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From basic to higher-order relational processes: Concepts of human-environment interactions among the Shuar

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Abstract

This thesis uses a biosocial anthropological approach to explore the wide variety of human-environmental interactions exhibited by the Shuar of the Ecuadorian Amazon. Based on 10 months of ethnographic inquiry and deploying a comparative and evolutionary perspective, this thesis focuses primarily on the holistic nature of ancient subsistence patterns. I delve into the adaptive strategies exhibited by the contemporary Shuar and attempt to delineate the socio-ecological, ritual and cosmological significance of these patterns of behaviour. I suggest how subsistence adaptations, like hunting, which have been greatly diminished in the Shuar communities, nevertheless reveal particular forms of cross-species interactions likely deeply rooted in coevolutionary processes. As clearly indicated by informants' oral histories, hunting patterns and meat-eating behaviour show complex trophic, socio-structural and ritual associations between humans and animal taxa. I then hypothesise that food taboos against eating particular animals (mostly large mammals) may have functioned as mechanisms for the preservation of prey and likely arose from ancient relationships with extinct megafauna. Further, concerning horticulture, a subsistence strategy still practised by the Shuar, I reveal how specific forms of human-plant interactions, such as those with *Manihot esculenta* Crantz and *Guadua* spp., inform patterns of patterns of growth, fertility and reproduction. This Amazonian form of human-plant coevolution exhibited by traditional horticulture underscores, in principle, basic and higher-order relational processes exemplified by the biosocial, ritual, ontological, and myth-cosmological associations between organismic kingdoms. Concerning the use of medicinal and psychoactive plants, I show how these kinds of botanical knowledge frequently intersect, thus representing adaptive behaviours highly dependent on embodied and cognitive engagements with plant materials. Both

conceived as elementary forms of cure and primary triggers of metaphysical formulations, relationships with these elements of the plant kingdom are likely to be well-embedded in our evolutionary history. Lastly, the thesis' attempt at cross-species comparisons linked to different evolutionary periods (i.e., archaic hominins, extant forager-horticulturalists and non-human primates) may shed new light on the nature of complex adaptive patterns exhibited by Indigenous peoples in general and the Shuar in particular.

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Chapter 1. Introduction

1.1 Constructing ecological niches and the human socio-cognitive niche

The physical environment has always played a determinant role throughout human evolution. Ancient hominins adapted to Plio-Pleistocene fluctuating ecosystems, exhibiting, for example, complex patterns of tool-using and carnivorous behaviour (Heinzelin et al., 1999; Plummer, 2004; McPherron et al., 2010; Harmand et al., 2015; Domínguez-Rodrigo et al., 2021; Mercader et al., 2021; Cobo-Sánchez et al., 2022; Mussi et al., 2023; Plummer et al., 2023; Rodríguez et al., 2023). Nevertheless, as suggested by O'Brien et al. (2023), it was early *Homo* who showed a more generalist and ecologically flexible pattern of behaviour compared with other sympatric hominins, e.g., *Paranthropus boisei,* who was an ecological specialist. The behavioural flexibility of early *Homo* to effectively adapt to a broader range of biomes and paleoenvironmental and paleoclimatic variabilities (Zeller et al., 2023) likely prompted the subsequent amplification of cognitive traits (hence allowing the occupation of higher trophic levels via innovative meat-eating strategies) (Potts, 2012). Notably, Raia et al. (2020) have indicated, however, that contrary to other *Homo* species whose extinction may have been primarily driven by climate change, *H. sapiens* was the only species whose climatic niche has widened. Under this scenario, the recent findings concerning our earliest dispersal into Eurasia ~70–200ka (Petraglia et al., 2010; Groucutt et al., 2015; Rabett, 2018; Harvati et al., 2019; Vallini et al., 2024) and the interbreeding with other hominins such as *H. neanderthalensis* and Denisovans (Sankararaman et al., 2016; Stringer & Crété, 2022) further strengthen the view that the plasticity of the human socio-cognitive niche (Whiten & Erdal, 2012) has proven effective in penetrating Earth's ecosystems.

On this basis, it is evident that this ecological flexibility has enabled our species to adapt and specialise in a wide variety of Late Pleistocene environments (Roberts & Stewart, 2018). Rainforests may thus no longer appear as pristine environments generally unsuitable for human habitation (Meggers, 1954); i.e., contrary to the long-held assumptions that tropical forests imposed significant limiting factors for human occupation and hence, the successful development of subsistence adaptations (Meggers, 1954; Bailey et al., 1989), evidence suggests that rainforest ecosystems have played a critical role in human evolution. Human rainforest occupation from Sri Lanka (Roberts et al., 2015, 2017; Wedage et al., 2019), the Philippines (Xhauflair et al., 2024) and the Amazon (Morcote-Ríos et al., 2021; Iriarte et al., 2022; Aceituno et al., 2024) is just an example of how complex patterns of human-environmental interactions were exhibited during this period. For example, archaeological and ethnographic evidence indicates a wide range of behavioural patterns exhibited by hunter-gatherers in tropical forests, epitomised by complex ecological and cosmological associations with the plant (Bar-Yosef et al., 2012; Virtanen et al., 2022; Aceituno et al., 2024; Ugalde & Kuhn, 2024) and animal (Iriarte et al. 2022; Wedage et al., 2019; Hampson et al., 2024; Oktaviana et al., 2024; Robinson et al., 2024) kingdom.

1.1.1 Amazonian coevolutionary entanglements

Based on this behavioural plasticity shown by humans in occupying and modifying tropical forests, the Amazon rainforest is a prominent socio-ecological milieu to illustrate how certain patterns of behaviour (spanning subsistence strategies and the ritual and mytho-cosmological structure) have developed through evolutionary time. This PhD thesis therefore focuses on the complex human-environment interactions exhibited by the Shuar of the Ecuadorian Amazon. The Shuar are an

Indigenous population scattered between the Ecuadorian and Peruvian upper Amazon and, occupy primarily a tropical moist forest and premontane tropical wet forest living below 1000m (Bennett et al., 2002). Alongside the Achuar, Awajun, Shiwiar and Wampis, the Shuar belong to the Jivaroan ethnic group (currently known as *Aents Chicham*) (Deshoullière & Utitiaj Paati, 2019) and number approximately 40,000–110,000 individuals. (Rubenstein, 2001; CODENPE, 2012). As for other *Aents Chicham* (e.g., Brown, 1986; Descola, 1994) as well as for other Amazonian peoples (e.g. Siskind, 1973; Kaplan, 1975; Jackson, 1983; Gray, 1996), the Shuar have traditionally been forager-horticulturalists (Stirling, 1938; Harner, 1972; Karsten, 2000[1935]). Notably, the Shuar are mostly known for the past ritual practice of shrinking the heads of enemies killed (*tsantsas*) in war (see Harner, 1972; Karsten, 2000[1935]; Rubenstein, 2007); and some of these shrunken heads are held in Western collections and museums (Rubenstein, 2007).

Fig 1.1. Map of Morona Santiago province showing Palora and Huamboya where the communities of this study are located (source: commos.wikimedia.org).

This thesis is based primarily on 10 months (February-October 2023) of ethnographic fieldwork carried out among the Shuar communities of Tawasap, Yawintz and Wawaim, located in the province of Morona Santiago, Amazonia, Ecuador. Using an anthropological biosocial approach, this thesis explores the Shuar socio-ecological, ritual, ontological and mytho-cosmological systems. Specifically, it delves into the most basic relational processes shown by subsistence patterns (hunting, horticulture, and gathering) to further make sense of higher-order relational

processes exhibited by the theoretical apparatuses. For example, concerning Shuar meat-eating strategies, elementary forms of cognition are likely to be revealed by connecting past hunting behaviours (mostly based on informants' narratives given that hunting activities have been highly reduced in the communities) with behavioural patterns exhibited by ancient hominins, extant foragers, and non-human primates. This move towards an evolutionary and comparative perspective that links ethnographic data with paleoanthropological and primatological evidence, may show the underlying cognitive mechanisms of the human predatory pattern (Thompson et al., 2019). Moreover, based on archaeological evidence that highlights complex human-megafauna associations within Amazonian paleoecologies (Iriarte et al. 2022; Hampson et al., 2024; Robinson et al., 2024), it is then suggested that the extinction of Pleistocene megafauna may have instilled in Amazonians the formulation of superstructural mechanisms, ranging from food taboos to shamanic mediations for the safe consumption of animal matter (Reichel-Dolmatoff, 1971; Kaplan, 1975; Ross, 1978).

Regarding the subsistence adaptations still practised by the Shuar (namely, horticulture and the gathering of medicinal plants), the biosocial stance of this thesis may further illuminate patterns of behaviour that, unlike hunting activities that heavily depended on the informants' oral histories for their reconstruction, were observed empirically in the field. As such, relationships with plant matter such as tubers (e.g., *Manihot esculenta* Crantz), and medicinal and psychoactive plants (e.g., *Banisteriopsis caapi*), range from the most elementary forms of bodily and cognitive engagement to cosmological and metaphysical principles. Viewed through the lens of a comparative and evolutionary perspective, the aforementioned behavioural patterns may well indicate complex forms of human-plant entwinements (and hence spanning the socio-ecological, ritual, and cosmological structure) that likely stem from ancient coevolutionary processes.

A prominent example of those relational processes is the use of medicinal plants by the Shuar. For example, as recorded ethnographically, the Shuar use a wide variety of plant materials to treat certain ailments, such as the recent SARS-CoV-2 infections. Consistent with other Amazonian pharmacopoeias (Giovannini, 2015; Pedrollo et al., 2016; Daly & Shepard, 2019; Shepard & Daly, 2023), the plant medicinal knowledge shown by the Shuar reveals patterns of behaviour also exhibited by ancient hominins (Hagen et al., 2023) and extant great apes (e.g., Sumatran orangutans, *Pongo abelii*: Laumer et al., 2024 and chimpanzees, *Pan troglodytes*: Freymann et al., 2024) in that complex associations with plant materials provide health benefits amid specific biological circumstances. As for the use of entheogenic plants by the Shuar, aside from the hallucinogenic effects of plants' bioactive compounds (as in the case of *natem*/ayahuasca decoction N,N-Dimethyltryptamine (DMT) contained in *Diplopterys cabrerana* that acts in conjunction with the β-carboline alkaloids present in *Banisteriopsis caapi* see Rivier & Lindgren, 1972), the emetic properties of the decoction play also a crucial role (see Fotiou & Gearin, 2019; Politi et al., 2022). The overlap between medicinal and psychoactive plants within the Shuar botanical knowledge is interesting; and, accordingly, is highly likely that entheogens may have been selected for their antiparasitic properties before being absorbed into the ritual and religious system (Rodriguez et al., 1982). The lines of evidence shown by this thesis may ultimately suggest that the nature of Indigenous animistic onto-epistemologies is deeply rooted in the most basic forms of cognitive and socio-ecological processes and cross-species interactions exhibited throughout evolutionary history.

1.2 Ancient patterns of adaptation and socio-ecological processes

It is assumed that more complex intellectual abilities emerged in early animal taxa during the Cambrian explosion (Godfrey-Smith, 2017; Ginsburg & Jablonka, 2019). Early metazoans have thus been capable of exploiting, modifying and penetrating new ecological niches due to the emergence of associative learning (Ginsburg & Jablonka, 2010) and novel embodied cognition (Trestman, 2013). Cambrian animals were, in principle, endowed with the primordial form of consciousness (Barron & Klein, 2016) that allowed a corporeal immersion in new ecological realities and the capacity to alter their surroundings. It is pertinent to argue that, as far as organismal agency is concerned (taking as an example the evolution of life from the Cambrian to hominin taxa), three evolutionary processes appear prominently thus far. First, over billions of years, the mediation of favourable environmental conditions has facilitated the emergence of life, which radically transformed during the peak of the Cambrian explosion, in which a basic cognitive toolkit led to the complexification of animal bodies (Trestman, 2013). Hominin evolution, therefore, has depended substantially on transmitted fundamental cognitive capabilities and body plans whose gradual complexification has allowed cognizant adaptive strategies to manage environmental fluctuations. Environmental mediation, in short, lays the foundation for potential adaptive behaviours. Organisms must thus adjust consciously and strategically to environmental contingencies in order to maximise their fitness without causing much disturbance.

Secondly, organisms' modification of biotic and abiotic elements has played and continues to play a crucial role in the coevolutionary trajectories within and between species. More constructively, as Trappes et al. (2022) argue, three different mechanisms delineate agents' capacity to alter their environments and niches: niche construction (individual's modification to

the environment), niche choice (individual's selection of the environment), and niche conformance (individual's phenotype adjustment following environmental pressures). If, according to authors, organisms can be agents of evolution because of their faculty to affect selective pressures, let alone the resources and information available for generating new phenotypic variation (Trappes et al., 2022: 546), what are the major drivers of organisms' behavioural adaptation and phenotypic plasticity? On the basis of empirical evidence, one might speculate that organisms' phenomenal experiences of oscillating physical realities depend on the degree of cognitive complexity developed throughout the evolutionary history of the animal kingdom. The question of qualia is, for an organism, the primary source of knowledge concerning the intensity of bodily embeddedness, whereby it reacts to environmental pressures and constructs its socio-ecological dwelling.

Thirdly, among organisms, the assimilation of biological properties is coeval with the environment's modification and niche construction (Levins & Lewontin, 1985; Odling-Smee et al., 2003; Okasha, 2005; Baedke et al., 2021). An organism's physical continuity will likely be subjected to ecological constraints that impinge upon its bodily structure, thus stimulating its cognitive skills and activating a potential set of qualia. Decoding environmental inputs allows living things to devise strategies actively (via modification) to delve into restricted ecological relations, which provide the elementary structure of life processes. If, for example, within a food web, energy circulation goes from the sun to the lowest trophic level to the highest one represented by carnivores (MacArthur, 1955), predator-prey interactions are essential for its stability (Gross et al., 2009). This chain of species interactions within which modification leads to assimilation and vice versa is likely to be drastically disrupted by maladaptive behaviours. So the question of human evolution appears problematic whenever the alleged intellectual superiority of our species warrants

a technocultural development that crosses ecological thresholds, ignoring nature's fundamental role in our existence.

1.3 Human adaptive behaviours

As we navigate across anthropological reflections about our biological and socio-ecological conditions, living amid future uncertainties strengthens the will for a better understanding of human nature. Socio-cultural anthropology, in particular, allows us to observe the interconnectedness between subjects and their socio-material actualities holistically. Crucially, the uniqueness of our discipline has been demonstrated since the dawn of long-term ethnographic immersion. Those theoretical and methodological contributions emphasise that the complex behavioural patterns exhibited by the Trobrianders (Malinowski, 1922, 1935), the Nuer (Evans-Pritchard, 1940), the Tsembaga (Rappaport, 2000 [1968]), and the Hadza (O'Connell et al., 1988) are the fabric of social relations with more-than-human others. As Evans-Pritchard (1940: 87) reported, "The Nuer do not live in an iron age or even in a stone age, but in an age in which plants and beasts furnish technological necessities." It comes as no surprise that the physical environment shapes the different modalities of humans' subsistence strategies. Indeed, the Melanesian Trobrianders and Tsembaga are primarily horticulturalists, whereas in East Africa the Nuer are highly devoted to pastoralist activities and practice horticulture marginally and the Hadza are essentially hunter-gatherers.

There is, however, a point of convergence between the different modes of socio-ecological relations exhibited by these peoples. Specifically, how the Trobrianders, the Tsembaga, the Nuer and the Hadza interact with their local ecologies reveals adaptive behaviours whose socio-material

and superstructural mechanisms range from meat-eating strategies to kula transactions to marriage rules to ritual cycles to garden magic. It became clear, then, that these societies have adjusted successfully to a wide array of biomes (i.e., lowland rainforest, montane rainforest, and savannah), showing particular ways of relating with the highly localised flora and fauna. It might also be pointed out that, paradoxically, even in the Global North the capitalist mode of production has unveiled the intricate interweaving of multispecies assemblages (e.g., the relations between humans, matsutake mushroom, *Tricholoma matsutake* and other non-human organisms) and their embeddedness in wider planetary ecologies (Tsing, 2015).

It is hardly surprising that, as far as social anthropology is concerned, the tools of natural sciences acted as referential templates to inform how individual organisms' social relations (primarily human social relationships) needed to be analysed empirically (Radcliffe-Brown, 1952). Of course, those were principally human institutions' structural and functional properties. These societal systems are, however, enmeshments of sympatric species from diverse organismic kingdoms, as in the case of totemism. These phenomena are illuminating, given the latest anthropological and philosophical interests in multispecies entanglements (e.g., Kohn, 2007; Candea, 2010; Kirksey & Helmreich, 2010; Van Dooren, 2019; Kirksey, 2020; Daly, 2021; Hartigan, 2021; Arregui, 2023). The analysis of ethnographic data further underpins the complexity of these human-environment interactions, reporting indigenous metaphysical principles that regard the material world as a set of relationalities (Viveiros de Castro, 1998; Bird-David, 1999; Ingold, 2006; Nadasdy, 2007; Descola, 2013; Rose, 2013; Panoff, 2018). It might thus be speculated that the ontological and epistemological schemes exhibited by foragers and horticulturalists worldwide are likely to be grounded on mindful negotiations and relations with ecological niches. So, the primary aim of this thesis is to unravel these specific kinds of

relationships by investigating a particular Amazonian reality in connection with broader patterns of behaviour and deeper evolutionary dynamics.

It is thus palpable that, as anthropologists, we follow the "eternal pursuit of complexities" in that sociality transcends the anthropocentric order of things (Abad Espinoza, 2022c). This move towards holistic thinking has profound implications regarding the construction of anthropological knowledge, especially in concert with other scientific disciplines. Thus, the studies of animal culture and cognition (Griffin, 1998; Allen, 2019; Schuppli & Van Schaik, 2019) and plant intelligence (Marder, 2013; Mancuso & Viola, 2015; Calvo et al., 2020) may very well align with the basic principles of indigenous ontologies and ecological knowledge. For instance, high levels of empirical knowledge regarding the behaviour and cognition of animals and plants have been reported among hunter-gatherers and horticulturalists. Among these societies, therefore, the attribution of agentive qualities to animal and plant kingdoms depends considerably on profound biosocial interactions ranging from Circumpolar peoples' meat-eating strategies to Amazonian conceptualisations of the chemosensory properties of plants (Nadasdy, 2007; Willerslev, 2007; Shepard & Daly, 2023). These highly social and embodied activities are likely based on coevolutionary interactions, providing these societies with an empirical platform to develop complex modes of relations with the natural world.

The ethnographic examples discussed above have shown how modern indigenous peoples exhibit subsistence adaptations that evolved within a wide range of ecosystems. Zeller et al. (2023) argue that early *Homo* adapted to different biomes utilising different types of resources, hence showing a resilient and successful strategy over hundreds of millennia. From this evolutionary perspective, contemporary hunters, gatherers, horticulturalists and even pastoralists exhibit patterns of behaviour partially in accord with the resilience and adaptability of our ancestors.

However, as the Anthropocene supersedes the Holocene, the anthropogenic changes to ecosystems (e.g., the shift from integrated agricultural practices to monocultures) have taken modern humans away from the ancient resilience pathways (Zeller et al., 2023). As such, contrary to natives' relational ecologies, the so-called modernity tries to crush any remnant of resilience and adaptiveness through harmful and invasive cultural practices eradicating species dependent on narrow niches (Wang et al., 2023) or triggering trophic cascades (Estes & Duggins, 1995) that drastically disrupt ecosystem structure. Following this line of reasoning, it becomes evident that although humans represent a prominent destructive force of Earth's systems, this does not follow a progressive evolutionary line.

1.4 Resilience in the Anthropocene

As stated previously, the practice of anthropology involves holistic thinking that bridges the gap between the biological and social domains. We cannot aim to understand our current climate crises, the emergence of zoonotic diseases, mass extinction, or rising socio-economic inequality without paying close attention to our evolutionary history's ecological and socio-cultural determinants. The Holocene might be viewed as a good starting point to appreciate the different behavioural pathways undertaken by humans. For example, on the one hand, this geological epoch saw a drastic change in humans' subsistence patterns, thus prompting a sequence of unpredictable deleterious effects that have pervaded our biosocial condition (Larsen, 2023; Lewis et al., 2023); this mode of relation with the environment has thus shaped the current patterns of sedentism, population growth, host-pathogen dynamics, and socio-economic and health disparities. On the other, evidence suggests that, throughout the Holocene climate change events, some small-scale societies coped and thrived

primarily due to their adaptive and flexible political and socio-eco-cosmological systems (Robbins Schug et al., 2023).

If social-cultural anthropology aims to clarify the current Anthropocene epoch, it must integrate these biosocial facts of human evolution. We can thus shed light on the variations of behavioural patterns and coevolutionary spatio-temporal dynamics of the human-environment interface. Considering these evolutionary trajectories, we can also better appreciate the mechanisms behind modern Indigenous peoples to cope with the detrimental environmental impacts of modernity. Recent archaeological evidence from the Amazon rainforest suggests, for instance, that complex settlements existed before the European invasion (Prümers et al., 2022). Levis et al. (2017) have also reported structured patterns of plant domestication by Amazonian peoples. However, according to Fausto & Neves (2018), domestication is likely to be a foreign concept among Amazonians precisely because human-plant interactions are essentially characterised by "familiarisation". This phenomenon is well illustrated in Chapter 4 and, hence, shows the complex ecological, biosocial and ontological relations that women establish with tubers (e.g., manioc, *Manihot esculenta* Crantz) (e.g., Hugh-Jones, 1979; Descola, 1994; Emperaire et al., 2012). For example, the Shuar women consider cultigens (primarily *Manihot esculenta* Crantz) as their children and thus show special devotion during planting, tending and harvesting them. The ecological and biosocial relations that women establish with tubers (from the unique care of the gardens to trophic exchanges to consanguineal relations) are hence well-embedded in a mytho-cosmological and ritual structure that enable the ontological associations between biological kingdoms and immaterial beings (Chapter 4).

Remarkably, Mayshar et al. (2022) reported that instead of perishable food sources such as tubers, the cultivation of appropriable cereal grains was likely the prime factor for the emergence

of complex hierarchies during the Neolithic Revolution. This is illuminating considering the archaeological and ethnographic evidence that posits food storage (e.g., cereal grains and acorns) as a trigger of socioeconomic and political inequalities (Hayden, 2020) that likely led to the further emergence of religious specialists (Watts et al., 2022). One might say that, besides patterns of shifting cultivation and the biological properties of tubers, Amazonian horticulture is a holistic subsistence strategy that entails different levels of interconnected relational processes (hence highlighting the socio-ecological and metaphysical qualities of entities involved in gardening activities) and thus is thoroughly at odds with notions of complex hierarchy through appropriation. From this, we might thus infer that a bifurcation of subsistence strategies (i.e., intensive agriculture versus traditional foraging/horticulture) and the further adoption or rejection of them have had significant implications for the current state of ecosystems and the degree of people's well-being. Traditional subsistence strategies are just an example of how more adaptive and resilient paths have been retained, adopted, or revived by societies to deal with the environmental and socio-economic impacts of the Holocene-Anthropocene transition.

1.5 Research objectives

The primary objectives of this study were to:

1. Investigate Shuar subsistence patterns and their socio-ecological, ritual, and cosmological significance.

2. Compare Shuar patterns of behaviour with those exhibited by early hominins, extant forager-horticulturalists, and non-human primates in order to delineate underlying behavioural and/or cognitive mechanisms.

3. Explore the complex, profound, and coevolutionary relationships between humans and the plant and animal kingdom within the Shuar socio-ecological, ontological and mytho-cosmological systems.

4. Prove that the metaphysical and cosmological concepts exhibited by the Shuar and other Amazonian peoples likely emerged from ancient cross-species associations and coevolutionary processes.

5. Propose that, contrary to the long-held assumption of the anthropogenic nature of animism, there are strong indications that the nature of this particular form of panpsychism may be biogenic.

1.6 Thesis structure and summary of chapters

Shortly after the introduction outlined in this chapter, in Chapter 2, I illustrate the main features of the study site and population and provide a detailed description of the methods and strategies used in this study. The chapter then describes the primary characteristics of the ethnographic approach, how informants were selected to constitute the study sample and how data were collected. It also takes an ethical stance concerning ethnographic research among vulnerable communities;

consequently, it gives as an example the digital inquiries I carried out with the Shuar during the pandemic, and, how these have influenced the subsequent in-person ethnographic investigation shown in this thesis. Lastly, it argues, nevertheless, that in-person ethnographic research is critical to an in-depth study of the complex human-environmental interactions within Indigenous worlds.

Chapter 3 begins by outlining the evolutionary roots of human carnivory in order to make sense of Shuar hunting patterns. I then attempt to make a cross-species comparison taking into account disparate evolutionary periods (i.e., archaic hominins, extant foragers and primates) to reveal potential underlying cognitive mechanisms that likely support primary forms of carnivorous behaviour. As hunting activities have been nearly completely diminished in the communities, I relied on informants' oral histories to reconstruct the basis of Shuar meat-eating strategies. Thus, with the aid of cross-species comparisons and informants' narratives, I demonstrate some differences and commonalities in the carnivorous behaviour of the species taken into account. I also speculate how Amazonian ritual practices to regulate prey taxa (i.e., food taboos and shamanic neutralisation of animal matter) may have evolved from ancient interactions with animals. This conjecture draws heavily from recent archaeological findings that demonstrate the potential associations of Amazonias with extinct Pleistocene megafauna. I ultimately support the postulation that it was the need for protein and fat that likely caused the extinction of megafauna and, as a consequence, I argue that this factor has driven Amazonian peoples to devise ritual practices that aim at the preservation of prey.

Chapter 4 provides a detailed description of Shuar traditional horticultural practices. It therefore delves into the biosocial, ecological, ritual, ontological and mytho-cosmological dimensions of

gardening. In order to achieve such understanding, horticulture was tackled as a domain within which women exhibit highly embodied and cognitive engagements with plant life, inorganic matter, and mythical beings. I demonstrate that tubers' rapid growth and good production are highly contingent on women's sophisticated cognitive skills epitomised by specific forms of nurturing cultivated plants (mainly manioc, *Manihot esculenta* Crantz) and gardening rituals to negotiate with cosmic and mythical forces (e.g., the mother of the crops Nunkui and the mythical mediator *Guadua* spp.). It is then suggested that apart from the embodied practices of tending tubers (hence highlighting woman-manioc consanguineal relations) and the ritual behaviour exhibited by women, the agential qualities of the vegetal world (from manioc to *Guadua* bamboo) may have played a key role in modelling Indigenous notions of growth, fertility, and reproduction. This may ultimately lead to surmise that human-plant coevolution in the Amazon likely paved the way for the formation of empirically sound concepts of plant behaviour and cognition.

In Chapter 5, I focus on the significance of Shuar pharmacopoeias, primarily on the various uses of medicinal and psychoactive plants. To make sense of this ethnopharmacological knowledge, I attempt to delineate the ancient roots of this behaviour by comparing the self-medicative behaviour (zoopharmacognosy) in primates and similar behavioural patterns found in hominins and other Amazonian societies. I also provide ethnographic evidence on how the Shuar treat certain ailments with a wide variety of plant materials, including a particular infusion that this society consumes to combat COVID-19. I then pay significant attention to the ritual consumption of *natem* decoction (mostly a combination of *Banisteriopsis caapi* with *Diplopterys cabrerana* and occasionally *Calliandra angustifolia*) and its beneficial effects on well-being, primarily due to its cleansing (physical and spiritual) properties. Notably, all of these ethnographic data are then compared with

scientific studies that further corroborate the use of the bioactive properties of plants by Shuar ethnopharmacology.

Chapter 6 presents a novel explanation concerning Shuar metaphysics, particularly the conception of mind/soul and matter. To do this, I engage in an anthropological and philosophical discussion with Western metaphysical notions (dualism-monism), the theoretical contributions of animism and perspectivism and the ethnographic records of hunter-gatherers and horticulturalists. This comparative move thus sheds light on the limits of animism and multinatural perspectivism to grasp Indigenous concepts of the material world and the ultimate nature of reality. It is then suggested that the theories of animism/perspectivism are predicated upon an inversed dualistic conception that foregrounds physicalities as primary differentiators between organismic kingdoms; and, accordingly misconceiving the fundamental attributes of the primordial order of things. Instead, as suggested by the mytho-cosmological structure exhibited by the Shuar and other Indigenous societies, there are strong indications that, at the most basic level, existents possess primary forms of consciousness and matter. These therefore stem from the unitary properties of life exhibited in mythical times, which are principally highlighted during altered states of consciousness (induced by the ritual consumption of entheogenic plants).

Chapter 7 provides the general conclusion of the thesis.

Chapter 2. Methodological and ethical considerations

2.1 Study site and population

The study setting is located in the Morona Santiago province of the Ecuadorian Amazon and involves the Shuar communities of Twasap, Yawintz, and Wawaim. Tawasap and Yawintz are adjacent communities within Canton Palora, whereas Wawaim is within Canton Huamboya Scattered between the Upper Amazonian territories of Ecuador and Peru, the Shuar traditionally lived by hunting, gathering, fishing, and horticultural subsistence strategies (Stirling, 1938; Harner, 1972; Karsten, 2000[1935]). Their population comprises approximately 40,000–110,000 individuals (CODENPE, 2012; Rubenstein, 2001) and together with the Achuar, Awajun, Wampis, and Shiwiar, form the *Aents Chicham* ethnic group (formerly Jivaro) (Deshoullière & Utitiaj Paati, 2019). Each Shuar community hosts approximately 15-20 households comprising ~100 individuals, and except for older adults, most community members are fluent in Shuar and Spanish. Unlike a few Shuar communities of the Cross-Cutucú region (Colehour et al., 2014), the communities involved in the present thesis are almost utterly acculturated and absorbed into the market economy.

The local ecology of the communities exhibits a high proportion of deforested areas and a few forest patches; ecological disturbances are primarily due to cattle ranching, logging, extractivism, and cash crop plantations (e.g., Pitahaya, *Hylocereus* spp.). A combination of deforestation and extractivism is, strictly speaking, a primary source of pollution and socio-ecological hardship, as documented among the Shuar of Congüime in the valley of the Cóndor Mountain Range (Guzmán-Gallegos, 2021). The Shuar's sedentarisation and, as a result, the construction and demarcation of

the communities have also prompted the gradual alteration of local ecologies. Traditional subsistence strategies such as hunting and fishing have thus been highly reduced, and Indigenous oral histories emphasise the past abundance of flora and fauna within their ecological niches. Nevertheless, even though anthropogenic alterations of the ecosystem have threatened and are still threatening to eradicate this society's biocultural heritage and survival, traditional ecological knowledge withstands the detrimental effects of the Anthropocene. As such, traditional subsistence adaptations such as horticulture are widely practised, and tubers represent the primary source of carbohydrate intake; gardens are, therefore, the locus of multispecies human-plant interactions spanning different ontological domains. Additionally, medicinal and psychoactive plants play a central role in the Shuar biosocial, ritual and cosmological structure.

2.2 Research design and data collection

Ethnographic methods ranging from participant observation to unstructured and semi-structured interviews were applied during a fieldwork period from February to October 2023. Throughout the 10 months of fieldwork among the Shuar communities, I was primarily hosted by Tzama, a Shuar leader and shaman (*uwishin*), in his traditional house located in Mura in the Tawasap community. Mura, a hill of approximately 900m above sea level (asl), was the ancestral dwelling place of Tzama's ancestors and also operated as a burial ground. Notably, Tzama's grandfather, Ambrosio Tzamarenda, was a powerful and well-known shaman who used to dwell in Mura; this place is therefore endowed with religious and ritual significance, and nowadays most rituals are held in this location. Moreover, during my frequent trips to the nearby Yawintz community, I was occasionally hosted by Nawech and his family. Nawech, a Shuar in his 50s, sometimes

accompanied me to visit the Wawaim community located 40 km away from Yawintz. In Wawaim, the community of Nawech's deceased father Sharimiat, I was hosted by his brothers. It is worth remarking that since Mura (Tawasap community) was my main place of dwelling during the fieldwork period, I only rarely used to spend some days in the other two communities (mostly Wawaim given its distance from Tawasap); however, I used to frequently visit the other communities (primarily Yawintz due to its nearby location from Tawasap) staying there for hours or even the whole day.

Additionally, it is noteworthy that my hosts were individuals whom I had already befriended during my first fieldwork in 2018. Interestingly, these social relationships have been maintained and even strengthened throughout the digital inquiries I have carried out with the Shuar during the pandemic (Abad Espinoza, 2022b). Thus, most of the informants who provided crucial data for the further development of the hypothesis and theoretical arguments present in this thesis were primarily kin of Tzama and Nawech. It must be stated that, owing to the kinship ties between the majority of the population of Tawasap and Yawintz (e.g., Nawech's wife Yanua is Tzama's cousin) and the kinship ties between Nawech and some individuals of Wawaim, the sample consisted primarily of kin individuals.

Fig 2.1. The forest surrounding Mura.

Given this background, key informants (n=25) were selected according to their knowledge of traditional subsistence strategies and their ecological, ritual and mytho-cosmological significance. Medicinal plant knowledge and ritual behaviour concerning the consumption of entheogenic plants were also critical factors for the selection of informants present in this thesis. As noted, the selection of key informants was thus facilitated by my prior fieldwork experience with the Shuar in 2018 and the subsequent digital investigation that I carried out throughout the pandemic (Abad Espinoza, 2022). Accordingly, most of the fieldwork conversations with the Shuar were primarily

based on previous digital interactions; though this kind of ethnographic inquiry has been characterised by fragmented episodes of data collection, this nevertheless helped me to strengthen social bonds essential for the physical immersion in the empirical realities of the Shuar.

The sample thus comprises individuals of both genders and different generational backgrounds: elders (*n*=9), adults (*n*=13), and young adults (*n*=3). Most conversations and interviews occurred through social relations involving commensality (e.g., eating food and drinking manioc, *Manihot esculenta* Crantz beer) and during participation in gardening or foraging activities. Both conversations and interviews were held largely in Spanish, with the only exception of elders where conversations needed the mediation of a bilingual Shuar for translation. These were recorded with the aid of a voice recorder or, in some instances, directly transcribed into an ethnographic notebook when conversations were highly short and informal (e.g., writing down the name of a plant previously obtained by a hasty chat). Besides the use of the voice recorder for long conversations and interviews (lasting on average from 30 to 45 minutes), I have frequently used the ethnographic notebook during gardening activities or trips to the forest and, when possible, used the cellphone to take photographs.

The methodological approach of this thesis was based primarily on the following ethnographic and anthropological strategies: (1) concerning traditional subsistence adaptations still practised by the Shuar like horticulture or gathering of plants, significant attention was paid to the multi-sensory nature of human-plant interactions and the ritual behaviour, ranging from corporeal encounters with plant matter to oral narratives of mythical, cosmological, and ontological relationships between humans and a wide variety of plants with nutritional, medicinal and psychoactive properties; (2) concerning subsistence strategies no longer present in the communities like hunting, descriptions and, whenever possible, enactment of ancestral hunting patterns proved crucially

important for a better understanding and reconstruction of past socio-ecological and ritual behaviours towards animal taxa and their mytho-cosmological and ontological underpinnings; and ultimately (3) the comparison and connection of these localised ethnographic realities with broader biosocial and evolutionary anthropological frameworks and other ethnographic contexts.

2.3 An ethical dilemma: Ethnographic inquiry among vulnerable communities

SARS-CoV-2 has unsettled any clear distinction between human exceptionalism and the biological world, the cultural and the natural (de Chadarevian & Raffaetà, 2021; Faas et al., 2020). Furthermore, the porosity of our bodies suggests that, like other organisms, we share a biological structure vulnerable to microbial agents (Arregui, 2020; Faas et al., 2020; Lainé, 2018). On this basis, multispecies pandemics are highly likely to emerge due to anthropogenic alterations in ecological niches that allow the exchange of infectious diseases and instigate the homogenisation of virospheres (Aronsson & Holm, 2020). No wonder anthropologists face an ethical dilemma regarding an ethnographic investigation in vulnerable biocultural environments. As Stavig (2021) contends, we must decide whether to continue with the imperialist "will to know" or halt fieldwork to protect ourselves and our interlocutors from the pandemic. Although the specific modalities of human-animal engagements among indigenous peoples could elucidate the root of the transmission of pathogenic zoonotic organisms (MacGregor & Waldman, 2017), our potential bodily intrusion might generate an extra-circulation of foreign pathogens. Like the infected objects intentionally given to native Amazonians to accelerate their extermination during the XIX and XX centuries (Espinosa & Fabiano, 2022: 19), the scientific determination to physically explore localised socio-ecological realities might endanger entities' biocultural survival.

In this sense, the ethical commitment to step back from participant observation gives us significant insights concerning incorporeal investigation's reflective, retrospective and introspective nature. These were thus my own reflections concerning the COVID-19 pandemic outbreak, and, how I grappled with the radical interruption of socio-material interactions; that is to say, digital ethnography came to the rescue of the anguished anthropologists in the grips of SARS-CoV-2 and its effects on classic ethnographic methods. By choosing thoughtfully online methods that abide by ethical considerations of research with marginalised communities (Newman et al., 2021), I could safely surmount the biophysical uneasiness of seclusion and pathogenic infection. Nevertheless, as SARS-CoV-2 infections gradually diminished worldwide, and by extension, the shift from virtual to in-person ethnographic investigation was critical for the development of this thesis, the ethical commitment to the safety of my Shuar informants pervaded the entire ethnographic experience.

As such, since my arrival in February 2023 in the Shuar communities, I felt a sense of distress in that my material presence could have been a potential carrier of pathogens that could have infected any member of the communities. After all, some Amazonian peoples, primarily in Brazil, have suffered the fatal effects of the pandemic (de Castro et al., 2020; Charlier & Varison, 2020; Ferrante et al., 2020). Even if at the time of my arrival, the rates of SARS-CoV-2 infections were very low in the Shuar communities and I got three shots of COVID-19 vaccine, I nonetheless took some precautions primarily during conversations with vulnerable individuals (e.g., during interviews with older adults, I used to frequently sanitise my hands and maintain a certain physical distance). So, with these precautions in mind, I was able to physically immerse in natives' socio-ecological realities largely concealed from digital ethnography.

2.4 Reflections on the necessity of in-person ethnographic fieldwork

Based on my personal experience, I may argue that virtual research's highly reduced sensory capacities not only neutralise an observation that aims to be empirical. Indeed, the whole sensory experience is shrunk so as not to be able to perceive a world in constant flux where materialities clash and merge following the life-cycle of the cosmos. More fundamentally, the question of not being there entails that our capacity to grasp the essential attributes of life gravitates to the void of the transient simulation of intense perceptions. The vacuity of these digital interactions comes to the fore when specific worlds of forms, meanings, and sensations are cut off into small segments that need to be sewn together by the creative operations of the imagination. Still, it seems problematic to give shape to something that we only see in blurred pictures or, worse, hear in fragmented voices stemming from screens. What are the plants like? How do the Shuar relate to them? How intense are the relationships between the Shuar, plants, animals, and non-human organisms that share a particular socio-ecological milieu? How do the Shuar modify and mix the plants to treat Covid-19, and, in turn, how does this mixture affect the former? These open-ended questions both puzzle and illuminate the broad spectrum of multispecies studies, which seek to immerse into the multi-sensory worlds of humans and non-humans' entanglements (Fijn & Kavesh, 2021; Ogden et al., 2013; van Dooren et al., 2016). Therefore, whether we attempt to complement ethnographic methods with natural sciences tools such as analysing Pacific salmon scales and otoliths (Swanson, 2017) or the phytochemical components of Amazonian shamanic plants (Daly & Shepard, 2019); all of these cross-disciplinary inquiries share the same common ground of corporeal immersion with the recent phenomenological approaches in multispecies ethnography

like investigating the complex relationships between humans and elephants in a Cambodian sanctuary (Erickson, 2017) or humans and pigeons in rural Pakistan (Kavesh, 2021).

Obviously, the dematerialised presence of entities haunts the imagination of an ethnographic encounter that never happened. Remarkably, digital disparities significantly impact the flexible but fragile online research process. Virtual research will be impossible with indigenous peoples, according to Vilaça (2020), due to the low level of internet usage in their communities and the elders' rejection of these forms of sociality. We cannot help but agree with Vilaça as elders are the principal keepers of ancestral knowledge. Even though younger people provide important information through virtual means, we risk losing the entire context of production (Ibid). Whatever the case may be, even if, within a short time, technology will allow us to reach every corner of the globe with top-notch digital communication, the disengaged anthropological lens of a virtual investigation cannot submerge into the specific socio-ecological relationships that come into existence in a given spatio-temporal context. Conversely, only a pragmatic and relational inquiry using a 360-degree ethnographic perspective can understand how a localised aggregation of entities simultaneously modify, assimilate, and compenetrate each other. This thesis is therefore the outcome of such a kind of ethnographic inquiry that has immersed in highly embodied forms of cross-species relations and indigenous theoretical apparatuses to ultimately reconstruct Amazonian patterns of behaviour embedded in complex evolutionary dynamics.

Chapter 3. Ancestral behavioural patterns and the significance of Shuar hunting

The evolution of meat procurement strategies in the hominoid lineage is both a riddle and a fascinating matter. A diet based on vertebrate tissues has triggered in the genus *Homo* substantial morphological, physiological, metabolic, behavioural, and cognitive changes (Aiello & Wheeler, 1995; Milton, 1999; Stanford & Bunn, 2001; Mann, 2007; Pobiner, 2016) that permeate our evolutionary history. From the adaptation of Early Miocene apes (e.g., *Morotopithecus*) to feeding on leaves in Eastern Africa seasonal wooded grasslands (MacLatchy et al., 2023) to the Plio-Pleistocene emergence of stone toolmaking and carnivory (Domínguez-Rodrigo et al., 2005; Sahnouni et al., 2018; Domínguez-Rodrigo et al., 2021; Cobo-Sánchez et al., 2022; Plummer et al., 2023), all these adaptive shifts point to ecological constraints as a significant driver in the evolution of our trophic and socio-cognitive niche.

In particular, throughout the Plio-Pleistocene ~3 Mya, environmental and climatic variability and faunal turnovers may have caused strong selection pressures in our forebears, prompting the spread of Oldowan behaviour and thus facilitating the procurement of animal tissues (Plummer, 2004; Potts, 2012). This shift towards a diet rich in protein and fat likely caused a radical intellectual change in our genus since the brain increased in size (Aiello & Wheeler, 1995; Milton, 1999). Specifically, the emergence of *H. erectus* ~1.8 Mya saw the evolution of morphological and cognitive traits leading to adaptive shifts in foraging and subsistence patterns (Leonard et al., 2007). Such biological changes (increase in body and brain size) in early *Homo* relative to *Australopithecus* signal the connection between its behavioural repertoire (tool use and social cooperation) and the procurement of high-quality nutrients (Antón et al., 2014). If, throughout

hominin evolution, the reduction of the gut correlates with encephalisation, it became clear that in order to maintain an energetically expensive neural tissue, the assimilation of animal matter is critical (Aiello & Wheeler, 1995; Leonard et al., 2007). What, then, are the evolutionary and socio-ecological implications of this behaviour?

Whether the meat-eating strategies of ancient hominins reveal hunting or scavenging patterns is a matter of debate (Pickering & Dominguez-Rodrigo, 2010; Dominguez-Rodrigo & Pickering, 2017; Thompson et al., 2019). There are, however, significant ecological consequences emanating from the extension of the trophic niche and the further incorporation of animal products into our ancestors' diet. For example, evidence suggests that Plio-Pleistocene carnivore extinctions in East Africa correlate with hominin exploitation of herbivores ranging from scavenging/kleptoparasitism to active hunting due to encephalization and enhanced cognitive skills (Faurby et al., 2020). Also, the consumption of vertebrate tissues (mainly from mammals) by hominins and their close association with the carnivore guild may have triggered the incorporation of parasites such as *Taenia* tapeworms in their gut ecology (Henneberg et al., 1998; Hoberg et al., 2001; Hoberg, 2006). These trophic associations thus indicate that the assimilation of animal matter in early hominins has played a critical role in modelling modes of relations (predator-prey/host-parasite) and coevolutionary dynamics between taxa. Carnivory, in short, opened the way for complex biosocial relations, leading to significant evolutionary changes in the genus *Homo* (Foley, 2001).

Dominguez-Rodrigo & Pickering (2017: 19) argue that "hunting and meat-eating were among the basal adaptive strategies of the very earliest human ancestors." The authors, in turn, suggest that this behavioural module shared by humans, chimpanzees (*Pan troglodytes*) and bonobos (*Pan paniscus*) represents a "synapomorphy, rather than a homoplasy, of these sister taxa" (Dominguez-

Rodrigo & Pickering, 2017: 8). Take this phylogenetic continuity in behavioural and cognitive traits among the hominoid lineage. Although there are considerable ecological and technological differences between modern hunter-gatherers' and archaic hominins' meat procurement strategies (Ben-Dor et al., 2021), one might point out that an underlying neurocognitive structure may nevertheless operate in the carnivorous behaviour of these taxa. In effect, if we take these rudimentary socio-cognitive mechanisms, Indigenous empirical knowledge of ecological niches, tool use, cooperative hunting, and meat sharing somewhat correspond with other primate taxa carnivory, such as chimpanzees (*Pan troglodytes*) (Pruetz & Bertolani, 2007; Pruetz et al., 2015; Samuni et al., 2018; Pika et al., 2019; Achorn et al., 2023), bonobos (*Pan paniscus*) (Surbeck & Hohmann, 2008; Fruth & Hohmann, 2018; Samuni et al., 2020), capuchin monkeys (e.g., *Sapajus macrocephalus* and *Sapajus libidinosus* (Torralvo et al., 2017; Falótico, 2022) and to a lesser degree Baboons (*Papio* spp.) (Strum, 1975; Goffe & Fischer, 2016; Sommer et al., 2016).

While all these behavioural patterns point to several similarities in humans and non-human primates, there are considerable differences underlying the predatory behaviour of these taxa (Butynski, 1982). A compelling explanation for this gap is that a new socio-cognitive niche, which evolved from the ancestral primate-like behavioural patterns, enabled humans to take a carnivorous position and deploy marked behavioural innovations (i.e., cooperation, egalitarianism, theory of mind, language, and culture) (Whiten & Erdal, 2012). It seems likely that both social and ecological factors might have played a pivotal role in the evolution of these cognitive faculties. For example, the social-brain hypothesis suggests a correlation between relative brain size and primates' different degrees of social complexity (Dunbar, 1998). It is this complex level of sociality (e.g., demographic increase), coupled with brain expansion, that probably has enabled Acheulean hominins ~1.5 Mya to occupy a high trophic level as big game hunters (Dominguez-Rodrigo &

Pickering, 2017). Ecologically speaking, incorporating animal-source foods (ASF) was likely a direct response to Pleistocene environmental fluctuations as hominins began deploying innovative cognitive solutions and foraging behaviours to explore new dietary niches (Kaplan et al., 2000).

It might be said that, among extant primates, only humans and panins share a common behavioural adaptation (a synapomorphic trait) to a carnivorous diet (Dominguez-Rodrigo & Pickering, 2017) and show complex social systems. Their behavioural and cognitive qualities might thus differ in degree but not in kind, and hence, social and ecological selection pressures may have played a vital role in their evolution. In order to tackle the basic tenets of hominin carnivory, one should first elucidate its evolutionary pathways and implications for contemporary humans.

This chapter then attempts to delineate the elementary structures of human carnivory, drawing upon ethnographic, archaeological, and primatological investigations to highlight the main differences and similarities in meat acquisition patterns within the primate order. It suggests a possible evolutionary scenario for the different modalities in meat-eating strategies among the Shuar as well as other contemporary forager-horticulturalists. This is based on the following theoretical assumptions. First, a comparison of the behavioural and cognitive complex (i.e., tool use, cooperative hunting, and meat sharing) within and between species may shed light on the most basic cognitive, social, and technical skills for meat acquisition. Second, it is hypothesised that, as far as predatory carnivory has been internalized gradually in the *Homo* lineage, relations with prey taxa necessitated higher-order categories of representation as meat-eating strategies became more cognitively demanding and sophisticated. As a corollary, it is postulated that Indigenous peoples' higher-order regulatory devices (e.g., food taboos and ritual regulations of trophic interactions) must intersect with the most basic behavioural and ecological processes to

maintain trophic levels. These, one might say, are trade-offs between the energetic costs of maintaining a large brain (via the modification of animal flesh and assimilation of high-quality biological elements such as protein and fat) and the conservation of prey communities. Ultimately, these adaptive behaviours prevalent among the Shuar and other Amazonian peoples serve as empirical platforms to speculate how meat-eating strategies may have evolved from ancient human-megafaunal interactions.

3.1 Embodiment and cognition in human carnivory

It is assumed that the last common ancestor of *Pan* and *Homo* probably engaged in hunting and meat-eating activities (Dominguez-Rodrigo & Pickering, 2017; Wood & Gilby, 2017). Archaic hominids like *Ardipithecus ramidus* may have captured prey through somatic means (viz., by hand either on the ground or in trees), a pattern similar to chimpanzees (Stanford, 2012: 145). Likewise, taking chimpanzees as referential models, Pickering & Dominguez-Rodrigo (2010: 110) argue that "pre-lithic hominids likely hunted small animals, which did not require extrasomatic processing to consume." By contrast, it is believed that scavenging was the first prey-acquisition pattern employed by hominins, who may have primarily exploited marrow (fat) rather than flesh (protein) (Blumenschine, 1991). In the Pliocene, with basic percussive technology, this foraging behaviour may have provided hominins access to within-bone nutrients rich in fat from large-animal resources (Thompson et al., 2019). Not surprisingly, the assimilation of animal matter and its rich packages of macronutrients and micronutrients (e.g., protein, fat, iron, zinc, vitamin A, vitamin B-12) (Murphy & Allen, 2003; Ben-Dor et al., 2021) was likely the driving force behind both scavenging and hunting patterns among early hominins.

While incorporating high-quality animal products may have been the primary biological determinant for our ancestors' adaptive shift in dietary patterns, little is known about the relational processes (bodily and cognitive engagement between agents) involved in those trophic associations. Speculatively, hominin carnivory may likely have emerged as a highly relational embodied activity (be it hunting or scavenging) of meat acquisition in which the processes of tracking, chasing, stalking, touching, killing, butchering (cut and percussion), and chewing of animal bodies triggered a myriad of sensible qualities exemplified in the modification and assimilation of matter (i.e., flesh, bones, blood, and other body fluids). This ancient behaviour thus indicates complex patterns of adaptation and cognitive engagement with physicalities that provided the means for dietary expansion (Plummer et al., 2023), introducing significant quantitative and qualitative changes throughout hominin evolution (Isaac, 1978; Aiello & Wheeler, 1995; Stanford, 1999; Navarrete et al., 2011).

Interestingly, archaeological evidence from Nyayanga, Kenya, suggests that nearly 3 Mya *Paranthropus* sp. could have made stone tools and butchered animal carcasses (including megafauna like hippopotamid taxa) (Plummer et al., 2023). Hence, this archaic hominin would have modified abiotic and biotic components (making stone tools and processing large-animal carcasses) and assimilated significant biological properties epitomised in high-quality animal products. It is thus highly likely that *Paranthropus* was actively engaging in a higher trophic level, exploiting the benefits of nutritional elements derived from consuming meat and marrow. Even if environmental fluctuations were strong selection pressures for a dietary shift in ancient hominins, the socio-ecological implications for even the lowest degree of carnivory might have been substantial. As such, within specific environmental constraints, the emergence of hominin carnivory could have opened the way for new ecological relationships where varying agentive

forces modified and assimilated each other. Carnivory, conceived here as the highest degree of bodily exposure (interspecific physical contact and co-contamination of pathogenic organisms), likely exerted a significant cognitive load in early *Homo,* causing the selection for novel cognitive faculties as the brain increased in size (Kaplan et al., 2000). The evolution of human cognition would therefore likely have relied substantially on centripetal relational processes that stemmed from the most basic exchanges of entities' bodily compounds.

3.1.2 On relationalities

Let's elaborate on the relational processes involved in the carnivorous dietary niche of ancient hominins. Imagine a group of Pliocene ancestors scavenging on a large animal carcass left by sabertooth felids. There, they were pounding the bones with stone tools and tree boles to obtain marrow. While relishing the package of inside-bone nutrients (Thompson et al., 2019), they confronted other agentive forces immersed in the same spatio-temporal dimension of trophic interactions. From pathogens circulating in animal matter to maggots feeding on the putrefying corpse to other carnivores and scavenger animals, this wide array of taxa was most likely in close contact with our archaic relatives. Take, for example, another Pliocene scenario in which *Australopithecus afarensis* (~3.39 Mya) was both cutting and pounding with stone tools the bones of a large ungulate to obtain flesh and marrow (McPherron et al., 2010). Under these potential circumstances, a similar pattern of multispecies encounters (from microorganisms to apex predators) may have arisen from even the most basic form of subsistence strategies. Alternatively, even in the case of pre-lithic hominins (e.g., *Ardipithecus ramidus*) who, as putative hunters, may have preyed upon small animals (Pickering & Dominguez-Rodrigo, 2010; Stanford, 2012), the

relational pattern of interspecific interactions (albeit probably in less degree) would likely have caused in the former a considerable intensification of cognitive processes.

Two hypothetical consequences might have emerged from the highly embodied and relational activity of meat acquisition among early hominins. Firstly, there was likely a simultaneous intensification of both the assimilation of high nutritional values and the degree of cognitive abilities employed in procuring animal matter. Indeed, hominin carnivory and its high degree of bodily immersion in specific socio-ecological interactions (from the tracking to the consumption of prey taxa) may have involved complex relational processes between organic and inorganic matter (e.g., Finkel & Barkai, 2024). Different agents (from microorganisms to predators to scavengers to plants to stone tools) may thus have been engaged in the processing and consumption of animal carcasses. This, coupled with hominins' highly multisensory engagement with animal tissues and fluids and the incorporation of high-quality nutrients, would likely have selected for increased cognitive skills.

Secondly, a complexification of socio-structural patterns likely occurred through the process of meat acquisition from large animals. According to Ben-Dor & Barkai (2020), unlike small and medium-sized animals, large animals would have yielded high-fat content and high energetic return, requiring only rudimentary technology to obtain their nutritional properties. Percussion scavenging among Pliocene hominins is just a clear picture of how elementary forms of large-animal exploitation might have triggered complex social relations, such as intergenerational and cross-gender cooperation between group members in butchering activities (Thompson et al., 2019: 9). While preying upon small animals could have exerted significant selection pressures in the socio-cognitive niche of the earliest hominins, the implications for the evolution of higher levels of sociality must have been constrained by the small amount of animal matter available to consume

and socialise (e.g., Pickering & Dominguez-Rodrigo, 2010; Stanford, 2012). On the other hand, the acquisition of megafauna taxa was likely a primary evolutionary driver of novel behavioural and cognitive capabilities as hominins began to immerse in highly embodied relational processes (via cooperative butchering, meat sharing, carcass patrolling, and perhaps some forms of reciprocal exchanges) that enabled both the incorporation of abundant nutritional components and the amplification of levels of sociality (primarily due to a large amount of available animal matter) (Linares Matás & Yravedra, 2021).

Ben-Dor & Barkai (2024) suggest that megafauna extinctions during the Pleistocene were likely due to the hominins' preference to acquire prime adult animals for their higher fat content. Megafauna extinctions, thus, may have been an ecological agent of selection for evolutionary changes (the transformation of behavioural and cultural patterns), driving humans to specialise in acquiring small game (Ben-Dor & Barkai 2021a). This, consequently, likely triggered the development of smaller and more precise hunting weapons, thus underscoring the evolution of cognitive skills (Ben-Dor & Barkai, 2023). The decline in large prey may have also contributed to a major reliance on plant foods, a pattern observed among some African hunter-gatherer populations such as the Hadza and the Ju/'hoansi (!Kung) (Ben-Dor & Barkai, 2020). Nevertheless, the specialisation in hunting skills and technological innovations for acquiring small taxa were likely contingent on ancient cognitive and behavioural patterns that stemmed from high levels of contact intensity with abundant animal matter. The importance of megafauna may therefore lie in the capacity for complex socialisation that hominins must have implemented for the modification (butchery and meat sharing) and subsequent assimilation (commensality) of large quantities of animal tissues.

It might also be argued that apart from the possible early emergence of hominin carnivory and, accordingly, its evolutionary consequences for the *Homo* species (encephalisation and complex behaviour) (Isaac, 1978; Aiello & Wheeler, 1995; Stanford, 1999; Navarrete et al., 2011), our ancestors' cognitive socio-niche (see Fuentes et al., 2023 for a discussion of the potential complex behaviour of the small-brained *Homo naledi*) acted as a buffer against environmental constraints. After all, the evolution of the hominin lineage is intricately intertwined with other entities' physical, morphological, behavioural, and cognitive qualities, shaping our biosocial and cultural realities. If, for example, within a food web, energy circulation goes from the sun to the lowest trophic level to the highest one represented by carnivores (MacArthur, 1955), predator-prey interactions are essential for its stability (Gross et al., 2009). This chain of species interactions within which modification leads to assimilation and vice versa is likely to be drastically disrupted by maladaptive behaviours. So the question of human evolution appears problematic whenever the alleged intellectual superiority of our species warrants a technocultural development that crosses ecological thresholds, ignoring nature's fundamental role in our existence.

Consider the emergence of hominin carnivory. Our ancestors' behaviour suggests, in particular, complex patterns of adaptation and cognitive engagement with physicalities that provided the means for expanding the diet (Plummer et al., 2023), introducing significant quantitative and qualitative changes throughout hominin evolution. While sophisticated cognitive abilities were critical in early hominins to manufacture Oldowan tools, butcher animal corpses, and ultimately assimilate essential nutrients (from meat and marrow), modern humans' behaviour paradoxically reverses the critical role of contact intensity involved in predator-prey interactions. It is precisely for this rift in the relational processes of modification and assimilation that the capitalist mode of production has taken a leading role in altering trophic interactions worldwide. This, in turn, has

considerably devalued a crucial stage in hominin evolution and, hence, all of the implications regarding our ancient relations with the material world.

Notably, contrary to the deep immersion in biosocial and ecological interactions involved in activities of meat procurement exhibited by ancient hominins and extant foragers, the rationale of contemporary human carnivory is to mechanise and dismantle otherwise multispecies relationalities within trophic chains. Although our genus might have gradually taken the prominent role of hunters (Domínguez-Rodrigo et al., 2021), thus prompting the extinction of a variety of taxa (e.g., large carnivores) since the Pliocene and Pleistocene (Faurby et al., 2020), according to Coimbra et al. (2020), present-day human carnivory is threatening one-quarter of the world's vertebrates through the mechanisms of livestock production, predation, and bycatch. It is as if the higher the human cognitive capacities, the more we disconnect ourselves from the basic tenets of organismic life. It is necessary, therefore, to overturn this existential paradox, postulating that the most basic form of cognition in life forms is the capacity to be immersed (viz., highest bodily awareness of environmental pressures) in the enmeshments of Earth's systems across different spatiotemporal scales. It should also be noted that the necessity of environmental mediation for the organisms' survival and fitness maximisation (through modification and assimilation) is intimately correlated with species-specific bodily structure, cognitive abilities, and behaviour towards ecological niches. Consequently, if we add the organisms' capability to be immersed and, in turn, compenetrate each other against given environmental selection pressures (namely niche construction, adaptive behaviour, and all the cognitive skills to meet biosocial needs), we bring to the fore the quintessence of complex life.

One may hence assume that, in order to gain a better understanding of human evolution, encephalisation should primarily be posited as the inexorable evolutionary leap that divides *H.*

sapiens from early hominin species (Ponce de León et al., 2021). For example, if we consider the evolution of human carnivory, an unbridgeable chasm persists between modern large-scale predatory practices of meat acquisition and the immersive, embodied, and relational one practised by our hominin ancestors. To bridge this gap, we must thus revert to the ontological condition of organismic life consisting of millions of years of organism-environment interactions. In this sense, traditional hunting activities foreground the elementary cognitive abilities for well-adapted socio-ecological behaviours, which, in turn, trigger a high degree of sensible qualities through trophic exchanges between agents. As we shall see, and as shown by the Shuar and other forager-horticulturalists, these ancient relational processes would likely have shaped the human socio-cognitive niche and, hence, the capacity to relate with prey taxa in concrete and abstract forms.

3.2 Hunting patterns

The gradual adaptive characteristics of our genus might have allowed a certain degree of ecological balance in the Amazon biome. Challenging the alleged harsh environmental conditions (Meggers, 1954), ancient Amazonian societies actively transformed and engineered the physical environment (Balée, 2013; Ellis et al., 2023; Aceituno et al., 2024) so that inherited ecologies play a crucial role in current populations. How did human niche construction operate among Amazonians to form the basic eco-cosmic structure that sustains the life processes? What are the factual implications of the culturally transmitted ecological knowledge and metaphysical assumptions that pervade indigenous thought? One prominent example is the Shuar conceptualisation of hunting as a relational, ecological, biological, and metaphysical endeavour. This subsistence adaptation, however, is highly dependent on particular forms of human-environment interactions to

successfully activate a vast range of relational processes spanning trophic, socio-structural, and socio-cosmic spheres (Abad Espinoza, 2022c). Interestingly, in contrast to the regular hunting expeditions (primarily to acquire mammals) reported by Zapata-Rios et al. (2009) among the Shuar of Miasal, the hunting behaviour exhibited by the Shuar of the communities of this study was less frequent. Informants therefore constantly complained that hunting activities have decreased significantly mainly due to the loss of local ecologies via a pervasive process of deforestation. In principle, the profound biosocial interactions involved in meat-eating strategies have been thoroughly dismembered.

Let us begin with the interrelated levels of relations mentioned previously. Organisms, as active agents of ecological and biological processes (Levins & Lewontin, 1985; Odling-Smee et al., 2003; Okasha, 2005; Baedke et al., 2021), are entrenched in a given physical environment which mediates any form of relation determined by the intensity of their bodily immersion and cognitive engagement. Contact intensity among organisms initiates a complex set of socio-ecological sequences and feedback loops whose persistence and thrivability depend on relational timescales through which a trade-off between modification and assimilation is attained. Specifically, the more an organism is cognitively immersed in circumscribed ecological niches, the greater its ability to skillfully modify the environment and assimilate its material properties, thus maintaining its position in the trophic structure.

Humans, however, try to change this course through harmful and invasive cultural practices eradicating species dependent on narrow niches (Wang et al., 2023) or creating trophic cascades (Estes & Duggins, 1995) that drastically disrupt ecosystem structure. Following this line of reasoning, it becomes evident that although humans represent a prominent destructive force of Earth's systems, this does not follow a progressive evolutionary line. As a specific cultural

ontology and worldview of Western civilisation, anthropocentrism fails to account for the different bodily and cognitive interactions within and between organisms immersed in localised ecological niches. Such thinking and way of approaching the material world set us apart from the mechanisms that had facilitated billions of years of life processes. Environmental mediation, as a biogeophysical centripetal force, does not operate among organisms whose maladaptive behaviour dissolves ecological relations rather than immerses in their fabric. If anthropocentric thinking induces several alterations to intricately interwoven ecological patterns, then how do indigenous ontologies and ecological knowledge maintain ecosystem services instead of harming them? The answer to this question is likely to be found in traditional subsistence activities like hunting exhibited by extant forager-horticulturalists.

If we limit the geographic distribution of hunting to specific ecological regions, i.e., the Amazon, the Subarctic, the Arctic, and Southeast Asia's tropical forests, a particular underlying structural pattern emerges. Embedded in local Indigenous ecologies, thus, notions of reciprocity, predation, and mindful negotiations between humans and other entities guide the material, socio-cosmological, and metaphysical dimensions of hunting (e.g., Hallowell, 1960; Reichel-Dolmatoff, 1971; Karim, 1981; Brightman, 1993; Descola, 1994; Lima, 1999; Valeri, 2001; Vitebsky, 2005). Based on oral narratives, components of this underlying structure can be inferred from Shuar traditional hunting and hence heuristically described as follows.

On a material level of relations, hunting involves a radical relational activity via which the body comes into contact with other organisms' agentive forces that modify and assimilate physical properties founded on the ecosystem's food web. Environmental mediation and organismal agency are thus evolutionary forces that shape and regulate the circulation of organic (e.g., microbes, bodily fluids and flesh) and inorganic (e.g., rocks, minerals and water) matter. As such, procuring

high-quality protein derived from game animals depends on high cognitive abilities to track (O'Connell et al., 1988) and even mimic (Moser et al., 2023) the specific behaviour of taxa. From an ethological standpoint, animals' behavioural patterns are grasped through sophisticated empirical knowledge culturally transmitted over time. Informants' statements of the particular behaviour of animals (i.e., sexual, social, feeding, communicative and movement) are, cognitively speaking, corroboration of the complex ecological knowledge and multisensory qualities evolved in a given physical environment. For example, O'Connell et al. (1988) reported that the Hadza of Tanzania monitor the behaviour of vultures, lions (*Panthera leo*) and hyenas (Hyaenidae) to exploit potential scavenging opportunities. Likewise, Nawech, a middle-aged Shuar man from the Yawintz community, explains the behaviour exhibited by his grandparents to increase hunting opportunities: “During a hunting expedition, our people used to be very attentive to the sounds emitted and the footprints left by a particular prey.” Notably, most of the Shuar considered the knowledge of the behavioural ecology of a particular taxon a primary factor that would heavily determine the procurement of animal matter.

Fig 3.1. Nawech in his house in Yawintz.

On a socio-structural level, hunting skills go hand in hand with strict cooperation among community members, whether men, women or even dogs (see also Descola, 1994; Karsten (2000[1935]). When asked about the significance of the utilisation of dogs (*Canis lupus familiaris*) in hunting activities, Nawech gave an explanation primarily focusing on the ancestral practice of giving psychoactive plants to dogs in order to enhance their hunting skills:

> Dogs were highly used in the past by our grandparents to track animals in the forest. They were thus very helpful in monitoring and hunting different prey with the aid of the hunter. My grandfather used to give dogs a particular kind of *maikiua* (*Brugmansia sp.*) to help dogs obtain specific visions and then become proficient hunters. With the aid of *maikiua* (*Brugmansia sp.*), then, dogs could achieve some attributes such as strength and courage indispensable to face certain dangerous animals (Nawech, Yawintz community).

Interestingly, the use of *Brugmansia sp.* to boost dogs' hunting abilities narrated by Nawech, concords with the ethnoveterinary knowledge documented among Amazonian (e.g., Shuar, Quichua, Awajún/Aguaruna) and the Caribbean peoples of Trinidad and Tobago (Lans et al., 2000; Kohn, 2007; Jernigan, 2009; Bennett & Alarcón, 2015).

Additionally, strategically and as an elaborate activity, the preparation and performing of traditional hunting thus necessitate gender and cross-species collaboration for successful prey acquisition. Structurally, social activities ranging from tool-making to stalking prey to preparation and food sharing are by-products of the high degree of bodily and cognitive engagement involved in hunting. It is also important to note that relationships within the domain of marriage and mating opportunities have depended significantly on patterns of meat-acquisition strategies. Proficient hunting skills, then, appear to have played a key role in the Shuar social system. Here is Nawech again:

> In our grandparents' time, the best hunter used to obtain more than one wife. If one man was deemed a good hunter, he could go to a household and then ask the girl's father if he could give her to him in marriage; if the girl had more than one sister, he could even marry all of them. The main point was that a good hunter could provide sufficient meat to sustain even a big family (Nawech, Yawintz community).

From Nawech's narrative, we can infer that, notwithstanding the considerable decrease in hunting activities within the communities, traditional meat acquisition strategies are still remembered as primary mechanisms for biosocial reproduction. A similar pattern has also been documented among other Amazonian societies such as the Sharanahua of Peru (Siskind, 1973) and the Bolivian Sirionó (Holmberg, 1969) and Tsimane' (Gurven & von Rueden, 2006). Interestingly, among chimpanzees (*Pan troglodytes*), a rudimentary form of meat-mating exchanges has been observed, laying the foundation for the development of the meat-for-sex hypothesis (e.g., Stanford, 1996; Gomes & Boesch, 2009). This, in brief, may hence hint at the deep evolutionary roots of meat procurement in the hominoid lineage and the implications for the subsequent patterning of biosocial systems.

The success of human carnivory is therefore highly dependent on socially transmitted empirical knowledge and cooperation/exchange on the one hand and the conjunction between raw animal flesh (nature) and culinary fire (culture) (Lévi-Strauss, 1969: 336) on the other. It has been assumed that cooking fire had important implications for the biological and cognitive evolution of the genus *Homo* (Wrangham et al., 1999; Wrangham & Carmody, 2010); the evolutionary significance of cooking may hence derive from the substantial increase of energy gained from meat (Carmody et al., 2011), the reduction of the cost of its digestion (Boback et al., 2007), and the considerable reduction of pathogenic bacteria that grow on the flesh of freshly killed animals (Smith et al., 2015). It is noteworthy that, among Amazonian peoples, the aforementioned implications of cooking fire might be robustly supported empirically by the tendency to overcook meat, and, on a more theoretical plane, reducing animal subjects into objects (Fausto, 2007: 504) appropriate for human consumption. Interestingly, unlike the superstructural mechanisms to desubjectivise prey (and hence transforming the inherent qualities of animals into something edible through, e.g.,

shamanic intervention) (Viveiros de Castro, 2004) exhibited by some Amazonian societies (e.g., Piaroa: Kaplan, 1975; Makuna: Århem, 1996; Jotï: Zent, 2013); with the exception of the red brocket deer, *Mazama americana* (as will be described later), the Shuar do not exhibit a specific ritual behaviour during butchering, cooking or consumption of animal matter. And yet, even if the Shuar endow fire with mythological significance, apart from the preparation of the psychoactive plants' decoctions (in which fire is likely to play a prominent role in the conjunction of mental and material properties see Chapter 6), its significance in culinary practices appears circumscribed to the physical order of things.

Furthermore, the cardinal importance of the trophic structure is foregrounded at the intersection between modification (human niche construction) and assimilation (food chain), which, for its maintenance, requires the intervention of metaphysical negotiations and regulations. Although the Shuar immerse in species-specific ecological realities (via modification and assimilation of physical properties in hunting) through complex cognitive abilities, socially transmitted environmental knowledge, and cooperation among community members, a trade-off must be attained between these empirical factors to constrain negative anthropogenic impacts. This, in short, is devised by superstructural mechanisms, viz., metaphysical principles and what Rappaport (1968) conceived as cosmological axioms.

On a socio-cosmic and metaphysical level, the relational process of hunting activities involves a series of agentive forces whose biological existence is underpinned by mytho-cosmological assumptions. Most lifeforms are thus part of a primordial order in which subjective qualities (i.e., the capacity to act and think) pervade across timescales. Because of these essential attributes, predator-prey interactions are multidirectional in that varying degrees of intentionality model the level of sociality and trophic exchanges. For any trophic exchange to occur through hunting,

humans must abide by the social norms that endow the prey with specific kinship ties with the hunter. For example, according to Tzama, a shaman and leader of the Twasap community: “When hunting was a widespread activity among our people, each hunter used to respect the animal prey and then referred to it as a brother-in-law.” This form of addressing game animals as affines (i.e., brother-in-law) has also been reported among other *Aents Chicham* societies, such as the Achuar (Descola, 1994) and Awajún/Aguaruna (Brown, 1986). By contrast, consanguineal relations (animals are called both grandfathers or grandmothers) are prevalent among the Rock Cree (Brightman, 1993) and those of erotic desire among the Desana (Reichel-Dolmatoff, 1971).

Why has this particular sociality evolved between indigenous peoples and animal taxa? Is it plausible that ancient human-animal interactions in the American continent might provide clues regarding current indigenous worldviews and ecological knowledge? If contact intensity between humans and animals extends beyond the basal trophic structure involving relationships constructed and enacted socially, how are these connected with higher levels of metaphysical complexity? In sum, natives' theoretical apparatus, whose function is the conservation of the flux of life, derives from subjective experiences well grounded in highly dynamic material realities. Thus, the Shuar are a prominent case of how ancestral hunting operated in highly cognitive, embodied, and relational trophic niches that, to regulate them, higher-order metaphysical categories were needed.

3.3 The Shuar trophic niche and relational ecologies

During fieldwork, it became evident that a persistent and pervasive process of deforestation had turned the once thickly forested areas surrounding the communities into a few scattered forest patches. In the neighbouring Tawasap and Yawintz communities, for example, informants' oral

traditions echoed the lush forest saturated with game animals. Thus, pointing to the dirt road that crosses the Yawintz community, Nawech describes the main characteristics of the forest that used to cover the communities:

> Long ago the Yawintz community was a place with a huge forest; there was also a salt lick in which different animals such as silvery woolly monkeys (*Lagothrix lagothricha poeppigii*), white-lipped peccaries (*Tayassu pecari*), and South American tapirs (*Tapirus terrestris*) used to feed on it. The salt lick was thus a prominent place to hunt those animals; the Shuar who lived in Mura (Tawasap community), in fact, used to frequently descend the mountain (Mura) in order to hunt the animals in the salt lick. Unfortunately, when the Salesians founded the FICSH (Federación Interprovincial de Centros Shuar), the communities were established, giving room to the destruction of a great part of the forest (Nawech, Yawintz community).

Likewise, as creatures of the Anthropocene (Ficek, 2019), cattle have colonised and modified the local ecology of the Wawaim community. For instance, according to the reminiscences of Nanki, a Shuar elder: "Wawaim was a dense forest in which balsa trees (*Ochroma pyramidale*) and wild animals were abundant; here we used to procure a great amount of fresh meat." These local ecologies, embodied in a wide array of taxa, thus provided the necessary conditions for the socio-ecological relationships involved in traditional hunting and the assimilation of high-quality protein (Leroy et al., 2023).

If the Shuar still remember their historical ecology, this should not be understood as memories that bear traces of a romantic and idealised past. Rather, this is to be grasped as a tangible reality where the most basic socio-ecological relations occurred, providing life's continuity and regeneration. If a given ecosystem is a demarcated biogeophysical milieu in which living and non-living things exchange material components (Rappaport, 1984), then life is a complex and continuous contact process between physicalities. From an evolutionary standpoint, the Amazon

rainforest illustrates how human niche construction operated at different paces since the Late Pleistocene human expansion in the region. Thus, the possible Late Pleistocene human-megafauna interactions documented in rock pictographs of the Serranía de la Lindosa, Colombian Amazon (Morcote-Ríos et al., 2021; Iriarte et al., 2022; Aceituno et al., 2024; Hampson et al., 2024; Robinson et al., 2024) and the recent archaeological evidence of anthropogenically modified landscapes which harboured complex social structures (Saunaluoma et al., 2021; Prümers et al., 2022; Walker et al., 2023), point to dynamic coevolutionary processes between entities. This active composition of biosocial realities in continuous interaction and modification foregrounds niche construction's malleability and bidirectionality (Fuentes, 2016).

Unarguably, a dynamic engagement between organisms depends on the physical environment as a mediator. The environment thus attracts biological agents centripetally, which must conform to specific material conditions through bodily immersion, and, hence, complex interactions between plasticity, symbionts and niche construction are likely to occur in this context (e.g., Rohner et al., 2024). Immersion is, in principle, the highest degree of contact intensity by which organisms' embodied cognition allows the perception of nature's fundamental properties through a chain of modification, assimilation, and compenetration within ecological niches. Of paramount importance is the practice of traditional hunting to better appreciate complex relationships ranging from trophic exchanges (i.e., modification, assimilation and compenetration of material properties) to metaphysical concepts (i.e., modification, assimilation and compenetration of spiritual properties). As noted, these biosocial and metaphysical enmeshments appear prominently in the ethnographic records of Indigenous societies living in different ecosystems ranging from the Amazon (Reichel-Dolmatoff, 1971; Descola, 1994; Århem, 1996; Lima, 1999) to circumpolar territories (Hallowell, 1960; Tanner, 1979; Brightman, 1993; Vitebsky, 2005) to Southeastern Asia

tropical forests (Karim, 1981; Howell, 1989; Valeri, 2001). Human niche construction can thus imply a varied set of relationships between humans and more-than-human beings whose adaptation depends on the degree of cognitive and bodily engagement established with a particular econiche.

It is hardly surprising that the longing for subsistence activities like hunting among the Shuar highlights the relational nature of the Amazon biome. Viewed through an evolutionary lens, it further addresses the implications of human carnivory since the first arrival of *H. sapiens* in the Americas (Braje et al., 2017). Humans' behavioural plasticity may have allowed the exploration, alteration, and restructuration of novel ecological regions and trophic niches. As for early hominins and closest living relatives such as chimpanzees (*Pan troglodytes*) and bonobos (*Pan paniscus*), hunting and meat-eating represent a synapomorphic trait and behavioural adaptation (Dominguez-Rodrigo & Pickering, 2017). Consequently, taking predatory carnivory to a higher level, humans took over the food chain, occupying the top trophic level in these new biomes. This behavioural phenomenon, however, led to a series of socio-ecological, mytho-cosmological, and ontological adaptive negotiations between humans and other entities.

At one spatio-temporal level, hunting and predatory carnivory likely drove South America's Late Pleistocene megafaunal extinctions (Mothe et al., 2020; Prates & Perez, 2021; Carlini et al., 2022; Prates et al., 2022; Ferreira et al., 2024). At another spatio-temporal level, hunting activities and close human-animal interactions are currently considered critical drivers of cross-species pathogenic transmission (Milstein et al., 2020; Milstein et al., 2022; Shaffer et al., 2022; Souza et al., 2022). Notably, the coevolutionary interactions between humans, extinct Pleistocene megafauna, and extant animals likely provide the basis for indigenous ontological, eco-cosmological, and mythological systems. On a more metaphysical level, the Amazonian regulation and negotiation of multispecies relationships, trophic exchanges, disease aetiology, and socio-

structural patterns involve a complex set of spiritual forces defying the architecture of objective reality (e.g., Lima, 1999; Conklin, 2001; Fausto, 2007). Indigenous concepts concerning the Amazon's biogeophysical properties thus mirror the cosmos' primordial agentive qualities. After all, megafauna extinction might have provided natives with empirical evidence to adjust their subsistence strategies via profound philosophical reflections about the natural world. The apparent positive correlation between metaphysical presuppositions and entities' adaptive biosocial qualities thus reflects unique coevolutionary processes immersed thoroughly in local ecologies.

3.4 From basic cognition to higher-order categories of trophic interactions

Wild meat's great importance is well-documented among Lowland South America's indigenous societies (Siskind, 1973; Rival, 1993; Descola, 1994; Gurven & von Rueden, 2006; Milstein et al., 2020). For example, according to Descola (1994: 250), the Achuar of the Ecuadorian Amazon consider meat a "major contribution to well-being, claiming that life is hardly worth living without it." Likewise, Milstein et al. (2020) suggest that for the Waiwai of southern Guyana, hunting, butchery, and consumption of wild animals play a critical role in shaping their way of being despite the close contact with zoonotic pathogens. Although the Waiwai appear to dispose of the carcass infected by parasites, the extensive filarial infection of a necropsied black spider monkey (*Ateles paniscus*) does not pose any problem if cooking with the meat. These filarids, Milstein et al. (2020) report, are called *poroto maúre* (spider monkey cotton) by those people and are thought to serve spider monkeys to make aprons (*keweyú*). If, for the Waiwai, these entrails embody species-specific ontological categories that upset empirical notions of parasitic infection, then it might be said that trophic interactions are entwinements of biotic components and indigenous concepts of

living things. Interestingly, unlike other primates, meat procurement strategies such as the production and use of stone tools caused in the *Homo* lineage a leap towards brain and cognitive evolution ranging from causal and normative cognition to the emergence of language (Stout & Chaminade, 2012; Gärdenfors & Lombard, 2020; Birch, 2021). This most likely indicates that, in the case of human carnivory, abstract thinking has provided the means to expand trophic exchanges beyond the limits of physical nature.

Traditional hunting and meat-eating practices among the Shuar are a remarkable example of how ecological relations and patterns of behaviour overlap with abstract concepts. Even though most ethnographic data are drawn upon informants' oral narratives of past foraging activities and not from direct empirical evidence, the significance of predatory carnivory in patterning Indigenous eco-cosmological and ontological systems is unquestionable. At its most basic, the mediatory role of the Amazon biome for human niche construction and the socio-ecological effects of such anthropogenic activities have provided particular conceptualisations of the trophic niche of these people. A carnivorous diet has primarily driven Amazonians to enhance their social, technological and cognitive skills to procure high-quality protein. Constrained by environmental factors, such complex skills are best exemplified in hunting tools that likely emerged from the high level of bodily and cognitive engagement with the plant kingdom.

3.4.1 Elements of tool-assisted vertebrate predation

Even though perishable tools are likely to be invisible matter for the archaeological record (Almeida-Warren et al., 2017; Pascual-Garrido & Almeida-Warren, 2021), the use of plant tools for the acquisition of vertebrate prey may have played a pivotal role in the life of our earliest

ancestors (Thieme, 1997; Marlowe, 2005; Pickering & Dominguez-Rodrigo, 2010; Thompson et al., 2019). Let's briefly illustrate the evolutionary significance of the use of plant materials in meat-eating strategies among the primate order. Remarkably, some non-human primates exhibit an analogous pattern of tool-assisted predation (e.g., the predation of vertebrate prey using jabbing sticks). For example, chimpanzees (*Pan troglodytes*) have been observed hunting bushbabies, *Galago senegalensis* (Pruetz & Bertolani, 2007; Pruetz et al., 2015), squirrels, *Protoxerus stangeri/Heliosciurus rufobrachium* (Huffman & Kalunde, 1993; Nakamura & Itoh, 2008) and mongooses (Wilfried & Yamagiwa, 2014); bearded capuchins (*Sapajus libidinosus*) lizards, *Tropidurus* ssp. (Falótico & Ottoni, 2014; Falótico, 2023); and ultimately Bornean orangutans (*Pongo pygmaeus*) have been observed attempting to catch walking fish (Russon et al., 2014). It seems therefore likely that high levels of relations with plant matter are at stake among these primates; this, of course, is well documented by these species' bodily engagement with plant tools (i.e., the degree of modification and/or manipulation of raw materials from the vegetal world) that enable them to penetrate particular trophic niches and then expand their dietary breadth (hence augmenting the species' nutritional intake) even amongst a low-level carnivory primate such as the orangutan.

Thus, the malleability of plant matter, alongside the high degree of primates' sensorimotor and sensible qualities involved in tool shaping and usage (from rousing to jabbing the prey), likely hint at the deep evolutionary roots of primate plant tool-use behaviour. It is thus highly likely that the LCA of panins or even of *Homo* and *Pan* used plant tools for foraging activities (Haslam, 2014). Yet, as shown by the use of food (fruits and vegetables) to lure and catch fish by brown capuchins, *Sapajus apella* and the manipulation of stick tools by Bornean orangutans, *Pongo pygmaeus* and bearded capuchins, *Sapajus libidinosus* to catch fish and hunt reptiles and mammals respectively

(Mendes et al., 2000; Falótico & Ottoni, 2014; Russon et al., 2014; Falótico, 2023), it is reasonable to believe that, throughout its evolutionary history, the primate predatory pattern might have depended significantly on the use of plant tools.

As with chimpanzee termite fishing, which, from a cognitive point of view, shows a wide array of behavioural and cultural variants in the modalities of plant-tool selection and alteration (i.e., variation in plant parts/materials modified and used as tools: bark, herb, stick) (Suzuki et al., 1995; Sanz et al., 2004, 2009; Almeida-Warren et al., 2017; Pascual-Garrido & Almeida-Warren, 2021); interestingly, the plant tool-using behaviour exhibited by the aforementioned primates in vertebrate predation shows, albeit in less degree of complexity, similar relational patterns of behaviour. The intensity of primate-plant interactions may well be the primary trigger of haptic experiences; e.g., 92% of tool source species (raw materials to manufacture termite-fishing tools) are also exploited for food by the Issa chimpanzees of Western Tanzania (Almeida-Warren et al., 2017). Perceptual experiences, however, are likely to be augmented by the immersive nature of tool-assisted meat acquisition and consumption; that is, phenomenologically speaking, the compenetration of organic matter (vegetal and animal) may stimulate higher-order levels of perception and instil novel forms of interspecies relationalities. That said, the mounting evidence of primate plant tool use, ranging from rudimentary digging tools for underground storage organs (USOs) extraction (Hernandez-Aguilar et al., 2007) to the more complex wooden spears for vertebrate hunting (Pruetz & Bertolani, 2007; Falótico, 2023) might shed light on the "archaeologically invisible" perishable tools (Almeida-Warren et al., 2017; Pascual-Garrido & Almeida-Warren, 2021) likely used by the earliest hominins. Plant tool use in vertebrate predation is therefore likely an ancient behaviour pattern (Pruetz & Bertolani, 2007; Russon et al., 2014); its evolutionary significance is nevertheless to be assessed by solid empirical observations and theoretical models.

After the short description of the nature of plant-tool use within the primate order, we can now return to our discussion concerning the implications of the modification of plant matter for meat procurement among the Shuar. As noted, comparing the hunting behaviour of the Shuar with that of the great apes shows substantial parallels in how culturally transmitted behaviours (e.g., tool use, cooperative hunting and meat sharing) facilitate trophic interactions. While these behavioural patterns appear to link humans with our closest living relatives in meat acquisition strategies, these only operate at a rudimentary level. At this socio-cognitive and material level, tool manufacture and use signal adaptive behaviour for procuring critical sources of animal nutrients. Both the chimpanzees who hunt bushbabies (*Galago senegalensis*) by thrusting spear-like trimmed branches (Pruetz & Bertolani, 2007) and the Shuar who hunted white-lipped peccaries (*Tayassu pecari*) with a chonta (*Bactris gasipaes*) spear modify plants to obtain and subsequently assimilate their preys. However, technologically speaking, unlike their primate relatives, humans exhibit a complex repertoire of plant tools and a wide variety of uses in hunting activities (see Marlowe, 2005). In this frame, the Shuar have thus been modifying the peach palm (*Bactris gasipaes*) to manufacture spears and blowguns, different palm petioles to make blowgun darts, and *Strychnos tomentosa* Benth. to fabricate poison for darts (Bennett, 1992; Bennett et al., 2002). So, while wielding a traditional *Bactris gasipaes* spear (*nanki*), which is primarily used nowadays in ritual activities and as a tourist attraction, Sharian, a Shuar elder from the Tawasap community, describes its ecological and ontological significance for hunting activities and warfare:

> With this chonta (*Bactris gasipaes*) spear our ancestors used to hunt and make war. Look how hard is the structure of the spear! This spear is very hard and powerful! Our grandparents used to believe that chonta palm (*Bactris gasipaes*) possessed the power of *arutam*; with this spear, a hunter could kill a big animal such as a white-lipped peccary (*Tayassu pecari*) and a warrior could kill his enemy (Sharian, Tawasap community).

It is therefore unsurprising that, given the behavioural ecology of the white-lipped peccary (and hence its gregarious and aggressive nature), some Amazonian societies equate the hunting of this species with warfare (Rival, 1996; Lima, 1999; Fausto, 2007). For example, Rival (1996) notes that the Huaorani of Ecuador hunt peccaries (whose meat is regarded as highly intoxicating and thus is consumed infrequently by the Huaorani) with *Bactris gasipaes* spears whereas other small mammals and birds are hunted with blowpipes (likely made from the softer wood of *Bactris gasipaes* according to the Huaorani); the opposition between these meat-eating strategies primarily stems from the act of killing the prey in that in the former the animal is fatally wounded by spear-thrusting (i.e., violent perforation of flesh, blood spilling and close contact between hunter and prey), whereas in the latter the animal is killed not precisely by the act of hunting but by curare poison (i.e., a painless death with a little amount of blood being shed and a detached relationship between hunter and prey) (see also Fausto, 2007). Lima (1999) has also reported that the Juruna of Brazil conceive the hunting of peccaries as complex material and metaphysical transactions (namely human and peccary shamans negotiate the potential trophic interactions) within which an inversion of perspectives is likely to occur (a hunter can transform into a peccary) if the hunter does not respect certain conditions. In this case, it might be inferred that, apart from the reversal of points of view, there is also an inversion of trophic levels, that is, a predator (hunter) becomes a prey (peccary) (Abad Espinoza, 2022c: 13).

The abovementioned ethnographic examples may very well illustrate that, from an ecological and socio-cognitive point of view, the complex modification of plant matter and, hence, the creation of hunting weapons (e.g., spears) to acquire animal matter (e.g., big animals) likely indicate the deep evolutionary and ontological linkage between humans, large prey and tools. As with Lower Paleolithic humans who may have established profound ontological and cosmological

associations with stone tools and large animals such as Proboscideans and fallow deers (*Dama mesopotamica*) (Barkai, 2021; Finkel & Barkai, 2024; Litov & Barkai, 2024), Amazonian foragers may have devised, probably due to the extinction of megafauna (e.g., Halfon & Barkai, 2020), conceptual apparatuses in which the regulation of trophic interactions depends significantly on complex and profound relations with plant materials and particular animal taxa. The evolutionary significance of fat-rich animals (Ben-Dor & Barkai, 2024) might be supported, at least in theory, by the Amazonian superstructural mechanisms (from food taboos to shamanic mediation) that aim at the neutralisation or even avoidance of the consumption of certain large animals. In summary, over thousands of years, the coevolution between cognitive and technical skills, on the one hand, and the social and biophysical dimensions, on the other, have provided these people with higher levels of ecological understanding. As we will see below, this is a phenomenon where the material and the technological complex intersect with highly abstract notions that modulate particular trophic associations.

3.4.2 The regulation of trophic associations and preservation of prey communities

What, then, are the selection pressures for adaptive meat-eating behaviours underpinned by abstract categories of trophic interactions? We have therefore hypothesised that, as far as predatory carnivory has been internalised in the *Homo* lineage, relations with prey taxa necessitated higher-order categories of representation as meat-eating strategies became more cognitively demanding and sophisticated. It is, then, at the junction between complex modification of biophysical elements (e.g., toolmaking, animal butchery and cooking with fire) and the assimilation of high-quality protein and fat that the emergence of abstract regulatory mechanisms has allowed the continuity

of predator-prey interactions. Moreover, adaptive behaviours, such as Amazonian food taboos on large mammals (Ross, 1978), likely arose from ancient human-megafaunal interactions (Iriarte et al., 2022). The demise of ancient megafauna may thus have triggered in the Amerindians' cognitive repertoire those adaptive strategies that deem protein and fat intake a matter of biosocial and metaphysical transactions. Throughout an evolutionary framework, this chapter has thus tried to analyse the basic cognitive, social, and technical skills for meat procurement within the primate order. As a result, it might be argued that, evolutionarily speaking, the superstructural mechanisms to regulate predator-prey interactions (from the mediatory role of shamans and game masters to food prohibitions to the ritual treatment of the prey) exhibited by forager-horticulturalists from the Amazon (Reichel-Dolmatoff, 1971; Kaplan, 1975; Ross, 1978; Descola, 1994; Lima, 1999; Fernández-Llamazares & Virtanen, 2020) to circumpolar regions (Hallowell, 1960; Tanner, 1979; Brightman, 1993; Vitebsky, 2005) to Southeastern Asia tropical forests (Karim, 1981; Valeri, 2001) are likely to be intricately entwined with the most basic forms of behaviour and cognition found in our primate relatives.

Even if hunting activities have been nearly completely diminished in the Shuar communities, informants' oral narratives of past hunting behaviours and the prohibition of eating particular animals may represent the last remnants of ancient ecological knowledge. It is therefore highly likely that socially transmitted ecological knowledge and ritual behaviour have been halted primarily due to different external factors, such as habitat loss, religious acculturation, and secularisation. Based on this, it appears that only a very few individuals such as shamans (*uwishin*) or wise men (*wea*) possessed sufficient knowledge about the significance of the prohibition of eating certain animals; a prominent example of this kind of food taboo is the prohibition of eating the red brocket deer (*Mazama americana*). As Tzama describes this ancestral ritual behaviour:

> According to our ancestral traditions, it is permissible to only consume the meat of the *suu japa* (gray brocket deer, *Mazama gouazoubira*); this deer is small and its meat is soft and tasty. By contrast, we are prohibited from eating the red *japa* (red brocket deer, *Mazama americana*); this deer is inedible because he is the dog of the *iwanch* (evil spirit). Yet my grandfather used to tell me that if we paint this animal with *ipiak* (*Bixa orellana*) we can neutralise the evil spirit that dwells inside him; the meat would thus become safe for consumption (Tzama, Tawasap community).

It is noteworthy that, according to the ancestral practice narrated by the informant, the ritual of rendering edible something conceived as taboo or inedible animal matter is concordant with other Amazonian practices that aim at the desubjectification and/or neutralisation of the spiritual qualities of a given animal (Kaplan, 1975; Århem, 1996; Viveiros de Castro, 2004; Zent, 2013). It is somewhat intriguing, however, that the red brocket deer (*Mazama americana*) needed to be ritually painted with *Bixa orellana* (a red dye), which, paradoxically, might vaguely resemble the reddish fur of the former. When queried about why *Mazama americana* was to be neutralised with *Bixa orellana* and not, for example, with other means such as *Genipa americana* (another natural pigment of black colour), the informant straightforwardly replied that these were the dietary rules that his ancestors used to followed. One possible explanation for the use of *Bixa orellana* could be its ontological and mythological significance, albeit *Genipa americana* is endowed with the same qualities of the former (namely, both trees were sisters in mythical times). Alternatively, another explanation may hold that the chromatic similarity of *Bixa orellana* to *Mazama americana* likely operates as a neutraliser of ontological properties through the transposition of similar chromatic patterns; that is, the neutralisation of the evil spirit and the transformation of the inedible animal matter into something edible that likely incorporates the essential attributes of plant matter (see

also Viveiros de Castro, 2004: 476), though its morphological and chromatic features remain almost identical.

Notably, in refuting Ross' (1978) ecological thesis concerning the adaptive nature of the Amazonian food taboos on large animal species (i.e., cultural mechanisms for the preservation of endangered species), Decola (1994: 336-338*n*) argues that even if the Achuar forbid the consumption of the red brocket deer, *Mazama americana* (as with the Shuar, the Achuar conceive *Mazama americana* as an evil spirit), other species of deer of the genera *Mazama* (*Mazama gouazoubira* [also eaten by the Shuar] and *Mazama bricenii*) and *Odocoileus* (*Odocoileus virginianus*) are nevertheless legitimately consumed and even considered a delicacy. For Descola, then, it is highly unlikely that such an ecological explanation would have any scientific validity since of the four Cervidae in the Achuar habitat only one is prohibited; moreover, the taboo on eating tapir (*Tapirus terrestris*) is regularly transgressed and, illogically, some small animals are even prohibited by the Achuar. Although Descola's critique might seem, from an ethnographic point of view, a persuasive illustration of the complex human-animal relationships exhibited by the Achuar; however, the rationale of Ross' (1978) ecological thesis about the Amazonian taboos on eating certain large animals (tapir and deer) may be a more compelling explanation corroborated by ethnographic and archaeological evidence.

Ethnographically, it has been widely reported that big mammal species such as peccary, deer and tapir play a prominent role in the cosmological and ritual structure of Amazonian peoples (e.g., Reichel-Dolmatoff, 1985; Jernigan, 2009; Iriarte et al. 2022b; Hampson et al., 2024). For example, as previously noted, the Shuar use *Bixa orellana* to neutralise the evil spirit of the red brocket deer (*Mazama americana*) and then transform the prohibited animal matter into something edible. Among the Huaorani, relations with the white-lipped peccary (*Tayassu pecari*) are epitomised by

specific patterns of predation (the violent and war-like hunting with *Bactris gasipaes* spears) and avoidance (the conception of peccary's intoxicating meat) (Rival, 1996). Among the Juruna, predation on white-lipped peccaries ranges from the ecological dimension of hunting (conceived as a dangerous activity with war-like characteristics) to the more theoretical notions of shamanic mediations and bodily metamorphosis (Lima, 1999). The tapir (*Tapirus terrestris*) is also prohibited among the Tukanoans primarily due to its particular behavioural and ontological properties (Reichel-Dolmatoff, 1985).

The aforementioned ethnographic records that highlight the key role played by large mammals within the ritual, cosmological and ontological systems of Amazonian societies may very well align with ancient patterns of human-animal interactions. These, archaeologically speaking, vary from the potential ontological and cosmological associations between Lower Paleolithic humans, large herbivores (Proboscideans and fallow deers, *Dama mesopotamica*) and stone tools (Barkai, 2021; Finkel & Barkai, 2024; Litov & Barkai, 2024) to prehistoric rock art illustrating the potential socio-ecological and cosmological significance of certain animals for ancient human populations such as Sulawesi warty pigs (*Sus celebensis*) and dwarf bovids (anoas, *Bubalus* sp.) in Indonesia (Aubert et al., 2019; Brumm et al., 2021; Oktaviana et al., 2024) and different mammals (e.g., Cervidae, Tapiridae, Proboscideans) in the Colombian Amazon (Iriarte et al. 2022; Hampson et al., 2024; Robinson et al., 2024). It is therefore not surprising that, though thousands of years have passed since the extinction of megafauna, some Amazonian populations still exhibit forms of ritual behaviour towards particular animals. These superstructural mechanisms may have been developed as regulatory devices for the preservation of prey taxa, and, hence, may have arisen from ancient human-animal interactions. To sum up, there is a strong indication that big animals

have played and still play a significant role in shaping humans' ecological, social, and cognitive systems.

Chapter 4. Disentangling Amazonian horticulture

One day, while walking through one of the gardens of the Tawasap community, Yasmin, a Shuar woman in her 20s, was trying to explain to me the use and names of the plants within it. Suddenly, she contended bluntly: "Most of the trees and plants in this garden are persons". Astonished by her statement, I began to spot the different vegetal beings I looked at and asked which are considered such. As a result of the ethnographic inquisitiveness, it was remarkable that the Indigenous ontological categories of people (Shuar) and person (*aents*) do not comprise a certain amount of plant life. More specifically, some of the weeds and bushes that surround the garden's paths appear to be, properly speaking, objects excluded from the domain of sociality. If, for the Ojibwa of North America, the concept of "person" transcends the anthropocentric notion of being human (Hallowell, 1960), then it might be the case that the Shuar socio-cosmological system only includes those beings that are essential for their practical life (Karsten, 2000[1935]: 280); in other words, biosocial reproduction is likely to be the ultimate cause for the assignment of agential qualities to the material world. From this functional standpoint, we may thus sympathise with the long-established conjectures, which conceive the natural world as part and parcel of an order established socially (Descola, 2006: 137-8; Radcliffe-Brown, 1952 [1929]: 129-130). Consistent with the rationale of these interpretations, natural objects far apart from the social order are of little significance to society's relational structure[1].

[1] Even if this issue is far more complex, the hypothesis provided by Radcliffe-Brown (1952 [1929]: 129), that most of the societies that depend on hunting wild animals and on the collection of wild plants have a ritual attitude towards these entities, may partially fit with the Shuar conceptualisations of nature.

As the time passed during our foray into the garden, Yasmin precipitously recognised the morphology, Indigenous taxonomies, and mytho-cosmological connotations of plants. Like the term *pemon* for the Makushi of Amazonian Guyana (Daly, 2021) or *masa* for the Makuna of the Colombian Amazon (Århem, 1996), for the Shuar, the word *aents* applies to most natural things endowed with personhood, plants included. Vegetal beings are, in principle, persons with gender differences who, under certain conditions, may establish consanguineous relations with humans (Descola, 1994, 2001; Taylor, 2001). As such, according to the informant, underground storage organs (USOs) such as manioc (*Manihot esculenta* Crantz), sweet potato (*Ipomoea batata*s), and taro (*Colocasia esculenta*) are thus conceived of as children. This statement aligns with other lowland South American societies (from the Amazon to the Cerrado biome) that deem horticultural activities and, hence, the tending of staple crops (primarily tubers) as embodied practices of childcare and motherhood (Hugh-Jones, 1979; Jackson, 1983; Descola, 1994; Mentore, 2012; Miller, 2016; Daly, 2021).

Fig 4.1. Papa china or taro (*Colocasia esculenta*).

To say that plants' agential attributes arise from highly socio-material relations is to move beyond the symbolic realm of external objects whose properties are likely to be decoded arbitrarily by the human mind (Lévi-Strauss, 1966). Tubers, as biophysical things embedded in intra- and interspecific relational processes (i.e., interactions spanning trophic, social, and metaphysical

levels), are nevertheless "concrete" triggers of sensory experiences (Lévi-Strauss, 1966, 1969) and, therefore, potential subjects within Indigenous animic and perspectival worlds (Viveiros de Castro,1998; Bird-David, 1999; Ingold, 2006; Descola, 2013). For example, the Shuar, like the Waiwai of Southern Guyana (Mentore, 2012) and the Canela of northeastern Brazil (Miller, 2016), maintain strong biosocial and mytho-cosmological bonds with the entities who inhabit the gardens; human-plant interactions are thus saturated with bodily and multi-sensory experiences.

If tubers are thought of as persons who, besides their specific physical and morphological properties, share similar inner traits (i.e., consciousness, soul, essence) with humans (sensu Descola), is there likely something intrinsic in plant behaviour patterns that may have stimulated significantly natives' cognitive apparatus? A parsimonious answer may hold that, apart from the complex adaptive and reproductive capabilities of underground storage organs (see Rival & McKey, 2008 for a discussion about manioc, *Manihot esculenta* Crantz), these are major sources of carbohydrates in Indigenous peoples' diets (see, e.g., Vincent, 1985 for the Hadza of northern Tanzania), and therefore, their potential social and mytho-cosmological significance may depend on the humans' trophic niche. This functional explanation has, however, its epistemological limits in that it thoroughly neglects the interspecies bodily and cognitive engagements involved in horticultural activities (i.e., the anthropogenic modification of soil for the planting, tending, and subsequent consumption of tubers requires intimate relations with a wide array of taxa). Nor does it take into account that, like the behavioural and adaptive plasticity exhibited by the genus *Homo* to respond effectively to diverse environmental pressures (O'Brien et al., 2023), plants also show forms of adaptive behaviour, communication, and intelligence (Trewavas, 2003; van Loon, 2016). This organismal agency, in short, may have provided vegetal beings with the most elementary

forms of connection, modification, and immersion in a fluid (physical and metaphysical) space (Coccia, 2019).

It might thus be hypothesised that contingent on the degree and extent of trophic exchanges, plants' behavioural and intellectual traits are likely to be the primary cause for the emergence of particular ontological systems. If, for the Shuar, tubers are persons immersed in both a chthonian and terrestrial realm and act as catalysts for trophic, social, and metaphysical associations, all these relational processes must have been entrenched in ancient behavioural patterns. Interestingly, it has been reported that our closest primate relative, the chimpanzee (*Pan troglodytes*), uses stick tools to harvest and subsequently consume underground storage organs (Hernandez-Aguilar et al., 2007). It has also been assumed that the assimilation of cooked tubers may have played a pivotal role in human biological evolution (Pennisi, 1999; Wrangham et al., 1999). Given these lines of evidence, it might be suggested that (1) high levels of human-plant interactions (from the incorporation of tool-assisted technology to culinary fire for the acquisition and consumption of tubers) were likely the basic building blocks of human socio-cognitive evolution (i.e., the formation of higher-order categories and amplification of social relations) and (2) tubers' behavioural and reproductive characteristics may have prompted the further modulation of indigenous concepts of growth, reproduction, regeneration, and well-being.

Although indigenous hunting activities have hitherto been of primary significance for the structuring of animistic ontologies based on predatory patterns (Viveiros de Castro, 1998; Descola, 2013), recent ethnographic and ethnobotanical inquiries highlight the implications of human-plant entwinements for the construction of Amazonian schemes of sociality and personhood; the biological, chemosensory, and metaphysical properties of plants hence affect the behavioural and cognitive templates of Amazonians (Zent, 2009; Daly & Shepard, 2019; Shepard & Daly, 2022).

Nevertheless, little has been done to explain human-plant interactions' cognitive and embodied dimensions and the implications for structuring higher-order metaphysical and cosmological categories. As such, I will attempt to unravel the elementary and more complex forms of relations exhibited by Shuar gardening activities involving primarily humans, tubers (mainly *Manihot esculenta* Crantz), and mythical mediators of ecological and biological processes such as the mother of crops (Nunkui) and *Guadua* bamboo (Kenku).

4.1 The familiarisation of plant life

During garden visits, interlocutors eagerly showed their ecological knowledge concerning shifting cultivation methods (Conklin, 1961). After felling trees and burning unwanted vegetation, the Shuar exhibited complex skills for planting, tending, and harvesting tubers. This, in turn, was subsequently paid off by the significant carbohydrate intake provided by staple crops such as manioc and its manifold uses in culinary practices. And yet, trophic dynamics are the basal structure of the social, cosmological, and ontological associations that emerge from high levels of bodily engagement within gardening activities. This ethnographic picture appears at odds with the long-held assumption that the Amazon biome exerted ecological limiting factors, viz., nutrient-poor soils that hindered human exploitation and the emergence of social complexity (Meggers, 1971). Indeed, evidence suggests that early to mid-Holocene anthropogenic activities have altered the Amazonian ecosystem gradually for millennia (Nascimento *et al.,* 2022), rendering it a milieu of biocultural complexity (Balée, 2013; Heckenberger & Neves, 2009; Clement et al., 2015). Against this backdrop, Levis et al. (2017) argue that there is likely a correlation between the abundance of pre-Columbian domesticated plants and archaeological sites that indicate the

extensive record of plant domestication by Amazonians. Also, complex patterns of anthropogenically modified landscapes, such as cultural forests and agricultural drainages, have been reported recently in the Amazonian localities of Macurany (Brazil) and Upano Valley (Ecuador) (Ellis et al., 2024; Rostain et al., 2024).

Following these lines of evidence, it is hardly surprising that the contemporary Shuar exhibit remarkable behavioural plasticity, enabling them to construct and shape particular ecological niches (as for gardening practices) amidst various environmental and socio-economic pressures. At the cognitive level, the sophisticated sensorimotor abilities shown during manioc's planting, tending, and harvesting would likely point to ancient ecological knowledge learned and transmitted socially. What, then, are the evolutionary implications of Amazonian paleoecologies and the ancient human-plant behavioural patterns to the current state of affairs of gardening practices? It is assumed that manioc cultivation through slash-and-burn agriculture was likely caused by the introduction of metal tools after the European conquest (Denevan, 1992); the spread and adoption of this agricultural pattern were thus accelerated by factors derived from colonisation (enslavement, warfare, dislocation of native populations and the growing demand for flour) and the nature of manioc cultivation (by plant cloning) that has required no intensive and persistent labour input (Fausto & Neves, 2018). It must be added, however, that ~8 kya, the process that led to manioc domestication and, hence, the introduction of clonal propagation (contrary to its wild ancestors that cannot reproduce from stem cuttings), necessitated highly sophisticated ecological knowledge and likely included forest burning (Watling et al., 2018).

One might be tempted to say that human niche construction, which involves primarily the endogenous causal process of ecological inheritance of semantic (patterns of behaviour acquired via social learning) and physical (trophic levels) resources (Kendal et al., 2011), may have operated

amongst Amazonians in a way that human-plant interactions achieved high levels of socio-ecological complexity. Inherited ecologies may have, at a minimum, acted as a platform for the development of a socio-cognitive niche that would have provided Amazonian societies with the capacity to devise mechanisms for the amplification of sociality. Within this framework, among the Shuar, the gender and kinship relationships encompassing humans and the vegetal kingdom might be a good starting point for grasping Indigenous notions of care, growth, and reproduction embedded within a complex socio-structural system.

4.1.1 Conceptualising gender

The symbolic and social significance of underground storage organs (USOs), such as yams (*Dioscorea* spp.), taro (*Colocasia esculenta*), sweet potato (*Ipomoea batata*s), and manioc (*Manihot esculenta* Crantz), has been reported extensively amongst the indigenous peoples of Amazonia (e.g., Barasana: Hugh-Jones, 1979; Makushi: Rival, 2001; Piaroa: Heckler & Zent, 2008; Waiwai: Mentore, 2012; Jarawara: Maizza, 2017) and Melanesia (e.g., Trobrianders: Malinowski, 1935; Wola: Sillitoe, 1983; Enga: Wiessner, 2005; Ambrym: Rio, 2007; Abelam: Coupaye, 2021). Although some variations exist in human-plant relational patterns, there are striking parallels in the high levels of bodily engagement with plant life exhibited by these societies. As noted previously, the Shuar appear to endow agential qualities to the plant kingdom and, thereby, gender differences are expected in plant social life. In this respect, the anthropologist Rafael Karsten, who studied the Shuar at the beginning of the 20_{th} century, argued that:

> The Jivaro go much further to attribute particular sex to each class of plants: some plants and trees are supposed to be men, others, and thereby most of them, are supposed to be women.

> This belief also explains the division of agricultural labour that prevails among the Jivaro. Those plants that are "men" must be planted and cared for by men, whilst those that are "women" must be cultivated by women. Most of the fruits, which are the staple food for the Indians, are considered female. For this reason, among the Jivaro as well as among all the Indian tribes, agriculture is essentially, but not exclusively, an obligation of the female sex ([1935]2000: 111).

Even if some Shuar (mainly young people) do not seem to regard plants as gendered beings, the particular way of treating plant life as entities with gender qualities still exists among portions of the population, such as older adults. When, for example, during gardening activities, informants were asked which plants possess gender identification, they promptly pointed to the staple crops which are planted, tended, and harvested by women. Tubers, (primarily *Manihot esculenta*), are thus conceived of as inherently females, a statement consistent with other Amazonian peoples, such as the Yukuna of the Colombian Amazon (van der Hammen, 1992: 163). The ethnographic records of Papua New Guinea societies also document this form of conceptualising tubers. For example, the Enga regard the sweet potato as intimately associated with the nurturing role of women (Wiessner, 2005); taro and yam play similar mothering roles among the Wola and Abelam, respectively (Sillitoe, 1983; Coupaye, 2013). Likewise, the Makushi of the Guiana Shield connect cultivated manioc with the regenerative figure of the mother, albeit wild manioc, which reproduces from seed, is conceptualised as male (Rival, 2001: 73). It is worth noting that the Shuar conception of manioc as an entity endowed with feminine traits contrasts with other *Aents Chicham* societies, such as the Achuar (Descola, 1994: 197) and the Awajun/Aguaruna (Brown and Van Bolt 1980: 173; Brown 1986: 105), who think of the tuber exhibits both feminine and masculine attributes. The aforementioned ethnographic examples may point to the fluidity of indigenous concepts concerning plant reproductive biology that defy Western-based categories of sex and gender (Subramaniam & Bartlett, 2023).

Unsurprisingly, for the Shuar, gardening activities entail a highly relational dimension of corporeal and cognitive engagements with plant matter. In this sense, the process of planting, tending and harvesting tubers is likely to be deep-rooted in the behavioural repertoire of these people. And yet, it seems that the transmission of ancestral ecological knowledge has not solely provided the Shuar with the necessary means to obtain critical sources of carbohydrates but also specific modes of conceiving tubers by their ethnobiological traits. As described below, kinship relationships with tubers might thus further illuminate the sociality platform devised by this society.

4.1.2 Kinship relations

Besides tubers' gender and reproductive traits, the notion that cultivated plants are the children of the people who take care of them in all their growth and reproductive stages has also been observed among indigenous horticulturalists. Ethnographic data thus illustrate complex patterns of parenthood (both men and women appear to nurture tubers) shown by lowland South American and Melanesian peoples towards cultivars (Seeger, 1981; Mosko, 2010; Miller, 2016; Maizza, 2017; Panoff, 2018; Daly, 2021). Among the Shuar, however, this parenthood pattern exhibits some limitations in that women primarily undertake the nurturing role. It is noteworthy that other Amazonians exhibit an analogous socio-structural model, such as the Tukanoans (Hugh-Jones, 1979; Jackson, 1983), the Achuar (Descola, 1994), and the Rio Negro societies (Emperaire et al., 2012; Cardoso & de Arruda Campos, 2023). This, in principle, entails that maximum care must be given to plants that provide the bulk of carbohydrates to compensate for the nutritional elements (fat and protein) obtained by hunting (Goldman, 1963: 58). The Shuar are hence well aware that,

from a functional and materialist point of view, their society depends substantially on cultivars for biosocial reproduction. Nevertheless, mechanisms that involve high levels of cognition (e.g., bodily interactions with organic matter and abilities to transform it) likely play a pivotal role in ensuring the procreative cycle of the social and biological order.

A remarkable thing during most of the interviews and conversations was the nearly ubiquitous presence of manioc beer. According to the informants, in the past, a long hunting trip, an excursion into enemy territory, or the garden clearing necessitated the prior consumption of manioc beer. The Shuar thus often highlighted the primary importance of this as an energy source whose effectiveness highly depends on the woman's skills to transform manioc into a fermented beverage. Although the Shuar regularly consume *Manihot esculenta* for different culinary uses (dishes accompanied with meat or fish), acknowledging its nutritional properties, like other Amazonian peoples (e.g., Desana: Reichel-Dolmatoff, 1971; Yanesha: Santos-Granero, 2000; Piaroa: Heckler, 2004; Makushi: Daly, 2019), manioc beer is fundamentally conceived as a catalyst of social bonding.

Fig 4.2. Yanua making manioc (*Manihot esculenta* Crantz) beer in Yawintz.

If manioc beer triggers social relations among humans, this sociality level is achieved through a prior lower-order relational process. The Shuar women who peel, wash, boil, mash, chew, spit pieces of manioc into the mash, and finally put it to ferment point to complex ecological

interactions. Unlike the Makushi technology of manioc beer fermentation via a saprotrophic fungus (*Rhizopus* sp.) (Daly, 2019), the Shuar fermentation techniques align with other Amazonians in that human saliva may offer bacterial inoculum that accelerates the fermentation process (Freire et al., 2016). Leaving aside manioc's ritual and cosmological connotations (discussed later), the biological causes of its transformation into a fermented beverage require the combination of different agentive forces and behavioural sequences. First, women's bodily and cognitive engagement with organic and inorganic materials (manioc, tools, water, fire) are of primary significance in that they allow the partial but efficient transformation of a raw product (as evidenced by the women's skills in mashing, chewing and spitting). Second, the final transformation into a fermented product (due to microorganisms) and subsequent consumption (sharing of manioc beer using the same drinking cup) may instigate a microbial exchange between the human microbiome and the environment (tools, vessels, water, plant substrate) (Colehour et al., 2014). Notably, Colehour et al. (2014) reported that these likely co-evolutionary relationships may have conferred health benefits to the Shuar of the Cross-Cutucú region since *Lactobacillus* taxa were found in manioc beer samples. This further corroborates the informants' notion of manioc beer as an energy and nutritional source, not to mention its intimate association with indigenous concepts of sociality and well-being.

Fig 4.3. *Tsanimp* or manioc (*Manihot esculenta* Crantz).

It has been reported that indigenous societies exhibit complex techniques to deal with tubers' toxicity (mainly due to the presence of cyanogenic glycosides). In lowland South America, for example, these processes of detoxification for the "bitter" variety of manioc have been documented among the peoples of the Northwestern Amazon, Guiana Shield, and Gran Chaco (C. Hugh-Jones, 1979; Kamienkowsk & Arenas, 2017; Daly, 2019). Among the Higaonon tribe of Bukidnon province in the Mindanao island, Philippines, methods to detoxify the poisonous content of wild

yam (*Dioscorea hispida* Dennst) have also been reported (Buenavista et al., 2021). Even if the Shuar generally consume the "sweet" variety of manioc and, accordingly, its lack of toxicity does not require any process of detoxification, the highly embodied nature of women's relations with this tuber (from its care in the gardens to its further transformation into beer and food) illustrates how notions of "motherhood" and "childcare" likely emerged from the close association between women's and gardens' reproductive abilities. Nonetheless, these procreative cycles exhibit fluctuating patterns of predation and reciprocity, likely modelling the concatenation of events involving plant life, humans and mythical beings.

4.2 Gardening, biosocial reproduction and plants' agential qualities

During most interviews and conversations, informants often indicated that the garden is the quintessential female domain. They thus regularly pointed out the strictly female nature of the gardens that, primarily in the past, prevented the intrusion of men into women's intimate connections with gardening practices. It is worth emphasising that the Shuar conceptualisation of gardens as fundamentally female spaces is in concert with their Achuar neighbours (Descola, 1994) but diverges from other lowland South American societies, such as the Amazonian Jarawara (Maizza, 2017) and the Canela of the Cerrado (Miller, 2016). Moreover, the Shuar, like the Tukano of the Colombian Amazon, connect gardens' generative qualities with women's capacity for reproduction. (Reichel-Dolmatoff, 1996: 67). Therefore, the parallel between women's bodies and gardens is not arbitrarily conceived; to the contrary, the reproductive and nurturing abilities of both women and gardens are conceptualised beyond their physical conditions. This is in stark contrast with Melanesian societies such as the Paiela of Papua New Guinea. According to Biersack (2001:

76), for instance, Paiela women are metaphorically considered "fenced" in the middle of the garden as “its sweet potato seed” since men appropriate the fruit of their wombs through bridewealth payments. As a result, the ontological status of women is predicated upon gardening activities (i.e., while wives plant and weed gardens, husbands clear and fence them) that metaphorically replicate the intrinsic reproductive capacity of women which men control.

Conversely, the Shuar women do not only work in a domain in which their procreative faculties are metaphorically emphasised by the reproduction and growth of their vegetal offspring but the peak of their fertility is highlighted in the empirical sphere of delivery. This interesting fact is overtly sustained by the ancestral practice of giving birth in the garden, as documented in other Amazonian peoples like the Achuar and the Tukano, for whom the procreative abilities of women are strongly associated with that of gardens (Descola, 1994: 217; Reichel-Dolmatoff, 1996: 74-75).

Fig 4.4. A garden in Yawintz containing *Inchi* or sweet potatoes (*Ipomoea batatas*).

If the biological fertility of women's bodies parallels that of gardens and their connection spans the biosocial and cosmic domains, then coevolutionary interactions between plants and humans may have been the key factors in shaping Shuar notions of gardening activities. In particular, the consanguineal relations that women establish with manioc (see Descola, 1994, 2001; Taylor, 2001; Emperaire et al., 2012; Cardoso & de Arruda Campos, 2023), can be understood as a specific form of human/plant coevolution whose primary significance is the conjunction of organismic kingdoms and their ontological interdependence. Behaviourally, these human-manioc relationships might accord with a definition of domestication that highlights the coevolutionary and mutualistic interactions in which the domesticator's niche-constructing activities influence the care, survival and reproduction (hence providing fitness benefits) of the domesticate which, in turn, provides the former with resources (Baedke et al., 2020; Purugganan, 2022).

Fig 4.5. Tatiana planting manioc (*Manihot esculenta* Crantz) in Yawintz.

However, this broad biological definition of domestication appears problematic if applied to Amazonian ecologies principally because of the domesticator's active control of the domesticate's survival and reproductive cycles (Purugganan, 2022). The Shuar, for instance, frequently indicated

that tubers' reproduction and growth highly depend on specific nurturing abilities exhibited by their human "mothers". These, indeed, can be exemplified by women's sophisticated cognitive skills shown in weeding, planting, tending and harvesting behaviour alongside elaborate gardening rites to care for and relate with tubers. As discussed later, ritual behaviour involves specific chants (*anent*) that foreground the mythical connection with Nunkui whose agential qualities benefit the growth and reproduction of cultivated plants. These unique ways of caring for plants coupled with a high level of bodily engagement correspond with the horticultural practices of other Amerindian and Melanesian peoples (Malinowski, 1935; Keesing, 1982; Godelier, 1986; Descola, 1994; Wiessner, 2005; Emperaire et al., 2012; Mentore, 2012; Maizza, 2017; Miller, 2016; Panoff, 2018; Daly, 2019). For example, when asked why gardening activities require specific forms of care, informants replied straightforwardly that, if not tended properly, manioc will refuse to grow and propagate; this would therefore cause significant nutritional and social problems since an infertile garden stands for women's failure in their reproductive and nurturing capabilities and duties.

The notion that cultigens are endowed with agential traits, such as volition, sensibility, and freedom of action has also been reported among the Krahô of the Brazilian Amazon and the Maenge of Papua New Guinea. Interestingly, for these societies, tubers (the sweet potato for the Krahô and taro for the Maenge) might move to other gardens if dissatisfied with the attention received from their nurturers (Morim de Lima, 2016; Panoff, 2018). This kind of "antidomestication" (Carneiro da Cunha, 2019) by which the active role of human niche construction in controlling tubers' fitness is reversed to more balanced interspecies relations (i.e., plants' agency is foregrounded throughout the horticultural cycle) likely denotes the horticultural behavioural patterns of these societies. Although the Shuar do not take tubers' volitional attributes to such an extreme as those exhibited by the sweet potato among the Krahô (Morim de Lima, 2016)

or taro among the Maenge (Panoff, 2018), they nevertheless endow manioc with blood-feeding behaviour. It is noteworthy, however, that this belief is still solely held among older people and hence, a great part of community members was thoroughly unaware of it. When, for example, elders were queried about the specific characteristics of manioc's blood-sucking habit, they just made clear that primarily young children were the targets of this aggressive activity. This description is congruous with the ethnographic records collected throughout the 20_{th} century amongst the *Aents Chicham* ethnic group (see, e.g., for the Shuar: Harner, 1972: 75-76; for the Achuar: Descola, 1994: 204; for the Awajun/Aguaruna: Brown, 1986: 106); this thus likely reveal that, at least in the communities of this study, the conception of manioc as a blood-sucking entity is almost lost. Nevertheless, even if the contemporary Shuar appear to ignore manioc's vampire-like properties, this notion may have had important implications for the regulation of trophic interactions and the maintenance of the biosocial and ontological interdependence between humans and manioc.

Human-manioc dynamics are thus divided into two reciprocal planes of trophic and ontological associations. First, the special devotion of women towards their vegetal offspring in guaranteeing their growth and propagation is reciprocated by the latter nutritional (viz., carbohydrate-rich roots assimilated through several dishes and manioc beer) and social importance. Second, a subsequent level of reciprocation is shown by an inversion of feeding patterns, which, probably to compensate for the cannibalistic tendency of their human nurturers, manioc reacts by exhibiting a hematophagous behaviour primarily towards their anthropoid siblings. Here we may draw a parallel with the Ma' Betisék of Malaysia (Karim, 1981) precisely because extreme principles of reciprocity between organismic kingdoms underpinned the regulation of trophic exchanges. However, it must be noted that, unlike the Ma' Betisék notions of reciprocal dynamics that involve

humans, plant and animal taxa, the Shuar limit these radical material and immaterial exchanges to human-manioc relationships. Among the Achuar, for instance, Descola (1996: 94) reported, “The mother feeds on her plant-children, who in their turn take from her human offspring the blood that they need for their own growth”. If gardening practices implicate sequences of reciprocal exchanges that allow the continuous preservation of trophic and biosocial associations, what, then, are the mechanisms and implications underlying human parturition in the gardens?

Though most women in the communities give birth in the nearby health facilities, the knowledge concerning the ancestral patterns of parturition was nonetheless widespread among community members. The Shuar, thus, were not puzzled when asked about their traditional childbirth practices and their obvious connection with blood and manioc. Notably, in line with other Amazonian peoples (Basso, 1973: 63; Kaplan, 1975: 38; Brown, 1986: 124; Reichel-Dolmatoff, 1996: 75); according to the informants, menstruating women are considered polluting to the gardens since menstrual blood is very harmful to the plants and hence most of the staple crops that they tend would be contaminated[2]. Nevertheless, among the Shuar, the taboo of menstrual blood does not imply an extremely negative connotation like those of some Melanesian and Amazonian societies where women's seclusion is normally practised during their periods (Basso, 1973; Keesing, 1982; Albert, 1985). This, paradoxically, is at odds with the practice of giving birth in the garden, which entails the loss of women's blood and the exposure of their newborn children who could easily be the victims of their hematophagous siblings. With this in

[2] Interestingly, for the Awajun/Aguaruna of Peru, the smell of menstrual blood and that of newborn infants (which is presumably associated with placental blood) are considered dangerous to the plants (Brown, 1986: 124). Consequently, the supposed harmful effects of newborn infants on the plants contradict the traditional practice of giving birth in the gardens reported in other *Aents Chicham* societies such as the Ecuadorian Shuar (this study) and Achuar (Descola, 1994) .

mind, we might then conceive gardening as a kind of reciprocal predation (Descola, 2001) through which maternal nurturing abilities and exchanges of plant materials and bodily fluids characterise the tight connection between women and their human and plant children. These cross-kingdom interactions may indeed point to ancient patterns of familiarising predation (Fausto & Neves, 2018) in which the nutritional properties, behaviour, and cognitive capacities of plants have been incorporated into the indigenous socio-ecological system. As a result of these entwinements with plant life, the Shuar behavioural and conceptual apparatuses were likely moulded gradually in accord with the biosocial reproduction and well-being of both humans and cultigens.

Human-manioc relations may thus imply that even if it is true that domestication is a coevolutionary process that arises from a mutualistic interaction (i.e., the niche construction role of the domesticator which actively manages the survival and reproduction of the domesticate which, in turn, provides the former with resources) (Purugganan, 2022), the active role of manioc has nevertheless been a key factor in fashioning patterns of behaviour and modes of thought that foreground the biosocial and ontological interdependence of biological kingdoms. As with the Maenge who endow taro with a soul and hence, intentional properties vis-à-vis their human nurturers (Panoff, 2018), the Shuar attribution of a soul (*wakan)* to manioc (see also Descola, 1996: 92) is not solely a matter of symbolic associations but likely stem from highly embodied and embedded coevolutionary processes between intentional agents. If extended and extending plant cognition is likely to be characterised by reciprocal relations with the environment (below and aboveground), instantiated by complex patterns of growth, behavioural plasticity, and biochemical exudates (Marder & Parise, 2024), then it is unreasonable to dismiss that such complex behavioural and cognitive qualities may have not shaped significantly traditional horticultural practices. Based on this, and as it will be described later, the Shuar mythological and ritual structure may well

clarify the significance of cross-species interactions and the intercommunication between ontological realms (those between humans, plants, and mythical beings) that inform patterns of growth and reproduction within the domain of the garden.

4.3 Gendered subsistence patterns

Recent archaeological and ethnographic evidence indicates the prominent role played by women in hunting activities (Haas et al., 2020; Anderson et al., 2023). Among contemporary forager-horticulturalists who exhibit shifting cultivation patterns, however, the division of labour between sexes can be highly demarcated, albeit in some cases a more cooperative model can be found. It seems, therefore, that in these societies, women's condition is relegated to the domestic sphere, e.g., gardening and household chores, contrary to the more important activities undertaken by men, e.g., hunting, warfare, and ritual (see, for instance, Basso 1973; Siskind 1973; Kaplan 1975; C. Hugh-Jones 1979; S. Hugh-Jones, 1979; Århem 1981; Keesing, 1982; Jackson 1983; Godelier, 1986; Rappaport 2000[1968]). Overall, it is hardly surprising that men in these societies are the prime actors who undertake most, if not all, ritual activities that permeate the way of life of these people.

Besides, among the Wakuénai of Venezuela (Hill, 1988), the Arakmbut of Peru (Gray, 1996) and the Tsembaga of New Guinea (Rappaport, 2000[1968]), it has been observed that the opposition between men and women is associated with the sensory properties of organic matter (e.g., hot-cold, hard-soft, dry-wet) that further determined their social and ontological condition. According to Rappaport (2000[1968]: 38-40), for instance, the Tsembaga equate notions of coldness, wetness, softness and rot with women's vaginal secretions and other properties of the

animal and plant kingdom; these associations thus highlight the attributes of the spirits of the low ground (growth, fertility, and decay) which contrast with those of the red spirits (hotness, dryness, hardness, and strength) primarily associated with warfare. Thus, one might parallel the Tsembaga concepts of growth and fertility (epitomised by the productivity of gardens), decay, and wetness (associated with vaginal secretions) (Rappaport, 2000[1968]: 38-39) with the Shuar notions of parturition, blood, growth, and reproduction within horticultural activities. Yet, for the Shuar, the division of labour does not entail a radical binary opposition between men and women underpinned by cosmological and/or metaphysical propositions. Hunting and gardening are therefore not antithetical and asymmetrical subsistence strategies whereby the position of men as hunters is more valued than that of women as gardeners.

This, in short, appears to contradict other Amazonian societies that underestimate horticulture as a women's domain and stress the mytho-cosmological significance of hunting and its association with men. For instance, Viveiros de Castro (1992: 42) has reported that the Araweté of Brazil conceive their gods as hunters and not agriculturalists; the Araweté eschatology thus poses that "in the heavens no one gardens since the plants grow on their own, but everyone hunts". Kaplan (1975: 39) has also observed that the Piaroa of Venezuela exhibit mythological and theological patterns predicated upon the asymmetrical opposition between men as hunters and women as gardeners. It seems therefore likely that the aforementioned ethnographic examples point to the almost secular nature of the horticultural activities undertaken by women, as already reported by Goldman (1963: 60) among the Cubeo of Colombia. For the Shuar, however, this bias towards the mytho-cosmological relevance of hunting and its association with men is inverted. This pattern concords with other Amazonian horticulturalists like the Achuar (Descola, 1994), the Quichua (Whitten,

1976), the Awajun/Aguaruna (Brown, 1986), and the Yekuana (Guss, 1989) who deem women's gardening activities as imbued with ritual, mythical, and cosmological dimensions.

As noted previously, the Shuar women show high levels of bodily immersion and cognitive capacities within gardening activities. Most notably, the consanguineal bonds they form with manioc epitomised by the special treatment towards these plant-children further substantiate the primary significance of traditional horticulture and manioc cultivation. In this regard, it is noteworthy that the complexity of gardening activities and human-manioc intersections shown by the Shuar contrasts with their Huaorani neighbours. Rival (2002: 89) reported that among this hunter-gatherer population manioc production is highly sporadic and gardens exhibit poor crop variety and a lack of dedication in the processes of weeding and burning. This may well clarify how variations in subsistence strategies and their socio-ecological, mytho-cosmological, and ontological significance likely correlate with the intensity of relations between biological kingdoms embedded in coevolutionary processes. In this sense, informants constantly echoed their grandparents in emphasising gardens' prime importance as the locus of female fertility and reproduction rooted in a mythical past. Accordingly, the close association between women and gardens' reproductive abilities is further supported by the interweaving of the mythical and ritual structure.

4.4 When metaphysical and mytho-cosmological principles meet practical activities

The mythical narrative holds that before the Shuar knew about tubers, they used to eat the raw leaves of *Calathea lute.* It was not before the appearance of Nunkui that provided tubers in abundance that their starvation could come to an end. Nevertheless, given that some children

mistreated Nunkui by throwing ashes in her eyes, the production of staple crops began to decrease significantly until it was thoroughly halted. Nunkui then decided to leave humans by inserting herself in the stem of Kenku (*Guadua* spp.), which, at that time, was a hollow tubular structure; but, before fleeing to the chthonian realm, she created the nodes of the *Guadua* bamboo while defecating regularly the seeds of wámpakar (*Pytholacca rivinoides*), a curse that would have propelled humans to work hard in the gardens to get rid of these weeds and thus be able to obtain their food procurement. Although this is an abridged version of the myth[3] recounted by the informants, this nonetheless underscores the basic postulates concerning the genesis of horticulture.

The implications of the mythical narrative are threefold. Firstly, it denotes a primaeval state whereby the ancient Shuar exhibited maladaptive behaviour by eating the raw leaves of *Calathea lute.* Informants, in fact, relentlessly pointed to the inedibility of raw *Calathea lute* leaves which are generally used to cover food. In Brazil, correspondingly, among the Kalapalo (Basso, 1973: 30) as well as among the Ramkokamekra-Canela (Miller, 2015: 385–90), the myths suggest that before the emergence of cultigens, humans ate roots and rotten wood, respectively. This primordial state of things may thus indicate a human dietary niche characterised by the ingestion of plant matter of poor nutritional quality.

Secondly, the emergence and abundance of edible tubers were caused by the intervention of Nunkui, a mythical being that parallels the figure of Cassava Mother/Mama among the Makushi (Rival, 2001; Daly, 2019) and the Waiwai (Mentore, 2012) and the *mãe da roça* (mother-of-the-field) among the Baré (Cardoso & de Arruda Campos, 2023). Further, the principal point is that

[3] For more detailed versions of the myth of Nunkui see (Harner, 1972: 72-75; Descola, 1994: 193-194; Karsten, 2000 [1935]: 367-368).

tubers emerged from the intentionality of an entity, that is, without the agential qualities of the female child Nunkui, the Shuar would have continued with their low-quality diet. This is consonant with the mythical repertoire of other horticultural societies that underline the reproductive capacities of a given female subject. Wiessner (2005: 125-6) reported, for instance, that for the Enga of highland Papua New Guinea, the story holds that during a time of famine, the sweet potato was procured by a woman and therewith rescued her husband from starvation; after her death, the husband found that sweet potato vines were growing on her grave and thus began to dig into the grave uncovering many tubers that he then distributed to his friends; the narration ends by implying that the vines grew from the woman's uterus. Likewise, for the Baré of the Brazilian Amazon (Cardoso & de Arruda Campos, 2023: 7), as well as for the Waiwai of Southern Guyana (Mentore, 2012: 147), manioc sprouted from the buried body of a teenage girl and an old woman, respectively. Taken together, these mythical narratives may hint at a spatio-temporal scale of pre-domestication (i.e., where tubers were likely procured in the wild) and the intimate relationship between women's bodies/generative capacities and tubers.

Thirdly, when Nunkui was mistreated, the plentiful food production of tubers immediately ceased. It may hence be speculated that, from an ecological point of view, this possibly points to an overexploitation of wild plant species. The myth then continues that before escaping to the underworld through the hollow *Guadua* bamboo (Kenku), Nunkui formed the nodes in the stem while excreting the seeds of wámpakar (*Pytholacca rivinoides*), thus propelling humans to work hard for their subsistence. The defecation behaviour (for an analysis of Amerindian myths about defecation and excrement see Lévi-Strauss, 1988) and the *Pytholacca rivinoides* weeds are themes that can be further linked with other Amerindian myths about the emergence of manioc. Interestingly, the Waiwai story told that before manioc sprouted from the buried body of the old

lady (Cassava Mother), she first gave humans great amounts of manioc flour through defecation (Mentore, 2012: 147). Compared with the Wawai narrative, the myth of Nunkui seems to transform the nature and context of the act of defecation. Thus, contrary to Cassava Mother's defecating behaviour that was beneficial to humans in that it provided a plant material already processed (manioc flour), Nunkui excreted *Pytholacca rivinoides* that, according to the Shuar, is considered a nuisance for horticultural activities.

The excretion of *Pytholacca rivinoides* by Nunkui was, therefore, a direct response to the disrespectful and insolent behaviour of humans. Here, we may draw a parallel with the Amazonian Tukano myth of the origin of horticulture. The story tells that after *Boo-bari mahsë* (Starch eater Person) taught First Woman to plant manioc, he prohibited her to touch her vagina while planting; however, she masturbated and urinated causing the seedlings to burn and the garden to be invaded by weeds (Reichel-Dolamtoff, 1996: 75). As Reichel-Dolamtoff (1996: 75) notes "the lesson of this, and similar stories, is said to be that the onerous tasks of planting and weeding constitute a punishment for women's lack of control of their sexuality". Even though in the myth of Nunkui the punishment does not stem from the sexual misconduct of women but from children's misbehaviour, the myths nevertheless converge in the matter of the arduous gardening tasks. Informants thus empirically corroborated this fact by frequently complaining about the detrimental effects of *Pytholacca rivinoides* on traditional horticulture and the exhausting activities of weeding and burning to get rid of these weeds.

It is also worth noting that apart from defecating the seeds of *Pytholacca rivinoides*, Nunkui transformed Kenku (*Guadua* spp.) from a hollow tubular structure to its current morphological condition (i.e., a bamboo stem with nodes). This has important implications for cross-species communication within the Shuar ontological and cosmological systems. Like the vine that

connected in mythical times heaven and earth (for a description of the myth see Descola, 1994: 69; Karsten, 2000 [1935]: 370-1), the hollow cylindrical structure of *Guadua* was the connector between the terrestrial and chthonian realms (Lévi-Strauss, 1988: 20; for a discussion of tubular structures in Amazonian mythology see also Hill, 2009; Hill & Chaumeil, 2011; Wright, 2013; S. Hugh-Jones, 2017). These species of the Plantae kingdom thus acted as mythical bridges and primary mediators for the interconnection between different cosmic and ontological planes. However, by creating the nodes in the stem, and, consequently, transforming the primordial morphological structure of *Guadua*, Nunkui blocked the tubular passage that enabled the intercommunication between realms. This, in turn, has shaped the post-mythic subsistence patterns and prompted the Shuar to intimately engage in both the socio-ecological and ritual dimensions of horticultural practices.

As noted before, for the Shuar women gardening activities entail a profound connection with their vegetal children and Nunkui. This, therefore, is instantiated by a sequence of gardening rites that foreground the key role of women in the growth and reproduction of cultigens. Interestingly, this contrasts with the behavioural patterns observed among Melanesian horticulturalists like the Trobrianders (Malinowski, 1935), the Umeda (Gell, 1975), the Kwaio (Keesing, 1982), the Baruya (Godelier, 1986) and the Maenge (Panoff, 2018), who regard men as the primary actors of magical formulae and operations that make gardens produce. *Anent* are therefore ritual chants solely sung by women during horticultural activities whereby there is a clear emphasis on their close association with Nunkui and the production of staple crops (see also Harner, 1972; Brown & Van Bolt, 1980; Brown, 1986; Descola 1994). Similar ritual chants sung by women for the reproduction, growth and protection of cultivated plants have also been reported among other Amazonian horticulturalists like the Quichua (Whitten, 1976: 72), the Cashinahua (Kensinger,

1995: 19), the Yekuana (Guss, 1989: 36), the Arakmbut (Gray, 1996: 50), and the Krahô (Morim de Lima, 2017). It is important to note, however, that among the Shuar communities, the knowledge of *anent* formulae seems to be scarce among young and adult women, and hence, is primarily exhibited by older adult women. Against this background, most informants complained about the lack of cultural transmission, stressing that traditional horticulture is a complex subsistence activity that necessitates substantial knowledge of the local ecology and the mythical and ritual apparatuses.

Moreover, contrary to the socio-ecological, symbolic, ritual, cosmological and ontological significance of the peach palm (*Bactris gasipaes*) among Amazonians (S. Hugh-Jones, 1979; Rival, 1993; Chaumeil, 2001), as Virtanen et al. (2022) argue, the importance of *Guadua* spp. has been overlooked. Among the Shuar, for example, this is not surprising since Uwí (*Bactris gasipaes*) plays a crucial role in ritual activities, epitomising the male principles of life (i.e., abundance, growth and procreation of nature) and death (i.e., warfare, destructive agency) (Mader, 2021). Thus, the peach palm (Uwí) acts as a masculine metaphysical postulate that provides the biological pattern of nature's abundance through his fruits and warfare model via his hard trunk and the spiritual energy (*arutam*) (Stirling, 1933: 139, 1938: 116) that saturates the spears. Kenku (*Guadua* spp.), by contrast, is conceived as an androgynous entity and the quintessential connector of earth and the underworld within the female domain of the gardens. Besides this, according to the informants, *Guadua* is a fertiliser in that its close association with Nunkui indicates the presence of fertile soil, a statement also confirmed by their Achuar neighbours (Descola, 1994: 196). Virtanen et al. (2022) have likewise reported that the Apurinã and Manxineru of the Brazilian Amazon link *Guadua* with fertile soil ideal for swidden cultivation and endowed it with cosmological and ontological significance.

It may hence be assumed that the association between *Guadua* and fertile soil reported among Amazonian peoples likely corroborates the empirical studies that have observed that *Guadua*-dominated forests coincide with eutrophic haplic cambisol and luvisol soils (de Carvalho et al., 2013); types of soils with high nutrient concentrations according to Amazonian standards (Virtanen et al., 2022). However, we cannot provide evidence of soil properties and fertility in the Shuar communities, and, accordingly, further investigations are needed to assess the implications of Indigenous ecological knowledge on scientific research. The primary point is, nevertheless, that concepts of growth, fertilisation, and reproduction within traditional horticulture may have emerged from complex coevolutionary interactions between humans and the vegetal kingdom. This is unsurprising since the mytho-cosmological and ontological significance of plants highly depends on the biosocial and cognitive properties attributed to them. From manioc's blood-feeding behaviour to *Guadua*'s fertilising qualities, gardening practices are well-embedded in the mythological and ritual structure that underpins the elemental ecological processes.

The ritual behaviour exhibited by the Shuar women thus illustrates how complex forms of embodiment and cognition are needed to negotiate with mythical entities that regulate the growth and reproduction of tubers. Besides the ritual chants *anent*, informants also pointed to other gardening rites that have almost completely disappeared in the communities. One example of these rites was the use of powerful stones (*nantar*) that were buried by women in the gardens to make them produce (see also Harner, 1972: 72; Brown, 1986: 115-122; Descola, 1994: 206-209). Given that *nantar* stones are believed to be closely associated with Nunkui, informants contended that only very few women possess them. Planting after the full moon appears to be another ancestral horticultural tradition no longer practised among the Shuar communities. Remarkably, some informants complained about the loss of this important gardening practice, thus highlighting the

positive influence of this lunar phase on the growth of staple crops (e.g., Beeson, 1946). Also, according to the informants, in the past, the planting of purple yam (*Dioscorea trifida*) required specific proprioceptive abilities. Specifically, as described and enacted by the Shuar, such practice entails that a woman prepares the soil (by stirring it very well and digging a hole) and then squats to hit the purple yam seeds with her buttocks. Thus, the primary significance of women hitting the soil and the seeds with their buttocks is to make *Dioscorea trifida* grow big. This therefore stems from the strong association that informants made between women's large buttocks and full-grown purple yams.

Fig 4.5. *Kenke* or purple yam (*Dioscorea trifida*).

Given this ethnographic evidence, one might be tempted to speculate that there is an implicit connection between the full moon and women's buttocks. These, indeed, are physical attributes conceived of as indicators of rapid growth and good production of staple crops. Interstingly, Conklin (2001: 153) has reported that among the Wari' of the Brazilian Amazon, the pubescent

girls' physical growth and sexual maturation are believed to be influenced by the special relationship they establish with the moon. On the other hand, among the Shuar, there appears to be an underlying pattern of bio-cosmic associations and ontological interdependence between women's bodies, the full moon phase and the growth of tubers. In sum, patterns of growth, fertility, and reproduction within traditional horticulture highly depend on a complex set of relationships between organismic kingdoms, celestial bodies, immaterial beings and inorganic matter.

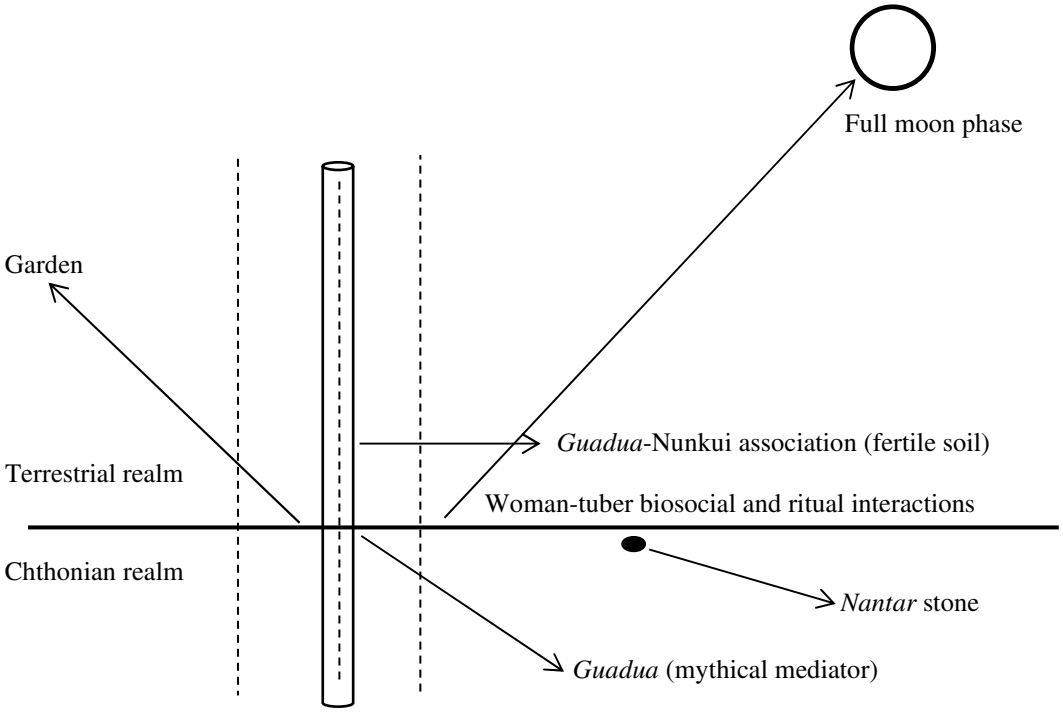

Fig 4.7. Cyclical process of tuber growth and reproduction.

It has been observed that some Amazonian peoples explicitly conceive the reproductive biology of manioc as a conjunction between female and male agencies embodied in the biological and morphological properties of the plant. For these societies, for instance, morphological and biological properties such as stem and root starches contain both female reproductive capacities and a semen-like substance derived from the fertilising attributes of the sun (Reichel-Dolmatoff,

1971; C. Hugh-Jones, 1979; Rival, 2001). Although the Shuar do not overtly make any connection between these female and male principles involved in the reproduction of manioc, the traditional horticultural practices exhibited by this Amazonian society strongly indicate patterns of growth and reproduction that arise from the connection of a wide variety of agential forces. For instance, Guss (1989: 34) reported that the Yekuana conceive gardens as female and metaphysical spaces linked to Heaven and the supernatural powers essential to manioc growth. Within this context, and as illustrated in Fig. 1, the fertilising and generative processes within Shuar gardens are determined by the concatenation of mythical connectors, cosmic forces, and the agential qualities of biosocial beings and inorganic matter. Overall, the association between the biosocial, ecological, cognitive, mytho-cosmological, and ontological qualities of gardens' entities is likely well-embedded in human-plant coevolutionary processes.

4.5 the significance of Shuar traditional horticulture

Among the Shuar communities documented in this thesis, traditional horticulture still plays a crucial role in providing carbohydrate-rich food crops and triggering social relations. These, in turn, are underpinned by a mythical and ritual structure that likely hints at complex patterns of human-plant coevolution. Although notions of gender and kinship relationships and certain ritual practices involving tubers are almost lost or preserved only by older adults, a holistic picture of ancestral gardening activities emerged from the informants' narratives. The female domain of the gardens may thus have operated as an ecological niche within which biosocial, mythical, cosmic and ontological associations between biological kingdoms informed patterns of growth, fertility and reproduction.

Therefore, the fertilising properties of *Guadua* (hence its association with Nunkui and its role as a mythical mediator between ontological realms) alongside the complex gardening rites exhibited by women (from ritual chants and magic stones to proprioceptive skills and relations with the full-moon phase) are the essential conditions for the rapid growth and good production of staple crops. From the conception of *Guadua* as a fertiliser (likely supported empirically) to the more imaginative notion of manioc's hematophagous behaviour, the Shuar conceptualisations of nature foreground the agentive qualities of the plant kingdom. This likely demonstrates that, from an evolutionary and a cognitive point of view, traditional horticulture is highly entrenched in ancient patterns of human-plant interactions that may have laid the foundation for the configuration of empirically sound concepts of plant behaviour and cognition. Ultimately, these biological and cognitive properties of plant life may have significantly shaped Indigenous socio-ecological, mytho-cosmological and ontological systems.

Chapter 5. Shuar ethnopharmacology and the nature of medicinal and sacred plants

It should come as no surprise that one of the main merits of Lévi-Strauss's book *The Savage Mind* was to foreground the universal intellectual capabilities of the human mind. For Lévi-Strauss (1963, 1966), then, both scientific and mythical thought apply equivalent forms of reasoning and methods of observation, notwithstanding both modes of thought differ in the nature of the things to which their logical process is applied. While modern thought is primarily guided by abstract notions, its Indigenous counterpart exhibits a particular "logic of the concrete" in which the senses play a prominent role in structuring the world (Lévi-Strauss, 1966, 1979). Take, for example, the debate between conceptions of universality and variability of cognitive traits among populations (Foley 2010; Lloyd 2010). On the basis of the significant role played by the sensory faculties among traditional societies (e.g., cognitive systems highly connected with the most basic properties of the plant and animal kingdom), human cognition may thus oscillate between the display of ancient cognitive abilities developed through evolutionary time (and hence universally shared by humans) and variations on the degree of activation of these exhibited by a vast array of human groups. Consequently, such a conundrum entails a nuanced perspective through which cultural, ecological, and phylogenetic factors influence the condition of the human mind (Foley, 2010). Evolutionarily speaking, this issue appears to be embedded in the historical socio-ecological relationships between our hominin lineage and other life forms.

Since the Cambrian explosion, approximately 541 Mya, almost all basic animal body plans emerged on Earth (Maloof et al., 2010; Trestman, 2013). It is suggested that during this evolutionary leap, a primordial form of cognitive and intellectual traits developed in ancient

organisms (Trestman, 2013; Godfrey-Smith, 2017; Ginsburg & Jablonka, 2019). Extant complex life forms, then, are likely to have inherited elementary forms of cognition that allow their biological persistence amid environmental constraints. The construction of particular ecological niches and, hence, the degree of survivorship and reproductive success may be directly proportional to the level of behavioural and cognitive qualities exhibited by a given species. If, for example, we take ecological constraints such as pathogen load, this, in turn, may pose strong selective pressures on the animal kingdom.

Animals may therefore have been utilising the biological properties of plant life for medical purposes (and hence coping with a wide range of parasites and pathogens) throughout evolutionary history (Huffman, 2003). Within the self-medicative behaviour of animals (zoopharmacognosy), the plant kingdom plays a significant role and its use has been reported in a wide array of taxa ranging from insects to mammals (Hemmes et al., 2002; Petit et al., 2002; Villalba et al., 2006; Singer et al., 2009; Lefèvre et al., 2010; Shurkin, 2014; Neco et al., 2019; Greene et al., 2020). Notably, among primates, self-medication behaviour (primarily via the assimilation of plant matter) appears to be more widespread than in other animal species (Baker, 1996; Huffman et al., 1997; Barelli et al., 2007; Fruth et al., 2014; Kreyer et al., 2022; Freymann et al., 2024a, 2024b; Laumer et al., 2024; Yinda et al., 2024). As Huffman (2001: 659) notes "It appears that the fundamentals of perceiving the medicinal properties of a plant by its taste, smell, and texture have their roots deep in our primate history."

Primates zoopharmacognosy, therefore, aligns with patterns of self-medication likely exhibited by ancient hominins (Hagen et al., 2023); for example, the putative use of medicinal plants by our closest human relatives, the Neandertals, may well indicate the sophisticated cognitive abilities and ecological knowledge shown by these hominins (Hardy et al., 2012; Hardy et al., 2013; Shipley

& Kindscher, 2016; Weyrich et al., 2017; Hardy, 2022 but see Buck & Stringer, 2014). After all, if the use of medicinal plants reported among great apes such as chimpanzees (*Pan troglodytes schweinfurthii*) and western lowland gorillas (*Gorilla gorilla gorilla*) corresponds with that of African traditional healers (Krief et al., 2005; Yinda et al., 2024), then the role of plant life in combatting parasitic and pathogenic organisms may have been well entrenched in primate evolutionary history (e.g., Huffman, 2001). The evolutionary implications of this pattern of behaviour in shaping humans' cognitive systems are likely to be substantial; extant forager-horticulturalists might, in principle, be considered essential keepers of transmitted medicinal plant knowledge amid the ecological and biocultural destruction of our current age.

In this chapter, I will describe my ethnographic experiences concerning the use of certain medicinal plants among the Shuar and the significance of their ethnopharmacological knowledge to combat parasites and emerging infectious diseases such as COVID-19. Interestingly, like other Amazonian pharmacopoeias (Giovannini, 2015; Pedrollo et al., 2016; Daly & Shepard, 2019; Shepard & Daly, 2023), within the Shuar botanical knowledge, the nature and use of medicinal and psychoactive plants usually overlap and intersect. This phenomenon, in short, reveals patterns of behaviour that, from an anthropological point of view, represent a holistic understanding of the vegetal world and its manifold biosocial and metaphysical dimensions. This kind of logic of the concrete (Lévi-Strauss, 1966), then, stems from the most basic forms of medication behaviour also exhibited by other animal taxa, particularly primates. Thus, highly localised yet sophisticated forms of cognition are of primary importance for the knowledge and use of plant secondary compounds that provide health benefits.

If the biophysical properties of the vegetal world are to be mainly considered empirical devices for the intellectual stimulation of the human mind, what of the other species of the animal kingdom

that display similar patterns of interaction with plant life? Even though humans are the only living entities that show unique cognitive abilities ranging from complex forms of communication (e.g., language, ritual systems) to the construction of metaphysical concepts, other animals may also exhibit, albeit on a more concrete level, behavioural and cognitive qualities (from the self-medication behaviour of caterpillars, *Grammia incorrupta*: Singer et al., 2009 to the more cognitively advanced of chimpanzees, *Pan troglodytes schweinfurthii:* Freymann et al., 2024b) linked to specific forms of interactions with medicinal plants. Within this evolutionary framework, and to better understand the significance of Amazonian pharmacopoeias (that is, the complex overlap between medicinal and psychoactive plants and their association with the ritual and cosmological structure), we must primarily look at the elementary socio-material relations established between organismic kingdoms.

5.1 The compenentration of physicalities

After a couple of months of intense fieldwork in the Shuar communities, I decided to come back to my home town Guayaquil to spend a week with my family. Although I was happy to see some of my family members, being in the biggest and most chaotic city in the country and one of the most dangerous cities in the world seemed a bad move. Paradoxically, being in Guayaquil appeared as a necessary evil in that one could enjoy certain benefits (from big supermarkets to health facilities) offered by a concrete jungle. And yet, during the nights I started to become agitated but not because of the intoxicated atmosphere saturated by the extremely loud salsa and reggaeton music; my stress was due to an annoying itching on my right calf. During the last days in Guayaquil, the itching intensified during the nights and I also began to notice that a red and

swollen spot appeared on my calf. The first thing that came to my mind was that an insect could have either stung or bitten me during my constant visits to the Shuar gardens or the surrounding forests. This seemed somehow a bit weird since I hadn't felt any insect sting or bite throughout my whole stay in the Amazon. Despite this irritating situation, my stay in Guayaquil came to an end and, consequently, I came back to the Amazon to continue the fieldwork.

After my return from Guayaquil, my first night spent in Mura (Tawasap community) was terrible primarily because of the intense itching and the annoying sensation of something that was tearing my flesh from the inside. I woke up early in the morning and I met Tzama who, as usual, had spent the night in Mura with his son Natem and daughter Tamia. Then, I desperately asked Tzama to take a look at my calf whose wound appeared very swollen with a yellowish fluid sometimes coming out from it. When Tzama started to inspect the sore, he straightforwardly told me "This is tupe (human botfly, *Dermatobia hominis*), it needs to be removed quickly!" I couldn't believe that the human botfly had laid her eggs on my skin and that a larva was causing me too much pain and itching. Unfortunately, Tzama had to leave in a hurry and hence could not help me with the extraction of the larva telling me to wait for his return in the afternoon. It was a frustrating situation to realise that a living thing such as *Dermatobia hominis* was developing in human flesh and likely thriving on this novel biological niche.

I then tried to calm down and decided to go down to the main village of Tawasap to find some help; I thought that waiting for Tzama until late in the afternoon was too much since the pain and itching were unbearable. While descending the hill of Mura I began to limp given that the gumboot of my right foot heavily scratched the wound. This painful situation forced me to walk slowly precisely because to not risk a bad slipping through the muddy terrain. When I finally arrived at the village, there were very few people in the surroundings, so I thought it was a good idea to sit

down and wait until the coming of some friend or known Shuar. While I was waiting on the small terrace of Tzama's house[4], I was thinking about how common *Dermatobia hominis* is in tropical regions such as the Amazon rainforest (e.g., Requena-Zúñiga et al., 2024). Not surprisingly, during my first fieldwork among the Shuar communities in 2018, a considerable number of Shuar and even visitors from other parts of the Amazon talked about instances of *Dermatobia hominis* infestations. Notably, like other Latin American realities (e.g., Andriotti et al., 2021), dogs (*Canis lupus familiaris*) exhibited also high rates of *Dermatobia hominis* infestations in the communities. With this anecdotal and empirical evidence in mind, my distress began to slightly diminish and, thereby, a certain human exceptionalism deep-seated in our modern cultural ontology seemed to fade away from my metaphysical presuppositions.

During this kind of philosophical reflection on our physical existence (and hence our biological vulnerabilities like any other forms of life), a voice suddenly began to call my name; it was Kakaram, a young Shuar man who was in Twasap for some weeks to help Tzama in restructuring his traditional house in Mura. Kakaram, a son of a mixed Shuar-Achuar marriage, had been revealed very good company during the frequent drinking of manioc (*Manihot esculenta Crantz*) beer and dinner times in Mura. These were his final days in Tawasap before returning to his community located near the Upano Valley in Morona Santiago. While talking about the possibility of visiting his community[5], I showed him the wound on my right calf so as to see If he could help me with the annoying and painful situation of having a botfly larva developing within my body. He immediately checked the wound and then began to make a clicking sound in order to entice the larva to come out. Suddenly Kakaram told me "Look at the larva which is trying to come out! You

[4] Although Tzama often sleeps in Mura, this is the house where he lives with with his wife Maria and his children Naikim, Natem and Tamia. The house also hosts a very tiny grocery shop where most community members gather together.

[5] As mentioned, given the difficult socio-political situation of the country, I was unable to visit other communties.

can see a part of its body moving!." In the meantime, another guy (a Quichua young man who was also helping in the community) appeared and noticing the *Dermatobia hominis* infestation, asked for some pincers in Tzama's house. With the aid of the pincers and in conjunction with the clicking sound, Kakaram was able to grip the larva and ultimately get rid of the parasitic entity. He then ripped a leaf from a nearby tobacco plant (*Nicotiana tabacum*) and rubbed it onto the wound.

As trivial as it might seem, the implications of the abovementioned fieldwork experience may nevertheless be twofold. First, from an ethnographic standpoint, it underscores the highly relational nature of the human-environment interface, as strongly indicated by the emergent field of multispecies studies (e.g., Kirksey & Helmreich, 2010; Ogden et al., 2013; van Dooren et al., 2016; Swanson, 2017; Fijn & Kavesh, 2021); in fact, it foregrounds the primary role of the elements of biological kingdoms (i.e., *Dermatobia hominis* and *Nicotiana tabacum*) in shaping the human physical and ontological condition. For example, Wilbert (1987) reported a vast use of *Nicotiana tabacum* (primarily linked to ritual activities due to the psychoactive compounds of the plant) among the Indigenous peoples of South America. It is also notable that, though the Shuar use *Nicotiana tabacum* principally during rituals, its administration as a wound-healing agent might be viewed as an extraordinary behavioural incident. Accordingly, there is an extensive body of evidence showing a wide array of plants used in the Amazon for wound healing (e.g., Apocynaceae, Araceae, Euphorbiaceae) (Villegas et al., 1997; Bourdy et al., 2000; Shepard, 2004; Giovannini, 2015); however, the use of *Nicotiana tabacum* for this practice is likely to be absent within Amazonian pharmacopoeias.

Fig 5.1. *Tsaank* or tobacco plant (*Nicotiana tabacum*).

During his fieldwork among the Matsigenka of Peru, for instance, Shepard (2004) reported that a healer used a caustic Araceae epiphyte to treat him for a caterpillar sting; interestingly, experimental evidence has indeed supported the traditional use of Araceae species (in this case *Alocasia denudate*) as a wound-healing agent (Latif et al., 2015). Even though the use of *Nicotiana tabacum* for wound healing is likely to be sporadic among the contemporary Shuar, the biolarvicidal effects of tobacco (Ekapratiwi et al., 2019) and the antibacterial compounds of its leaves (Fernanda et al., 2021) may further corroborate its use as a remedy for wound healing for

Dermatobia hominis infestations. It is also noteworthy that, like other Indigenous societies (Karim, 1981; Descola, 1994; Shepard, 2004), Shuar concepts of the aetiology of diseases (like the parasitic infestation (myiasis) caused by *Dermatobia hominis*) transcend the biological nature of host-parasite relationships. Let me briefly explain this phenomenon by returning to the fieldwork experience. After rubbing the tobacco leaf on my wound, Kakaram began to narrate an intriguing story about his uncle who fell victim to witchcraft; this act appears to have involved a serious case of myiasis or, biologically speaking, larval infestation caused by *Dermatobia hominis*. Here is Kakaram:

> One day a bewitching shaman sent a tsentsak (magic dart) to my uncle. A sore then appeared on my uncle's neck and he started to feel intense pain; he could neither sleep nor eat! It was an awful situation. Suddenly the wound became so swollen that many larvae started to come out from it. The tsentsak was so potent that tupe (*Dermatobia hominis*) infestation was very hard to combat; in fact, a powerful shaman needed to intervene to help and then cure my uncle (Kakaram, Tawasap community).

The aforementioned narrative underscores notions of shamanic aggression through magic darts (Van Andel et al., 2015; Daly & Shepard, 2019) and the subsequent infliction of pain embodied by a severe case of larval infestation. Notably, if we link Kakaram's story with my own experience of *Dermatobia hominis* infestation, a complex picture of interspecies interactions emerges. This, in turn, points to different levels of relational processes (from the medicative behaviour involving the rubbing of *Nicotiana tabacum* to the more ritual one involving the shamanic practices of cursing and curing). Accordingly, human–parasite relationships may have unarguably shaped forms of medicinal plant knowledge and metaphysical concepts of diseases.

Second, from an evolutionary viewpoint, the multispecies interactions involved in the abovementioned ethnographic experience may very well align with recent studies of animal cognition. Evidence suggests, for example, that insects show a variety of forms of sophisticated cognition (Perry et al., 2017) and have even the capacity for the most basic attributes of consciousness, namely subjective experience (Barron & Klein, 2016). Leaving aside the putative forms of qualia or complex cognitive abilities exhibited by insects, it is reasonable to believe that Indigenous notions of consciousness (that is, the conception of the soul as shared by a wide array of non-human entities) may corroborate, at least theoretically, the experimental studies that underline that these invertebrate species likely possess these capabilities. The ethnographic example of *Dermatobia hominis* may hence illustrate how a parasitic organism is endowed with forms of agency epitomised by shamanic aggression through magic darts.

Also, the ethnographic example of the topical application of *Nicotiana tabacum* leaf onto a wound caused by *Dermatobia hominis* infestation may further illuminate the potential evolutionary implications of the similar use of the bioactive properties of plants by non-human primates. The fur-rubbing/ointment behaviour and the external application of plant materials for self-medication (e.g., wound healing, ectoparasite removal, anti-inflammatory treatment) have thus been reported in a wide variety of primates, ranging from white-faced capuchin monkeys (*Cebus capucinus*: Baker, 1996; DeJoseph et al., 2002) to tufted capuchins (*Sapajus apella*: Ritchie & Fragaszy, 1988) to Bornean (*Pongo pygmaeus*: Morrogh-Bernard, 2008; Morrogh-Bernard et al., 2017) and Sumatran (*Pongo abelii*: Laumer et al., 2024) orangutans. Remarkably, Laumer et al. (2024) observed that a male Sumatran orangutan (*Pongo abelii*) chewed the leaves of *Fibraurea tinctoria* (a liana well-known for its its analgesic and antibacterial properties) and then applied the resulting juice onto a facial wound, covering ultimately the wound with the chewed leaves. This finding is

illuminating since the self-medication behaviour exhibited by the orangutan was likely intentional, and, hence, this appears to have followed a determined behavioural sequence (i.e., the specific selection of plant parts to apply onto the wound) with a particular aim (i.e., wound treatment). The wide array of relationships with the plant kingdom shown by the zoopharmacognosy of primates may indeed suggest forms of behaviour and cognition that, at its most basic, correspond with the medicinal plant knowledge of traditional societies. Accordingly, like the use of the bioactive properties of plants for wound healing exhibited by the Shuar and other Amazonian peoples (Villegas et al., 1997; Bourdy et al., 2000; Shepard, 2004; Giovannini, 2015), the analogous application of plant matter shown by primates likely reveal patterns of behaviour present in our last common ancestor (Laumer et al., 2024) or even perhaps deep down in the primate phylogenetic tree.

5.2 Indigenous knowledge of medicinal plants against emerging infectious diseases

Unarguably, from the Late Pleistocene of global human expansion to early urbanised societies and commercial networks, human niche construction has become the primary driver of ecosystem alterations, causing substantial rates of species extinctions and extirpations (Boivin et al., 2016). The Holocene thus marked the dawn of new socio-structural and ecological patterns whereby anthropogenic activities created the necessary conditions for agriculture, animal husbandry, the spread of zoonoses and socio-economic inequalities (Larsen, 2023). It is worth remarking that before the domestication of cattle (*Bos* spp.) or swine (*Sus scrofa*) throughout the Pliocene/Pleistocene, early *Homo* began to enter the carnivore guild (primarily exhibiting scavenging patterns), which thus provided the opportunity for taeniid tapeworms circulating

among carnivores (e.g., hyaenids and felids) and bovids to contaminate hominins (Hoberg et al., 2001). Notwithstanding these parasitic infections, and although the ancestors of the modern pathogens were likely present among the earliest hominins, it is unlikely that the transmission of the so-called crowd diseases (e.g., measles, influenza, and smallpox) could have occurred given the small number of individuals within their social groups (Larsen, 2018). It was not until the shift from foraging to farming ~12 ka (Larsen, 2023) that anthropogenic modifications of the environment opened the window for novel human-animal interactions and the spread of zoonotic diseases; domesticated animals thus acted as conduits for human infection by wildlife pathogens (Pearce-Duvet, 2006).

Overall, due to the novel Holocene sedentary lifestyles, the rise in human population sizes and densities coupled with the intensification of plant and animal domesticates has inevitably triggered the loss of dietary breadth and the transmissibility of zoonotic pathogens (Larsen, 2018, 2023; Lewis et al., 2023). This is not surprising, as the shifting of subsistence patterns from hunting and gathering to farming significantly impacted the well-being of human societies at that time. Chronologically speaking, for instance, intestinal parasites (human whipworm, *Trichuris trichiura*) have been found in a Late Mesolithic burial in Motala, Sweden, probably reflecting patterns of sedentism, crowding, and poor sanitation among the population of hunter-gatherers (Bergman, 2018). All these factors epitomised by the intensification of agriculture were thus significant drivers for the further transmissibility of bacterial pathogens such as *Salmonella enterica, Yersinia enterocolitica* and *Yersinia pestis* among the Neolithic Scandinavian populations (Bergfeldt et al., 2024). Since the Neolithic, the bacterium *Yersinia pestis* has spread across Eurasia, facilitated by the intensification of animal husbandry and human mobility (Andrades Valtueña et al., 2022). In the Upper Mun River valley, northeast Thailand, King et al.

(2017) also reported that during the Iron Age, changes to social structure and anthropogenic disturbances of tropical forest ecosystems (from the creation of rice paddies and moat systems to the corralling of domestic animals to population growth and social inequality) were critical factors for pathogenic infections (primarily due to the close contact with stagnant water and faecal matter) and health disparities. Remarkably, *Y. pestis*, the etiological agent of The Black Death (1347–1352 CE), which spread across Eurasia and North Africa and killed half of the population of those regions, is likely to have been caused by a combination of climatic, ecological, social and economic factors such as human-rodent-flea interactions, intensive agriculture, cereal trade and military campaigns (Green, 2020; Izdebski et al., 2022).

Therefore, the Holocene appears to have been one of the most dynamic periods of human adaptation and evolution (Larsen, 2023). It brought the acceleration of human dominion over nature, ranging from the European colonisation of the Americas to the nuclear explosions of the second half of the twentieth century. From these events, the Anthropocene has gained paramount importance (Lewis & Maslin, 2015) as a successive geological epoch and starting point of increasing anthropogenic alterations of Earth's sediment layers (see, e.g., Zalasiewicz et al., 2011; Waters & Turner, 2022). The European colonisation of the Americas, for instance, may serve as a point of reference to clarify the anthropogenic factors responsible for the alterations of econiches and pathogenic infections among indigenous peoples. If the emergence of human carnivory caused the assimilation of *Taenia* tapeworms in the gut ecology (Hoberg et al., 2001), the contact with different microbiomes nearly decimated Amerindian populations (Crosby, 1972), triggering the alteration of the localised microbial communities. In the Americas, for example, European colonialism triggered the contact of dissimilar virospheres (Aronsson & Holm, 2020), causing the spread of pathogens and, subsequently, the near extermination of Indigenous peoples (Crosby,

1972; Myers, 1988; Newson, 1996). Likewise, among the indigenous societies of the Kingdom of Tonga, Polynesia, evidence suggests that the introduction of new pathogens by Europeans was the primary driver for the population collapse (~80%) (Parton & Clark, 2022).

Within the framework of contact with foreign pathogens, Amazonian societies' reminiscences corroborate their suffering from smallpox, measles, and malaria as documented among the Yanomami (Rifkin, 1994; Rival, 2021), the Urarina (Fabiano, 2022), and the Cariban-speaking indigenous peoples of Eastern Guiana (Duin, 2021), to mention a few. Consistent with this statement and in connection with the past socio-ecological processes that influenced host-pathogen dynamics, current zoonotic and vector-borne diseases are likely to be caused by human-induced alterations of ecosystems and climate change (Páez et al., 2018; Del Lesto et al., 2022). The new SARS-CoV-2 (Rajendran & Babbitt, 2022) thus reminds us that cross-species transmission depends significantly on the different modalities of human existence; our presence in the material world is, properly speaking, inextricably intertwined with other entities and hence, chaotic outcomes are highly contingent upon the quality of the human-environment interface. In other words, the acceleration of anthropogenic activities driven by the modern conceit of predatory supremacy and the inexhaustible logic of nature's exploitation has caused the emergence of COVID-19 (see Aronsson & Holm, 2020; Fuentes, 2020; Kirskey, 2020; van Dooren, 2020). Zoonoses, in essence, are the by-product of the entangled and intricate relationships among humans, different animal taxa, and their econiches (e.g., MacGregor & Waldman, 2017; Doron, 2021; Milstein et al., 2022; Shaffer et al., 2022; van Vliet et al., 2022; Arregui, 2023).

The COVID-19 pandemic may hence be a tangible consequence of detrimental behaviours that have persistently impacted Earth's ecosystems. Like the bacterial diseases that heavily affected the Neolithic and mediaeval populations such as salmonellosis and the most fatal Black Death,

respectively, SARS-CoV-2 has taught us that zoonotic diseases move swiftly across geographic boundaries, underscoring our biological vulnerabilities. After all, our increasingly unsustainable relationship with the natural world will likely pave the way for future pathogenic infections (Lorenz et al., 2021; Weaver et al., 2022) which will pose a great risk for humanity. Notably, in the face of these health issues coupled with the unrestrainable effects of neocolonialism and global capitalism, traditional ecological knowledge may be a highly valuable empirical toolkit of resilience. As we shall see, medicinal plant knowledge among the Shuar has been the primary source of prevention and cure against potential COVID-19 infections. The ethnographic data presented here have been collected through digital[6] and classic ethnographic methods and show how certain elements of plant life are of primary importance to combat respiratory diseases, such as COVID-19.

5.2.1 A mixture of bioactive compounds

Notably, contrary to other Amazonian countries like Brazil, where the infection rates and deaths caused by COVID-19 were the highest among indigenous peoples (see, for instance, de Castro et al., 2020; Charlier & Varison, 2020; Ferrante et al., 2020), it seems that the Shuar communities have been less affected by it. In Amazonia, however, the health system's endemic precarity has exacerbated Indigenous societies' vulnerable conditions (Cárdenas Palacios & Reymundo Dámaso, 2021; Charlier & Varison, 2020; de Castro et al., 2020; Ferrante et al., 2020). In connection with the pandemic diffusion among the Shuar, one day chatting on Facebook, Yasmin, from the Tawasap community, explained to me how she has been curing her 10-month-old baby infected

[6] A period of intermittently digital ethnography was conducted with a few key Shuar informants primarily during the years 2020/2021 when The COVID-19 outbreak heavily hit the Ecuadorian Amazon (see Abad Espinoza, 2022).

by COVID-19: "I prefer to cure my baby with traditional medicinal plants, instead of sending him to the hospital where people are dying." I, therefore, realised that such kind of information, though transmitted in fragmented form through digital devices, revealed flexible patterns of medicinal plant knowledge in the face of emerging pathogenic infections.

Concerning the use of medicinal plants to combat the pandemic, similar practices have been documented widely among other Indigenous and traditional peoples of Amazonia (Oikonomakis, 2020; Cárdenas Palacios & Reymundo Dámaso, 2021; Del Aguila Villacorta et al., 2021; Wright, 2022; Shepard & Daly, 2023; Bedoya-Molina et al., 2024), Sub-Saharan Africa (Attah et al., 2021) and the Indian Himalayan Region (Maikhuri et al., 2024). For example, during the digital inquiry conducted with the Shuar during the pandemic times, I could record some valuable information about the medicinal trees and plants utilised in the concoction to treat COVID-19. Within this framework, one day, chatting on Facebook, Tzama's wife (María) vaguely described the plants they use in the infusion (i.e., kaip (*Mansoa alliacea),* chuchuguazo (*Maytenus laevis Reissek),* ajej (*Zingiber officinale*), orange (*Citrus x sinensis*) and key lime (*Citrus* × *aurantifolia*)). However, it was not until a WhatsApp call with Nawech that I could learn more about their current ethnopharmacological knowledge. According to him, the mixture of chuchuguazo (*Maytenus laevis Reissek),* zaragoza *(Conocarpus erectus),* uña de gato (*Uncaria tomentosa)* and aguardiente offers a more reliable option for curing the disease at home rather than in healthcare facilities working in precarious conditions.

Interestingly, like the Shuar, other Amazonian societies have also been observed to use different plant materials to treat potential COVID-19 infections. For example, Oikonomakis (2020) reported that the Kichwa of Sarayaku drink hot water and gargle with special leaves to combat the virus; they also drink a mixture of 12 medicinal herbs and aguardiente to strengthen their immune

system. Among the Urarina, Del Aguila Villacorta et al. (2021) documented the use of 16 plant species against the COVID-19 disease. Shepard & Daly (2023) also reported that the Makushi consume tea-like infusions containing a combination of bitter barks, garlic, ginger, and lime. It might be stated that, like ingenious alchemists, the Shuar, as well as other Amazonian peoples, exhibit high levels of ecological wisdom that allow them to relate profoundly with the elements of the vegetal world and their medicinal properties.

It would be unreasonable to assume that the abovementioned data collected by digital ethnographic methods have not shed light on the primary importance of particular behavioural patterns that have allowed the Shuar to deal with a sudden pandemic outbreak. Notably, during the post-pandemic fieldwork, I noticed that the Shuar still consume infused and/or macerated plant materials to treat COVID-19 infections (although highly diminished in the communities) and other respiratory diseases. For example, one day during a visit to Nawech's house in the Yawintz community, his wife Yanua was meticulously putting some plant parts into a recipient full of sugar cane alcohol (aguardiente). Amongst the wide variety of plant matter, I was familiar only with the sliced parts of *Zingiber officinale* roots submerged in aguardiente; after all, it was the first time that I could observe physically medicinal plants whose shapes were only partially appreciated by the blurred pictures sent by the Shuar throughout the pandemic. So, at one point Nawech and Yanua began to show me the root barks of *Maytenus laevis Reiss, Conocarpus erectus* and *Uncaria tomentosa* as the main plant materials of the infusion. While looking at the medicinal plant mixture inside the recipient, Nawech told me:

> Here you have the best cure for COVID-19! Wait a couple of days and the brew will be ready for consumption. It is very effective! And due to the fact that other respiratory infections are

> common in our communities, this brew is helping us too much. Whether you have a cold or flu, the plants of this remedy will ameliorate your health (Nawech, Yawintz community).

The use of *Zingiber officinale* to treat respiratory infections has also been reported by Bennett (2002) among the Shuar communities in the province of Morona Santiago. Giovannini (2015) reported a similar use of this plant by the Achuar. Experimental evidence suggests that fresh *Zingiber officinale* has antiviral activity against human respiratory syncytial virus (San Chang et al., 2013). These findings may thus further corroborate the use of this species by the Shuar as one of the principal ingredients of the infusion. Concerning *Uncaria tomentosa*, for instance, Keplinger et al. (1998) reported that the Asháninka of the Peruvian Amazon endow this plant with medicinal and religious significance. Interestingly, recent studies indicate that *Uncaria tomentosa* exhibits anti-inflammatory and antiviral effects against allergic asthma and SARS-CoV-2, respectively (Azevedo et al., 2018; Yepes-Perez et al., 2021). Moreover, besides the various ethnomedicinal properties of *Maytenus laevis Reissek*, this species is also used for the treatment of respiratory diseases such as bronchitis and cold (Ascate-Pasos et al., 2022). *Conocarpus erectus* exhibits antioxidant, antimicrobial, and antibacterial properties and is used traditionally as an analgesic and against catarrh, diarrhoea, and fever, among others (Coelho-Ferreira, 2009; Nascimento Santos et al., 2018; Armijos et al., 2022).

Fig 5.2. The root bark of chuchuguazo (*Maytenus laevis Reissek*).

Taken together, the phytochemical properties shown by these plants converge principally on the antiviral effects against respiratory infections. This, in short, may further substantiate their ethnopharmacological use by the Shuar against respiratory diseases like SARS-CoV-2 infection. Although further experimental studies are needed to assess the medicinal properties of the infusion, it is reasonable to assume that, due to the plants' phytochemical properties and the testimony of the Shuar, it is highly likely that the mixture provides an effective remedy against COVID-19, as well as other respiratory infections.

5.3 Purification, meditation, and the role of entheogens

Throughout my fieldwork, one of the most significant topics of discussion with the Shuar was the importance of entheogenic plants in their physical and spiritual existence. Thus, psychoactive plants, which, in turn, are considered sacred by the Shuar, play a pivotal role in shaping social and ritual behaviour and metaphysical concepts that manifest the ultimate nature of reality. During my first visit to the Tawasap community in 2018, for instance, a middle-aged woman jokingly asked me If I had never tried *maikiua* (*Brugmansia suaveolens*) to receive visions; only shortly after I realised that *Brugmansia suaveolens* is thought of by the Shuar as the strongest and most dangerous hallucinogenic plant (see also Bennett, 1992: 488) and hence, only prepared individuals and under certain circumstances can consume it. In addition to this anecdote, many fieldwork conversations, including those with children, revolved around sacred plants and their social, ritual, and metaphysical significance.

Fig 5.3. ***Maikiua*** **(*Brugmansia suaveolens*).**

It is noteworthy that, throughout the first and the second half of the 20th, Karsten (2000[1935]) and Harner (1972) reported the complex ritual behaviour involving psychoactive plants exhibited by (although at that time less acculturated) Shuar. Similar relationships with entheogenic plants have

been also documented among other Amazonian peoples (e.g., Achuar: Descola, 1994; Matsigenka: Shepard, 1998; Piaroa: Rodd, 2002; Yanomamo: Chagnon et al., 1971; Brewer-Carias & Steyermark, 1976). However, among the contemporary Shuar, as well as in other Amazonian contexts (e.g., Langdon, 2017), the use, consumption and relations with sacred plants have gravitated towards a more inclusive and global dimension of shamanic practices and psychedelic experiences. This phenomenon, as it turns out, has reduced significantly the complexity of ritual behaviour, thus decontextualising human-plant interactions through the mercification of ancient ethnobotanical knowledge (see Davidov, 2010; Fotiou, 2016). Yet it is worth mentioning that, even if some forms of commercialization have appeared within the Shuar communities (e.g., the selling of ayahuasca or *natem* in Shuar [*Banisteriopsis caapi*] decoction and the performance of its ritual complex to tourists), these can be imbued occasionally with serious ethnomedical connotations.

For example, throughout the months spent living with the Shuar, I have observed many volunteers and some tourists visiting the communities regularly. Unlike tourists who used to stay only a couple of days, primarily for leisure, volunteers could live in the Shuar communities for some weeks or even months. Although there were no professional ethnographers or anthropologists among the volunteers, this group of individuals were nevertheless likely to experience behavioural patterns practically hidden by the shallow tourist perception. As such, these individuals with different ethnic and cultural backgrounds[7] were principally helping the Shuar in building huts, reforesting certain areas, and organising cultural events; further, volunteers usually combined these secular activities with participation in ritual practices such as the consumption of psychoactive plants. It is in this context that some volunteers, especially after some form of learning about the basic aspects of entheogens, could drink the decoction of *natem*

[7] Most of the volunteers were young individuals from Europe, North and South America.

(primarily an admixture of *Banisteriopsis caapi* with *Diplopterys cabrerana* and occasionally *Calliandra angustifolia*).

Fig 5.4. Sharimiat holding a *natem* (*Banisteriopsis caapi*) in Wawaim.

There is one ethnographic anecdote that is worth mentioning here. Amongst the volunteers who used to live in the Tawasap community, Juan, an Argentinian guy 32 years of age, was the most interested in the bioactive properties of *Banisteriopsis caapi*. During one trip to the nearby waterfall, he recounted to me his story about depression and how hard was for him to live with this

mental ailment. He then told me about his past experiences with lysergic acid diethylamide (LSD), a psychedelic substance utilised for the treatment of various psychiatric disorders, such as anxiety and depression (see Fuentes et al., 2020). Even if LSD appeared to have somewhat helped him with his mental state, Juan thought nevertheless that, to ameliorate his well-being, he needed a radical change in his life. Thus, he decided to leave his job as a real state agent and began to search for information about ayahuasca and its phytochemical effects on depression (see Morales-Garcia et al., 2017, 2020); he then contacted Tzama to become a volunteer for a few months in the Twasap community. While bathing in the cold water of the waterfall Juan told me, "Now I am preparing myself to drink ayahuasca, I think that within a couple of days, Tzama will call me for the ritual." It is therefore reasonable to believe that Juan was undergoing some sort of physical and spiritual training before the consumption of the decoction of *Banisteriopsis caapi.*

5.3.1 A matter of physical and spiritual well-being

It is well known among Amazonian peoples the effects of *Banisteriopsis caapi* on linking different ontological spheres primarily by inducing altered states of consciousness (Brown, 1986; Descola, 1994; Rodd, 2002; Kohn, 2022). Experimental evidence thus substantiates the key role played by this entheogenic substance in shaping Indigenous metaphysical notions; that is, the consumption of this hallucinogen leads to a radical shift from materialist to panpsychist conceptions of the universe (Timmermann et al., 2021; Jylkkä et al., 2024). Among the Shuar, however, besides the metaphysical significance of *natem* (and hence its primary role in highlighting the ultimate structure of the universe through visions), the physiological implications for the consumption of the decoction are also noteworthy and of fundamental importance. These are therefore related to

Indigenous notions of purification through the process of vomiting. For example, one day in Mura I noticed a recipient containing a brown liquid inside; noticing my curiosity, Tzama then approached me and told me that this was a very potent decoction of *natem*. He then continued:

> As you can see, this is a very concentrated decoction; I made it with parts of the *natem* liana (*Banisteriopsis caapi*) and then added some leaves of *yaji* (*Diplopterys cabrerana*). I needed to boil it very well in order to obtain the potency of the plants; with this concentrated preparation of *natem* you will purify yourself by vomiting all the bad things within your body and experience a great variety of visions (Tzama, Tawasap community).

The abovementioned account is consistent with the statements made by Fotiou & Gearin (2019) and Politi et al. (2022) regarding the purgative and emetic significance of ayahuasca. This also may very well fit with scientific studies and ethnographic evidence that underscore the intricate relationship between the gut and the brain, especially after the ingestion of the decoction (Fotiou & Gearin, 2019; Politi et al., 2022). If the β-carboline alkaloids present in *Banisteriopsis caapi* stimulate the gastrointestinal tract (Politi et al., 2022) and N,N-Dimethyltryptamine (DMT) contained in *Diplopterys cabrerana*[8] induces visionary effects in conjunction with the former bioactive compounds (Rivier & Lindgren, 1972), then it is highly likely that the *natem* decoction links biophysical processes with higher-order notions of reality. This phenomenon may be supported empirically by returning to our former ethnographic anecdote described above.

While I was walking outside my room in the hut of Mura to leave for a visit to the Wawaim community, I was astonished when I saw Juan lying on his bed in a very intoxicating state; he had undergone the *natem* ritual guided by Tzama the previous night. I, then, approached him and asked

[8] Like *Diplopterys cabrerana*, *Psychotria viridis* also contains N,N-Dimethyltryptamine (DMT) and is frequently used in combination with *Banisteriopsis caapi* by Amazonian peoples (Bennett, 1992).

about the effects of the ingestion of the decoction on inducing visions; but to my surprise, his response focused primarily on the potent purgative effects of *natem*: "Drinking *natem* was very challenging; shortly after the ingestion of the brew I began to vomit a lot. Tzama told me that through the act of vomiting, I was expelling all the noxious elements from my body and thus cleaning my whole self." Though Juan told me that he experienced different kinds of visions, he nonetheless preferred to not give any detail about them. Interestingly, this narrative thus accords with Shuar and other Amazonian notions of the primary significance of psychoactive plants (e.g., *Banisteriopsis caapi*) as purgatives for the body and soul (Shepard, 2004; Jernigan, 2011). So, the hypothesis developed by Rodriguez et al. (1982) that the hallucinogenic plants utilised by Amazonians were primarily selected for their anthelmintic properties might have some empirical and conceptual value.

5.4 Thinking with the vegetal world

Throughout this chapter, I have tried to delineate certain ethnographic examples of medicinal plant knowledge and link them to rudimentary (primate zoopharmacognosy) and more sophisticated (decoction of psychoactive plants) elements of the relations between the animal and plant kingdom. If, for the Shuar, plant life still plays a crucial role in shaping their way of being, ranging from metaphysics to aesthetics to well-being (Abad Espinoza, 2019, 2022a), then the transmission of ecological knowledge must be flexible enough to withstand external pressures. As noted, Shuar ethnopharmacology, therefore, reveals patterns of behaviour also exhibited by ancient hominins (Hagen et al., 2023) and extant great apes (e.g., Sumatran orangutans, *Pongo abelii*: Laumer et al., 2024 and chimpanzees, *Pan troglodytes*: Freymann et al., 2024) in that complex associations with

plant materials provide health benefits amid specific biological circumstances. If the Amazon can be understood as a thinking forest with intrinsically psychedelic properties (Kohn, 2022), then its primary significance may lie in the complex evolutionary patterns of medicative behaviour and medicinal plant knowledge exhibited by Amazonian peoples.

Chapter 6. Consciousness, extension and the limits of human cognition

It is hard to deny that our current human condition is not affected by the radical alterations of the biosphere. As the allegedly superior species, we are entirely absorbed into the biophysical contingencies of the Earth. On the one hand, techno-scientific evolution provides us with the means to subdue ecosystems' biotic and abiotic components via different technological innovations ranging from nuclear weapons to chemical fertilisers to antibiotics. On the other, we grapple with the paradoxical status of being part of life's evolutionary process since approximately 3.4. billion years ago (Javaux, 2019). While our metaphysical presuppositions raise the human mind to the top of the universe, our ontic experience of the world indicates that human nature is deeply rooted in the physical properties of the cosmos. Thus, *res extensa* appears to be more than a passive biophysical phenomenon relegated to the margins of modern intellectual divinity. Such manifest existential axioms highlight the entropic nature of Earth's system (Gibbins & Haigh, 2020; Singh & Morgan O'Neill, 2022) and the abrupt development of organisms' bodily structure and basic cognition during the Cambrian period (Trestman, 2013; Barron & Klein, 2016). Through this important event in life history, we can trace the basis of our phylogenetic tree and realise that humans' biocultural evolution has always depended on the fundamental attributes of the material world.

Since life has been in constant flux for billions of years, it is pertinent to conceive living things as processes in the metaphysical sense of the term (Dupré, 2017). If non-human entities are solely physical properties that extend in space and time without any form of agency, how can we give meaning to contemporary issues such as climate change and zoonotic spillovers? The answer to this question seems to emerge from the quintessential attributes of existence that extend beyond

the apparent inertia of forms construed by human cognition. Theoretically, if an entity's phenomenal consciousness stems from the fact that there is something that it is like to be that entity (Nagel, 1974), extended nature's objects are far from being an inert matter miraculously bestowed for human domestication; consistent with this statement are Indigenous philosophical efforts to comprehend the elementary constitution of localised ecological niches embodied in relational conceptualisations of the world (Reichel-Dolmatoff, 1976; Bird et al., 2013; Rose, 2013; Zent, 2013; Walsh et al., 2023). Therefore, human existence is coeval with other life forms, establishing a "kincentric" ecological system (Salmón, 2000); that is, enmeshments of sympatric species from diverse organismic kingdoms (Abad Espinoza, 2024).

But why does an anthropocentric bias towards the material world linger in our modern thinking, although empirical evidence shows otherwise? This onto-epistemological dilemma points to a particular human condition and teleological thinking considering nature's elements as essentially designed for human survival (Preston & Shin, 2021). The *anthropos* is, in principle, only a portion of humankind that disproportionately benefit from fossil capital (Wirth, 2022) and, consequently, ignores the coevolutionary dynamics of life on Earth. Through this specific ontological status, the apparent supremacy of the human mind suffers from the cognitive inability to recognise, for example, both animal sentience (Leach et al., 2023) and the vegetal world surrounding us (Wandersee & Schussler, 1999; Jose et al., 2019). It is worth noticing that this is at odds with human-environment multifaceted interactions of different timescales of human evolution, ranging from Early Pleistocene African hominins (Antón et al., 2014) to contemporary Amazonian societies (Balée, 1994; Rival; 2002; Zent, 2013).

The question of our current existential condition in the universe can thus take two opposing directions. First, a superorganic one (Kroeber, 1917), whereby *res cogitans'* intellectual faculties

exert control over the realm of extension, seizing the Earth and aiming to expand its reach beyond the solar system. Second, a biosocial one that radiates from the elemental material conditions that allow coevolutionary and relational processes among living things across space and time. Following the second alternative may shed light on the conundrum of physical reality and the contingent existence of things within it. In other words, "if everything insofar as it is itself endeavours to persist in its own being", as Spinoza has suggested (E3p6), entities form a dynamic and active web of biosociophysical processes extending over spacetime.

Nevertheless, since our inherent capacity to alter the physical environment has increased substantially from the Early Holocene period (Larsen, 2023) onwards, the current environmental crisis is likely to be the most visible outcome of anthropogenic perturbations. These facts may corroborate empirically the emergence of the Anthropocene age which may threaten the future existence of *Homo sapiens* (Steffen et al., 2011) and whereby all living things strive for their material existence. The Anthropocene is thus synthesising the Cartesian project that aims to subjugate Earth's ecosystems to benefit only a few divine minds. And yet, it turns out that extended nature reacts to the *anthropos'* destructive interventions by triggering catastrophic events from climate change to the spread of pathogenic microorganisms. Taking this into account and, crudely speaking, unless we embrace alternative worldviews like those of Indigenous peoples who acknowledge nature's nonphysical values (Kohler et al., 2019), we can expect that the extant precarious socio-ecological conditions will compromise the continuity of life on Earth. The critical point is that novel ethical approaches to nature should emerge from ancestral ones that consider the realm of the living as intricate socio-eco-cosmological processes. On what grounds is our persistence to regard the physical environment as a mere cultural construct or a passive matter for exploitation warranted? Given the inextricable biosocial processes between humans and other

entities, a non-anthropocentric approach to the natural world should stem from within the fundamental attributes of ecological niches and their collectives. Ethically speaking, like Spinoza's *Natura*, similar profound concepts of nature are needed to widen our ecology's perspective (Naess, 1990: 39) and, therefore, plunge into the intricate ecosocial dimensions of life.

This chapter embarks on an anthropological and philosophical journey to analyse the metaphysical presuppositions concerning the relations with nature reported among the Shuar. Shuar concepts of human and more-than-human relationalities thus arise from highly embodied connections with sacred places (e.g., waterfalls, mountains, forest) and elements of the Plantae kingdom (e.g., *Nicotiana tabacum, Banisteriopsis caapi, Brugmansia suaveolens*). Apart from the aesthetic and biochemical properties of sacred places and plants, respectively, these components of the physical environment operate as fundamental ontological bridges. Visionary experiences are therefore highly contingent on ritual and ethical behaviours towards the elements of the natural world, which open the path for communication among agents beyond the limits of corporeal nature. The flux of biotic interactions and multisensory experiences instantiated by the ritual ingestion of sacred plants' psychoactive compounds highlights the underlying unity of things underpinned by a primordial substance. As I shall argue, this kind of ecocentrism and monistic conception of nature is an ethical stand via which a synthesis of life's coevolutionary processes and metaphysical postulates pave the way for a more sustainable future.

6.1 Primordial substance

No wonder our existence and survival are determined by extended nature whose intrinsic attributes provide the necessary biophysical conditions for life on Earth. Generally, the material world that hots the different organismic kingdoms that dwell within it can be understood by humans in two radically different ways. First, non-human nature is conceptualised as an extended thing substance that mechanically follows its laws whether it be God or physics as a cause. Second, this is conceived as a substance whose attributes of thought and extension are intertwined; that is, a nature that is thinking and extended at the same time and in which all its denizens are profoundly connected in a physical and metaphysical sense. Thus, for the former view, the Cartesian conception of nature appears to be strongly held by Western thought which radically separates in different ontological domains what is corporeal or extended (i.e., passive, brute, and inert nature devoid of intentionality) and what is thinking or rational (i.e., human beings as agents endowed with mind or soul). Consequently, this anthropocentric conception of the world indicates an outdated but long-held belief in evolutionary progress that puts humans on the top of the organismic pyramidal structure allowing their rational order to rule over all nature's beings. Conversely, for the latter view, nature is conceived as a complex order typified by the concatenation of biotic and abiotic elements rooted in relational processes of multiple space and time scales. Within this framework, according to Spinoza's monism, there is only one substance which is God/Nature that is necessarily infinite (E1p8), and hence from this substance follows infinite attributes (e.g., thought and extension) each of which expresses eternal and infinite essence (E1p11). If, for Spinoza's metaphysics, nature can be viewed as a substance whose whole is greater than the sum of its parts (Næss, 1995: 241), then biological kingdoms and inorganic matter are

only modes of the entire universe which is extended and thinks, and therefore their existence follows from the necessity of this divine nature.

It is not arbitrary to argue that most Amazonian cosmologies held a similar notion regarding corporeal nature as a complex and profound domain in which all entities are immersed and hence follow the mythical order of things. For example, Weiss (1972: 264) reported that the Asháninka of Peru conceived the development of the universe as a process of entities' diversification from a primal substance (mankind). Moreover, the creation myth of the Tukanoan peoples of Colombia and Brazil holds that an anaconda (*Eunectes* spp.)-canoe gave rise to all of humanity (Hugh-Jones, 2019). On the other hand, Zent (2009) reported that the Jotï of Venezuela view the vegetal substance as the mythical origin of humankind; each sub-group thus derives from three trees (i.e., *Apeiba* spp., *Inga bourgoni* Aublet, *Caraipa densifolia* Martius). Although the Asháninka, Tukano and Jotï concepts of primordial substance seem to diverge (viz., the first two ethnographic cases regard Animalia (*H. sapiens* and *Eunectes* spp.) and the third one the Plantae kingdom as mythical originators) within their cosmogonic myths, there is nonetheless a potential convergence between notions of primordial unity. The underlying principle may stem from the fact that, from the viewpoint of Amerindian philosophical apparatuses, the cosmos was not created *ex nihilo* (Viveiros de Castro, 2004: 477). The current state of things was therefore fundamentally determined by a sequence of transformations of the elementary building blocks of the universe. If humans for the Asháninka (Weiss, 1972), animals for the Tukano (Hugh-Jones, 2019) or plants for the Jotï (Zent, 2009) function as cosmogonic archetypes, the phylogenetic tree of these Amazonian societies is thus deeply rooted in their folk versions of evolutionary theory. Though it has been suggested that for these Indigenous peoples, the primary common condition of all entities is humanity (Descola, 1994: 93; Viveiros de Castro, 1998: 472), it may nonetheless be conjectured

that humanity is solely an index of the more complex substantial qualities shared by organismic kingdoms and even inorganic matter.

6.1.1 Interconnected Cosmic Elements

The Shuar cosmological and metaphysical presuppositions indicate a highly interconnected universe; thus, communication among different ontological planes was a prerogative in mythical times. Like the Yanomami of Venezuela (Chagnon, 1968), Desana of Colombia (Reichel-Dolmatoff, 1971) and Ma' Betisék of Malaysia (Karim, 1981), the Shuar conceive the universe as constituted of cosmic layers; the sky, earth, water, and chthonic realms are thus the essential components of the Shuar cosmological structure. Interestingly, the primary characteristic of the primordial order of things was that the sky and earth were connected by a vine which operated as a mediator for the communication between the two spheres. Another mythical connector is Kenku (*Guadua* spp.) whose tubular structure links the earth and the underworld; *Guadua* bamboo also acts as an indicator of fertile soil and is intimately associated with Nunkui, a mythical being that provides the growth and reproduction of tubers (see chapter 4). As pointed out by Lévi-Strauss (1988: 20), some Amerindian myths underline the opposition between the vine (as a connector between the sky and earth) and bamboo (as a connector between the terrestrial and chthonian realms). The plant kingdom thus plays a key role in structuring the cosmos as evidenced by the Shuar and other Amazonian peoples like the Venezuelan Jotï (Zent, 2009) and Wakuénai (Hill, 2009).

Take, for example, the liana that connected the sky and earth according to the Shuar mytho-cosmological system. The mythical narrative holds that the sun (Etsa) and the moon (Nantu) were

brothers married to the same woman named Auju. Though Auju was the wife of both brothers, she nonetheless preferred to sleep more with Etsa than with Nantu. Irritated by this fact, the moon decided to climb up to the sky and then told the squirrel (*Sciurus* spp.) to cut off the liana to prevent his wife Auju from chasing him; Auju thus fell to earth and transformed herself into a Great Potoo (*Nyctibius grandis*) (see Descola, 1994: 69; Karsten, 2000 [1935]: 370-1 for a detailed description of the myth).

From this highly abridged version of the myth told by the informants, we can delineate crucial aspects that have two important implications for the post-mythic order of things. First, a cosmic disruption arose from a highly strained situation (i.e., the moon's anger derived from an unfair adelphic polyandrous relationship) that prompted the moon to tell the squirrel to cut off the vine and thus thoroughly interrupting the communication between the celestial and terrestrial realms. This is consonant with the Jotï myth reported by Zent (2009: 15), which illustrates how a cosmic disorder (the collapse of the earth and the shaking of the sky) occurred when the primordial being (*ikyejka ja*) tired of the disproportion and abuse of power among the overpopulous *jkajo jadï* cut down the trees that sustain the biosphere. Second, it entails a complex set of transformations among primordial entities, a common theme in the mythical worlds of forager-horticulturalists ranging from the Americas to Southeast Asia and Melanesia (Hallowell, 1960; Weiss, 1972; Gell, 1975; Karim, 1981; Lévi-Strauss, 1988). If primordial physicalities transformed into organismic kingdoms and cosmic beings as shown by the Shuar and other Indigenous mythical narratives, is there something intrinsic in their behaviour patterns or agential qualities that point to a likely universal human condition?

6.1.2 The biogenic origin of entities

It is noteworthy that, according to the informants, all entities were regarded as Shuar in primordial times and hence are still persons (*aents*) even in the post-mythic age; a conception that has also been observed among other Amerindian people (Hallowell, 1960; Karim, 1981; Århem 1990, 1996; Descola, 1994; Daly, 2021). On this basis, Viveiros de Castro (1998: 471-2) postulates that the primary theme of Amerindian mythology is not a process of differentiating the human from the animal (as in the case of evolutionary theory) and that the original common condition of both humans and animals is not animality but rather humanity. Leaving aside the simplistic understanding of human evolution (*H. sapiens* appertains to the animal kingdom and its evolutionary history has entailed complex and gradual processes), like Descola (1994: 93), Viveiros de Castro points to the universal subjective qualities (i.e., to possess intentionality or soul) shared by humans and non-humans (mainly animals). From this perspective, Amerindian mytho-cosmological systems are reduced to a zoocentric scheme of relations based on an anthropogenic referential model (i.e., animism) (Descola, 2006).

There are compelling reasons to challenge such a view from both indigenous and scientific knowledge. For instance, Gell (1975: 225-6) reported that a myth of the Umeda of Papua New Guinea tells that their ancestors hunted and slew a cassowary (*Casuarius* spp.) whose carcass turned into the ancestors of their Punda neighbours. The significance of this myth (i.e., the non-anthropogenic origin of humans) may very well parallel the abovementioned Amazonian mythical narratives that indicate animals (e.g., anaconda, *Eunectes* spp. among the Tukano: Hugh-Jones, 2019) and plants (e.g., *Apeiba* spp., *Inga bourgoni* Aublet, and *Caraipa densifolia* Martius among the Jotï: Zent, 2009) as the originators of humankind. Thus, the zoogenic origin of humans for the

Umeda and Tukano and the phytogenic one for the Jotï point to a complex biogenic mytho-cosmological structure that invalidates the allegedly anthropogenic nature of animistic ontologies.

Let us elaborate on these points through the lens of archaeological and ethnographic evidence. For example, Douglass et al. (2021) reported that Late Pleistocene/Early Holocene hunter-gatherers of the montane rainforests of New Guinea hunted, harvested eggs and likely hatched and reared cassowary (*Casuarius* spp.) chicks. Tsang et al. (2022) also reported that among the Auwim people of East Sepik Province of Papua New Guinea, the acquisition, manufacture and use of cassowary bone daggers and their subsequent representation in rock art (by stencilling) indicate complex patterns of human-cassowary interaction spanning socio-ecological, cosmological and ritual dimensions. These findings have significant implications since, besides their economic and socio-ecological importance, cassowaries appear prominently in the mytho-cosmological and ritual repertoire of New Guinea peoples (e.g., Bulmer, 1967; Gell, 1975). Furthermore, recent evidence from the Orinoco River documented pre-Columbian rock engravings of gigantic snakes (likely Boidae: boas or anacondas), thus highlighting their prominence in the mythical repertoire (e.g., cosmogonic myths) of Amazonian peoples (Riris et al., 2024), such as the Arawak and Tukano (Garnelo, 2007; Hugh-Jones, 2019).

On the other hand, recent archaeological findings from the Serranía de la Lindosa, Colombian Amazon indicate that foragers occupied the Amazon biome since the Late Pleistocene and exploited a wide variety of plant taxa (primarily palms) (Aceituno et al., 2024). Nascimento *et al.* (2022) also reported patchy anthropogenic influences on Amazonian forest vegetation (landscape management through fire and plant domestication) throughout the early to mid-Holocene. Archaeological evidence thus lends further support to the complex relationships with carbohydrate-rich food crops, and medicinal and psychoactive plants found among contemporary

Amazonians that span the trophic, social, ritual and mytho-cosmological structures (Hill, 2009; Zent, 2009; Daly & Shepard, 2019; Shepard & Daly, 2022).

In summary, it might be argued that from the perspective of Amazonian and perhaps elsewhere mythology, the biogenic origin of entities seems a more plausible explanation than the anthropogenic one. For example, even if the Shuar endow subjective qualities (i.e., a soul, *wakan)* to the animal and plant kingdom, these ought not to be understood as purely of human origin. Contrarily, in primordial times, a constellation of beings (from earthly organismic kingdoms to celestial bodies) exhibited an amalgamation of behaviour patterns specific to humans and a given species or entity. Nevertheless, more-than-human behaviours and/or cognitive qualities seemed to prevail in mythical beings after the physical transformation into their current post-mythic state. So, if non-humans are endowed with agential attributes (whether in the form of soul, thinking or consciousness), what, then, is the underlying metaphysical principle that underpins such conceptual apparatus? Could it be the long-held assumption of a universal human condition? Or, is there perhaps something substantial inherited by post-mythic existents that transcends humanity itself?

The most parsimonious explanation would maintain that ancient Amazonians may have created their own evolutionary tree through complex and gradual processes of niche-constructing activities. That is, thousands of years of interactions with a wide variety of flora and fauna likely played a pivotal role in shaping Indigenous ecological knowledge and the further elaboration of the mythical and ritual structure and abstract concepts. All in all, a primordial substance of biogenic origin (be it from the Animalia or Plantae kingdom) is likely the physical and metaphysical principle that provides the underlying unity of entities. As we shall see below, the Shuar metaphysical system (from the conception of the soul to concepts of primordial unity and

metamorphosis) is highly dependent on the level of relations with the material world, primarily plant life and its bioactive properties.

6.2 The matter of the soul and the essence of the body

When informants were asked about abstract concepts such as the soul (*wakan*) and which non-human entities may possess it, significant variations in their interpretations were observed. Specifically, some Shuar (primarily young adults and adults) endow animals with a soul but not plants, while others (mainly elderly persons) conceive most of the animal and plant kingdom as endowed with it. Although this conceptual divergence might be due to strong secular and religious pressures (that is, the pervasive process of acculturation that the Shuar have undergone in the last decades), the notion of the soul as an essence in constant flux appeared prominently in the informants' narratives. Tzama, for example, gives us a clear picture of how the soul is conceptualised among the contemporary Shuar:

> When we die, it is believed that our *wakan* goes away. So, it goes away and takes possession of or transforms into a butterfly or a jaguar. Also, the *wakan* could live in a mountain or whichever place such as trees. The soul not only reincarnates in a person, animal or plant, but it remains floating because it is like air or energy. This can then take possession in whichever place, and at any moment, this does not remain in only one body. The *wakan* is the energy of life, the spirit, the essence of life! Which only temporarily takes possession in different entities (Tzama, Twasap community).

Interestingly, even if the informant's statement indicates an elaborate process of metempsychosis (i.e., the transmigration of the soul of a dead human into animals, plants and even mountains), on another occasion, Tzama nevertheless argues that "Plants do not have *wakan* but they possess

energy." It seems therefore likely that the exclusion of plant life from the metaphysical framework that suggests the primordial spiritual unity of entities represents an innovation of the Shuar conceptual apparatus (and hence a conception primarily held by young adults and adults but rejected by elderly individuals who still conceive the plant kingdom as endowed with soul and agential qualities). Take, for instance, the notion of the hematophagous behaviour of manioc, *Manihot* e*sculenta* Crantz (see Chapter 4; Harner, 1972: 75-76; Descola, 1994: 204; Brown, 1986: 106). As stated previously, older adults in the Shuar communities were the only individuals who conceived manioc as an entity with such behavioural and agential capabilities. Besides manioc, for these persons, other elements of the plant kingdom that play a key role in the mythological and ritual structure, such as *Guadua* spp.*, Bactris gasipaes, Bixa orellana, Genipa americana* and the psychoactive plants: *Nicotiana tabacum, Banisteriopsis caapi* and *Brugmansia suaveolens* were also conceived as ensouled beings. Nevertheless, like the Makushi people of Amazonian Guyana (Daly, 2021: 378) and the Achuar of the Ecuadorian Amazon (Descola, 1994: 197), the Shuar regard certain plants as just plants, such as weeds and bushes (that is, entities which do not possess a soul), albeit some of these elements of plant life are imbued with mythical significance (see, e.g., wámpakar, *Pytholacca rivinoides* as discussed in Chapter 4).

Taking into account the concept of the soul shared primarily by elderly individuals, we can say that it partially fits with the early conceptions reported by Karsten among the Shuar. As he writes:

> There are *wakáni* or souls not only in men but also in animals, plants, celestial bodies and other objects of nature. There are, apparently, no essential differences between human souls and souls which dwell in animals, plants or inanimate objects: the latter also seem to be conceived merely like human souls separated from the body, or speaking more strictly, the Jívaro know only one main kind of spirit or soul which dwell in men, animals and inanimate objects of nature (2000[1935]: 279-280) (my translation).

According to Karsten's observations, the Shuar metaphysical system was predicated upon a universal conception of the soul shared by biotic and abiotic elements. The no discrimination of abstract properties among entities presupposed by Karsten's statement seems to contradict some of our informants' accounts as well as the ethnographic reports of other *Aents Chicham* societies. For example, Descola (1994: 93) reported that the Achuar conceive humans and most plants, animals, and meteors as persons (*aents*) with a soul (*wakan*) and an individual life; however, he also postulated that contrary to the universalization of essences and the animistic philosophical apparatus attributed to the Shuar by Karsten, it is the degree and variations in the modes of communication among existents that operate as internal borders within the Achuar universe (Descola, 1994: 98 see also 2013: 6). On the other hand, among the Awajun/Aguaruna of Amazonian Peru, Brown noted that:

> Human beings, animals, plants, and some inanimate objects have souls. The souls of human beings are usually denoted by the word *wakán*; the souls of plants, animals, and things are most commonly indicated by the word *aents,* literally "person". A *wakán* is the aspect of a human being that continues to exist after death. The *aents* or "person" of a plant, animal, or thing is an anthropomorphic entity that is normally hidden inside the exterior form of the being or thing, but which may reveal itself to the knowledgeable human observer. I gloss both *wakán* and *aents* as "soul" because as far as I could determine they refer to an identical concept– namely, an enduring, hidden essence that when made visible has the form and characteristics of a human being (1986: 54-55).

It appears that, unlike the Shuar and the Achuar, the soul is conceptualised differently (that is, notions of *wakán* and *aents* are categorised differently and vary significantly) according to the Awajun/Aguaruna theoretical apparatus reported by Brown. However, despite variations in the concept of the soul and the kind of agential qualities attributed to organismic kingdoms and

inorganic matter between the *Aents Chicham* peoples, both the Awajun/Aguaruna and the contemporary Shuar conception of the soul as an essence concords with Karsten's *quasi*-panpsychist view of a universal soul. Leaving aside the apparent view of the human soul as a referential model from which the agency of other entities stem (albeit the human soul might be only an indexical category and is likely to not represent the essential attributes shared by biotic and abiotic elements), a form of panpsychism (in this case Amazonian animism) arises from intricate relations with the vegetal world (e.g., psychoactive plants) that enable the perception of the inner life of things (Sjöstedt-Hughes, 2023). From this, we can infer that phenomenal experiences of the ultimate nature of matter (that is, the elementary properties of the material universe epitomised by unique forms of consciousness) are highly determined by patterns of human-environment interactions (of which plant life acts as the primary determinant).

It is hardly surprising that, like the philosophical apparatuses of other Amazonian peoples (e.g., Jotï: Zent, 2009; Wakuénai: Hill, 2009; Makushi: Daly, 2021), the Plantae kingdom operates as a theoretical framework, patterning the Shuar superstructural mechanisms. So, even though external pressures (from the process of evangelisation to the introduction of a market economy) may have substantially undermined the socio-ecological, mytho-cosmological and ontological associations with plant life, the contemporary Shuar (mainly elderly individuals and to a lesser degree adults and young adults) still regard this biological kingdom as infused with the basic properties of the soul and consciousness. It might thus be said that, notwithstanding the cultural change undergone by the theoretical apparatus of the Shuar in particular and the *Aents Chicham* in general (Boster, 2003), the remnants of an ancestral socio-ecological and philosophical system can still be found in some parts of the population, as evidenced by this study. This, in turn, likely reflects flexible patterns of social learning and hence, the transmission of ecological knowledge and metaphysical

notions of the material world (as in the case of the conceptualisations of plant life) that may very well fit with the Shuar metaphysical system reported by Karsten (2000[1935]) more than a century ago. But as processes of biocultural destruction are increasingly pervasive, the empirical platform from which this society forms abstract concepts of the universe is reduced considerably, thus weakening potential efforts of cultural transmission.

6.2.1 A particular form of panpsychism?

Unarguably, the Amazonian metaphysical system illustrated above contrasts sharply with the basic postulates of Cartesian dualism. Axiomatically, Cartesian metaphysics conceives two substances which are ontologically different (i.e., thought and extension); thereby, the oppositions between body-mind and brute nature-rational soul are part of this highly anthropocentric notion of the universe which puts a thorny fence between humans and their divine intellect and non-humans and their physicalities. As Descartes perfectly notes in his sixth *Meditation*:

> And, therefore, merely because I know with certitude that I exist, and because, in the meantime, I do not observe that aught necessarily to my nature or essence beyond my being a thinking thing, I rightly conclude that my essence consists only in my being a thinking thing [or a substance whose whole essence or nature is merely thinking]. And although I may, or rather, as I will shortly say, although I certainly possess a body with which I am very closely conjoined; nevertheless, because, on the one hand, I have a clear and distinct idea of myself, in as far as I am only a thinking and unextended thing, and as, on the other hand, I possess a distinct idea of body, in as far as it is only an extended and unthinking thing, it is certain that I, [that is, my mind, by which I am what I am], is entirely and truly distinct from my body, and may exist without it (Descartes (1596-1650/1993), ¶ 9).

It is very clear that for Descartes a thinking substance is something unextended which transcends the physical conditions of bodies which, in turn, are merely extended things whose extension can be conceived in many ways (e.g., length, breadth, and depth). Therefore, the nature of the thinking substance is thoroughly different from that of the extended substance. This point is further emphasised by Descartes in his fourth *Meditation* when he argued that the human mind in so far as it is a thinking thing, does not participate in the properties of the body; the thinking substance must thus be conceived apart from any corporeal object (Descartes (1596-1650/1993), ¶ 1).

If we follow the Cartesian conception of substances, that is, one that is thinking and particular (i.e., human consciousness/soul) and one that is extended and universal (i.e., organic and inorganic matter), it is highly likely that these onto-epistemological assumptions would lead us astray from the ontological condition of being part of an organismic kingdom (Animalia) and hence, sharing with other biological agents a universal common ancestor since the emergence of life on Earth (Moody et al., 2024). Notably, the recent scientific endeavours that highlight the complex behavioural and cognitive qualities of the animal and plant kingdom (e.g., Griffin, 1998; Marder, 2013; Mancuso & Viola, 2015; Allen, 2019; Schuppli & Van Schaik, 2019; Calvo et al., 2020), may very well align with the basic ecological and metaphysical principles exhibited by the Shuar and other Indigenous peoples as discussed above. These empirical and conceptual apparatuses of both Western and Indigenous science thus show diverse yet commensurable patterns for the evolution of life that go beyond the mechanical notions of physical nature. Like these scientific pursuits, the Shuar metaphysical system attempts to connect at its most rudimentary level the agential properties shared by biological kingdoms.

In this frame, if we look at the particular form of Shuar panpsychism observed by Karsten (2000[1935]) a hundred years ago and the conceptual apparatus exhibited by the contemporary

Shuar (mainly elders) reported by this study, unique forms of consciousness/soul are manifested among a wide variety of biotic and abiotic components. To say, then, that a soul (*wakan*) is attached to a material body that could be any object of extended nature (viz., organismic kingdoms and inorganic matter), the Shuar do not hierarchically categorize the concept of the soul like the Aristotelian vegetative soul of plants or sensitive soul of animals. Likewise, the rational soul of humans that Descartes in the fifth part of his *Discourse on method* conceived as God's creation, does not fit into the propositions of this Amazonian society. For example, Hallowell (1960: 55) noted that, under certain circumstances, the Ojibwa of Canada attribute animate properties to some classes of objects such as stones. Daly (2021: 385) also reported that the Makushi concept of the soul/essence (*ekaton*) encompasses a wide range of biological entities from humans to animals and plants. This is consistent with some informants' accounts concerning the agential qualities of inorganic matter (e.g., stones used in rituals[9]) and especially the plant and animal kingdom. The soul (*wakan*), therefore, can be understood as a concept whose inclusivity unites what is seemingly thinking (i.e., human) and what is merely brute, inert and passive (i.e., corporeal nature).

How, then, could we understand the indigenous philosophical concepts of immaterial souls and material bodies? Are these not simply an inversion of the Western dualism between particular souls and universal physical nature? It appears, therefore, that the attempt to provide an answer for the animistic ontologies of Amerindian forager-horticulturalists symmetrically inverted the Cartesian conception of substances, viz., many immaterial substances, but only one extended substance (Heil, 2018: 319). According to Viveiros de Castro (1998), for instance, multinaturalism (understood as the core of Amerindian perspectivism and the primary characteristic of existents) presupposes the multiplicity of nature (i.e., many extended substances) and the unity of culture

[9] See chapter 4; see also Abad Espinoza (2019).

(i.e., one immaterial substance). Similarly, for the Indigenous animic systems analysed by Descola (2013), relations between humans and more-than-human others are predicated upon similar interiorities or one immaterial substance and many but dissimilar physicalities or extended substances. As such, these philosophical formulations derived from concrete ethnographic realities (viz., subsistence patterns, ritual behaviour, mythical narratives) seem to flip the dualistic coin. In other words, the symmetrical inversion of substances' attributes furnishes a compelling theoretical framework which operates as the schematic model of the indigenous metaphysical propositions.

Although the Amerindians conceive the physical body as the primary differentiator among entities, there is nonetheless an underlying immaterial force that unites them as purely subjective beings. This differentiation of material and immaterial substances thus gives room to the opposition between human and non-human entities which, for these people, appertain to a specific domain of nature (and hence are species-specific traits). Conversely, for Cartesian dualism, corporeal nature is what connects all beings in a single extended substance and immaterial substance is what divides our divine intellect and rational soul from the rest of the extended non-human nature. Thus, as Descartes notes in the third *Meditation:*

> For when I think that a stone is a substance, or a thing capable of existing of itself, and that I am likewise a substance, although I conceive that I am a thinking and non-extended thing, and that the stone, on the contrary, is extended and unconscious, there being thus the greatest diversity between the two concepts, yet these two ideas seem to have this in common that they both represent substances (Descartes (1596-1650/1993), ¶ 21).

If both Descartes' mind-body dualism and the abstractions of the Indigenous conceptualisations of the world (animism-perspectivism) are viewed as two sides of the same coin/substances, though symmetrically and conceptually inverted, one might say that the Amerindians are Cartesians in a

parallel world in which thought is the extended universal immaterial substance and extension is the thinking and particular material substance. This probably could have no sense, unless we analytically explore natives' metaphysical propositions that conceive the whole universe as one primordial substance. For example, as noted before, the Shuar and other Indigenous mythical repertoires highlight a primarily biogenic primordial structure (the ancestors of living things or the inherited behavioural qualities of post-mythic entities were fundamentally part of the animal and plant kingdom). Notably, Weiss (1972: 169) reported that for the Asháninka "There is no such occurrence as the creation of something out of nothing, but only the transformation of something out of something else." If we assume that the Indigenous cosmic structures were not a creation *ex nihilo* as Viveiros de Castro (2004: 477) put it, then it follows that a mythical substance has always been there, so this can be understood as infinite and eternal; in other words, an entity that is prior in nature given its ontological independence from the modes which are posterior and ontologically dependent on it (Schechtman, 2018: 6-7). On the basis of this mytho-cosmological edifice, biological entities and even inorganic matter can be considered as modes or modifications of a substance whose transformative attributes allow an underlying unity in the whole universe.

The basic principle of intersubjective connection among entities is better understood in post-mythic life; nevertheless, even though non-humans are endowed with the attribute of being conscious subjects (and hence the faculty to possess a soul like humans) it seems that their corporealities differ considerably. Does the physical nature of each species/entity function as the primary differentiator above the realm of immaterial correspondence? Or could there be a physical unity at a deeper level? To say that, like other forager-horticulturalists, the Shuar conceive the universe as one primordial substance, are not we approaching a noteworthy Amazonian monistic metaphysics? Indeed, if for Spinoza's "neutral monism" (Stubenberg, 2018), extension and

thought are either attributes of God or modifications of attributes of God (E1p14c2), then it could be said that for the Shuar the attributes of thought and extension appertain to the nature of the mythical substance and, hence, from its essence follows an infinite number of modes which are the transformative properties of the substance itself. In summary, according to the Indigenous conceptual apparatus, physical metamorphosis represents the innate dispositions of mythical beings (Hallowell, 1960); these behavioural qualities thus indicate a primordial nature whose essence is thoroughly transformative. As we will see below, mythical nature likely acts as the fundamental connector of physical and spiritual attributes in the face of the seemingly corporeal differentiation of existents.

6.3 Metaphysical principles

As described before, the conception of substance elaborated by Descartes (and hence the notion of a manifest ontological divide between thought and extension) may function, at least from the standpoint of animism/perspectivism, as theoretical building blocks from which a form of metaphysical variation (that is, the symmetrical inversion of concepts of substance's attributes) can be found among the conceptual apparatus of Amerindian peoples. Moreover, according to these ontological constructs, the universal nature of the soul and the particular characteristics of matter seem to point to the indivisibility of immaterial substance and the divisibility of extended substance, thus delineating the natural order of things within the indigenous worlds. If, for the Shuar, the soul (*wakan*) is universally shared by biotic and abiotic elements and their physicalities are the primary differentiators, one might say that the primordial substance has been divided throughout the post-mythic transition. This therefore should have generated two substances from

the mythical one. This transition could have split one substance into two with different properties; namely, on the one hand, one substance which is thinking and indivisible, and on the other, one which is extended and divisible. The indivisibility of the immaterial mind and the divisibility of the material body can be explained by Descartes' sixth *Meditation* that argues:

> There is a vast difference between mind and body, in respect that body, from its nature, is always divisible, and that mind is entirely indivisible. For in truth, when I consider the mind, that is, when I consider myself in so far only as I am a thinking thing, I can distinguish in myself no parts, but I very clearly discern that I am somewhat absolutely and entire; and although the whole mind seems to be united to the whole body, yet, when a foot, an arm, or any other part is cut off, I am conscious that nothing has been taken from my mind… But quite the opposite holds in corporeal or extended things; for I cannot imagine any one of them [how small soever it may be], which I cannot easily sunder in thought, and which therefore, I do not know to be divisible (Descartes (1596-1650/1993), ¶ 19).

To divide what is conceived as inert and passive bodies or even their parts, and the indivisibility of the transcendental immaterial substance (mind and rational soul), can be understood as a sort of metaphysical continuity or immortality of the immaterial substance and a physical discontinuity of the perishable extended things[10]. Consequently, the bodily and subjective existence of beings depends heavily on the dialectical relationship between the extended and thinking substances. This therefore represents the prime characteristic of mind-matter dualism and highlights the prominence of the transcendental soul over the physical nature. As noted, unlike this radical dualistic

[10] Paradoxically, for Viveiros de Castro (2004: 475), Western cosmology postulates a physical continuity and a metaphysical discontinuity between humans and animals; to wit., the former is conceived as material organisms which have a common biological structure, and the latter is conceived as the immaterial differentiation (mind-spirit) that renders humans superior to all beings. Instead, Amerindians postulate a metaphysical continuity (animism) and a physical discontinuity (perspectivism) between humans and non-humans (Ibid).

metaphysics, the Shuar do not see significant differences between the rational soul of humans and those of the "brutes", let alone conceive the realm of extension as mere biophysical properties devoid of agency (see also Guss, 1989; Descola, 1994; Lima, 1999). In this sense, and following the inferences of Marilyn Strathern (e.g., 2017, 2018) about the immanent nature of plant souls documented among the Mount Hagen people of highland Papua New Guinea, Daly (2021) argues that a notion similar to the Melanesian one of "immanentist life" can be found among the Makushi. Thus, Daly (2021: 385) suggests that, from the Makushi concepts of vegetal consciousness and the embodied and sensory dimension of gardening, souls are embodied and bodies are ensouled.

Given this background, and if we delve into the Shuar notions of the soul as the essence of life and an immaterial quality in constant flux (like the abovementioned quotation of our informant, Tzama), it becomes clear that the ultimate structure of extended things is the elemental properties of life (understand here as the capacity of an entity to be conscious and hence possess a soul). It is unsurprising that, despite the radical socio-ecological and cultural transformations undergone by the Shuar throughout the years, a conceptual framework still retains elements of the form of panpsychism in practice (e.g., animism: Vetlesen, 2019) reported by Karsten (2000[1935]) more than a century ago.

For example, as mentioned above, the Shuar elders conceive plant life (from tubers to psychoactive plants) as endowed with behavioural, cognitive and conscious attributes (i.e., possess a soul). Notably, information concerning notions of metempsychosis was also obtained from some informants of the Shuar communities. As Yasmin from the Yawintz community clearly explained "The spirit of my grandfather lives in the form of a butterfly (superfamily: Papilionoidea); if this butterfly happens to be killed or die due to natural causes, the soul of my grandfather will appear in another butterfly." This notion of the transmigration of the soul (in this case the circulation of

souls within the animal kingdom, albeit some informants claim that souls can reside in trees and even in organic matter) is consistent with the elaborate theory of metempsychosis reported by Harner (1972: 150-1) among the Shuar during the second half of the 20th century. However, in challenging the apparent Harner's generalisations of ethnographic data, Descola (1994: 92) argues "The Achuar conception of metempsychosis does not comprise a unified corpus of normative beliefs, but is the object of highly varied idiosyncratic individual interpretations." For Descola (1994: *n*336), then, Harner's ethnography has formed a dogmatic version of the diverse concepts of metempsychosis described by his informants. Though we may partly agree with Descola's critique in that conceptual variations can be found among natives (and hence in the Shuar case this phenomenon is likely to be more conspicuous given the high degree of acculturation), Harner's ethnographic data may nonetheless be viewed as accurate compared with the current Shuar theoretical framework (see also Boster, 2003 for a critique of Descola's misconception of Harner's observations). The critical point is that, from both past and current eschatological concepts, the soul lives as an eternal entity, be it in the form of mist as reported by Harner (1972: 151) or in the form of floating air/energy as stated by our informants.

The abovementioned lines of evidence show, at least from the immaterial order of things, the basic tenets of animism and perspectivism; that is, the metaphysical connection among corporeal beings. Physicalities, however, are the primary existential differentiators in a world where subjective qualities are universally shared, according to these anthropological and philosophical notions. In other words, each material body (conceived as clothing or envelope) functions as a bundle of affects that wraps and then conceals the internal human form of non-humans[11] (Viveiros

[11] It is worth noticing that perspectivism has mostly emphasized the relationships between humans and animals, namely, it seems that shapeshifting or bodily metamorphosis only occur between both entities (Viveiros de Castro 1998: 471-472; 2004: 475-476). Alternatively, Hill (2009: 101-102) argues that this emphasis on human-animal

de Castro, 1998: 471, 2004: 475); bodies must thus be viewed not as extended material organisms but as systems of intensive affects that differentiate each subject (Viveiros de Castro, 2004: 475). Indeed, as Viveiros de Castro puts it:

> This cosmological picture, which understands bodies as the great differentiators, at the same time posits their inherent transformability: interspecific metamorphosis is a fact of nature. Not only is metamorphosis the standard etiological process in myth, but it is still very much possible in present-day life (being either desirable or undesirable, inevitable or evitable, according to circumstances). Spirits, the dead, and shamans can assume animal form, beasts turn into other beasts, humans inadvertently turn into animals (Ibid: 475-476).

It is important to note that, unlike the perspectival ontology (that is, the species-specific bodily point of view) exhibited by some Amerindian peoples (e.g., Hallowell, 1960; Weiss, 1972; Århem, 1990; Brightman, 1993; Lima, 1999; Londoño Sulkin, 2005), the Shuar metaphysical system is not elaborated to such an extent that materialities are conceived as primary actors of multinatural traits (e.g., what to humans is blood, is maize beer to the jaguar [Viveiros de Castro, 1998: 478]). According to the contemporary Shuar, however, apart from shamans (*uwishin*) who, as a "natural prerogative" are capable of transforming into different non-human forms (primarily anaconda, *Eunectes* spp. or jaguar, *Panthera onca*), physical metamorphosis can be achieved through ritual activities, such as the consumption of sacred plants (*Nicotiana tabacum, Banisteriopsis caapi* and *Brugmansia suaveolens*), the respecting of certain taboos and the connection with sacred places (waterfalls and forest). As described below, the phenomenon of transmutation entails complex

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relations, has excluded the relations that humans have with plants, artefacts and natural phenomena; hence, according to him, this conception could be considered as a Eurocentric projection of a specifically Western worldview rather than an accurate reading of Amazonian ways of conceiving relations between humans and the material world.

levels of lower-order and higher-order relational processes between biotic, abiotic, and immaterial components.

What, then, are the ontological implications for the apparent bodily (and hence affectual) differentiation of entities? Could the conception of physicalities as natural demarcators essentially presuppose a real difference between transformative corporealities? If we suppose that modes are understood as ways of a substance, the latter is what it is, and, consequently, attributes are what a substance is (viz., its essence) (Heil, 2018: 319). Hence it follows that human and non-human entities are modes, or according to Spinoza, they are modifications (*affectiones*) of a substance (E1d5) whose attributes are nothing more than its essence (E1d4). Broadly conceived, the mythical substance must be absolutely infinite and thus indivisible (E1p8). Material bodies are, in principle, modes of an extended and thinking nature, albeit apparently physically differentiated and universally interconnected by their intentional qualities. By definition, are not existents fundamentally integrated by their transformative physicalities, which, on the surface, divide what is probably conceived as an underlying principle of substance' indivisibility? It might be argued that, for the Shuar, to conceive the properties of matter as inherently transformative (although at its most basic indivisible), is to regard themselves as part of a complex and profound domain in which the relationships among subjects are determined by a mythical essence that eternally flows and infuses the material world (Abad Espinoza, 2019). Therefore, by conceiving biological kingdoms, organic matter and immaterial beings as persons (*aents*), who, share conscious properties (and hence a soul, *wakan*) and the common condition of being part of a primordial substance (primarily biogenic), the Shuar seem to regard the domain of nature as intrinsically extended and thinking. This Amazonian version of Spinoza's monistic metaphysics (that is, neutral monism: Stubenberg, 2018), highlights the eternal unity of the primordial attributes of

nature (ranging from the physical to the mental and the transformative qualities of corporealities and immaterial subjectivities) that provides the laws and infinite spiritual pathways for all entities.

It may hence be said that the analysis of Spinoza's conception of substance (i.e., a single and indivisible, immanent and transcendent entity) is likely to help us render less extraneous an Amazonian ontology that considers bodies and intentionalities as part of the same primordial order. This single substance, according to Heil (2018: 319), can be extended and think (and much else besides); this can be extended in various ways and conscious in various ways, all at the same time. Against this backdrop, it might be postulated that, for the Shuar, entities can be considered as ways, that is, transformative ways or modifications of modifications of a single indivisible substance (this, in turn, can be matter, mind and may embody the properties of transmutation of the two). These interchangeable attributes of the primordial substance (i.e., thought, extension and transformation), can be understood as the eternal interconnections which profoundly unite human and more-than-human others within the biophysical, social and cosmic domain of nature. As we will see, this underlying unity is best understood during rituals in which the assimilation of the bioactive compounds of plant materials and deep engagement with the physical world provide the necessary existential paradigm and the knowledge of the ultimate structure of reality.

6.4 Visionary experiences and the true knowledge of things

If particular properties of the physical environment are made manifest by organisms' phenomenal experiences arising from their specific bodily structure (von Uexküll, 1982), then the question of what is it like to be a given biological agent (be it a mammal, a bird or a reptile) (Nagel, 1974) would underscore the significance of the limits of human cognition and the impossibility of a

minimal intersubjective communication among species. On that basis, any form of conscious experience will depend heavily on the degree and kind of organism-environment interactions immersed in different spatio-temporal scales. Modern humans, then, are likely to construe the realm of extension through metaphysical principles that either set our species apart from the material world or try to link our ontological status with other life forms. The variable traits of humans' cognitive skills and, therefore, the degree to which they engage with the concrete properties of the world (Lévi-Strauss, 1966) have significant implications for the ontological position humans occupy in the biosphere. The notion of human exceptionalism, for instance, has resulted in a significant ontological divide between humanity and the natural world (Kim et al., 2023); namely, this mode of thinking has hindered our ability to comprehend the intricate inner workings of biological and ecological systems, highlighting the distinct evolution of modern thought. Contrariwise, indigenous worldviews like those of the Shuar operate in line with biotic and abiotic factors entrenched in complex coevolutionary processes, as illustrated in this chapter.

So, if corporeal nature stops being viewed as a mere extended thing bestowed upon humans for exploitation and satisfaction of selfish desires, the Amazon rainforest might overturn the anthropocentric order of things, thus disclosing the entwined physical and mental attributes of entities and the mythical laws to be followed. What does it mean to follow the primordial order of things and hence, the existential paradigm that provides the paths for a virtuous existence? What, then, is to know the meaning of life, the true essence of things and the ultimate nature of reality? To give the answers to these metaphysical questions, our scientific endeavours must, at a minimum, sympathise with certain elements of panpsychism that go beyond the purest forms of physicalism. More concretely, the inferences about the Shuar ritual behaviour must gravitate towards the most basic socio-material relations in order to grasp the properties of extended things

and thus reveal that the physical world provides more than intellectual stimulation (e.g., nature good to think as suggested by Lévi-Strauss, 1964: 89). Extended nature, then, exhibits more than biophysical attributes (in this sense passive) that provide the empirical information wherewith the mind works and then decodes the physical realities of the world (Lévi-Strauss, 1966). It appears, therefore, that extension conceived in itself, can be understood as an attribute of the mythical substance whose modifications are part of the complex concatenations of interchangeable and inclusive attributes.

Forms of relations and communication with plant life may very well reveal, for example, the metaphysical principles that undergird the underlying assumptions of the primordial connection between mind/soul and matter. These, in turn, emphasise the high levels of bodily and cognitive engagement exhibited by organismic kingdoms embedded within ecological niches. The real essence of things, thus, is likely to arise from primordial biogenic elements that allow, from the metaphysical principles that shape post-mythic existence, the primary and eternal unity (both physically and spiritually conceived) of material subjectivities. Based on this primordial order of things, and the existential pathways provided by the fundamental attributes of the mythical substance, the transmutation of conscious, cognitive, behavioural and morphological properties of entities is likely to be a factual occurrence. It might hence be said that, according to the Shuar metaphysical system, the primordial order of things (i.e., the eternal unity of consciousness and matter) pervades the realm of extension; in other words, in contrast to the stark division between mind and matter (that is, physicalities devoid of agential properties apart from the human mind/soul), the Shuar conceptual apparatus conceives the material world as intrinsically intentional. To know the elemental qualities of corporeal nature, however, a deep immersion into socio-ecological niches as well as the undertaking of specific ritual practices are critical. For

example, physical places (e.g., waterfalls, forests and mountains) may operate as mediators of ontological realities, provided humans assimilate the biological properties of plants (e.g., the natural pigments of *Bixa orellana* and *Genipa americana* and the psychoactive compounds of *Nicotiana tabacum, Banisteriopsis caapi* and *Brugmansia suaveolens*) that would primarily link the human condition with the ultimate nature of reality (that is, the primordial unity of soul and matter) (see also Abad Espinoza, 2022a).

This particular way of communication, meditation, and, hence, achievement of a perfect state of being (i.e., the connection with the elementary structures of reality), entail that the meaning of life becomes less blurred and thus the apparent differentiation of entities ceases to be the shallow division of physicalities characterized by post-mythic existence. Rather, a deeper unity is attained by material subjectivities which are part of a single primordial substance. This kind of connection with the fundamental qualities of the material world in general, and the plant kingdom in particular, is best exemplified by the preparation of the *natem* (or ayahuasca, *Banisteriopsis caapi*) decoction. As Nawech from the Yawintz community describes this process:

> After you have cut the stems of the liana, you must boil the pieces in a pot and then you must carefully look at how the fire causes the water to boil; so while the *natem* is boiling, you need to profoundly meditate and think to obtain the powerful properties of the infusion. A lot of concentration is necessary to obtain the best and real essence of the plant (Nawech, Yawintz community).

The deep meditation and concentration narrated by our informant during the preparation of the infusion can be understood as the first stage (and hence a lower-order process) whereby the Shuar try to link intellectual properties with the most basic attributes of extended things. The ultimate nature of *Banisteriopsis caapi* is, by extension, not only achieved by a great mental effort but is

the amalgamation of organic and inorganic matter (e.g., human body, fire, water, tools, plant materials) that enables the conjunction of the elementary properties of the mind and matter for the subsequent activation of higher-order processes. In this sense, the real essence of the plant (and hence the conscious traits that infuse matter and vice versa) would provide, according to the Shuar metaphysical principles, the elemental pathways for the true knowledge of things and the meaning of existence; the elementary forms of consciousness and matter are therefore linked to reconstitute the mythical substance.

Recent studies performed on mice suggest that the main compounds present in *Banisteriopsis caapi* (harmine, tetrahydroharmine, harmaline, and N,N-Dimethyltryptamine (DMT) obtained from *Psychotria viridis* as admixture to the ayahuasca decoction) exhibit antidepressant effects and enhance cognitive functions, such as spatial learning and memory tasks (Morales-Garcia et al., 2017, 2020). Moreover, the use of psychedelics such as ayahuasca has been linked to shifts from physicalist to non-physicalist/idealist metaphysical beliefs (e.g., panpsychism) and an increase in well-being (Timmermann et al., 2021; Jylkkä et al., 2024). In addition to these empirical studies, Rodríguez & Winkelman (2021) have also assumed the likely evolutionary significance of psychedelics (psilocybin-containing fungi) in shaping the evolution of the socio-cognitive niche of early hominins. Taken together, these investigations may thus make it clear why, Amazonian societies like the Shuar, endow psychoactive plants with cosmological and metaphysical significance. For the Shuar, however, it is not only the assimilation of the bioactive compounds of plants that triggers a metaphysical connection, but it is at the lower levels of relations (that is, the complex associations of biotic and abiotic elements instantiated primarily by ritual behaviour) that a prior connection with the primordial order of things is manifested.

It is indeed unsurprising that the consumption of any entheogenic concoction obtained from *Banisteriopsis caapi, Brugmansia suaveolens* or *Nicotiana tabacum* must be held in places deemed sacred[12]. The individual should also endure certain restrictions (e.g., fasting and sexual abstinence) to be prepared for the vision quest that will show the ultimate nature of reality, thus providing the necessary physical and spiritual strength to effectively follow the paths for a virtuous life. In summary, one might say that to receive the metaphysical illumination (that in turn makes manifest the fundamental structure of the universe) from the basic elements of physical nature, the Shuar (sensu Spinoza) ought not to be liable to passions, and, therefore, ought not to be passive or have inadequate knowledge of things; namely, they must be active and be guided by reason (in a sense that the conscious and material properties of the world are understood correctly) to know the real essence of things that follow from a primordial substance.

Interestingly, given the complex nature of visionary experiences which, from a purely metaphysical point of view, may unveil the fundamental qualities of matter, only a shaman (*uwishin*) or a wise man *(wea*) can grasp the real essence and meaning of the vision. In this respect, *arutam*[13] visions can be conceived as the main cause of metaphysical illumination. The primary significance of *arutam* visions is therefore the conflation of a wide variety of subjective and material properties to form a new entity with primordial attributes. This kind of transcendental encounter (although well-embedded in socio-material realities) with extended subjectivities

[12] As mentioned, sacred places are waterfalls, forests, and mountains. It is noteworthy that in the Tawasap community, an old burial site where the ancestors of these people have been buried can be also conceived as sacred. For a description of the burial site (*mura*) and its rituals see Abad Espinoza (2019).

[13] According to my informants, *arutam* is the most powerful entity of the cosmos, and, consequently, this provides the spiritual energy to become a courageous, strong and wise person. For different interpretations about the concept of *arutam* see Harner (1972); Taylor (1996); Mader (1999).

(mainly entities of the animal kingdom) whose theoretical complexity can only be comprehended by the unique intellectual capabilities of shamans or wise men, can be conceived as the highest degree of connection with the elemental attributes of the universe. One might be tempted to say, then, that *arutam* is the substance itself in which the transformative properties of matter and the omnipresent nature of consciousness are foregrounded and hence, form the primordial unity of the substance's attributes. Although the physical form of subjectivities that embody *arutam* visions can vary between apex predators (e.g., anaconda, *Eunectes* spp., jaguar, *Panthera onca,* Harpy eagle, *Harpia harpyja*) and other animals with different behavioural or aesthetical qualities (e.g., parrot, *Psittaciformes*, turtle/tortoise, *chelonians*, hummingbird, *Trochilidae*), *arutam* (albeit less frequently) could also materialise in a vegetal, celestial or mythical entity. Sharian gives us a clear picture of the nature and significance of *arutam* visions and the ritual behaviour involved:

> I think that *maikiua* (*Brugmansia suaveolens*) is even better than *natem* (*Banisteriopsis caapi*) to encounter *arutam.* So if you want to drink the infusion of *maikiua,* you must prepare yourself a lot with fasting and meditation. Then if you are worthy to receive the vision, you can encounter a powerful animal such as an anaconda or jaguar; these animals will give you the power to become an invincible warrior or a virtuous and respected person (Sharian, Tawasap community).

It might be argued that, from the Shuar metaphysical beliefs, *arutam* visions can be primarily understood as the revelation of the ultimate nature of reality; namely, an existential paradigm highly dependent on lower-order relational processes and particular cognitive abilities to appreciate the complex interweavings of matter and mind. If, for example, we suppose that nature can be conceived as a primordial substance (sensu Spinoza), then *arutam* may hence be considered as an attribute of the substance; that is, the essence of the substance perceived by the intellect

(E1d4). Following this line of reasoning, the wide variety of properties pertaining to the realm of consciousness and matter conjoin to reconstitute the elementary forms of the universe, as instantiated by *arutam* visions. That is to say, the differentiation of physicalities and unity of intentionalities are rendered a single entity due to the concatenations of affects and subjectivities that highlight the underlying unity of the transformative attributes of the mythical substance.

If plants are indeed conceived as mere modes of extended nature (at least from the modern metaphysical beliefs), how can they reveal, apart from their bioactive compounds that induce an altered state of consciousness, the ultimate nature of reality? Why are particular forms of life (be they mammals, birds or reptiles) thought of as the primary images of a*rutam* visions? Before giving any possible answer to these questions, we should, first and foremost, comprehend the significance of this Amazonian form of panpsychism; in other words, as suggested by Kohn (2022), we must grasp the psychedelic nature of a thinking forest that encompasses the whole within its mind-like properties. The primordial substance, by its very nature (and hence the manifestation of the elementary conjunction of mind and matter), may thus be re-formed by the post-mythic metaphysical principles exemplified by *arutam.*

The metamorphosis of physicalities, therefore, can be understood as the modifications of modifications of the fundamental attributes of nature guided by the underlying mechanisms of physical and metaphysical continuity of entities sharing a universal existential principle. The Shuar concepts regarding the underlying unity of the elementary properties of mind and matter (triggered by *arutam* visions) are thus described by Yasmin in this way:

> If you are worthy of *arutam,* and hence, you see him as an anaconda who approaches you, you can transform yourself into this animal. Then your skin will start to peel and change into that

> of the anaconda. Because of this power, you can live a good life full of strength, courage and intelligence (Yasmin, Tawasap community).

It seems therefore likely that the matter-mind-manifesting properties of *arutam* involve the reconstitution of the lower and higher-order elements of the universe. That is, if extended things (which, in turn, are endowed with soul/consciousness) are likely to change their bodily properties, this nevertheless does not highlight the differentiation of their physicalities; on the contrary, it seems that the apparent physical difference primarily hints at the underlying eternal unity of mind and matter. To sum up, materialities ranging from organismic kingdoms to biotic elements appertain to a substance which is in constant transmutation, though the unity of its conscious and physical properties remains unchanged.

Chapter 7. General conclusion: Understanding Amazonian life forms in the midst of the ecological crises

Months before the preparation of the ethnographic inquiry documented in this thesis, Nawech sent me a WhatsApp message telling me that his uncle, Anank, passed away; after a couple of months, he wrote me via the same medium informing me that his father, Sharimiat, has also gone. These were shocking news for me, not only because those persons were knowledgeable elders and key informants but mainly due to the cultural implications of their deaths to the continuity and survival of Shuar ecological and philosophical knowledge. Both elders, who were more than 80 years old, were sage men (*wea*) of the Wawaim community. During my first fieldwork in 2018, they showed me ancestral ritual practices almost lost among the contemporary Shuar. So, the news of their passing brought to mind vivid memories of past bodily encounters of intense multi-sensory experiences. The particular properties of qualia triggered by these ethnographic encounters were thus strongly revived by the bitter cognisance of the physical absences of custodians of ancestral knowledge.

Specifically, by looking at certain pictures of my past fieldwork, some recollections began to form a coherent design of noteworthy behavioural instances. One of these portrayed Anank singing a courtship song while walking through the paths of the Wawaim community; the other showed Sharimiat at the waterfall of Wawaim performing a ritual while chanting and snuffing a mix of fermented tobacco (*Nicotiana tabacum*) leaves and water. All these remembrances, therefore, are likely to represent rare occurrences of ritual behaviour; in fact, I was not able to record again these kinds of ritual chants (anent) during the fieldwork of this thesis. This is remarkable in the sense that illustrates how patterns of thought and behaviour are highly dependent on social learning

(Boyd et al., 2011; Mathew & Perreault, 2015) for their maintenance through time. It might be suggested that, due to the loss of older adults in the Shuar communities, the arrest of fundamental socially transmitted concepts and behaviour is highly likely to occur. Similarly, aggressive anthropogenic impacts on forest ecosystems and acculturation processes may very well hamper the preservation of subsistence patterns.

For example, as noted in Chapter 3, hunting activities have thoroughly disappeared in the communities, primarily due to deforestation, the shift of patterns of habitation, and secular and religious acculturation. These factors have therefore triggered a significant loss of knowledge of the socio-ecological, ritual and cosmological underpinnings involved in meat-eating strategies. Thus, only a few individuals, mostly older adults, could provide critical information concerning ancestral hunting patterns. Interestingly, this ecological and ritual understanding is unlikely to be transmitted to the younger generations; in other words, if there are no forests, there will be no animals to hunt, and in turn, there will be no chance to teach, learn and hence successfully transmit the intricacies of this adaptive behaviour. From the making of *Bactris gasipaes* spears to the tracking and killing of prey and the subsequent ritual intervention (as in the case of the neutralization of the spirit of the red brocket deer, *Mazama americana* with *Bixa orellana*) for its sharing and consumption, the preservation of this socio-ecological and ritual behaviour undoubtedly depends on sophisticated patterns of socially transmitted knowledge.

Although in Chapter 4 I illustrated a subsistence strategy still prevalent among the contemporary Shuar, certain ritual practices revolving around traditional horticulture are no longer present. It might be argued that, from a socio-ecological standpoint, gardening activities have been relegated primarily to trophic associations with starchy root and tuber crops; consequently, this subsistence adaptation mostly highlights the nutritional (carbohydrate intake) and social (planting,

tending, harvesting, and commensality patterns) significance of cross-species interactions involved in horticultural activities. This therefore indicates that the transmission of ecological knowledge regarding gardening practices is strong enough to resist the pressures of an increasingly hostile market economy. As far as I could observe, the preservation of gardening behaviours was primarily based on vertical cultural transmission (from mother to daughter), the most widespread pattern in the Shuar communities.

By contrast, the knowledge of gardening rites and mytho-cosmological principles was highly restricted to older adults; these individuals were thus the only part of the population who exhibited a great understanding of ancestral ritual behaviours no longer practised by the Shuar. This kind of theoretical and practical knowledge, which is epitomised by the mythical and ritual structure, was in the past critical for the good growth and reproduction of gardens. But if the theoretical apparatus played such a key role in providing the paths for successful horticultural practices, Why did the contemporary Shuar not continue to transmit such essential knowledge? A possible answer based primarily on my fieldwork observations is that both secular and religious acculturation, coupled with the relentless infiltration of the capitalist mode of production, are the primary factors of the gradual collapse of the preservation of the conceptual edifice. Not surprisingly, young individuals are much more acculturated and influenced by modernity than their parents or grandparents (i.e., they go to school, sell their labour-power, speak only Spanish, and are proficient users of social media) and, hence, are more likely to ignore and/or not be interested in the teachings of their parents/grandparents. It is for these reasons that only the secular dimension of horticulture is pursued by some young individuals; after all, it is largely a matter of carbohydrate intake and commensality (e.g., the consumption of manioc, *Manihot esculenta* Crantz beer), which counts the most for young people. Critical elements of ritual behaviour and mythical narratives are then not

passed from mother/grandmother to daughter, mainly because the latter likely reject aspects of social learning (e.g., a girl not paying attention to the myth of Nunkui narrated by her grandmother), thus blocking the potential transmission of cultural knowledge.

As illustrated in Chapter 5, for the Shuar, the use of medicinal plants has played a pivotal role during the outbreak of SARS-CoV-2. Their ethnopharmacology appears to have proven effective in combatting potential infections with the combination of different plant materials consumed in the form of infusion. If this botanical knowledge ceases to be transmitted, then the Shuar are more likely to be vulnerable to pathogenic diseases; the matter of social learning and therefore the acquisition of medicinal plant knowledge is essential in this case. As Inkpen (2019: 3) argues, "Rather than treating human health as a war against invading pathogens, it involves seeing a person as an ecological system, and the maintenance of health as a matter of management, restoration and sustainability." Based on this premise, even if the Shuar are liable to pathogenic contamination, their well-being depends on a mindful negotiation between healthy biotic and abiotic factors within local ecologies. This, however, is increasingly threatened by anthropogenic impacts and, in contrast to the high production of domesticated crops, forest trees are highly vulnerable to logging and cattle ranching, a widespread phenomenon in the Amazon.

If forests continue to vanish, it would be impossible to pass on botanical knowledge fundamental for adaptation since the lack of an empirical platform would hinder any form of social learning even with the presence of highly knowledgeable individuals. As Bennett et al., (2002: 1) note, “As forests disappear and traditional lifestyles change, the probability of preserving botanical knowledge diminishes.” Also, the decline of Shuar native speakers may gradually trigger the loss of important medicinal plant knowledge and the possibility of its transmission to the new generations, a pattern that aligns closely with other Indigenous societies (Cámara-Leret &

Bascompte, 2021). Combined, all these factors would inevitably undermine the preservation of the knowledge of medicinal and psychoactive plants, thus greatly reducing their biosocial and ritual significance. This thesis was therefore an attempt to document the holistic nature of ancestral subsistence patterns (either those no longer or still practised by the contemporary Shuar), taking into account cross-species comparisons and evolutionary history in order to better grasp the complexity of human nature.

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