Amazon Assessment Report 2021

Chapter 10

Critical interconnections between the cultural and biological diversity of Amazonian peoples and ecosystems

Aldeia Massape, onde vivem cerca de 200 Kanamari, Terra Indígena Vale do Javari (Foto: Bruno Kelly/Amazônia Real)

THE AMAZON WE WANT
Science Panel for the Amazon

SUSTAINABLE DEVELOPMENT SOLUTIONS NETWORK
A GLOBAL INITIATIVE FOR THE UNITED NATIONS

About the Science Panel for the Amazon (SPA)

The Science Panel for the Amazon is an unprecedented initiative convened under the auspices of the United Nations Sustainable Development Solutions Network (SDSN). The SPA is composed of over 200 preeminent scientists and researchers from the eight Amazonian countries, French Guiana, and global partners. These experts came together to debate, analyze, and assemble the accumulated knowledge of the scientific community, Indigenous peoples, and other stakeholders that live and work in the Amazon.

The Panel is inspired by the Leticia Pact for the Amazon. This is a first-of-its-kind Report which provides a comprehensive, objective, open, transparent, systematic, and rigorous scientific assessment of the state of the Amazon's ecosystems, current trends, and their implications for the long-term well-being of the region, as well as opportunities and policy relevant options for conservation and sustainable development.

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Graphical Abstract

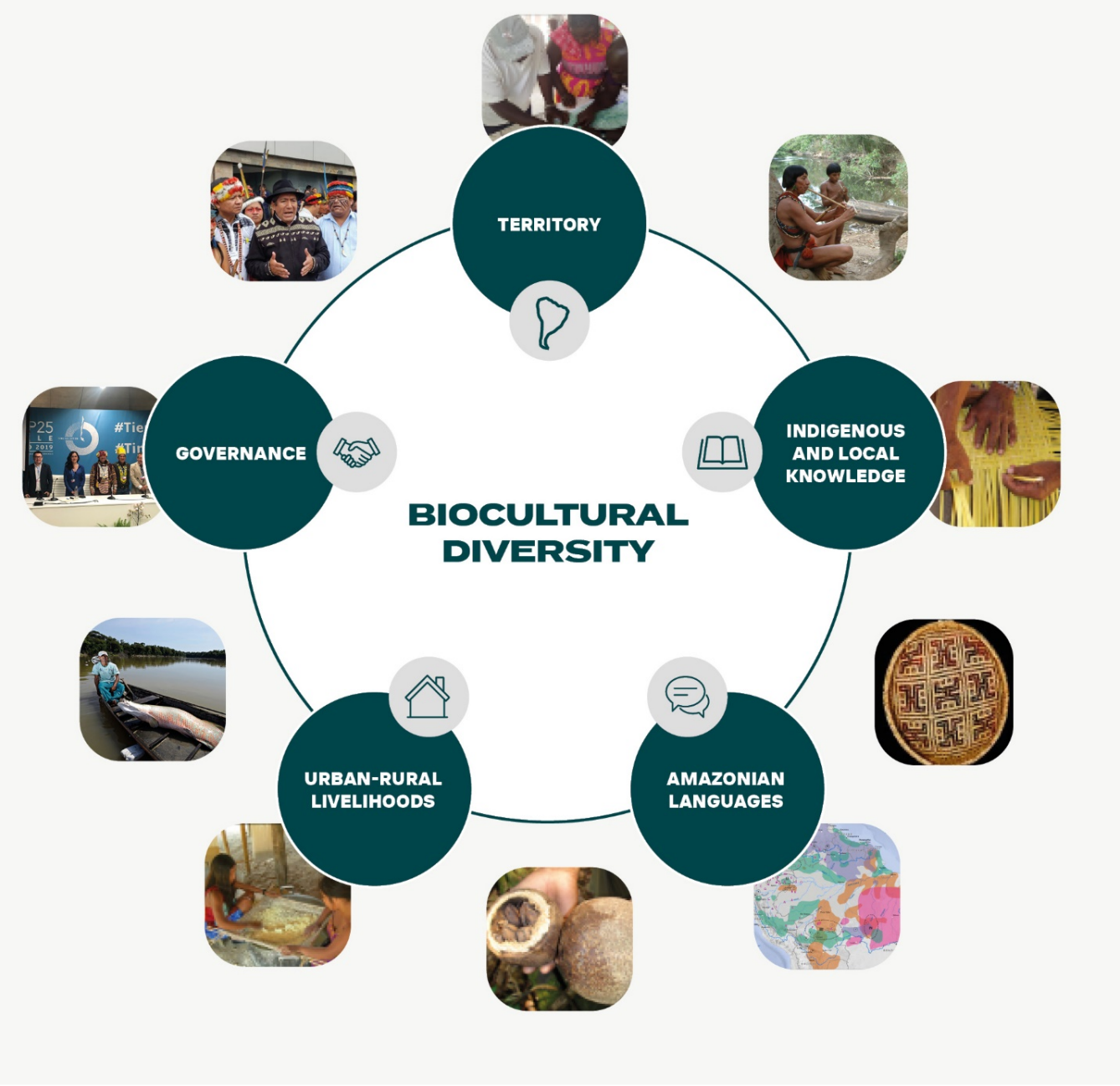

Figure 10.A This figure represents a roadmap for the different subsections included in this chapter and highlights the interconnection between biocultural diversity elements: territory, governance, languages, knowledge, and livelihoods. The concept of biocultural diversity considers the diversity of life in its human-environmental dimensions, including biological, sociocultural, and linguistic diversity. Biodiversity, cultural diversity, and linguistic diversity are interconnected and have co-evolved as social-ecological systems (Maffi 2001). These connections are present in our daily lives, in urban and rural spaces and their interlinkages, from what we eat to our livelihood styles, including our understanding and relationships with one another and with the environment around us. In this chapter, we focus more specifically on Indigenous peoples and local communities (IPLCs) across Amazonian countries, but these critical biocultural connections are manifested among all Amazonian residents.

Critical Interconnections between Cultural and Biological Diversity of Amazonian Peoples and Ecosystems

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Key Messages

- Indigenous peoples and local communities (IPLCs) play a critical role in the sustainable use and conservation of Amazonian biodiversity and ecosystems. Over 3,000 Indigenous lands and territories have been recognized across the Amazon under diverse tenure systems, which, when added to formally recognized protected areas, represent approximately 45% of the region, protecting almost half of its remaining forests (RAISG 2020; FAO 2021).
- Non-Indigenous Amazonian local communities, including small collective groups such as Afro-descendent communities (Maroons, *Quilombolas*) and extractivists of mixed descent (*mestizos, caboclos, ribeirinhos*), have been historically dispossessed and are often overlooked in scientific research, recognition of rights, and social and environmental policies.
- Recognizing Indigenous peoples' and local communities' rights to their territories and resources is fundamental for the maintenance of Amazonian forests and other terrestrial and aquatic ecosystems, carbon stocks, and biocultural diversity, including agrobiodiversity and genetic resources, as well as food security across the Amazon.
- Sophisticated environmental knowledge systems and worldviews held by IPLCs include essential resources, practices, and concepts for understanding, using, and managing the Amazon. This knowledge is critical for informing and guiding scientific research, development projects, conservation policies, and bioeconomy initiatives.
- Many Indigenous Amazonian languages are critically endangered by some of the same forces that threaten biodiversity. Just as these languages, cultures, and worldviews are in danger of extinction, so too are the knowledge systems associated with them, which are linked to and sustaining of Amazonian biodiversity.
- Women have an important role in Amazonian conservation and development, playing a critical role in the maintenance of Amazonian agrobiodiversity, food security, and sovereignty among Indigenous peoples, Afro-descendant populations, and other local communities.
- Indigenous peoples and local communities across the Amazon are stewards of diverse worldviews, values, institutions, and governance systems that are crucial not only to biodiversity conservation but also to democracy itself.

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Abstract

In this chapter, we explore important interconnections between biological and cultural diversity in the Amazon, defined as biocultural diversity. Biocultural diversity considers the diversity of life in all its dimensions, including biological, sociocultural, and linguistic aspects, which are interconnected and have co-evolved as social-ecological systems. This chapter focuses on the worldviews, knowledge systems, livelihood strategies, and governance regimes of Amazonian peoples as documented in ethnographic, ethnobiological, and human ecology studies beginning in the mid-to-late twentieth century. The focus here is on Indigenous peoples and local communities (IPLCs) across Amazonian countries and the territory of French Guiana. We synthesize important social and political processes that have led to the formal recognition of IPLCs' lands and/or territories across the Amazon, notwithstanding persistent gaps, challenges, and obstacles to the recognition, consolidation, and protection of these areas, which will be discussed in other chapters of this report. The Amazon's immense cultural diversity is manifested through approximately 300 spoken Indigenous languages, expressed in worldviews and spiritual relationships with nature. IPLCs have played a critical role in shaping, protecting, and restoring Amazonian ecosystems and biodiversity under changing contexts, despite ongoing historic processes including genocide, disease, violence, displacement, and conflicts between the conservation and development agendas. Amazonian peoples hold diverse and interconnected livelihood strategies, including agriculture and agroforestry, fisheries and aquatic management, hunting, resource gathering and extraction, and rural/urban market-based economic activities and wage-based employment in different sectors. These activities and practices are influenced to varying extents by seasonal and geographical variations, ecosystem features, cultural diversity, market forces, and public policies. We highlight the important role played by women in protecting agrobiodiversity, promoting food security and sovereignty in the Amazon. Policies aiming to conserve and use Amazonian biodiversity need to recognize the sociocultural and territorial rights of IPLCs, and be integrative of Indigenous and local knowledge, languages, worldviews, and spiritual practices.

Keywords: *Biocultural diversity; Amazonian peoples; Indigenous peoples and local communities (IPLCs); Indigenous and local knowledge (ILK); Indigenous and local cosmologies and epistemologies; livelihoods; territorial governance*

10.1. Introduction

This chapter outlines critical interconnections between sociocultural and biological diversity across the Amazon, what has been called "biocultural diversity". The concept emerged from the intersection between diverse academic disciplines and Indigenous and local knowledge systems (ILK), and recognizes that all humans are immersed in a web of interdependence between cultural, linguistic, and biological systems (Maffi and Woodley 2010). Across the globe, human cultures have co-evolved with different ecosystems through the places we live, the food we eat, the landscapes we construct, and the spiritual and political systems we advocate. In the Amazon, biocultural diversity is especially rich, as expressed through a multitude of cultural identities, worldviews, languages, knowledge systems, and livelihoods; and their associated governance regimes, technological innovations, and landscape management practices (Balée 1989, 2003; Heckenberger 2010; Salisbury and Weinstein 2014; Athayde et al. 2017a; Caballero-Serrano et al. 2019). These interlinked processes have important, but largely overlooked, implications for decision-making and policies related to biodiversity conservation and sustainable development, as discussed in other parts of this report.

For this chapter, we have adapted the definition of "Indigenous peoples and local communities" (IPLCs) as proposed by the United Nations to reflect the diversity of Amazonian peoples including those who self-identify as Indigenous, belonging to specific nations or ethnic groups, as well as Afro-descendant communities, *caboclo* or *mestizo* riverine

dwellers, and forest extractivist communities such as rubber tappers, açaí collectors, palm nut gatherers, and others. Some of these peoples and communities have, through years of struggle, seen their cultural and territorial rights partially recognized by the encompassing nation states, while others have not. Therefore, in addition to the tremendous diversity of social-ecological contexts and livelihood strategies in the Amazon, there are also widely variable political and legal particulars that impinge on different peoples' sociocultural sovereignty, access to resources, and territorial rights (IWGIA 2020). This chapter focuses on the worldviews, knowledge systems, livelihood strategies, and governance regimes of Amazonian peoples as documented in ethnographic, ethnobiological, and human ecology studies beginning in the mid-to-late twentieth century. In this regard, the chapter follows up on the historical context presented in Chapters 8 and 9, while setting the stage for discussions about the contemporary Amazon in the following chapters.

The Amazon is home to approximately 47 million people living in the eight Amazonian nations of Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Suriname, and Venezuela, plus the territory of French Guiana. Of this total, approximately 2.2 million are Indigenous people (4.6%), consisting of at least 410 distinctive ethnic groups or nations, including some 80 of whom remain in voluntary isolation (IWGIA 2020; RAISG 2020). Over 3,000 Indigenous lands and territories have been recognized across the Amazon under diverse tenure systems, which, when added to formally recognized protected areas, represent nearly 45% of the region, protecting almost half of the remaining forests (RAISG 2020; FAO 2021). More than 80% of the area occupied by Indigenous peoples in the Amazon is forested, and 35% of all Latin America's remaining intact forests are occupied by Indigenous peoples. These statistics are a clear indication of the inextricable link between cultural and biological diversity in the Amazon and highlight IPLCs as crucial partners for ongoing biodiversity conservation, as well as forest management and ecological restoration (IPBES 2019).

10.2. Colonization and territorial delimitation of the Amazon

To contextualize biocultural relationships within the complexity of post-colonial Amazonian social formations, we briefly describe the historical processes of colonization, resistance, and partial recognition of Indigenous peoples and local communities' sociocultural and territorial rights that took place during the twentieth century across Amazonian countries. A historical timeline summarizing the main moments and events that led to the current assertion of rights and territorial configurations across Amazonian countries is presented in Figure 10.1.

The very earliest European explorers of the Amazon described large villages that numbered in the thousands (Denevan 1976; Hemming 2008), and recent archaeological work has confirmed the existence of large, pre-colonial polities in some parts of the Amazon that built extensive earthworks and developed rich artistic and religious traditions (Erickson 2006; Heckenberger et al. 2008; Rostain 2008; Fausto 2020; see Chapter 8). Some Amazonian peoples engaged in long-distance trade with Andean and coastal peoples (Camino 1977; Santos-Granero 2002). European colonization resulted in enslavement, displacement, decimation from diseases, violence, and the cultural extinction of many Indigenous peoples since the sixteenth century (see Chapter 9). Complex pre-colonial political formations and artistic traditions found in the archaeological record were all but exterminated in the first hundred years of European colonization (Walker et al. 2015). Therefore, the observations made by missionaries, explorers, and researchers among Indigenous peoples do not reflect the primordial, "pre-contact" status of Amazonian political and social life (Shepard et al. 2020). Instead, the social formations and ecological adaptations of historical and contemporary Indigenous peoples of the Amazon must be understood through the lens of post-conquest genocide (Beckerman 1979).

Ensuing cycles of migration and resource exploitation in the Amazon (see Chapter 11) resulted in the

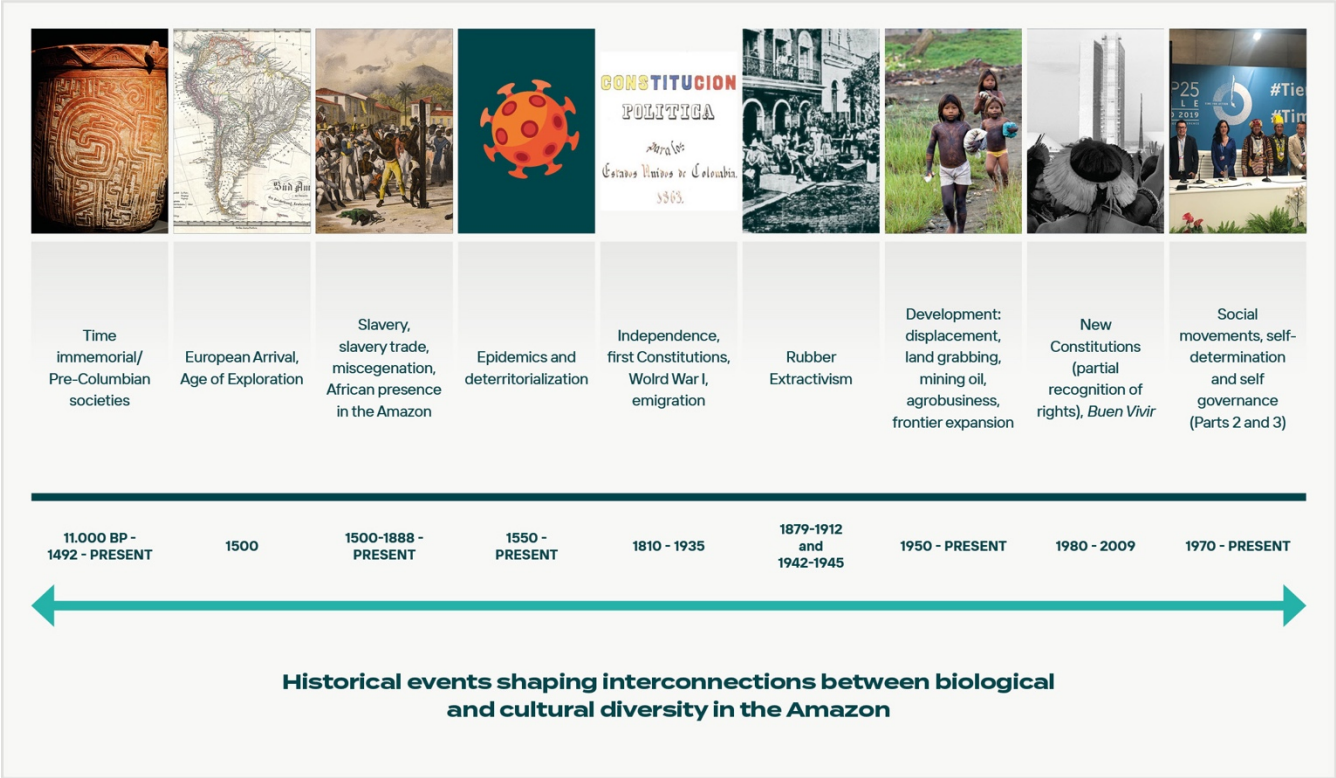

Figure 10.1 Timeline summarizing historical events affecting the sociocultural and territorial rights of IPLCs across Amazonian countries. Dates and events are approximations and do not necessarily apply to all countries or peoples, while some events and their effects are ongoing. (New Constitutions photo by Beto Ricardo/ISA; other figures under Creative Commons usage rights).

formation of diverse Amazonian identities and sociocultural groups, including peasants, riverine communities, forest-based communities, and Afro-descendant groups such as the Maroons in Suriname and French Guiana, and the *Quilombolas* in Brazil (Kambel 2006; Superti and Silva 2015; Chambouleyron and Ibáñez-Bonillo 2019). In particular, the rubber boom of the late nineteenth century resulted in a massive migration of impoverished peasants to the Amazon's interior, resulting in the enslavement, displacement, or extermination of thousands of Indigenous communities (Schmink and Wood 1992; Hecht 2010).

Throughout these historical processes, surviving Indigenous peoples, Afro-descendant communities, and/or peasants or *caboclos* constituted local communities throughout the Amazon interior and were engaged in various extractive and economic activities such as rubber tapping, hunting, fishing, mining, and plantation agriculture (Chapter 11). Extractive economies were built on a system of debt peonage that, in addition to providing cheap labor and raw materials to colonists, religious missionaries, and emerging nation states, also sought to assimilate, repress, and exterminate Indigenous cultural, linguistic, and religious diversity in the name of "civilization" and progress (Ribeiro 1962). In this sense, extractive industries and economic cycles were closely tied to the birth of nation states in Latin America and the consolidation of colonial understandings of racial and cultural superiority over Indigenous as well as enslaved African populations (Chapter 13).

Indigenous peoples and Afro-descendant populations in the Amazon have been historically judged according to racist, colonial stereotypes that viewed them as backward, inferior, primitive, and an obstacle to cultural and economic development

(Castro-Gómez 2009, 2010). Such ideologies permeated early constitutions and other laws impacting these populations in different Amazonian countries. For example, the Colombian Constitution of 1886 aimed to build a modern country "without inferior races", referring to what they called the "savages" inhabiting Amazonian forests (Castro-Gómez 2009; Marquardt 2011). Such ideologies led to the promulgation of laws promoting European immigration to several Latin American countries after World War I, in an effort to "whiten" their populations (Castro-Gómez 2009; Kabalin Campos 2018; Silva and Saldivar 2018).

The ongoing existence of isolated or "uncontacted" Indigenous peoples and historical processes of "first contact" with them have generated misconceptions in the popular imagination, reviving colonial stereotypes of people who have lived untouched in "Stone Age" conditions since time immemorial (Milanez and Shepard 2016). However, in most cases, isolated peoples belonged to larger polities who maintained networks of trade and social relations with their neighbors until recent times. Often, it was the experience of enslavement and violence during the so-called "rubber boom" at the turn of the twentieth century that forced some Indigenous peoples to choose radical social isolation from all outsiders as a survival strategy (Shepard 2016). Several Amazonian countries have developed specific policies and agencies to protect these vulnerable populations and their territories (Opas et al. 2018).

Beginning in the 1950s, and continuing through to the present, most Amazonian countries embarked on a "developmentalist" project, promoting internal colonization to hinterland areas considered demographically "empty," but in fact populated by remnant IPLCs. These policies led to the creation of internal frontiers, where land grabbing, deforestation, and resource extraction contributed to social conflicts and ideological struggles over the use and function of land (Schmink and Wood 1984). In this period, lasting until the 1980s, most Amazonian countries still viewed Indigenous peoples with a paternalistic attitude as inferior human beings who should be assimilated into the national labor force, as exemplified in the Brazilian "Indian Statute" of 1973 (Ramos 1998).

In response to oppressive labor conditions, violence, and territorial displacement produced by these processes, diverse Indigenous, Afro-descendant, and other Amazonian peoples began to mobilize, beginning around the 1970s, claiming collective rights to land, livelihood, cultural autonomy, and democratic participation (Silva and Postero 2020), while gaining attention and support from national and international social and environmental movements (Ramos 1998). The Coordination of Indigenous Organizations of the Amazon Basin (COICA) was founded in Peru in 1984, and includes member organizations in all Amazonian countries, as well as French Guiana. Amazonian IPLCs have contributed to and benefited from international initiatives such as the International Labor Organization Convention 169 of 1989, which was ratified by Bolivia, Brazil, Colombia, Ecuador, Peru, and Venezuela. The right to self-determination has also been recognized in other international instruments, such as the 2007 UN Declaration on the Rights of Indigenous Peoples (UNDRIP). As a result of such national and international movements, many Amazonian countries implemented constitutional or legal reforms guaranteeing different territorial, cultural, social, and political rights to IPLCs (Figure 10.2 and Box 10.1; Cottrol and Hernandez 2001; Seider 2002; Postero 2007; Almeida 2008).

In the 1990s, the Buen Vivir (or "Living Well") philosophy emerged in Latin America as an alternative to the dominant model of capitalist development that had brought widespread poverty, inequality, and environmental destruction to the region (Gudynas and Acosta 2011; Vanhulst and Beling 2015). This philosophy is rooted in Indigenous Andean worldviews and languages (*Sumak Kawsay* in Kichwa, and *Suma Qamaña* in Aymara), focusing on the idea of collective well-being among humans, and between humans and nature. Buen Vivir principles were incorporated into the constitutions of Ecuador (2008) and Bolivia (2009).

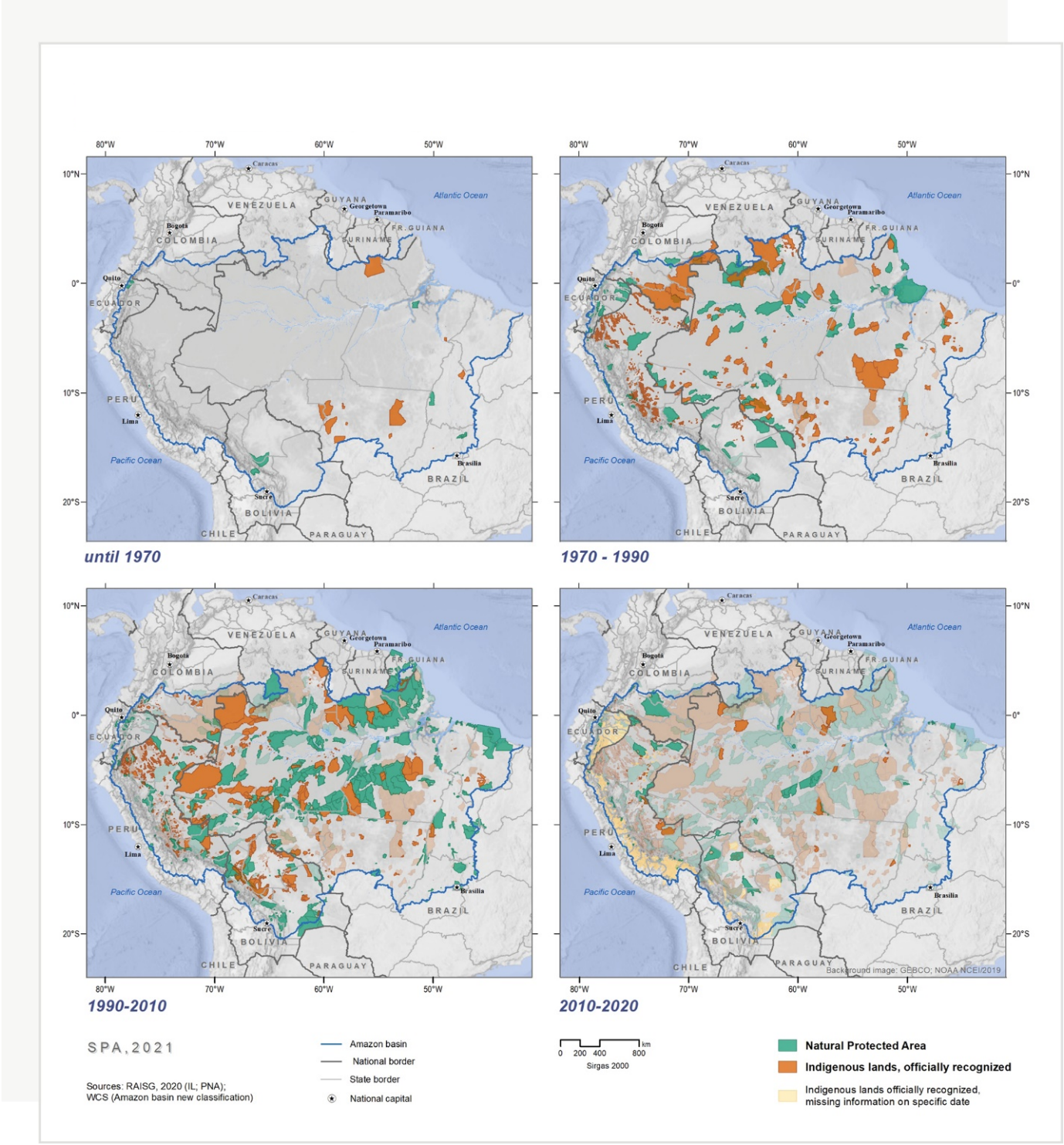

Figure 10.1 Maps showing the evolution of recognition of Indigenous territories (ITs) and protected areas (PAs) in the Amazon in different time periods. The map is limited to the Amazon drainage basin and does not include surrounding or adjacent lowlands like the Orinoco basin. Some specific country information may be missing.

Box 10.1 Paiterey Karah: The fight for the demarcation of the Sete de Setembro Indigenous Land - Cacoal - Rondônia - Brazil. By Gasodá Surui[1]

The Indigenous People Paiter, whose name means “True People'' or “Ourselves”, also known as the Rondônia Suruí, live at the Paiterey Karah, which in the Tupi Mondé language means “the land of the Paiterey.” This territory is known as Sete de Setembro Indigenous Land, a name given by the National Indian Foundation (FUNAI) as a reference to the first contact of the group with non-Indigenous peoples, which happened on September 7, 1969.

The Paiter speak a language of the Mondé family in the Tupi stock and are formed by four clan groups that make up our sociocultural life: *Gãmeb* (black wasp), *Gapgir* (yellow wasp), *Kaban* (*mirindiba* fruit), and *Makor* (*taboca* bamboo). The population in 2001 was approximately 1,500 people distributed in 28 villages established across the territory, with the objective of caring for and protecting the land against possible attacks and invasions by illegal loggers, miners, hunters, and fishers.

According to the Paiterey, the original territory, before the contact with the non-Indigenous society, extended to Cuiabá, and the current borders were nonexistent. After the arrival of non-Indigenous people, Paiter lands were invaded and the forests were destroyed. Then, the government arrived, opening the BR364 road, which resembled an enormous snake that opened up the forest, swallowing our people, diminishing our land, expelling the Paiterey, and leaving everything to the invaders.

Through intergenerational communication, the Paiter still remember the time when they ran away from their original territory in the nineteenth century, fleeing from the persecution of whites. During the escape, conflicts occurred with other Indigenous and non-Indigenous groups. From the end of the nineteenth century to the 1920s, with the exploitation of rubber, the construction of the Madeira–Mamoré railway, and the installation of telegraph lines by Rondon, the migratory flow to Rondônia increased, and its effects were felt on the Indigenous populations in the region, causing many struggles and deaths.

The physical demarcation of the Surui land happened in 1976 after significant pressure on the Brazilian government from Paiter leaders and FUNAI, involving several trips to Brasilia to discuss the matter. The homologation happened via decree 88.867 of October 17, 1983. Currently, the Sete de Setembro Indigenous Land occupies an area of 248,147 ha, located in the States of Rondônia and Mato Grosso. This is a space where the Paiter preserve their values, beliefs, and customs, and where historical processes and social relations develop. The reduction to the territory excluded important sites for Indigenous rituals, such as the Pimenta Bueno region, near the limit of Cacoal, where a *tucumanzal* (*Astrocaryum* palm stand) was located, a fundamental material for handicrafts used as body adornments during the gift exchange of the *Iway* and *Metare*, at the celebration of *Mapimaih*.

[1] Indigenous leader of the Paiter people, also known as Rondônia Surui. Graduated in Tourism from the Centro Universitário São Lucas in Porto Velho, Rondônia. Master in Geography and Ph.D. student in Geography at the Federal University of Rondônia. Creator and founder of the Paiter *Wagôh Pakob* Indigenous Cultural Center, "Force of Nature", a Paiter Indigenous initiative created in November 2016 to defend and guarantee the territory, as well as the culture and traditional knowledge of the Paiter Surui people of Aldeia Paiter. Researcher in the Geographic, Nature and Human Territoriality Research Group at the Federal University of Rondônia.

Despite these political advances and their potential contribution to the conservation of biocultural diversity, many challenges remain to the operationalization of IPLCs concepts and rights in the Amazon (Vanhulst and Beling 2015). In Venezuela and Bolivia, for example, legal land rights are granted to only a small proportion of territorial claims. In Brazil, even though approximately 21% of the Amazon region has been demarcated as Indigenous lands, agribusiness, logging, and mining interests have lobbied to undermine these established protections, leading to a new wave of conflict, rights violations, invasions, illegal deforestation, and violence against Indigenous peoples, Afro-descendant populations, and other local communities (RAISG 2020; see following Chapters). In response, Indigenous, Afro-descendant, and other Amazonian communities have recently joined together to fight for their common cause, with a striking emergence of women-led coalitions and collectives (Giacomini 2017; Mello and Schmink 2017).

10.3. Cosmologies, worldviews, and knowledge systems: Implications for natural resource management

Among Amazonian Indigenous peoples and local communities, sociocultural, political, and economic organization is mediated by specific ways through which people view and interact with the world and, more broadly, with the cosmos. These cosmologies and worldviews are differentiated within and across cultural groups and have a strong influence on people's perceptions and interactions with ecosystems and biodiversity (Hill 1988; Reichel 1999; Seeger 2004).

In contrast to European colonial societies, Amazonian Indigenous peoples do not view the forests that surround them as separate, "natural" realms full of objectified resources to be dominated and exploited by humans. Instead, they look at the diverse animals, plants, and other entities as sentient beings with their own social lives and subjective points of view (Costa and Fausto 2010; Rival 2012). In this sense, Amazonian shamans are more than healers; they are responsible for communicating and negotiating with the multitude of other beings that populate the cosmos to protect human societies (Descola 1994; Carneiro da Cunha 1998; Viveiros de Castro 1998; Shepard 2004; Athayde et al. 2016). In his autobiography, The Falling Sky, Yanomami shaman Davi Kopenawa (Kopenawa and Albert 2014: 116-118) enumerates predatory illnesses and shamanic helper spirits, the xapiri, as an encyclopedic list of biological species:

> "When they encounter us in the forest, the *në wäri* evil beings consider us game. They see us as spider monkeys and our children as parrots. It is true! This is the name they give us! We could never survive without the protection of the *xapiri*. … Many *xapiri* are good at following evil beings' trails, including the hunting dogs and the peccary spirits, who sniff their tracks. …
>
> The wasp spirits arrow them, the spirits of the *witiwitima namo kite* lacerate them with their sharp blades, and the coati spirits knock them out with their clubs. … Those of the *wari mahi* tree thrash them. With their skulls split open and their bodies covered in wounds, the stunned evil beings eventually stumble. Then the *xapiri* can force them to let go of their prey and give up the fight."

Amazonian peoples view the cosmos as a kind of ecosystem (Reichel-Dolmatoff 1976; Århem 1996), and predation is a fundamental metaphor that structures the multi-faceted relationships between humans, animals, and the spirit world (Fausto 2007). Just as humans hunt and kill animals for food, certain dangerous animals, demons, and other predatory spirits look upon humans as prey. This relational understanding of Indigenous Amazonian cosmology has been referred to as "animism" (Descola 1994) or "perspectivism" (Viveiros de Castro 1996; Lima 1999), rife with transformations and exchanges that cross-cut species boundaries and defy Western dichotomies such as nature/culture, body/mind, and matter/spirit (Daly and Shepard 2019). An important aspect of Indigenous and local knowledge (ILK) is that perceptions

and relationships differ between age groups, gender, and roles played in the community (Reichel 1999; Howard 2003; Athayde et al. 2017a; Athayde and Silva-Lugo 2018).

Just as Indigenous peoples' concepts about human–animal relationships challenge Western concepts about taxonomy and ontology, they also defy capitalistic notions about resource extraction and management. For example, in opposition to Adam Smith's notion of market forces governing Western economic affairs, Kopenawa (Kopenawa and Albert 2014: 149) describes the concept *në rope*, which is translated as "value of growth," a kind of "invisible hand" regulating Yanomami economy, ecology, and spirituality:

> "The value of growth remains abundant in the forest and if our gardens take the value of hunger, our shamans drink the *yãkoana* [psychoactive snuff] to bring it back home. … When the forest's richness runs away, the game becomes skinny and scarce, for this richness is what makes the game prosper. …This is why the shamans also bring down the image of the game's fat with that of the forest's fertility."

Amazonian farming and forest management systems are characterized by an extraordinary diversity of domesticated, semi-domesticated, and wild plants, with cyclic alternation between phases of cultivation, abandonment, and recovery (Rival 2012; Carneiro da Cunha 2017). For many Indigenous peoples, these cyclic movements are tied to special rituals and ceremonies (including songs and special body preparations) that ensure the maintenance of customary laws that regulate interactions between the physical and the spiritual worlds (Seeger, 2004). Diversity is a fundamental theme in all aspects of Amazonian livelihoods, including farming, hunting, gathering, fishing, and weaving, as well as myth, ritual, and shamanism (Shepard 1999; Emperaire and Eloy 2008; Heckler and Zent 2008; Athayde et al. 2017a,b).

Complex webs of human–nature relationships manifested in the daily lives of Amazonian IPLCs are connected to specific ILK domains, including artistic expressions such as music, weaving, body painting, pottery, and material culture in general. Among the Kawaiwete (also known as Kaiabi) of the Brazilian Amazon, highly-valued baskets woven by men are considered living entities and carry a symbolic language that connects them to ancestors and collective memory. A basket can be, at the same time, a living being, a ritualistic object, and a recipient used by women to spin cotton (Athayde et al. 2017b; Figure 10.3).

The traditional pharmacopeia of Amazonian peoples includes plant remedies for common conditions such as diarrhea, intestinal worms, leishmaniasis, and snake bites, as well as medicines to improve a man's aim when hunting, a woman's dexterity at creating delicate handicrafts, the productivity of a garden, or a person's singing abilities (Shepard 2004; Kujawska et al. 2020). In this sense, the connections between health, society, and the environment are manifold and multi-faceted, embracing physical and spiritual well-being as well as productive social, ecological, and agricultural interactions.

Indigenous peoples' worldviews and values contrast sharply with the norms, scientific practices, and governance institutions of settler-colonist nation states. For instance, Indigenous notions of "ownership" and "mastery" highlight the subjectivity, agency, and reciprocity in relations with diverse non-human beings, in sharp contrast to objectifying Western notions about property and resource use (Fausto 2008). Among local riverine communities, connections with the Amazonian pink dolphin (*Inia geoffrensis*) can take many forms. These dolphins appear in the local imagination as enchanted beings that can appear as humans and have sexual relations with women. In other circumstances, connections with this species can include partnerships or mutual hostility, invoking a reciprocal affective tie that transcends the human-animal divide (Arregui 2019).

In a recent review, Fernández-Llamazares and Virtanen (2020) examine the widespread notion of

"game animal masters" among diverse Amazonian Indigenous peoples. They discuss the overlooked potential of this Indigenous notion to contribute to biodiversity conservation. In Peru, for example, the Matsigenka people say that invisible guardian spirits of the forest, the Saangariite ('invisible ones'), who raise game animals as their pets, may punish careless or excessive hunters by hiding their animals from them (Shepard 2002). The notion of panema among non-Indigenous hunters of the Brazilian Amazon also involves reciprocity with forest spirits and punishment for excessive or "perverse" hunting (Vieira et al. 2017).

The arrival of global capital markets to the Amazonian hinterlands throughout the twentieth century and the introduction of Western technologies such as shotguns, haul nets, metal tools, chainsaws, and gasoline engines, has transformed Indigenous peoples' impacts on Amazonian forests (Alvard 1995; Souza-Mazurek et al. 2000; Shepard et al. 2012). Indigenous and other forest peoples participated in market activities that reduced animal populations to the point of local extinction in some regions in the mid-twentieth century (Antunes et al. 2016). Yet, while some populations have recovered from commercial hunting, Indigenous understandings of this process may rely on cosmological and shamanic, as much as material, perceptions about the restoration of human–animal relationships (Pimenta et al. 2018).

10.4. Languages and biocultural conservation

In the Amazon, Indigenous peoples' worldviews, understanding, and interconnections with nature and biodiversity are encoded and expressed in approximately 300 to 350 Amazonian languages

Figure 10.2 Biocultural interactions expressed through basketry and textile production among men and women from the Kawaiwete (also known as Kaiabi) Indigenous people of the Brazilian Amazon. Graphic designs carry special meanings tied to Kawaiwete cosmology and spirituality (Athayde et al. 2017b). A. Wisio Kaiabi spinning cotton. B. More Kaiabi weaving a sling used for carrying babies; C. Men weaving a basket made of *tucumã* palm (*Astrocaryum aculeatum*). D. Kawintai'i Kaiabi (*in memoriam*) painting a designed basket. E. Designed basket showing the *Kururu'i* (small frog) graphic design. Photos by Simone Athayde, Xingu Indigenous Territory, Brazilian Amazon.

(Aikhenvald 2012). This is all that remain of a much bigger number of languages, after five centuries of European colonization (Voort 2019). Approximately 75% of Amazonian language diversity has been lost forever, without substantial documentation (Palosaari and Campbell 2011). The consequences of language loss are severe for the social and cultural fabric of Indigenous communities, for academic research, and for humanity as a whole. Each language represents an irreplaceable cultural heritage of specialized knowledge, art, and ways to conceptualize and understand the world, that are preserved in — and transmitted by — its linguistic categories and structures (Dorian 1989; Krauss 1992; Wurm 2001; Harrison, 2007; Moseley 2007, 2010; Evans 2010; Austin and Sallabank 2011).

As observed in Chapter 12, the Amazon region harbors exceptional Indigenous language diversity. Its languages are classified into approximately 25 different families (Crevels 2012). Furthermore, it has a world record of approximately 20 linguistic isolates that are not genealogically related to any other known languages (Crevels 2012; Seifart and Hammarström 2018). As Adelaar (1991:45) observes, this represents "unsurpassed genetic variety".

Most Amazonian languages are seriously threatened by extinction. Although population numbers are rising, speaker numbers are dwindling due to a tendency to shift to national languages, abandoning Indigenous languages (Crevels 2002; Grinevald 1998). Language shift is usually motivated by migration or perceived economic advantages in a dominant monolingual society (Harbert 2011; Thomason 2015). So far, only a few inventories reliably map the actual socio-linguistic situation of Amazonian languages (Sichra 2009; Galucio et al. 2018). Unfortunately, just like biological species, languages are becoming extinct before we even know what is lost.

Local languages may convey ILK and linguistic structures intricately linked to biodiversity. Ethnoecological studies among several Amazonian peoples have revealed a detailed vocabulary for classifying forest habitat types according to geomorphology, hydrology, soil types, and salient indicator species (Parker et al. 1983; Fleck and Harder 2000; Abraão et al. 2010). In some cases, Indigenous habitat classification is comparable to, or even more sophisticated than, contemporary scientific classification systems and can be applied to "ground truth" satellite imagery or streamline biodiversity inventories (Shepard et al. 2004; Abraão et al. 2008). Shepard (1997) and Zent (2009) have documented bioculturally relevant systems of noun classification in the languages of the Matsigenka people of Peru and the Uwojtüja (Piaroa) of Venezuela, respectively. Numeral classifiers in Matsigenka refer in their most basic sense to plants or plant parts, but can be applied in derived forms to create culturally relevant analogies between plants, animals, and material culture (Shepard 1997). Likewise, among the Piaroa, of more than 100 commonly used noun classifiers, at least 75 are used to categorize and distinguish between different botanical life forms, plant parts, growth habits, and ecological associations. This linguistically encoded system is comparable to the scientific botanist's taxonomic key, as it facilitates their ability to recognize and classify several hundred plant taxa. These and other examples provide specific instances of how the maintenance of folk botanical knowledge is directly dependent upon language preservation (Zent 2009).

Language loss is likewise connected with environmental destruction and the extinction of biological species, especially in the Amazon. In the past decades, the interdependence of linguistic and biological diversity has become increasingly obvious (Maffi 2001; Loh and Harmon 2005; Gorenflo et al. 2012). Those regions of the world with the highest species diversity also contain the highest linguistic diversity. The similarity between evolutionary biological speciation and language genesis was noted by Charles Darwin (1871).

In the 1988 Declaration of Belém, conservation biologists, ethnobiologists, and anthropologists acknowledged the existence of an 'inextricable link' between biological and cultural diversity. Seminal

articles (Harmon 1996; Golan *et al.* 2019) helped identify biolinguistic diversity hotspots in the Amazon Basin, Central Africa, and Indo–Malaysia/Melanesia (Maffi 2001; Loh and Harmon 2005, 2014). Approximately 70% of the world's languages are spoken on approximately 24% of the earth's terrestrial surface, comprising regions of high biodiversity (Gorenflo et al. 2012). Furthermore, as Harmon and Loh (2018) indicate, "analysis of the conservation status of languages indicates that they are more threatened overall than mammals, birds, or reptiles, and as severe a state as amphibians."

Language extinction due to shifts triggered globally by urbanization, migration, and other factors is relatable to environmental destruction and habitat loss in the Amazon. As recent satellite images

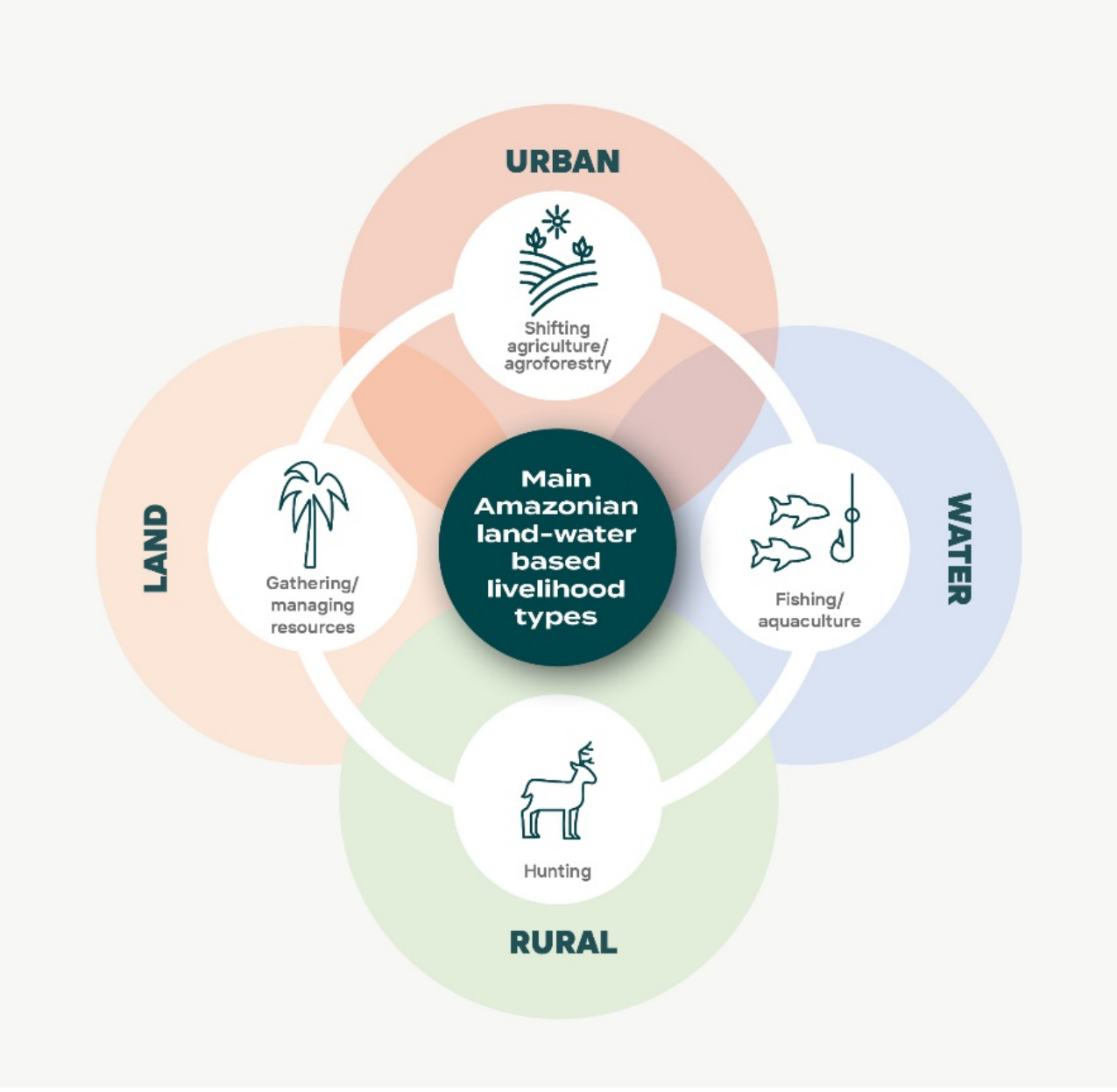

Figure 10.3 Multi-sited rural–urban livelihood strategies of Indigenous peoples and local communities in the Amazon.

show, those parts of the Amazon where Indigenous peoples live and whose languages survive also tend to be those parts that are still green. Frainer et al. (2020) highlight the fact that national and international policies have approached cultural, linguistic, and biological diversity separately, whereas these "diversities" have co-evolved and shaped the world as we know it. Therefore, the integration of ILK and languages in biodiversity assessments, management, and policies is crucial.

10.5. Biocultural diversity, lands, and livelihoods

As seen in previous sections, scientific studies of ILK systems and their corresponding imprint on the landscape have revealed different entanglements of cultural and natural diversity that were first described by historical ecologists (Posey 1985; Balée 1989, 2003, 2013). With the recognition and delimitation of Indigenous lands that took place beginning in the 1970s through the 1990s in many Amazonian countries, and the more recent (partial) recognition of collective land rights for Afro-descendant populations in some countries (*Quilombolas*, Maroons), the livelihoods of IPLCs have been increasingly shaped by national and international policies; by governmental, non-governmental, and scientific institutions; and by market forces and rural-urban networks (Piñedo-Vasquez et al. 2008; Figure 10.4; Chapter 14).

The concept of biocultural landscape and heritage recognizes the reciprocal relationships between IPLCs and forests, rivers, and other Amazonian ecosystems since time immemorial to the present (Cross-Chapter 31.A). For example, the Jodï people of Venezuela do not inhabit the forest in a passive way, but are active agents in constantly recreating a living forest through several management practices encoded in specific linguistic concepts and spiritual connections (Box 10.2, Figure 10.5).

Like Indigenous peoples, Afro-descendant and other Amazonian communities engage in multi-sited rural-urban livelihoods that are finely tuned to diverse ecosystems as well as seasonal fluctuation in river levels, especially in the flooded *varzea* forests along the main channel of the Amazon and its larger tributaries (Adams et al. 2009, see Chapter 14). Referred to variably as *caboclos, mestizos*, peasants, or "riverine" dwellers (*ribeirinhos*), these populations have intensively participated in regional, national, and global markets through extraction, processing, and commercialization of forest resources (Fraser et al. 2018). Since the colonization of the Amazon associated with different economic cycles in the nineteenth and twentieth centuries, IPLCs' livelihoods have been connected to global consumption and technological developments, as well as to national and regional fluctuations in demand for wage labor (Fraser et al. 2018; Chapters 11 and 14). Geographer Bertha Becker (in memoriam) refers to the Amazon as an "urbanized forest," describing urbanization processes that began in the 1980s triggered by the construction of railroads, highways, ports, and the vehiculation of urban society (Becker 2005). This understanding has direct relevance to the design of integrated policies that consider the interconnected nature of cultural and biological diversity in the Amazon.

10.5.1. Amazonian agriculture and agroforestry

Traditional agricultural systems of the Amazon include a multiplicity of cultivated and managed plants and involve complex strategies of landscape management and integration with other livelihood activities such as hunting, fishing, and extractivism, as well as with urban markets (Denevan et al 1988; Emperaire and Eloy 2008; Porro et al. 2012; Clement 2019). The Amazon is a center of genetic diversity for diverse crops such as cassava, peanuts, maize, sweet potato, yam, chili peppers, and cacao (Figure 10.6; Clement et al. 2015; Zent and Zent 2012). Women often play an important role in food security and sovereignty through their cultivation, exchange, management, and conservation of crops (Silva 2004; Emperaire and Eloy 2014).

Cassava or manioc (*Manihot esculenta*) is the primary staple crop for many contemporary Indigenous peoples and peasants and other local communities of the Amazon (Boster 1984; Salick *et al.* 1997;

Figure 10.4 Juae and a younger kinsman (*jluwëna*) playing a flute known as *jɑ̰ni jtawibo* on the banks of the Kayamá river during a hunting expedition. Credits: Yheicar Bernal, Stanford Zent, and Eglée Zent, photo taken in 2005 in the Kayamá river, Estado Bolívar, República Bolivariana de Venezuela.

Clement et al. 2010; Table 1). Indigenous peoples cultivate hundreds of land races and varieties of manioc (Frechione 1982; Heckler and Zent 2008; Emperaire and Eloy 2008), most of which are divided among two major types, "bitter" manioc, containing toxic levels of cyanide and requiring detoxification before consumption, and "sweet" manioc, edible after simple boiling. These two principal types correspond to two main culture areas in the historical and contemporary Amazon, with bitter manioc cultivation found principally along the courses of the major Amazonian rivers in the central and eastern Amazon and coastal areas, and sweet manioc cultivation predominant along tributary and headwater rivers, especially in the western Amazon (McKey and Beckerman 1993; Clement et al. 2010).

Bitter manioc cultivation in the northwestern Amazon is associated with tremendous agrobiodiversity of manioc cultivars (Emperaire and Eloy 2008), as well as cultural innovations in the processing and removal of lethally toxic cyanogenic glucosides, notably the woven tipiti manioc press and a wide range of specialized basketry (Figure 10.7; Ribeiro 1980; Dufour 2007). Processes associated with bitter manioc cultivation are deeply integrated into social, symbolic, and cosmological systems (Hugh-Jones 1980; Chernela 1993).

Like other documented cases of agricultural systems of Indigenous peoples in the western Amazon (Boster 1984; Johnson 2003), the polycultural swidden agricultural systems of the Kichwa Indigenous people in Ecuador contain a great diversity of cultivated and managed food, medicinal, and ritual species (Coq-Huelva et al. 2017). Known locally as chakras, these systems reflect Kichwa worldviews and values as expressed in the philosophy of *Sumak Kawsay* or "Living Well," which reinforces collective management and reciprocal relationships between humans and non-human beings (Acosta 2016

Box 10.2 The Jodï people: Livelihood strategies, biocultural diversity, and spirituality in Venezuela

The Jodï Indigenous people possess a rich knowledge of primary forest species and their uses, including more than 220 edible species, 180 medicinal plants, 190 species with other technological uses, and 550 species known to be eaten by wildlife (upon which people depend for food) (Zent 1999).

A close examination of Jodï subsistence practices reveals that they do not merely exploit the forests they inhabit but also create them to some extent. Specific manipulative techniques related to their foraging and trekking habits were shown to have a considerable effect on forest composition and the distribution of species. The harvest of wild fruits, for example, often involves the felling of older trees and cutting of branches, thus opening up light gaps. At the same time, people eat fruits and deposit seeds on the spot. Another practice is the small-scale application of fire to grassy spots and fallen tree crowns. It is common to find stands of fire-resistant, economically-important palms and heliconias colonizing these areas. Seje (*Oenocarpus bacaba*) and maripa (*Attalea maripa*) palms are often felled for fruit and to create a suitable growing environment for palm larvae, a favorite food.

Besides creating light gaps, the Jodï also make use of natural tree fall clearings by transplanting useful species in them. Such managed spaces are often found close to trails at great distances from main settlements and provide future resource caches during trekking expeditions. Taken together, these environment-modifying activities make for a very patchy, diversified landscape. This case study corroborates not only the anthropogenic nature of Amazonian forests, but also shows that native foragers continue to make substantial contributions to this process (Zent and Zent 2004).

The most impressive and prolific linkage between the Jodï and biodiversity lies in their worldviews, ritual practices, and the notion of personhood. The notion of what constitutes the soul or spiritual being(s) of a person (their *jnamodï*) is literally wrapped up in the diversity of living organisms around them and with whom they have contact throughout their lives. When a baby is born, the father must go out into the forest and collect an organic bundle consisting of the tiny pieces or remains of many different species of trees, vines, herbs, mushrooms, insects, mammals, birds, dirt, and other natural substances. In some reported cases, the bundle contains more than 100 different species. He then comes back and bathes the infant with the macerated bundle to form its spiritual self, called *jnamodï*. The *jnamodï* of a person acts as their intangible intermediary in their dealings with the forest and its various living entities. The fact that one shares a spiritual kinship with those entities facilitates prosperous and sustainable interactions, such as hunting success, bountiful harvests, and immunity from pathogenic contagion (Figure 10.5). Therefore, according to Jodï cosmology, every person spiritually consists of a diversity of different species. People are not only dependent on the biodiverse forest, they are part of it (Zent et al. 2019).

Chapter 14). Chakras are especially associated with women's activities such as planting and tending cassava, potatoes, and other root crops, as well as preparing fermented manioc beer (Whitten 1978). The Kichwa chakra system has provided strategic and diverse food resources to confront the rapidly changing contemporary context (Coq-Huelva et al. 2017).

Amazonian Afro-descendant groups and peasants

or *caboclos* have also developed sophisticated agricultural and agroforestry systems, contributing to the rich agrobiodiversity represented in the region. A study of the Aluku Maroons (Afro-descendant group) of French Guiana documented 38 cultivated crops, with 156 varieties (Fleury 2016). Further research for the documentation and "in-situ" conservation of these varieties should be a priority, respecting IPLCs intellectual property rights over these important genetic resources (Santilli 2012).

Agroforestry systems are an integral part of swidden cultivation or slash-and-burn agriculture as practiced by contemporary Amazonian peoples (Hauser and Norgrove 2013). Hundreds of species and varieties are cultivated in swidden-fallow agroforestry systems, with staple cultigens such as manioc and maize (*Zea mays*) raised alongside, or in succession, with managed agroforestry species such as peach palm (*Bactris gasipaes*), cacao (*Theobroma cacao*), açai palm (*Euterpe oleracea*), babaçu palm (*Attalea speciosa*), and Brazil nut (*Bertholletia excelsa*), among many others (Pinton and Emperaire 1992; Porro et al. 2012; Chapter 11). Owing to long fallow periods, Indigenous agroforestry systems imitate the forest in terms of their structure and diversity (Posey, 1985; Denevan et al. 1988), and swidden fallows enriched with dozens of protected, managed, or semi-domesticated plant species can be understood as intermediates between agricultural zones and forest ecosystems (Alcorn, 1989; Cardoso 2010; Cardoso et al. 2010).

Rooted in the agricultural practices of Indigenous peoples, the field of agroecology emerged in the 1970s-1980s as a response to the socio-environmental damage inflicted by the Green Revolution (Altieri 1996; Holt-Giménez and Altieri 2013).

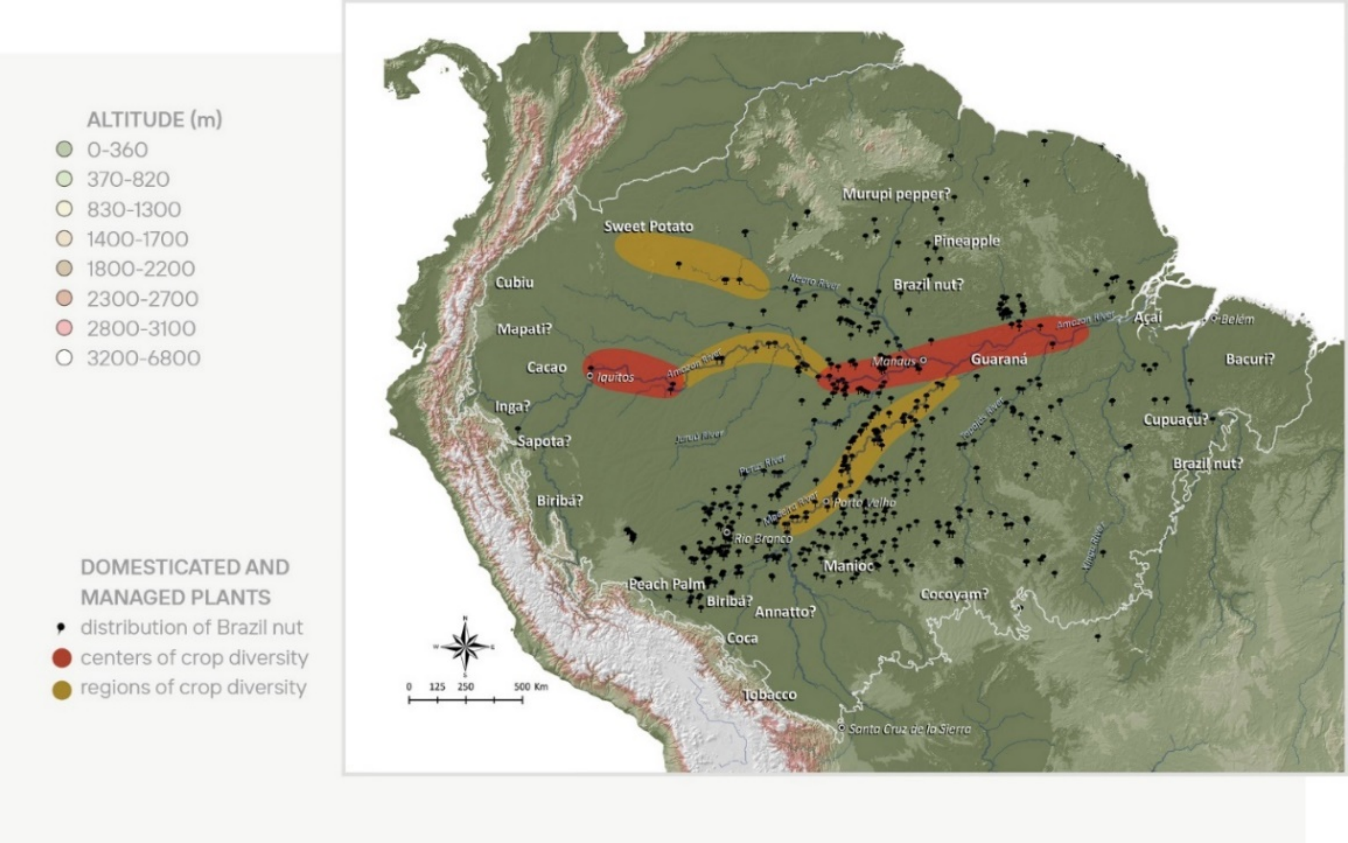

Figure 10.5 Plant and crop management and domestication in the Amazon. The names of species identify the known or potential origins of domestication of 20 native Amazonian crop species. The centers and regions of crop genetic diversity include significant or moderate concentrations of crop genetic resources. Source: Clement et al. (2015).

Table 10.1 Varietal diversity of Manioc (*Manihot esculenta*) in the Amazon. Source: Cunha and Lima (2016). Details about the sources for the information provided can be found in the original article.

Indigenous peoples traditional local communities	*Area*	*Sweet*	*Bitter*	*Sweet + Bitter*	*Source*
Amuesha (Aruak)	*Peru*			*204*	*Salick et al. 1997*
Wanana, Tukano, Arapaso	*Middle Uaupés, AM, Brasil*			*137*	*Chernela 1986*
Pluri-ethnic communities: Barcelos	*Middle Rio Negro*			*120*	*Corbellini 2004*
Piaroa (Piaroa-Saliban)	*Cuao and Manapiare (Orinoco basin), Venezuela*			*113*	*Heckler and Zent 2008*
Pluri-ethnic communities: Santa Isabel	*Upper-Middle Rio Negro, AM, Brazil*			*106*	*Emperaire, Eloy 2014.*
Tukano (Uaupes)	*Uaupés, AM, Brazil*			*100*	*Emperaire 2002*
Aguaruna (Jivaro)	*North Central Peru*			*100*	*Boster 1984*
Huambisa (Jivaro)	*Peru*			*100*	*Boster 1983*
Tatuyo (Tukano)	*Uaupés, AM, Brazil*			*100*	*Dufour 1993*
Wajãpi (Tupi-Guarani)	*Amapá, Brazil*	*94*	*3*	*97*	*Oliveira 2006*
Aluku (quilombola)	*French Guiana*			*90*	*Fleury 2016*
Makushi (Karib) e Wapishana (Aruak)	*Roraima, Brazil Guyana, Venezuela*			*76,77*	*Elias et al. 2000 Daly 2016*
Cubeo, Piratapuia e Tukano (Tukano), Tikuna (Tikuna) e Sateré-Mawé (Mawé)	*Cuieiras river, Lower Rio Negro, AM, Brazil*	*65*	*5*	*70*	*Cardoso 2008*
Wayana (Karib)	*French Guiana*			*65*	*Fleury 2016*
Pluri-ethnic communities	*Middle Rio Negro, AM, Brazil*			*64*	*Emperaire et al. 1998*
Bare (Aruak)	*Upper Rio Negro, AM, Brazil*			*60*	*Emperaire 2002*
Local communities Mamirauá and Amanã	*Middle Solimões, AM, Brazil*			*54*	*Lima et al. 2012*
Kayapo-Mebêngôkre (Gê)	*Pará, Brazil*			*46*	*Robert et al. 2012*
Kuikuro (Karib)	*Upper Xingu, Mato Grosso, Brazil*			*36-46*	*Carneiro 1983; Heckenberger 1998; Smith and Fausto 2016*
Pataxó (Macro-Gê)	*Bahia, Brazik*			*34*	*Arruda Campos 2016*
Paumari (Arawa)	*Purus, AM, Brazil*			*14-30*	*Prance et al. 1977; FUNAI/PPTAL/GTZ 2008*
Krahô (Timbira-Gê)	*Tocantins, Brazil*	*9*	*12*	*21*	*Dias et al. 2007–2014; Morim de Lima 2016*
Canela-Ramkokamekra (Timbira-Gê)	*Maranhão, Brazil*	*7*	*9*	*16*	*Miller 2015*
Kaiabi (Tupi-Guarani)	*Mato Grosso, Brazil*	*9*	*6*	*15*	*Silva 2009*
Enawenê-Nawê (Aruak)	*Mato Grosso, Brazil*	*14*	*1*	*15*	*Santos 2001*

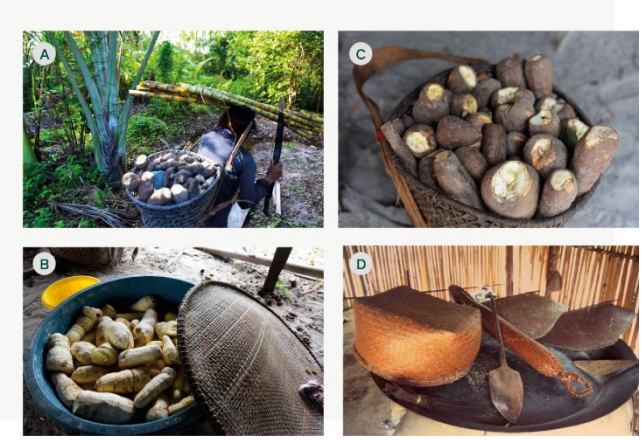

Figure 10.6 Bitter manioc processing among the Baniwa Indigenous people in the Upper Rio Negro, Brazil. Bitter manioc is harvested from a swidden garden on the upper Rio Negro (A) and brought back to the household for processing (B). Cyanide-containing bitter manioc is peeled (C), grated, pressed and sieved to remove water-soluble toxins using an extensive technology of baskets (D) made of *Ischnosiphon* spp (Marantaceae) and other plant fibers. Photos by Glenn Shepard, 2018.

Agroecology combines the principles of ecology with the traditional knowledge of Indigenous groups, local communities, and small farmers into a sustainable production system that protects agrobiodiversity and ecosystem services and values food security and sovereignty (Holt-Giménez and Altieri 2013). Agroforestry systems are considered a critical and viable economic option for conserving and restoring forest ecosystems worldwide (IPBES 2018). Given the tremendous erosion of global crop genetic diversity, attributed in part to the green revolution and agribusiness, the Amazon region is critically important for in-situ agrobiodiversity conservation (Steward 2013; Cunha and Lima 2016).

10.5.2. Fisheries and aquatic management

Freshwater fisheries play a critical role in sustaining Amazonian economies, cultures, and livelihoods. The Amazon Basin accounts for approximately 20% of the world's freshwater biodiversity (Lévêque et al. 2008), which is now critically threatened by commercial fisheries, land-use and livelihood changes, climate change, exotic species, hydroelectric dams and other large infrastructure projects, and mining operations (Doria et al. 2017; Goulding et al. 2019, see Part 2). With vanishing fish diversity and increasing river impoundment and degradation, associated ILK and specific fishing techniques are also being lost at a fast pace (Doria et al. 2017).

Traditional fishing strategies in the Amazon vary according to river type (white-water, black-water, clear-water), seasonal flooding regimes, and other livelihoods, including agriculture, hunting, animal husbandry, and extractivism (McGrath et al. 1993). The Amazon's floodplain ecosystems supported large pre-colonial Indigenous populations and remain important to regional economies owing to their fertile soils and abundance of aquatic resources (Roosevelt et al. 1996; McGrath et al. 1993; Goulding et al. 2019).

Fish species move beyond geopolitical frontiers, making it a difficult resource to manage. Seasonal fish migrations cross over numerous administrative and national boundaries, and between protected and non-protected areas, requiring social-ecological approaches and integrated coordination among Amazonian countries, which is seriously lacking (Doria et al. 2017; Goulding et al. 2019). Available research suggests IPLCs can plan an important role in understanding the diversity, ecology, and management of fish and other aquatic resources (Chernela 1994; Begossi et al. 1999; Ortega et al. 2001; Doria et al. 2017).

10.5.3. Hunting

Hunting is an important livelihood strategy among Amazonian IPLCs, but since productivity is generally lower for tropical forests than open habitats, overhunting has been considered a major threat to biodiversity in the Amazon (Bennett and Robinson 2000). Excessive hunting can have significant, wide-reaching impacts on the ecosystem by disrupting seed dispersion, predation, and herbivory (Wright 2003; Peres et al. 2016). Moreover, deforestation, habitat fragmentation, and agricultural expansion exacerbate impacts, for example when forest fragments are "emptied" of key species

(Redford and Feinsinger 2003; Francesconi et al. 2018; Ponta et al. 2019).

Some IPLCs' hunting practices and cosmologies emphasize checks, balances, and reciprocal exchanges between humans and prey species that would appear to restrain excessive hunting (Reichel-Dolmatoff 1976; Ross 1978; Shepard 2014; Vieira et al. 2017). However, the introduction of firearms to all but the most isolated Indigenous peoples and the commercial hunting of some species (Antunes et al. 2016) has drastically increased the impact of subsistence hunting, contributing to growing defaunation around established settlements (Jerozolimski and Peres 2003; Shepard et al. 2012; Boubli et al. 2020).

Yet, several Amazonian Indigenous groups maintain cosmologies, restrictions, food taboos, and other biocultural practices that may prevent overhunting. For instance, the Eñepa (Panare) of Venezuela avoid hunting near certain mountains considered to be the abodes of spirits who protect game animals (Zent and Zent 2018). The Ye'kuana rotate hunting zones and "rest" certain zones to allow game animals to recuperate (Hames 1980). Indigenous peoples of the upper Xingu observe some of the most extensive game animal taboos in the Amazon, contributing to the local abundance of large primates, tapir, and other harvest-sensitive mammals (Carneiro 1978; Shepard et al. 2012).

10.5.4. Brazil nut extractivism

The Brazil nut (*Bertholletia excelsa*) is the most important non-timber forest product of the Amazon (Duchelle et al. 2011), providing seasonal economic inputs to local, national, and international markets for tens of thousands of smallholders (Bojanic 2001; Peres et al. 2003; Kainer et al. 2007; Quaedvlieg et al. 2014). Brazil has historically been the main producer, but in 2018 Bolivia was the top exporter of Brazil nuts ($228M), followed by Peru ($65M), and Brazil ($60M) (OEC 2021). Brazil nut groves are especially abundant and intensely managed in the tri-national border area between Madre de Dios in Peru, the Brazilian state of Acre, and the department of Pando in Bolivia (Bakx 1988; Stoian 2000; Mittermeier et al. 2003). Brazil nut grove management has played an important role in resolving land conflicts, limiting deforestation, and providing sustainable economic activities in this region (Allegretti 2008; Cronkleton and Pacheco 2010). On the other hand, the current land use is a consequence of historical land use (for rubber) which promoted permanent occupation of *terra firme* forests, the ideal habitat for both Brazil nut and rubber (Chapter 11). Collaborative access arrangements, growing international demand, and organic certification have made Brazil nut a cornerstone of the region's economy and conservation efforts.

Archaeological data documents the consumption of Brazil nuts as early as 11,000 years ago (Roosevelt et al. 1996), and a preponderance of genetic, ecological, and ethnobotanical evidence suggests that the current basin-wide range of the Brazil nut has been significantly affected by human management practices (Shepard and Ramirez 2011; Scoles and Gribel 2011). Comparison of Indigenous language terms for Brazil nut throughout the Amazon has contributed to the reconstruction of possible routes of human-induced dispersal, providing another example of the links between language, culture, and biodiversity (Figure 10.8; Shepard and Ramirez 2011).

10.6. Governance and policymaking

The livelihood strategies and relationships of Amazonian IPLCs with biodiversity and the landscape involve a multiplicity of forms of governance. Here, we define governance as the set of rules, norms, and customary laws (or institutions) used by Indigenous peoples and local communities to a) access, use, manage, circulate, and market biodiversity; b) occupy the territory; c) make decisions about land and the territory; d) relate to nation states and other actors; and e) achieve self-determination (Sefa Dei and Restoule 2018). This multiplicity is based on a diversity of socio-cosmological systems

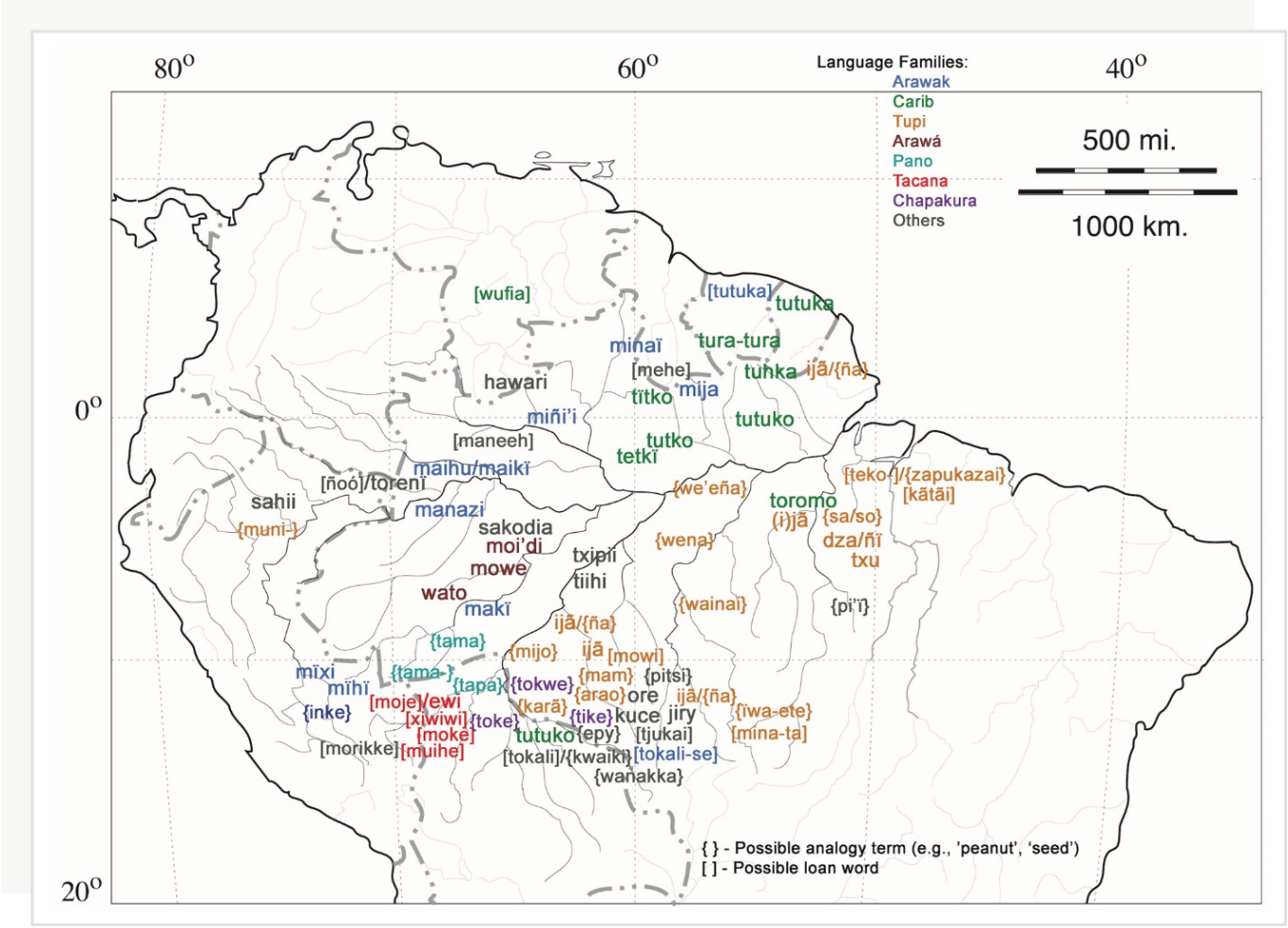

Figure 10.7 Indigenous terms for Brazil nut (*Bertholetia excelsa*) across several Indigenous peoples across the Amazon. Source: Shepard and Ramirez (2011).

and livelihood regimes, and it is expressed through various arrangements of communal institutions and collaborative relations, articulated or not with modes of state and private governance.

In fact, the main common feature of Amazonian IPLCs' socio-environmental governance systems is that they are organized in different regimes of communal governance of biodiversity, historically established in the different forms of territorial use, and are based on socio-political arrangements and diverse ecological knowledge regimes in their relations with animals, plants, fungi, minerals, and spirits (Diegues 1998; Lu, 2006; Futemma and Brondizio 2003; Stronza 2009; Almeida 2012; Castro 2020; Capelari et al. 2020). At the same time, such forms of governance are articulated with IPLCs' worldviews and cosmologies that, as we saw in previous sections, define living beings by their vital principles and the inseparability between nature and culture (Kohn 2013).

These Indigenous and local governance systems are often at odds with the laws and regulations of nation states, requiring new forms of socio-political organization (Erazo 2013; Athayde and Schmink 2014). Erazo (2013) noted the challenges faced by the Kichwa people from Ecuador to conform to the Ecuadorian Agrarian Reform and Colonization law, which created tensions between

people's existing obligations to their kin group and their obligations toward a larger group of organizational members and leaders, a situation which continues to the present day.

Analysis of communal forms of governance emerged after the ecological debate on biodiversity conservation with the publication of the article The Tragedy of Commons (Hardin 1968). Harding stated that in communal governance arrangements, understood by the author as open access, individuals led inexorably to the depletion of natural resources. However, since the early 1980s, an increasing number of scholars have documented examples of biodiversity and spaces shared in common. These studies have shown that various IPLCs' communal strategies are based on a set of norms, values, institutional arrangements, and world-views that often have the potential to generate sustainable community management of biodiversity over the long term (Feeny et al. 1990; McKean and Ostrom 1995; Agrawal 2014; Ostrom 2015). The most significant contribution of "commons" studies has been to show that a multiplicity of regimes of communal governance can be defined as dynamic collective institutional arrangements that regulate the access, use, management, circulation, and control of biodiversity for food, wood, medicines, rituals, fertilizers, and fuel, as well as access to resources for spiritual and religious practices (Ostrom et al. 1994; Diegues and Moreira 2001; McKean and Ostrom 2001).

There are many examples of commons governance by IPLCs in the Amazon, linked mainly to forest agroextractivism, hunting practices, and fishing along lakes and rivers, but these governance systems are sparsely documented (Futemma and Brondizio 2003; Lu 2006). In the landscape of Amazonian "commons", biodiversity is appropriated by a well-defined community of users that have the power to define resource use rights mechanisms in communal regimes, establishing rules, incentives, and penalties, as well as including or excluding other users through local regulations.

In the pluri-ethnic riverine communities of the Puranga-Conquista (RDS) Sustainable Development Reserve in Rio Negro, Brazil, the household is the basic socio-political unit of the community. Heads of households are responsible for managing and negotiating access and control of spaces and natural resources that they are using directly. In general, each family has a set of cultivated spaces and forests that are for their use and possession. Fishing, hunting, and forest areas are managed at the community level. In this case, the community created governance mechanisms that allow access to the territory by all members of the community and exclude access to others. At the broadest level, with the creation of the RDS, a new governance model was instituted, with co-participation between the community and the State. In this case, governance was carried out through collegial and legal instruments of co-management, such as councils and management plans (Cardoso et al. 2008). Such a trans-scalar model that articulates household management with a network of relatives and allies reaching to the community level can be seen in several modes of (re)territorialization by Amazonian IPLCs (MacDonald 1995; Little 2003; Lu 2006).

Artisanal fishing communities of the Middle Amazon River provide a "laboratory" in which it is possible to explore examples of communal regimes. According to Pereira (2000), in this region some communities have autonomous local governance to regulate their fishing practices whereas others do not. Of those that do, some control only access to fishing grounds, while others control both access and the level of individual resource appropriation. In some communities, there is widespread adherence to management schemes, and in others, opposition threatens to destroy management institutions and deplete local fish stocks. In the case of a community floodplain fishery in the Peruvian Amazon, the resource institution was active at creating rules and means to keep outsiders out of the fishery. During an initial period of external threat, when fishing activity was high, governance was employed to create rules on allowed fishing techniques and seasons (Pinedo et al. 2000). However, for Lu (2016), interest and participation in the institution waned with the dissipation of the external

threat and because of internal conflict. Such common arrangements in fishery activities are based on local configurations of kinship, local notions of territoriality, ecological knowledge, the formation of alliances, and mutual respect among actors. Such arrangements have been threatened since the 1970s, mainly in Brazil and Peru (McGrath et al. 1993; Pinedo et al. 2000; Pereira 2000), when the "war of the lakes'' began. This was a result of the modernization of the fishing fleet and State-granted permission to access IPLCs' territories, generating conflicts, modes of resistance, and requiring the subsequent creation of instruments of co-governance between communities and the State to mitigate conflicts.

Fishing agreements (*acordos de pesca*) and community governance (Isaac and Barthem 1995; Pinedo et al. 2000; Castro and MacGraph 2001; MacGraph et al 2008) systems to regulate *Arapaima gigas* by Indigenous peoples in the Juruá river (Figure 10.9) and riverine communities in the Mamirauá Reserve can be considered success stories of collective management (Castello et al 2008; Campos-Silva and Peres 2016; Campos-Silva et al 2017). These cases illustrate the problems and potential solutions of co-management schemes in artisanal fisheries as a means of amplifying stock abundance and lake productivity, by limiting exploitation by larger, often external commercial boats, while improving the quality of life for artisanal fishers and their communities.

Local communal arrangements can also be seen among IPLCs that practice forest and agroforestry. For Lu (2001, 2016), who studied the commons in Ecuador, the consistency of responses within communities suggests the existence of institutional arrangements that influence the way that agriculture is practiced. In communities that practice individual property arrangements, large tracts of land ranging from 20 to 200 hectares have been divided among households and the rights to the remaining land area are maintained by the household. In contrast, in communities with communal property arrangements, households only gain withdrawal rights to the lands they have cleared and cultivated, which are significantly smaller than those of individual property arrangement households.

These Amazonian systems of biodiversity governance have been under tremendous pressure, as 'commoners' are losing access to the territory and biodiversity, often through violent expropriation (MacDonald 1995; Lu 2016; Begotti and Peres 2020), shaping what many authors call the "tragedy of commoners" or "tragedy of enclosures" (Ortega Santos 2002; Molina and Martínez-Alier 2001). Such pressures are owing to the advance on the forest, with processes of land privatization, infrastructure construction, and agropastoral and mineral exploitation of Amazonian resources, with consequent impact on IPLCs' communal modes of governance. But, because of these pressures, in some cases, political mobilization and the institution of social movements by IPLCs has led to social resistance and reaffirmation of traditional communal appropriation regimes in Amazonian countries (MacDonald 1995; Allegretti and Schmink 2009; Silva and Postero 2020).

Some of these communal territorial governance regimes have been recognized and incorporated into the national constitutions of Amazonian countries in the form of territorial and cultural rights, or as models of *buen vivir*, *bem viver*, or living well, as in the case of Indigenous peoples in Ecuador and Bolivia (Acosta 2016; Gudynas and Acosta 2011) and Brazil (Schlemer at al 2017; Baniwa 2019). These rights have generally taken the form of three main tenure types: a) Indigenous reserves under which a group is given legal communal land title to large areas containing multiple communities; b) community tenure in which communities are given legal title through customary land tenure laws established for colonists; and c) protected areas, under which the state maintains public ownership of land in protected areas but grants legal use rights to Indigenous or community residents (Richards 1997).

The complexity and scale of environmental problems promote various types of collective and collaborative governance strategies between actors, given the impossibility of addressing them on their

Figure 10.8 Co-management of *Arapaima gigas* (*Pirarucu*) by the Paumari Indigenous people in the State of Amazonas, Brazil. A. Meeting to coordinate lake and fishing management activities. B. Traditional fishing techniques used by Paumari Indigenous fishers. C. Abimael Chagas Cassiano Paumari showing a large *Pirarucu* captured in the Tapauá River. Photos by Adriano Gambarini, archive Operação Amazônia Nativa – OPAN.

own. Therefore, effective collaboration is an important item on the research and policymaking agenda, which can contribute to the design of more equitable and sustainable long-term collaborative initiatives between government, civil society, and IPLCs for achieving common goals, as well as implementing forest-based economies and nature-based solutions for the region.

10.7. Conclusions

Recognizing the multiple interconnections between socio-cultural and biological diversity in the Amazon is essential to sustainability and environmental justice for the Basin as a whole. Biocultural diversity in the region is manifested in IPLCs languages, worldviews, livelihoods, and deep historical entanglements with Amazonian plants, animals, and ecosystems. The valorization and maintenance of these lifeways in Indigenous territories, local communities, and urban centers is of critical importance for the conservation of Amazonian sociobiodiversity and the future of life on Earth for at least three main reasons. Firstly, the empirical and philosophical underpinnings of Indigenous and local knowledge systems provide key concepts and practices for developing a deeper, more historically and socially situated understanding of the Amazon in its interconnected biological, ecological, and cultural dimensions. This includes first-hand knowledge and information about plant and animal species, sustainable management practices, and climate resilience (Heckenberger et al. 2008; Schwartzman et al. 2013). Secondly, Amazonian peoples maintain sophisticated knowledge about sustainably managing diverse agricultural, aqua-tic, and agroforestry systems, which in turn have dynamically shaped the region's ecosystems. Certain elements of Amazonian landscapes and biodiversity that were once considered "natural," such as Brazil nut groves, açai palm stands, and other economically-important "hyperdominant" plants bear the imprint of long-term manipulation, domestication, and management by Indigenous peoples (Heckenberger et al. 2008; Clement et al. 2010; Shepard and Ramirez 2011; Balée 2013; Clement 2019, Cross-Chapter 31.A). ILK systems have been, and should remain, instrumental in identifying and managing useful plant and animal species, contributing to global agricultural diversity, sustainably managing forests for subsistence and market-based economies, as well as innovative approaches to social-ecological restoration, climate change mitigation, and bioeconomy initiatives (Parts 2 and 3). Thirdly, IPLCs across the Amazon are holders of diverse world-views, values,

institutions, and governance systems, all of which must contribute to shaping culturally plural, inclusive, and democratic societies. According to the UN Declaration on the Rights of Indigenous Peoples (UNDRIP 2007, supported by all Amazonian countries), IPLCs have the right to self-determination; they should be free to determine their political status and pursue their economic, social, and cultural development. IPLCs' languages, customary laws, institutions, and decision-making structures have resulted in the successful governance of their lands and territories for decades, if not centuries, and should continue to contribute to the implementation of Sustainable Development Goals (SDGs), the Convention of Biological Diversity's Post-2020 Global Biodiversity Framework, and other international policies of biodiversity conservation, environmental justice, and sustainable development.

Diversity, in all its forms, must be understood as a value to be cherished, nourished, promoted, and protected. Biocultural diversity in the Amazon and elsewhere provides the entire globe with knowledge, resources, alternatives, and innovations for addressing uncertainty as we navigate turbulent times and the social-ecological tipping points of the Earth's resilience. The Amazon is a living biocultural system that cannot survive without the valorization, empowerment, and participation of the diverse societies that have flourished among its rivers, forests, savannas, and estuaries.

10.8. Recommendations

- Support the recognition of land, territorial, and socio-cultural rights of Indigenous peoples, Afro-descendant communities, and other local communities, in connection to policies that value and support forest and water-based livelihoods, including economic incentives and credit for non-timber forest products.
- Support the documentation and preservation of Amazonian Indigenous languages and associated knowledge systems as living manifestations of endangered biocultural diversity.
- Develop policies for raising public awareness about Amazonian languages, including concrete actions for linguistic revitalization and conservation integrated with biodiversity conservation policies.
- Promote applied research on agrobiodiversity connected to food security and sovereignty among Amazonian IPLCs, respecting associated biocultural relationships and intellectual property rights.
- Recognize and support women's leadership and role in agrobiodiversity conservation and resource management in the Amazon.
- Support forest-based and ecosystem-based livelihoods in the Amazon through economic incentives, policies, and regulations.
- Support the protection of the territories of Indigenous peoples in voluntary isolation.

10.9. References

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