Protected areas and the neglected contribution of Indigenous Peoples and local communities: Struggles for environmental justice in the Caatinga dry forest

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Abstract

1. Despite evidence about the contribution of Indigenous Peoples and local communities (IPLCs) to conservation, prevailing strategies still seek their separation from nature, often triggering conflicts. Current pledges to expand global protected area coverage suggest a need for critical analysis of governance quality and the way conservation interacts with the wellbeing of IPLCs.
2. We present the case of Catimbau National Park in the Caatinga dry forest of northeast Brazil, where we explored connections between the wellbeing of IPLCs and landscape through different values, practices and institutions, and perceptions of how environmentally just the park's governance has been.
3. The wellbeing of IPLCs is inextricably connected with the Caatinga landscape, through multiple place-based relational values that, although differing between Indigenous and non-indigenous inhabitants, have in both cases developed over generations. Although often framed as degraders, IPLCs exhibit a strong motivation to conserve, reflected through local institutions including forest gardens, sustainable use regulations, restoration activities and prevention of external encroachment.
4. The strict form of protected area implemented at Catimbau, instead of a locally-led or sustainable use reserve, explicitly targeted resettlement of IPLCs and livelihood reorientation. These imposed objectives have clashed with a way of life in this peopled landscape and precluded local stewardship on a larger scale. Long-term conflict arose through governance deficiencies which sparked multidimensional injustices. These include not only misrecognition of local values and customary institutions, but also lack of procedures for consent or decision making influence, plus distributional harms including tenure insecurity and denied development assistance.
5. Development and conservation strategies must reject narratives about poor, resource-dependent rural communities and embrace the opportunities that local knowledge and institutions bring for effective conservation. As conservation efforts

are expanded post-2020, the people of the Caatinga and beyond must be recognised as embedded and a key part of any solution.

6. In strict protected areas like Catimbau, where social conflict constrains their ability to function, seeking legal changes in governance type can be onerous. However, we describe other local level actions to build relationships and agency that may foster transitions towards better governance, and just treatment of IPLCs.

Resumo

1. Apesar das evidências sobre a contribuição dos Povos Indígenas e Comunidades Locais (PICLs) para a conservação, as estratégias predominantes ainda buscam sua separação da natureza, muitas vezes desencadeando conflitos. As promessas atuais de expandir a cobertura global de áreas protegidas sugerem a necessidade de uma análise crítica da qualidade de governança e da maneira como a conservação interage com o bem-estar das PICLs.
2. Apresentamos o caso do Parque Nacional do Catimbau na floresta seca da Caatinga no nordeste do Brasil, onde exploramos as conexões entre o bem-estar das PICLs e a paisagem por meio de diferentes valores, práticas e instituições, e percepções de quão ambientalmente justa tem sido a gestão do parque.
3. O bem-estar das PICLs está intrinsecamente ligado à paisagem da Caatinga, por meio de múltiplos valores relacionais de base local que, embora diferentes entre indígenas e não indígenas, em ambos os casos se desenvolveram ao longo de gerações. Embora muitas vezes classificadas como degradantes, as PICLs exibem uma forte motivação para conservar, refletida por meio de instituições locais, incluindo cultivos florestais, regulamentações de uso sustentável, atividades de restauração e prevenção de invasões externas.
4. A forma inflexível de área protegida implementada no Catimbau, em vez de uma reserva localmente controlada ou de uso sustentável, visava explicitamente o reassentamento das PICLs e a reorientação dos meios de subsistência. Esses

objetivos impostos colidiram com um modo de vida nesta paisagem povoada e impediram a gestão local em uma escala maior. O conflito de longo prazo surgiu por meio de falhas de gestão que geraram injustiças multidimensionais. Isso inclui não apenas o não reconhecimento de valores locais e instituições de usos e costumes, mas também a falta de procedimentos para consentimento ou influência na tomada de decisões, além de danos distributivos, incluindo insegurança de posse e negação de assistência ao desenvolvimento.

5. As estratégias de desenvolvimento e conservação devem rejeitar narrativas sobre comunidades rurais pobres e dependentes de recursos e abraçar as oportunidades que o conhecimento local e as instituições trazem para uma conservação eficaz. À medida que os esforços de conservação são expandidos pós-2020, o povo da Caatinga e além deve ser reconhecido como uma parte fundamental de qualquer solução.
6. Em áreas estritamente protegidas como o Catimbau, onde o conflito social restringe sua capacidade de funcionamento, buscar mudanças legais do tipo de gestão pode ser dispendioso. No entanto, descrevemos outras ações em nível local para construir relacionamentos e ações que possam promover transições para uma melhor gestão e tratamento justo de PICLs.

Keywords

Conservation, equity, environmental justice, Indigenous Peoples and local communities, protected areas, stewardship, wellbeing, tropical dry forest.

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Author contribution statement

KM, ND, WDC and MT secured funding and designed the study. KM, ND, WDC, JB and FT contributed to fieldwork. KM, ND and WDC conducted analysis. ND and KM led the writing while all other authors contributed.

Data Availability Statement

We present aggregated socio-economic data generated through interviews by village in Table 1, and provide the interview template as supporting information in English and Portuguese. The full interview transcripts are not publicly available due to the sensitivity of information and potential for responses to be attributed to individuals even when anonymised. Anonymised, quantitative socio-economic data will be archived on the Zenodo open digital repository.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

1 Introduction

The contribution of Indigenous Peoples and local communities' (IPLCs) values, practices and institutions to the conservation of nature is increasingly supported by evidence (Blackman et al., 2017; Bridgewater et al., 2015; Dawson et al., 2021; Garnett et al., 2018; Persha et al., 2011; Schleicher et al., 2017), and over time has become an accepted norm in global policy processes (Borrini-Feyerabend et al., 2013; Brosius, 2004; Hockings et al., 2019; Posey, 1999). The Intergovernmental Panel on Biodiversity and Ecosystem Services (IPBES), for example, has made advances in articulating environmental values of IPLCs and made efforts to weave their diverse knowledge systems with the western science that usually dominates policy (Chan et al., 2018; Tengo et al., 2017). Global conservation policy rhetoric now suggests a shift in thinking, away from exclusive conservation, to reorient around the non-material connections to nature that many IPLCs hold, the customary institutions through which they are expressed, and their capacity effectively conserve through stewardship (Bhola et al., 2020; Borrini-Feyerabend and Hill, 2015; Reyes-Garcia et al., 2021; Witter and Satterfield, 2019). The inclusion of equity as a targeted attribute of protected area governance in Aichi Target 11 of the 2010-2020 Global Biodiversity Framework represented a step towards mainstreaming the role, not simply of participation, but of IPLCs' values and knowledge in conservation. The Convention on Biological Diversity (CBD) adopted definitions and guidance on equitable governance, which drew heavily from theoretical frameworks on environmental justice (Zafra Calvo et al., 2019). The guidance comprises progressive principles regarding IPLCs' "identities, values, knowledge systems and institutions", including "to recognize and accommodate customary tenure and governance systems in protected areas," standards which "should be applied irrespective of governance type," (CBD, 2018).

The governance of protected and conserved areas varies widely with respect to ownership and control, strictness of regulations applied (i.e. IUCN categories i to vi), division of zones and responsibilities. Numerous examples do exist of conservation initiatives under the relative control of IPLCs (e.g. Campos-Silva et al., 2018; Diemont and Martin, 2009; Sabin et

al., 2019; Terer et al., 2012). Some existing territories and areas conserved by IPLCs have also been added to the global protected and conserved area network (Dudley et al., 2018; MacKinnon et al., 2020). However, such cases tend to be geographically scarce and temporally sporadic, even across Latin America where Indigenous rights have gained considerably greater political traction than Africa or Asia (Colchester, 2004; Tauli-Corpuz et al., 2020). For many protected areas, implementing principles for equitable site-level conservation governance represents a fundamental change in approach and progress since 2010 has, in general, been very limited (Maxwell et al., 2020; Zafra Calvo et al., 2019).

An important strategic and ontological distinction can be made regarding the approach to human-nature relations adopted by protected areas: on one hand, IPLCs can be viewed as part of nature, whose values comprise responsibilities of care for it and whose stewardship actions provide a means to effective conservation; on the other hand, interventions may focus on separating IPLCs from nature, either to preserve ecosystems in a 'pristine state' or to provide specific ecosystem services such as wildlife tourism (Kashwan et al., 2021; Muradian and Pascual, 2018). Many protected areas follow the latter rationale, as state, non-governmental organisations (NGOs) or private actors actively seek to displace IPLCs or their activities, override local institutions rather than integrate or build conservation around them, and promote commercialisation of their livelihoods or forms of compensation (Anaya and Espírito-Santo, 2018; Dressler and Roth, 2011; Igoe and Brockington, 2007; Masse and Lunstrum, 2016; Mbaria and Ogada, 2016).

Initiatives that apply (and often heavily enforce) logics of separation endure despite evidence from many parts of the world that they cause social harms and generate conflicts, which can, counterproductively, impair conservation effectiveness (Dawson et al., 2021; Dunlap and Sullivan, 2020; Holmes and Cavanagh, 2016; Newmark and Hough, 2000; Rechciński et al., 2019; Redpath et al., 2013). Exclusive conservation endures not only due to persistent narratives thatIPLCs' dependence on natural resources represents a the major threat to biodiversity, but also because of the entrenched power relations, structures and practices

prevalent at protected areas and in the organisations controlling them (Delabre et al., 2020; Hagerman and Pelai, 2016; Skutsch and Turnhout, 2020). Where governance appears to be more inclusive, through integrated conservation and development programs, community-based conservation, conservancies or eco-tourism, control may still rest with external organisations such as private enterprises, and exclusion of IPLCs may still occur, for example by introducing individual property rights that override customary, communal tenure (Bixler et al., 2015; Cavanagh et al., 2020; Dahlberg and Burlando, 2009; Dressler et al., 2016; Galvin et al. 2018).

In 2021, in the wake of unprecedented biodiversity loss, there are widespread calls to vastly scale up the area of land and sea designated for conservation, which have been met with numerous leaders' pledges and a draft goal of the global biodiversity targets to achieve thirty percent coverage by 2030 (MacKinnon et al., 2021). However, there is comparatively little attention so far to how these new areas should be conserved, or to whether those already in existence should strive to meet specific governance standards. The forthcoming goals to rapidly and globally scale-up conservation efforts present a critical time to assess and reflect upon protected area governance, the role of and impacts upon IPLCs, and their links to conservation outcomes at regional scales, ecosystem levels and at individual sites.

In this article, we focus on an empirical study of a protected area in Brazil's Caatinga dry forest ecosystem, where similar calls are being made to scale up existing conservation efforts. We apply an interdisciplinary framework to empirical research with IPLCs, as well as conservation and development practitioners, at Catimbau National Park, a protected area in the Caatinga. Our research explores two main questions: a) How is the wellbeing of both Indigenous Peoples and local communities connected to the surrounding Caatinga landscape and the places and resources within it, through different types of values, practices and institutions? And b) What role have IPLCs played in the governance of Catimbau National Park, and how just do they perceive it to have been in terms of: the recognition of their values, practices and institutions; the procedures through which decisions have been

made; the distribution of costs and benefits; and, the effectiveness of conservation? We then discuss what actions, pathways or changes in governance might enhance environmental justice and conservation effectiveness at Catimbau National Park, as well as the extent to which this single-site assessment informs strategies for expanding conservation efforts in the Caatinga and beyond.

1.1 Conceptual framings of IPLCs' values and how they relate to conservation governance

Research frameworks have advanced to place greater emphasis on exploring the non-material connections between people and nature, to IPLCs' knowledge systems and to the politics that disrupt or support them. The emergence of such interdisciplinary approaches has generated critical analysis of conservation governance, practices and impacts. Ecosystem services framings extended beyond the supply of material benefits from nature to focus on a variety of regulating and cultural services. However, applications of the ecosystem services framework have concentrated on instrumental values or what nature provides to people's wellbeing in a relatively one-directional and hedonic sense, and in so doing have downplayed the importance and plurality of embedded relational values about nature (Chan et al., 2018; Himes and Muraca, 2018). Relational values comprise more profound associations such as how nature shapes a person or peoples' place-based identity, social relations or culture (Ishihara, 2018; Kleespies and Dierkes, 2020). Those values may have evolved over long timescales and embrace reciprocal connections by which being part of and caring for nature becomes an essential part of living a good life, in a longer-term, eudaimonic sense (Jax et al., 2018; West et al., 2018). The wider consideration of values increases attention to different worldviews underpinning them, including for example forms of spiritual devotion to nature, holding aspects of the natural world sacred and ritualised exchange with natural entities (Muradian and Pascual, 2018; Saxena et al., 2018). Focusing attention to relational values, their diversity, profundity and plurality, has been expressed as

the major contribution of the IPBES-derived concept of Nature's Contributions to People, moving beyond an ecosystem services framing (Kadykalo et al., 2021).

Relational values have been explored in different terms through other research approaches applied to conservation, such as traditional ecological knowledge (Berkes, 1993) and more holistic social wellbeing frameworks (Coulthard et al., 2011; Gough and MacGregor, 2007). Applied wellbeing research has revealed plurality in values and worldviews, and highlighted that any social objectives associated with conservation and development initiatives must be adapted to how particular IPLCs define a good life and how they value different kinds of resources, relationships and places (Biedenweg and Gross-Camp, 2017).

Increasing attention to relational values about nature and how they shape people's definitions of wellbeing also has important implications for environmental governance (Bataille et al., 2021). Shared values (or ways of thinking) are expressed through social and cultural practices and institutions (or ways of doing). When shared environmental values shape a group of people's ethical approach to nature, influence the ways they use, enjoy, benefit from places and resources, then associated institutions often develop around a shared understanding of use and allocation, tenure and access, social inclusion, knowledge transfer, decision making and authority (Gadgil et al., 1993). In turn, those institutions can evolve and become lasting customary forms of governance and management practices through which the aspect of nature in question is conserved or sustainably used (Waylen et al., 2010). The knowledge systems, which these values, practices and institutions comprise, may develop and endure over very long timescales through intergenerational transfer and become a central, embedded part of a people's identity, as is the case with many IPLCs (Gadgil et al., 1993; Reyes-Garcia et al., 2021). Local values and knowledge may also develop over relatively short timescales in all types of settings and communities through deliberation and leadership, and can also involve bringing diverse people together around a shared vision, for example as Murphy et al. (2019) show in urban lake environments in Bangalore, India. However, Indigenous knowledge systems can be considered distinct from

more contemporarily constructed local knowledge systems, even if the division is not always clear cut (Brondizio et al., 2021).

Crucially, customary local institutions rarely operate in isolation and attention must also be paid to the way they interact with more 'formal' governance associated with legal and policy structures and external organisations at multiple scales, in addition to wider social, economic, environmental, climatic and political drivers of change (Brehony et al., 2020; Tran et al., 2020; Wright, 2017). An environmental justice approach pays specific attention to the dynamics, including historic and systemic drivers of justice or injustice, that determine whose knowledge and values (and whose do not) shape policy and practice, and how people and nature are variously affected (Coolsaet, 2020). Such approaches have been increasingly applied to conservation policy and practice (Martin et al., 2013; Massarella et al., 2020). Environmental justice frameworks spread attention across three interrelated dimensions: distribution (of costs, benefits, risks and opportunities); procedures (the processes through which objectives are set and decisions are made); and, recognition (of different worldviews, identities, values and institutions; Sikor et al., 2014). Recognition can be the more difficult dimension to elicit ideas about as it relates largely to non-material aspects of wellbeing which can be difficult to measure and articulate, is potentially the most politically sensitive as it raises issues relating to identities and fundamental differences between people's ways of life or of viewing the world, and the politics of difference through which misconceptions or discrimination occur (Martin et al., 2016; Young, 2011). For these reasons, although the three dimensions are interrelated, some scholars view recognition as the central dimension, without which justice is rarely perceived (Honneth, 2004). Recognition can occur (and misrecognition be caused) through diverse mechanisms, in wordss such as legal recognition of indigeneity, identity or rights, or through actions and interactions, including processes building intersubjective understanding, resolution of longstanding conflict or the diffusion of new norms and behaviours that reduce social and political discrimination (Fraser, 2018; Vermeylen, 2019).

Methodology

Study site

The Brazilian Caatinga is the largest and most-species rich seasonally dry tropical forest in the world (Silva et al., 2017). The human population is made up of approximately 28 million people, including Indigenous Peoples, *quilombolas* (afro-descendant traditional peoples) and rural communities (Albuquerque et al., 2017; Bragagnolo et al., 2017). In Brazil, the definition of IPLCs is particularly diverse. Formal, legal recognition of Traditional Peoples and Communities includes all "culturally differentiated groups that recognize themselves as such, that have their own forms of social organization, that occupy and use territories and natural resources as a condition for their cultural, social, religious, ancestral and economic reproduction, using knowledge, innovations and practices generated and transmitted by tradition," (Brasil, 2007). In practice this includes numerous *extrativista* populations that are neither Indigenous peoples nor Quilombolas, which are the only two groups that have their traditional land rights formally recognised in the Brazilian constitution (Brasil, 1988). This raises a number of significant issues in the struggle for territorial recognition among Traditional Populations and Communities across Brazil (see, for example, Anaya and Espirito-Santo, 2018; Fraser, 2018), with important implications for equitable conservation governance.

This study took place in Catimbau National Park in Pernambuco State, which despite its legal status as a strictly protected area, is still home to over 300 households (Specht et al., 2019; Tabarelli et al., 2017). Catimbau National Park is neighboured by the Kapinawá Indigenous Territory, where circa 2,000 inhabitants occupy an area of over 12,000ha in size. Additional Kapinawá settlements exist within Catimbau National Park (Cavalcante et al., 2016).

In the face of climate challenges, the Caatinga's biodiversity and the livelihoods of those living there are in flux and under threat (de Oliveira et al., 2012). During past drought events in the Caatinga, many people struggled to produce harvests, suffered starvation or were compelled to migrate (Buckley, 2010). Most households in the area of Catimbau National Park raise goats while fewer raise cattle (both supported by native vegetation), and practice some subsistence agriculture as well as collecting native plants for a wide range of subsistence uses and occasional items for sale, including handicrafts (Specht et al., 2019). Grazing livestock, particularly goats, have been implicated as a major driver of degradation within the park (Antongiovanni et al., 2020).

The primary NGO concerned with social and economic development within the park and surrounding area is Amigos do Bem, who have around 5,000 volunteers across the region (https://www.amigosdobem.org/). They run a local school, community centre, facilitate medical care and dentistry, water supplies, electricity and road infrastructure and distribute clothes, food, bedding and other resources to those in need. They also operate cashew plantations just outside the park and provide work opportunities and accommodation to plantation workers. Incomes are low on average and state benefits in the form of pensions, *Bolsa Família* social welfare payments and others account for 44.4% of local GDP in the Caatinga area (Buainain and Garcia, 2013).

Around 7% of the Caatinga has been demarcated as Conservation Units, yet degradation has led to calls to expand the network (Antongiovanni et al., 2020; Specht et al., 2019), mirroring global appeals for increased protected area coverage, or even a 'half earth' approach, as part of the strategic goals of the Convention on Biological Diversity (Watson et al., 2020). Catimbau National Park was established in 2002 and at 607 km² is one of the largest protected areas in the Caatinga. The park was instigated through a workshop at which the conservation practitioners, policymakers and natural scientists present determined that a strictly protected area was most suitable to conserve the species of conservation concern recorded near to Catimbau (Leal et al., 2005). Brazil has legal provision for different

342 forms of protected area, both strictly protected and for sustainable use with various forms of
343 governance (Rylands and Brandon, 2005). Indeed, some of those forms emerged through
344 bottom up processes of IPLCs expressing their voices. One famous activist, Chico Mendes,
345 even lends his name even to the state conservation agency (Maciel et al., 2018). Catimbau
346 was prioritised on the basis of the number of endemic and range-restricted species present,
347 the lack of severely degraded land, the perception of relatively low numbers of human
348 inhabitants and presence of sites of archaeological importance (ISA, 2017). The rock
349 formations, caves and prehistoric cave paintings also attract tourists, for which an
350 Association of Tourism Guides and Development has operated since the park was
351 established (Siqueira, 2006).

352 Our study focuses on villages within Catimbau National Park, including those inhabited by
353 Indigenous Kapinawá and others by long-term residents who do not self-identify as
354 Indigenous. No quilombola communities are present within the park. The resettlement and
355 compensation of people living within a protected area is mandatory for a National Park under
356 Brazilian legislation and has been expressed as a goal for Catimbau by the Brazilian Institute
357 of Environment and Renewable Natural Resources (IBAMA) or Chico Mendes Institute for
358 Biodiversity Conservation (ICMBIO) since establishment, though not implemented. Although
359 required by the National System of Conservation Units (SNUC) legislation, Catimbau
360 National Park still does not have a management plan, and the limits of the buffer zone
361 around the park have still not been legally defined.

362

363 *Study methods*

364 This social research was funded specifically to contribute complementary understanding to
365 the Long-Term Ecological Project (LTEP-Catimbau) in Catimbau National Park
366 (https://www.peldcatimbau.org), led by the Federal University of Pernambuco, which
367 explores land-use and climate change. We applied an analytical framework combining
368 concepts of wellbeing and environmental justice (see conceptual framework section above

for more detail), which can provide complementary understanding of local perspectives in relation to environmental governance (Dawson et al., 2017; Edwards et al., 2016). We adopted a broad, holistic definition of wellbeing comprising a material dimension, but alongside social and cultural values, including relational values about nature, through which subjective meaning is attributed to the resources, relationships and social practices which contribute to a person's quality of life (Coulthard et al., 2018; Gough and McGregor, 2007). We then explored perceptions of conservation and development governance based on an environmental justice framework (Schlosberg, 2009), which in the context of conservation research has become conceptually synonymous with equity (Martin et al., 2016).

During the initial stage of the research, we held informal discussions in September and October 2017 with the current and previous park managers, representatives of the development NGO *Amigos do Bem*, two local tourist guides and 14 members of five of the communities situated within the park. In addition to informal interviews in villages within the park, members of the research team undertook 'landscape walks' with members of three of those communities to gain understanding of values attributed to and uses of the landscape, access to natural resources and perceived changes over time. This preliminary phase of research enabled us to: 1) Develop a foundation of trust among local communities, clarify the motivations and methodology behind the research, and ascertain their consent to participate further in the research. Time taken to explain the research project, funding, aims and ethical standards and procedures over multiple days was particularly important in some communities given the turbulent relations with conservation managers and a perceived lack of benefit from past research participation; 2) Develop our understanding of the social, economic, environmental and political context to guide methods to further explore wellbeing and environmental justice. This included an overview of the social diversity present to inform sampling strategies for subsequent interviews. It also enabled us to identify key local issues or aspects of life to ground interview questions in; and, 3) Establish working relationships as a basis for future engagement, such as stakeholder workshops to be held towards the end of the project.

Ethical approval to conduct interviews was obtained from the Ethics Committee in Research from the Federal University of Amapá (CAAE 82787718.3.0000.0003, Permit number 2.497.655) and the Ethics Committee of the School of Biological Sciences at the University of Aberdeen, United Kingdom. Carrying out this research within Catimbau National Park was also authorized by ICMBIO (SISBIO – Authorization number 60074-1).

Data collection and analysis

Figure 1. Map of study area and villages where research was conducted

We selected two Indigenous villages and two non-indigenous villages (determined through self-identification by people within those villages), located within the park from which to randomly select households, and from which to interview an individual over 18 years of age (Figure 1). Using satellite imagery and through discussion with village leaders we identified and numbered all occupied households in the four selected villages within the park and randomly selected 40 households across the two Indigenous communities and 40 across the two non-indigenous communities for semi-structured interviews, the second phase of the research (Table 1). In total, seventy-nine household-level semi-structured interviews were conducted (one of the 80 selected was inadvertently missed) between April and August 2018, in Portuguese, with two members of the research team present (one male and one female), so that answers could be noted as fully as possible (see Supporting Information for interview template). Before each interview we explained the research funding, partners, motivations, timeline, processes, ethical approach and potential outputs in detail. We provided the option to decline or to rearrange the time, and obtained verbal consent before starting each interview. Verbal consent was deemed most appropriate due to both the high rate of illiteracy and the degree of land tenure insecurity faced by respondents, which could have caused them unease about signing a written document. Interviews lasted between one and four hours, though the vast majority took between 1.5 and 2.5 hours.

The interview data used to analyse wellbeing included details about livelihoods, indications of quality of life, different types of values held, the practices through which they are expressed, and connections to the Caatinga landscape and natural resources. we also sought to identify changes over time and any patterns or differences between people. We then examined interview transcripts for recurrent themes or patterns regarding historical and current involvement of the Indigenous People and local communities in environmental governance, including interactions between local customary and external institutions, traditional values and modern aspirations, and various environment and development priorities. We further identified the ways in which these interactions have been perceived to impact on the wellbeing of local inhabitants and the effectiveness of conservation actions. In line with an environmental justice approach we paid particular attention to recognition of values, practices and institutions; the procedures through which decisions have been made; the distribution of costs and benefits; and the effectiveness of conservation.

437 Table 1 Demographic and sampling data for four villages within Catimbau National Park

	Malhador	Caldeirao	Igrejinha	Muquem
No. households in village	36	16[a]	68	24
% households in which interviews conducted	66.7%	93.8%	42.6%	45.8%
Female interviewees	45.8%	66.7%	48.2%	54.5 %
Female-headed household	4.2%	0	24.1%	27.3%
Average number of people living in households	3.8	4.9	4.4	5.5
Respondents <40 years old	54.2%	60%	55.2%	27.3%
Self-reported Indigenous status	All Indigenous Kapinawá	All Indigenous Kapinawá	Non-indigenous	Non-indigenous
Respondent illiterate	41.7%	20%	69%	72.7%
Living in '*taipa*' house made of earth and sticks	12.5%	20%	62.1%	81.8%
Occupation				
Retired	25%	20%	13.8%	36.4%
Subsist/only farm labour	4.2%	6.7%	58.6%	36.4%
Commercial farmer	12.5%	13.3%	24.1%	18.2%
Other profession[b]	58.3%	60%	3.5%	9%
Land size				
<0.5 hectares	4.2%	6.7%	51.7%	27.3%
0.5 to 2ha	54.1%	60%	34.5%	63.7%
>2ha	41.7%	33.3%	13.8%	9%
Livestock				
No/poultry only	12.5%	66.7%	48.2%	45.6%
<10 goats/ 1 cow	20.8%	20%	34.5%	36.4%
<20 goats/5 cows	37.5%	13.3%	13.8%	9%
20+ goat/5+ cow	29.2%	0	3.5%	9%

438 [a] 16 households were located within the boundaries of the National Park, and only those

439 households were selected for interviews, though more were located outside of the Park.

440 [b] Comprising teachers and other school workers (18/25), van, bus and taxi drivers (4),

441 builders (1), health workers (1) and administrators (1).

442

443 **Results**

Wellbeing and values among the People of the Caatinga

The people who live in the Vale do Catimbau have a deep connection with the landscape and natural resources, and their culture comprises conservation-oriented values and practices that have developed for many generations. All 79 respondents detailed multiple instrumental values or ways in which their wellbeing was supported by the Caatinga landscape around them and the resources it contains, within the park. In most cases, across both Indigenous and non-indigenous respondents, they also gave examples of how their wellbeing was inextricably connected with the Caatinga and specific places within it, indicating the extent of relational values about nature, how those connections define their way of life and overlap with instrumental values and material uses. In addition to varied material resource use providing subsistence and economic benefits supporting local livelihoods, their connections to the Caatinga were described in more diverse and profound ways, including place-based cultural and spiritual values, collective identity and shared practices; recreational opportunities; sense of physical security, and physical and mental health benefits.

The most widespread uses, practised within the park by all respondent households, were collection of firewood and materials to make household items such as brooms. Seven respondents (notably all non-indigenous) specified these to be the only provisioning ecosystem services of value to them. However, the other 91% of respondents referred to various combinations of additional natural resource uses they commonly engaged in, including: grazing for livestock, predominantly goats and cattle; collection and use of medicinal plants for both people and animals; collection and consumption of teas, fruits, nuts and honey; wood for building fences and; items with which to make handicrafts. Further, less widely practised uses included making furniture, household utensils, clubs and poles, ropes and ties, fans, skirts, belts, mats, musical instruments, earrings, hairbands and jewellery. Hunting was very common in the past but meat from domestic animals has largely taken its place, due to a combination of changing norms, introduction of rules and reduction in

availability, with hunting now practised infrequently by only a small number of individuals harvesting occasional Black-Rumped Agouti (*Dasyprocta prymnolopha sp.*), Six-Banded Armadillo (*Euphractus sexcinctus*), Brazilian Guinea Pig (*Cavia aperea*), Sao Lorenzo Punare (*Thrichomys apereoides*) and Ground-Doves (*Columbina sp.*).

In terms of relational values, respondents described during informal discussion, landscape walks and interviews, a strong sense of community, place attachment and non-material benefits related to their way of life in the Caatinga. They see themselves as an integral part of the landscape, despite trends towards livelihood diversification. Although many had spent time away for studies or work, whether in Pernambuco or large cities like Sao Paulo, they were usually drawn back to their village. Ninety four percent of respondents had grown up in the same village they inhabited presently and the others had all moved from a neighbouring village to be married. Far from declining settlements with ageing populations, many young families and children were among the respondents' households, and the majority were under 40 years of age (Table 1). The beauty, tranquillity, sense of physical security relative to elsewhere, and quality of social interaction within their communities were the main explanations given for remaining or returning. If the Caatinga was well preserved it was said to serve regulatory functions such as providing clean, cool air for their health, with a very low incidence of disease, to provide shade for people and animals and also to "*call the rain*," making soils suitable for growing vegetables, enabling plants to grow for grazing animals. Inhabitants regularly spent time walking or overnighting in the Caatinga, whether in gorges, forest areas, or among mountains and rock formations, for recreation, peace, reflection and meditation, spiritual purposes, rituals or cultural events such as to play music and practice dances specific to the local area like the '*samba de coco'*. There was a strong awareness among respondents that people had lived in this part of the Caatinga for hundreds or even thousands of years, passing on their traditions and that in many ways their way of life had changed quite little to the present. While there are undoubtedly challenges to living in a remote part of this harsh environment (described in more detail below), and many voiced aspirations for better education and services, respondents also wished for continuity,

wanting (as one Indigenous woman described) "*our children to enjoy the same quality of life in the village as we have.*" The strength of place connection and community was such that 92% of those interviewed expressed a wish to remain even in the face of hardships, such as recent severe droughts. As an elderly Indigenous woman defiantly stated, "*Even if there is drought here, I'll still stay.*"

Despite the consistency over time of community values and strength of connections to the Caatinga, there have been considerable changes affecting the wellbeing of people within Catimbau National Park, particularly over the past 10 years. Enhanced healthcare, education, electricity, roads and transport and increased numbers of water tanks in the villages have enhanced people's lives. Remittances from relatives working away were surprisingly rare, with just nine of the respondents stating they receive occasional small amounts of money from relatives. However, respondents described how the combination of the nationwide *Bolsa Família* cash transfer program, regular provision of food and clothing to households by development NGOs and increased opportunities to earn income mean it is rare for a family to struggle to meet basic needs of finding sufficient food or water, even during times of drought such as that experienced by interviewees between 2012 and 2018. By 2018, many families had been able to invest in technology, with 46% of households owning a car or motorbike and some investing in private water tanks. One respondent (non-Indigenous man in his twenties) exemplified the magnitude of change in their circumstances with, "*10 years ago a donkey made you rich!*" Some aspects of deprivation do persist though: Housing standards remain poor as many households still lack disposable income, with 42% of respondents living in very basic houses of earth and sticks relative to the other 58% who reside in more robust constructions made of brick, cement, timber and tiles. Although education access and levels have greatly improved, illiteracy will take many years to reduce substantially, and the majority of respondents, 52%, were illiterate.

Our data highlight some differences in values and wellbeing between the two communities identifying as Indigenous Kapinawá and the two non-indigenous communities. A cultural

leader from the village of Malhador described, through informal discussions, the long and ongoing struggle for their territorial rights and recognition of Indigenous status from the Brazilian Government, a history which the Kapinawá have documented in both books and film (Azeredo Grünewald, 2009). Details of their relational values about nature were explained by Indigenous interviewees who revealed they maintain strong spiritual links to nature through animism, believing that when a person dies they remain part of nature in another form, and must therefore respect land, trees and natural objects where 'encantados' reside. This spiritual connection leads them to see themselves as an integral part of this social-ecological system with responsibilities to care for nature, believing "*If we are to die, everything dies.*" They perform regular rituals of cleansing their souls with smoke and water, undertaking collective journeys to rivers, caves and other sacred areas to do so. During informal discussions an Indigenous cultural leader described these gatherings and maintenance of this belief system as "*our greatest strength.*"

In both Indigenous villages taking part in this study, Malhador and Caldeirão, the communities have established separate Indigenous primary schools, and collectively the Indigenous Kapinawá have also established a museum. These institutions provide political representation and also financial support and livelihood opportunities. Among our sample, this greater social and political organisation meant that Indigenous households had higher rates of literacy, better housing standards, greater land and livestock holdings, better access to health services and more diverse, higher paid occupations than those in the two non-indigenous villages (Table 1). Crucially in this water-limited ecosystem, the Indigenous villages also enjoy better access to water because they themselves had constructed more communal and individual tanks that are regularly filled during periods of drought.

Recognition of local values, practices and institutions in the governance of Catimbau National Park

The extent to which the Caatinga's resources contribute to local people's material wellbeing provides an instrumental reasoning for supporting conservation: As one respondent

estimated, "*about 70% of what I use in my day-to-day life is taken from nature, so conservation is very important.*" However, the various inter-connections between the ecosystem and the wellbeing of those living within it have developed over many generations. They represent knowledge systems and practices specific to local communities that provide clear relational values that underpin a strong motivation to preserve the Caatinga. As one Indigenous man in his twenties expressed, "*Nature is everything for people here. The future of the people here depends on the conservation of today. The function of these people is to protect nature*."

Numerous examples were provided by respondents of local institutions and practices aimed at the conservation, restoration or sustainable use of the Caatinga and biodiversity within it. Conservation is deemed to be a priority objective of village-level land and resource decisions. "*Our community and counsellors always focus on the conservation of nature,"* reported one Indigenous man. However, their participation in the governance of the park is negligible and locals perceive the conservation structures run by the state agency ICMBio to be unjust. For example, one young non-Indigenous man articulated that "*The park managers are aware of people's traditions, but they do not respect them.*" This sentiment was even stronger among the Indigenous communities who had perceived early on that the park management wanted to control their cultural practices. As articulated by an Indigenous respondent in his forties, "*Park managers wanted the village rituals such as the Toré ritual to be authorised by the administration of the park, to occur on days of the management's choice*." In response villagers voiced defiantly, for example, that "*we are the guardians of our territory… We feel threatened with the creation of Catimbau National Park, and this threat only directs us to reflect on our history and to strengthen our culture and traditions.*"

Some local conservation practices persist despite their lack of inclusion in the park's objectives. The Kapinawá Indigenous communities within Malhador and Caldeirão communities conduct a number of activities to preserve, manage and restore the Caatinga habitat on land of their villages. Firstly, they maintain forest gardens within the village

comprising a wide variety of native species that produce particularly valued resources such as fruits, medicines, wood and seeds that may be used for crafts or carving, and flowers attractive to bees and insects that are beneficial for honey production and fruit farming. Secondly, through the history of settlers seeking to turn the Caatinga into productive land for crops or livestock, channels have formed that drain the land and potentially contribute to desertification. Villagers actively block those channels to ensure water may be retained and avoid erosion. As described by one young Indigenous community leader, "*Where I live now the land was initially bare like here (pointing), but I have started to restore native vegetation there and slowly it is getting better*." Indeed, respondents claimed that the park's rules regulating certain land uses were the same as those the villagers would themselves follow even if the park were absent, with examples provided including: it is forbidden within the villages to collect wood for commercial purposes, that authorisation from the village council or leader must be sought to cut trees, that certain species, including Baraúna (*Schinopsis brasiliensis*) and white-wood (*Cordia oncocalix*) that have become scarce cannot be cut or that only branches of certain species be harvested to enable regrowth. As an Indigenous woman in her forties explained, "*The standing Caatinga, conserved, provides much more benefit to us. Most of the village thinks this way, that it is extremely important to conserve the Caatinga, and they have the knowledge and practices to withdraw resources from nature in a sustainable way, for example to remove only some branches from the 'Bálsamo (Myroxylon peruiferum*)*, Catingueira (Cenostigma pyramidale) and Carcará (Senegalia bahiensis)' trees so that they are able to regenerate.*" Another Indigenous woman described during the interview that they use technology to informally monitor and manage their village lands: "*If you see images of a map of the park by computer, you see that deforestation has increased. The Indigenous people are always struggling to maintain their lands. Even today, there are mini squatters who open "bites" in the Caatinga, and take lands belonging to the Indigenous people…… we know how to live in the Caatinga, know what species are threatened, and how to live in a more sustainable way*."

Decision-making procedures, exclusion and conflict

Strikingly, the only formal interaction respondents from the four villages reported having experienced with the park management was at the initial meeting about its creation in 2002 in the nearby town of Catimbau. Respondents who had attended that meeting recalled that the local mayor and IBAMA staff sought to persuade inhabitants as to the benefits of a national park, making claims of the employment and income it would bring to them, while little detail was given about boundaries and regulations. Respondents reported that testimonies were given by local people selected by IBAMA, but who were not local representatives, and that many attendees felt there was little space for questions or to voice disagreement with the result that the documents were signed before people felt informed enough to debate the issues, let alone give their agreement. As an Indigenous man in his fifties recalled, "*At this meeting, it was said that with the creation of the park the population would benefit, but I did not agree with the things that were said at that meeting and there was no opportunity to disagree.*"

People reported that soon after, despite a lack of clarity about the rules or even boundaries of the park, large fines began being incurred by locals for activities including hunting, burning, clearing, making tracks, taking captive birds, and building houses or wells without permission. While people perceived they gained little or none of the benefits that had been promised, they felt the restrictions on their practices and were dismayed by the lack of communication from the park's management. For example, one young Indigenous man described his experience of how relationships broke down at that time: "*Park employees from Catimbau came with rules and no dialogue at all!.... soon after it was created, park employees were often seen passing by the village and imposing fines on the villagers, until the inhabitants of Malhador came together to prevent the employees of the park from coming here*."

This situation was soon similarly inflamed in all villages within the park, when locals learnt of plans to relocate all inhabitants to areas outside of the park's new boundaries, with possible compensation to be offered. As described by a non-Indigenous woman, "*They just had a*

meeting and then told people about the rules only after the park agreement was signed. I found it difficult to understand the rules, but understood that we should leave the park. It was forced on us!". The lack of benefit, communication or local influence on decisions alongside the imposition of rules and threat of relocation cumulatively resulted in the widespread feeling among locals that "*we lost our land*," or, more accurately, the loss of rights of use or control over it.

Respondents described the first years immediately after the park was established as characterised by overt conflict. The breakdown of communication persisted as the authorities, with few resources to impose their objectives, receded, and although the direct impacts on people subsided, the unaddressed conflict has simmered on. Respondents unanimously described how they come to know of rules and any developments about the park "*only by rumour*." A non-Indigenous man stated simply that, "*The management of the park does not speak to the residents of Igrejinha, and has not done so for more than 10 years."* The perceived tenure insecurity associated with living in a National Park has left residents with low levels of trust for the park's management. These perceptions have been reinforced by the efforts of park management to enforce legislation that impedes some forms of development reaching villages within the park. Respondents reported instances between the park's establishment in 2002 up to 2018 (claims validated during subsequent stakeholder workshops) where the park authorities had intervened to prevent or impose fines on those involved in construction of wells (including by development NGOs to reduce vulnerability to drought), provision of electricity, state housing schemes and road improvements.

The distribution of costs and benefits of conservation in Catimbau National Park

Sixteen years since the park's establishment, the resolve of local inhabitants to mobilise against and resist further imposition of conservation regulations remains strong. People are aware that the removal of all inhabitants through compensated resettlement remains the policy of the park and central government for this type of conservation unit. Indeed, some larger land owners who do not permanently reside in the park have been approached about

purchase of their land and several respondents stated that land surveyors had recently visited some villages to measure land with a view to registering it as a precondition of indemnification. Despite some initial efforts by a new park manager to re-initiate communication with residents since 2017, the expectation that a process of resettlement may arise continues to drive people's behaviour. As a young Indigenous woman clarified, "*It (resettlement) is the fear of all people here,*" suggesting the sense of insecurity is also felt by the more politically represented Indigenous Peoples within the park. Another Indigenous woman explained that their insecurity stems from the fact that "*IBAMA and ICMBio (the state conservation agencies) have a lot more money than FUNAI (the state agency for Indigenous Peoples), and today who has the most money is the boss*."

Feelings of opposition to any resettlement remain steadfast among 92% of respondents, who made strong statements to the effect: "*My land is priceless," "Let's move the heavens and the earth so it does not happen," "I will only leave in a coffin," "I give my blood and my life for this land.*" In contrast, six respondents, all non-indigenous from Igrejinha village, stated that they would happily leave if they were to be compensated, one stating: "*If the compensation came, I would not even untie the hammock.*" Meetings have been held in the villages to determine their collective stance, with the near-unanimous position reported variously as: "*No one will leave, and we have to be ready. We were born here and we die here, and that's it!*"; *"We respect the law a lot, but in matters of relocation and indemnification of land, this law we will never respect,"* and; *"There has already been a meeting within the village, and the consensus of the majority is clear, that no one will leave their land. The value of the land goes far beyond what it produces, since it has sentimental value and we have our history in that land."*

Villagers within the park have also had very little involvement in, consultation about or benefit from tourism. Instead, apart from the sale of handicrafts by a small number of individuals from their homes, tourist guides, provisions and accommodation are all centred in Catimbau. A non-Indigenous man in his fifties, living in a village that tourists frequent for its

rock formations and nature, stated that "*Nobody here benefits, even though people here know more about the place than the guides from Catimbau*." Remarkably, no inhabitants of the park have been trained as guides. The Kapinawá have established their own museum, though this is not actively marketed as a tourist attraction in Catimbau and serves a function for education and cultural heritage within the community.

Conservation effectiveness in Catimbau National Park

When asked if they perceived the Caatinga to have improved or degraded since the establishment of the park, the responses were very mixed, with numerous direct and indirect drivers of habitat quality identified. Twenty two percent of respondents believed the Caatinga had improved, though 71% of those responses came from Indigenous respondents who believed their own community's efforts had been the primary cause. Forty three percent of respondents stated there had been no change to the Caatinga since the park was established with most pointing to the lack of governance and management activities to actively conserve, while local conservation institutions struggle through the lack of support afforded to them or even acknowledgement of them by park authorities. A further 22% believed nature had declined since the park was set up. Some stated the vegetation cover had remained largely unchanged, while the diversity of plants and wildlife had declined due to both lack of rainfall and their historic overexploitation through hunting, particularly by former landowners from outside the area. Others, particularly from the Indigenous village of Malhador highlighted that intensive commercial farming through external companies and individuals had been allowed to take place in the productive valleys neighbouring their lands, involving clearance of native vegetation and extensive use of pesticides, which locals feared could have knock on effects on their water, farming, biodiversity and apiculture.

Grazing by local people has at times been framed by scientists and park authorities as a major threat to biodiversity in Catimbau National Park. Our interview data showed that livestock farming, primarily goats along with smaller numbers of cattle, was still an important occupation. However, livestock farming was far from the primary income-generating activity

716 of respondents. In contrast, livestock farming appears to be in decline, due to drought,
717 diversification and reallocation towards alternative assets such as cars, motorbikes, housing
718 improvements and education. Forty-one of the seventy-nine respondents reported reduced
719 livestock holdings due to loss or sale of cattle or goats in the last five years, and average
720 numbers across the 79 households were just 8.4 goats and 0.5 cattle. Furthermore 32
721 households kept poultry only, meaning most livestock was in concentrated ownership with
722 60% of the goats and 85% of cattle belonging to just 11% of households, with seven of those
723 occurring in one of the four villages, Malhador. Only 16% of households reported livestock
724 trade as their primary form of income, and the proportion of households engaged in
725 commercial farming ranged from just 13% to 24% across the four villages (Table 1).

726

727 **Discussion**

728 Pledges to substantially increase the global coverage of protected areas by 2030 appear
729 likely to be implemented (MacKinnon et al. 2021). However, conservation success is rare
730 and such a move risks injustices for people and perverse outcomes for nature unless
731 sufficient attention is paid to the quality of governance, and particularly to social equity and
732 the contribution of IPLCs to effective conservation (Barnes et al., 2018; Bhola et al., 2020).
733 Our study critically analysed conservation governance processes and their interaction with
734 the wellbeing of IPLCs at a single protected area established within the previous 20 years in
735 the Caatinga dry forest ecosystem of northeast Brazil. Our analysis at Catimbau National
736 Park reveals numerous deficiencies in governance common to many protected areas
737 globally, particularly the neglect of values and institutions through which IPLCs may
738 themselves contribute to conservation decision making and outcomes.

739 The conservation strategy applied at Catimbau, based on the selection of Brazil's strictest
740 protected area type, explicitly sought to exclude and separate local people from the area
741 through resettlement and livelihood reorientation. Our exploration of local wellbeing and
742 values about nature reveals how this clashes with an established identity and way of life in

743 this peopled landscape and so foregoes local knowledge systems and stewardship, instead
744 creating social harms and conflict. Both Indigenous and local communities at Catimbau
745 National Park retain place-based, intergenerationally-transferred relational values about
746 nature and customary institutions that foster environmental stewardship. This arguably
747 reflects the complexities of legal, if not intersubjective recognition of IPLCs as "traditional"
748 versus "settler" populations (Fraser, 2018). A failure to recognise IPLCs' knowledge systems
749 and to instead frame them as resource-dependent people, responsible for degradation, who
750 should be relocated, is incongruent with principles for equitable governance or rights-based
751 conservation (Reyes-Gracia et al., 2021; Tauli-Corpuz et al., 2020). As such, it is crucial that
752 as conservation efforts are expanded post 2020, the people of the Caatinga be recognised
753 as embedded within that social-ecological system, as sharing a strong interest in preserving
754 and restoring the Caatinga's biodiversity, as exhibiting their own agency and capabilities and
755 therefore representing a key part of any solution (Seppälä, 2011; Siegmund-Schultze, 2020).
756 Accordingly, the only actors who could ethically be targeted for compensation and removal
757 from Catimbau National Park are those originating from outside the park who run
758 commercial enterprises of crop or livestock farming within it. In October 2021, the Kapinawá
759 Indigenous Peoples produced a document detailing and denouncing 'environmental crimes'
760 within Catimbau National Park as new commercial farm operations had used machinery to
761 clear and fence large sections of the protected area
762 (https://www.facebook.com/remdipe/posts/266713958371127/ accessed 3rd November
763 2021). They called upon the Brazilian government agencies, who seemingly had not reacted,
764 to to stop the degradation or extend their Indigenous Territory so they may prevent the land
765 conversion themselves.

766 In many cases across Brazil, strict protected areas have been designated based on scientific
767 recommendations and economic goals, leading to the actual or threatened limitation of
768 access rights of traditional communities and Indigenous Peoples (Anaya et al., 2018;
769 NUPAUB, 1995). Once the strictest form of protection has been applied, it is bureaucratically
770 difficult to switch status (Loureiro and Cunha, 2008). However, some progressive examples

771 exist in Brazil of establishing intercultural understanding and recognising local governance
772 for conservation and social development more broadly (Peres, 2011, Tran et al., 2020). In a
773 recent example, the limits of the Serra do Papagaio state park in Minas Gerais were
774 changed after local communities undertook a process of participatory mapping, identifying
775 key areas within the park that are important for local livelihoods, and via a series of
776 participatory meetings, the park boundaries were redefined to exclude these areas and
777 include other areas of intact native vegetation. The process actually led to an increase in
778 size of the park of approximately three thousand hectares, with benefits for conservation and
779 local communities alike (Menegassi, 2021).

780 Similar to Catimbau National Park, strict protected areas lacking effective governance have
781 been documented at numerous sites in Brazil (Anaya et al., 2018; NUPAUB, 1995; Santana
782 et al., 2020) and in many parts of the world (Bixler et al., 2015; Cavanagh et al., 2020;
783 Dahlberg and Burlando, 2009; Dawson et al., 2021; Dressler and Roth, 2011; Holmes and
784 Cavanagh, 2016; Masse and Lunstrum, 2016; Mbaria and Ogada, 2016; Rechciński et al.,
785 2019). Such cases are often labelled ‘paper parks’, however this points to resource
786 limitations as the major cause of ineffectiveness, whereas a more detailed analysis of
787 governance and social interactions can reveal the unequal power relations and value
788 hegemony behind conservation initiatives to be further drivers of ineffectiveness, and routes
789 to improve governance (Borrini-Feyerabend and Hill, 2015; Delabre et al., 2020). Catimbau
790 became a ‘paper park’ not simply because of its lack of resources but rather due to the break
791 down in relationships and communication, absence of legitimacy perceived among IPLCs
792 and inertia caused by the underlying conflict.

793 Overcoming conflicts and transitioning towards more just and effective protected area
794 governance presents challenges. This is particularly the case in Brazil, where despite calls
795 for more collaborative conservation models (ICMBio, 2017; Maretti, 2019; Seixas et al.,
796 2018) the administration continues to take a suite of actions that deprioritise environmental
797 protection and Indigenous rights, and the role of civil society in decision-making processes

(Bragança, 2021; Coalização Ciência and Sociedade, 2021; Dantas, 2021; Ferrante and Fearnside, 2019; Lisboa, 2019; Menegassi, 2020; Silveira 2020; Siqueira-Gay et al., 2020; Thomaz et al., 2020). However, whilst legal frameworks may obstruct changes in governance type, site level governance quality may still be improved through the actions of and interactions between key local actors. For example efforts can be made to establish the participatory processes guaranteed in federal legislation (e.g. The National Plan for Protected Areas and National System of Protected Areas - PNAP and The National System of Conservation Units – SNUC, Peres, 2011; Rylands and Brandon, 2005).

As a precursor to more inclusive, collaborative governance, existing conflicts should be addressed through establishing local dialogue to air perspectives and past grievances, to better recognise plural values and forms of discrimination experienced by Indigenous Peoples and cultural minorities, and to build intercultural understanding and relationships to work to promote resolution (Alvarez and Coolsaet, 2020; Madden and McQuinn, 2014; Martin et al., 2016; Vermeylen, 2019). Such processes can be lengthy and difficult but are often essential steps to more constructive cooperation (Young et al., 2016). Such cooperation can provide a foundation for more integrated conservation and development planning and implementation, via regular, culturally-appropriate stakeholder forums (Araujo et al., 2021; Siegmund-Schultze, 2020). This kind of cross-sector integration, and weaving of different forms of knowledge is widely considered desirable as a means to address interrelated issues of sustainable development, biodiversity conservation and climate change, yet remains rare in practice (Reed et al., 2017; Tengö et al., 2017).

To transition away from exclusive, top-down decision making and begin to address governance deficiencies and associated injustices at local level, communities themselves could be gradually supported and empowered to exercise control over aspects of land, resources, and social development (D'Alisa and Giorgos, 2015; Diaz et al., 2020; Loureiro and Cunha, 2008). At Catimbau, recent enhancements in material wealth and community resilience, particularly among Indigenous inhabitants, were realised through local collective

825 action to self-govern schools and health services, supported by social protection
826 mechanisms and networks, rather than through any external, conservation-related
827 alternative livelihood programs. These examples could usefully be applied to foster
828 resilience among non-indigenous communities where such capacities, institutions, support
829 and benefits were relatively lacking. Such mechanisms may address injustices in a more
830 holistic and empowering way than sharing tourism revenue or minimal participation in
831 National Park meetings, which are often prioritised as mechanisms to improve equity in
832 protected area governance (Cundill et al., 2017; Dawson et al., 2018).

833 The findings presented hold implications for other threatened ecosystems worldwide, and
834 the Indigenous and Traditional peoples, and local communities that inhabit them (Salick and
835 Ross, 2009). In all places in the world where biological and cultural diversity are interrelated
836 and have evolved together within a dynamic and complex social-ecological system, local
837 knowledge, practices and long term stewardship play a role (Gadgill et al., 1993; Biró et al.,
838 2019). These knowledge systems, particularly forms of tenure and access, should receive
839 much greater consideration across conservation, agriculture and climate research, policy
840 and practice (Cinner and Aswani, 2007). This is especially pertinent in the Caatinga and
841 other semi-arid regions, where increasing climate variability is expected to cause social and
842 environmental pressures that will potentially exacerbate conflicts over conservation and
843 development (El-Beltagy and Madkour, 2012; Torres et al., 2017). Future conservation and
844 development policies and programs for the Caatinga in Brazil and internationally (most
845 urgently the CBD post-2020 strategic plan and related protected area expansions) must
846 avoid falling back on old narratives. Instead contemporary conservation efforts must
847 foreground and hold people accountable to the now well-articulated governance principles
848 and qualities placing local knowledge, control and stewardship at their centre to promote a
849 more effective and equitable future for people and nature.

850

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Focus on improving how nature is conserved and by whom instead of how much to protect

Pledges have been made to increase the land set aside for conservation by 2030. But the common assumption that governments and conservation organisations should protect nature by excluding local people, is unsupported. Evidence shows where Indigenous Peoples and local communities apply their own knowledge to conserve habitats and species, their stewardship produces better environmental and social outcomes than initiatives controlled by external organisations that exclude local people. This controversy suggests a need to reflect on how conservation decisions are made and what is most successful before any expansion of protected areas.

This study focused on Catimbau National Park in the Caatinga dry forest of northeast Brazil. We explored how the park was set up, and discussed with the communities who live there how they feel about the park and how they use, manage and are connected to the Caatinga. We found their lives closely bound to nature, not only because they use resources for food, medicine and more, but living in that place for generations has become their identity and involves a deep spiritual connection. Despite claims that local people are not good for conservation, we found they actually look after the Caatinga by restoring it, keeping forest gardens and preventing commercial exploitation by companies or individuals from outside the area. When the park was set up by the Brazilian government without their consent, and they heard they would have to leave, they were appalled and have fought against being relocated. In the meantime, because they live inside the park's boundaries they have been denied some development assistance from charities and state agencies for housing and water tanks, which are important for a good quality of life in this dry area.

It is difficult to change from a National Park, as designation which in Brazil prohibits any human inhabitants, to another type of reserve that allows them to stay. However until that change can be made, we recommend efforts are made to rebuild trust with and support those Indigenous and local communities living inside the park to act as its stewards. Overall, this case shows that if new protected areas are created, they should involve and respect Indigenous and local communities' ways of living and let them apply their knowledge as part of any solution. Clear standards for how to treat and involve Indigenous and local communities in conservation need to be set up and the park managers and state agencies responsible must be held accountable to them, so that conservation efforts do not harm cultural minorities and repeat the failures of the past.

Supporting Information

Semi-structured interview topics and process

Interviews took the form of a conversation, including a minimum set of quantitative and qualitative questions in undetermined order, with further questions and topics added to explore in more detail the various responses and priorities determined by the respondent. The list of topics addressed to each interviewee, focusing on them as individuals and their household, covered: their perceptions of a good life; important resources and access to them; social and cultural values and practices; social difference, dynamics and cohesion; participation and autonomy; history and demographics of household members; livelihoods, social protection and remittances; housing, food security, sanitation and other basic needs; education; land and livestock; local institutions and forms of landscape or resource governance and management; assets; aspirations; key drivers of change, development trends and issues, responses to environmental challenges; experiences of the process of and rationale for establishment of the park; perceptions of the rules, decision making and how they have affected people's lives; interaction between conservation, development and local livelihoods (past, current and how they might work in the future); tourism, and; feelings about potential relocation and compensation.

Semi-structured interview template (English and Portuguese)

The topics and questions listed do not represent a rigid structure for each interview but rather a list of questions that can be weaved into an open conversation, to which additional questions can be added to gain additional detail based on the respondent's own priorities and perspectives.

Questions about wellbeing and livelihoods

1. House quality - house material, size.

2. How many years have you lived here?

• Where did you live before?

• Why did you move?

3. How many people live in this house and who (adults / children)?

• How many children do you have?

• Do you have other relatives in the community / village / nearby?

4. Education / literacy

• Where is the school that the children attend?

• What is (are) the school year/s that they are studying?

• What is the highest level of education among your family members?

• Does everyone in the house know how to read and write?

5. What do those who live in this house do for their livelihood?

• What are the main ways of generating income?

• Who contributes most of the income?

• Do any relatives who work elsewhere (another city / state) send any help (money or supplies)?

• Do you live here all year or spend some of the year elsewhere in search of work?

• Has this changed over time?

• Do you have other houses / apartments elsewhere?

6. How much land do you have? (ideally number and size of fields in hectares)

• What do you use the land for? - trees versus annual crops, etc.?

• How has this changed over time and why (including buying or selling land)?

• Is your land here in the community or do you also have land elsewhere?

• Did you get your inherit or purchase your land?

• Do you own the land (if so, documented or un-documented), or is it rented / borrowed?

7. Do you raise livestock?

• How many head do you have of cattle, goats, chickens, etc.?

• How have the quantities, the purpose of raising livestock and / or ways in which they are raised changed over time?

• Have you changed, or would you like to change the type of livestock you raise? Why?

8. Do you believe that your own life situation is similar to the situation of other people who live here? Or are there differences within the community?

• Is your situation a little better or a little more difficult than the situation of others? How? Why?

• Do others in the community do anything differently?

• Do you have any specific challenges that perhaps others do not? (including women versus men, poor versus rich, indigenous versus not). E.g. do you think that you, as a woman, have a few more challenges, or that the challenges you face are different from those faced by men?

9. How would you describe your quality of life compared to 10 years ago?

• How has it improved?

• How has it gotten worse?

• What are the main factors that caused these changes?

• Is there electricity here? How long ago was it installed?

• Do you have a road? How long ago was it built?

• Do you have a well? How long ago was it installed?

10. Have you made any improvements to your home recently?

• What improvements have you made?

• Did you do it with your own resources? Or with government help, a loan, etc.?

11. Do you have any kind of transportation? (car, motorcycle, cart, horse)

• How long have you had this transport?

• How did you acquire it?

• How does having this transport make a difference in your life?

12. Where do you get water from? (piped at home, well, somewhere else?)

• Any problems with this (e.g. cleanliness or water availability)?

• Do you have enough water for drinking, washing, cooking and other uses?

• How has this changed over time?

13. How did the drought affect you?

• What helps you to cope with these changes and what creates difficulties?

14. Do you always have enough food?

• Do you rely on any support? For example, food parcels, water tanker, welfare payments.

• Who gives this support? (e.g. government, city hall, charity (Amigos do Bem), relatives, etc.)

• How important is this support (e.g., Amigos do Bem) in the daily lives of people here?

15. What are your aspirations for the future for you and your family?

• Do you think you will be able to fulfill them?

• What would help and what would make it more difficult to achieve these aspirations?

16. Do you have any plans to change anything in the coming years?

• E.g. type of livestock (e.g. changing from goats to cattle), sending children to university, some investment, etc.

17. Have any people ever left the community / village? Are there any abandoned houses here?

•Why?

• Where did they go?

• Do they intend to return?

• Is the land they had still theirs? Or do other people in the community use that land now?

Questions about equity issues

18. Do you think this is a good place to live? Why?

• E.g. it is peaceful, safe, climate, way of life, special places, wildlife, stories and narratives.

• And what else makes this a good place to live?

19. What do you use the land for?

• E.g. animals, plants (e.g. plants for making ropes, teas, medicines), firewood, material for the production of crafts, household utensils (e.g. broom, tools), building materials (e.g. wood for fencing), important places for them (which places and why they are important).

20. Are there any rules or guidelines that you have developed in the village / community about raising livestock? For example, places where animals are not supposed to go, or places that are used for animals only at certain times of the year?

• Is there an area where everyone can put their animals to graze? Or does each household have their own areas for that?

• Who decides and how do they decide? Does the village council advise on grazing in any way?

21. And regarding the use of other things, do you have any rules that you have agreed with each other? For example, regarding harvesting wood for building fences, or collecting firewood?

22. Are there important knowledge or traditions that are passed down from parents to children in your family? Please, describe them.

23. Has the park affected these traditions in any way?

• Do you feel that these traditions and knowledge are respected by the park?

• Does the park recognize or in any way impede your ability to maintain your customs or practices?

24 Has the park in any way affected how you use your land?

• Is there anything that the park does not allow?

• Are you able to complain about this?

• Regarding the rules that you have within the community / village about grazing and collecting firewood etc., do you feel that these rules are respected by the park authorities?

25. Were the ways in which you use the land ever considered or discussed as a part of park management? Describe, give examples.

26. And what was it like at the beginning when the Catimbau National Park arrived here?

• At the time, how did you hear about the Park?

• Were there any meetings? Were you involved in meetings or discussions?

• Did anyone give any information about the park boundaries and what you can and cannot do within the park limits?

27. Do you know why they decided to put a park here?

• Do you think it is important to preserve this part of the Caatinga? Why/ why not?

28. Has the Caatinga / forest / landscape improved or worsened since the park arrived here?

• Do you think this is because the area is now a park? Or has it changed because of other things? What are these other things?

• Is there any difference in the appearance of the Caatinga inside and outside the park?

29. Do you have any idea about how livestock could be raised here without negatively impacting the Caatinga / forest / vegetation, but that at the same time would not negatively impact on you?

30. We noticed that in some parts of the Catimbau Valley there are large plantations of tomatoes, peppers, passion fruit and other things, with irrigation and use of pesticides. Is this kind of activity affecting you and the community here in any way?

• Do you think that, having the park here has prevented this type of activity from spreading in the Vale do Catimbau? If so, is this a good thing or a bad thing? Why?

31. Is there any gain or loss for you from keeping the forest and the wildlife here?

32 Do you benefit from the park in any way?

• Do you feel negatively impacted in any way?

• And do you think other people benefit or are being negatively impacted? Who and how?

33. How does tourism work here?

• Do the tourists come here to the community / village?

• Has there been any discussion with you and the community / village about this?

• What are the good and bad things about tourism here?

• Who benefits from tourism? Please give examples.

• Has there been any change over time, has it gotten better or worse? Explain.

34. How are the relations with the park authorities?

• Has anyone from the park ever come here?

• Did they come to talk about the rules, to hear your ideas or something else?

• Has that changed over the years? Explain.

35. Is there a system that managers use to make decisions about the park?

• Were there any meetings?

• Did you or anyone from here attend a meeting?

• How could the system be improved?

36. Do you know if anyone has ever been fined or punished for something they did within the park? Explain.

• What kind of thing can lead to a fine or other punishment?

•What do you think? Is that fair?

37. Is there anything the park could be doing that could help people here?

38. Regarding a possible indemnification and relocation of people, in your view, how realistic is the plan and how likely is it to happen?

• Has anything happened or is happening in relation to this?

• Did you organize yourself in any way within the community / village regarding this issue?

• Did you receive any information? If so, how?

• Did you have a chance to respond? What is the mechanism for you to do that?

• Did it affect the likelihood of investing in things here?

39. Is there anything else that we haven't touched on, but that you would like to mention? Or anything you would like to ask?

Portuguese version: Bem-estar e meios de subsistência

1. Qualidade da casa - material da casa, tamanho.

2. Por quantos anos você mora aqui?

- Onde você morava antes?
- Por que você se mudou?

3. Quantas pessoas moram nessa casa e quem (adultos/crianças)?

- Quantos filhos você tem?
- Você tem outros parentes na comunidade/aldeia/nas proximidades?

4. Educação/alfabetização

- Onde fica a escola que as crianças frequentam?
- Elas estão estudando qual/quais série/s?

- Qual é o maior grau de escolaridade dos membros da família?
- Todos na casa sabem ler e escrever?

5. O que os que vivem nesta casa fazem pelo seu sustento?

Quais são as principais formas de geração de renda?

Quem contribui com a maior parte da renda?

- Algum parente que trabalha em outro lugar (cidade, estado) manda alguma ajuda (dinheiro ou suprimento)?
- Vocês moram aqui o ano todo ou se mudam em alguma época do ano em busca de trabalho?
- Isso mudou com o tempo?
- Você tem outras casas/apartamentos em outro lugar?

6. Quanta terra você tem? (idealmente número e tamanho dos campos em hectares)

- Você utiliza a terra para quê ? - árvores *versus* cultivos anuais, etc?
- Como isso mudou ao longo do tempo e por quê (incluindo compra ou venda de terra)?
- A sua terra está aqui na comunidade ou você também tem terra em outro lugar?
- Você conseguiu sua terra herdando ou comprando?
- A terra foi possuída com títulos/sem/alugada/emprestada?

7. Você/s criam animais?

- Quantas cabeças (gado, cabra, galinha etc.)?
- Como as quantidades, e o propósito e/ou modo de criá-los mudaram com o tempo?
- Você já mudou, ou gostaria de mudar o tipo de pecuária que cria? Por quê?

8. Você acreditaquesua situação de vida é parecida com a situação das outras pessoas que vivem aqui? Ou existem diferenças dentro da comunidade?

- Sua situação é um pouco melhor ou um pouco mais difícil do que a situação dos outros? Como? Por que?
- Os outros fazem alguma coisa diferente?
- Você/s têm alguns desafios espécificos que talvez outros não têm? (incluindo mulheres *versus* homens, pobres *versus* ricos, indígenas *versus* não). **E.g**. você acha que você, como mulher, tem alguns desafios a mais, ou que são diferentes dos homens?

9. Como você descreveria sua qualidade de vida em relação a 10 anos atrás?

- Como melhorou?
- Como piorou?
- Quais são os principais fatores que causaram essas mudanças?
    - Chegou luz? Quando?
    - Tem estrada? Faz quanto tempo?
    - Tem poço? Faz quanto tempo?

10 Você fez algumas melhorias recentemente em sua casa?

- Quais foram as melhorias que você fez?
- Fez com recurso próprio? Ou com ajuda do governo, um empréstimo etc.?

11 Vocês têm algum tipo de transporte? (carro, moto, carroça, cavalo)

- Faz quanto tempo que tem esse transporte?
- Como conseguiu?
- Como isso fez/ az diferença em sua vida?

12 De onde vocês conseguem água? (encanalada em casa, poço, outro lugar?)

- Algum problema com isso (e.g. limpeza ou disponibilidade de água)?
- Vocês têm água suficiente para beber, lavar, cozinhar e outros usos?
- Como isso mudou com o tempo?

13 Como a seca afetou você?

- O que ajuda você a enfrentar essas mudanças e o que cria dificuldades?

14 Vocês sempre têm comida suficiente?

- Vocês contam com algum apoio? Por exemplo cesta básica, carro pipa, bolsa família.
- Quem é que dá esse apoio? (e.g. governo, prefeitura, amigos do bem, parentes, etc.)
- Qual é a importância desse apoio (e.g. os amigos do bem) na vida cotidiana das pessoas daqui?

15 O que você sonha para o futuro para você e sua família?

- Você acha que vai conseguir cumprí-las?
- O que ajudaria e o que faria mais difícil de conseguir?

16 Você tem planos de mudar alguma coisa nos próximos anos?

- E.g. tipo de criação (bode para gado), filhos que vão estudar na faculdade, algum investimento, etc.

17 Existem pessoas já saíram de da comunidade/aldeia? Existem cadasabandonadas aqui?

- Por que?
- Para onde foram?
- Eles pretendem voltar?
- A terra que eles tinham segue sendo deles? Ou outras pessoas na comunidade usam essa terra agora?

Questões sobre a equidade

18 Você acha que aqui é um bom lugar para viver? Por que?

- E.g. é sossegado, seguro, clima, meio de vida, lugares especiais, vida selvagem, histórias e narrativas.
- E o que mais faz daqui um bom lugar para viver?

19 O que vocês utilizam da terra?

- E.g. animais, plantas (e.g. plantas para confeccionar cordas, chás, remédios), lenha, algum material para a produção de artesenatos, utensílos domésticos (e.g. vassoura, ferramentas), materiais de construção (e.g. madeira para cerca), lugares importantes para eles (quais são e por que são importantes).

20 Existem regras ou diretrizes que vocês desenvolveram na aldeia/na comunidade sobre a criação dos animais? Por exemplo, lugares onde os animais não devem ir, ou lugares que são usados para os animais em apenas algumas épocas do ano?

- Existe alguma área que todos podem colocar seus animais para pastorear? Ou cada um tem seus lugares próprios para isso?
- Quem decide e como decidem? Oconselho controla o pastejo de alguma forma?

21 E sobre uso de outras coisas, vocês têm algumas regras que concordaram entre si? Por exemplo, sobre extração de madeira para construção de cercas, ou coleta de lenha?

22 Existem conhecimentos ou tradições importantes que são passadas de pai para filho em sua familia? Por favor descreva-os.

23 O parque afetou de alguma forma essas tradições?

- Você sente que essas tradições e conhecimentos são respeitados pelo parque?
- O parque reconhece ou impede de alguma forma sua habilidade de manter suas costumes ou práticas?

24 O parque afetou de alguma forma como você usa a sua terra?

- Existe alguma coisa que o parque não permite ?
- Você tem como revindicar?
- Em relação às regras que vocês têm dentro da comunidade/aldeia sobre pastejo e coleta de lenha etc, você se sente que essas regras são respeitados pelas autoridades do parque?

25 As formas de que você usa a terra foram considerados ou discutidos como uma parte da gestão do parque? Descreva, dê exemplos.

26 E como foi no começo quando o Parque Nacional do Catimbau chegou aqui?

- Na época, como você ouviu falar sobre o Parque?
- Houveram algumas reuniões? Você estava envolvido em reuniões ou discussões?
- Alguém deu alguma informação sobre os limites do parque e o que pode e não pode fazer dentro do parque?

27 Você sabe o por quê que decideram colocar um parque aqui?

- Você acha importante preservar essa parte da Caatinga? Por quê sim/porque não?

28 A Caatinga/floresta/paisagem melhorou ou piorou desde que o parque chegou aqui?

- Por que você acha que essa área agora é um parque? Ou mudou por causa de outras coisas? Qual ou quais são essas outras coisas?
- Tem alguma diferença no aspecto da da Caatinga dentro e fora do parque?

29 Você tem alguma ideia sobre como os animais poderiam ser criados aqui semprejudicar a Caatinga/floresta/vegetação, mas que ao mesmo tempo vocês não fossem prejudicados?

30 Nós notamosque em algumas partes do Vale do Catimbau existem plantios grandes de tomate, pimentão, maracujá e outras coisas, com irrigação e uso de agrotóxicos. Esse tipo de atividade está afetando de alguma forma você e a comunidade aqui?

- Você acha que, tendo o parque aqui impediu que espalhasse esse tipo de atividade no Vale do Catimbau?
    - Se sim, isso é uma coisa boa ou ruim? Por que?

31 Há algum ganho ou perda para você de manter a floresta e os animais daqui?

32 Você beneficia do parque de alguma forma?

- Se sente prejudicado de alguma forma?
- E você acha que outros pessoas beneficiam ou estão sendo prejudicados? Quem e como?

33 Como funciona o turismo aqui?

- Eles vêm aqui para a comunidade/aldeia?
- Houve alguma discussão com você e a comunidade/aldeia aqui sobre isso?
- Quais são as coisas boas e ruins sobre o turismo aqui?
- Quem se beneficia do turismo? Por favor, dê exemplos.
- Houve alguma mudança ao longo do tempo, ficou melhor ou pior? Explique.

34 Como são as relações com as autoridades do parque?

- Alguém do parque já veio por aqui?
- Eles vieram para falar sobre as regras, ouvir suas idéias ou o quê?
- Mudou ao longo dos anos? Explique.

35 Existe algum sistema que os gestores utilizam para tomar as decisões sobre o parque?

- Houveram reuniões?
- Você ou alguém daqui foi para alguma reunião?
- Como o sistema poderia ser melhorado?

36 Você sabe se alguém já levou uma multa ou foi punido por algo no parque? Explique.

- Que tipo de coisa pode levar uma multa ou outro tipo de punição?
- O que você acha disso? É justo?

37 Há alguma coisa que o parque poderia estar fazendo que poderia ajudar as pessoas daqui?

38 Em relação a uma possível indenização e relocação de pessoas, na sua visão, quão realista é o plano e o quão provável está para aconteçer?

- Algo já aconteceu ou está acontecendo em relação a isso?
- Vocês se organizaram de alguma forma dentro da comunidade/aldeia em relação a essa questão?
- Você recebeu alguma informação? Como?
- Vocês têm chance de responder? Como podem fazer isso?
- Afetou a probabilidade de investir em coisas aqui?

39 Tem mais algum assunto em que não tocamos, mas que você gostaria de mencionar? Ou alguma coisa que você gostaria de perguntar?

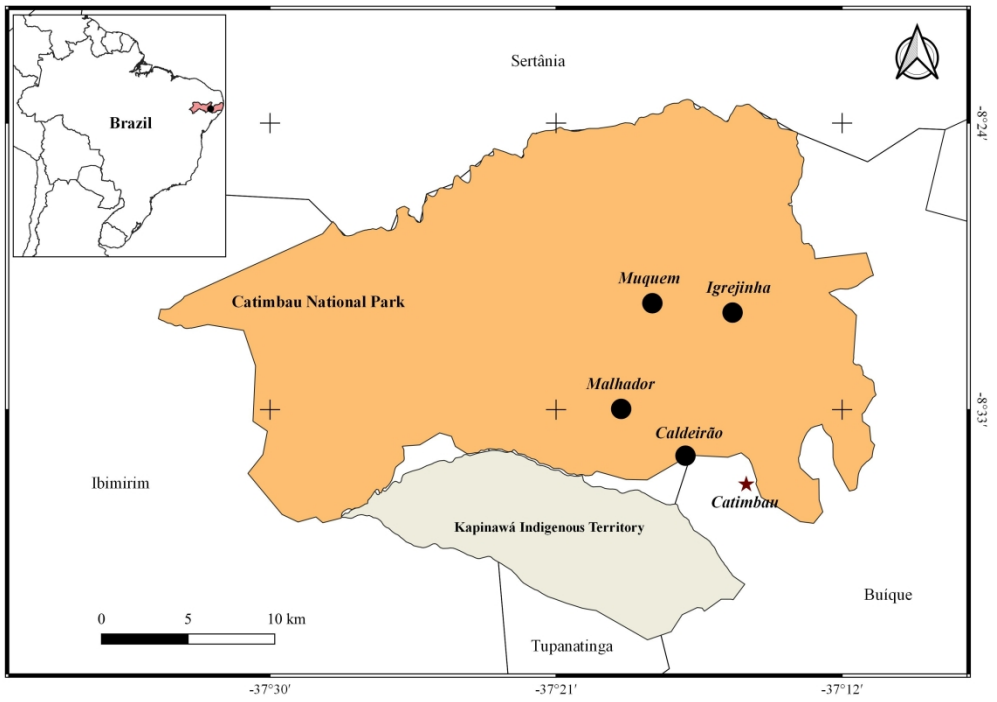

Figure 1. Map of study area and villages where research was conducted

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