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The plant universe in the culture of Brazilian Indigenous peoples

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ABSTRACT

The forest is the main provider for the lives of Indigenous peoples, with their imagination intrinsically linked to the animals, trees, and entities that inhabit it. The purpose of this article is to present some of the coexistence relationships between Indigenous peoples and the forest where they live, the meaning of territoriality, respect for the forest, its manifestations, and the entities that dwell in and pass through it. It also explores the representation of the plant universe for traditional populations that preserve the environment and are constantly threatened by external forces. The study was conducted with Indigenous peoples from different ethnic groups living in the following Brazilian biomes: Amazon, Cerrado, and Caatinga. Open and semi-structured interviews were used as methods for data collection. This approach is based on a socio-affective construction of knowledge, aligning with the Indigenous worldview. It respects and upholds their relational significance and transcribes lived and shared cultural experiences. These experiences are expressed through the rich use of metaphors, stories, and symbols, incorporating soundscapes, visual elements, and landscapes as part of their lived space. The study delves into the environmental, mythical, and spiritual dimensions of Indigenous peoples.

Keywords: Indigenous, plant, forest, supernatural beings, Amazon rainforest, ethnoconservation

1. INTRODUCTION

Observing the environment involves the use of mental categories through which we classify and organize the phenomena around us, making them understandable. Once these categories are learned, it becomes difficult to perceive the world in any other way, as the dominant classification system shapes our perception and behavior, ultimately influencing how we see and interact with the world [1].

Alexander von Humboldt (1769–1859) understood nature as a unique living entity, where organic forces are in constant action, producing phenomena that can only be explained through their relationships with the whole [2]. From this idea emerged the concept of a global nature, characterized by extreme diversity and interconnected by an infinite web of relationships [3].

Understanding nature is highly complex and varies for each individual. It is important to explore why and how people incorporate the infinite beings we call natural into their worlds, and why, for some, it seems necessary to exclude these entities from their lives [4]. Our uniqueness in relation to the rest of existence is relative, just as humanity's awareness of this complexity is also relative [2].

The analysis of interactions among the inhabitants of the Western world can no longer be confined solely to the institutions that govern human society—producing rules, social norms, belief systems, values, laws, principles, orders, precepts, prescriptions, determinations, dispositions, guidelines, specifications, and commandments—where non-humans and so-called 'primitive peoples' are merely treated as accessories in the decoration of this social representation, dominated by the holders of power and manipulators of information who monopolize the stage. These societies, often labeled as 'primitive,' invite us to explore the natural and harmonious coexistence of their social and cultural lives with thousands of species of plants, animals, and mythological entities [2].

When people engage in experiences that are highly relevant to their lives, they begin to reflect on the meaning of what is happening. In trying to understand these experiences, they attribute meanings to them, often accompanied by feelings of pleasure or displeasure [5]. Therefore, what is experienced must possess a significant intensity, the impact of which imparts a sense of importance capable of completely transforming the broader context of existence [6].

The process of understanding another's reality is engaging, but we must bear in mind that not all beliefs and natural phenomena observed in a given culture align with those of Western culture [7]. Regardless of how illogical or absurd certain information may seem to some, all data must be documented, as some concepts can inspire new hypotheses to be tested. We have faithfully adhered to this philosophy in the studies of the Indigenous communities presented, as we believe in it and, above all, respect the culture of these traditional peoples.

2. MATERIALS AND METHODS

The studies were conducted with Indigenous peoples living in the Brazilian Amazon, including the Kayabi, Apiaká, Juruna (who identify as Yudjá), Arara, Tenharim (who identify as Kagwahiva), Mura, and Sateré Mawé ethnic groups; in the Savannah biome, including the Xavante, Bororo, Guarani Kaiowá, and Guarani Nandeva ethnic groups; and in the Caatinga biome, including the Pankararu and Pankaiwká ethnic groups.

The studies were carried out after receiving authorization from the Indigenous communities and the National Indigenous People Foundation (FUNAI, a Brazilian governmental agency that protects Indigenous interests and culture). Interviews with the Bororo were conducted in August 2010; with the Kayabi and Apiaká in June 2011; with the Pankararu and Pankaiwká in July and August 2012; with the Guarani Kaiowá and Guarani Nãndeva in 2014 and 2015; with the Kagwahiva in October and November 2014; with the Mura and Sateré Mawé in January and February 2016 and March 2018; with the Juruna and Arara in 2019; and with the Xavante in February 2023.

One of the study regions is known as the 'Volta Grande do Xingu' (Xingu River's Big Bend), located in the state of Pará, Brazil, between latitudes 03°23' S and 03°38' S and longitudes 51°33' W and 52°00' W. This 130-kilometer stretch of rapids and braided channels on the Xingu River is an important tributary of the Amazon River and home to Indigenous peoples of the Juruna and Arara ethnic groups.

The Indigenous people of the Kagwahiva ethnic group live in the Tenharim Marmelos Indigenous Land, located entirely in the state of Amazonas, within the municipalities of Humaitá and Manicoré, between the geographic coordinates 7°48' and 8°53' south latitude and 61°35' and 62°10' west longitude. In the past, before the construction of the Trans-Amazonian Highway, these Indigenous peoples lived together in a single village on the banks of the Marmelos River, in the area where the highway now crosses the river [8].

The Indigenous people of the Mura and Sateré Mawé ethnic groups live in the Rio Urubu Indigenous Territory, located in the municipality of Itacoatiara, state of Amazonas, on the left bank of the Amazon River. It is situated between latitudes 02°59' S and 03°12' S, and longitudes 58°04' W and 59°48' W [9].

The Indigenous Kayabi studied live in the Kayabi Indigenous Territory, located in the state of Pará. It lies between latitudes 7°54' S and 9°13' S, and longitudes 56°39' W and 57°54' W, on the right bank of the Teles Pires River [10]. The Indigenous Apiaká studied live in the Mayrowy village, located in the state of Mato Grosso. It lies between latitudes 7°39' S and 8°32' S, and longitudes 57°50' W and 58°21' W, on the left bank of the Teles Pires River [11].

The Indigenous Bororo studied live in the Meruri village, located in the state of Mato Grosso. It lies between latitudes 15°23' S and 15°44' S, and longitudes 52°51' W and 53°13' W [12, 13]. The Indigenous Xavante studied live in the Ubawawe Indigenous Territory, located in the state of Mato Grosso. It lies between latitudes 14°23' S and 14°42' S, and longitudes 53°20' W and 53°38' W.

The Indigenous Guarani Kaiowá and Guarani Nãndeva studied live in different villages, located in the state of Mato Grosso do Sul, near the BR-163 highway, between latitudes 21°45' S and 23°12' S, and longitudes 53°55' W and 54°58' W. The Pankararu and Pankaiwká Indigenous lands are located in the sertão (hinterland) of the state of Pernambuco, near the São Francisco River. The territories are situated between latitudes 9°02' S and 9°17' S, and longitudes 38°06' W and 38°16' W [14].

The method used for data collection was open and semi-structured interviews [15]. This type of interview allows for greater flexibility and fluidity in the interaction between the interviewee and the interviewer, fostering a more spontaneous dialogue and enabling the exploration of more personal and complex subjects.

Indigenous people of different genders and ages were interviewed. The interviewees were selected based on recommendations from the communities themselves, according to their

knowledge of the entities. This approach is grounded in a socio-affective construction of knowledge, as such knowledge is an integral part of the history and reality of the individuals.

The approach used in this study was qualitative, as the data were obtained through semi-structured interviews, which followed free dialogues to gather descriptive data from the reports of the target audience. The rationale for adopting a qualitative methodology in this work is based on a socio-affective construction of knowledge, as such knowledge is an integral part of the subjects' history and reality [16]. In this way, qualitative research aims to expand understanding of the phenomena in question through analysis derived from the participants' own reports [17].

3. RESULTS AND DISCUSSION

Territoriality and ethnoenvironments

The territoriality of indigenous peoples is closely linked to their mobility, an essential aspect to consider in territory management, as it reflects a form of land use that is not confined to the borders established by the State. The indigenous conception of territory is directly tied to its utility for accessing specific resources essential for the community's survival.

Indigenous peoples distinguish between various physical spaces within the landscape, each of which enables the application of different techniques for utilizing and managing natural resources. The primary unit, as it is the most representative of the landscape and the source of much of the resources, knowledge, and traditions of indigenous peoples, is the forest. The forest is the main provider for the lives of indigenous peoples, with their imagination intrinsically linked to the animals, trees, and entities that inhabit it.

In the Tupi-Kagwahiva language, the forest is known as *ka'gwyra*, and *ka'gwyrauhava* refers to the part of the forest where much time is spent [18]. *Ka'gwyrauhava* is crisscrossed by numerous paths and trails that lead to key points of interest for the Tenharim people, such as areas with fruit trees, mud pits, chestnut groves, old villages and gardens, cemeteries, and especially the Marmelos River. The river serves as a key reference point for constructing spatiality within the Tenharim Marmelos Indigenous Land.

In the Xavante people's perception of the Cerrado, there are also subdivisions, which can be classified as ethnoenvironments:

Amhu is the Xavante term for the Cerrado, particularly areas where the trees are low and dense. It is the habitat of many animal species, such as the tapir (*Tapirus terrestris*), red brocket (*Mazama americana*), peccary (*Tayassu pecari*), agouti (*Dasyprocta* spp.), armadillos, and rhea (*Rhea americana*). This environment also supports the growth of important fruits that serve as food for these animals, such as baru (*Dipteryx alata*) and mangaba (*Hancornia speciosa*).

Itehudu refers to areas where the trees are tallest, often featuring buriti palm paths, lakes, and flooded regions. These areas serve as habitats for animals such as the giant anteater (*Myrmecophaga tridactyla*), peccary, collared peccary (*Tayassu tajacu*), red brocket, paca (*Cuniculus paca*), and tapir.

Ape refers to the open field, resembling a pasture, where animals such as the pampas deer (*Ozotoceros bezoarticus*), tapir, rhea, and seriema (*Cariama cristata*) live.

Tsirãpré refers to a more closed Cerrado, but with shorter trees.

Marã, generically called the bush, can have different forest formations and serves as a breeding ground for various animal species, such as the tapir, collared peccary, giant anteater, red brocket, giant armadillo (*Priodontes maximus*), and several species of monkeys.

Tsõwahu is the place that red brockets and peccaries typically frequent because there is an abundance of food.

Buru'rã is an environment located within the open savannah field (*ape*), where animals such as the red brocket and tapir typically drink water.

The relevant culture is learned through the instruments that societies use and the landscapes they shape. For the geographer Vidal de La Blache (1845-1918), these elements only make sense when understood as components of life patterns [19]. The cultural significance of the landscape for the Xavante is approached as a functional response to the socioeconomic challenges historically faced by the community, shaped by both individual preferences and the collective values of the Xavante people. In this regard, according to the theory of geographer Carl Sauer (1889-1975), the cultural landscape of Xavante territoriality has been shaped from a natural landscape, with culture as the agent, territory as the environment, and the cultural landscape as the result [20]. The natural landscape provides the materials that constitute the cultural landscape, but the force that shapes and transforms the landscape resides in culture itself. This concept, therefore, incorporates strong subjective elements [21].

In relation to the cosmology of the Guarani Kaiowá, the forest, or *ka'aguy*, is understood as vegetation that has not been altered by human action and is the space where animals and spirits reside. Due to the history of land use, occupation, and the alteration of the original vegetation cover, these areas are now significantly transformed. The indigenous perception of the landscape is also reflected in these changes, with the term 'forest' being applied to more generic definitions, which have internal differentiations based on physiognomic characteristics, equivalent to the stages of secondary succession.

The remnants of native vegetation are referred to by the Guarani Kaiowá as *ka'ati* or "weaker forest," which includes areas in the pioneer and initial stages of regeneration; *ka'aguy* or "larger forest," representing areas in the medium and advanced stages of regeneration; and *yvynadi* or "open fields," referring to open areas that have been anthropogenically altered and are composed of herbaceous vegetation.

Cosmological aspects are present in these classifications. To enter the preserved forest (*ka'aguy*), one must take certain precautions; otherwise, "you follow the trail of Kurupira, an entity that protects wild animals, and you end up getting lost. This precaution is not necessary to enter the *ka'ati*" (J. Fernandes, 16 years old, ♂, Guarani Kaiowá ethnic group, Dourados Indigenous Reserve, July 17, 2014).

"You don't know what's waiting for you inside the forest, where there are sacred trees, medicines, and snakes. So, when you enter the forest, the first thing you do is ask Kurupira, the owner of the forest, not to release the animals. When you enter the forest, you announce your entry and exit from nature and the forest, as if asking permission: "I'm entering, I'm going to leave, I'm going to return, I'm going to need this, I'm going to need that." When the forest is cut down, the owner of the forest leaves" (ñandesy Floriza S., ♀, Guarani Kaiowá ethnic group, Dourados Indigenous Reserve, March 14, 2015).

It is evident that the process of transforming the vegetation cover severely impacts not only the indigenous way of life but also alters its most fundamental aspects, such as the cosmological ones:

“Ñanderu told us that the forest, that the trees are crying. So, I thought about it—when animals are missing from the forest, what does that say? But when they finish cutting down the forest, everything ends, and it doesn't speak anymore. When there is no forest, there is no jaguarê [jaguar], there is nothing left. In the past, there were beautiful trees, lots of trees, good forest, there was hunting of all kinds, a lot of movement, and today there is no more. You don't see birds here, other than a smooth-billed ani [*Crotophaga ani*, a very common and synanthropic bird], you don't see animals like that, they're all gone. That's why they talk—the forest talks too, the trees, that's what we feel. And there's no way we can go back to doing that. If we're going to go back, it's going to take a lot of manpower. We can go back, but we'll only go back a little, we can't go much further. We just can't let it end. We still have to have a little bit left. As long as we hold as we hold on to this, our culture is still here—our language, our way of life, how we can walk, how we can protect ourselves, everything. And perhaps there are many difficulties for us because I think that an indigenous person, especially, has to have their culture to live better. And we are fighting like this, hoping for something better for us” (G.J. Oliveira, ♂, Guaraní Kaiowá ethnic group, Dourados Indigenous Reserve, July 25, 2014).

Respect for the forest, its manifestations, and the entities that live in and pass through it

“My uncle had a vine that he never told us what it was, but he didn't cut it because the legend said that if he cut the vine, it would get lost in the forest. Therefore, there are vines that cannot be cut” (C.R.S. Santos, 46 years old, ♂, Paquiçamba village, Paquiçamba Indigenous Land, April 29, 2019).

During the studies conducted with indigenous populations, it was possible to observe the perfect harmony that most members of these traditional communities have with the environment in which they live, reinforced by the rich collection of cosmological concepts directly related to elements of nature, such as plants, animals, fungi, rock outcrops, fallen trunks at the foot of trees, dead leaves forming the forest floor, tracks left by wild animals on the ground, streams, the passage of the wind, and even the silence that occurs inside the forest. This silence was poetically described by one of the interviewees from the Arara ethnic group as 'the tone of the forest':

“The “tone of the forest” is truly special, especially around twelve o'clock – from half past eleven to noon. Imagine taking a half-day tour deep in a forest like this. You're surrounded by it, and you begin to observe so many wonderful things. Many good things happen to us in

these moments. It is during this time that you truly hear the silence of the forest. After the silence, you begin to hear the birds singing again, the wind rustling through the leaves, and all the unique sounds the forest holds for us. Then, after noon, the forest returns to its usual rhythm. At midday, the forest seems to pause; it becomes silent. The tone of the forest is found in its silence. It is within this silence that you sense its presence. Because it's only in its absence that you realize how much you miss it. And when the silence passes, you feel its essence – that it exists, and we long for it when it's not there. Then the birdsong, the sound of the wind, the “normal” return, and you sense even the wind stops a little, out of respect for the forest. The silence of the forest is good, it's very good because it serves as an experience for us and we pass it on to our children, so they can be more attentive, you know, aware of how to move around and respect the forest” (E.P. Arara, 50 years old, ♂, Arara ethnic group, Itkoum village, Arara's Big Bend of Xingu Indigenous Land, January 25, 2019).

“This land, taken by non-Indigenous people, was created by God for everyone to live in peace. But when the non-Indigenous arrived, they tried to eliminate the Xavante people, who only wanted to live in peace and hunt for food. One day, there will be no space left for the Xavante people. Traditional food is disappearing. Along the riverbanks, we find the medicines we use to treat illnesses, but the forests that protect the rivers and the Xavante people are also vanishing” (elder Cecilia “Perini”, ♀, Xavante ethnic group, Beira da Mata village, Ubawawe Indigenous Territory, February 20, 2023, translation of Xavante into Portuguese by Professor S. Amilton).

For Indigenous people, the notion of the environment is not merely a place to live but an ecological niche to respect and preserve in all its forms and aspects. This deep, affectionate relationship that Indigenous people have established with nature contrasts sharply with the approach of non-Indigenous people who settle near Indigenous territories, such as miners and farmers, whose relationship is often marked by domination and environmental degradation. It is from this duality that conflicts arise.

The respect that Indigenous peoples show for the environment in which they live is evident. Some believe in entities that protect animals, which cannot be seen. Respect for the forest is expressed in various ways and is connected to the individual beliefs of each Indigenous person, with common patterns of interpretation regarding the primary entities of the forest being observed. Belief, according to David Hume (1711–1776), is more properly a sensitive act than a cognitive aspect of our nature. It is something felt by the spirit, distinguishing ideas and judgments from the fictions of the imagination [22].

There are many narratives about fantastic entities that dwell in the forest, possessing both an ecological connotation and a mysterious nature, some of which are widely known. These entities are said to punish those who destroy the forest and harm its animals. In this way, the presence of these beings is associated with a “conservationist ethic,” as they promote ecologically responsible behavior among those who believe in their existence [23].

Some believe that these entities protect wild animals. They are beings that few people have managed to see, and evidence of their existence is conveyed through testimonies passed down across generations. The respect Indigenous peoples have for the forest is expressed in various ways and is connected to the individual beliefs of each person—whether hunter, gatherer, or craftsman. No common pattern of interpretation regarding these forest entities has been observed, but it is evident that, in general, the people of the forest have admiration, fear, and respect for what the forest and its members represent [24].

The presence of these fantastic entities confirms that the world is full of surprises. From this perspective, the philosopher Michel Foucault (1926–1984) argues that it is impossible to view the world through the lens of rectilinear motion: *'When it finally proved impossible to make the whole world conform to the laws of rectilinear motion, when the complexity of plants and animals resisted the simple forms of extended substance sufficiently, nature needed to manifest itself in its strange richness'* [25].

These beings are characterized by a strange natural richness that does not conform to a standard shape, as they are different or constantly changing, acquiring new forms. However, it is important to emphasize that these are not beings that undergo metamorphosis, but rather beings that, despite having a simple and defined body structure, inhabit the popular imagination in a heteroclitic and non-linear manner.

The role of these entities is often tied to the protection of specific elements, activities, or places, according to the cosmology of the indigenous community. These protective entities inhabit forests, lakes, rivers, streams, the wind, the subsoil, and other natural surroundings, occupying various levels within the cosmologies of these indigenous peoples. They are believed to safeguard plants of cultural or practical interest, animal species involved in hunting and fishing activities, and natural spaces that hold significance in the traditions of these communities [26]. These entities often assume a corporeal form to punish individuals who violate sacred places without seeking permission—typically requiring an offering or a formal request—or those who overexploit resources, such as hunting or fishing beyond what is necessary for sustenance. They may also act against those who invade and destroy forests, among other transgressions.

At the threshold between metaphor and metamorphosis, some beings take on physical form. However, these beings can only be perceived through the inherent invisibility of literary language. Even when illustrated, it is within the text that these entities achieve the full realization of their existence, in the realm of the unlikely. It is these metaphysical perplexities that give shape to such beings, including the 'metaphysical animals' themselves [24].

Mysticism plays a defining role in various human-animal interactions and is represented by many species. The mythogenic Amazonian ecological culture interprets elements of the natural environment based on their roles in myths and their place within the native cosmos. This ecological culture is a direct heir to indigenous traditions, sharing with them the oral transmission of cultural practices across generations [27].

There are no facts, only interpretations. For Nietzsche (1844-1900), the only real world is the one apprehended through the senses. He rejects utopias, ideals, and morals precisely because he does not believe in the objective existence of values. In his view, any moral or metaphysical 'fact' exists only in the mind that conceives it and serves to distort the real world, relying on judgments rooted in something unreal [28].

On this basis, Nietzsche criticizes the 'improvers of humanity'—people or ideas that claim to improve the world or bring happiness through metaphysical values and promises of existence

beyond the material and empirical world [28]. For him, attempting to modify or define the world we experience based on an immaterial, rational, or metaphysical world diminishes and distorts our understanding of reality.

The plant universe of indigenous peoples

To understand the relationship between indigenous peoples and nature, as well as their cosmological thinking, it is essential to examine their social manifestations. These are rooted in the construction of a distinct way of life, historically shaped by concrete singularities, where community relations are mediated by factors such as social organization, representations of religiosity, economy, and work. This way of life is based on diverse methods of utilizing available natural resources.

It is also important to recognize that both their way of life and culture are highly dynamic. Consequently, perceptions and the representative significance of socio-ecological, cosmological, archaeological, and socio-historical elements can be redefined and updated over time and across generations. These shifts often reflect changes in the environment where indigenous peoples live. The forest landscape and its structure are crucial for local ecological processes. According to historical ecology, the way indigenous peoples use the forest demonstrates that the outcomes achieved are the result of society's interaction with nature. This underscores the importance of these relationships for the biological conservation of the environment. Human life is viewed as a historical process that transforms the landscape it inhabits. While humans are the primary cause of disturbances in ecosystems, the negative impacts they cause range from less extensive to more degrading interventions.

The Arara people's interpretations of their surrounding environment are deeply influenced by the plant universe. The term used is 'indigenous experience,' an experience that is constantly nourished, whether by a small flowering plant or by the forest entity, which interacts with and provides for animals, spiritual beings, and the indigenous people themselves. The indigenous experience continues for those who persist in following and respecting the culture of these traditional peoples. Therefore, to access this rich knowledge, one must follow the traditions, which are nothing more than the 'indigenous experience' passed down by the elders. 'The indigenous experience is about how to use something and understand its purpose'.

"We can't just know stuff about white people; we've got to know our own culture, our indigenous culture. We need to know how to make medicine, how to enter the forest. I love following all the knowledge of the forest—being born in the forest, raised in the forest, knowing everything. We need to know how to find water, make a fire, gather wood to build a house, use tree bark for medicine, where to find plants—all of this is the indigenous experience. I don't want to lose my culture, my heritage. I teach everything I know, feeling the presence of wild pigs, jaguars, monkeys, tortoises. We need to know the smell of these animals" (M.P.S. Arara, 52 years old, ♀, Arara ethnic group, Itkoum village, Arara's Big Bend of Xingu Indigenous Land, July 12, 2019).

Our interviewee, an Arara woman, shared with us about the 'beautiful flowers that indigenous people collect in the forest and plant near their homes.' These flowers are *Heliconia*

psittacorum and *Nautilocalyx* sp., described as 'the charm of the people, the manifesto of the forest, the roses of the forest.' According to her, these are just a few examples of plants, among many others that indigenous people know, which cannot be revealed because they point to special places in the forest where 'experiences of the forest' can be accessed. It is impossible for non-indigenous people to define or understand such locations, and it is wiser to simply repeat her words:

"These flowers are the charm of the forest. They belong to the forest entities. You can tell they're well cared for—leaves and flowers, everything. It's through experience that you learn where these plants grow. You walk through the forest to get that experience. Then, you sit down to rest, and you'll always find these beauties in these spots, always showing off their flowers. They're special places, where you find things you've never seen before. It was like this in the forest, back when the ancestors were around—'Oh, let's pick a spot, let's go to so-and-so's place, then we'll go to this place, there's that plant, let's check it out, it's beautiful there, it's nice there, we'll take it, decorate it, and put it here.' The elders always knew these special places in the forest" (M.P.S. Arara, 52 years old, ♀, Arara ethnic group, Itkoum village, Arara's Big Bend of Xingu Indigenous Land, July 12, 2019).

So many beauties in the forest need protection, and that protection cannot come from the human condition, not even from indigenous people themselves. Just as hunting is protected by the Pai da Mata (Father of the Forest), an entity with frightening characteristics according to the indigenous people, the forest is protected by the Mãe da Mata (Mother of the Forest), who, as the provider of everything in the Arara people's universe, possesses extraordinary beauty despite the marks and scars left by the actions of living beings. However, it is clear that some of the interventions indigenous people make in the forest, such as farming, are considered recoverable, as they are part of the culture of these traditional peoples.

"All plants have an owner. Trees, like the rubber tree, the chestnut tree—every tree has the Mãe da Mata (Mother of the Forest) who takes care of them and feels the harm that humans cause her. The elders say that Mãe da Mata's skin is completely cut up because of the cuts rubber tappers made on the rubber tree to collect latex for rubber production. So, every wound they made on the rubber tree became a wound on Mãe da Mata. This isn't just a legend, it's true. The forest is beautiful, but there are many damaged parts. There are cut, injured trees. It's beautiful, but it has scars because it's mistreated—almost every living human being offends it. Insects gnaw on the wood, eat the leaves. All of this worries Mãe da Mata. Capoeira belongs to her too. The countryside has its own way. You destroy the forest to plant crops, but eventually, the forest comes back, like an animal that loses its feathers and grows them back. If you leave the cornfield, after a while, the forest returns" (M.P.S. Arara, 52 years old, ♀, Arara ethnic group, Itkoum village, Arara's Big Bend of Xingu Indigenous Land, July 12, 2019).

"In addition to providing resources, the forest offers one of the most important indigenous values: freedom. This freedom is always under threat from the transformations and impacts that have occurred and may continue to affect indigenous territories."

"In the forest, indigenous people feel free, like birds. We're here, we grab some sticks, set them on fire, and make a fire to roast a tortoise or a fish. After eating, everyone heads to their hammock to sleep and have a peaceful night. People say, 'Look, the Indian is lazy, why does he want this land?' But the Indian works the land and takes care of its natural resources because the forest is his home, it's the Indian's home. We're here. We don't have money, we don't have transportation, but we've got cassava, our flour, and the meat that comes from the forest. If we want to eat a tortoise, we've got the seasoning, chestnuts, and coconuts. We've got all these options. So, without the forest, we can't live—where are we supposed to go?" (M.P.S. Arara, 52 years old, ♀, Arara ethnic group, Itkoum village, Arara's Big Bend of Xingu Indigenous Land, July 12, 2019).

The freedom to live within the culture of indigenous peoples is directly linked to their understanding of happiness. To simplify a complex concept, happiness would be the freedom to live in one's culture, a freedom that is becoming increasingly distant due to the ongoing and potential transformations in their territory. These transformations thus act to separate indigenous people from their cultural way of life and, consequently, further remove them from happiness.

This distance from happiness seems to fuel another complex emotion inherent to the human condition: longing—especially the longing for times of abundance. During our time with the Arara people, the most frequent and pressing complaint was about the loss of abundance, particularly the fish population, that once thrived in the Xingu River, one of the main tributaries of the Amazon River:

"Happiness is living like we do—peacefully, with a healthy diet, with my kids walking all over the forest, without limits. We're in paradise. So, for us, it's really good. This is our happiness, it's just not better because they killed our river, our source of income, our source of life" (E.P. Arara, 50 years old, ♂, Arara ethnic group, Itkoum village, Arara's Big Bend of Xingu Indigenous Land, January 25, 2019).

It seemed as though the entire forest was illuminated by his presence, as if he (D. Tenharim, 84 years old, ♂, Kagwahiva ethnic group, Hawk clan, Kampinhu-hu village, Tenharim Marmelos Indigenous Land, November 12, 2014) could feel all the entities and phenomena present in that environment. He then stopped, looked at the tree, and began singing a song in the form of a prayer. This was followed by a brief but intense meditation, as if he were sinking into the deepest sleep of his soul. Afterwards, he looked at everyone present, emotional, with tears in his eyes. It was then that his grandson began translating the 'prayer,' which carried far more meaning than we could fully understand. However, such an experience becomes somewhat possible if we limit ourselves to awakening within us the memory of that moment.

But in this case, we must leave the task of bringing the image to life in all its details entirely to the imagination. The tribute was translated, right after honoring the tree, in the following way by his grandson, who accompanied us (Tramandy, 27 years old, ♂, Kagwahiva ethnic group, Hawk clan, Marmelos village, Tenharim Marmelos Indigenous Land):

"He was paying his respects, saying goodbye to the tree that was dying, and he was really sad because that tree used to provide the bark for a traditional medicine the Tenharim people made. He remembered seeing his grandfather, when he was still a child, and then his father, take the bark from that tree to make medicine. That tree had been there for so many years—an old tree that had treated the illnesses of the indigenous people for generations. Thanks to it, he could still walk through the forest and see his children and grandchildren grow. But now, that giant of the forest was dying. Who knows how many years it had lived? Five hundred? A thousand? Now, it would make way for the others that had been waiting for it to fall so the light could come in and shine on the younger trees still growing."

What could the gaze of a Tenharim, accustomed to their world, perceive when observing it? Many of the interviewees spoke of the richness of the environment in which they live and expressed concerns about how these environments are increasingly being impacted.

"We are very rich. We have the untouched forest, we have the fruits [...]. When I see that it's being harmed, it feels like a piece of my heart is being ripped out [...]. I want it to stay like this, green, just like it is. I want to breathe, take from it [...]. This land is like a mother to us. We see it that way because that's how our ancestors passed it down to us. It affects our lives, it messes with our lives, because it's where we breathe and where we live" (M.S. Tenharim, 52 years old, ♀, Kagwahiva ethnic group, Curassow clan, Mafuí village, Tenharim Marmelos Indigenous Land, November 8, 2014).

According to some interviewees, when the forest is cut down, the entities that protect it leave. Therefore, it is clear that impacts on the vegetation cover severely alter not only the Tenharim way of life but also deeper aspects, such as their cosmology. The loss of this cosmology, passed down through generations, can cause irreversible damage to Tenharim culture.

Plant richness used in traditional medicine and the botanical classification systems employed

Most of the plants used by indigenous people for medicinal purposes are found in nature, and they collect the vegetative material in situ. It's important to note the existence of a plant classification system based on the therapeutic qualities attributed to the plants and their use for such purposes.

Practices related to the popular use of medicinal plants are a viable alternative for treating diseases or maintaining health in many communities [29].

The pharmacology of indigenous peoples is quite rich and includes various types of plants used to treat different diseases. The most commonly used part is the bark, for medicinal preparations, and it is generally used in teas, likely due to the ease of extracting its properties through infusion. The bark, leaves, and roots are traditionally the most commonly used parts for popular medicinal treatments [30, 31], probably because of their ease of collection and the practicality of extracting their properties through infusion. Other plant parts used to prepare medicines include the sap, seeds, and fruit pulp.

Some peculiarities of the medicinal plants used by indigenous people cannot be understood without considering the cultural factors involved and the physical environment in which they occur. The manifestation of a disease among indigenous people seems to be based on the perception of the confluence of biotic, abiotic, and/or supernatural elements that bring misfortune. When the members of a community share a certain worldview, group cohesion is established, and the socialization and sociability of its members are formed, providing elements and ways of explaining and giving meaning to reality [32].

The use of plants is the result of a series of cultural influences, and the popular knowledge of their diverse uses is developed by cultural groups that still live closely with nature, observing it daily and exploring its potential. This knowledge is kept alive and growing through systematic and constant experimentation, preserving this heritage [33, 34].

Based on the information collected through interviews, workshops, and field surveys, which included an in situ presentation of most of the plants important in the lives of the Mura and Sateré Mawé, it was possible to identify 192 plant species, both introduced and naturally occurring in the Rio Urubu Indigenous Territory. These species represent various forms of life (trees, shrubs, subshrubs, herbs, vines, and palm trees), with 85 plant species being used in prophylactic and curative medicine by these indigenous people.

To designate medicine, the Bororo use the term *erúbo*. According to the use of the expression *erúbo* and its variants, the plant world of the Bororo is subdivided into plants that constitute *erúbo* (medicine) and plants that do not possess this quality. There are often two names for a single plant: one revealing its therapeutic properties, and therefore incorporating the term *erúbo* in the binomial, and the other being its actual name [35]. For example, the acuri palm (*Scheelea phalerata*) has the specific name *ápe* or *apido*, but when used with the aim of conferring qualities similar to those of peccaries, it is called *jugo-dóge eimejéra uiorúbo* (with *jugo* being the name the Bororo give to the peccary *Tayassu pecari*).

In Bororo botany, two parallel systems of plant classification and nomenclature are evident. One system is based on the physical characteristics of plants, assigning names according to these traits. The other is based on the therapeutic qualities attributed to the plants and their use for medicinal purposes, resulting in a special nomenclature associated with their *erúbo* character. These two levels are intertwined. In many cases, a plant only has a name derived from its morphological characteristics, possibly because its therapeutic qualities have not been recognized or attributed by the Bororo. In other cases, and this is merely a hypothesis (albeit well-documented), the therapeutic qualities of a plant are confirmed through successful, ongoing experimentation, leading to the establishment of a "therapeutic" name while the botanical designation is gradually lost [35].

"Based on the information gathered through interviews with the Bororo, many of which included in situ presentations of plants, a total of 128 plant species were identified. The discovery of the large variety of herbs, according to some accounts, came through observing wild animals: 'Each *erúbo* belongs to an animal, which feeds on the grass to protect itself from

a specific harm.' For example, the tapir has its herb, *ki uiorúbo* (*ki* is the Bororo name for the tapir, *Tapirus terrestris*); the bush deer has *pobógo erúbo* (*pobógo* is the Bororo name for the red brocket, *Mazama americana*); and the wild dog has *okwa uiorúbo* (*okwa* is the Bororo name for the crab-eating fox, *Cerdocyon thous*), among others [36]. For *erva-de-bicho* (*Polygonum meissnerianum*), one of the main *erúbo* used by the Bororo, its name *barége eké* (in the Bororo language, *barége* means 'animals,' and *eké* means 'food') suggests that it is used by multiple animal species. *Ki uiorúbo*, a magical plant whose leaves the tapir (*ki*) enjoys trampling on, is used by the Bororo, who typically rub the leaves on their legs when walking at night to avoid snake bites. According to reports, the tapir is rarely bitten by snakes.

The Guarani Kaiowá and Guarani Nandeva use the term *pohã* to designate medicine, often incorporating it into the names of plants used for prophylactic and curative purposes, such as *taĩrasi pohã* and *teju pohã*. Reflecting the vast diversity of medicinal plants utilized by these indigenous groups, which are categorized under *yvyra* (tree), *ka'a* (herb), *ysypo* (vine), and *pindo* (palm), our study documented 169 plant species used in traditional medicine. Trees are the most frequently used, with 74 species identified, followed by herbs with 52 species, shrubs with 23, and lianas with seven species. Additionally, three species of palm trees were recorded, along with one epiphyte, one hemiepiphyte, and one parasitic plant. Seven taxa could not be classified by life form, as they were only mentioned by interviewees. The study also documented the use of bromeliads in traditional medicine, such as *Bromelia balansae*. Furthermore, the use of rare vascular plants was noted, including a pteridophyte (fern) from the Dennstaedtiaceae family.

The use of lichen species with therapeutic value has been infrequently documented in ethnobotanical research worldwide, and there is no record of lichens being used in traditional Brazilian medicine [37]. However, among the Pankararu and Pankaiwká peoples, two species of lichens from the Parmeliaceae family (*Canoparmelia salacinifera* and *Parmotrema wrightii*), known as 'stone flower,' were recorded and used as medicine [14]. In a study conducted with the Kayabi, the use of lichens as medicine was also observed. The most commonly used lichens are *iwepoi*, which is chewed to combat fatigue, and *akyykiap*, a red-colored lichen that typically grows on the trunk of the *ingaz* tree (genus *Inga*).

Based on the information gathered from the interviews, many of which included the in situ presentation of plants, it was possible to document a total of 87 plant species with the Pankararu and Pankaiwká, in addition to two lichen species. Tree species are the most frequently used by the indigenous people, with 49 taxa identified, followed by herbs with 28 species. Additionally, four shrub species, two cactus species, two lichen species, two palm species, one bromeliad species, and one liana species were recorded.

It was observed that the diversity of plant species recognized by the Tenharim, particularly those used for medicinal purposes, is quite extensive, as acknowledged in the statements of the informants themselves. Confirming this vast diversity of remedies, 104 plant species used in prophylactic and curative medicine by these indigenous people were recorded. Note the existence of a plant classification system based on the therapeutic qualities attributed to the plants, the parts used, the life forms of the species, and the conditions in which each species or its parts are found. These associated characteristics are used to taxonomically classify a given species. Thus, the same taxon may have more than one name depending on the part used or its intended purpose [18].

For example, among the Tenharim, the chestnut tree (*Bertholletia excelsa*) has several names, each defined by specific criteria, such as a particular part of the plant combined with its

function or condition. Among the names given to the chestnut tree, the following stand out: *nhahã iva* for the chestnut tree itself, *nhayva* or *ñayba* for the chestnut alone, *kataña* for the chestnut husk, *yvotira* or *yvytyra* for the chestnut flower that has fallen to the ground, indicating that the tree will soon bear fruit, *ipotyra* for the blossom still on the tree, signaling that annual chestnut production will occur, *nhadyva* to refer to someone's chestnut grove, and *iravagwete tuvi juyv* as a generic term for a place where clustered chestnut trees are found [18].

Another example of a Tenharim classification that stands out involves four species with no apparent taxonomic relationship, as they belong to four distinct families. The understory palm *Astrocaryum gynacanthum* was identified as *tukuma'ia* by several interviewees when discussing its small fruits, which are enjoyed by both the indigenous people and local fauna. This name is a clear reference to *tukuma* (*Astrocaryum aculeatum*), but with smaller fruits, as indicated by the suffix *i*, used as a diminutive, according to La Vera Betts' Kagwahiva Dictionary [18]. However, the same species was called *ka'a* (leaf) or *ka'a pukuhu* when the focus was on its leaves, which are used to make *pokeka*. *Pokeka* is a type of leaf-wrapped package used to roast fish and mushrooms. These packages are usually tied with a vine known as *y'po* or *ipopohu*, which is the root of a hemi-epiphyte species belonging to the genus *Philodendron* [18].

Similarly, the herbaceous plant *Ctenanthe ericae* is given names like *ka'a*, *ka'a poku*, or *ka'a pukuhu*, as it is used for the same purpose: making *pokeka*. However, this does not appear to be a strict rule, as the vine from the genus *Abuta* is also called *ka'a*, even though its leaves are used for cleaning the face rather than for making *pokeka*. Adding to the complexity of the classification system, the leaves of another vine, *Machaerium caudatum*, which are also used for cleaning the face, are given a completely different name, *koetinha* or *koetinga*, despite serving the same function [18].

4. CONCLUSIONS

Knowledge and traditions are forms of resistance to the hegemonic logic of the Western world. Empirical knowledge about the dynamics of nature, combined with the rich culture of indigenous peoples, are fundamental factors for sustainable interaction between these peoples and the environment in which they live. Their rites, practices, and knowledge, established through perceptive experiences, are important manifestations of resistance for the conservation of the history and culture of traditional peoples.

Many indigenous territories are located in a mosaic of environments that include conserved areas of natural vegetation, agricultural areas, and pastures. The fragmentation of natural environments around these demarcated indigenous territories has led to the disruption of old paths and the breakdown of social relationships rich in cultural diversity, negatively impacting the indigenous way of life. Territorial fragmentation, with the separation of natural environments, has interrupted the movement of dozens of animal species, many of which are important for the hunting activities carried out by indigenous peoples. The areas surrounding indigenous territories are often primarily occupied by pasturelands and mechanized monocultures of soy and sugarcane, which contrast with forest and savanna areas—a mosaic of phytophysiognomies where the main social practices of indigenous peoples take place, playing a crucial role in the territorial consolidation of these traditional peoples.

Indigenous traditional knowledge refers to the knowledge systems embedded in the cultural traditions of indigenous communities, encompassing traditional subsistence technologies, such as techniques used in hunting, fishing, agriculture, and extractivism, as well as perceptions about ecology and the relationships between fauna and flora, traditional medicine, astronomy, climate, and more. This knowledge, essential for the subsistence and survival of indigenous peoples, is generally based on the accumulation of empirical observations and interactions with the environment, and can be understood as heritage technologies passed down through generations.

The ecological perceptions of indigenous peoples are deeply connected to their intense interactions with the environment they inhabit and the wide variety of plants and animals linked to their way of life. The socio-cultural and subsistence activities of indigenous peoples are tied to a close relationship of dependence on subsistence agriculture and the natural resources of their environment, which include plants, water resources, and both aquatic and terrestrial fauna—essential components of their culture, transformed into knowledge.

All human communities, regardless of culture or geographic location, interact in some way with natural resources, exploring their potential, accumulating knowledge, and developing emotional connections with them. The relationships between indigenous peoples and their environment are crucial for the preservation of natural habitats and the creatures that inhabit them. These relationships are complex, emphasizing a mythical connection between humans and the elements of nature.

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