	SPOA0254	1.17	0.99	SPOA0259	1.41	0.996	SPOA0249	1.95	0.357	SPOA0248	1.36	0.504	SPOA0250	1.07	0.922	SPOA0244	1.11	0.390
SPOA0256	1.2	0.656	SPOA0258	0.82	0.73	SPOA0255	1.12	0.622	SPOA0260	1.1	0.897	SPOA0250	1.56	0.593	SPOA0249	1.87	0.023	SPOA0251	1.06	0.749	SPOA0245	0.83	0.693
SPOA0257	0.84	0.812	SPOA0259	0.87	0.508	SPOA0256	1.71	0.837	SPOA0261	1.32	0.42	SPOA0251	1.35	0.510	SPOA0250	1.49	0.440	SPOA0252	1.17	0.301	SPOA0246	1.13	0.785
SPOA0258	0.79	0.778	SPOA0260	1.04	0.448	SPOA0257	1.05	0.999	SPOA0262	1.09	0.533	SPOA0252	1.37	0.166	SPOA0251	0.92	0.644	SPOA0253	0.93	0.863	SPOA0247	1.17	0.460
SPOA0259	0.79	0.571	SPOA0261	1.28	0.582	SPOA0258	1.16	0.803	SPOA0263	1.07	0.383	SPOA0253	1.16	0.842	SPOA0252	1.45	0.014	SPOA0254	1.11	0.909	SPOA0248	1.19	0.703
SPOA0260	0.92	0.829	SPOA0262	1.05	0.173	SPOA0259	1.01	0.649	SPOA0264	1.1	0.716	SPOA0254	1.02	0.951	SPOA0253	1.15	0.899	SPOA0255	1.11	0.696	SPOA0249	1.02	0.984
SPOA0261	1.34	0.6	SPOA0263	0.76	0.154	SPOA0260	1.09	0.887	SPOA0265	1.09	0.582	SPOA0255	2.12	0.239	SPOA0254	0.92	0.746	SPOA0256	1.05	0.947	SPOA0250	1.16	0.625
SPOA0262	1.15	0.079	SPOA0264	0.63	0.75	SPOA0261	1.15	0.408	SPOA0266	1.19	0.05	SPOA0256	1.53	0.355	SPOA0255	1.87	0.113	SPOA0257	0.87	0.658	SPOA0251	0.99	0.790
SPOA0263	0.85	0.263	SPOA0265	0.56	0.514	SPOA0262	1.05	0.664	SPOA0267	1.06	0.242	SPOA0257	1.34	0.737	SPOA0256	1.64	0.380	SPOA0258	0.93	0.910	SPOA0252	1.12	0.399
SPOA0264	0.64	0.695	SPOA0266	0.55	0.052	SPOA0263	1.07	0.022	SPOA0268	1.02	0.827	SPOA0258	1.17	0.686	SPOA0257	1.25	0.772	SPOA0259	0.96	0.857	SPOA0253	1.06	0.951
SPOA0265	0.61	0.539	SPOA0267	0.74	0.454	SPOA0264	1.07	0.667	SPOA0269	1.15	0.985	SPOA0259	1.39	0.190	SPOA0258	1.07	0.950	SPOA0260	1.07	0.906	SPOA0254	0.94	0.916
SPOA0266	0.47	0.032	SPOA0268	0.85	0.791	SPOA0265	1.15	0.653	SPOA0270	1.96	0.771	SPOA0260	1.62	0.029	SPOA0259	1.29	0.209	SPOA0261	0.87	0.808	SPOA0255	1.07	0.809
SPOA0267	0.59	0.184	SPOA0269	0.9	0.859	SPOA0266	1	0.222	SPOA0271	1.04	0.192	SPOA0261	0.70	0.571	SPOA0260	1.62	0.099	SPOA0262	0.72	0.457	SPOA0256	0.98	0.944
SPOA0268	0.74	0.531	SPOA0270	1.01	0.957	SPOA0267	1.12	0.293	SPOA0272	1.08	0.976	SPOA0262	0.85	0.292	SPOA0261	0.65	0.525	SPOA0263	1.14	0.149	SPOA0257	0.93	0.886
SPOA0269	0.85	0.77	SPOA0271	0.98	0.869	SPOA0268	1.14	0.993	SPOA0273	1.09	0.004	SPOA0263	1.64	0.148	SPOA0262	1.02	0.325	SPOA0264	0.95	0.957	SPOA0258	1.05	0.957
SPOA0270	0.87	0.836	SPOA0272	0.9	0.875	SPOA0269	1.75	0.967	SPOA0274	1.56	0.864	SPOA0264	2.35	0.352	SPOA0263	1.24	0.035	SPOA0265	1.00	0.995	SPOA0259	0.94	0.767
SPOA0271	0.85	0.795	SPOA0273	0.84	0.026	SPOA0270	1	0.92	SPOA0275	1.26	0.856	SPOA0265	1.67	0.409	SPOA0264	1.75	0.529	SPOA0266	1.05	0.951	SPOA0260	0.96	0.834
SPOA0272	0.93	0.865	SPOA0274	1.02	0.817	SPOA0271	1.06	0.564	SPOA0276	1.19	0.405	SPOA0266	2.23	0.191	SPOA0265	1.70	0.422	SPOA0267	1.39	0.243	SPOA0261	0.85	0.803
SPOA0273	0.66	0.009	SPOA0275	0.88	0.822	SPOA0272	1.01	0.916	SPOA0277	1.4	0.856	SPOA0267	2.08	0.078	SPOA0266	1.51	0.104	SPOA0268	0.85	0.667	SPOA0262	0.97	0.771
SPOA0274	0.86	0.887	SPOA0276	1.02	0.763	SPOA0273	1.45	0.008	SPOA0278	1.02	0.814	SPOA0268	0.78	0.442	SPOA0267	1.99	0.146	SPOA0269	0.98	0.959	SPOA0263	1.05	0.637
SPOA0275	0.98	0.468	SPOA0277	1.07	0.841	SPOA0274	1.29	0.957	SPOA0279	1.01	0.07	SPOA0269	0.96	0.978	SPOA0268	0.74	0.460	SPOA0270	0.89	0.795	SPOA0264	1.04	0.982
SPOA0276	1	0.788	SPOA0278	1.2	0.653	SPOA0275	1.07	0.733	SPOA0280	1.3	0.744	SPOA0270	0.78	0.663	SPOA0269	0.91	0.867	SPOA0271	0.99	0.814	SPOA0265	1.02	0.976
SPOA0277	1.01	0.811	SPOA0279	0.54	0.053	SPOA0276	1.38	0.322	SPOA0281	1.34	0.199	SPOA0271	1.13	0.892	SPOA0270	0.63	0.397	SPOA0272	0.99	0.984	SPOA0266	1.27	0.213
SPOA0278	1.13	0.76	SPOA0280	0.66	0.192	SPOA0277	1.08	0.849	SPOA0282	1.11	0.309	SPOA0272	0.70	0.645	SPOA0271	0.96	0.205	SPOA0273	0.75	0.038	SPOA0267	1.21	0.570
SPOA0279	0.61	0.192	SPOA0281	1.38	0.082	SPOA0278	1.3	0.723	SPOA0283	1.72	0.118	SPOA0273	9.13	0.000	SPOA0272	0.68	0.629	SPOA0274	1.01	0.965	SPOA0268	0.93	0.784
SPOA0280	0.65	0.225	SPOA0282	1.23	0.203	SPOA0279	1.05	0.01	SPOA0284	1.09	0.613	SPOA0274	1.11	0.866	SPOA0273	8.00	0.000	SPOA0275	1.02	0.950	SPOA0269	0.93	0.868
SPOA0281	1.48	0.047	SPOA0283	1.14	0.307	SPOA0280	1.13	0.68	SPOA0285	1.28	0.382	SPOA0275	1.11	0.831	SPOA0274	0.93	0.610	SPOA0276	0.77	0.123	SPOA0270	0.91	0.209
SPOA0282	1.41	0.188	SPOA0284	1.27	0.578	SPOA0281	4.99	0.232	SPOA0286	0.99	0.379	SPOA0276	0.78	0.554	SPOA0275	1.14	0.765	SPOA0277	0.99	0.874	SPOA0271	0.95	0.767
SPOA0283	1	0.548	SPOA0285	0.92	0.146	SPOA0282	1.03	0.247	SPOA0288	1.16	0.96	SPOA0277	1.13	0.954	SPOA0276	0.75	0.457	SPOA0278	0.97	0.916	SPOA0272	0.91	0.891
SPOA0284	1.38	0.332	SPOA0286	0.61	0.019	SPOA0283	1.29	0.007	SPOA0289	1.44	0.206	SPOA0278	1.16	0.842	SPOA0277	1.01	0.835	SPOA0279	0.84	0.670	SPOA0273	0.88	0.243
SPOA0285	0.89	0.646	SPOA0288	0.9	0.98	SPOA0284	1.02	0.772	SPOA0290	1.13	0.92	SPOA0279	1.48	0.099	SPOA0278	1.04	0.937	SPOA0280	1.05	0.903	SPOA0274	0.96	0.890
SPOA0286	0.52	0.012	SPOA0289	0.74	0.405	SPOA0285	1.07	0.297	SPOA0291	1.06	0.364	SPOA0280	1.41	0.187	SPOA0279	1.41	0.157	SPOA0281	0.93	0.493	SPOA0275	1.10	0.658
SPOA0287	1.03	0.686	SPOA0290	1.01	0.981	SPOA0286	1.17	0.141	SPOA0292	1.2	0.159	SPOA0281	0.85	0.318	SPOA0280	1.40	0.125	SPOA0282	0.86	0.438	SPOA0276	0.77	0.183
SPOA0288	0.86	0.934	SPOA0291	0.9	0.503	SPOA0287	1.09	0	SPOA0293	1.2	0.168	SPOA0282	0.60	0.127	SPOA0281	0.90	0.259	SPOA0283	0.65	0.049	SPOA0277	0.91	0.778
SPOA0289	0.77	0.49	SPOA0292	1.3	0.001	SPOA0288	1.03	0.926	SPOA0294	1.03	0.687	SPOA0283	0.73	0.017	SPOA0282	0.68	0.017	SPOA0284	0.90	0.779	SPOA0278	0.94	0.894
SPOA0290	1.15	0.856	SPOA0293	1.2	0.216	SPOA0289	1.17	0.222	SPOA0295	1.25	0.86	SPOA0284	0.76	0.557	SPOA0283	0.72	0.041	SPOA0285	0.88	0.394	SPOA0279	0.92	0.550
SPOA0291	0.82	0.562	SPOA0294	1.02	0.518	SPOA0290	1.15	0.889	SPOA0296	1.39	0.705	SPOA0285	0.81	0.129	SPOA0284	0.74	0.506	SPOA0286	1.09	0.316	SPOA0280	1.02	0.949
SPOA0292	1.26	0.023	SPOA0295	0.96	0.965	SPOA0291	1.02	0.698	SPOA0297	1.01	0.111	SPOA0286	0.95	0.914	SPOA0285	0.82	0.070	SPOA0287	0.83	0.532	SPOA0281	0.92	0.560
SPOA0293	1.16	0.055	SPOA0296	0.68	0.643	SPOA0292	1.29	0.184	SPOA0298	1.08	0.242	SPOA0288	0.78	0.835	SPOA0286	1.00	0.503	SPOA0288	0.85	0.864	SPOA0282	0.78	0.019
SPOA0294	0.99	0.933	SPOA0297	0.71	0.102	SPOA0293	1.39	0.378	SPOA0299	1.18	0.088	SPOA0289	3.99	0.176	SPOA0287	0.79	0.148	SPOA0289	1.04	0.979	SPOA0283	0.77	0.093
SPOA0295	0.88	0.931	SPOA0298	0.66	0.453	SPOA0294	1	0.482	SPOA0300	1.04	0.14	SPOA0290	0.67	0.832	SPOA0288	0.60	0.763	SPOA0290	0.95	0.979	SPOA0284	0.83	0.640
SPOA0296	0.72	0.457	SPOA0299	0.67	0.058	SPOA0295	1.24	0.787	SPOA0301	1.16	0.803	SPOA0291	0.77	0.078	SPOA0289	4.59	0.258	SPOA0291	0.86	0.151	SPOA0285	0.92	0.103
SPOA0297	0.61	0.268	SPOA0300	0.57	0.251	SPOA0296	1.16	0.538	SPOA0302	1.05	0.969	SPOA0292	1.12	0.090	SPOA0290	0.63	0.808	SPOA0292	1.06	0.314	SPOA0286	1.04	0.333
SPOA0298	0.59	0.254	SPOA0301	1.08	0.626	SPOA0297	1.06	0.076	SPOA0303	1.24	0.189	SPOA0293	1.40	0.009	SPOA0291	0.74	0.067	SPOA0293	1.01	0.887	SPOA0287	0.73	0.126
SPOA0299	0.6	0.061	SPOA0302	0.91	0.732	SPOA0298	1.2	0.615	SPOA0304	1.08	0.317	SPOA0294	1.33	0.054	SPOA0292	1.11	0.007	SPOA0294	1.05	0.540	SPOA0288	0.83	0.862
SPOA0300	0.58	0.256	SPOA0303	1.3	0.294	SPOA0299	1.06	0.322	SPOA0305	1.23	0.159	SPOA0295	1.15	0.881	SPOA0293	1.39	0.035	SPOA0295	1.01	0.977	SPOA0289	1.09	0.925
SPOA0301	0.95	0.991	SPOA0304	0.83	0.187	SPOA0300	1.14	0.361	SPOA0306	1.08	0.266	SPOA0296	1.35	0.688	SPOA0294	1.32	0.190	SPOA0296	0.97	0.910	SPOA0290	0.91	0.947
SPOA0302	0.88	0.426	SPOA0305	1.05	0.345	SPOA0301	1.3	0.773	SPOA0309	1.03	0.61	SPOA0297	2.41	0.091	SPOA0295	1.20	0.843	SPOA0297	1.06	0.902	SPOA0291	0.91	0.660
SPOA0303	1.23	0.069	SPOA0306	1.34	0.373	SPOA0302	1.07	0.967	SPOA0310	1.21	0.581	SPOA0298	1.92	0.071	SPOA0296	1.25	0.698	SPOA0298	1.27	0.383	SPOA0292	0.95	0.163
SPOA0304	0.81	0.137	SPOA0309	0.81	0.433	SPOA0303	1.34	0.316	SPOA0311	1.35	0.842	SPOA0299	1.36	0.221	SPOA0297	1.88	0.042	SPOA0299	1.06	0.911	SPOA0293	1.05	0.694
SPOA0305	1.06	0.764	SPOA0310	0.76	0.212	SPOA0304	1.05	0.156	SPOA0312	1.03	0.205	SPOA0300	1.98	0.102	SPOA0298	2.85	0.234	SPOA0300	0.93	0.852	SPOA0294	1.09	0.481
SPOA0306	1.43	0.09	SPOA0311	0.92	0.981	SPOA0305	1.09	0.44	SPOA0313	1.17	0.194	SPOA0301	1.18	0.167	SPOA0299	1.48	0.076	SPOA0301	0.93	0.375	SPOA0295	1.20	0.788
SPOA0309	0.72	0.596	SPOA0312	1.1	0.62	SPOA0306	1.32	0.8	SPOA0314	1.09	0.97	SPOA0302	1.29	0.439	SPOA0300	2.02	0.087	SPOA0302	1.10	0.664	SPOA0296	1.02	0.973
SPOA0310	0.65	0.08	SPOA0313	1.02	0.777	SPOA0309	1.1	0.995	SPOA0315	1.25	0.133	SPOA0303	0.81	0.083	SPOA0301	1.17	0.250	SPOA0303	0.80	0.159	SPOA0297	1.01	0.961
SPOA0311	0.9	0.944	SPOA0314	1.04	0.748	SPOA0310	1.18	0.818	SPOA0316	1.18	0.377	SPOA0304	1.55	0.040	SPOA0302	1.16	0.771	SPOA0304	0.86	0.460	SPOA0298	1.17	0.640
SPOA0312	1.08	0.77	SPOA0315	1.89	0.029	SPOA0311	1.1	0.911	SPOA0317	1.06	0.886	SPOA0305	1.52	0.040	SPOA0303	0.87	0.426	SPOA0305	1.10	0.332	SPOA0299	0.96	0.856
SPOA0313	0.84	0.813	SPOA0316	0.6	0.149	SPOA0312	1.21	0.197	SPOA0318	1.49	0.946	SPOA0306	1.17	0.181	SPOA0304	1.75	0.009	SPOA0306	1.16	0.201	SPOA0300	1.01	0.985
SPOA0314	0.98	0.68	SPOA0317	0.88	0.849	SPOA0313	1.25	0.444	SPOA0319	1.34	0.953	SPOA0309	1.53	0.227	SPOA0305	1.52	0.023	SPOA0309	0.94	0.853	SPOA0301	0.90	0.540
SPOA0315	2.1	0.128	SPOA0318	0.85	0.948	SPOA0314	1.31	0.91	SPOA0320	1.09	0.485	SPOA0310	2.06	0.088	SPOA0306	1.27	0.168	SPOA0310	1.11	0.733	SPOA0302	1.06	0.801
SPOA0316	0.56	0.102	SPOA0319	1.01	0.927	SPOA0315	1.26	0.322	SPOA0321	1.22	0.099	SPOA0311	1.16	0.812	SPOA0309	1.53	0.046	SPOA0311	0.80	0.377	SPOA0303	0.70	0.231
SPOA0317	0.82	0.561	SPOA0320	0.95	0.923	SPOA0316	1.13	0.826	SPOA0322	1.17	0.353	SPOA0312	0.74	0.340	SPOA0310	1.54	0.047	SPOA0312	0.81	0.690	SPOA0304	0.91	0.115
SPOA0318	0.74	0.876	SPOA0321	0.99	0.657	SPOA0317	1.24	0.583	SPOA0323	1.4	0.736	SPOA0313	1.07	0.931	SPOA0311	1.16	0.858	SPOA0313	0.78	0.280	SPOA0305	1.02	0.815
SPOA0319	1.02	0.926	SPOA0322	1.88	0.011	SPOA0318	1.05	0.901	SPOA0324	1.11	0.915	SPOA0314	1.01	0.934	SPOA0312	0.66	0.207	SPOA0314	0.98	0.786	SPOA0306	1.12	0.659
SPOA0320	0.91	0.867	SPOA0323	0.96	0.992	SPOA0319	1.31	0.946	SPOA0325	1.39	0.584	SPOA0315	0.22	0.043	SPOA0313	0.87	0.241	SPOA0315	1.27	0.676	SPOA0309	1.00	0.941
SPOA0321	0.92	0.902	SPOA0324	1.06	0.528	SPOA0320	1.27	0.856	SPOA0326	1.26	0.156	SPOA0316	0.65	0.148	SPOA0314	0.99	0.686	SPOA0316	0.91	0.672	SPOA0310	1.22	0.188
SPOA0322	2.29	0.002	SPOA0325	0.78	0.315	SPOA0321	1.23	0.201	SPOA0327	1.1	0.767	SPOA0317	1.19	0.635	SPOA0315	0.24	0.005	SPOA0317	0.94	0.719	SPOA0311	1.02	0.999
SPOA0323	0.94	0.956	SPOA0326	1.14	0.145	SPOA0322	1.56	0.502	SPOA0328	1.14	0.865	SPOA0318	0.65	0.792	SPOA0316	0.68	0.032	SPOA0318	0.93	0.974	SPOA0312	0.85	0.664
SPOA0324	1.13	0.475	SPOA0327	1.01	0.954	SPOA0323	1.06	0.804	SPOA0329	1.01	0.858	SPOA0319	0.72	0.541	SPOA0317	1.09	0.755	SPOA0319	0.98	0.944	SPOA0313	0.92	0.545
SPOA0325	0.67	0.43	SPOA0328	1.04	0.551	SPOA0324	1.11	0.585	SPOA0330	1.14	0.131	SPOA0320	0.80	0.507	SPOA0318	0.60	0.766	SPOA0320	0.68	0.560	SPOA0314	1.08	0.663
SPOA0326	1.18	0.296	SPOA0329	0.98	0.761	SPOA0325	1.11	0.846	SPOA0331	1.6	0.792	SPOA0321	0.13	0.005	SPOA0319	0.74	0.569	SPOA0321	1.10	0.887	SPOA0315	1.22	0.605
SPOA0327	0.99	0.99	SPOA0330	0.65	0.143	SPOA0326	1.22	0.23	SPOA0332	1.06	0.802	SPOA0322	0.93	0.668	SPOA0320	0.76	0.005	SPOA0322	1.02	0.970	SPOA0316	0.97	0.906
SPOA0328	1.19	0.476	SPOA0331	0.88	0.769	SPOA0327	1.03	0.688	SPOA0333	1.14	0.971	SPOA0323	1.53	0.544	SPOA0321	0.17	0.001	SPOA0323	0.93	0.917	SPOA0317	0.97	0.906
SPOA0329	0.91	0.884	SPOA0332	1.02	0.425	SPOA0328	1.05	0.947	SPOA0334	1.03	0.826	SPOA0324	0.92	0.886	SPOA0322	1.00	0.982	SPOA0324	0.89	0.666	SPOA0318	0.93	0.963
SPOA0330	0.73	0.408	SPOA0333	0.87	0.966	SPOA0329	1.05	0.639	SPOA0335	1.26	0.121	SPOA0325	0.83	0.130	SPOA0323	1.50	0.547	SPOA0325	0.85	0.208	SPOA0319	1.06	0.908
SPOA0331	0.73	0.643	SPOA0334	1.13	0.462	SPOA0330	1.13	0.179	SPOA0336	1.02	0.76	SPOA0326	0.70	0.030	SPOA0324	1.03	0.526	SPOA0326	0.92	0.449	SPOA0320	0.88	0.621
SPOA0332	1.05	0.611	SPOA0335	0.97	0.945	SPOA0331	1.01	0.775	SPOA0337	1.51	0.149	SPOA0327	1.00	0.929	SPOA0325	0.87	0.718	SPOA0327	0.79	0.692	SPOA0321	0.81	0.252
SPOA0333	1.01	0.976	SPOA0336	0.67	0.453	SPOA0332	1.35	0.986	SPOA0338	1.07	0.531	SPOA0328	1.90	0.014	SPOA0326	0.71	0.024	SPOA0328	0.98	0.637	SPOA0322	0.98	0.642
SPOA0334	1.1	0.53	SPOA0337	0.44	0.01	SPOA0333	1.02	0.98	SPOA0339	1.09	0.281	SPOA0329	1.02	0.933	SPOA0327	0.97	0.934	SPOA0329	1.18	0.677	SPOA0323	0.93	0.920
SPOA0335	0.99	0.892	SPOA0338	0.52	0.311	SPOA0334	1.52	0.465	SPOA0340	1.22	0.03	SPOA0330	1.22	0.369	SPOA0328	1.97	0.010	SPOA0330	1.08	0.624	SPOA0324	0.88	0.388
SPOA0336	0.64	0.355	SPOA0339	0.08	0.002	SPOA0335	1.05	0.205	SPOA0341	1	0.029	SPOA0331	1.06	0.981	SPOA0329	1.07	0.972	SPOA0331	0.92	0.779	SPOA0325	0.91	0.582
SPOA0337	0.43	0.007	SPOA0340	0.08	0	SPOA0336	1.09	0.557	SPOA0342	1.06	0.848	SPOA0332	0.74	0.307	SPOA0330	1.11	0.716	SPOA0332	1.12	0.825	SPOA0326	0.84	0.057
SPOA0338	0.44	0.229	SPOA0341	0.05	0.001	SPOA0337	1.18	0.735	SPOA0343	1.38	0.385	SPOA0333	0.48	0.712	SPOA0331	1.19	0.645	SPOA0333	0.94	0.967	SPOA0327	0.81	0.679
SPOA0339	0.09	0.004	SPOA0342	0.08	0.001	SPOA0338	1.35	0.733	SPOA0344	1.08	0.27	SPOA0334	0.49	0.071	SPOA0332	0.77	0.133	SPOA0334	1.10	0.657	SPOA0328	1.07	0.806
SPOA0340	0.1	0.029	SPOA0343	0.06	0	SPOA0339	1.04	0.389	SPOA0345	1.16	0.77	SPOA0335	0.91	0.559	SPOA0333	0.44	0.690	SPOA0335	1.09	0.768	SPOA0329	1.09	0.896
SPOA0341	0.05	0	SPOA0344	1.45	0.022	SPOA0340	1.18	0.058	SPOA0346	1.32	0.215	SPOA0336	1.63	0.343	SPOA0334	0.58	0.157	SPOA0336	0.87	0.782	SPOA0330	1.29	0.168
SPOA0342	0.09	0.012	SPOA0345	0.13	0.006	SPOA0341	1.37	0.132	SPOA0347	1.17	0.681	SPOA0337	1.62	0.037	SPOA0335	0.94	0.738	SPOA0337	1.11	0.660	SPOA0331	1.12	0.871
SPOA0343	0.09	0.002	SPOA0346	0.14	0.005	SPOA0342	1.21	0.638	SPOA0348	1.34	0.024	SPOA0338	3.54	0.025	SPOA0336	1.66	0.311	SPOA0338	2.25	0.347	SPOA0332	1.04	0.951
SPOA0344	1.38	0.065	SPOA0347	0.2	0.003	SPOA0343	1.36	0.704	SPOA0349	1.26	0.017	SPOA0339	202.00	0.001	SPOA0337	1.61	0.055	SPOA0339	0.94	0.969	SPOA0333	0.86	0.927
SPOA0345	0.15	0.013	SPOA0348	0.3	0.006	SPOA0344	1.13	0.234	SPOA0350	1.09	0.087	SPOA0340	142.00	0.001	SPOA0338	4.15	0.021	SPOA0340	0.86	0.275	SPOA0334	1.18	0.506
SPOA0346	0.16	0.005	SPOA0349	2.15	0.011	SPOA0345	1.1	0.905	SPOA0351	1.07	0.949	SPOA0341	129.00	0.001	SPOA0339	149.00	0.003	SPOA0341	0.96	0.627	SPOA0335	1.13	0.505
SPOA0347	0.23	0.001	SPOA0350	1.14	0.059	SPOA0346	1.25	0.34	SPOA0352	1.17	0.815	SPOA0342	44.10	0.002	SPOA0340	109.00	0.002	SPOA0342	1.03	0.805	SPOA0336	0.93	0.915
SPOA0348	0.3	0.01	SPOA0351	0.83	0.83	SPOA0347	1.11	0.493	SPOA0353	1.08	0.286	SPOA0343	88.80	0.002	SPOA0341	164.00	0.001	SPOA0343	0.93	0.831	SPOA0337	1.26	0.062
SPOA0349	2.27	0.172	SPOA0352	0.98	0.691	SPOA0348	1.21	0.018	SPOA0354	1.07	0.097	SPOA0344	1.32	0.094	SPOA0342	47.40	0.002	SPOA0344	1.00	0.965	SPOA0338	1.26	0.488
SPOA0350	0.99	0.833	SPOA0353	0.82	0.119	SPOA0349	1.06	0.478	SPOA0355	1.03	0.608	SPOA0345	74.80	0.000	SPOA0343	86.50	0.001	SPOA0345	0.97	0.892	SPOA0339	0.96	0.965
SPOA0351	0.77	0.231	SPOA0354	0.93	0.826	SPOA0350	1.07	0.035	SPOA0356	1.23	0.144	SPOA0346	89.70	0.001	SPOA0344	1.19	0.211	SPOA0346	0.87	0.723	SPOA0340	0.78	0.047
SPOA0352	0.89	0.704	SPOA0355	0.85	0.381	SPOA0351	1.02	0.819	SPOA0357	1.27	0.733	SPOA0347	23.10	0.009	SPOA0345	79.80	0.000	SPOA0347	1.10	0.690	SPOA0341	0.94	0.794
SPOA0353	0.72	0.126	SPOA0356	1.11	0.135	SPOA0352	1.11	0.93	SPOA0358	1.24	0.313	SPOA0348	10.90	0.001	SPOA0346	91.20	0.002	SPOA0348	0.91	0.517	SPOA0342	1.09	0.775
SPOA0354	0.88	0.561	SPOA0357	1.01	0.917	SPOA0353	1.2	0.585	SPOA0359	1.54	0.09	SPOA0349	0.63	0.285	SPOA0347	29.80	0.001	SPOA0349	1.67	0.163	SPOA0343	0.92	0.548
SPOA0355	0.93	0.891	SPOA0358	1.19	0.066	SPOA0354	1.05	0.384	SPOA0360	1.37	0.1	SPOA0350	0.79	0.197	SPOA0348	10.40	0.000	SPOA0350	0.77	0.368	SPOA0344	1.03	0.813
SPOA0356	1.25	0.109	SPOA0359	1.1	0.141	SPOA0355	1.09	0.21	SPOA0361	1.04	0.566	SPOA0351	0.43	0.075	SPOA0349	0.66	0.002	SPOA0351	0.57	0.029	SPOA0345	0.97	0.855
SPOA0357	0.95	0.882	SPOA0360	0.87	0.851	SPOA0356	1.27	0.597	SPOA0362	1.12	0.969	SPOA0352	0.67	0.184	SPOA0350	0.62	0.072	SPOA0352	0.91	0.707	SPOA0346	0.80	0.156
SPOA0358	1.04	0.526	SPOA0361	0.97	0.692	SPOA0357	1.27	0.718	SPOA0363	1.43	0.96	SPOA0353	1.49	0.180	SPOA0351	0.39	0.195	SPOA0353	0.86	0.466	SPOA0347	1.02	0.414
SPOA0359	1.02	0.304	SPOA0362	0.96	0.993	SPOA0358	1.01	0.267	SPOA0364	1.1	0.628	SPOA0354	0.69	0.085	SPOA0352	0.69	0.092	SPOA0354	0.95	0.568	SPOA0348	0.93	0.660
SPOA0360	0.81	0.624	SPOA0363	1.16	0.284	SPOA0359	1.13	0.331	SPOA0365	1.02	0.328	SPOA0355	0.82	0.084	SPOA0353	1.52	0.029	SPOA0355	0.88	0.208	SPOA0349	1.46	0.014
SPOA0361	0.87	0.616	SPOA0364	0.82	0.332	SPOA0360	1.06	0.826	SPOA0366	1.1	0.99	SPOA0356	0.87	0.296	SPOA0354	0.65	0.035	SPOA0356	0.97	0.778	SPOA0350	1.00	0.881
SPOA0362	0.9	0.932	SPOA0365	1.14	0.656	SPOA0361	1.3	0.542	SPOA0368	1.17	0.028	SPOA0357	0.61	0.142	SPOA0355	0.86	0.175	SPOA0357	0.92	0.731	SPOA0351	0.55	0.334
SPOA0363	1.21	0.465	SPOA0366	1.05	0.917	SPOA0362	1.05	0.967	SPOA0369	1.23	0.405	SPOA0358	1.02	0.998	SPOA0356	1.00	0.680	SPOA0358	1.03	0.954	SPOA0352	0.96	0.860
SPOA0364	0.75	0.053	SPOA0368	0.74	0.026	SPOA0363	1.14	0.486	SPOA0370	1.03	0.693	SPOA0359	0.33	0.005	SPOA0357	0.61	0.244	SPOA0359	1.06	0.893	SPOA0353	1.02	0.949
SPOA0365	1.1	0.445	SPOA0369	0.81	0.383	SPOA0364	1.03	0.906	SPOA0371	1.06	0.647	SPOA0360	0.55	0.148	SPOA0358	0.99	0.759	SPOA0360	0.88	0.620	SPOA0354	0.94	0.184
SPOA0366	1.06	0.935	SPOA0370	0.93	0.997	SPOA0365	1.19	0.398	SPOA0372	1.02	0.911	SPOA0361	0.52	0.002	SPOA0359	0.34	0.006	SPOA0361	1.11	0.710	SPOA0355	0.85	0.326
SPOA0367	1.11	0	SPOA0371	1.27	0.56	SPOA0366	1.29	0.936	SPOA0373	1.07	0.718	SPOA0362	0.44	0.482	SPOA0360	0.54	0.117	SPOA0362	0.99	0.993	SPOA0356	0.93	0.433
SPOA0368	0.65	0.023	SPOA0372	1.07	0.899	SPOA0367	1.01	0.523	SPOA0374	1.04	0.951	SPOA0363	0.79	0.278	SPOA0361	0.55	0.010	SPOA0363	1.07	0.896	SPOA0357	0.90	0.425
SPOA0369	0.65	0.119	SPOA0373	0.88	0.672	SPOA0368	1.1	0.02	SPOA0375	1.19	0.27	SPOA0364	0.64	0.021	SPOA0362	0.44	0.247	SPOA0364	1.09	0.586	SPOA0358	0.93	0.529
SPOA0370	0.85	0.865	SPOA0374	0.74	0.186	SPOA0369	1.1	0.918	SPOA0376	1.33	0.21	SPOA0365	0.57	0.245	SPOA0363	0.75	0.216	SPOA0365	0.64	0.007	SPOA0359	1.00	0.841
SPOA0371	1.42	0.473	SPOA0375	0.97	0.909	SPOA0370	1.05	0.943	SPOA0377	1.15	0.608	SPOA0366	1.01	0.974	SPOA0364	0.66	0.005	SPOA0366	0.84	0.864	SPOA0360	0.94	0.814
SPOA0372	0.88	0.961	SPOA0376	0.87	0.752	SPOA0371	1.15	0.571	SPOA0378	1.37	0.406	SPOA0367	1.01	[redacted]	SPOA0365	0.50	0.210	SPOA0368	1.08	0.541	SPOA0361	1.24	0.303
SPOA0373	0.96	0.918	SPOA0377	1.01	0.758	SPOA0372	1.23	0.932	SPOA0379	1.03	0.144	SPOA0368	1.64	0.015	SPOA0366	0.92	0.902	SPOA0369	1.02	0.993	SPOA0362	0.99	0.894
SPOA0374	0.91	0.864	SPOA0378	1.12	0.205	SPOA0373	1.21	0.65	SPOA0380	1.12	0.876	SPOA0369	0.68	0.143	SPOA0367	1.03	[redacted]	SPOA0370	0.93	0.784	SPOA0363	1.02	0.992
SPOA0375	1.07	0.803	SPOA0379	1.22	0.195	SPOA0374	1.11	0.883	SPOA0381	0.99	0.834	SPOA0370	0.71	0.476	SPOA0368	1.59	0.012	SPOA0371	0.91	0.809	SPOA0364	1.13	0.611
SPOA0376	0.9	0.907	SPOA0380	0.93	0.967	SPOA0375	1.13	0.464	SPOA0382	1.18	0.993	SPOA0371	0.55	0.277	SPOA0369	0.61	0.252	SPOA0372	0.85	0.906	SPOA0365	0.83	0.648
SPOA0377	1.05	0.769	SPOA0381	0.94	0.917	SPOA0376	1	0.979	SPOA0383	1.17	0.915	SPOA0372	0.68	0.763	SPOA0370	0.77	0.536	SPOA0373	0.80	0.164	SPOA0366	1.01	0.989
SPOA0378	1.39	0.368	SPOA0382	1.15	0.83	SPOA0377	0.99	0.637	SPOA0384	1.28	0.69	SPOA0373	0.90	0.195	SPOA0371	0.53	0.266	SPOA0374	1.07	0.909	SPOA0368	1.13	0.260
SPOA0379	1.34	0.049	SPOA0383	0.98	0.976	SPOA0378	1.01	0.427	SPOA0385	1.38	0.953	SPOA0374	1.00	0.554	SPOA0372	0.57	0.715	SPOA0375	0.87	0.783	SPOA0369	1.12	0.130
SPOA0380	0.85	0.611	SPOA0384	1.01	0.97	SPOA0379	1.14	0.131	SPOA0386	1.03	0.875	SPOA0375	0.63	0.372	SPOA0373	0.78	0.369	SPOA0376	0.93	0.825	SPOA0370	0.86	0.750
SPOA0381	1.07	0.573	SPOA0385	0.91	0.978	SPOA0380	1.18	0.794	SPOA0387	1.04	0.71	SPOA0376	0.85	0.431	SPOA0374	1.31	0.466	SPOA0377	0.81	0.500	SPOA0371	0.92	0.880
SPOA0382	1.16	0.81	SPOA0386	0.99	0.932	SPOA0381	1.41	0.913	SPOA0388	1.06	0.659	SPOA0377	0.92	0.722	SPOA0375	0.60	0.212	SPOA0378	0.79	0.212	SPOA0372	0.90	0.933
SPOA0383	0.93	0.972	SPOA0387	1.07	0.807	SPOA0382	1.3	0.921	SPOA0389	1.1	0.084	SPOA0378	0.78	0.121	SPOA0376	0.87	0.149	SPOA0379	1.00	0.963	SPOA0373	0.78	0.369
SPOA0384	0.99	0.982	SPOA0388	1.01	0.956	SPOA0383	1	0.948	SPOA0390	1.17	0.764	SPOA0379	1.07	0.678	SPOA0377	0.92	0.721	SPOA0380	0.89	0.745	SPOA0374	0.83	0.557
SPOA0385	0.88	0.947	SPOA0389	1.14	0.726	SPOA0384	1.06	0.844	SPOA0391	1.13	0.75	SPOA0380	1.19	0.570	SPOA0378	0.68	0.105	SPOA0381	1.02	0.903	SPOA0375	0.87	0.777
SPOA0386	1.13	0.786	SPOA0390	0.88	0.7	SPOA0385	1.26	0.961	SPOA0392	1.21	0.002	SPOA0381	1.85	0.077	SPOA0379	0.99	0.683	SPOA0382	0.88	0.818	SPOA0376	0.86	0.801
SPOA0387	1.03	0.9	SPOA0391	0.99	0.908	SPOA0386	1.08	0.855	SPOA0393	1.26	0.04	SPOA0382	0.83	0.785	SPOA0380	1.05	0.844	SPOA0383	0.94	0.885	SPOA0377	0.82	0.630
SPOA0388	0.86	0.585	SPOA0392	6.43	0.009	SPOA0387	1.07	0.621	SPOA0394	1.03	0.059	SPOA0383	1.05	0.947	SPOA0381	2.01	0.046	SPOA0384	0.85	0.737	SPOA0378	0.90	0.586

SPOA0389	1.15	0.398	SPOA0393	4.83	0.011	SPOA0388	1.13	0.52	SPOA0395	1.52	0.006	SPOA0384	0.80	0.683	SPOA0382	0.76	0.675	SPOA0385	0.87	0.899	SPOA0379	0.87	0.488
SPOA0390	0.85	0.224	SPOA0394	2.32	0.026	SPOA0389	1.21	0.122	SPOA0396	1.2	0.004	SPOA0385	1.10	0.952	SPOA0383	0.98	0.968	SPOA0386	0.91	0.847	SPOA0380	0.98	0.949
SPOA0391	0.98	0.932	SPOA0395	3.5	0.036	SPOA0390	1.02	0.961	SPOA0397	1.25	0.08	SPOA0386	0.93	0.841	SPOA0384	0.76	0.718	SPOA0387	0.98	0.935	SPOA0381	1.05	0.731
SPOA0392	7.47	0.001	SPOA0396	5.76	0.008	SPOA0391	1.11	0.789	SPOA0398	1.26	0.003	SPOA0387	1.59	0.379	SPOA0385	1.09	0.965	SPOA0388	0.54	0.165	SPOA0382	0.88	0.822
SPOA0393	6	0.026	SPOA0397	4.08	0.041	SPOA0392	1.42	0.002	SPOA0399	1.19	0	SPOA0388	0.62	0.489	SPOA0386	0.87	0.705	SPOA0389	0.99	0.948	SPOA0383	0.98	0.951
SPOA0394	1.87	0.041	SPOA0398	6.03	0.003	SPOA0393	1.07	0.042	SPOA0400	1.11	0.264	SPOA0389	0.58	0.018	SPOA0387	1.49	0.367	SPOA0390	0.92	0.745	SPOA0384	0.90	0.853
SPOA0395	3.52	0.077	SPOA0399	8.53	0.001	SPOA0394	1.28	0.089	SPOA0401	1.41	0.955	SPOA0390	1.05	0.626	SPOA0388	0.49	0.534	SPOA0391	0.78	0.718	SPOA0385	1.04	0.978
SPOA0396	5.69	0.001	SPOA0400	0.99	0.712	SPOA0395	1.02	0.06	SPOA0402	1.13	0.793	SPOA0391	0.66	0.498	SPOA0389	0.64	0.005	SPOA0392	0.10	0.007	SPOA0386	0.92	0.877
SPOA0397	5.25	0.049	SPOA0401	0.85	0.776	SPOA0396	1.25	0.004	SPOA0403	1.21	0.954	SPOA0392	0.56	0.012	SPOA0390	0.99	0.886	SPOA0393	0.11	0.023	SPOA0387	1.03	0.968
SPOA0398	6.05	0.007	SPOA0402	0.85	0.717	SPOA0397	1.08	0.062	SPOA0404	1.15	0.53	SPOA0393	0.49	0.172	SPOA0391	0.69	0.378	SPOA0394	0.81	0.266	SPOA0388	0.62	0.471
SPOA0399	9.5	0.006	SPOA0403	0.99	0.911	SPOA0398	1.07	0	SPOA0405	1.25	0.992	SPOA0394	0.85	0.547	SPOA0392	0.63	0.012	SPOA0395	0.12	0.031	SPOA0389	0.99	0.950
SPOA0400	1.05	0.291	SPOA0404	0.8	0.023	SPOA0399	1.28	0.002	SPOA0406	1.04	0.663	SPOA0395	0.69	0.292	SPOA0393	0.54	0.110	SPOA0396	0.10	0.000	SPOA0390	0.99	0.983
SPOA0401	0.79	0.068	SPOA0405	0.95	0.988	SPOA0400	1.21	0.47	SPOA0407	1	0.961	SPOA0396	0.63	0.221	SPOA0394	0.71	0.122	SPOA0397	0.15	0.057	SPOA0391	0.79	0.736
SPOA0402	0.83	0.661	SPOA0406	0.82	0.076	SPOA0401	1.13	0.921	SPOA0408	1.08	0.876	SPOA0397	0.83	0.236	SPOA0395	0.65	0.377	SPOA0398	0.08	0.001	SPOA0392	0.13	0.005
SPOA0403	0.88	0.926	SPOA0407	0.97	0.943	SPOA0402	1.2	0.773	SPOA0409	1.18	0.712	SPOA0398	0.38	0.032	SPOA0396	0.78	0.072	SPOA0399	0.06	0.002	SPOA0393	0.15	0.007
SPOA0404	0.73	0.02	SPOA0408	1	0.319	SPOA0403	1.12	0.906	SPOA0410	1.07	0.033	SPOA0399	0.30	0.007	SPOA0397	1.51	0.648	SPOA0400	0.84	0.195	SPOA0394	0.85	0.262
SPOA0405	1.01	0.979	SPOA0409	1.02	0.838	SPOA0404	1.01	0.96	SPOA0411	1.05	0.058	SPOA0400	0.97	0.982	SPOA0398	0.42	0.026	SPOA0401	1.00	0.970	SPOA0395	0.12	0.014
SPOA0406	0.88	0.597	SPOA0410	0.44	0.023	SPOA0405	1.05	0.982	SPOA0412	1.19	0.608	SPOA0401	1.17	0.343	SPOA0399	0.33	0.000	SPOA0402	0.90	0.680	SPOA0396	0.09	0.003
SPOA0407	0.93	0.89	SPOA0411	0.68	0.019	SPOA0406	1.15	0.6	SPOA0413	1.41	0.876	SPOA0402	1.35	0.488	SPOA0400	1.07	0.506	SPOA0403	0.83	0.797	SPOA0397	0.22	0.055
SPOA0408	1.02	0.597	SPOA0412	0.71	0.261	SPOA0407	1.04	0.7	SPOA0414	1.15	0.464	SPOA0403	1.02	0.982	SPOA0401	1.22	0.583	SPOA0404	0.85	0.140	SPOA0398	0.09	0.001
SPOA0409	1.01	0.816	SPOA0413	0.67	0.369	SPOA0408	1.09	0.994	SPOA0415	1.08	0.987	SPOA0404	1.30	0.008	SPOA0402	1.18	0.502	SPOA0405	0.85	0.905	SPOA0399	0.07	0.000
SPOA0410	0.38	0.003	SPOA0414	1.08	0.697	SPOA0409	1.21	0.692	SPOA0416	7.41	0.199	SPOA0405	0.69	0.840	SPOA0403	0.96	0.915	SPOA0406	0.93	0.756	SPOA0400	0.87	0.242
SPOA0411	0.43	0.046	SPOA0415	1.08	0.854	SPOA0410	1.23	0.008	SPOA0417	5.97	0.269	SPOA0406	1.30	0.502	SPOA0404	1.11	0.252	SPOA0407	0.81	0.546	SPOA0401	0.99	0.971
SPOA0412	0.77	0.151	SPOA0416	1.09	0.185	SPOA0411	1.13	0.024	SPOA0418	2.34	0.325	SPOA0407	0.88	0.479	SPOA0405	0.75	0.881	SPOA0408	0.80	0.680	SPOA0402	0.91	0.768
SPOA0413	0.74	0.341	SPOA0417	1.2	0.376	SPOA0412	1	0.537	SPOA0419	5.79	0.506	SPOA0408	1.04	0.967	SPOA0406	1.31	0.010	SPOA0409	0.87	0.461	SPOA0403	0.94	0.942
SPOA0414	1.12	0.58	SPOA0418	1.05	0.648	SPOA0413	1.09	0.958	SPOA0420	10.2	0.346	SPOA0409	0.90	0.764	SPOA0407	0.85	0.625	SPOA0410	0.99	0.624	SPOA0404	0.92	0.335
SPOA0415	1.27	0.374	SPOA0419	0.78	0.092	SPOA0414	8	0.55	SPOA0421	4.08	0.871	SPOA0410	2.71	0.009	SPOA0408	1.20	0.490	SPOA0411	3.36	0.044	SPOA0405	0.84	0.862
SPOA0416	0.97	0.843	SPOA0420	0.86	0.36	SPOA0415	6.01	0.94	SPOA0422	11.3	0.245	SPOA0411	1.51	0.076	SPOA0409	0.83	0.522	SPOA0412	0.98	0.911	SPOA0406	0.93	0.796
SPOA0417	1.3	0.222	SPOA0421	0.74	0.388	SPOA0416	1.84	0.407	SPOA0423	15.8	0.401	SPOA0412	2.06	0.039	SPOA0410	2.38	0.005	SPOA0413	0.83	0.488	SPOA0407	0.91	0.703
SPOA0418	1.07	0.643	SPOA0422	0.69	0.116	SPOA0417	4.46	0.095	SPOA0424	1.13	0.618	SPOA0413	1.45	0.414	SPOA0411	1.32	0.026	SPOA0414	0.88	0.703	SPOA0408	1.06	0.922
SPOA0419	0.68	0.102	SPOA0423	0.88	0.049	SPOA0418	7.33	0.252	SPOA0425	1.03	0.876	SPOA0414	1.26	0.225	SPOA0412	2.08	0.003	SPOA0415	1.12	0.729	SPOA0409	0.94	0.703
SPOA0420	0.81	0.163	SPOA0424	0.78	0.282	SPOA0419	5.39	0.035	SPOA0426	1.11	0.75	SPOA0415	1.39	0.366	SPOA0413	1.49	0.428	SPOA0416	0.91	0.265	SPOA0410	1.10	0.143
SPOA0421	0.65	0.372	SPOA0425	0.85	0.795	SPOA0420	11.5	0.23	SPOA0427	1.25	0.219	SPOA0416	1.27	0.087	SPOA0414	1.17	0.423	SPOA0417	0.90	0.490	SPOA0411	3.37	0.051
SPOA0422	0.64	0.009	SPOA0426	1.37	0.011	SPOA0421	16.6	0.407	SPOA0428	1.02	0.95	SPOA0417	0.90	0.482	SPOA0415	1.56	0.333	SPOA0418	1.09	0.723	SPOA0412	1.08	0.463
SPOA0423	0.83	0.129	SPOA0427	1.08	0.37	SPOA0422	1.06	0.413	SPOA0429	1.08	0.407	SPOA0418	1.45	0.220	SPOA0416	1.23	0.142	SPOA0419	1.14	0.285	SPOA0413	0.85	0.653
SPOA0424	0.74	0.347	SPOA0428	0.68	0.306	SPOA0423	1.01	0.158	SPOA0430	1.2	0.076	SPOA0419	1.02	0.979	SPOA0417	0.94	0.591	SPOA0420	0.85	0.068	SPOA0414	0.84	0.443
SPOA0425	0.96	0.907	SPOA0429	1.17	0.292	SPOA0424	1.02	0.683	SPOA0431	1.12	0.005	SPOA0420	0.64	0.039	SPOA0418	1.49	0.217	SPOA0421	0.81	0.422	SPOA0415	0.97	0.963
SPOA0426	1.32	0.085	SPOA0430	0.76	0.024	SPOA0425	1.04	0.78	SPOA0432	1.18	0.253	SPOA0421	1.20	0.606	SPOA0419	1.08	0.686	SPOA0422	0.86	0.343	SPOA0416	0.96	0.564
SPOA0427	1.13	0.695	SPOA0431	1.94	0.003	SPOA0426	1.07	0.091	SPOA0433	1.07	0.657	SPOA0422	1.30	0.482	SPOA0420	0.63	0.020	SPOA0423	0.81	0.124	SPOA0417	0.98	0.874
SPOA0428	0.63	0.099	SPOA0432	1.38	0.21	SPOA0427	1.04	0.699	SPOA0434	1.2	0.458	SPOA0423	0.75	0.065	SPOA0421	1.03	0.887	SPOA0424	1.10	0.830	SPOA0418	1.05	0.855
SPOA0429	1.53	0	SPOA0433	0.78	0.547	SPOA0428	1.21	0.673	SPOA0435	1.02	0.093	SPOA0424	0.93	0.373	SPOA0422	1.45	0.018	SPOA0425	0.70	0.143	SPOA0419	1.04	0.899
SPOA0430	0.71	0.062	SPOA0434	1.09	0.521	SPOA0429	1.1	0	SPOA0436	1.16	0.918	SPOA0425	0.65	0.191	SPOA0423	0.85	0.312	SPOA0426	1.02	0.992	SPOA0420	0.83	0.055
SPOA0431	2.26	0.018	SPOA0435	0.9	0.691	SPOA0430	1.13	0.894	SPOA0437	1.13	0.889	SPOA0426	1.07	0.727	SPOA0424	1.05	0.854	SPOA0427	1.00	0.653	SPOA0421	0.88	0.706
SPOA0432	1.39	0.092	SPOA0436	0.83	0.618	SPOA0431	1.19	0.011	SPOA0438	1.93	0.486	SPOA0427	0.78	0.171	SPOA0425	0.63	0.191	SPOA0428	0.87	0.160	SPOA0422	1.00	0.872
SPOA0433	0.7	0.283	SPOA0437	0.83	0.099	SPOA0432	1.23	0.411	SPOA0439	1.09	0.824	SPOA0428	1.04	0.521	SPOA0426	1.06	0.801	SPOA0430	0.88	0.038	SPOA0423	0.83	0.513
SPOA0434	1.1	0.437	SPOA0438	0.88	0.3	SPOA0433	1.18	0.605	SPOA0440	1.13	0.73	SPOA0429	1.01	0.440	SPOA0427	0.76	0.082	SPOA0431	0.77	0.007	SPOA0424	1.02	0.980
SPOA0435	0.92	0.851	SPOA0439	1.09	0.305	SPOA0434	1.1	0.518	SPOA0441	1.12	0.857	SPOA0430	0.90	0.557	SPOA0428	0.99	0.822	SPOA0432	1.08	0.077	SPOA0425	0.69	0.184
SPOA0436	0.68	0.16	SPOA0440	1.1	0.16	SPOA0435	1.1	0.482	SPOA0442	1.07	0.109	SPOA0431	0.51	0.029	SPOA0429	0.99		SPOA0433	1.04	0.785	SPOA0426	1.00	0.965
SPOA0437	0.79	0.136	SPOA0441	0.77	0.904	SPOA0436	1.16	0.919	SPOA0443	0.99	0.018	SPOA0432	0.91	0.902	SPOA0430	0.93	0.700	SPOA0434	1.00	0.707	SPOA0427	0.98	0.983
SPOA0438	1.01	0.853	SPOA0442	0.52	0.035	SPOA0437	1.11	0.881	SPOA0444	1.08	0.495	SPOA0433	0.94	0.783	SPOA0431	0.53	0.001	SPOA0435	1.03	0.919	SPOA0428	0.88	0.474
SPOA0439	1.16	0.139	SPOA0443	0.75	0.049	SPOA0438	2.87	0.267	SPOA0445	1.06	0.01	SPOA0434	0.61	0.063	SPOA0432	0.99	0.578	SPOA0436	0.79	0.315	SPOA0429	0.79	0.453
SPOA0440	1.06	0.763	SPOA0444	1.14	0.209	SPOA0439	1.07	0.3	SPOA0446	1.06	0.682	SPOA0435	0.79	0.396	SPOA0433	0.90	0.893	SPOA0437	1.03	0.644	SPOA0430	0.88	0.069
SPOA0441	0.68	0.797	SPOA0445	1.17	0.249	SPOA0440	1.11	0.865	SPOA0447	1.52	0.97	SPOA0436	0.66	0.613	SPOA0434	0.57	0.117	SPOA0438	1.09	0.551	SPOA0431	0.81	0.072
SPOA0442	0.51	0.025	SPOA0446	1.03	0.707	SPOA0441	1.16	0.848	SPOA0448	1.16	0.914	SPOA0437	0.93	0.909	SPOA0435	0.81	0.275	SPOA0439	0.96	0.956	SPOA0432	1.03	0.564
SPOA0443	0.73	0.058	SPOA0447	0.93	0.987	SPOA0442	0.99	0.049	SPOA0449	1.06	0.203	SPOA0438	1.54	0.009	SPOA0436	0.55	0.362	SPOA0440	0.89	0.849	SPOA0433	0.97	0.985
SPOA0444	1.11	0.415	SPOA0448	0.93	0.849	SPOA0443	1.03	0.095	SPOA0450	1.15	0.663	SPOA0439	0.61	0.079	SPOA0437	0.89	0.610	SPOA0441	0.94	0.968	SPOA0434	1.04	0.609
SPOA0445	1.1	0.266	SPOA0449	0.83	0.369	SPOA0444	1.13	0.767	SPOA0451	1.14	0.256	SPOA0440	0.64	0.121	SPOA0438	1.63	0.147	SPOA0442	1.27	0.204	SPOA0435	1.03	0.836
SPOA0446	0.98	0.922	SPOA0450	1.29	0.335	SPOA0445	1.07	0.083	SPOA0452	1.17	0.167	SPOA0441	2.68	0.485	SPOA0439	0.62	0.047	SPOA0443	0.16	0.002	SPOA0436	0.92	0.813
SPOA0447	0.8	0.902	SPOA0451	0.79	0.078	SPOA0446	1	0.641				SPOA0442	1.08	0.541	SPOA0440	0.57	0.024	SPOA0444	0.60	0.075	SPOA0437	1.08	0.495
SPOA0448	0.91	0.845	SPOA0452	0.85	0.162	SPOA0447	1.49	0.999				SPOA0443	1.40	0.032	SPOA0441	1.95	0.647	SPOA0445	4.09	0.001	SPOA0438	1.05	0.556
SPOA0449	0.74	0.227				SPOA0448	1.16	0.571				SPOA0444	1.12	0.042	SPOA0442	1.05	0.654	SPOA0446	0.64	0.253	SPOA0439	0.93	0.774
SPOA0450	1.37	0.179				SPOA0449	1.02	0.798				SPOA0445	3.58	0.001	SPOA0443	1.40	0.002	SPOA0447	0.85	0.898	SPOA0440	0.89	0.788
SPOA0451	0.81	0.529				SPOA0450	1.1	0.701				SPOA0446	1.22	0.632	SPOA0444	1.14	0.066	SPOA0448	0.97	0.846	SPOA0441	0.93	0.957
SPOA0452	0.79	0.064				SPOA0451	1.18	0.04				SPOA0447	1.01	0.995	SPOA0445	3.48	0.002	SPOA0449	1.02	0.944	SPOA0442	1.25	0.299
						SPOA0452	1.21	0.068285				SPOA0448	1.16	0.523	SPOA0446	1.21	0.570	SPOA0450	1.09	0.880	SPOA0443	0.17	0.001
												SPOA0449	0.97	0.563	SPOA0447	0.88	0.917	SPOA0451	0.91	0.222	SPOA0444	0.57	0.020
												SPOA0450	1.70	0.223	SPOA0448	1.35	0.276	SPOA0452	0.83	0.289	SPOA0445	3.82	0.003
												SPOA0451	1.62	0.019	SPOA0449	0.98	0.572				SPOA0446	0.61	0.216
												SPOA0452	1.18	0.164	SPOA0450	1.71	0.225				SPOA0447	0.97	0.977
															SPOA0451	1.50	0.011				SPOA0448	0.98	0.566
															SPOA0452	1.04	0.162				SPOA0449	0.93	0.198
																					SPOA0450	1.00	0.971
																					SPOA0451	0.85	0.169
																					SPOA0452	0.83	0.287

Chapter 10 - Bibliography

Abdul-Tehrani, H., Hudson, A. J., Chang, Y. S., Timms, A. R., Hawkins, C., Williams, J. M.*, et al.* (1999). "Ferritin mutants of *Escherichia coli* are iron deficient and growth impaired, and *fur* mutants are iron deficient." *J Bacteriol* **181**: 1415-28.

Adhikari, P., Berish, S. A., Nowalk, A. J., Veraldi, K. L., Morse, S. A. and Mietzner, T. A. (1996). "The *fbpABC* locus of *Neisseria gonorrhoeae* functions in the periplasm-to-cytosol transport of iron." *J Bacteriol* **178**: 2145-9.

Agar, J. N., Yuvaniyama, P., Jack, R. F., Cash, V. L., Smith, A. D., Dean, D. R.*, et al.* (2000). "Modular organization and identification of a mononuclear iron-binding site within the NifU protein." *J Biol Inorg Chem* **5**: 167-77.

Ahn, B. E., Cha, J., Lee, E. J., Han, A. R., Thompson, C. J. and Roe, J. H. (2006). "Nur, a nickel-responsive regulator of the *fur* family, regulates superoxide dismutases and nickel transport in *Streptomyces coelicolor*." *Mol Microbiol* **59**: 1848-58.

Alahari, A., Tripathi, A. K. and Le Rudulier, D. (2006). "Cloning and characterization of a *fur* homologue from *Azospirillum brasilense* sp7." *Curr Microbiol* **52**: 123-7.

Alavi, M., Miller, T., Erlandson, K., Schneider, R. and Belas, R. (2001). "Bacterial community associated with *Pfiesteria*-like dinoflagellate cultures." *Environ Microbiol* **3**: 380-96.

Alldredge, A. L. and Silver, M. W. (1988). "Characteristics, dynamics and significance of marine snow." *Progress In Oceanography* **20**: 41-82.

Alldredge, A. L., Cole, J. J. and Caron, D. A. (1986). "Production of heterotrophic bacteria inhabiting macroscopic organic aggregates (marine snow) from surface waters." *Limnology and oceanography* **31**: 68-78.

Altschul, S. F., Madden, T. L., Schaffer, A. A., Zhang, J., Zhang, Z., Miller, W.*, et al.* (1997). "Gapped blast and psi-blast: A new generation of protein database search programs." *Nucleic Acids Res* **25**: 3389-402.

Amin, S. A., D. H. Green, et al. (2009). "Photolysis of iron-siderophore chelates promotes bacterial-algal mutualism." Proc Natl Acad Sci U S A **106**(40): 17071-17076.

Anderson, E. S., Paulley, J. T., Martinson, D. A., Gaines, J. M., Steele, K. H. and Roop, R. M., 2nd (2011). "The iron-responsive regulator *irr* is required for wild-type expression of the gene encoding the haem transporter *bhuA* in *Brucella abortus* 2308." *J Bacteriol* **193**: 5359-64.

Andrews, S. C. (1998). "Iron storage in bacteria." *Adv Microb Physiol* **40**: 281-351.

Andrews, S. C., Robinson, A. K. and Rodriguez-Quinones, F. (2003). "Bacterial iron homeostasis." *FEMS Microbiol Rev* **27**: 215-37.

Archer, D. E. and Johnson, K. (2000). "A model of the iron cycle in the ocean." *Global Biogeochem. Cycles* **14**: 269-279.

Archibald, F. (1983). "*Lactobacillus plantarum* , an organism not requiring iron." *FEMS Microbiol Lett* **19**: 29-32.

Archibald, F. (1986). "Manganese: Its acquisition by and function in the lactic acid bacteria." *Crit Rev Microbiol* **13**: 63-109.

Aristegui, Javier, Gasol, Josep, M., Duarte, Carlos, M.*, et al.* (2009). "Microbial oceanography of the dark ocean's pelagic realm." Waco, TX, ETATS-UNIS, American Society of Limnology and Oceanography.

Armstrong, J. E. and Van Baalen, C. (1979). "Iron transport in microalgae: The isolation and biological activity of a hydroxamate siderophore from the blue-green alga *Agmenellum quadruplicatum*." *J Gen Microbiol* **111**: 253-262.

Arosio, P., Ingrassia, R. and Cavadini, P. (2009). "Ferritins: A family of molecules for iron storage, antioxidation and more." *Biochimica et Biophysica Acta (BBA) - General Subjects* **1790**: 589-599.

Ayala-Castro, C., Saini, A. and Outten, F. W. (2008). "Fe-S cluster assembly pathways in bacteria." *Microbiol Mol Biol Rev* **72**: 110-25, table of contents.

Azam, F. and Malfatti, F. (2007). "Microbial structuring of marine ecosystems." *Nat Rev Micro* **5**: 782-791.

Bagos, P. G., Liakopoulos, T. D., Spyropoulos, I. C. and Hamodrakas, S. J. (2004). "Pred-tmbb: A web server for predicting the topology of beta-barrel outer membrane proteins." *Nucleic Acids Res* **32**: W400-4.

Bailey, T. L. and Elkan, C. (1994). "Fitting a mixture model by expectation maximization to discover motifs in biopolymers." *Proc Int Conf Intell Syst Mol Biol* **2**: 28-36.

Bandyopadhyay, S., Chandramouli, K. and Johnson, M. K. (2008). "Iron-sulfur cluster biosynthesis." *Biochem Soc Trans* **36**: 1112-9.

Baumann, P. and Baumann, L. (1981). The marine gram-negative eubacteria: Genera *Photobacterium*, *Beneckea*, *Alteromonas*, *Pseudomonas*, and *Alcaligenes* in the prokaryotes. H. S. M. P. Starr, H. G. Trüper, A. Balows & H. G. Schlegel., Berlin: Springer-Verlag.**:** 1302**–**1331.

Beier, C. L., Horn, M., Michel, R., Schweikert, M., Gortz, H. D. and Wagner, M. (2002). "The genus *Caedibacter* comprises endosymbionts of *Paramecium* spp. Related to the *Rickettsiales* (alphaproteobacteria) and to *Francisella tularensis* (gamma-proteobacteria)." *Appl Environ Microbiol* **68**: 6043-50.

Beinert, H. (2000). "Iron-sulfur proteins: Ancient structures, still full of surprises." *J Biol Inorg Chem* **5**: 2-15.

Beinert, H., Holm, R. H. and Munck, E. (1997). "Iron-sulfur clusters: Nature's modular, multipurpose structures." *Science* **277**: 653-9.

Bendtsen, J. D., Nielsen, H., Widdick, D., Palmer, T. and Brunak, S. (2005). "Prediction of twin-arginine signal peptides." *BMC Bioinformatics* **6**: 167.

Beringer, J. E. and Hopwood, D. A. (1976). "Chromosomal recombination and mapping in *Rhizobium leguminosarum*." *Nature* **264**: 291-3.

Berish, S. A., Mietzner, T. A., Mayer, L. W., Genco, C. A., Holloway, B. P. and Morse, S. A. (1990). "Molecular cloning and characterization of the structural gene for the major iron-regulated protein expressed by *Neisseria gonorrhoeae*." *J Exp Med* **171**: 1535-46.

Biebl, H., Allgaier, M., Tindall, B. J., Koblizek, M., Lunsdorf, H., Pukall, R*., et al.* (2005). "*Dinoroseobacter shibae* gen. Nov., sp. Nov., a new aerobic phototrophic bacterium isolated from dinoflagellates." *Int J Syst Evol Microbiol* **55**: 1089-96.

Biers, E. J., Wang, K., Pennington, C., Belas, R., Chen, F. and Moran, M. A. (2008). "Occurrence and expression of gene transfer agent genes in marine bacterioplankton." *Appl Environ Microbiol* **74**: 2933-9.

Bijlsma, J. J., Waidner, B., Vliet, A. H., Hughes, N. J., Hag, S., Bereswill, S*., et al.* (2002). "The *Helicobacter pylori* homologue of the ferric uptake regulator is involved in acid resistance." *Infect Immun* **70**: 606-11.

Birnboim, H. C. and Doly, J. (1979). "A rapid alkaline extraction procedure for screening recombinant plasmid DNA." *Nucleic Acids Res* **7**: 1513-23.

Blain, S., Queguiner, B., Armand, L., Belviso, S., Bombled, B., Bopp, L*., et al.* (2007). "Effect of natural iron fertilization on carbon sequestration in the southern ocean." *Nature* **446**: 1070-1074.

Bollen, A., Lathe, R., Herzog, A., Denicourt, D., Lecocq, J. P., Desmarez, L*., et al.* (1979). "A conditionally lethal mutation of *Escherichia coli* affecting the gene coding for ribosomal protein s2 (rpsb)." *J Mol Biol* **132**: 219-33.

Bosello, M., Mielcarek, A., Giessen, T. W. and Marahiel, M. A. (2012). "An enzymatic pathway for the biosynthesis of the formylhydroxyornithine required for rhodochelin iron coordination." *Biochemistry* **51**: 3059-66.

Bosello, M., Robbel, L., Linne, U., Xie, X. and Marahiel, M. A. (2011). "Biosynthesis of the siderophore rhodochelin requires the coordinated expression of three independent gene clusters in *Rhodococcus jostii* rha1." *J Am Chem Soc* **133**: 4587-95.

Boyd, P. W., Law, C. S., Wong, C. S., Nojiri, Y., Tsuda, A., Levasseur, M*., et al.* (2004). "The decline and fate of an iron-induced subarctic phytoplankton bloom." *Nature* **428**: 549-553.

Boyd, P. W., Watson, A. J., Law, C. S., Abraham, E. R., Trull, T., Murdoch, R*., et al.* (2000). "A mesoscale phytoplankton bloom in the polar southern ocean stimulated by iron fertilization." *Nature* **407**: 695-702.

Boyer, E., Bergevin, I., Malo, D., Gros, P. and Cellier, M. F. (2002). "Acquisition of Mn(II) in addition to Fe(II) is required for full virulence of *Salmonella enterica* serovar Typhimurium." *Infect Immun* **70**: 6032-42.

Braun, V. and Killmann, H. (1999). "Bacterial solutions to the iron-supply problem." *Trends Biochem Sci* **24**: 104-9.

Braun, V., Hantke, K. and Koster, W. (1998). "Bacterial iron transport: Mechanisms, genetics, and regulation." *Metal Ions Biol Syst* **35**: 67-145.

Bruland, K. W., Orians, K. J. and Cowen, J. P. (1994). "Reactive trace metals in the stratified central north pacific." *Geochimica et Cosmochimica Acta* **58**: 3171-3182.

Brune, I., Werner, H., Huser, A. T., Kalinowski, J., Puhler, A. and Tauch, A. (2006). "The Dtxr protein acting as dual transcriptional regulator directs a global regulatory network involved in iron metabolism of *Corynebacterium glutamicum*." *BMC Genomics* **7**: 21.

Buck, K. N. and Bruland, K. W. (2007). "The physicochemical speciation of dissolved iron in the Bering Sea, Alaska." *Limnology and Oceanography* **52**: 1800-1808.
Buesseler, K. O. and Boyd, P. W. (2009). "Shedding light on processes that control particle export and flux attenuation in the twilight zone of the open ocean
Butler, A. (2005). "Marine siderophores and microbial iron mobilization." *Biometals* **18**: 369-374.
Butler, A. and Theisen, R. M. (2010). "Iron(III)-siderophore coordination chemistry: Reactivity of marine siderophores." *Coordination Chemistry Reviews* **254**: 288-296.
Cao, J., Woodhall, M. R., Alvarez, J., Cartron, M. L. and Andrews, S. C. (2007). "Efeuob (*ycdnob*) is a tripartite, acid-induced and cpxar-regulated, low-pH fe^{2+} transporter that is cryptic in *Escherichia coli* K-12 but functional in *E. coli* O157:H7." *Mol Microbiol* **65**: 857-75.
Carrondo, M. A. (2003). "Ferritins, iron uptake and storage from the bacterioferritin viewpoint." *EMBO J* **22**: 1959-68.
Cartron, M. L., Maddocks, S., Gillingham, P., Craven, C. J. and Andrews, S. C. (2006). "Feo - transport of ferrous iron into bacteria." *Biometals* **19**: 143-57.
Cescau, S., Cwerman, H., Letoffe, S., Delepelaire, P., Wandersman, C. and Biville, F. (2007). "Haem acquisition by haemophores." *Biometals* **20**: 603-13.
Chao, T. C., Becker, A., Buhrmester, J., Puhler, A. and Weidner, S. (2004). "The *Sinorhizobium meliloti fur* gene regulates, with dependence on mn(II), transcription of the *sitABCD* operon, encoding a metal-type transporter." *J Bacteriol* **186**: 3609-20.
Chatfield, C. H., Mulhern, B. J., Burnside, D. M. and Cianciotto, N. P. (2011). "*Legionella pneumophila* Ibtu acts as a novel, TonB-independent receptor for the legiobactin siderophore." *J Bacteriol* **193**: 1563-75.
Cheton, P. L. and Archibald, F. S. (1988). "Manganese complexes and the generation and scavenging of hydroxyl free radicals." *Free Radic Biol Med* **5**: 325-33.
Chin, N., Frey, J., Chang, C. F. and Chang, Y. F. (1996). "Identification of a locus involved in the utilization of iron by *Actinobacillus pleuropneumoniae*." *FEMS Microbiol Lett* **143**: 1-6.
Coale, K. H., Fitzwater, S. E., Gordon, R. M., Johnson, K. S. and Barber, R. T. (1996). "Control of community growth and export production by upwelled iron in the equatorial pacific ocean." *Nature* **379**: 621-624.
Coale, K. H., Johnson, K. S., Chavez, F. P., Buesseler, K. O., Barber, R. T., Brzezinski, M. A.*, et al.* (2004). "Southern ocean iron enrichment experiment: Carbon cycling in high- and low-Si waters." *Science* **304**: 408-414.
Coale, K. H., Johnson, K. S., Fitzwater, S. E., Gordon, R. M., Tanner, S., Chavez, F. P.*, et al.* (1996). "A massive phytoplankton bloom induced by an ecosystem-scale iron fertilization experiment in the equatorial pacific ocean." *Nature* **383**: 495-501.
Cope, L. D., Yogev, R., Muller-Eberhard, U. and Hansen, E. J. (1995). "A gene cluster involved in the utilization of both free haem and haem:Hemopexin by *Haemophilus influenzae* type b." *J Bacteriol* **177**: 2644-53.
Cornelis, P. and Andrews, S. C. (2010). Iron uptake and homeostasis in microorganisms. Norfolk, Caister Academic.
Cornelis, P., Matthijs, S. and Van Oeffelen, L. (2009). "Iron uptake regulation in *Pseudomonas aeruginosa*." *Biometals* **22**: 15-22.
Cornelissen, C. N. and Sparling, P. F. (1994). "Iron piracy: Acquisition of transferrin-bound iron by bacterial pathogens." *Mol Microbiol* **14**: 843-50.
Crichton, R. R. and Boelaert, J. R. (2001). ”Inorganic biochemistry of iron metabolism : From molecular mechanisms to clinical consequences.” Chichester, Wiley.
Crosa, J. H. and Walsh, C. T. (2002). "Genetics and assembly line enzymology of siderophore biosynthesis in bacteria." *Microbiol Mol Biol Rev* **66**: 223-49.
Crosa, J. H., Mey, A. R. and Payne, S. M. (2004). “Iron transport in bacteria.” Washington, D.C., ASM ; Oxford : John Wiley.
Cunliffe, M. (2011). "Correlating carbon monoxide oxidation with cox genes in the abundant marine Roseobacter clade." *ISME J* **5**: 685-91.
da Silva, S. M., Pimentel, C., Valente, F. M., Rodrigues-Pousada, C. and Pereira, I. A. (2011). "Tungsten and molybdenum regulation of formate dehydrogenase expression in *Desulfovibrio vulgaris hildenborough*." *J Bacteriol* **193**: 2909-16.
Davies, B. W. and Walker, G. C. (2007). "Disruption of *sitA* compromises *Sinorhizobium meliloti* for manganese uptake required for protection against oxidative stress." *J Bacteriol* **189**: 2101-9.

Delany, I., Spohn, G., Rappuoli, R. and Scarlato, V. (2001). "The fur repressor controls transcription of iron-activated and -repressed genes in *Helicobacter pylori*." *Mol Microbiol* **42**: 1297-309.
Deneer, H. G., Healey, V. and Boychuk, I. (1995). "Reduction of exogenous ferric iron by a surface-associated ferric reductase of *Listeria* spp." *Microbiology* **141 (Pt 8)**: 1985-92.
DeRisi, J. L., Iyer, V. R. and Brown, P. O. (1997). "Exploring the metabolic and genetic control of gene expression on a genomic scale." *Science* **278**: 680-6.
Diaz-Mireles, E., Wexler, M., Sawers, G., Bellini, D., Todd, J. D. and Johnston, A. W. (2004). "The Fur-like protein Mur of *Rhizobium leguminosarum* is a Mn(II)-responsive transcriptional regulator." *Microbiology* **150**: 1447-56.
Diaz-Mireles, E., Wexler, M., Todd, J. D., Bellini, D., Johnston, A. W. and Sawers, R. G. (2005). "The manganese-responsive repressor Mur of *Rhizobium leguminosarum* is a member of the Fur-superfamily that recognizes an unusual operator sequence." *Microbiology* **151**: 4071-8.
Doucette, G. J., Erdner, D. L., Peleato, M. L., Hartman, J. J. and Anderson, D. M. (1996). "Quantitative analysis of iron-stress related proteins in *Thalassiosira weissflogii*: Measurement of flavodoxin and ferredoxin using HPLC." *Marine Ecology Progress Series* **130**: 269-276.
Drechsel, H., Freund, S., Nicholson, G., Haag, H., Jung, O., Zahner, H*., et al.* (1993). "Purification and chemical characterization of staphyloferrin b, a hydrophilic siderophore from staphylococci." *Biometals* **6**: 185-92.
Drechsel, H., Tschierske, M., Thieken, A., Jung, G., Zähner, H. and Winkelmann, G. (1995). "The carboxylate type siderophore rhizoferrin and its analogs produced by directed fermentation." *Journal of Industrial Microbiology & Biotechnology* **14**: 105-112.
Duce, R. A. and Tindale, N. W. (1991). "Atmospheric transport of iron and its deposition in the ocean." *Limnology and oceanography* **36**: 1715-1726.
Emsley, J. (2001). ”Nature's building blocks : An a-z guide to the elements.” Oxford, Oxford University Press.
Entsch, B., Sim, R. G. and Hatcher, B. G. (1983). "Indications from photosynthetic components that iron is a limiting nutrient in primary producers on coral reefs." *Marine Biology* **73**: 17-30.
Erdner, D. L., Price, N. M., Doucette, G. J., Peleato, M. L. and Anderson, D. M. (1999). "Characterization of ferredoxin and flavodoxin as markers of iron limitation in marine phytoplankton." *Marine Ecology Progress Series* **184**: 43-53.
Escolar, L., Perez-Martin, J. and de Lorenzo, V. (1999). "Opening the iron box: Transcriptional metalloregulation by the Fur protein." *J Bacteriol* **181**: 6223-9.
Faraldo-Gomez, J. D. and Sansom, M. S. P. (2003). "Acquisition of siderophores in gram-negative bacteria." *Nat Rev Mol Cell Bio* **4**: 105-116.
Feely, R. A., Doney, S. C. and Cooley, S. R. (2009). "Ocean acidification : Present conditions and future changes in a high-CO2 world." *Oceanography* **22**: 36-47.
Felsenstein, J. (1985). "Confidence limits on phylogenies: An approach using the bootstrap." *Evolution* **39**: 783-791.
Fenton, H. J. H. (1894). "Lxxiii.-oxidation of tartaric acid in presence of iron." *Journal of the Chemical Society, Transactions* **65**: 899-910.
Fernandes, J. L. (2012). "Iron chelation therapy in the management of transfusion-related cardiac iron overload.” Lid - 10.1111/j.1537-2995.2012.03580.X [doi].
Ferreiros, C., Criado, M. T. and Gomez, J. A. (1999). "The *Neisserial* 37 kda ferric binding protein (FbpA)." *Comp Biochem Physiol B Biochem Mol Biol* **123**: 1-7.
Fontecave, M. and Ollagnier-de-Choudens, S. (2008). "Iron–sulfur cluster biosynthesis in bacteria: Mechanisms of cluster assembly and transfer." *Arch Biochem Biophys* **474**: 226-237.
Forman, S., Nagiec, M. J., Abney, J., Perry, R. D. and Fetherston, J. D. (2007). "Analysis of the aerobactin and ferric hydroxamate uptake systems of *Yersinia pestis.*" *Microbiology* **153**: 2332-41.
Fricke, B., Parchmann, O., Kruse, K., Rucknagel, P., Schierhorn, A. and Menge, S. (1999). "Characterization and purification of an outer membrane metalloproteinase from *Pseudomonas aeruginosa* with fibrinogenolytic activity." *Biochim Biophys Acta* **1454**: 236-50.
Fuangthong, M. and Helmann, J. D. (2003). "Recognition of DNA by three ferric uptake regulator (*fur*) homologs in *Bacillus subtilis*." *J Bacteriol* **185**: 6348-57.
Gay, P., Le Coq, D., Steinmetz, M., Berkelman, T. and Kado, C. I. (1985). "Positive selection procedure for entrapment of insertion sequence elements in gram-negative bacteria." *J Bacteriol* **164**: 918-21.

Gledhill, M. and van den Berg, C. M. G. (1994). "Determination of complexation of iron(III) with natural organic complexing ligands in seawater using cathodic stripping voltammetry." *Marine Chemistry* **47**: 41-54.
Gonzalez, J. M. and Moran, M. A. (1997). "Numerical dominance of a group of marine bacteria in the alpha-subclass of the class proteobacteria in coastal seawater." *Appl Environ Microbiol* **63**: 4237-42.
Gonzalez, J. M., Kiene, R. P. and Moran, M. A. (1999). "Transformation of sulfur compounds by an abundant lineage of marine bacteria in the alpha-subclass of the class Proteobacteria." *Appl Environ Microbiol* **65**: 3810-9.
Gonzalez, J. M., Mayer, F., Moran, M. A., Hodson, R. E. and Whitman, W. B. (1997). "*Microbulbifer hydrolyticus* gen. Nov., sp. Nov., and *Marinobacterium georgiense* gen. Nov., sp. Nov., two marine bacteria from a lignin-rich pulp mill waste enrichment community." *Int J Syst Bacteriol* **47**: 369-76.
Gonzalez, J. M., Simo, R., Massana, R., Covert, J. S., Casamayor, E. O., Pedros-Alio, C*., et al.* (2000). "Bacterial community structure associated with a dimethylsulfoniopropionate-producing north atlantic algal bloom." *Appl Environ Microbiol* **66**: 4237-46.
Gordon, R. M., Martin, J. H. and Knauer, G. A. (1982). "Iron in north-east pacific waters." *Nature* **299**: 611-612.
Granger, J. and Price, N. M. (1999). "The importance of siderophores in iron nutrition of heterotrophic marine bacteria." *Limnology and Oceanography* **44**: 541-555.
Gresock, M. G., Savenkova, M. I., Larsen, R. A., Ollis, A. A. and Postle, K. (2011). "Death of the TonB shuttle hypothesis." *Front Microbiol* **2**: 206.
Grifantini, R., Sebastian, S., Frigimelica, E., Draghi, M., Bartolini, E., Muzzi, A*., et al.* (2003). "Identification of iron-activated and -repressed Fur-dependent genes by transcriptome analysis of *Neisseria meningitidis* group b." *Proc Natl Acad Sci U S A* **100**: 9542-7.
Güssow, K., Proelss, A., Oschlies, A., Rehdanz, K. and Rickels, W. (2010). "Ocean iron fertilization: Why further research is needed." *Marine Policy*.
Haber, F. and Weiss, J. (1932). "Ãœber die katalyse des hydroperoxydes." *Naturwissenschaften* **20**: 948-950.
Hamza, I., Chauhan, S., Hassett, R. and O'Brian, M. R. (1998). "The bacterial Irr protein is required for coordination of haem biosynthesis with iron availability." *J Biol Chem* **273**: 21669-74.
Hansel, C. M. and Francis, C. A. (2006). "Coupled photochemical and enzymatic Mn(II) oxidation pathways of a planktonic roseobacter-like bacterium." *Appl Environ Microbiol* **72**: 3543-9.
Hantke, K. (1981). "Regulation of ferric iron transport in *Escherichia coli* K12: Isolation of a constitutive mutant." *Mol Gen Genet* **182**: 288-92.
Hantke, K. (2001). "Iron and metal regulation in bacteria." *Curr Opin Microbiol* **4**: 172-7.
Harle, C., Kim, I., Angerer, A. and Braun, V. (1995). "Signal transfer through three compartments: Transcription initiation of the *Escherichia coli* ferric citrate transport system from the cell surface." *EMBO J.* **14**: 1430-8.
Hassett, D. J., Sokol, P. A., Howell, M. L., Ma, J. F., Schweizer, H. T., Ochsner, U*., et al.* (1996). "Ferric uptake regulator (fur) mutants of *Pseudomonas aeruginosa* demonstrate defective siderophore-mediated iron uptake, altered aerobic growth, and decreased superoxide dismutase and catalase activities." *J Bacteriol* **178**: 3996-4003.
Haygood, M. G., Holt, P. D. and Butler, A. (1993). "Aerobactin production by a planktonic marine *Vibrio* sp." *Limnology and oceanography* **38**: 1091-1097.
Heemstra, J. R., Jr., Walsh, C. T. and Sattely, E. S. (2009). "Enzymatic tailoring of ornithine in the biosynthesis of the Rhizobium cyclic trihydroxamate siderophore vicibactin." *J Am Chem Soc* **131**: 15317-29.
Hernandez, J. A., Peleato, M. L., Fillat, M. F. and Bes, M. T. (2004). "Haem binds to and inhibits the DNA-binding activity of the global regulator FurA from *Anabaena* sp. Pcc 7120." *FEBS Lett* **577**: 35-41.
Hibbing, M. E. and Fuqua, C. (2011). "Antiparallel and interlinked control of cellular iron levels by the Irr and RirA regulators of *Agrobacterium tumefaciens*." *J Bacteriol* **193**: 3461-72.
Hideki, F., Rumi, S., Toshi, N. and Isao, K. (2007). "Size distribution and biomass of nanoflagellates in meso- and bathypelagic layers of the subarctic pacific." *Aquatic Microbial Ecology* **46**: 203-207.
Higgs, P. I., Larsen, R. A. and Postle, K. (2002). "Quantification of known components of the *Escherichia coli* TonB energy transduction system: TonB, ExbB, ExbD and FepA." *Mol Microbiol* **44**: 271-81.
Hoang, T. T., Karkhoff-Schweizer, R. R., Kutchma, A. J. and Schweizer, H. P. (1998). "A broad-host-range FLP-FRT recombination system for site-specific excision of chromosomally-located DNA sequences: Application for isolation of unmarked *Pseudomonas aeruginosa* mutants." *Gene* **212**: 77-86.
Hobbie, J. E., Daley, R. J. and Jasper, S. (1977). "Use of nuclepore filters for counting bacteria by fluorescence microscopy." *Appl. Environ. Microbiol.* **33**: 1225-1228.

Hohle, T. H. and O'Brian, M. R. (2009). "The *mntH* gene encodes the major Mn(II) transporter in *Bradyrhizobium japonicum* and is regulated by manganese via the Fur protein." *Mol Microbiol* **72**: 399-409.

Hohle, T. H., Franck, W. L., Stacey, G. and O'Brian, M. R. (2011). "Bacterial outer membrane channel for divalent metal ion acquisition." *Proc Natl Acad Sci U S A* **108**: 15390-5.

Holmes, K., Mulholland, F., Pearson, B. M., Pin, C., McNicholl-Kennedy, J., Ketley, J. M.*, et al.* (2005). "*Campylobacter jejuni* gene expression in response to iron limitation and the role of Fur." *Microbiology* **151**: 243-257.

Homann, V. V., Sandy, M., Tincu, J. A., Templeton, A. S., Tebo, B. M. and Butler, A. (2009). "Loihichelins a-f, a suite of amphiphilic siderophores produced by the marine bacterium *Halomonas* lob-5." *Journal of Natural Products* **72**: 884-888.

Homuth, M., Valentin-Weigand, P., Rohde, M. and Gerlach, G. F. (1998). "Identification and characterization of a novel extracellular ferric reductase from *Mycobacterium paratuberculosis*." *Infect Immun* **66**: 710-6.

Hopkinson, B. and Morel, F. (2009). "The role of siderophores in iron acquisition by photosynthetic marine microorganisms." *Biometals* **22**: 659-669.

Hopkinson, B. M. and Barbeau, K. A. (2012). "Iron transporters in marine prokaryotic genomes and metagenomes." *Environ Microbiol* **14**: 114-28.

Hutchins, D. A., Rueter, J. G. and Fish, W. (1991). "Siderophore production and nitrogen fixation are mutually exclusive strategies in anabaena 7120." *Limnology and oceanography* **36**: 1-12.

Hutchins, D. A., Witter, A. E., Butler, A. and Luther, G. W. (1999). "Competition among marine phytoplankton for different chelated iron species." *Nature* **400**: 858-861.

Ito, Y. and Butler, A. (2005). "Structure of synechobactins, new siderophores of the marine cyanobacterium *Synechococcus* sp. Pcc 7002." *Limnology and oceanography* **50**: 1918-1923.

Jakubovics, N. S. and Jenkinson, H. F. (2001). "Out of the iron age: New insights into the critical role of manganese homeostasis in bacteria." *Microbiology* **147**: 1709-18.

Jeblick, J. and Kusch, J. (2005). "Sequence, transcription activity, and evolutionary origin of the R-body coding plasmid pKAP298 from the intracellular parasitic bacterium *Caedibacter taeniospiralis*." *J Mol Evol* **60**: 164-73.

Jickells, T. D., An, Z. S., Andersen, K. K., Baker, A. R., Bergametti, G., Brooks, N.*, et al.* (2005). "Global iron connections between desert dust, ocean biogeochemistry, and climate." *Science* **308**: 67-71.

Johnson, H. A. and Tebo, B. M. (2008). "In vitro studies indicate a quinone is involved in bacterial Mn(II) oxidation." *Arch Microbiol* **189**: 59-69.

Johnson, K, S., Gordon, R, M., Coale and K, H. (1997). ”What controls dissolved iron concentrations in the world ocean?” Amsterdam, PAYS-BAS, Elsevier.

Johnston, A. W. B., Setchell, S. M. and Beringer, J. E. (1978). "Interspecific crosses between *Rhizobium leguminosarum* and *R. Meliloti*: Formation of haploid recombinants and of R-primes." *J Gen Microbiol* **104**: 209-218.

Johnston, A. W., Todd, J. D., Curson, A. R., Lei, S., Nikolaidou-Katsaridou, N., Gelfand, M. S.*, et al.* (2007). "Living without Fur: The subtlety and complexity of iron-responsive gene regulation in the symbiotic bacterium *Rhizobium* and other alpha-proteobacteria." *Biometals* **20**: 501-11.

Jones, D. T., Taylor, W. R. and Thornton, J. M. (1992). "The rapid generation of mutation data matrices from protein sequences." *Comput Appl Biosci* **8**: 275-82.

Juretic, D., Zoranic, L. and Zucic, D. (2002). "Basic charge clusters and predictions of membrane protein topology." *J Chem Inf Comput Sci* **42**: 620-32.

Kammler, M., C. Schon, et al. (1993). "Characterization of the ferrous iron uptake system of *Escherichia coli*." *J Bacteriol* **175**(19): 6212-6219.

Karner, M. B., DeLong, E. F. and Karl, D. M. (2001). "Archaeal dominance in the mesopelagic zone of the pacific ocean." *Nature* **409**: 507-510.

Keele, B. B., Jr., McCord, J. M. and Fridovich, I. (1970). "Superoxide dismutase from *Escherichia coli* B. A new manganese-containing enzyme." *J Biol Chem* **245**: 6176-81.

Keen, N. T., Tamaki, S., Kobayashi, D. and Trollinger, D. (1988). "Improved broad-host-range plasmids for DNA cloning in gram-negative bacteria." *Gene* **70**: 191-7.

Kehres, D. G., Janakiraman, A., Slauch, J. M. and Maguire, M. E. (2002a). "Regulation of *Salmonella enterica* serovar Typhimurium MntH transcription by H_2O_2, Fe(2+), and Mn(2+)." *J Bacteriol* **184**: 3151-8.

Kehres, D. G., Janakiraman, A., Slauch, J. M. and Maguire, M. E. (2002b). "SitABCD is the alkaline Mn2+ transporter of *Salmonella enterica* serovar Typhimurium." *J. Bacteriol.* **184**: 3159-3166.

Kehres, D. G., Zaharik, M. L., Finlay, B. B. and Maguire, M. E. (2000). "The NRAMP proteins of *Salmonella typhimurium* and *Escherichia coli* are selective manganese transporters involved in the response to reactive oxygen." *Mol Microbiol* **36**: 1085-100.

Kelm, S., Shi, J. and Deane, C. M. (2009). "Imembrane: Homology-based membrane-insertion of proteins." *Bioinformatics* **25**: 1086-8.

Kim, H., Lee, H. and Shin, D. (2012). "The FeoA protein is necessary for the FeoB transporter to import ferrous iron." *Biochemical and Biophysical Research Communications* **423**: 733-738.

Kioerboe, T. and Jackson, G. A. (2001). "Marine snow, organic solute plumes, and optimal chemosensory behavior of bacteria." *Limnology and Oceanography* **46**: 1309-1318.

Kirchman, David, L., Elifantz, Hila, Dittel, Ana, I.*, et al.* (2007). "Standing stocks and activity of archaea and bacteria in the western arctic ocean." Waco, TX, ETATS-UNIS, *American Society of Limnology and Oceanography*.

Kranzler, C., Lis, H., Shaked, Y. and Keren, N. (2011). "The role of reduction in iron uptake processes in a unicellular, planktonic cyanobacterium." *Environ Microbiol* **13**: 2990-9.

Köster, W. (2001). "ABC transporter-mediated uptake of iron, siderophores, haem and vitamin B_{12}." *Research in Microbiology* **152**: 291-301.

Landing, W. M. and Bruland, K. W. (1987). "The contrasting biogeochemistry of iron and manganese in the pacific ocean." *Geochimica et Cosmochimica Acta* **51**: 29-43.

Law, N. A., Caudle, M. T., Pecoraro, V. L. and Sykes, A. G. (1998). "Manganese redox enzymes and model systems: Properties, structures, and reactivity." *Advances in inorganic chemistry*, Academic Press. **Volume 46:** 305-440.

Legrain, M. l., Mazarin, V. r., Irwin, S. W., Bouchon, B., Quentin-Millet, M.-J., Jacobs, E.*, et al.* (1993). "Cloning and characterization of *Neisseria meningitidis* genes encoding the transferrin-binding proteins Tbp1 and Tbp2." *Gene* **130**: 73-80.

Letoffe, S., Ghigo, J. M. and Wandersman, C. (1994). "Iron acquisition from haem and hemoglobin by a *Serratia marcescens* extracellular protein." *Proc Natl Acad Sci U S A* **91**: 9876-80.

Li, L., Chen, O. S., McVey Ward, D. and Kaplan, J. (2001). "Ccc1 is a transporter that mediates vacuolar iron storage in yeast." *J Biol Chem* **276**: 29515-9.

Lin, S., Sandh, G., Zhang, H., Cheng, J., Perkins, K., Carpenter, E. J.*, et al.* (2009). "Two flavodoxin genes in *Trichodesmium* (oscillatoriales, cyanophyceae): Remarkable sequence divergence and possible functional diversification." *Journal of Experimental Marine Biology and Ecology* **371**: 93-101.

Locher, K. P., Rees, B., Koebnik, R., Mitschler, A., Moulinier, L., Rosenbusch, J. P.*, et al.* (1998). "Transmembrane signaling across the ligand-gated FhuA receptor: Crystal structures of free and ferrichrome-bound states reveal allosteric changes." *Cell* **95**: 771-8.

Lorain, S., Lecluse, Y., Scamps, C., Mattei, M. G. and Lipinski, M. (2001). "Identification of human and mouse hira-interacting protein-5 (hirip5), two mammalian representatives in a family of phylogenetically conserved proteins with a role in the biogenesis of Fe-S proteins." *Biochim Biophys Acta* **1517**: 376-83.

Maddocks, S. E. and Oyston, P. C. (2008). "Structure and function of the lysr-type transcriptional regulator (LttR) family proteins." *Microbiology* **154**: 3609-23.

Mahowald, N., Kohfeld, K., Hansson, M., Balkanski, Y., Harrison, S. P., Prentice, I. C.*, et al.* (1999). "Dust sources and deposition during the last glacial maximum and current climate: A comparison of model results with paleodata from ice cores and marine sediments." *J. Geophys. Res.* **104**: 15895-15916.

Makui, H., Roig, E., Cole, S. T., Helmann, J. D., Gros, P. and Cellier, M. F. (2000). "Identification of the *Escherichia coli* K-12 NRAMP orthologue (MntH) as a selective divalent metal ion transporter." *Mol Microbiol* **35**: 1065-78.

Maniatis, T., Fritsch, E. F. and Sambrook, J. (1982). "Molecular cloning : A laboratory manual." Cold Spring Harbor, N.Y., Cold Spring Harbor Laboratory.

Maranger, R., Bird, D. F. and Price, N. M. (1998). "Iron acquisition by photosynthetic marine phytoplankton from ingested bacteria." *Nature* **396**: 248-251.

Marrs, B. (1974). "Genetic recombination in *Rhodopseudomonas capsulata*." *Proc Natl Acad Sci U S A* **71**: 971-3.

Martin, J. H., Coale, K. H., Johnson, K. S., Fitzwater, S. E., Gordon, R. M., Tanner, S. J.*, et al.* (1994). "Testing the iron hypothesis in ecosystems of the equatorial pacific ocean." *Nature* **371**: 123-129.

Martin, J. H., Gordon, R. M. and Fitzwater, S. E. (1990). "Iron in antarctic waters." *Nature* **345**: 156-158.
Martin, J. H., Gordon, R. M. and Fitzwater, S. E. (1991). "The case for iron." *Limnology and oceanography* **36**: 1793-1802.
Martin, J., Ito, Y., Homann, V., Haygood, M. and Butler, A. (2006). "Structure and membrane affinity of new amphiphilic siderophores produced by *Ochrobactrum* sp. Sp18." *Journal of Biological Inorganic Chemistry* **11**: 633-641.
Martinez, J. S., Zhang, G. P., Holt, P. D., Jung, H. T., Carrano, C. J., Haygood, M. G.*, et al.* (2000). "Self-assembling amphiphilic siderophores from marine bacteria." *Science* **287**: 1245-1247.
Martinez, M., R. A. Ugalde, et al. (2005). "Dimeric *Brucella abortus* Irr protein controls its own expression and binds haem." Microbiology **151**(Pt 10): 3427-3433.
Masse, E. and Gottesman, S. (2002). "A small RNA regulates the expression of genes involved in iron metabolism in escherichia coli." *Proc Natl Acad Sci U S A* **99**: 4620-5.
Massé, E., Salvail, H., Desnoyers, G. and Arguin, M. (2007). "Small RNAs controlling iron metabolism." *Curr Opin Microbiol* **10**: 140-5.
Massé, E., Vanderpool, C. K. and Gottesman, S. (2005). "Effect of RyhB small RNA on global iron use in *Escherichia coli.*" *J Bacteriol* **187**: 6962-71.
Mawji, E., Gledhill, M., Milton, J. A., Tarran, G. A., Ussher, S., Thompson, A. (2008). "Hydroxamate siderophores: Occurence amd importance in the atlantic ocean." *Environ Sci Technol* **42**: 8675-8680.
Measures, C. I., Landing, W. M., Brown, M. T. and Buck, C. S. (2008). "High-resolution Al and Fe data from the atlantic ocean clivar-CO_2 repeat hydrography a16n transect: Extensive linkages between atmospheric dust and upper ocean geochemistry." *Global Biogeochem. Cycles* **22**: GB1005.
Mendez, J., Guieu, C. and Adkins, J. (2010). "Atmospheric input of manganese and iron to the ocean: Seawater dissolution experiments with saharan and north american dusts." *Marine Chemistry* **120**: 34-43.
Merlin, C., McAteer, S. and Masters, M. (2002). "Tools for characterization of *Escherichia coli* genes of unknown function." *J Bacteriol* **184**: 4573-81.
Mey, A. R., E. E. Wyckoff, et al. (2005). "Iron and *fur* regulation in *Vibrio cholerae* and the role of Fur in virulence." *Infect Immun* **73**(12): 8167-8178.
Middag, R., de Baar, H. J. W., Laan, P., Cai, P. H. and van Ooijen, J. C. (2011). "Dissolved manganese in the atlantic sector of the southern ocean." *Deep Sea Research Part II: Topical Studies in Oceanography* **58**: 2661-2677.
Miethke, M., Hou, J. and Marahiel, M. A. (2011). "The siderophore-interacting protein Yqjh acts as a ferric reductase in different iron assimilation pathways of *Escherichia coli.*" *Biochemistry* **50**: 10951-64.
Miller, T. R. and Belas, R. (2004). "Dimethylsulfoniopropionate metabolism by Pfiesteria-associated Roseobacter spp." *Appl Environ Microbiol* **70**: 3383-91.
Millero, F. J. (2006). "Chemical oceanography." Boca Raton ; London, Taylor Francis.
Millero, F. J., Woosley, R., DiTrolio, B. and Waters, J. (2009). "Effect of ocean acidification on the speciation of metals in seawater " *Oceanography* **22**.
Mitsui, A. and Arnon, D. I. (1971). "Crystalline ferredoxin from a blue-green alga, *Nostoc* sp." *Physiologia Plantarum* **25**: 135-140.
Moore, J. K., Doney, S. C., Glover, D. M. and Fung, I. Y. (2001). "Iron cycling and nutrient-limitation patterns in surface waters of the world ocean." *Deep Sea Research Part II: Topical Studies in Oceanography* **49**: 463-507.
Moran, M. A., Belas, R., Schell, M. A., Gonzalez, J. M., Sun, F., Sun, S.*, et al.* (2007). "Ecological genomics of marine roseobacters." *Appl Environ Microbiol* **73**: 4559-69.
Moran, M. A., Buchan, A., Gonzalez, J. M., Heidelberg, J. F., Whitman, W. B., Kiene, R. P.*, et al.* (2004). "Genome sequence of *Silicibacter pomeroyi* reveals adaptations to the marine environment." *Nature* **432**: 910-3.
Morel, F. M. M. and Price, N. M. (2003). "The biogeochemical cycles of trace metals in the oceans." *Science* **300**: 944-947.
Morris, R. M., Frazar, C. D. and Carlson, C. A. (2012). "Basin-scale patterns in the abundance of SAR11 subclades, marine actinobacteria (om1), members of the Roseobacter clade and SAR116 in the South Atlantic." *Environ Microbiol* **14**: 1133-44.
Morris, R. M., Rappe, M. S., Connon, S. A., Vergin, K. L., Siebold, W. A., Carlson, C. A.*, et al.* (2002). "SAR11 clade dominates ocean surface bacterioplankton communities." *Nature* **420**: 806-10.

Nakagawa, T., Nakamura, S., Tanaka, K., Kawamukai, M., Suzuki, T., Nakamura, K.*, et al.* (2008). "Development of r4 gateway binary vectors (r4pgwb) enabling high-throughput promoter swapping for plant research." *Biosci Biotechnol Biochem* **72**: 624-9.

Neilands, J. B. (1952). "A crystalline organo-iron pigment from a rust fungus (*Ustilago sphaerogena*)." *Journal of the American Chemical Society* **74**: 4846-4847.

Nienaber, A., Hennecke, H. and Fischer, H. M. (2001). "Discovery of a haem uptake system in the soil bacterium *Bradyrhizobium japonicum*." *Mol Microbiol* **41**: 787-800.

Niven, D. F., Ekins, A. and al-Samaurai, A. A. (1999). "Effects of iron and manganese availability on growth and production of superoxide dismutase by *Streptococcus suis.*" *Can J Microbiol* **45**: 1027-32.

Noinaj, N., Guillier, M., Barnard, Travis J. and Buchanan, S. K. (2010). "TonB-dependent transporters: Regulation, structure, and function." *Annual Review of Microbiology* **64**: 43-60.

Noya, F., Arias, A. and Fabiano, E. (1997). "Haem compounds as iron sources for nonpathogenic *Rhizobium* bacteria." *J Bacteriol* **179**: 3076-8.

O'Brien, I. G. and Gibson, F. (1970). "The structure of enterochelin and related 2,3-dihydroxy-n-benzoylserine conjugates from *Escherichia coli*." *Biochim Biophys Acta* **215**: 393-402.

Ochsner, U. A. and Vasil, M. L. (1996). "Gene repression by the ferric uptake regulator in *Pseudomonas aeruginosa*: Cycle selection of iron-regulated genes." *Proc Natl Acad Sci U S A* **93**: 4409-14.

Oeffelen, L., Cornelis, P., Delm, W., Ridder, F., Moor, B. and Moreau, Y. (2008). "Detecting *cis*-regulatory binding sites for cooperatively binding proteins." *Nucl. Acids Res.* **36**: 46.

Oh, H. M., Kang, I., Lee, K., Jang, Y., Lim, S. I. and Cho, J. C. (2011). "Complete genome sequence of strain IMCC9063, belonging to SAR11 subgroup 3, isolated from the Arctic Ocean." *J Bacteriol* **193**: 3379-80.

Oh, H. M., Kwon, K. K., Kang, I., Kang, S. G., Lee, J. H., Kim, S. J.*, et al.* (2010). "Complete genome sequence of *Candidatus* puniceispirillum marinum IMCC1322, a representative of the SAR116 clade in the alphaproteobacteria." *J Bacteriol* **192**: 3240-1.

Oliveros, J. (2007). "Venny. An interactive tool for comparing lists with venn diagrams." from citeulike-article-id:6994833.

Palenik, B., Brahamsha, B., Larimer, F. W., Land, M., Hauser, L., Chain, P.*, et al.* (2003). "The genome of a motile marine *Synechococcus*." *Nature* **424**: 1037-1042.

Palenik, B., Ren, Q., Dupont, C. L., Myers, G. S., Heidelberg, J. F., Badger, J. H.*, et al.* (2006). "Genome sequence of *Synechococcus* 9311: Insights into adaptation to a coastal environment." *Proceedings of the National Academy of Sciences* **103**: 13555-13559.

Palmer, T. and Berks, B. C. (2012). "The twin-arginine translocation (TAT) protein export pathway." *Nat Rev Microbiol* **10**: 483-96.

Pandey, A., Bringel, F. and Meyer, J.-M. (1994). "Iron requirement and search for siderophores in lactic acid bacteria." *Applied Microbiology and Biotechnology* **40**: 735-739.

Pankowski, A. and McMinn, A. (2009). "Iron availability regulates growth, photosynthesis, and production of ferredoxin and flavodoxin in antarctic sea ice diatoms." *Aquatic Biology* **4**: 273-288.

Parker, D., Kennan, R. M., Myers, G. S., Paulsen, I. T. and Rood, J. I. (2005). "Identification of a *Dichelobacter nodosus* ferric uptake regulator and determination of its regulatory targets." *J Bacteriol* **187**: 366-75.

Patzer, S. I. and Hantke, K. (1998). "The ZnuABC high-affinity zinc uptake system and its regulator Zur in *Escherichia coli*." *Mol Microbiol* **28**: 1199-210.

Patzer, S. I. and Hantke, K. (2001). "Dual repression by Fe(2+)-Fur and Mn(2+)-MntR of the MntH gene, encoding an NRAMP-like Mn(2+) transporter in *Escherichia coli*." *J Bacteriol* **183**: 4806-13.

Peter, D. C., Rebecca, J. G., Mark, R. D., Pratik, S., Julie, M. R. and David, A. C. (2007). "Distinct protistan assemblages characterize the euphotic zone and deep sea (2500 m) of the western North Atlantic (Sargasso Sea and gulf stream)." *Environmental Microbiology* **9**: 1219-1232.

Peters, J. W. and Broderick, J. B. (2012). "Emerging paradigms for complex iron-sulfur cofactor assembly and insertion." *Annu Rev Biochem* **81**: 429-50.

Petersen, T. N., Brunak, S., von Heijne, G. and Nielsen, H. (2011). "Signalp 4.0: Discriminating signal peptides from transmembrane regions." *Nat Methods* **8**: 785-6.

Petursdottir, S. K. and Kristjansson, J. K. (1997). "*Silicibacter lacuscaerulensis* gen. Nov., a mesophilic moderately halophilic bacterium characteristic of the blue lagoon geothermal lake in Iceland." *Extremophiles* **1**: 94-9.

Peuser, V., B. Remes, et al. (2012). "Role of the Irr Protein in the Regulation of Iron Metabolism in *Rhodobacter sphaeroides*." *PLoS One* **7**(8): e42231.

Peuser, V., Metz, S. and Klug, G. (2011). "Response of the photosynthetic bacterium *Rhodobacter sphaeroides* to iron limitation and the role of a Fur orthologue in this response." *Environmental Microbiology Reports* **3**: 397–404.
Peuser, V., Remes, B. and Klug, G. (2012). "Role of the Irr protein in the regulation of iron metabolism in *Rhodobacter sphaeroides*." *PLoS One* **7**: e42231.
Platero, R., de Lorenzo, V., Garat, B. and Fabiano, E. (2007). "*Sinorhizobium meliloti* Fur-like (Mur) protein binds a Fur box-like sequence present in the MntA promoter in a manganese-responsive manner." *Appl Environ Microbiol* **73**: 4832-8.
Platero, R., Peixoto, L., O'Brian, M. R. and Fabiano, E. (2004). "Fur is involved in manganese-dependent regulation of *mntA* (*sitA*) expression in *Sinorhizobium meliloti*." *Appl Environ Microbiol* **70**: 4349-55.
Pohl, E., Haller, J. C., Mijovilovich, A., Meyer-Klaucke, W., Garman, E. and Vasil, M. L. (2003). "Architecture of a protein central to iron homeostasis: Crystal structure and spectroscopic analysis of the ferric uptake regulator." *Molecular Microbiology* **47**: 903-915.
Pollack, J. R. and Neilands, J. B. (1970). "Enterobactin, an iron transport compound from *Salmonella* Typhimurium." *Biochem Biophys Res Commun* **38**: 989-92.
Pollard, R. T., Salter, I., Sanders, R. J., Lucas, M. I., Moore, C. M., Mills, R. A.*, et al.* (2009). "Southern Ocean deep-water carbon export enhanced by natural iron fertilization." *Nature* **457**: 577-580.
Pond, F. R., Gibson, I., Lalucat, J. and Quackenbush, R. L. (1989). "R-body-producing bacteria." *Microbiol Rev* **53**: 25-67.
Posey, J. E. and Gherardini, F. C. (2000). "Lack of a role for iron in the lyme disease pathogen." *Science* **288**: 1651-1653.
Puehringer, S., Metlitzky, M. and Schwarzenbacher, R. (2008). "The pyrroloquinoline quinone biosynthesis pathway revisited: A structural approach." *BMC Biochem* **9**: 8.
Puigbo, P., Guzman, E., Romeu, A. and Garcia-Vallve, S. (2007). "Optimizer: A web server for optimizing the codon usage of DNA sequences." *Nucleic Acids Res* **35**: W126-31.
Puri, S., Hohle, T. H. and O'Brian, M. R. (2010). "Control of bacterial iron homeostasis by manganese." *Proc Natl Acad Sci U S A* **107**: 10691-5.
Qi, Z. and O'Brian, M. R. (2002). "Interaction between the bacterial iron response regulator and ferrochelatase mediates genetic control of haem biosynthesis." *Mol Cell* **9**: 155-62.
Qi, Z., Hamza, I. and O'Brian, M. R. (1999). "Haem is an effector molecule for iron-dependent degradation of the bacterial iron response regulator (Irr) protein." *Proc Natl Acad Sci U S A* **96**: 13056-61.
Quatrini, R., Lefimil, C., Holmes, D. S. and Jedlicki, E. (2005). "The ferric iron uptake regulator (Fur) from the extreme acidophile *Acidithiobacillus ferrooxidans*." *Microbiology* **151**: 2005-15.
Que, Q. and Helmann, J. D. (2000). "Manganese homeostasis in *Bacillus subtilis* is regulated by MntR, a bifunctional regulator related to the diphtheria toxin repressor family of proteins." *Mol Microbiol* **35**: 1454-68.
Rajasekaran, M. B., Nilapwar, S., Andrews, S. C. and Watson, K. A. (2009). "EfeO-cupredoxins: Major new members of the cupredoxin superfamily with roles in bacterial iron transport." *Biometals* **23**: 1-17.
Rakin, A. and Heesemann, J. (1995). "Yersiniabactin/pesticin receptor: A component of an iron uptake system of highly pathogenic *Yersinia*." *Contrib Microbiol Immunol* **13**: 244-7.
Ramakrishnan, G., Meeker, A. and Dragulev, B. (2008). "FslE is necessary for siderophore-mediated iron acquisition in *Francisella tularensis* schu s4." *J Bacteriol* **190**: 5353-61.
Ramakrishnan, G., Sen, B. and Johnson, R. (2012). "Paralogous outer membrane proteins mediate uptake of different forms of iron and synergistically govern virulence in *Francisella tularensis*." *J Biol Chem* **287**: 25191-202.
Rappe, M. S., Connon, S. A., Vergin, K. L. and Giovannoni, S. J. (2002). "Cultivation of the ubiquitous SAR11 marine bacterioplankton clade." *Nature* **418**: 630-3.
Raymond, K. N., Dertz, E. A. and Kim, S. S. (2003). "Enterobactin: An archetype for microbial iron transport." *Proc Natl Acad Sci U S A* **100**: 3584-8.
Reddy, K. J., Bullerjahn, G. S., Sherman, D. M. and Sherman, L. A. (1988). "Cloning, nucleotide sequence, and mutagenesis of a gene (*irpA*) involved in iron-deficient growth of the cyanobacterium *Synechococcus* sp. Strain pcc7942." *J Bacteriol* **170**: 4466-76.
Reid, R. T., H., L. D., Faulkner, J. and Butler, A. (1993). "A siderophore from a marine bacterium with an exceptional ferric ion affinity constant." *Nature* **366**: 455-458.

Resch, M., Dobbek, H. and Meyer, O. (2005). "Structural and functional reconstruction *in situ* of the active site of carbon monoxide dehydrogenase from the carbon monoxide oxidizing eubacterium *Oligotropha carboxidovorans*." *J Biol Inorg Chem* **10**: 518-28.

Roche, J. L., Murray, H., Orellana, M. and Newton, J. (1995). "Flavodoxin expression as an indicator of iron limitation in marine diatoms." *Journal of Phycology* **31**: 520-530.

Rodionov, D. A., Gelfand, M. S., Todd, J. D., Curson, A. R. and Johnston, A. W. (2006). "Computational reconstruction of iron- and manganese-responsive transcriptional networks in alpha-proteobacteria." *PLoS Comput Biol* **2**: e163.

Rodriguez, G. M., Voskuil, M. I., Gold, B., Schoolnik, G. K. and Smith, I. (2002). "*ideR*, an essential gene in *Mycobacterium tuberculosis*: Role of *ideR* in iron-dependent gene expression, iron metabolism, and oxidative stress response." *Infect Immun* **70**: 3371-81.

Ruangkiattikul, N., S. Bhubhanil, et al. (2012). "*Agrobacterium tumefaciens* membrane-bound ferritin plays a role in protection against hydrogen peroxide toxicity and is negatively regulated by the iron response regulator." *FEMS Microbiol Lett* **329**(1): 87-92.

Rudolph, G., Semini, G., Hauser, F., Lindemann, A., Friberg, M., Hennecke, H.*, et al.* (2006). "The iron control element, acting in positive and negative control of iron-regulated *Bradyrhizobium japonicum* genes, is a target for the Irr protein." *J Bacteriol* **188**: 733-44.

Rue, E. L. and Bruland, K. W. (1995). "Complexation of iron(III) by natural organic ligands in the central North Pacific as determined by a new competitive ligand equilibration/adsorptive cathodic stripping voltammetric method." Amsterdam, PAYS-BAS, Elsevier.

Rue, E. L. and Bruland, K. W. (1997). "The role of organic complexation on ambient iron chemistry in the equatorial pacific ocean and the response of a mesoscale iron addition experiment." Waco, TX, ETATS-UNIS, American Society of Limnology and Oceanography.

Rueter, J. G. and Unsworth, N. L. (1991). "Response of marine *Synechococcus* (cyanophyceae) cultures to iron nutrition." *Journal of Phycology* **27**: 173-178.

Runyen-Janecky, L., Dazenski, E., Hawkins, S. and Warner, L. (2006). "Role and regulation of the *Shigella flexneri* Sit and MntH systems." *Infect Immun* **74**: 4666-72.

Rusch, D. B., Halpern, A. L., Sutton, G., Heidelberg, K. B., Williamson, S., Yooseph, S.*, et al.* (2007). "The sorcerer II global ocean sampling expedition: Northwest atlantic through eastern tropical pacific." *PLoS Biol* **5**: e77.

Rutherford, K., Parkhill, J., Crook, J., Horsnell, T., Rice, P., Rajandream, M. A.*, et al.* (2000). "Artemis: Sequence visualization and annotation." *Bioinformatics* **16**: 944-5.

Sabri, M., Leveille, S. and Dozois, C. M. (2006). "A SitABCD homologue from an avian pathogenic *Escherichia coli* strain mediates transport of iron and manganese and resistance to hydrogen peroxide." *Microbiology* **152**: 745-58.

Saitou, N. and Nei, M. (1987). "The neighbor-joining method: A new method for reconstructing phylogenetic trees." *Mol Biol Evol* **4**: 406-25.

Sambrook, J., Fritsch, E. F. and Maniatis, T. (1989). Molecular cloning. Cold Spring Harbor, N.Y., Cold Spring Harbor Laboratory Press.

Sandmann, G., Peleato, M. L., Fillat, M. F., Lázaro, M. C. and Gómez-Moreno, C. (1990). "Consequences of the iron-dependent formation of ferredoxin and flavodoxin on photosynthesis and nitrogen fixation on *Anabaena* strains." *Photosynthesis Research* **26**: 119-125.

Schafer, A., Tauch, A., Jager, W., Kalinowski, J., Thierbach, G. and Puhler, A. (1994). "Small mobilizable multi-purpose cloning vectors derived from the *Escherichia coli* plasmids pk18 and pk19: Selection of defined deletions in the chromosome of *Corynebacterium glutamicum*." *Gene* **145**: 69-73.

Schauer, K., Rodionov, D. A. and de Reuse, H. (2008). "New substrates for TonB-dependent transport: Do we only see the ˜tip of the iceberg"?" *Trends in Biochemical Sciences* **33**: 330-338.

Schroder, I., Johnson, E. and de Vries, S. (2003). "Microbial ferric iron reductases." *FEMS Microbiol Rev* **27**: 427-47.

Schryvers, A. B. and Morris, L. J. (1988). "Identification and characterization of the transferrin receptor from *Neisseria meningitidis*." *Mol Microbiol* **2**: 281-8.

Schwartz, C. J., Giel, J. L., Patschkowski, T., Luther, C., Ruzicka, F. J., Beinert, H.*, et al.* (2001). "IscR, an Fe-S cluster-containing transcription factor, represses expression of *Escherichia coli* genes encoding Fe-S cluster assembly proteins." *Proc Natl Acad Sci U S A* **98**: 14895-900.

Schwyn, B. and Neilands, J. B. (1987). "Universal chemical assay for the detection and determination of siderophores." *Anal Biochem* **160**: 47-56.
Shaw, A. K., Halpern, A. L., Beeson, K., Tran, B., Venter, J. C. and Martiny, J. B. (2008). "It's all relative: Ranking the diversity of aquatic bacterial communities." *Environ Microbiol* **10**: 2200-10.
Shi, D., Xu, Y., Hopkinson, B. M. and Morel, F. M. M. (2010). "Effect of ocean acidification on iron availability to marine phytoplankton." *Science* **327**: 676-679.
Sies, H. (1993). "Strategies of antioxidant defense." *Eur J Biochem* **215**: 213-9.
Singleton, C., White, G. F., Todd, J. D., Marritt, S. J., Cheesman, M. R., Johnston, A. W.*, et al.* (2010). "Haem-responsive DNA binding by the global iron regulator Irr from *Rhizobium leguminosarum*." *J Biol Chem* **285**: 16023-31.
Small, S. K., Puri, S., Sangwan, I. and O'Brian, M. R. (2009). "Positive control of ferric siderophore receptor gene expression by the Irr protein in *Bradyrhizobium japonicum*." *J Bacteriol* **191**: 1361-8.
Smillie, R. M. (1965). "Isolation of phytoflavin, a flavoprotein with chloroplast ferredoxin activity." *Plant Physiology* **40**: 1124-1128.
Smith, D. P., Kitner, J. B., Norbeck, A. D., Clauss, T. R., Lipton, M. S., Schwalbach, M. S.*, et al.* (2010). "Transcriptional and translational regulatory responses to iron limitation in the globally distributed marine bacterium candidatus *Pelagibacter ubique*." *PLoS One* **5**: e10487.
Smith, M. J., Shoolery, J. N., Schwyn, B., Holden, I. and Neilands, J. B. (1985). "Rhizobactin, a structurally novel siderophore from *Rhizobium meliloti*." *Journal of the American Chemical Society* **107**: 1739-1743.
Sogin, M. L., Morrison, H. G., Huber, J. A., Mark Welch, D., Huse, S. M., Neal, P. R.*, et al.* (2006). "Microbial diversity in the deep sea and the underexplored "Rare biosphere"." *Proc Natl Acad Sci U S A* **103**: 12115-20.
Spaink, H. P., Okker, R.J.H., Wijffelman, C.A., Pees E., and Lugtenberg B.J.J. (1987). "Promoters in the nodulation region of the *Rhizobium leguminosarum sym* plasmid pRL11." *Plant Mol Biol* **9**: 27-39.
Spatafora, G. A. and Moore, M. W. (1998). "Growth of *Streptococcus mutans* in an iron-limiting medium." *Methods in Cell Science* **20**: 217-221.
Stadtman, E. R., Berlett, B. S. and Chock, P. B. (1990). "Manganese-dependent disproportionation of hydrogen peroxide in bicarbonate buffer." *Proc Natl Acad Sci U S A* **87**: 384-8.
Stingl, U., Tripp, H. J. and Giovannoni, S. J. (2007). "Improvements of high-throughput culturing yielded novel SAR11 strains and other abundant marine bacteria from the oregon coast and the Bermuda Atlantic time series study site." *ISME J* **1**: 361-71.
Stojiljkovic, I. and Hantke, K. (1992). "Haemin uptake system of *Yersinia enterocolitica*: Similarities with other tonb-dependent systems in gram-negative bacteria." *EMBO J* **11**: 4359-67.
Stojiljkovic, I., Baumler, A. J. and Hantke, K. (1994). "Fur regulon in gram-negative bacteria. Identification and characterization of new iron-regulated *Escherichia coli* genes by a fur titration assay." *J Mol Biol* **236**: 531-45.
Stojiljkovic, I., Cobeljic, M. and Hantke, K. (1993). "*Escherichia coli* K-12 ferrous iron uptake mutants are impaired in their ability to colonize the mouse intestine." *FEMS Microbiol Lett* **108**: 111-5.
Stojiljkovic, I., Larson, J., Hwa, V., Anic, S. and So, M. (1996). "HmbR outer membrane receptors of pathogenic *Neisseria* spp.: Iron-regulated, hemoglobin-binding proteins with a high level of primary structure conservation." *J Bacteriol* **178**: 4670-8.
Stumm, W. and Morgan, J. J. (1981). "Aquatic chemistry : An introduction emphasizing chemical equilibria in natural waters." New York ; Chichester, Wiley.
Sun, S., Chen, J., Li, W., Altintas, I., Lin, A., Peltier, S.*, et al.* (2010). "Community cyberinfrastructure for advanced microbial ecology research and analysis: The CAMERA resource." *Nucleic Acids Res* **39**: D546-51.
Sunda, W, G., Huntsman and S, A. (1998). "Interactive effects of external manganese, the toxic metals copper and zinc, and light in controlling cellular manganese and growth in a coastal diatom." Waco, TX, ETATS-UNIS, American Society of Limnology and Oceanography.
Sunda, W. G. (2010). "Iron and the carbon pump." *Science* **327**: 654-655.
Sunda, W. G. and Huntsman, S. A. (1994). "Photoreduction of manganese oxides in seawater." *Marine Chemistry* **46**: 133-152.
Sunda, W. G. and Huntsman, S. A. (1995). "Iron uptake and growth limitation in oceanic and coastal phytoplankton." *Marine Chemistry* **50**: 189-206.

Szklarczyk, D., Franceschini, A., Kuhn, M., Simonovic, M., Roth, A., Minguez, P*., et al.* (2011). "The string database in 2011: Functional interaction networks of proteins, globally integrated and scored." *Nucleic Acids Res* **39**: D561-8.

Tagliabue, A., Bopp, L., Aumont, O. and Arrigo, K. R. (2009). "Influence of light and temperature on the marine iron cycle: From theoretical to global modeling." *Global Biogeochem. Cycles* **23**: GB2017.

Tai, S. S., Yu, C. and Lee, J. K. (2003). "A solute binding protein of *Streptococcus pneumoniae* iron transport." *FEMS Microbiol Lett* **220**: 303-8.

Tamura, K., Peterson, D., Peterson, N., Stecher, G., Nei, M. and Kumar, S. (2011). "MEGA5: Molecular evolutionary genetics analysis using maximum likelihood, evolutionary distance, and maximum parsimony methods." *Mol Biol Evol* **28**: 2731-9.

Tegen, I. and Fung, I. (1995). "Contribution to the atmospheric mineral aerosol load from land surface modification." *J. Geophys. Res.* **100**: 18707-18726.

Todd, J. D., G. Sawers, et al. (2006). "The *Rhizobium leguminosarum* regulator IrrA affects the transcription of a wide range of genes in response to Fe availability." *Mol Genet Genomics* **275**(6): 564-577.

Todd, J. D., Kirkwood, M., Newton-Payne, S. and Johnston, A. W. (2011). "DddW, a third DMSP lyase in a model Roseobacter marine bacterium, *Ruegeria pomeroyi* DSS-3." *ISME J* **6**: 223-6.

Todd, J. D., M. Wexler, et al. (2002). "RirA, an iron-responsive regulator in the symbiotic bacterium *Rhizobium leguminosarum*." Microbiology **148**(Pt 12): 4059-4071.

Todd, J. D., Sawers, G. and Johnston, A. W. (2005). "Proteomic analysis reveals the wide-ranging effects of the novel, iron-responsive regulator RirA in *Rhizobium leguminosarum* bv. viciae." *Mol Genet Genomics* **273**: 197-206.

Todd, J. D., Sawers, G., Rodionov, D. A. and Johnston, A. W. (2006). "The *Rhizobium leguminosarum* regulator IrrA affects the transcription of a wide range of genes in response to Fe availability." *Mol Genet Genomics* **275**: 564-77.

Todd, J. D., Wexler, M., Sawers, G., Yeoman, K. H., Poole, P. S. and Johnston, A. W. (2002). "RirA, an iron-responsive regulator in the symbiotic bacterium *Rhizobium leguminosarum*." *Microbiology* **148**: 4059-71.

Tong, Y. and Guo, M. (2009). "Bacterial haem-transport proteins and their haem-coordination modes." *Arch Biochem Biophys* **481**: 1-15.

Torres, E. and Ayala, M. (2010). "Biocatalysis based on haem peroxidases: Peroxidases as potential industrial biocatalysts." Heidelberg, Springer.

Tortell, P. D., Maldonado, M. T., Granger, J. and Price, N. M. (1999). "Marine bacteria and biogeochemical cycling of iron in the oceans." *FEMS Microbiology Ecology* **29**: 1-11.

Traxler, M. F., M. R. Seyedsayamdost, et al. (2012). "Interspecies modulation of bacterial development through iron competition and siderophore piracy." *Mol Microbiol*.

Trick, C. G. (1989). "Hydroxamate-siderophore production and utilization by marine eubacteria." *Current Microbiology* **18**: 375-378.

Tsolis, R. M., Baumler, A. J., Heffron, F. and Stojiljkovic, I. (1996). "Contribution of TonB- and Feo-mediated iron uptake to growth of *Salmonella* Typhimurium in the mouse." *Infect Immun* **64**: 4549-56.

Tsuda, A., Takeda, S., Saito, H., Nishioka, J., Nojiri, Y., Kudo, I*., et al.* (2003). "A mesoscale iron enrichment in the western subarctic pacific induces a large centric diatom bloom." *Science* **300**: 958-961.

Uchino, Y., Hirata, A., Yokota, A. and Sugiyama, J. (1998). "Reclassification of marine *Agrobacterium* species: Proposals of *Stappia stellulata* gen. Nov., comb. Nov., *Stappia aggregata* sp. Nov., nom. Rev., *Ruegeria atlantica* gen. Nov., comb. Nov., *Ruegeria gelatinovora* comb. Nov., *Ruegeria algicola* comb. Nov., and *Ahrensia kieliense* gen. Nov., sp. Nov., nom. Rev." *J Gen Appl Microbiol* **44**: 201-210.

Untergasser, A., Nijveen, H., Rao, X., Bisseling, T., Geurts, R. and Leunissen, J. A. (2007). "Primer3plus, an enhanced web interface to primer3." *Nucleic Acids Res* **35**: W71-4.

van den Berg, C. M. G. (1995). "Evidence for organic complexation of iron in seawater." *Marine Chemistry* **50**: 139-157.

Van Trappen, S., Mergaert, J. and Swings, J. (2004). "*Loktanella salsilacus* gen. Nov., sp. Nov., *Loktanella fryxellensis* sp. Nov. And *Loktanella vestfoldensis* sp. Nov., new members of the Rhodobacter group, isolated from microbial mats in antarctic lakes." *Int J Syst Evol Microbiol* **54**: 1263-9.

Vartivarian, S. E. and Cowart, R. E. (1999). "Extracellular iron reductases: Identification of a new class of enzymes by siderophore-producing microorganisms." *Arch Biochem Biophys* **364**: 75-82.

Vassinova, N. and Kozyrev, D. (2000). "A method for direct cloning of Fur-regulated genes: Identification of seven new fur-regulated loci in *Escherichia coli*." *Microbiology* **146 Pt 12**: 3171-82.
Venter, J. C., Remington, K., Heidelberg, J. F., Halpern, A. L., Rusch, D., Eisen, J. A*., et al.* (2004). "Environmental genome shotgun sequencing of the sargasso sea." *Science* **304**: 66-74.
Veyrier, F. J., Boneca, I. G., Cellier, M. F. and Taha, M. K. (2011). "A novel metal transporter mediating manganese export (MntX) regulates the Mn to Fe intracellular ratio and *Neisseria meningitidis* virulence." *PLoS Pathog* **7**: e1002261.
Vollack, K. U., Hartig, E., Korner, H. and Zumft, W. G. (1999). "Multiple transcription factors of the FNR family in denitrifying *Pseudomonas stutzeri*: Characterization of four FNR-like genes, regulatory responses and cognate metabolic processes." *Mol Microbiol* **31**: 1681-94.
Wachtershauser, G. (2000). "Origin of life. Life as we don't know it." *Science* **289**: 1307-8.
Wan, X. F., Verberkmoes, N. C., McCue, L. A., Stanek, D., Connelly, H., Hauser, L. J*., et al.* (2004). "Transcriptomic and proteomic characterization of the Fur modulon in the metal-reducing bacterium *Shewanella oneidensis*." *J Bacteriol* **186**: 8385-400.
Wandersman, C. and Delepelaire, P. (2004). "Bacterial iron sources: From siderophores to hemophores." *Annu Rev Microbiol* **58**: 611-647.
Wang, Z., Kadouri, D. E. and Wu, M. (2011). "Genomic insights into an obligate epibiotic bacterial predator: *Micavibrio aeruginosavorus* ARL-13." *BMC Genomics* **12**: 453.
Webb, E. A., Moffett, J. W. and Waterbury, J. B. (2001). "Iron stress in open-ocean cyanobacteria (*Synechococcus, Trichodesmium, and Crocosphaera* spp.): Identification of the IdiA protein." *Appl. Environ. Microbiol.* **67**: 5444-5452.
Wells, M, L., Price, N, M., Bruland and K, W. (1995). "Iron chemistry in seawater and its relationship to phytoplankton: A workshop report." Amsterdam, PAYS-BAS, Elsevier.
Wexler, M., Todd, J. D., Kolade, O., Bellini, D., Hemmings, A. M., Sawers, G*., et al.* (2003). "Fur is not the global regulator of iron uptake genes in *Rhizobium leguminosarum*." *Microbiology* **149**: 1357-65.
White, G. F., Singleton, C., Todd, J. D., Cheesman, M. R., Johnston, A. W. and Le Brun, N. E. (2011). "Haem binding to the second, lower-affinity site of the global iron regulator Irr from *Rhizobium leguminosarum* promotes oligomerization." *FEBS J* **278**: 2011-21.
Whitman, W. B., Coleman, D. C. and Wiebe, W. J. (1998). "Prokaryotes: The unseen majority." *Proc Natl Acad Sci U S A* **95**: 6578-83.
Wilhelm, S, W., Macauley, K, Trick and C, G. (1998). "Evidence for the importance of catechol-type siderophores in the iron-limited growth of a cyanobacterium." Waco, TX, ETATS-UNIS, American Society of Limnology and Oceanography.
Williams, K. P., Sobral, B. W. and Dickerman, A. W. (2007). "A robust species tree for the alphaproteobacteria." *J Bacteriol* **189**: 4578-86.
Wood, P. M. (1978). "Interchangeable copper and iron proteins in algal photosynthesis." *European Journal of Biochemistry* **87**: 9-19.
Wu, J. and Luther, G. W. (1995). "Complexation of Fe(III) by natural organic ligands in the northwest Atlantic Ocean by a competitive ligand equilibration method and a kinetic approach." *Marine Chemistry* **50**: 159-177.
Wyckoff, E. E., Mey, A. R., Leimbach, A., Fisher, C. F. and Payne, S. M. (2006). "Characterization of ferric and ferrous iron transport systems in *Vibrio cholerae.*" *J. Bacteriol.* **188**: 6515-6523.
Wyckoff, E. E., Stoebner, J. A., Reed, K. E. and Payne, S. M. (1997). "Cloning of a *Vibrio cholerae* vibriobactin gene cluster: Identification of genes required for early steps in siderophore biosynthesis." *J Bacteriol* **179**: 7055-62.
Xu, Q., Rawlings, N. D., Farr, C. L., Chiu, H. J., Grant, J. C., Jaroszewski, L*., et al.* (2011). "Structural and sequence analysis of imelysin-like proteins implicated in bacterial iron uptake." *PLoS One* **6**: e21875.
Yang, J., Ishimori, K. and O'Brian, M. R. (2005). "Two haem binding sites are involved in the regulated degradation of the bacterial iron response regulator (Irr) protein." *J Biol Chem* **280**: 7671-6.
Yasmin, S., Andrews, S. C., Moore, G. R. and Le Brun, N. E. (2011). "A new role for haem, facilitating release of iron from the bacterioferritin iron biomineral." *J Biol Chem* **286**: 3473-83.
Yeoman, K. H., Curson, A. R., Todd, J. D., Sawers, G. and Johnston, A. W. (2004). "Evidence that the rhizobium regulatory protein RirA binds to *cis*-acting iron-responsive operators (IROs) at promoters of some Fe-regulated genes." *Microbiology* **150**: 4065-74.

Yeoman, K. H., M. J. Delgado, et al. (1997). "High affinity iron acquisition in *Rhizobium leguminosarum* requires the *cycHJKL* operon and the *feuPQ* gene products, which belong to the family of two-component transcriptional regulators." *Microbiology* **143 (Pt 1)**: 127-134.

Yooseph, S., Sutton, G., Rusch, D. B., Halpern, A. L., Williamson, S. J., Remington, K.*, et al.* (2007). "The *Sorcerer II* global ocean sampling expedition: Expanding the universe of protein families." *PLoS Biol* **5**: e16.

Yu, N. Y., Wagner, J. R., Laird, M. R., Melli, G., Rey, S., Lo, R.*, et al.* (2010). "PsortB 3.0: Improved protein subcellular localization prediction with refined localization subcategories and predictive capabilities for all prokaryotes." *Bioinformatics* **26**: 1608-15.

Zhang, L., McSpadden, B., Pakrasi, H. B. and Whitmarsh, J. (1992). "Copper-mediated regulation of cytochrome c553 and plastocyanin in the cyanobacterium *Synechocystis* 6803." *Journal of Biological Chemistry* **267**: 19054-19059.

Zhou, D., Hardt, W. D. and Galan, J. E. (1999). "*Salmonella* Typhimurium encodes a putative iron transport system within the centisome 63 pathogenicity island." *Infect Immun* **67**: 1974-81.

Zhou, D., Qin, L., Han, Y., Qiu, J., Chen, Z., Li, B.*, et al.* (2006). "Global analysis of iron assimilation and Fur regulation in *Yersinia pestis*." *FEMS Microbiol Lett* **258**: 9-17.

Zhu, H., Alexeev, D., Hunter, D. J., Campopiano, D. J. and Sadler, P. J. (2003). "Oxo-iron clusters in a bacterial iron-trafficking protein: New roles for a conserved motif." *Biochem J* **376**: 35-41.

Zhuang, G., Duce, R. A. and Kester, D. R. (1990). "The dissolution of atmospheric iron in surface seawater of the open ocean." *J. Geophys. Res.* **95**: 16207-16216.

Wexler, M., K. H. Yeoman, et al. (2001). "The *Rhizobium leguminosarum* TonB gene is required for the uptake of siderophore and haem as sources of iron." *Mol Microbiol* **41**(4): 801-816.

Wyckoff, E. E., A. R. Mey, et al. (2006). "Characterization of Ferric and Ferrous Iron Transport Systems in *Vibrio cholerae*." *J. Bacteriol.* **188**(18): 6515-6523.