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Bamboo for People and Primates: An Ethnography of 'Convivial Connections' between Conservation, Development and Identity on the Ecuadorian Coast.

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Abstract

The coastal province of Manabí Ecuador has some of the highest rates of deforestation in Latin America, and remaining fragments are home to two primate species threatened with extinction – the mantled howler monkey (*Alouatta palliata aequatorialis*), and the Ecuadorian white-fronted capuchin (*Cebus aequatorialis*). Manabí is also reputed to contain the greatest concentration of *Guadua angustifolia* bamboo in the country, and the development of a sustainable bamboo economy is being promoted by some as a solution to the social and environmental issues that plague the region.

This thesis uses an ethnoprimatological approach to explore the messiness of conviviality, or "living with", in human and nonhuman worlds, through an investigation of lived realities and interrelationships between people, primates, and bamboo in the Pacoche Wildlife Refuge of coastal Ecuador. Starting from the premise that participants' relationships with the nonhuman are embodied in historically situated experiences and political-economic and social contexts that are constantly in flux, and based on findings generated by a mixed methods approach, this thesis uncovers the many meanings and values associated with bamboo, as an everyday raw material, a cause for contention with local authorities, a "green" commodity, an important part of cultural heritage and identity, and a vital component of primate habitats. Findings also reveal that unraveling the complex power structures embedded within conservation politics can expose new ways of seeing and thinking about conservation that prioritize local knowledge and existing relationships between humans and nonhumans as active agents in shaping forest ecosystems. Ultimately, this thesis argues for a community-based conservation model aligned with principles of convivial conservation, where local residents are integral participants in the conservation process.

Keywords: ethnoprimatology, convivial conservation, bamboo development, primate conservation, *Alouatta palliata*, *Cebus aequatorialis*, *Guadua angustifolia*, coastal Ecuador.

Summary for Lay Audience

In this dissertation I examine the interrelationships between people, primates and bamboo in the coastal province of Manabí Ecuador, with a focus on the Pacoche Wildlife Refuge. This province has some of the highest rates of deforestation in Latin America, and the remaining forest fragments are home to two primate species threatened with extinction – the Ecuadorian mantled howler monkey (*Alouatta palliata aequatorialis*), and the Ecuadorian white-fronted capuchin (*Cebus aequatorialis*). Manabí is also reputed to contain the greatest concentration of bamboo (*Guadua angustifolia*) in the country, and the development of a sustainable bamboo economy is promoted by some as a solution to the social and environmental issues that plague the region. The research on which the dissertation is based aimed to explore the opportunities and challenges for conviviality, or "living with", in human and nonhuman worlds, focusing especially on how they play out in the practice of conservation and development and in people's responses to related proposals and interventions. In reporting my findings, I argue for a community-based approach to conservation that includes local residents as integral participants in the conservation process. This thesis is based on the premise that the way humans relate to their environments and the nonhuman species that inhabit them are shaped by historical, political-economic and social contexts that are in a constant process of change. Understanding these relationships is crucial to finding convivial strategies to address conservation and development conflicts. Among other things, findings based on a mix of social and primatological methods reveal the variety of meanings and values associated with bamboo, as an everyday raw material, a cause for contention with local authorities, a "green" commodity, an important part of cultural heritage and identity, and a vital component of primate habitats.

Ultimately, the findings of this study show that unraveling the complex power structures embedded within conservation politics can reveal new ways of *seeing* and *thinking* about conservation that prioritize local knowledge and existing relationships between humans and nonhumans as active agents in shaping forest ecosystems. These results emphasize the importance of more effective and inclusive conservation strategies in the future.

Coauthorship Statement

Chapter Five - Human-Bamboo Relations: Smallholder and *Bambusero* Perspectives in the Province of Manabí, was coauthored by Tamara Britton, Dr. Zoe Pearson (Associate Professor, School of Politics, Public Affairs and International Studies, University of Wyoming), and Mina Moscatelli (MA, University of Wyoming). The interview data for this chapter was collected and analyzed collaboratively as part of a larger interdisciplinary team of researchers and non-profit experts from Ecuador, the United States, and Canada investigating the ecological, economic, social, and political context of Ecuador's bamboo industry. The distribution of writing tasks for this coauthored chapter are as follows: Tamara wrote the introduction, smallholders, *bambusersos* and conclusion sections of this chapter; Mina wrote the smallholders and data collection sections; and Zoe wrote the *bambuseros* and conclusion sections. All parties contributed to the editing phase.

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PART I:

Theoretical, Methodological and Historical Foundations

CHAPTER ONE

Introduction

I first arrived in the Pacoche Coastal and Marine Wildlife Refuge (PWR) in the fall of 2016, following a map I had found online from the University of Sussex about the best places in Ecuador to observe nonhuman primates (hereafter primates) in their natural habitats. Even the term 'natural habitat' nestled within the myth of 'pristine wilderness' is something that I now understand to be in constant flux as human impacts have altered the landscape considerably. The Pacoche Wildlife Refuge, tucked along the coastline in the province of Manabí, was the last stop on a long cross-country road trip with my partner Santiago. I still remember the bus dropping us off on the side of the E15 highway[1], giant palm leaves and bamboo culms (stalks) towering over us as we hiked into the Pacoche Lodge; the fog so thick I could hardly read the sign. That first night, I peered out my bedroom window into the misty vegetation and spotted a female howler monkey curled up in a ball near the midsection of a bamboo culm to sleep for the night. I watched her as the evening turned black, and when I awoke in the morning to the haunting calls of howler monkeys echoing through the forest, she was still there. But as the sun rose and more tourists arrived, loudly chattering back and forth making monkey noises in jest, she disappeared deeper into the forest away from human disturbance. I hiked the trails all day, and never found her again, but I did see other howler troops feeding on foliage along the highway, unbothered by the loud tractor-trailers honking their horns and speeding by. These encounters with how howler monkeys reacted *or not* to human presence made a lasting impact on me. I reflected on the

[1] This highway also known as the *Ruta del Spondylus* (the route of the Spondylus) has acquired a great significance throughout much of this project as a key throughfare for the coastal region and a threat to the conservation of resident howler monkeys.

landscape I had observed travelling around the region – smoldering fields of smoke as far as the eye could see, reducing the horizon to a bald vista ready for the planting of cash crops. Meanwhile, Pacoche was this green jewel, lush, damp, and full of life – like an island in the desert, and people (like myself) poured in with their binoculars, eager for a wildlife experience. From my research on gorillas at the Toronto Zoo during my undergraduate degree to my family vacation to Spain where I insisted we visit Gibraltar to see the Barbary macaques, long before I had ever heard the term 'ethnoprimatology' I have been fascinated with spaces of human and nonhuman primate interaction. I wondered back then how an endangered species like the mantled howler monkey (*Alouatta palliata*) has any chance of long-term survival in a place where human development is bursting at the seams. But if there was a chance to understand this potential to strike a balance, Pacoche would seem to be an ideal place.

The Conservation Conundrum

In coastal Ecuador, where the Pacoche Wildlife Refuge is found, anthropogenic pressures over the past half-century have profoundly reshaped the landscape through mass deforestation and forest fragmentation (Dodson and Gentry, 1991; Sierra, 2013; González-Jaramillo, 2016). Between 1990-2010, the country experienced the highest deforestation rates in South America (FAO, 2011). The most affected forests have been in the coastal region, where accelerated rates of deforestation took place between 1990 and 2008 (Sierra, 2013). In the province of Manabí, the expansion of cattle-ranching since the 1970s and short-cycle slash and burn crops have been major contributors to these landscape changes (Bates, 2008). As a result of these activities, the province suffers from high levels of soil degradation, erosion, desertification, and water shortages (Mosandl et al., 2008). However, the largest contributor to environmental damage in the province has been the massive expansion of shrimp aquaculture that has become one of

Ecuador's highest export commodities since the 1990s. Due to this expansion, almost 90% of all mangroves have been lost (Twilley et al., 1998). This wide-scale forest clearing has resulted in a transformation of the coastal landscape, producing a patchwork of fragmented forests that continue to shrink with each passing year (MAE, 2009). As a result, all of the remaining areas containing suitable habitat for endangered species such as the Critically Endangered white-fronted capuchin (*Cebus aequatorialis*) and the Vulnerable mantled howler monkey (*Alouatta palliata aequatorialis*) (IUCN, 2021) are considered irreplaceable. It is within this struggle between human and nonhuman that this thesis is situated.

What follows is an ethnography of conviviality[2] – a series of stories gathered over nearly two years of fieldwork that embraces the messiness of "living with" human and nonhuman worlds (Büscher & Fletcher, 2020). Throughout this dissertation I argue that embracing this messiness involves understanding the interrelated socio-ecological and political-economic factors embedded within conservation and development that are in a continuous process of reshaping. I am inspired by Deleuze and Guattari's (1980) concept of "rhizomatic connections", which they describe as "haphazard intersections… and elements that coexist with one another without structure, like a patchwork quilt"; they later go on to explain that "rhizomes are the heterogenous links between things… [that] create transspecies connections" (*in* Holland, 2013:31-32). While I find these concepts good to think with about the messiness of multispecies interconnections, this thesis takes a more applied anthropological approach focused on the lived realities and interrelationships of people, primates, and bamboo in and around the Pacoche

[2] I use the term conviviality in reference to Büscher and Fletcher's (2019:286) concept of "convivial conservation" which claims we need a new type of conservation model situated within a new political-economic framework that focuses on distribution instead of accumulation and shared habitats that combine human and nonhuman needs – see page eight for more information.

Wildlife Refuge to understand the challenges and opportunities for conviviality between species sharing endangered environments.

In ecology, principles such as symbiosis allow us to analyze the complementary roles played by a variety of nonhuman actors in an ecosystem. In *The Hidden Life of Trees*, for example, Peter Wohlleben emphasizes how trees communicate as part of a family or community in an attempt to embrace these similarities between human and nonhuman worlds (Wohlleben, 2016). What is often missing from the study of these symbiotic relationships, however, is the role of *Homo sapiens*. Over time, humans have been cut out of accounts of interrelated ecological interactions and labeled as the disrupting species, the problem, or the villain in the ecosystem story. Just look around you, and the ways in which human beings have drastically modified our environments to meet our wants and needs is overwhelming. The art exhibition "The Anthropocene Project" by Burtynsky, Baichwal and de Pencier (2018) profoundly illustrates the scale of our impact on the planet to make us reflect on our actions. However, what is missing from these doom and gloom scenarios is the resiliency and recovery of nature, its ability to adapt and reshape itself, as well as the ways in which human use can actually *help* nature. Bamboo, with its remarkable self-propagating structure, is proposed throughout this thesis as a connecting organism or rhizome that brings together other elements – people and primates. It is through the shared use or partitioning of this nontimber forest resource, and appreciating the multitude of meanings carried within socio-ecological and political-economic relationships, that both people and primates can find ways to coexist. It is from this perspective that this thesis is critical of current mainstream conservation paradigms and argues that what is needed is a grounded multispecies approach to conservation practice that views both humans and nonhumans as active agents in shaping forest ecosystems.

Living, learning, and working in an agroforestry environment -- a mosaic patchwork of differing forest types, crops, coastlines, pasturelands, and human settlements, wrapped together as a National Wildlife Refuge -- has taught me a lot about the politics of conservation and conviviality. I learned that to design effective strategies to address pressing conservation issues, we need to challenge top-down approaches and find ways for local communities to be an integral part of the conservation process. To do so, I argue there is a need to acknowledge the complex power structures embedded within conservation politics and be open to new ways of seeing and thinking about conservation that prioritize local knowledge and existing relationships between humans and nonhumans sharing the same space.

Early on in this research process, when I first began my journey into my PhD program, an academic mentor commented to me: “So, Tamara, you still think it’s all about the primates…”? (Anonymous, personal communication, n.d.). This provocative quote has been playing over and over in my mind for nearly five years now and has inspired me to think deeper about the ways in which primate conservation is embedded within a web of global and local connections. The following work is a compilation of stories from generous participants, coupled with my experiences, reflections, and interpretations during this process of learning what the complexities between people, primates, and bamboo means in the practice of conviviality. To begin, I will provide a brief description of the theoretical ‘big picture’ frameworks that inspire and bring together each of the upcoming chapters.

Theoretical Frameworks

Conservation Paradigms

The rise of modern conservation practice can broadly be attributed to two central ideals that mark the great conservation debate: preservation and/or sustainability. The ideal of preservation, most famously associated with John Muir and Theodore Roosevelt's fortress conservation model, was rooted in an exclusionary approach designed to protect natural resources from the presumed dangers of human interference (Brockington, Duffy & Igoe, 2008). Sustainability, on the other hand, was defined by the pragmatist Pinchot as "the application of common sense to common problems for the common good" (Shabecoff, 1993 *in* Western & Wright, 1994: 3) and gave rise to the Integrated Conservation-Development model (ICD) that continues to influence the mainstream conservation landscape today. These opposing ideals have informed the foundation of modern conservation practice, ranging from preservationist targets such as the 30 x 30 movement to conserve 30% of the world's nature by 2030, to the popular 'green developmentalism' movement, which proposes new market solutions to environmental problems (McAfee, 1999). Such initiatives under green developmentalism include carbon sequestration programs and other payment for ecosystem services (PES) models, as well as new forms of natural capital marketed as nature-based solutions (including bamboo), which have become increasingly popular strategies in recent years.

Rather than ally myself with one or another of these ideals, I argue for a social science approach that incorporates a more inclusive way of thinking about conservation. My work is inspired by Büscher and Fletcher's (2019:286) concept of "convivial conservation" which rejects natural-cultural dichotomies, and economic systems of continued growth, and offers an alternative to current conservation paradigms. "Convivial" in this sense not only involves a political economic critique of current systems, but also a socio-ecological perspective that

"promotes nature for and by humans …through building and engaging in relationships with nonhuman ecologies".

The Social Science of Conservation

Conservation social science was born out of a critique of the fortress model and the social conflicts it creates (i.e., forced displacement, inherent discrimination, and power inequalities). Conservation social scientists often refer to the Durban Action Plan of the 5th World Parks Congress in 2003, which emphasized how the top-down protected area model has been responsible for dispossession, poverty, and culture change through privatization, legislation, and enforcement as well as the alteration of land-use rights and access to natural resources (Brockington et al., 2008; West et al., 2006). Igoe and Brockington (2007:443) discuss how under the fortress model, local people are positioned as having "a fundamentally flawed relationship with nature" the solution to which requires that they be "transitioned into eco-rational subjects" by "competent conservationists".

These critiques have encouraged more inclusive alternatives, such as community-based conservation (CBC), that allow for the exploration of different ways of defining and practicing conservation. CBCs are described as small-scale initiatives that motivate communities to assume ownership and responsibility for their own natural resources by putting differing degrees of power in the hands of local people (Horwich & Lyon, 2007). The premise of this strategy is that residents who feel they can participate in conservation-related decisions have an increased sense of ownership of conservation efforts and thus become more likely to take responsibility for natural resources as assets for future generations (Lyman et al., 2013). Thanks to the diversity of social science approaches, these alternatives have become more abundant in recent years and have gained significant footing across conservation discourse. Due to the critiques of

exclusionary conservation strategies, community involvement is now considered essential in conservation planning and implementation. However, Chapin (2004) argues that conservationists can sometimes treat community involvement as a catchphrase to rally support and funding because CBC often implies equality and is used to legitimize conservation initiatives as the more socially and politically responsible option. Therefore, we must be cautious to avoid essentializing particular approaches and recognize that there is much variability across individual projects and contexts, principally regarding the degree to which local knowledge and expertise are incorporated into each project. While CBC promotes more inclusive forms of conservation and development action, it is fraught with messy and complex relationships, assumptions, and power dynamics across many scales. CBC is highly variable and transforms over time as conditions change; it is not a magic solution but is best described as representing an alternative set of approaches to the mainstream protectionist model.

Looking at conservation through a critical lens allows us not only to be more aware of the intentions and agendas behind conservation strategies, but also of the unintended consequences of these strategies for marginalized populations and biodiversity. Brockington, Duffy, and Igoe (2008) encourage us not to think of communities as clearly bounded entities but as fluid networks and shared social practices that intersect through micro-power relations and overlapping and divergent interests (*see also* MacDonald, 2003; West, 2006). They state that what constitutes a community is socially, historically, and politically constructed and is influenced in conservation by external agents such as NGOs, government institutions and private enterprises. It is important to remember that "within any given community, different individuals may have multiple belief systems simultaneously and various adaptations to contemporary systems and challenges" (MacDonald, 2003:23).

These perspectives highlight how conservation is not just about biology. It requires a more holistic view of ecosystems with human beings and our institutions as key influential components. It is about politics and power, history and values, and how people view and shape the environment through their decisions and behaviours. The social sciences bring the study of social phenomena, social processes, and individual attributes into the conservation discussion, demonstrating that conservation is just as much a social process as it is an ecological one (Lepp & Holland, 2006). West and Brockington (2006) explain that different cultures relate to the environment in different ways, which demonstrates how nature and the environment are socially produced. The diverse disciplines across the conservation social sciences also encourage us to be critical of the rosy picture painted by protectionist and 'win-win' conservation models and to be conscious of the systemic causes and power inequalities embedded within these strategies (Bennett et al., 2017; West, 2006). These social science critiques have challenged the oversimplifying of people's relationships with nature by connecting conservation strategies to larger-scale global and transnational processes (West et al., 2006).

Social science research can help conservation practitioners better understand their target audiences, identify barriers to effective collaboration, provide a foundation for the monitoring and evaluation of programs, and suggest ways of encouraging people towards more sustainable habits. It can also help in informing conservation education and marketing tactics at all stages of the planning and implementation of conservation projects (Bennett et al., 2017; Igoe, 2011). The social sciences demonstrate that "conservation concepts have cultural histories, political consequences and ecological impacts that shape the world and need to be understood to find better solutions and thus often bridge the gap between academic and practical applications" (Bennett et al., 2017:102).

Ethnoprimatology and an Anthropology Beyond the Human

Aligned with the premises of the convivial conservation model that emphasizes “living with” approaches to understanding and practicing conservation (Büscher & Fletcher, 2020), this thesis investigates how political, economic, and cultural forces shape the ecologies of humans and nonhuman organisms. To meet these aims, I argue that in order to *see* conservation differently, we must look at it from multiple perspectives, including those that challenge “the foolishness of human exceptionalism” (Haraway, 2008:244), and instead concentrate on the mutual ecologies and coproduced niches of humans and nonhumans (Fuentes, 2010).

For the purposes of this thesis, I am interested in an ‘anthropology beyond the human’ that investigates the multitude of ways that people, primates, and bamboo are intertwined across the social, economic, ecological and political realms of conservation and development. To explore these interconnections, I rely heavily on the field of ethnoprimatology, which focuses on relationships between human and nonhuman primates. The study of ethnoprimatology combines theoretical and methodological approaches from various fields in both the natural and social sciences to provide a more holistic understanding of the anthropogenic factors involved with primate conservation (Campbell et al., 2010; Fuentes, 2012; Setchell et al., 2017; Riley & Ellwanger, 2013). Ethnoprimatology uses a mixed methods approach and thick description to explain the complexities of ecological relationships (Dore et al., 2018a; Riley, 2007).

The term was initially coined by Leslie Sponsel in 1997 in his chapter *The Human Niche in Amazonia: Explorations in Ethnoprimatology*. Here, Sponsel challenged the separation of sociocultural and biological anthropology, arguing that "human phenomena are not so neatly compartmentalized" (Sponsel, 1997:114). The central aim of ethnoprimatology is to provide alternative insights into primate conservation issues to find better strategies to address the

impending primate extinction crisis (Estrada et al., 2017). According to Dore (2018b), the field allows researchers to socialize ecosystems[3] through analyzing ideological factors and power imbalances involved in conservation politics that can be otherwise hidden.

Ethnoprimatology was a response to the need for a new paradigm for thinking about human-environmental relationships and studying the potential for humans and nonhuman primates to coexist in shared environments. The field provides the opportunity to overcome top-down, natural-cultural dichotomies that position humans as part of the conservation problem instead of the solution, making it an ideal match for the convivial conservation approach that inspires much of this thesis. Like convivial conservation, ethnoprimatology focuses on the structural causes of environmental destruction as well as the possibilities for reciprocal relationships and interconnected histories that entangle species together (Riley, 2007; Fuentes & Hocking, 2010; Fuentes, 2010). Adding a sociocultural perspective to primatology allows for the opportunity to explore complex belief systems and the social, economic, and political landscapes people and primates share in order to find culturally relevant and democratic strategies to address conservation challenges (Fuentes, 2012; Savage et al., 2010; Waters et al., 2018).

[3] According to Dore (2018: 918), socializing ecosystems means considering more than just ecological perspectives, but also drawing attention to structural and political factors - or a "wider field of agents" involved in primate conservation.

Context – Study Area and Populations

(*Figure 1:* Map of Manabí province, INEC, 2022).

This project took place at various sites across the province of Manabí, with a focus on the Pacoche Coastal and Marine Wildlife Refuge (PWR). Located in the central coastal part of Ecuador (1.05222°S 80.4506°W), Manabí is home to 1,592,840 inhabitants, or 9% of the country's total population (INEC, 2022). About 42% of inhabitants live in rural areas (INEC, 2022), and 14% listed agriculture as their primary occupation (INEC, 2010). According to the most recent census in 2022, the majority of the population identifies as *mestizo* (62.9%), with a significant proportion as *montuvio* (33.6%), and smaller numbers as Afro Ecuadorian (1.9%), white (1.4%), Indigenous (0.2 %), and other (0.1%) (INEC, 2022).

As the province with the most coastline, Manabí is known for its vast beaches, fishing villages, and rich seafood cuisine. Concentrated on export products and the regional market (Mendoza et al., 2019), Manabí's economy relies heavily on natural resources, predominantly agriculture and fishing, with the city of Manta as one of the world's largest tuna exporters. Other economically significant commodities include*: toquilla* straw hats (Panama hats), cacao, bananas, *tagua* (vegetable ivory), hardwoods, coffee, corn, citrus fruits, rice, cotton, and seafood, as well as the production of a regional alcoholic beverage called *aguardiente* (Savelli, 2023). Over the past few decades, tourism has also become a significant contributor to the local economy, with Manta functioning as a cruise ship port.

The province of Manabí suffers from high levels of soil degradation, erosion, and desertification (Mosandl et al., 2008). Across the province, as elsewhere in the coastal region, forest loss has led to the rapid destruction of things that bear on people's livelihoods, including the loss of water quality and quantity, biodiversity, and irreplaceable forest products, as well as a reduction in other ecosystem services such as erosion control and the disruption of climate cycles (Paudyal et al., 2022; Paladines et al., 2015; Van Der Hoek, 2017). Consequently, Manabí fluctuates between severe droughts and floods, which have been gradually increasing due to climate change over the past half-century. These natural disasters were further compounded by the 7.8 earthquake that hit the northern part of the province in 2016 (Mendoza et al., 2019). This region is characterized by some of the most threatened tropical forests on the planet (Conservación Amazónica, 2019). It hosts a wide diversity of micro-ecosystems comprising distinct climatic zones from dry-forest coastal valleys with a tropical dry climate to wooded mountainous areas with cloud forests in a subtropical humid climate (Harris et al., 2004). It is in these coastal forest fragments across Manabí where 24% of Ecuador's native bamboo forests are currently found (INBAR, 2018).

The Pacoche Coastal and Marine Wildlife Refuge

Pacoche Wildlife Refuge (PWR) was established in 2008 as part of Ecuador's country-wide expansion of protected areas. Being categorized as a "Wildlife Refuge" within Ecuador's National System of Protected Areas (Sistema Nacional de Áreas Protegidas, SNAP), the PWR is classified as a relatively small conservation area (less than 5000 ha) with conservation objectives focused on threatened species and their related ecosystems. According to SNAP, the management of wildlife refuges is meant to prioritize habitat and species management, environmental research and monitoring, ecosystem restoration and environmental education; human presence must be

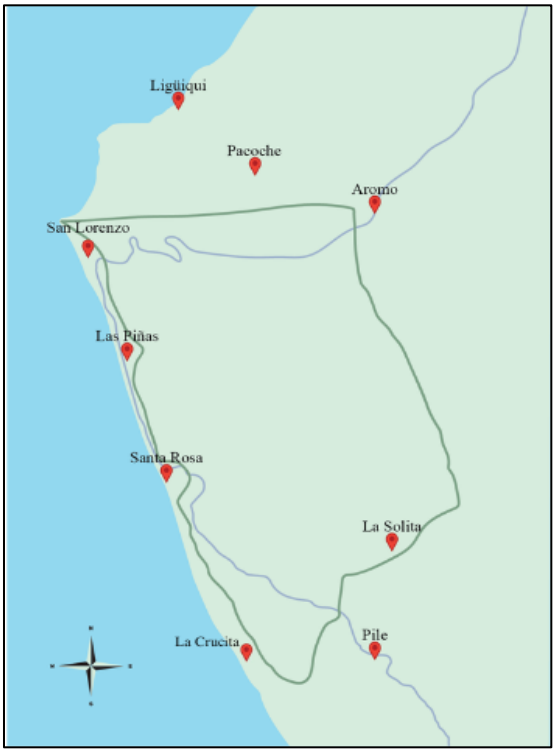
kept to a minimum and the level of use restrictions is generally high (SNAP, 2015). Nonetheless, the fact that portions of the PA are populated and cultivated is an expression of historical patterns of land occupation in this area, much pre-dating the 2008 establishment of the PA.

The Pacoche Wildlife Refuge appears as a green 'oasis' in the middle of a dry-scrub forest landscape, just 20 minutes away from the growing port city of Manta. This area has been deemed worthy of protection due to its abundance of natural springs and unique micro-climate, which has resulted in a wide variety of flora and fauna including 42 species of mammals (two of them primates – *Alouatta palliata* and *Cebus aequatorialis*) and over 250 species of birds; 55 taxa are endemic to the area (Greenearth Ecuador, 2017; MAE, 2017). The park spans a marine-coastal area of 26,468.21 hectares and a terrestrial area of 5,049.69 hectares of coastal dry forest and *garua* rainforest. The annual precipitation in PWR is less than 500 millimeters (mm) –arid to semi-arid– and is concentrated in a single rainy season from January to April, with a high irregularity of precipitation due to the episodic appearance of the El Niño phenomenon (MAE, 2017). Rainfall is heaviest in January, averaging 79mm; it subsequently averages 72mm in February and 60mm in March (Weather Atlas, 2024). However, 300m above sea level the mist (*garúa*) -- a low intensity precipitation, provides a consistent moistening to the vegetation enabling a high level of humidity most frequent between May and October (MAE, 2009; MAE, 2017).

The ecosystem sustained in the Pacoche Mountains modifies the local climate and adjacent areas between Pacoche and the surrounding communities. Due to these orographic conditions, the average daily temperature in these mountainous areas varies between 23 °C and

24.5 °C while temperatures in nearby human settlements vary between 25.5 °C and 27 °C (MAE, 2009; MAE, 2017).

The most recent 2009 local census estimates the human population of the Pacoche Wildlife Refuge at 3,948 with a high population density of 263.2 habitants / km (MAE, 2009). Of the nine communities that exist within or on the borders of the park, four are coastal. These settlements include: the *comunas* of El Aromo, Pacoche, Liguiqui, San Lorenzo, Santa Rosa, Las Pinas, La Solita, La Crucita and Pile *(see figure #2*). According to the Ministry of the Environment (MAE) (2009), the main crops in the refuge are sugarcane, *toquilla* straw for making the famous Panama hats, and corn. However, coffee, cacao, bananas, plantains, and other citrus fruit plots are also common. Local populations also readily extract firewood and timber for construction from the forest. The continuous production and extraction of agricultural and forestry products creates income for local communities throughout the year, with key products including *panela* (brown cane sugar), *guarapo* (sugar cane juice), and locally sold handicrafts made from *toquilla* straw, *Guadua* bamboo and the *tagua* palm nut (vegetable ivory) extracted from the forest. Data from the Ministry of the Environment (2009) estimates that only 17% of the population in the area relies on agriculture as their primary source of income. The most significant proportion of the population (over 30%) depends primarily on fishing and other trades, such as sewing, carpentry, artisan handicrafts and



(*Figure 2:* PWR terrestrial border and towns).

tourism, which tend to exist as secondary employment sectors (MAE, 2009). Industrial agriculture, the demand for infrastructure and services, and the lack of compliance with protection initiatives are putting great ecological pressure on the area (Cervera et al., 2015).

Tourists come to the PA to see the sea turtles hatch and visit the beaches in nearby Santa Marianita, Ecuador's most famous site for kite surfing. Other tourist attractions include an ethnographic museum in the town of Pacoche and archaeological ruins in nearby Liguiqui. While there is no formal marketplace, tourists can purchase a variety of locally sourced handicrafts, as well as coffee, chocolate, and sugar-based products from hotel vendors. Visitors come to the area primarily to explore two hiking trails – *El Faro,* leading through dry forest, cliffs and marine areas, and *El Sendero de Mono* (The Monkey Trail) which requires being accompanied by a certified tour guide. It is along these trails that they can observe the refuge's main attractions: the two primate species and native bamboo to which I turn next.

Cebus aequatorialis

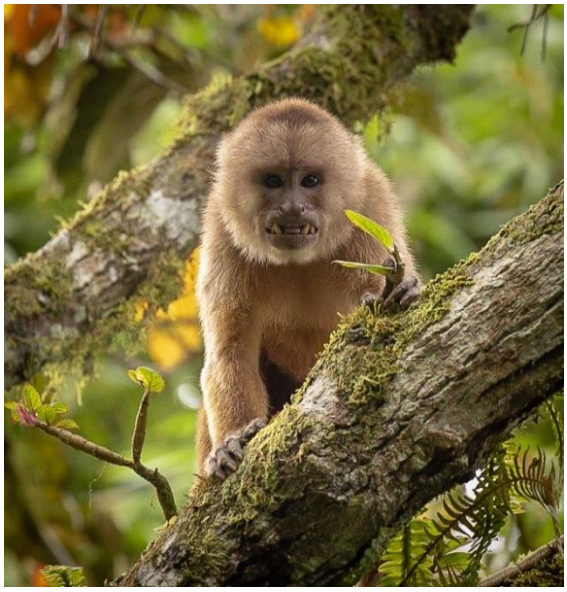


Figure 3: Cebus aequatorialis (S. Mendieta, 2022).

The Critically Endangered Ecuadorian white-fronted capuchin (*Cebus aequatorialis*) is found only in the Pacific coastal region, west of the Andes Cordillera. Its distribution ranges from the northern province of Esmeraldas (south of the Rio Guayllabamba) eastwards to the foothills of the Andes, in areas of lower altitude (below 2420 m) in the province of Pichincha, and as far south as northern Peru (de la Torre et al., 2022; Tirira, 2017; Cervera et al. 2018a, 2018b, Moscoso et al. 2021). A habitat distribution model by Campos and Jack (2013) identified four high-priority areas for the

conservation of this species, two of which are the most significant: 1) The Chongón-Colonche Mountain range in Manabí and Guayas provinces, 2) and the Mache-Chindul and Jama-Coaque Mountain range in Manabí and Esmeraldas provinces. More recently, de la Torre et al. (2022) has added the southwestern province of Azuay as an additional priority region. In 2022-23, *C. aequatorialis* was placed for a second time on the IUCN Red List Top 25 World's Most Endangered Primates in 2022-2023 – a list that is updated every four years, highlighting the severity of its precarious status (Mittermeier et al., 2022). Its Critically Endangered classification (CR)[4] is based on the severe decrease (>80%) in forest habitat over the past three generations (approximately 48 years).

Studies estimate an extensive home range that can be up to 500 hectares, with a strong preference for areas near streams with a high percentage of tree coverage, including both primary and secondary forests as well as agroforestry habitats (Jack & Campos, 2012; Rylands et al., 2013; Cervera et al., 2018b) and bamboo-dominated forests (see Chapter Six). Current research estimates that this species is found in approximately 24 protected areas and private reserves with suitable tree coverage to support the population (de la Torre et al., 2022; Campos & Jack, 2013). Tirira (2021b) calculates that only 39% of the appropriate habitat is currently under state protection, and an additional loss of 7% is anticipated over the next 25 years. A recent primate census in Western Ecuador indicated a low number of sightings of this species (in less than 5% of all study samples) highlighting the need for immediate conservation action (Cervera et al., 2018a:61).

[4] The IUCN Red List classification system for species considered at risk of extinction consists of nine categories: NE (Not Evaluated), DD (Data Deficient), LC (Least Concern), NT (Near Threatened), VU (Vulnerable), EN (Endangered), CR (Critically Endangered), EW (Extinct in the Wild), and EX (Extinct). https://www.iucnredlist.org/

Initially, *C. aequatorialis* was considered a subspecies of *Cebus albifrons* (Groves, 2001, 2005; Tirira, 2008); however, based on its geographic isolation and unique morphological characteristics, such as the reddish colour of its pelage, several studies have discerned its valid species status (Lynch-Alfaro et al., 2010; Lynch-Alfaro, Izar y Ferreira, 2014; Boubli et al., 2012). Currently, results from genetic analysis are preliminary and inconclusive in supporting this argument (Cervera et al., 2018).

C. aequatorialis is considered monotypic (Rylands et al., 2013) and is best described as diurnal, arboreal, and gregarious, living in groups of five to twenty individuals, with proportionally more females than males per group (Albuja, 2002; Jack & Campos, 2012; Rylands et al., 2013; Cervera et al., 2018). It has been observed that larger troops disperse into subgroups for foraging and scouting behaviours (see Chapter Six). As omnivores, capuchins are known for having a broad diet ranging from fruits and flowers to leaves, insects, reptiles, amphibians, birds and small mammals. Capuchins have also been observed competing with fishermen to capture crabs in mangrove areas of Manabí (Cervera et al., 2018). Often referred to as extractive foragers, capuchins prefer foods that are challenging to access and require more complex problem-solving (Fragaszy et al., 2004). As discussed in Chapter Six of this thesis, *C. aequatorialis* has also been observed participating in tap-scanning foraging behaviour on bamboo culms in the Pacoche Wildlife Refuge.

The primary threat to *C. aequatorialis* is forest fragmentation, particularly the loss of suitable habitat due to livestock, agriculture, and aquaculture activities. The exploitation of timber and human population growth in the coastal region also escalates the deforestation of critical habitats. Additionally, the species is persecuted by farmers as a crop pest for foraging on oranges, corn, and cacao yields. Capuchins are also popular candidates for the illegal pet trade

and are highly vulnerable to zoonotic disease spread due to the isolation of populations. In the Pacoche Wildlife Refuge, capuchins carry the reputation from smallholders as being aggressive, bold, daring, and mischievous. Locals reported capuchins following and attacking women in the forest, as well as stealing people's clothing and exhibiting lewd behaviour (Britton, 2019).

Across various Indigenous groups in the Amazonian region, capuchins are often linked to myths surrounding human-animal and animal-human transformations. Additionally, research in the Pacoche Wildlife Refuge in 2018 found that capuchin blood was historically used as a remedy for asthma and cough ailments (Britton, 2019). De la Torre et al. (2022) highlight the need for more targeted studies on the species to understand the anthropogenic impacts on its behaviour and ecology, particularly relationships with humans in agricultural environments.

Regarding their conservation significance, capuchins are considered both seed predators and seed dispersers, but they also play a unique role in controlling insect infestations (Fedigan & Jack, 2001; Kinzey, 1997). According to Campos and Jack (2013), capuchins are "good indicators of overall ecosystem health because they are conspicuous, require relatively large areas of forest and tend to disappear from small, isolated forest fragments and heavily disturbed areas…. [Thus], *C. aequatorialis* can serve as umbrella species for identifying and delineating areas of high-quality forest" (p. 900). Updated data on the home range and population density of this species is deficient, and more research on the main threats, as well as how they adapt to fragmented habitats, is crucial to the survival of *C. aequatorialis* (Albuja & Arcos, 2007; Campos & Jack, 2013).

Alouatta palliata aequatorialis

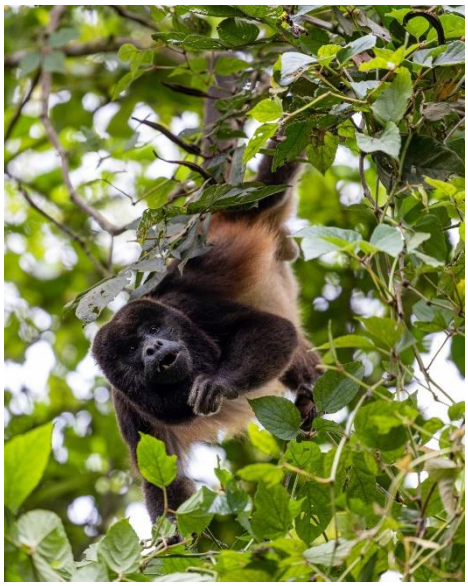


Figure 4: Alouatta palliata, (S. Mendieta, 2022).

The mantled howler monkey (*Alouatta palliata*) is listed as Vulnerable on the IUCN Red List of Threatened species (IUCN, 2021). *A. palliata* is represented by five subspecies, ranging from southern Mexico throughout Central America and down to the Pacific coast of Northern Peru. The Ecuadorian mantled howler (*Alouatta palliata aequatorialis*) is also listed as Vulnerable on the IUCN Red List, and is considered Critically Endangered in the Ecuadorian Red List of Mammals (Tirira, 2021), with an estimated population decline of over 30% within the next three generations. (Tirira, 2017; Tirira, 2008). This subspecies is found only in fragmented tropical, subtropical, and lowland temperate forests of the western part of Ecuador, most commonly below 800m of altitude (Tirira, 2017).

A. palliata aequatorialis males are significantly larger than females, with dark brown pelage, lighter in colour on the flanks – in comparison, females are often lighter in colour, sometimes greyish or brownish. Males have a sizable throat pouch that houses their enlarged hyoid bone used to make loud vocalizations that can be heard over a kilometre away (Fuentes et al., 2018; Tirira, 2017). *Alouatta* is a diurnal and gregarious genus, living in groups of 2-50 individuals. They can live in relatively small forest patches averaging 3-60 hectares per group and have a largely folivorous diet supplemented by ripe fruits (especially from the *Ficus* and *Inga* genera), seeds and flowers. Favouring the middle and upper strata of the forest (Tirira, 2008; Rylands et al., 2013b), higher population density in this subspecies has been linked to forests with greater tree connectivity (Cervera et al., 2015).

A. palliata spend a great deal of time resting and are relatively slow-moving. They are considered highly territorial, with males defending their group from the presence of external males, sometimes causing violent altercations. Additionally, intruding males have been known to commit infanticide when taking over a new group, something that increases in frequency in areas of high population density (Estrada, 2015; Kowalewski & Zunino, 2004). *A. palliata* are considered highly valuable to forest ecosystems as known seed dispersers of over 15 different tree species (Estrada, 2015; Garber & Kowalewski, 2015). They are also commonly referred to as forest gardeners, pruning the trees as they forage for young leaves and buds, encouraging new growth.

While considered highly adaptable and able to withstand degraded forest habitats with high degrees of human disturbance (Martinez-Mota et al., 2007; Arroyo-Rodriguez & Dias, 2010), the mantled howler is at elevated risk of zoonotic disease transmission due to its proximity to humans in anthropogenic environments (Helenbrook et al., 2015). It is also at risk of the loss of genetic variability in isolated populations. In February 2016, over 40 individuals were found dead in the Pacoche Wildlife Refuge, with the cause remaining inconclusive. This mass mortality was hypothesized as a result of a severe drought that made food resources scarce, however the potential of disease transmission is also likely (Fuentes, et al., 2018). This mortality coincides with another case of similar proportions in Nicaragua (Mathewson, 2016).

Similar to *C. aequatorialis*, the primary threat to *A. palliata* is the loss of forest habitat, mainly due to the conversion of land to cash crops, as well as livestock grazing, aquaculture activities, and large-scale infrastructure projects such as housing developments. While hunting of this animal for human consumption in Indigenous communities in Esmeraldas is still practiced, it is no longer considered common (howler blood was also a traditional medicine for respiratory

illnesses) (Britton, 2018). The illegal capture of this subspecies as pets remains an issue, particularly because howlers do not adapt well under captive conditions (Fuentes et al., 2018). *A. palliata* tend to frequent highway edges and have been known to come down from the trees to cross main roadways, putting them at risk of road mortality, electrocution from powerlines, as well as attacks from dogs (see Chapter Six*;* Cervera et al., 2015).

A. palliata also play essential roles in the cosmologies and symbologies of various cultures in Central and South America. Howler monkeys are the most consumed form of bushmeat in the Neotropics; however, some Indigenous communities have social taboos against eating howler meat linked to passing on undesirable traits such as lethargy to the consuming party (Urbani & Cormier, 2015). Their howl is also sometimes considered a bad omen (Cormier, 2006). In some Amazonian belief systems, howlers are viewed as former human beings (Viveiros de Castro, 1998) or even kin in Guajá society (Cormier, 2003). My own previous research in 2018 in the Pacoche Wildlife Refuge indicated that smallholders view howler monkeys as "friends in the forest" that "call to the gods to bring the rain" (Britton, 2018: 65). They also regularly associated howler monkeys with human-like characteristics, depicting howlers as Christians, that perform Hail Marys when they feel threatened by people" (Britton, 2018:67).

Guadua angustifolia

Figure 5: Guadua angustifolia (S. Mendieta, 2022).

There are 1,718 bamboo species worldwide, categorized into 128 genera, each with unique properties and uses that can vary widely. These species are divided into three main categories: herbaceous bamboos (*Olyreae*), woody bamboos (*Bambuseae*), and temperate woody bamboos (*Arundinarieae*). As part of the grass family (*Poaceae*), bamboos self-propagate by spreading their rhizome (roots) structure. They are classified as either clumping (sympodial) or running (monopodial) species (Zhaohua & Wei, 2018). In Ecuador, there are a total of 42 bamboo species, and 11 have been determined to be endemic to the country. While 33 different *Guadua* species have been identified across Latin America, four are native to Ecuador, with the majority concentrated across five provinces in the coastal part of the country (MAGAP & INBAR, 2018).

Named after German botanist Kunth, *Guadua angustifolia kunth* is a tropical woody bamboo species native to Ecuador, Colombia, and Venezuela, but it has also been introduced in other parts of Latin America and Asia. *Guadua angustifolia* is considered an open clumping species because while culms (stalks) grow in clumps, the distance between rhizomes tends to be dispersed – as much as 1 to 2.5 m. Each *Guadua* rhizome can produce up to 4 new culms of similar diameter and length characteristics as the original plant from which the rhizome spread (Londoño et al., 2002). This ability to spread out and replicate over distances indicates the invasive nature of this species and its ability to move in and take over openings in the canopy and out-compete many tree species for light (Ospina & Finegan, 2004). *Guadua angustifolia*

thrives in very humid environments like lower montane and subtropical forests, with annual rainfall between 2000 and 2500 mm. The preferred climate ranges between 20-26 °C at an altitude between 900 and 1600 meters above sea level (Londoño et al., 2002). In explaining the composition and ecological importance of bamboo groves, Zhaohua and Wei (2018) state that "rhizomes of different ages nourish the next generation together (the bamboo buds develop into shoots). One rhizome connects to different generations of bamboo stands, growing harmoniously together, sharing nutrients and relying on and supporting each other" (Zhaohua and Wei, 2018:77). In this way, bamboo contributes a wide range of vital ecosystem services, including water regulation, soil retention, erosion control, biomass production, and carbon sequestration. It also fulfils valuable socio-economic functions for local communities as a nontimber forest product, as is certainly the case with the *Guadua* found growing in the Pacoche Wildlife Refuge.

Guadua is viewed as a priority species because of its commercial value. Often referred to as "green steel" because of their superior strength and flexibility, culms are lightweight, durable, and resilient, making them excellent for structural supports and a wide variety of building needs, including seismically resistant structures (MAGAP & INBAR, 2018). Considered the third largest bamboo and one of the strongest in the world, *Guadua* is highly sought after for construction. While the internodes of a *Guadua* culm are hollow, they have thick node walls of up to 1.3cm, giving the culm superior strength (Muñoz-Florez et al., 2010). Culms can reach up to 30m in height and 20cm in diameter. However, the average size of a culm ranges between 9-13cm and 15-25m tall (Muñoz-Florez et al., 2010). Larger culms are only produced by groves that are 6-8 years old (Judziewicz et al., 1999). The superior size of the culms in the Pacoche Wildlife Refuge is an indication of low impact harvesting practices and the long history of these bamboo groves in the area.

What makes bamboo unique is the speed with which it grows and its ability to self-propagate. While many tree species need 30-50 years to grow before they are ready to be harvested for construction, a single bamboo shoot can grow up to a metre in a single day and reach maturity in just 3-7 years (Zhou et al., 2005). Its fast growth rate, resilience, and complex rhizomatic structure provides the potential for high yields without replanting, making it economically viable and a good option for restoring critical ecosystem functions on degraded and deforested lands (Robelo & Buckingham, 2015). If managed responsibly according to sustainable practices, culms from a bamboo clump can be harvested annually, thereby stimulating growth and ensuring continuous canopy coverage (Sheil et al., 2011). More recent literature has begun to evaluate the ecosystem services provided by bamboo forests, including carbon sequestration, erosion control, water regulation, and biodiversity conservation (Paudyal et al, 2022; Muñoz-López et al., 2021; Yiping & Henley, 2010). Studies reveal that based on its fast renewability, bamboo forests could sequester as much or more carbon than other similar land uses in the tropics (Manandhar et al., 2019; Yuen et al., 2017). Most relevant to this project is evidence that demonstrates how bamboo can thrive on degraded landscapes and has been successfully used in a variety of land restoration projects as part of a landscape-mosaic approach to regenerate and protect soil against erosion, break up densely compacted soil to promote regrowth, and help to protect water sources and increase water quality (Robelo & Buckingham, 2015; Laestadius et al., 2011; Tardio et al., 2017). While this research shows great potential for bamboo's role in restoring degraded habitats, studies generally indicate that as the intensity of management increases, the biodiversity value of bamboo forests tends to decrease. However, in areas where human impacts are high, such as in the province of Manabí, there is potential for bamboo to be used to connect forest fragments and provide a habitat (permanent or temporary)

for arboreal species compared to other agricultural land uses (Añazco & Rojas, 2015; Yiping & Henley, 2010). Given these ecological benefits, bamboo is marketed as a nature-based solution to address several of the United Nations' Sustainable Development Goals (SDGs) (United Nations, 2023) by contributing to "win-win" strategies that balance people, the economy, and the environment (INBAR, 2018). With increased demand in the forestry industry over recent years, alongside the movement towards green alternatives, bamboo is becoming an important resource on a global scale through the use of catchy labels such as "green steel" or "green gold". This trend is evident in Ecuador's National Strategy 2018-2022 for green and inclusive development of the bamboo industry (INBAR, 2018) in line with international commitments towards climate change mitigation to offset carbon emissions (REDD+ and the Bonn Challenge) and enhance carbon stocks in forests.

While bamboo is a resource that has been used by rural populations worldwide for millennia, to date, most of the claims about bamboo's potential contributions to sustainable development are based on studies from China and, more recently, India, where bamboo is well-researched and invested in by government and private entities. With most bamboo diversity in the Neotropics, recent literature has begun to test these claims in other contexts and with a wider variety of species. Additionally, to date, studies that provide hard evidence of bamboo's contribution to poverty alleviation remain thin at best (Binfield et al., 2023; Boissière et al., 2020; Lobovikov et al., 2012). Critics of the promotion of bamboo's potential as a green alternative note the need to consider the social and ecological sustainability of supply chains and to develop domestic markets to keep bamboo use close to the source and ensure that manufacturing processes are energy efficient and waste products are reduced and reused. This

study is more interested in the myriad ways that bamboo is valued as more than just a commodity, historically, politically, socio-culturally, and ecologically – as part of habitat.

Methods

I collected the majority of the qualitative and quantitative data for this study between September 2021 and July 2023. I took a brief break in data collection in August 2022, however my research assistants Ramón and Denzel continued to collect data on primates during this time. Some preliminary data was also collected in the Pacoche Wildlife Refuge between May and July 2019 as part of a baseline data phase. In November 2021, and again between May and June of 2022, I adopted a multi-sited approach and travelled outside of the protected area to collect qualitative data in other parts of the province of Manabí (around Chone, Bahía de Caraquez, and El Carmen) and the province of Pichincha (Santo Domingo and Pedro Vicente Maldonado), as part of a team of interdisciplinary researchers investigating the development of the bamboo industry in Ecuador. The interview methods used for this part of the study will be outlined in Chapter Five. The ethnoprimatological methods used for the primate behaviour and vegetation sampling portion of the project will be outlined in detail in Chapter Six.

A total of 101 participants were interviewed during the entirety of this project. Most of these interviews took place in and around the Pacoche Wildlife Refuge with smallholder farmers (55), Ministry of the Environment employees (4), local governmental representatives and tour guides (3), and academics (2). We also interviewed bamboo experts or entrepreneurs in other parts of Manabí and Pichincha provinces (36 – I personally interviewed 15, while Dr. Pearson and graduate student Mina Moscatelli interviewed the other 21), and we shared all data for this part of the project.

Interviews

A combination of both unstructured and semi-structured open-ended interviews were conducted throughout this study. The informal nature of these ethnographic methods allows participants to

feel more comfortable with a casual conversation style and the space to express the depth of their ideas in their own words (Newton, 2010). James Spradely refers to this interviewing style as involving "Grand Tour questions," where the participant is given an opportunity to talk openly about a particular subject matter without any predefined boundaries (*in* Mannik & McGarry, 2017:73). Both interview styles give the participant more control over the conversation and allow the researcher to better contextualize and interpret the data (Newton, 2010). All interviews were audio recorded with the participant's verbal permission (*see Appendix D and E for interview guides*).

Interviews are "meaning-making occasions" that highlight how relations between researchers and their participants are integral to the research process (Holstein & Gubrium 1995: 4; Skinner, 2012, in Mannik & McGarry, 2017: 76). Thus, it was important for me to build rapport with participants before I asked them for an interview. Most of this data was collected after I had already met and spoken informally with the majority of participants at community events and activities or after being introduced by shared acquaintances. Some unstructured interviews took place on Saturday mornings when the *comuna* President of Pacoche would invite Santiago and me over for breakfast alongside other community members and we would chat informally about conservation, politics, and primate related themes.

During interviews, I was highly aware of my own expressions, both physically and verbally, which Martin Forsey (2010) refers to as "engaged listening" or deep listening (*in* Mannik & McGarry, 2017:77). I rarely held more than two interviews on the same day in order to make sure I was prepared to give my full attention and energy to the interaction. To most planned interviews, we always brought a thank you gift, such as a loaf of bread, a pineapple or some Western University pens to reciprocate the participant's contribution and time. While I am

fluent in Spanish, it is not my first language. So, either my partner Santiago or my research assistant Ramón would accompany me to most interviews to help translate when I needed clarification with local dialect or misinterpreted expressions.

Throughout my data collection (during interviews and participant observation), I took detailed handwritten fieldnotes in my notebook, where I would record key pieces of information, descriptions, quotations, and reminders for myself about the relevant subject matter. I would later type up these notes on my computer and fill in the details and personal reflections to complete the entry.

Participant Observation

Participant observation is a staple method for anthropological research that involves observing human behaviour while building relationships and interpreting patterns and connections witnessed during day-to-day experiences (Mannik & McGarry, 2017). Throughout the ethnographic process, my approach was always that of a student and a learner, where building trust with participants was of key importance (Agar, 1980). Using the participant observation method helps to reduce the problem of reactivity, which refers to people changing their behaviour because they know they are being studied. It also helps to give the researcher an intuitive understanding of what is going on, allowing them to ask the right questions and appreciate the context needed to cross-check information from other data sources (LeCompte & Schensul, 1999; Bernard, 2017). Setchell et al.'s (2017) paper on biosocial approaches to conservation argues that using ethnographic field methods such as participant observation and semi-structured interviews can better help us to understand human-wildlife interactions. They explain that integrating biological and social research methods can function to expose barriers to

conservation participation, such as unequal power relationships between local populations, government agencies and outsiders.

For this study, participant observation took place largely during forest walks with smallholders, as well as with park rangers, tour guides and bamboo experts as they went about their daily tasks. Unstructured walking interviews usually accompanied these sessions, which allowed for targeted questions and prompts to better understand the process of the behaviour or activity being practiced. Through these follows, I was an active participant, meaning I expressed a high degree of involvement in the activity based on what was appropriate in each scenario. Mannik and McGarry (2017) explain that despite involvement and interaction with the study population, informants never fully accept the researcher as an "insider." As a white Canadian female researcher, I stood out in many of these encounters, as my presence was often in predominantly male spaces within the context of my field site(s). I participated in as many activities as I was invited to, including funerals, community celebrations, public events, birthday parties, conservation activities, inaugurations, forest tours, artisanal workshops, academic presentations, cultural activities, and daily chores, as well as accompanying participants at their places of work. Additionally, I participated in harvesting, processing, and building using sugarcane and *Guadua* bamboo. The emergent design of my research meant that my participation was based on opportunities that presented themselves while in the field and allowed me to gain a deeper understanding of the relationships between people, primates, and bamboo from a wide variety of perspectives.

Participatory Approaches

For the purposes of this study, I used a participatory action approach when conducting workshops with study participants on conservation themes. Following the example of others who

have applied participatory approaches to conservation issues (Waters, 2014; Horwich & Lyon, 2007; Reynolds & Bettinger, 2008), I held two community events in the *comuna* of Pacoche (one on bamboo harvesting and the other an appreciation event) and a workshop series in Pacoche for the canopy bridge portion of the project described in Chapter Seven. These sessions aimed to allow for bilateral knowledge transfer where participants are empowered to share their experiences as active conservation practitioners in the protected area. Participatory approaches to species conservation have produced successful results for endangered species survival because community members become co-researchers in the inquiry and action to address questions and issues that are significant to them directly. Local people have their own complex criteria for decision-making that can be misunderstood or misrepresented by other stakeholders; therefore creating spaces for collaborative discussion and sharing of trial-and-error processes becomes a learning experience for building trust between everyone involved (Horwich & Lyon, 2007; Waters, 2014). Waters (2014) argues that making people central to the project reveals hidden impediments to conservation and opens the potential to address these issues that can make conservation goals achievable. The use of a participatory approach during workshops is a community-based method involving sustained engagement and building trust with study participants as active collaborators in the research process. Each workshop, through the design, construction, and installation phase, provided a teachable opportunity to open dialogue about conservation themes (such as the role of primates and bamboo in ecosystem health) and local concerns/strategies. Throughout all components of this project, I was greatly influenced by the Conservation through Community Involvement (CCI) approach (Reynolds & Bettinger, 2008).

Data Analysis

The analysis of ethnographic research is an inductive process, meaning that the key study themes emerge directly from the data as it is being reviewed. This procedure is not linear but cyclical and requires continuous revision throughout the research process (Mannik & McGarry, 2017), which begins with a central research question (or series of questions) and then develops based on emergent themes. Audio recordings for the interviews that took place in the Pacoche Wildlife Refuge were reviewed alongside the related field notes from the participatory processes to identify key themes, quotations, and a general sense of overall meaning. These data were then entered into Nvivo software and coded systematically to analyze the frequency of patterns. Narratives were pulled directly from field notes (see Chapter Five for a description of the analysis of the data collected from the multi-sited approach to bamboo development).

Positionality and Ethics

Bourke (2014) explains that during the research process, it is reasonable to expect that the researcher's own beliefs, cultural background, gender, class, ethnicity, political perspectives, educational background, life experiences, and so on are all variables in how the research is framed. "Just as the participant's experiences are framed in social-cultural contexts, so too are those of the researcher" (Bourke, 2014, p. 1). In turn, our own identities not only shape our perceptions and interpretations of our data but also how others perceive us as researchers and outsiders, which impacts how they relate and interact with us.

In reference to this point, I will note here that the way male participants interacted with me when I was alone or with my research assistant Ramón changed drastically from when I was with my husband – an Ecuadorian national. Male participants would rarely look directly at me or talk directly to me when I was accompanied by Santiago. We would make jokes about these

situations and strategize about seating arrangements during interviews. To try and change this dynamic, Santiago sometimes introduced himself as “the driver” instead of my partner. Through this thesis, I frequently reference him as he greatly assisted with my field research, both the social component and the primate component, as a photographer, interpreter, logistics coordinator, camera trap technician, driver, cultural consultant, and, of course, for moral support. While in the field, I always used my married last name, *Mendieta*, to try and blend in.

Keeping these research realities in mind, it is important to note that much of the data presented throughout this thesis is my interpretation of events, experiences, and encounters, and I do my best to share direct quotes and narratives from participants to better include their points of view to provide a broader perspective. I combine these stories with my own personal reflections with the knowledge that the researcher’s bias shapes the entire process, whether we like to admit it or not (Bourke, 2014). Always presenting myself as a student and never claiming to be an expert was crucial during the research process, and navigating my relationships with and responsibilities towards participants with sometimes conflicting interests was a significant challenge throughout this project. Most participants referred to me as *la gringita*, or *la Canadiense* highlighting my appearance and perceived status as a foreigner, while others called me *doctora,* overemphasizing and demonstrating respect for my academic achievements.

Critiques of the colonial origins of the discipline of primatology are critical of the tendency towards “parachute science,” or the idea of people from countries of affluence travelling to range of countries to collect data and returning home to publish – never to return to the field site again (Rodrigues et al., 2022). I was determined not to be considered among these transient scholars, and, since 2018, have demonstrated a commitment to building and sustaining

professional relationships with my study participants which will continue indefinitely as I continue my conservation work in this area in future years.

Riley and Bezanson (2018) recognize primate researchers' ethical obligation to the communities in which they do their work. They discuss the best practice code of ethics for primatological fieldwork established in 2014, which is directly applicable to all conservation programs regardless of the species or habitat under protection. All conservation practitioners should be held accountable for their actions and engage in ethical research practices such as obtaining consent, transparency, and being cognizant of how our presence and behaviour fits within the local cultural context. Riley and Bezanson (2018) highlight that research is a privilege, and as such, we need to be aware of the potential consequences of our work and act as role models in the field. As an applied anthropologist, navigating my positionality as a researcher and a conservation practitioner was sometimes challenging. With these principles constantly in mind, I was careful to present myself respectfully and professionally in all interactions consistently and conscious of practicing culturally appropriate forms of reciprocation. I also recognize that my status as a Canadian doctoral student allowed me certain privileges and access to opportunities that have greatly benefited my fieldwork, such as invitations to attend and speak at public lectures, meetings with government and academic officials, networking opportunities with local experts, and formal research agreements with local universities and NGOs (ULEAM, Greenearth Ecuador, Fundación Ceiba, TMA, Proyecto Washu, The Regenerative Field Institute, and GEPE).

A permit was also required to conduct research on primates within a nationally protected area in Ecuador. The Ministry of the Environment administered such a permit for the duration of the study under the number MAAE-ARSFC-2022-2149 (*see Appendix C*). For the social research component with human subjects, this project gained ethics approval from the Western University

Non-Medical Research Ethics Board (NMREB) Project ID: 111919. Additional ethics approval for the multi-sited interview component of this study was granted for the research team (Dr. Zoe Pearson, myself, and Mina Moscatelli, through the University of Wyoming IRB, Protocol #20210505MM03026 (*see Appendix A and B for letters of ethics approval*).

Thesis Structure

PART ONE: Theoretical, Methodological and Historical Foundations has provided the necessary background context to situate the upcoming chapters. The following Chapter Two will complete this background with a detailed description of the political-economic history of the province of Manabí to explain how people's relationships to land and natural resources are embedded within histories of national and international policies. This section will focus on the importance of regional and occupational identity and resilience to changing conditions – a theme that will be woven through the upcoming chapters. Next, PART TWO brings together two chapters that focus on the politics of conservation within a protected area context. Chapter Three dives deep into the creation story of the Pacoche Wildlife Refuge and the various sources of friction that exist between local residents (*comuneros*), institutional actors, and 'outsiders'. This chapter provides a detailed ethnographic account of land politics and how the establishment of the protected area and associated land use regulations have impacted local livelihoods, and how residents are responding to these changes. Understanding how local people perceive, and participate *or not,* in top-down conservation strategies is a vital step in working towards more inclusive and effective mechanisms that embrace "convivial approaches" to conservation action. This chapter is followed by Chapter Four – Playing Politics: Knowledge, Power and Role of the Media in Conservation Participation, where the story of the death of an adult male howler monkey 'Felipe' is used to demonstrate how institutions involved in conservation attempt to wield power and authority through exclusive access to information and control over the narrative. This chapter highlights how conservation gatekeepers use credibility linked to status as a requirement for conservation participation and the local counter responses to these power structures. PART THREE: Convivial Connections between People and Primates in Bamboo Landscapes, then

shifts the focus outside of purely a protected area context to analyze the complexities of a different conservation paradigm known as “green developmentalism” (McAfee, 1999). Chapter Five explores human-bamboo relations through an analysis of the multitude of meanings and values associated with bamboo from the perspectives of two key groups of actors: smallholder farmers and *bambuseros*. This chapter aims to illustrate different points of view when looking at bamboo as more than just a commodity, but also a series of social and political relationships that impact people’s identity and connection to land. These alternate perspectives are important when thinking about the proposed development of a bamboo economy in the coastal region of the country and the potential barriers to this growth. Then, Chapter Six – Primates and Bamboo uses an ethnoprimatological approach to look at resource-partitioning between two sympatric primate species, *Alouatta palliata* and *Cebus aequatorialis*, in terms of the ecological value of bamboo as a vital part of habitat for endangered species. Finally, Chapter Seven discusses the applied community participation component of this research, called the MonoMico project. This chapter highlights the important conservation contributions of local participants in community monitoring of primates and the value of using primates as flagship species to rally local interest. This section describes community outreach activities and workshops, concluding with a brief description of the bamboo canopy bridge project that addresses the issue of forest fragmentation in the protected area. This section shows how involving community members in the planning, design and implementation of conservation projects is wrought with challenges, but also rewards in terms of creating more equitable and convivial spaces for conservation participation and the ownership of such projects.

CHAPTER TWO

The Political Economic History of Manabí

Ecuador's mainland is divided into three regions – the highlands, the coast to the west, and the Amazon to the east – that are marked by distinct differences in climate, geography, and regional and cultural identities. Historically, travel between these areas was challenging at best due to the physical topography of the Andes Mountain range, and consequently, each region developed a distinct economic and social terrain based on the environmental and historical conditions (Clark, 1998). The concept of regionalism, specifically regional identity, is an important theme throughout this dissertation as it greatly influences Ecuadorians' relationships with the land and natural resources. Macdonald (2003) explains that people's responses and relationships to the land are embodied in historically situated experiences and moulded based on dominant political interests and international/national state institutions. As demonstrated in this chapter, Macdonald's points ring true with regard to the people of Manabí.

This chapter will provide the historical context needed to understand how conservation practice and the proposed development of the bamboo economy are interconnected with ongoing ecological processes and shifting paradigms of what it means to make land productive. Recognizing that processes of modernization vary considerably across regional, ethnic, and class-based identities, I focus specifically on how government policies and interventions have altered political-economic configurations and impacted *campesino* (smallholder farmer) populations in the coastal province of Manabí. I argue that due to these processes over the past century and a half, Manabita *campesinos* possess a unique regional identity that distinguishes them from inhabitants of other parts of the country. Throughout this dissertation I use the term

campesinos as an occupational identity to refer to both landowning populations who engage in subsistence and petty commodity agricultural production. However, I acknowledge that as a heterogenous group, *campesinos* must be understood as distinctive in terms of class, ethnic, and regional affiliations. The subsequent brief description of these regional differences during the early developmental phases of Ecuador's history is necessary to foreshadow why responses to changing political-economic configurations impacted regional populations in differing ways.

The History of Regionalism

The highland Andean region (where the national capital Quito is located) was the centre of the economy during the colonial period due to the region's relative population density compared to the adjacent coastal plain. While the highlands developed domestically with a strong conservative influence from the Spanish crown and Catholic church, the coastal region developed a more externally oriented economy based on the export of cacao (cocoa) and products such as tagua (ivory nut or vegetable ivory), earnings from which permitted access to consumption goods from abroad (North & Larrea, 1997; Clark, 1998). The coastal region with its humid tropical climate, low hills, and difficult geography, was primarily navigable along extensive river systems in the Guayas River basin connecting with the port city of Guayaquil (Clark, 2008). Thus, with few roads, much of the 19th century development of Ecuador's coast was concentrated along connections to this river network, with a wide dispersal of settlements (Zambrano, 2020; Hidrovo, 2006). The completion of the Guayaquil-Quito Railway in 1908 stimulated labour migrations from the more populated highland regions as well as facilitating the movement of goods between the highland and coastal regions (Clark, 1998). While the highlands

were structured around the hacienda labour system[5] for domestic markets which favoured protectionist economic policies, those inhabiting the sparsely populated coast wanted fewer trade barriers and more labour to fill the needs of rapidly expanding export production (Clark, 1998). These regional differences in the agricultural economy resulted in differing demands for labour, distinctive land tenure systems, and deep political divides between more secular coastal liberal and Catholic highland conservative elite classes. While this chapter focuses primarily on the development of land on the central coast, due to the strong political competition between regions it is necessary to situate these processes in relation to what was happening in the highlands, which greatly influenced coastal development and regional identity (Redclift, 1978; Clark, 1998). I argue that understanding these changes in global and local processes is a vital first step to the analysis of not only the current conservation panorama in the province, but also Ecuador's role in the burgeoning green economy.

Manabí - Cultural and Regional Identity

> Looking around over a vast valley of rice fields, tall green stalks blowing in the wind and separated by rows of towering coconut palms, I slip on a fallen palm leaf that crunches under my sandal and I fall hard. After helping me up, Sixto asked me if I've ever noticed how *montuvios* walk? "Sure footed, and connected to the earth", he says. "We never put all our weight on the leading foot, but balance, treading slowly, each step with cautious intention. That is why we never fall" (S. Triviño, personal communication, June 2023).

The province of Manabí is located in Ecuador's central coast, between two major ecozones —the Chocó-Darién and Tumbesian regions, together considered a biodiversity hotspot. According to

[5] Highland haciendas (large estates) were oriented to production for domestic markets and employed dependent Indigenous labourers who were primarily compensated with use of a subsistence plot (a "huasipungo") rather than wages. Land was used extensively, with peasant tenants settled on more marginal lands while the most fertile land was used for cash crop production. Peasants often accrued debts to the landowners due to loans and favours they sought to meet their needs, leading to heritable debt called "concertaje" or debt peonage. Concertaje was abolished in 1918 in part to loosen peasant ties to highland estates and facilitate labour migrations to the coast (Clark, 2008).

Harris et al. (2004) many rural human settlements in the region today continue to be located in the same river valleys and coastal shorelines as in former times. In fact, the populations who inhabit these communities today, while intertwined in modern political-economic systems[6], continue to follow similar subsistence strategies utilizing a wide variety of econiches such as a reliance on marine resources, inland agroforestry practices and livestock raising (Harris et al., 2004; Hormanza et al., 2020). Along the coastline, many of these populations referred to today as *cholos* (Sánchez et al., 2019; Vidal et al., 2018) are descendants of the Manteno-Huancavilca culture of merchants who inhabited coastal Ecuador between 1000 and 1535 AD (Hidrovo, 2006). These early inhabitants were specialists in harvesting and manufacturing artisanal products from different shell species (particularly *Spondylus*) throughout the precolonial period where there is a long record of human occupation (Harris et al., 2004). These ancestral populations near the modern-day port city of Manta were also masters of sea navigation and skilled craftspeople. They widely monopolized the use of in-demand raw materials such as *Spondylus* shell, balsa wood and caña *Guadua* (bamboo) to build rafts used to trade along sea exchange routes (Hormanza et al., 2020). Hidrovo's (2006) research on the development of the port of Manta explains how existing settlements at the time of Spanish arrival functioned as redistribution centers for agricultural products and exotic items, while inland settlements near the modern-day provincial capital of Portoviejo functioned as religious centers. Hidrovo argues that precolonial sites in the region indicate well developed self-sufficient subsistence economies with different spatial structures than are found in other parts of the country. These settlements were widely distributed and inhabited by people who collected, processed, and/or manufactured

[6] According to Wolf (1982) "Peasant communities in this sense were very much part of the larger social political and economic systems that changed as the systems changed and were in no means static or tribal from their pre-Hispanic past. These systems developed as a result of a tug of war between conquerors and the conquered" (p.148).

specialized items. Hidrovo (2006) explains that until the 19th century there was little presence of the colonial state in the province of Manabí and existing populations remained largely Indigenous and widely dispersed. Vidal et al. (2018) adds that the resistance of the Indigenous population since the beginning of the Spanish colonization allowed them to obtain reductions in taxes and to maintain their ancestral lands through royal decrees. Zambrano (2020) explains that the Spaniards were much less organized, and in smaller numbers, on the coast than in the Andes. Therefore, it was not until the mid-19th century establishment of estates that conflicts with local populations increased due to the growth of migration from the highlands.

Due to the external demand for exotic products, the economy of Manabí and its ports began to flourish in competition with the port of Guayaquil. Hidrovo (2006) explains that this competition, and the resulting restrictions on import and export products, led the region to develop a reputation for contraband activity to avoid customs declarations and taxes. The funds acquired through fluctuations of smuggling activity supported the development of the region throughout various export-boom phases, particularly during the 19th century. Much of Manabí's regional character and autonomy is tied to the export and manufacturing of exotic products (*toquilla*, *tagua* and *cacao* in particular), which differed from economic activities happening elsewhere on the coast. The agro-economy of Manabí is based in a long history of natural resource collection and craftsmanship of a variety of specialized products that gave the region a distinct organization through the dispersal of small towns; each serving a particular export function (Hidrovo, 2006).

Today, Manabí is considered a region with its own unique identity where the local population is generally referred to as *Manabitas*, or by the political identity of *Manabitaism*, due to the self-sufficiency of the province. Hormanza et al. (2020) state that "Manabitas have always

been merchants, sailors and travelers, which has given rise to intrinsic qualities of hospitality, solidarity, generosity, and love of the land" (Hormanza et al., 2020: 396). Manabitas are distinguished by a deep sense of regional pride as revolutionary fighters in guerrilla rebellions during the Liberal Revolution[7] in solidarity with the local hero General Eloy Alfaro Delgado. Nicknamed *El Viejo Luchador* (the old fighter), Eloy Alfaro was born in Montecristi, Manabí in 1842, and is reputed for his "unshakable will" due all he achieved as a freedom fighter (Clark, 1998). As a figure of popular memory, he embodies the qualities of courage, perseverance, and humility that are thought to be characteristic of the coastal *montuvio* (generally mixed race between Afro and/or Indigenous and European) population (Vidal et al., 2018).

While I recognize that culture is a dynamic and political process that is constantly being negotiated and contested, across the literature Manabitas are said to have a strong connection to their cultural and regional roots (Vidal et al., 2018). Sánchez et al. (2019) reveal the existence of a cultural duality that characterizes Manabí's population in relation to the province's geography. *Cholo* populations are defined as a reclaimed ethnic social group connected to their Indigenous cultural ancestry who inhabit rural communities along the coastline, while coastal interior populations typically inhabiting mountainous areas are referred to as *montuvios*. Legally recognized as a social group by the Ecuadorian government in 2001, *montuvio* is referred to by

[7] Redclift (1978) states that in 1895 Eloy Alfaro's Liberal Revolution highlights the period when both coastal and highland landowners aligned in their opposition to re-distributive land tenure (i.e.: compatible class interests and the coast asserted themselves in national political levels). Between 1895-1910 liberal policies to separate the church and state became a reality through the Liberal Revolution. Clark and Becker (2007:10) explain that in "1895 the Liberal Revolution was also the legislative turn to address the 'Indian problem', where Eloy Alfaro promoted himself as the protector of the Indian race through the establishment of a minimum wage, right to pay off debts, no more labour for 'free', as well as the *Ley de Jornaleros* (day labour law) for an 8-hour work day and abolished debt prison, and heritable debt all in an effort to modernized Ecuador's economy". Clark and Becker (2007:13) also add that another part of the Liberal Revolution in 1904 included the *"Ley de Cultos* (religion) which resulted in the confiscation of church lands, followed by the *Ley de Beneficencia* (charity) to control previous church landholdings and rent them out to use the profits to fund social programs in urban areas".

some as a labour or class identity. This reflects a history of agricultural and ranching practices that have since been transformed into an ethnic identity which distinguishes members from Indigenous populations despite similar occupations, but also separates them from the *mestizo* (mixed race) majority (Roitman, 2008; Sanchez et al., 2019). In her book *Indigeneity, and Identity in Manabí* (2016), Regalado explains how modern day *montuvios* or "men of the mountain", were once Indigenous populations who fled the crown during colonization, into areas that were inaccessible to the Spaniards. The difficulty of chasing them meant that it was impossible to collect tribute payments from them because they never stayed in the same place. She explains that this is the autonomous origin of the *montuvio* (Regalado, 2016:167).

As suggested in the fieldnote quoted at the start of this section, to identify as *montuvio* reflects a key piece of cultural heritage and pride in being sure-footed amidst the turbulence, not only politically but environmentally, given the risk of earthquakes, droughts, and floods that plague this region. Through this connection to the land these populations also became independent contributors to in the informal economy, through the collection of natural resources such as *toquilla* straw, *tagua* (vegetable ivory), rubber, and caña *Guadua* and the ensuing illegal exportation of these products through informal channels (Regalado, 2016:175). Although 62.9% of the population of Manabí officially identify as *mestizo* (INEC, 2022) – Indigenous-European mixed race – cultural heritage rejuvenation projects have recently declared Manabí a Cholo-Montuvio province (Sánchez et al., 2019). The term *montuvio* has grown in popularity among young people in recent years who embrace it as an ethnic identity. According to the most recent national census in 2022, 7% of the country identifies as *montuvio*, divided predominantly between three central coastal provinces, Manabí (41%), Guayas (28.3%), and Los Rios (24.3%) (INEC, 2022). Throughout this dissertation, I use the term *montuvio* interchangeably with

montañero, a self-identified occupational term used specifically by *campesinos* in the Pacoche Wildlife Refuge who own or work agroforestry plots (on what they refer to as "the mountain") for primarily subsistence production and the harvesting of forest products.

The province fluctuates seasonally between periods of droughts and floods, and the impact of these natural disasters was further compounded in April 2016 by a devastating earthquake that hit the northern city of Pedernales (Mendoza et al., 2019). Rural Manabitas have responded to these challenges through a diversification of livelihood strategies in order to satisfy basic needs and circumvent vulnerabilities due to climate change and natural disasters (Luna et al., 2020). Some of these strategies include non-farm work, an increased reliance on artisanal fishing, and the rotational planting of cash crop varieties. The spirit of Manabitas as *luchadores* (fighters) aligned with the local hero Eloy Alfaro is evident in the resilience of the rural population in their adaptation to the challenging and changing political-economic configurations that will be discussed throughout the remainder of this chapter and in later chapters.

Global Market Demand and Labour Systems in Coastal Manabí

Processes of modernization, current landscapes, and class-identity politics evident along the Ecuadorian coast today have largely been shaped by the global demand for exotic export products. As explained in the previous section, Manabitas have a long history as traders and merchants supplying raw materials along key trade routes in the Pacific Coast. However, the contribution of agro-exports to Manabí's regional economic growth, particularly during the 1800s and 1900s became structured around two key agricultural models that gave the region its reputation for producing sustainable livelihoods for its inhabitants: 1) extractive harvesting and 2) monocultures with intercrop plantations. The global demand for three export products in particular is discussed across the literature as playing a key role in Manabí's development and

regional identity: *tagua* (vegetable ivory) (1870-1960), *toquilla* straw hats (mid-18th to early-20th centuries), and cacao (1750-1820) and (1870-1925). Each had its own impact on changing configurations of labour and migration for the province (Fitz-Henry, 2015; Hidrovo, 2006; Hormanza et al., 2020; Toro, 2016; Zambrano, 2020).

Early models of organization in Manabí created a differentiated type of *campesino* production that involved payment for the collection of natural resources. This form of 'extractive agriculture' was directly connected with the export sector, and historically marked the way of life for *montuvios* in Manabí (referred to as *recolectores* or harvesters by Zambrano, 2020). Making land more productive during the extractive stage involved the purchase of large properties in valleys and mountainous areas regulated by the state. Thus, while some *montuvios* collected forest products from unclaimed lands, processes where *recolectores* were given access to credit to collect natural products from *terrantenientes* (large landowners) gradually became the norm (Zambrano, 2020). The collection economy remained the common practice in the province until the mid-20th century and was a staple element of regional pride that came from having a certain degree of autonomy from landlords, that continues today (Redclift, 1978).

The growth of demand for export products in the late 1800 to early 1900s encouraged the onset of the plantation period enabled by the private appropriation of land for the purpose of managed cultivation. This shift from communal access and responsibility for land's productivity to private landownership gradually replaced autonomy with dependence (Redclift, 1978). The plantation model also developed differently in Manabí than in other parts of the coast due to what Zambrano (2020) described as "the cultural presence of an economy based on polyculture" or monoculture with intercropping (Zambrano, 2020:353). This meant that cash crops such as cacao and coffee were intercropped with other short-cycle food crops such as yuca, banana,

plantain, corn, and rice that were consumed and sold. These agricultural practices were often accompanied by raising livestock and other extraction activities on the plantation estate. Zambrano (2020) argues that *montuvio* Manabitas were privileged from the beginning of the commercialization process because they produced in a different way than those producing solely for domestic consumption. Even in the 19th and early 20th centuries monoculture plantations in the area were limited because of the strong regional practice of intercropping various products on the same plot (Redclift, 1978).

Zambrano (2020) adds that in Manabí, it was smallholder properties that accommodated the cultivation of coffee for export, beginning in the 1950s, as well as extensive livestock farming, which became important for the economy in the 1970s to 1980s. Today, Manabí is responsible for 45-50% of Ecuador's coffee production, as well as 40-50% of cotton production, 25% of corn production, 12-17% of cacao production, and 10-12% of banana production. Over the past decade the government has invested heavily in encouraging smallholders to produce coffee and cacao (particularly the fair-trade variety), and like the polyculture (intercropping) model discussed earlier, today's cash crops are often still planted using agroforestry techniques, intercropped alongside other short-cycle food products to maximize sustainability (Luna et al., 2020). *Campesinos* in Manabí today can be viewed as a resilient population who have adapted widely to the changing configurations of market fluctuations and ways of making land productive over the past century and a half. These populations therefore should not be essentialized as practicing traditional or static agricultural forms, but rather utilizing a variety of livelihood strategies – ranging from extractive and polyculture (intercropping) techniques to alternative subsistence activities – in order to withstand changing conditions. As coastal *campesinos* become increasingly incorporated into new agribusiness models, they continue to

find innovative strategies to pressing challenges based on their regional identity as *luchadores* (fighters).

Land Reform and Economic Development Policies

This next section addresses how global trends and approaches regarding land reform and economic development policies restructured land ownership across Ecuador, with a particular focus on the province of Manabí and *campesino* responses to these changing configurations. After a brief description of land distribution in Manabí prior to the land grab in the 1900s, this section will describe the impact of agrarian reform, colonization projects and development interventions on agrarian structure, and how rural populations used collective land tenure agreements as strategies to maintain ownership. The continual process of land reform across Latin America and Ecuador is highly complex and context-specific, thus this section does not claim to give an exhaustive account, but rather to highlight key moments and outcomes that reflect the resilience of rural populations.

Prior to 1763 land ownership in the province Manabí was not regulated. *Campesinos* could cultivate what they wanted where they wanted, so long as they were the first occupant. Land at this time was considered plentiful (Zambrano, 2020). In rural communities the environment was organized differently than in the cities, based around ancestral forms of production, community possession of land, and lifeways built around agroforestry and fishing (Hidrovo, 2006). Zambrano (2020) explains that in 1780 the process of legalization of land tenure started in Manabí, as land began to be valued differently due to the interests of those involved in the export of *toquilla* and the first cacao boom. It was during this first boom that violent invasions of communal territories began in Jipijapa with the intent to appropriate the land for private use. Until 1830 the majority of land in the province remained communal and did not

acquire any value until it was cultivated; much of the agricultural frontier in Manabí was expanded through harvesting crops on lands that did not have a specific property owner. Hidrovo (2006) highlights that in the late-19th century very few landowners in Manabí owned official land titles (merely 60), and most of the inhabitants living in small ancestral settlements used the land under community models. Due to the boom in rubber, *tagua*, and cacao, the end of the 19th century and early 20th century is referred to as the "land grab" period where increased levels of immigration to the region resulted in the expansion of private interests, the monopolization of land, and the concentration of wealth and power. Hidrovo (2006) describes how this period saw the origin of the coastal *hacienda* system through the emergence of the landowner class. The legalization of private property substantially modified the relations of production through purchase. Land was accessed through the violent dispossession of locals and then vacant lots were awarded to new immigrants. However, even as recently as the 1930s, while some land had legal titles and had been legally bought, sold, and exploited for years, verbal contracts were still more common in the province than legal titles (Zambrano, 2020). This suggests that, unlike in the overpopulated highland region, land in Manabí was still considered plentiful.

Agrarian Reform (1964 and 1973)

In *Agrarian Reform and Peasant Organization on the Ecuadorian Coast*, Redclift (1978) argues that these reforms did not come about due to pressure from below but were due to pressure from international bodies to modernize agricultural production. In particular, North American interests from the Inter-American Development Bank (IADB) impacted changes in agrarian structure as part of a set of policies implemented across South America through the "Alliance of Progress" Project under President Kennedy's administration. In addition to agricultural productivity, the purpose of these reforms was to avoid the types of social uprisings

that resulted from the socialist Cuban Revolution (Redclift, 1978; Juarez, 2020). Ecuador's first agrarian reform and colonization law was established in 1964 and was responsible for the founding of IERAC (The Ecuadorian Land Reform and Colonization Agency), which gave the state power, influence, and access to rural areas especially in the highlands to become the "law of the land". Modernizing agricultural production through these reforms included bringing an end to the huasipungo system[8] that dominated the highland region. This meant that former huasipungeros under some circumstances could purchase the small agricultural plots they had been working within the haciendas. Landowners were left with smaller properties constituting the more fertile land, and in some cases used the purchase fees to invest in improvements to their production techniques (Clark, 1998; Juarez, 2020). *Hacienda* landlords were supposed to receive financial compensation for redistributing their land from funds accrued through the coastal export economy, however this caused conflicts between coastal and highland landowners and the policy was weakly enforced. Redclift (1978) notes that while this change did greatly increase the number of smallholdings at the time, many large landowners found ways to evade the laws, and "the rate that *hausipungos* were handed over to tenants during reform was so slow it was expected to take over 170 years to complete" (Redclift, 1978:24). These reforms came in tandem with modernization policies resulting in large infrastructure projects intended to make rural areas more accessible throughout the 1960s and 1970s. It is for these reasons that North and Larrea (1997) argue that agrarian reform was more about development and introducing rural populations into the capitalist system than it was about the redistribution of land.

[8] The *hausipungo* system replaced the *hacienda* labour system in 1918. *Huasipungeros* or service tenants worked on estates in exchange for huts and a small plot of subsistence land (Clark, 2008) – see previous footnote on page 52.

Clark (1998) explains that there were three proposed models regarding agricultural renewal at the time – smallholder, medium-landowner, and large landowner – that circulated in national discourse and influenced policy decisions. The first model was based in part on critiques of the antiquated *hacienda* system and the need to make large estate properties more productive through the redistribution of land. The second and third models were rooted in racialized ideas of Indigenous peoples and their 'traditional forms' of agriculture as obstacles to development and modernization. Clark (1998) outlines that while racialized ideologies were not always explicit, they were perpetuated through discourses regarding 'traditional' versus 'modern' agriculture. Thus, while reforms in the 1960s and 1970s did extend access to more land for smallholders, and produced more smallholders in return, they also slowly began to introduce *campesinos* into capitalist labour and land markets (Clark, 2017).

The second agrarian reform law in 1973 further encouraged large landowners to use more technological advancements and new methods to make unused or underused land more productive (Redclift, 1978). Redclift (1978) notes that during the second reform, IERAC was put under the control of the Ministry of Agriculture and the agrarian elites who ran it, which debilitated the organization because elites were opposed to agrarian reform in the first place. IERAC thus became constrained and confined to primarily colonization projects as an alternative to land distribution in areas with high populations. These reforms were made possible at this time due to *la siembra del petroleo* (the sowing of oil), meaning that oil revenue was invested in agricultural modernization/technology on *latifundias* (large landholdings) with the intention of establishing a much more robust agribusiness sector under state control. Bates (2008) explains that land distribution which began in the 1950s to 1960s and accelerated in the 1970s involved government programs sponsored by the IADB and the Peace Corps to colonize rainforest

sections of the country on the Pacific coast and the Amazon to alleviate pressure on the heavily populated Andes region. The state provided free-land incentives for colonizers to make the land productive through small farms, cattle ranches, and plantations. Bates (2008) highlights that individuals were given land titles in exchange for clearing over 50% of their property to convert the land into productive use such as cash crops. Colonization was seen as a form of investment for the urban middle class. This process replaced coastal *latifundias* with family farming (through the colonization/ migration of middle-class people into coastal frontier zones) and resulted in the distribution of more small and medium sized plantations (Redclift, 1978). Colonization pressures encouraged local *campesino* populations to convert their land into cattle pasture in order to secure official land titles (Erazo, 2013). However, most families did not have the labour required to clear that much land and only converted 15-25 acres for pastureland and some cash crops (Bates, 2008).

Campesinos developed two different notable strategies to obtain legal titles at the time. The first strategy involved accessing micro-credit to produce short-cycle crops in order to compete with larger landowners and make land productive. However, it remained difficult for small and medium landowners to obtain the level of technology/modernization of production used by larger landowners with more robust finances. Access to credit reinforces dependency, and many who contracted credit were unable to repay their debt, forcing them to sell their land for low prices and migrate to urban areas in search of employment (Gerber & Veuthey, 2010). Gerber and Veuthey (2010: 466) refer to this process of pushing smallholders off their lands as "depeasantization" which in turn resulted in a "rural exodus" creating what Roberts (1975) describes as "cities of peasants" due to the expansion of capitalist agriculture.

In *Governing Indigenous Territories*, Erazo describes a second strategy for obtaining legal land titles, this one involving the forming of communal land agreements as "collectives" or "cooperatives". This strategy reflects the earlier process of "communalization" through the *Ley de Comunas* in 1937, which involved the creation of legally recognized communities in response to struggles over the *hacienda* system (Clark, 2017). Clark (2017) explains that *comunas* at the time "were critiqued as extensions of state administration reaching rural areas" (Clark, 2017:353), however the decision to obtain collective land rights in response to increased pressures from state colonization was later viewed in many cases as an advantageous move given the changing conditions. As mentioned earlier in this chapter, in the province of Manabí, cultural traditions of land tenure were historically communal. For instance, Bauer (2012) discusses a trend towards coastal communities in Manabí requesting state recognition of Indigenous heritage to acquire legal land status based on the ancestral prehistory of the area. Bauer (2012) explains that acquiring legal Indigenous status also brings other benefits to the *comuna*, such as funding for development projects. Thus, in line with the ideology of *el mestizaje*, claims of Indigenous heritage in Manabí are often more a political group strategy than an outcome of personal desires to identify as Indigenous. The politics of *comuna* organization within the context of the Pacoche Wildlife Refuge will be elaborated upon in the upcoming chapter.

Economic Development Policies

Like agrarian reform, changing policies and interventions throughout recent economic development phases over the past several decades have increasingly impacted agrarian structure and *campesino* relationships with land and natural resources. The economic development period referred to as the "borrowing binge" between the 1950s to the 1970s with its focus on import substitution industrialization (ISI) policies brought overall improvements in living standards and

infrastructure investments (North & Larrea, 1997). However, justified by national efforts to "modernize" the economy, much of Ecuador's social spending was aimed at integrating rural Indigenous populations into the national economy through these reforms, which in turn resulted in the gradual disappearance of traditional agricultural systems across much of the country (Clark, 1997).

With the fall of oil prices in the 1980s and 1990s, the state began to withdraw support and resources from rural areas through structural adjustment policies (SAPs) demanded by the World Bank and the IMF. Neoliberal policies led to a decrease in social security and increase in unemployment leaving much of the population and leaders of rural cooperatives without sufficient resources or financial support (Clark, 1997). Erazo (2013) explains that community leaders needed to find new ways to secure funding from external alliances that came with certain expectations from outsiders and the imposition of external values that were gradually negotiated over time. Erazo (2013) calls this social process "autonomy without resources", meaning that the responsibilities to provide local infrastructure and social services shifted from state to local governments, and then to foreign capital interests. Thus, while collective organizations and institutions were weakened financially, they also became much more organized and connected. North and Larrea (1997) explain that the era of SAPs is commonly referred to as the "lost decade" because national economies came under the control of foreign capital, however Indigenous people instead view it as a decade "won", due to achieving political recognition and the ability to organize in response to the harmful impacts of SAPs. Clark (1997) recognizes that neoliberal policies provided marginalized groups with new spaces to voice their concerns.

Clark (2017) adds that the most recent economic development period in the early 2000s, during the Correa government, is known as "roll back neoliberalism". Changing configurations

under this new paradigm led to what Clark refers to as “an end to agrarian reform” (Clark, 2017:352) as the state began to invest in smallholders by promoting agribusiness commodity chains that have since been criticized as making *campesinos* subordinate to agribusiness in what amounts to “an indirect form of land grabbing” (Clark, 2017:357). However, Clark suggests that at this time, access to land became less important than access to public services, social welfare, and infrastructure which the government delivered significantly through funds acquired from an increase in national resource extraction (oil and mining). Also, as mentioned in the previous section on agro-exports, the Correa government invested $60 million to increase productivity of smallholders, primarily in cacao and coffee for national consumption and fair-trade export. During the Correa period, alongside a massive influx in agribusiness (shrimp, flowers, and biofuels in particular), there was growth in both the agroecology and fair-trade industries (Clark, 2017). These investments have benefited smallholders in the province of Manabí who were already accustomed to intercropping with these cash crop varieties. Sepulveda et al. (2017) explains that many small-scale farmers in Manabí are becoming coffee and or cacao certified organic (85%) due to the agroforestry “shade-grown” techniques they practice; 43% of all existing certifications nationwide are found in the province of Manabí. Many *campesinos* continue to practice subsistence crop rotation with corn, yuca and plantain which allows for more resilience to harsh climatic conditions and provides revenue and subsistence year-round (Luna et al., 2020).

Despite the drastic changes in economic policies rural Ecuador has undergone over the past 30 years which have widened and intensified inequalities, Manabí *campesinos* continue to adapt to changing configurations of land and resource access through various strategies ranging from income and crop diversification, and negotiations with foreign interests, to communal land

agreements. While processes of modernization have historically defined making land productive largely in contrast to traditional agriculture, recent literature shows the promise of investing in agroforestry practices that are gradually redefining what "productive land" means in the 21st century. For example, international aid organizations such as AECID (Spanish Agency for International Development Cooperation) and COPADE (Comercio para el Desarrollo), partnered with INBAR (International Bamboo and Rattan Organization), have recently become the principal investors in funding the development of a sustainable bamboo industry in coastal Ecuador. The next section discusses these alternative definitions of making land productive further, through a look at global conservation trends and how they have led to yet another reconfiguration of land politics in Ecuador over the past few decades.

Global Conservation Trends: Impacts on National Policy and Interventions

The global shift towards conservation and climate change in public discourse occurred throughout the 1980s and officially became part of international policy in 1992 with the United Nations Conference on Environment and Development (UNCED), known as the Earth Summit. This shift came alongside the growth of neoliberalism, as conservation became associated with sustainable development objectives. In 2016, as part of these conservation movements, the Ecuadorian government signed the Paris Accord and committed to zero deforestation by 2025, focusing on high priority areas like the coastal region. This ambitious goal is part of a series of conservation policy changes and strategies the country has implemented in response to global trends towards greener governance over the past few decades. As discussed in the previous section, the withdrawal of the state in the 1980s due to neoliberal policies resulted in an influx of international non-governmental organizations (NGOs) to fulfill the social provisioning needs of the population. Many of these organizations from the Global North brought a different set of

expectations around environmental impacts which altered local people's understandings and relationships to one another and the land. Erazo (2013) argues that this period of global influence has been even more profound than the previous periods dominated by government interests. She outlines that much of the conservation funding in the 1990s was attracted to ideas of biodiversity and cultural conservation in "hotspots" such as the Amazon. This funding supported projects that discouraged the practice of cattle ranching and cash cropping that had been encouraged in previous decades. These practices were substituted with a push towards ecotourism and artisanal fair-trade products. In some cases, protecting the environment through giving up more lucrative options in exchange for environmentally friendly initiatives forced populations into "poverty traps" (Karsenty, 2007, in Scales, 2015). These shifts in priorities from external agents also created shifts in power and ideologies about land use. Erazo (2013:3) argues that in these ways "Indigenous peoples/peasant movements have been shaped not only by histories of colonialism and exclusion, but more recently by processes of negotiation between state obligations, family obligations, connections to land, and additional obligations to NGOs and TNCs".

In Ecuador, shifts in national policy towards conservation agendas are in line with changes in the Ecuadorian constitution that took place in 2008 which adopted the Indigenous Kichwa principle of *Sumak Kawsay* or "Good Living". Through these changes, Ecuador became the first country in the world to grant the rights of nature (Article 71-74), as *Sumak Kawsay* entitles all Ecuadorians to their cultural practices and identity based on self-sufficient livelihoods through a balance between ecology and economy (Hazlewood, 2012). This momentous change in public policy brought a great deal of international attention. How *Sumak Kawsay* is interpreted by rural populations is a different story. Fitz-Henry (2015) analyzes how these large-scale shifts in political ideologies of *Sumak Kawsay* are deployed in public discourse regarding development

projects such as the construction of the Pacific Oil Refinery (RDP) in Manabí. She finds that *Sumak Kawsay* had little influence on local communities' motivations for or against the RDP project. She quotes a local from the farming community of El Aromo bordering the Pacoche Wildlife Refuge, saying that "the rights of nature are a luxury of the developed world" (Fitz-Henry, 2015: 277). The people of Manabí have historically experienced themselves as culturally distinct from the Indigenous populations in the Andes, and thus Fitz-Henry found that *Sumak Kawsay* is a less persuasive narrative for rural Manabitas than stories of the earlier mentioned local hero and liberal revolutionary Eloy Alfaro. Lalander's (2014) work in the Ecuadorian Amazon during the Yasuni ITT[9] makes a similar argument, stating that idealized harmonious relationships with nature as represented in the constitution are not relatable for most of the population because "they do not reflect the hardships of peasant life and those who do not identify as Indigenous" (Lalander, 2014: 9). These examples highlight the importance of regional, ethnic, and class-based identity in land use politics and how global conservation trends are not always well-received or beneficial to rural populations.

In alignment with the more recent global conservation goals set by the Global Biodiversity Framework (GBF) to protect 30% of the earth's surface by 2030 (30 x 30), Ecuador has been gradually expanding its protected area system in recent years. Today, 20% of Ecuador's territory is nationally protected, with the majority of PAs (protected areas) found in the coastal region. Critiques of the 30 x 30 targets are concerned with issues of quality over quantity. Research has shown that the establishment of PAs often serves more than simply a conservation

[9] The Yasuni initiative refers to the creation of a trust by the Correa government designed to prevent the drilling of oil in the Yasuni National Park if the international community provided significant donations to offset the loss of revenue for leaving the oil in the ground. "The project was discontinued in 2013 after only 0.37% of the donations needed were acquired. Following a public referendum, the government claimed they would only drill in 1% of the park and that all operations would be conducted by national oil companies" (Lalander, 2014:12).

purpose for local governments. As discussed in the previous section, social scientists have widely argued that protected areas also function as a form of state-making integration project by expanding jurisdictional control over rural people and places, particularly in the Global South (Igoe & Brockington, 2007; Vaccaro et al., 2013). Under the PA conservation model, making land productive involves opening areas to tourism development and state protection through the enforcement of institutional regulations to ensure that natural resources are maintained, despite the impacts these regulations may have on rural livelihoods. Thus, the overall effectiveness of this conservation strategy on the protection of biodiversity is in question, especially in Latin America where population density is high within park boundaries (Van Der Hoek, 2017). A more detailed description and critique of Ecuador's National System of Protected areas (SNAP) will be presented in Chapter Three.

The global push towards green development policies that support economically driven programs places new values on nature and alters people's relationships with natural resources. Often these programs fit under what is coined the "Nature-Based Solutions" paradigm or "green developmentalism" which seeks to save nature by putting a price tag on it, proposing market solutions to environmental problems. Such global policies include payment for ecosystem services (PES) models that have become increasingly popular in recent years. This form of conservation intervention is also represented through the privatization of protected areas in Ecuador. The Socio Bosque Program (SB) is a national payment for ecosystem services incentive designed in response to international agreements to reduce deforestation rates. It provides direct monetary transfers to individuals or communities per hectare of native forest protected. According to de Koning et al. (2011), there are an estimated 10 million hectares of natural forest nationally, and since the inception of this program, over six million hectares are now privately

owned. The pilot introduced in 2005 established a ranking system based on deforestation threats, ecosystem service value and poverty levels. Based on these criteria, it found that Esmeraldas and Manabí provinces on the coast of Ecuador were considered the highest priority areas (de Koning et al., 2011). This initiative is regulated by the Ministry of the Environment and involves a social investment component to help with poverty alleviation. To participate, recipients must commit to protecting the forest for a minimum of 20 years and agree to the monitoring of compliance regarding the prohibition of land conversion and burning or logging. Compliance monitoring is undertaken by the Ministry of the Environment through the use of satellite images, aerial photography and site visits (de Koning et al., 2011). Through her research in the Ecuadorian Amazon, Erazo (2013) explains that many community members in Rukullakta did not participate in the vote for *Socio Bosque* because of the strict financial consequences associated with not abiding by this 20-year contract. This obligation greatly increased citizens' responsibility to protect the forest by leaving land unused, which contrasted with local perceptions that unused property is open for claim. The agreement requires that citizens have faith not only in their community leaders and their governments but also in one another to respect the contract. Another requirement, and perhaps the most controversial, is that recipients must possess legal land tenure to participate. Efforts slowed considerably after two years since many of the rural poor do not have adequate access to land tenure, and the entire program has since been discontinued due to lack of funds (Luna et al., 2020). De Koning et al. (2011) argue that Socio Bosque was advertised as a "pro-poor" conservation program which inaccurately addresses the complex reality of the lives of those who live in conditions of poverty, as it assumes that the poor are a homogenous group who own land titles.

Under new conservation paradigms that focus on nature-based solutions , the definition of making land productive has also shifted in an attempt to strike a balance between conservation and economic development. Büscher et al. (2012) argue that these new forms of natural capital also create new forms of power. For instance, shifts in priorities from external (international) agencies also create shifts in power, property regimes and ideologies that nature must be profitable and utilized in order to be conserved. These concepts are vital to take into consideration when thinking about the development of sustainable bamboo economy in coastal Ecuador.

Conclusion

Despite the fragmentation of the landscape, Manabí is a province filled with natural treasures ranging from pristine beaches, abundant forest resources and rich biodiversity. While populations struggle with extreme fluctuations in weather and natural disasters, they continue to display resilience in the face of changing global and national configurations. This chapter has focused on the complex, ever-changing relationships *campesino* populations in the province of Manabí have with land and natural resources, as well as with the forces that govern their access to them. The province's unique history of international trade and human occupation coupled with its continued role in agro-exports has provided an excellent platform to demonstrate the impacts of global trends and regional identity on land politics. This section has also shown how the province is situated in relation to other regions regarding national policies and interventions, offering a glimpse of economic cycles, land reforms, development phases and conservation trends that have shaped the character of the nation. These social processes of modernization have restructured agrarian society over the past century, largely based on changing definitions of what it means to make land productive. In so doing, they have had lasting impacts on *campesino* populations,

their livelihood decisions, adaptations, and opportunities. This history is vital to understanding the upcoming chapters because it has shaped how current concerns regarding primate conservation and development are situated within these complex webs of global and national contexts.

As many corporations are searching for ways to brand themselves as socially and environmentally responsible, knowledge of the history of these political-economic processes is the first step to making informed decisions about new possibilities such as bamboo development. With Manabí's history of agro-export expertise and the highest concentration of natural bamboo forests in Ecuador, the province is well-situated to be a key producer in the supply chain to Global North markets. As many *montuvio* smallholders have bamboo growing wild on their properties, some feel that bamboo, like *tagua* and *toquilla,* presents an opportunity for rural farmers to revitalize the collection economy that has historically provided them with autonomy and sustainability. The fragile environmental and social balance of the province could either be greatly improved or devastated by the impacts of this industry in the future. Chapter Five will dig deeper into the current realities of the bamboo economy in Manabí by addressing how this forest resource is entangled in complex socio-political relationships and different types of meaning that vary across actors along the supply chain. The hope is that we might learn from history and glean inspiration from the Manabita spirit as *luchadores* (fighters) with its deep connections to land and natural resources, to continue to foster resilience to whatever is on the horizon.

PART II:

The Politics of Conservation and Participation in a Protected Area Context

CHAPTER THREE

The Creation of the Pacoche Wildlife Refuge: Local Perceptions and Transitions in Labour and Land Ownership

… "Tierra bella cual ninguna, cual ninguna hospitalaria Para el alma solitaria, para el yermo corazón Vivir lejos ya no puedo de tus mágicas riveras Manabí de mis quimeras Manabí De mi ilusión"	…"Beautiful land like no other hospitable like no other For the lonely soul, for the barren heart I can no longer live far away from your magical rivers Manabí of my chimeras Manabí of my illusion"

El Pasillo Manabí – Elias Cedeño Jerves and Francisco Paredes Herrera

Historian and proud Manabita herself, Libertad Regalado writes about "the spirit of Manabitas as free, entrepreneurial, hospitable, and rebellious" (Regalado, 2016:7) with a deep sense of regional pride. This essence of *El Viejo Luchador* (the old fighter) (see previous chapter) speaks to the resilience of Manabitas in the face of changing sociopolitical and environmental conditions across a province with high fluctuations of droughts and floods. Rural Manabitas (or *montuvios*) have a strong connection to the land and natural resources, as demonstrated in the provincial anthem *El Pasillio Manabí* that people in the province sing on special occasions.

The purpose of this chapter is to demonstrate this resiliency through the ways in which local populations living in and around the Pacoche Wildlife Refuge are responding to and, in some cases, rebelling against transitions related to land and labour as a result of the PA. This section will also illustrate the potential for flagship species (i.e., howler monkeys) to help rally community involvement in conservation and create spaces for dialogue between different actors.

West (2006) critiques the way that "conservation has been positioned as an engine for rural development", noting that in practice there are striking "contradictions between different interests in terms of how various actors imagine and interpret conservation and development" (West, 2006:218). Different interpretations of what conservation is and how it can be achieved directly impact rural livelihoods, conceptualizations of identity, and relationships with the land and natural resources.

As discussed in the Introduction, the protected area (or fortress) conservation model is rooted in a history of exclusion and private interests (Brockington & Duffy, 2010). It is often criticized by social scientists for perpetuating colonial determinism in terms of how inhabitant knowledge (Ingold, 2000) and contributions to conservation practices are often disvalued in favour of those of outside experts (Macdonald, 2003). This model has undergone significant revisions over the years, where we see a shift toward park management plans that include the sustainable use of natural resources and participatory interventions to incorporate local populations in the quest for conservation action (West, Igoe, & Brockington, 2006).

This chapter draws on ethnographic accounts to demonstrate how antiquated versions of the protected area model continue to prevail. These accounts will show how the perpetuation of hierarchical displays of power through the inability of the state to meaningfully include local populations in forest conservation efforts has instead created an environment of indifference, distrust, ambiguity and, in some cases, hostility. While conservation is a political process, and it is necessary to reveal the frictions it can perpetuate, it is equally important to draw attention to the opportunities for collaboration and different ways of understanding and participating in conservation outside of state-dominated models. I begin by providing some necessary policy

background on the creation of the protected area system (SNAP) in Ecuador before focusing on the Pacoche Wildlife Refuge.

The System of Nationally Protected Areas in Ecuador: A Policy Perspective

Galapagos National Park was declared Ecuador's first protected area (PA) in 1959. Alongside the global movement towards the fortress conservation model in the 1960s-70s, Ecuador followed other Latin American countries in establishing the National System of Protected Areas (Sistema Nacional de Áreas Protegidas, SNAP) in 1976. Later, between the mid-1980s and mid-1990s, Ecuador was part of the international movement towards expanding protected areas (Naughton-Treves et al., 2006). At this time, PAs across South America began to develop in response to an increase in the "demand to explore new agricultural frontiers and international pressure for the government to strengthen civil society through donor investment" (Brockington, Duffy, & Igoe, 2008: 33). As a result, today South America has a high number of PAs and a low record of forced evictions compared to other parts of the world (Brockington, Duffy, & Igoe, 2008).

Naughton-Treves et al. (2006) draw attention to how PAs in Ecuador exist under a special type of land tenure. Article 70 of the original Forestry Law of Conservation and Natural Wildlife Areas enacted in 1981, later revised in 1999, obliges the government to purchase any titled land within their boundaries. Stating:

> Privately owned lands and natural resources included within the limits of the natural heritage areas [including national parks, wildlife refuges, biological and ecological reserves, etc.]... will be expropriated or will revert to the domain of the State, in accordance with the laws of the matter (MAATE, 2004: 20).

However, the authors go on to explain that this stipulation has rarely been met, as Article 1 of the Forestry Law (2004) declares that while forestry assets in these areas are said to belong to the state, an exception to this law is for land possessed (or occupied?) by settlers and community

members. Article 2 affirms that the state will guarantee Indigenous, Black, or Afro-Ecuadorian populations the rights provided to them in Article 84 of the 2008 National Constitution. This article means that these communities have a legal right to their land and dignity, also confirmed in the Law of the Communes (Article 56 and 57), to be discussed in further detail in the next section. Despite these laws and protections, there remain grey areas for those in power to exploit in their best interests and continue perpetuating conflict surrounding land claims. For instance, Erazo (2013) draws our awareness to the fact that the state retains natural resource rights in the Amazon when it comes to subsurface materials like oil. Despite laws that protect land rights for Indigenous populations, these agreements are frequently undermined by the government concessions for agricultural expansion and resource extraction[10]. Additionally, Fiallo and Jacobsen's (1995) study on the attitudes of rural residents towards conservation in Machalilla National Park in the province of Manabí uncovered that in some protected areas, while Indigenous residency is legally acknowledged, they do not have legal land titles. The argument over informal and formal property claims remains a heated debate that will be elaborated upon in this chapter.

Influenced by global paradigm shifts in conservation discourse, Ecuador's SNAP has undergone a series of strategic revisions roughly every ten years, doubling the number of parks between the mid-1980s and early 2000s (MAE, 2007). Today, Ecuador is home to 76 nationally protected areas covering 26,208 million hectares of land, which represents 20% of the country's territory (MAATE, 2022), with the coastal region now having more individual PAs than any other part of the country (Pazmiño Manrique et al., 2018). In 1989, SNAP revised its strategy to

[10] This trend may be changing. For example, most recently, on August 20th, 2023, Ecuadorians participated in a referendum, with 59% of the vote to stop petroleum drilling in block 43 of Yasuni National Park in the Amazon region. Known as Ishpingo-Tambococha-Tiputini ITT, this victory is considered a major triumph for Indigenous and environmental activists in protecting Indigenous territory.

incorporate community participation and management in park policies, and in 1996, the enforcement of park regulations became the responsibility of the Ministry of the Environment (MAE), now named the Ministry of Environment, Water and Ecological Transition (MAATE). Since 2007, again following trends in the increase of ICDPs (International Conservation and Development Projects) worldwide, there has been a significant shift in the philosophy of SNAP policy, which began incorporating sustainable development into its conservation strategy (Pazmiño Manrique et al., 2018). These revisions parallelled previously discussed changes to the country's constitution that made Ecuador the first country in Latin America to promote the rights of nature within an Indigenous knowledge framework (Gudynas, 2009). Referred to as *Sumak Kawsay* (in Quichua), *Buen Vivir* or "good living", this model promotes the relationship between nature and human beings (Art. 72). In line with the SNAP policy, the changes to the constitution also affirm the right of citizens to participate in crafting government policy and in the management of protected areas (Gravez et al., 2013). Ecuador's National System of Protected Areas (SNAP) is now composed of four subsystems: Natural Heritage Areas (NHA), Protected Areas of Local Governments, Community Areas, and Private Areas (Gravez et al., 2013).

Through SNAP legislation, PA management began integrating concepts such as citizen participation, shared management, concessions for service provision, and the valuation of ecosystem services. SNAP then recognized for the first time that the sustainability of these protected ecosystems depends on cooperation with the communities that inhabit them (MAE, 2013). To offset the social impacts of conservation through preservation, land use zoning strategies for sustainable activities have become the norm through a more integrated conservation approach. In policy, SNAP (2007-2016) has made it a priority to revise management practices conducted by the Ministry of the Environment (MAE) by redefining the

use of natural resources to ensure these policies do not harm the quality of life of resident populations.

Through recent updates in the SNAP legislation, different parks have been further classified under categories according to their administrative needs and the size of the territory under protection. These include National Parks, Ecological Reserves, Wildlife Refuges, Biological Reserves, National Recreational Areas, Wildlife Production Reserves and Geobotanical Reserves, each with varying conservation priorities and restrictions. According to Fundación Futuro Latinoamericano (2011), most of the protected areas in Ecuador (including the Pacoche Wildlife Refuge) are under federal governance and regulated by the Ministry of the Environment. The differences between these categories are displayed in the Table 1:

Table 1: Protected Area Management Categories in Ecuador (SNAP, 2015).

SNAP Categories for PAs	Classification System
Ecological Reserve (9 in total)	• Natural areas of variable size with little human intervention. These are areas with outstanding natural resources or sites of species of great national significance. • The main objective is to preserve genetic material, ecological diversity, scenic beauty, and environmental regulation for scientific research of natural elements for environmental education. • If there are no conflicts with research and education, recreational and tourism activities are permitted in limited areas.
National Park (11)	• Large conservation area (over 10,000 ha). • Conservation objectives are focused on landscapes, complete ecosystems and species. • The environment must remain little altered, with a minimum of human presence. Priority activities consist of environmental research and monitoring, and the development of nature tourism as an activity supporting the conservation of natural resources. • The level of use restrictions is high.
Wildlife Refuge (10)	• A small conservation area (less than 5000 ha). • The main conservation objectives are focused on threatened species and their related ecosystems. • The general conservation status of the area must be little altered, with a minimum of human presence. Priority actions are related to habitat and species management, environmental research and monitoring, ecosystem restoration and environmental education. • The level of use restriction is considered high.
Biological Reserve (5)	• A large conservation area (over 10,000 ha). • The main conservation objectives are complete ecosystems and their species, and environments are to be little altered with minimal human presence.

	• In this type of reserve, priority activities are focused on biological, ecological and environmental research, with environmental education also possible as a secondary activity. • The level of restriction on the use of its natural resources is considered very high (very restricted) to guarantee the development of ecological processes.
Wildlife Production Reserve (5)	• A medium-sized area (between 5,000 and 10,000 ha). • Conservation objectives are ecosystems and species susceptible to management, which should be little altered, but have a medium level of human presence (depending on local biological resources). • The priority actions are related to sustainable wildlife management, environmental education, ecosystem restoration and nature-oriented tourism. • The level of use restriction is considered low.
Marine Reserve (3)	• Areas of variable size. • Conservation activities are focused on the marine ecosystems and species. • The reserve must be little or moderately altered, and human presence will be related to the intensity of fishing carried out there and must be adjusted to the conservation needs and zoning defined in the park management plan.
National Recreation Area (6)	• A medium-sized area (between 5,000 and 10,000 ha). • The main conservation objective is the natural landscape, which may be moderately altered and moderately supports human presence. • The main activities are related to tourism and recreation, ecosystem restoration, and environmental research and monitoring. • The level of use restriction is low.
Geobotanical Reserve	• An extended area intended for the conservation of wild flora and outstanding geological resources. Areas with diverse ecosystems, landscapes and exceptional geological formations are protected in order to ensure the continuity of the evolutionary, natural processes, and at the same time promote the recovery of the areas altered by human intervention. • These areas offer recreational, tourist and cultural education opportunities, and the area is considered a germplasm bank of flora and fauna species in danger of extinction.

The new SNAP legislation also established a zoning system of multiple-use areas within parks to incorporate the socio-economic concerns of local communities in park management. These zones include: 1) a strict conservation zone, 2) an active conservation zone, 3) a recuperation zone, and 4) a buffer zone around the park perimeter (MAE, 2013). In practice, Andrade and Rhodes (2012) assert that zoning strategies in PA management frequently suffer from severe implementation and compliance issues, where regulations often need to be clarified. This lack of compliance is mainly due to the issue that in many parks worldwide, local people are rarely consulted on the creation of park management plans. Park staff often lack the institutional capacity to work with local communities and rely on external NGOs to provide these services

(Brockington & Duffy, 2010). Brandon and Wells (1992) are also critical of these types of zoning strategies, arguing that jurisdiction regarding who is responsible for enforcement and where these zone'' boundaries are often utterly unknown by local people. Their research and my findings during my masters research in 2018, later reaffirmed during this project, highlight that many community members do not even know these zones exist. Also, buffer areas are often severely degraded and overexploited in many cases, and park administrators need to offer more effective land use alternatives. Park rangers who are employed to enforce these zones and restrictions often function, or are interpreted by locals, as a form of natural resource police who further separate rural residents from access to resources and their connection to the land (Naughton-Treves et al., 2006; Igoe & Brockington, 2007). Hunting, fishing, subsistence farming, and access to forest resources are crucial livelihood activities for many rural populations, meaning that implementing zoning restrictions that label these activities as illegal can have devastating consequences for rural livelihoods. For example, research by Luna et al. (2020) provides an example of Afro-Ecuadorian populations in NW Ecuador and the critical role that natural resources play in their household economies, where land is the main factor of production. They explain that resource-use regulations in PAs that make up 14% of all land coverage in NW Ecuador severely impact people's livelihoods. The study found that conservation strategies that restrict access to logging, in practice encourage agricultural intensification to recuperate lost income for populations without land tenure. For reasons such as these, ecologist Yntze Van Der Hoek (2017) argues that the effectiveness of PAs as a conservation strategy in preventing deforestation is in question worldwide – especially in Latin America, where population density is high within park boundaries. The next section uses data gathered from open-ended interviews with study participants and fieldnotes to tell the story of the Pacoche Wildlife Refuge, the history

of the area and the ongoing changes in land ownership and labour that occurred as a result. These discussions reveal stories of friction and local resistance to state institutions, 'outsiders' and even other neighbouring *comunas*, and provides the socio-political context to understand how conservation is situated within these landscapes. It begins with a creation story.

The Birth of the Pacoche Wildlife Refuge

Santi and I pulled up to the town hall in the center of San Lorenzo, an impressive two-story white cement building with large, tinted windows just down the street from the elementary school. We entered the open-air lobby and were greeted warmly by a beaming Carlos, who got up from his desk to invite us into his office. Carlos and I had gotten to know each other well over the years, and this was one of the many times I had the pleasure of interviewing him. Since my arrival in Pacoche in 2018, I have often seen him driving around in his beat-up pickup truck or on horseback herding his cattle. He is a handsome man in his early 60s, always sporting his wide-brimmed cowboy hat, which he graciously tips to greet me. Carlos collected hundreds of artifacts walking along the Liguiqui road between Pacoche and San Lorenzo on his way to his job as a rural councilor. However, after nearly 34 years in his office, the shelves were bare – not one pot shard or ceramic figurine. This modesty reflects Carlos's personality, a true patriot for his people with a deep connection to his ancestral history. Every artifact he had discovered he had donated to be put on public display at the local ethnographic museum.

Throughout our interviews, Carlos proudly identified as both *indígena* and *montuvio*, as well as *Pacochero*[11]. When he is not fulfilling his civic duties, he works on his land – mostly his

[11]A demonym or *gentilicio* (in reference to being from a particular geographical place) meaning specifically from the *comuna* of Pacoche. This is the term by which many participants chose to identify themselves during interviews.

coffee crops. He sells the beans under the brand *Cacha Café*, named after an Indigenous (*Manteña*) warrior, *Chiris Cacha*, who fought against the Spanish. Carlos explained how he identifies with this historical figure: "I am also a fighter for my community – more so with my mind and a pen, but I fight for my people" (C. Chuez, personal communication, October 2022). He also illustrated on a piece of paper how his full name, ***C**arlos **A**dolofo **Ch**uez **A**lvia*, forms the acronym *Cacha.* Carlos is one of the few interview participants who was directly involved in creating the protected area during his 15-year run as *comuna* President of Pacoche. He tells the story of the Pacoche Wildlife Refuge and how it all began with the construction of the *Ruta del Spondylus* (E15 highway – *Troncal del Pacífico*)[12].

> In 1998, when the road that crosses the mountain was first opened, the construction of the road was introduced to the public right outside this office, in the streets of San Lorenzo. As an attempt to compensate landowners for the road's impact, the government built a tree nursery planned to reforest about 60 hectares of trees (which never happened). They also agreed to build the ethnographic museum in Pacoche (that's how we got the museum) (C. Chuez, personal communication, October 2022).

This coastal highway was later expanded in 2011 under then-President Rafael Correa. It became a tourist attraction today as the *Ruta del Spondylus,* the main throughway connecting Esmeraldas, Manabí, and Santa Elena provinces.

Carlos went on to explain that:

> After the original construction of the road, with the support of a foundation called Eco Ciencia, we began working to protect the primary forest from further development. The foundation came here to support this area and worked with the communities of El Aromo, San Lorenzo, and Pacoche on the theme of the artisanal *toquilla* straw. They came here, made nurseries, and planted the *toquilla* straw from seed on the mountain. That is where the idea to protect the forest was born, for the theme of protecting the water (C. Chuez, personal communication, October 2022).

[12]The *Ruta del Spondylus* or E15 highway is the main coastal route that divides the Pacoche Wildlife Refuge was named after the precious *Spondylus* shell, which historically served as both a ceremonial offering and currency, as well as the driving factor of trade across the Andes and as far north as Mexico (Harris et al., 2004). The coastal region of Ecuador was the epicentre of *Spondylus* sourcing and producing throughout the pre-Columbian era, where specific occupational specializations were honed – most notably deep-sea diving (Harris et al., 2004).

The theme of the importance of water that flows through the mountain was a common point of discussion across many interviews. In fact, after reading my MA thesis, Ramón Flores, a close friend and local research assistant throughout my fieldwork, commented that the thesis was missing sufficient information about the value of water. Overall, many participants expressed an enormous sense of pride that the natural springs from Pacoche once provided the water for the city of Manta. Between 1938 and 1966, the first piping system was installed, funneling water into a series of holding tanks and dams built across the mountain. Participants talked about how the beach in the *Boca de Pacoche* (now called Santa Marianita – Playa Bonita) was used as the central receiving point for shipping pipes and other materials connected to the river system at the time. Unfortunately, after extreme weather events brought on by El Niño in 1982–83, holding tanks and rivers overflowed and dried up, and the water has yet to return consistently. Many study participants agree that the plentiful water and the *Guadua* bamboo produced by the unique micro-climate here make this mountain so crucial to the region economically and environmentally. In a province that suffers from severe water shortages and seasonal droughts, the reasons for this pride are clear.

Carlos detailed how shortly after the highway was completed in 1998-2000, he worked alongside the NGO EcoCiencia and researchers from the United States and Germany to document the flora and fauna and establish the *Bosque Protector de la Cuidad de Manta,* a municipally protected area. The President of the *comuna* of Liguiqui, Carlos Alvia, commented that the protected area was initially created because, “People like you, foreigners who came here and said look at how beautiful it is here, you need to take care of it. Because there are unique flora and fauna here, they [EcoCiencia] gave us workshops. They showed us videos from other

countries where they care for their environment" (C. Alvia, personal communication, November, 2022).

It was not until 2008, as part of a series of concessions, that the *Bosque Protector* (Protected Forest) officially became part of SNAP so that it might address public concerns about the construction of the Pacific Oil Refinery (RDP)[13], located approximately 8km from the protected area. Sr. Chuez outlined how, "it's like saying, we will nationally protect this area over here, and it will give us the green light for the refinery project, over there" (C. Chuez, personal communication, October 2022). Even though the developers promised to reforest a buffer area around the refinery, environmentalists and many *comunas* were still unconvinced, and with good reason. To build what was planned to be one of the largest petrochemical complexes in South America, 1,200 hectares of forest were cleared, resulting in devasting consequences on flora and fauna and affecting the local climate (Fitz-Henry, 2015). Leo Alonso**,** ex-president of the *comuna* of Liguiqui**,** talked about the conflict over the refinery. He said, "The *comunas* had to come together to ask for help from Pachakutik[14] to fight to protect the land—this gained international attention from National Geographic, etc. As a result, in 2014, the new management plan for the PA was amended to expand the borders of the reserve" (L. Alonso, personal communication, December 2022).

[13] Initially financed through three state-owned oil companies, PetroEcuador (Ecuador), PdVSA (Venezuela), and CNPC (China), and projected to refine 300,000 barrels of heavy crude a day when operational in 2017. However, following the death of Hugo Chavez, the project was eventually frozen due to a lack of financing and environmental permissions (Fitz-Henry, 2015).

[14] Pachakutik (*The Pachakutik Plurinational Unity Movement)* is Ecuador's left-wing Indigenous-led political party. It was founded in 1995 primarily to advance the interests of various Indigenous organizations throughout the country.

Naming of the PA

While transitioning the municipally protected forest into a national wildlife refuge was a relatively seamless bureaucratic process, coming up with a locally acceptable name for the reserve was different.

One sunny afternoon, while surveying dry forest on public trails in the PA on the outskirts of El Aromo, Santi, Xavier, and I met a *campesino* hiking up the side of a ravine after bringing his cattle down to the stream for a drink. He asked us what we were doing in the area, and we said we were researching the monkeys in the *Refugio de Pacoche*. The man immediately stiffened his posture and appeared bothered by our response. He barked back at us, "this forest belongs to El Aromo and NOT to Pacoche… Pacoche hardly has any forest at all… you must be confused" (Anonymous, personal communication, January 2022). After some unclear dialogue back and forth, in which we explained that we had a permit from the Ministry of the Environment to conduct research in the protected area, the man left angry, and the interaction confounded us. This was not the only time someone from one of the rural communities corrected us about using the term "Pacoche" to refer to the protected area, with others claiming things like, "this forest belongs to La Solita; Pacoche is over there" (Anonymous, personal communication, June 2022). Regardless, we learned quickly that we must avoid using the official name of the reserve when interacting with residents from communities other than Pacoche.

After recounting this story to Carlos, he chuckled and said, "Yes, there was a big conflict between the *comunas* about the name… mostly between San Lorenzo, Pacoche and El Aromo. In public meetings, people still say to me how can we agree with you when you are the one who stole our forest? [Said laughing]… The people here do not understand that all of the benefits of the protected area are for everyone" (C. Chuez, personal communication, October 2022). The

public was invited to comment on the naming of the reserve through an editorial in the local newspaper. Carlos recounted how he has kept the article all these years titled *A problem in San Lorenzo is born, what do we call the forest*? with public opinion in favour of the name Pacoche. The Presidents from the nearby *comunas* (San Lorenzo, Las Piñas, Pacoche, Santa Rosa, El Aromo, Liguiqui, Pile, San Mateo, and Rio Manta) were all included in the process, and after many heated debates, a final consensus was eventually reached that the name should be "The Pacoche Coastal and Marine Wildlife Refuge" (or Pacoche Wildlife Refuge, for short).

In an interview with Eleutario Mero, the vice President of the *comuna* of El Aromo, he commented,

> There were some problems at the beginning because they put the name "Pacoche" quietly without telling anyone. They never consulted the public in the rural area. They did it amongst themselves, and then we all found out after it was done. From there it was called the forest of Pacoche. We were never invited to any meetings – they decided everything themselves. The name should represent all of the communities, not only one! [Says angrily]. El Aromo has part of the forest – it was always independent. Every sector has its own boundaries. So that's where the conflict comes from to this day. So, when the MAATE comes here and says they are working in the Pacoche forest, we get really mad because it is not their forest, it is ours, it's the forest of El Aromo (E. Mero, personal communication, November 2022).

Other participants shared that the name Pacoche was based on two central factors. The first was that the natural spring water supplied to Manta was from Pacoche, and the second was because the word "Pacoche" is representative of the ancestral history of the area. Leo Alonso (a park ranger for the Ministry of the Environment, archeologist, and ex-President of the comuna of Liguiqui) explained:

> The name Pacoche is a term that was not introduced by outsiders. It comes from our ancestors of the Manteña-Huancavilca culture, where *Pacocha* means a place of water or the land of water. *Pacha* is like Mother Earth, and *Cocha* is like water or the lagoon in *Quichua*. Pacoche has a much longer history in the area. The Machalilla National Park further south is also an example of an ancestral name given to a protected area, which does not belong to the town of Machalilla (L. Alonso, personal communication, December 2022).

Carlos Alvia commented, “many people did not agree with the result because the majority of the territory was within the borders of San Lorenzo, so why would they name it Pacoche when they only have a small amount of land, and the community is not even inside the PA?” (C. Alvia, personal communication, November 2022). These conversations indicate how many of the arguments about naming the PA were centered around the issue of ancestral territory, which remains a contentious subject to this day. After speaking with residents from different *comunas*, it became clear that landownership and community boundaries can be fuzzily defined and are often shifting. Many participants told conflicting stories about the region’s history, claiming that the community where they were born (and reside) has the most forest/land.

Reflecting on this conflict over the name of the PA, Bauer’s (2018) ethnography on fishing communities in coastal Ecuador (south of the Pacoche Wildlife Refuge) in a *comuna* called Salango provides insight. Bauer states that “socioeconomic relationships not only exist between individuals but also with the environment” (Bauer, 2018:51), and it is through these relationships that people create a sense of collective identity. Additionally, Tsing (2001) encourages us to look at the different elements of the environment as “actors in human histories, where nature is not an objective entity but a part of the human experience” (in Bauer, 2018:51). By changing the name of the forest to “Pacoche”, residents in other *comunas* responded as if it were an attack on their identity and connection to place.

History of the ‘Pacocha’ Territory

Carlos pulled out a piece of paper to clarify these debates and started drawing a map for us. He explained that Pacoche originally extended from San Mateo down to Las Piñas (but deeper into the forest area), and the community of San Lorenzo is located along the coast.

> Before 1938, all these lands of Pacoche and everything else, including San Mateo and La Travesia. Santa Marianita, everything from *Barbascillo* beach in Manta downwards

> belonged to *federales* or people who have HUGE amounts of land (*terratenientes*), the three Reyes brothers: José Lizandro, José Flavio, and José Rojelio – they were all Reyes Zambrano. No official communities existed at this time, but there were a few small settlements. They used areas like Santa Marianita beach for fishing or to *bajar las cañas, o bajar las balsa de caña*, [meaning to load/ship/to send bamboo and other cargo to Manta] (C. Chuez, personal communication, October 2022).

Cristobal Reyes, President of the Pacoche *comuna*, shared that colonial records dating back to 1532 indicate that "the Indigenous populations who inhabited this area were called *Los Paches*, but now everyone just groups people from this part of the coast as the Manteña-Huancavilca culture. The *pueblo Pache* were known for their tattooed faces and spoke a language called *Pache*. I think it is important that people here know where they come from" (C. Reyes, personal communication, September 2022). He explained that the reason Pacoche has an ancestral *comuna* is because of the archeological evidence that demonstrates "we come from *una cultura millioneria* (a thousand year old culture)" (C. Reyes, personal communication, date). Cristóbal outlined how unlike *comunas* in other parts of the country, none of the *comuneros* are technically direct descendants of their Indigenous ancestors because they are all *mestizos* – the Indigenous populations disappeared here due to the Spanish. Carlos Chuez went on to explain,

> In 1938, the *ley de las comunas* was born – across the country. Of all the little towns that were scattered about (*caserios*) – the biggest one was here in Pacoche, and they registered/got themselves legally acknowledged as a *comuna* – until then this whole area was originally called Pacocha. When they became a *comuna*, they accidentally put an E instead of an A. I remember in a book, up until the 1960s more or less, on one of the maps it all said *Pacoche* (C. Chuez, personal communication, October 2022).

Pacoche was one of the first *comunas* in the area, while others like Liguiqui and El Aromo were formalized later, in 1952. Cristóbal noted that the division of Los Pache's ancestral territory into separate *comuna*s makes them confront each other over territory today, even though they are all originally from the same culture.

In a story recounted by Carlos Chuez, one of the Reyes brothers, José Flavio, used to go extract bamboo in the mountains to build everything in Manta – because they owned it all, they

could take whatever they wanted. While some participants shared that the Reyes brothers tricked people into working for them for free, others claim that José Flavio was a man of the people who would maintain order in the communities. Carlos stated,

> The elders claim Flavio Reyes was an excellent person. He also gave jobs and kept returning to the mountain on his horse and visiting the people of Pacoche and San Lorenzo. He would shoot a partridge in the forest on his way from Manta and then give it to the people here to share together. People would ask him for *caña* to build their homes, and he would never say no. He taught the people how to cut the bamboo in the forest whenever they needed it, but only the mature bamboo. He would say don't cut down any trees or young bamboo. He was a philanthropist and the first protector of the forest. He taught the people how to care for it properly (C. Chuez, personal communication, October 2022).

It was around 1972 when the brothers began to distribute their land for sale during the second period of Agrarian Reform. Carlos clarified that "the people of Pacoche started to raise *un falso* (raised a fuss) saying these lands should be distributed to people of Pacoche, who don't have any land! And that was the last drop that overflowed the cup, and they started to sell lots of land to the people" (C. Chuez, personal communication, October 2022).

This history aligns with the endless tales from Ramón Flores and other *campesinos* who proudly shared stories with me during our forest walks about the land they inherited from their fathers, who had undoubtedly bought it 'cheap' during this time. Most *campesinos* I spoke with have multiple properties scattered around the humid forest part of the mountain and also in the transition forest areas closer to town. Few had purchased these lands themselves, but some had since acquired the legal land documentation to use them (*usufructo*)[15] under the *comuna*.

[15] Usufructo is the right to use communal property. The usufructuary is the possessor of the land but not its owner. He can use it and enjoy its returns, although he is not entitled to dispose of it freely. An asset's full ownership contains two rights: bare ownership and usufruct.

The Role of Comunas and Land Titles

As an outsider learning about the concept of ancestral *comunas* for the first time, I will admit that I idealized the notion of this sort collective: sharing land, resources, and history – how marvelous. However, I soon realized through Erazo's (2013) book “Governing Indigenous Territories" and my field research that a *comuna*, while based on the foundation of a shared Indigenous ancestral history, is not a homogenous entity and is riddled with just as many complexities as any other form of social organization.

According to *comuna* President Cristóbal Reyes, there are approximately 3,800 *comunas* registered nationally. He explained how, on the coast, because of the high population density, *comunas* function differently than in other parts of the country. “We function with more resistance, and we live more independently from one another. Here you grow your own food, and you have your own home, you don’t care as much about your neighbour’s space” (C. Reyes, personal communication, September 2022). In my interviews, I asked participants if they were members of the *comuna*. I had previously assumed that if you lived in the *comuna*, you were automatically a part of it, but this is not the case. While most participants identified as *comuneros* (particularly in Pacoche and Liguiqui), I received various responses on what it means to *be* a *comunero*. It was unanimous that each participant who identified as a *comunero* claimed to have an ancestral connection to the land. Leo shared, that “we maintain our ancestral roots by maintaining our communal territories, cultivating the earth, sourcing natural resources from the forest and the ocean, taking care of it – restoring it” (L. Alonso, personal communication, December 2022). However, it also became apparent that this ancestral connection is not actually a requirement in some *comunas*. Conversations with *comuna* presidents made it evident that each *comuna* has its own membership rules, some more flexible than others. In some cases, owning

land for 5-10 years and living in the *comuna* or marrying someone in the *comuna* can be grounds for membership. In any case, new applicants must possess a land deed (*usufructo*), which does not guarantee their inclusion.

For instance, the Vice President of El Aromo explained,

> Being a *comunero* is part of our history, you need to be of Indigenous descendance, from here. We can't accept you if you are not from here unless you have special permission from the *comuna*, but you won't have the same benefits as the rest. Many people from outside want to join, but we are very careful of who we let in (E. Mero, personal communication, November 2022).

Cristóbal Reyes added,

> In *comuna* territory, when the *cabildo*[16] permits outside institutions to enter (get involved with land titles), we lose control, and we end up with them selling everything. This is why we have to be very careful. I do not permit any outsider to come here and access the land. In the past, some *cabildos* have allowed the mass sale of land – *traficantes de tierra* (C. Reyes, personal communication, July 2022).

Comuneros must vote on whether a person is deemed 'worthy' of membership. If the applicant is viewed as someone who brings conflict and disturbance, they are not voted in. Generally, it appears that 'worthiness' is determined based on an individual's respect for local culture, values, and, most importantly, the land. Values associated with individualism and the accumulation of personal wealth are not well received in this context, as everyone is expected to give to communal needs such as funerals, fiestas, and infrastructure development, based on their financial ability. Relationships between *comuneros* as neighbours are often based on reciprocal exchanges of goods and services rather than money. If you give me some bananas, I will give you back a few *cañas* from the forest in exchange. However, not all relationships between *comuneros* are harmonious, as there is much division between those in favour or not of the current President. Leo shared that, "not everyone wants to be part of the *comuna* because not everyone trusts the elected *cabildos* (council members), and there are always problems" (L.

[16] *Cabildo* = the community council of the *comuna*

Alonso, personal communication, December, 2022. This allegiance tends to enormously impact participation in the monthly *comuna* meetings at the *Casa Comunal*. Several presidents shared that some active *comuneros* are always present at meetings and participating in community business, but overall, they are few. Generally, participation across all *comunas* interviewed for this study (Pacoche, Liguiqui, El Aromo, San Lorenzo, Las Piñas and Pile) appears to be dwindling.

The President is the head of the *cabildo* or council of annually elected representatives, all volunteers, with no financial incentives for their efforts. Annual elections make it challenging to maintain consistency over the years. If most voters are pleased with their service, however, some elected representatives, including the President, can be continuously re-elected as the public deems fit. While being elected is an honour, it also comes with great responsibility. Carlos Alvia, *comuna* President of Liguiqui said, “people sometimes offer us money (as Presidents of the *comuna*) to let them do whatever they want to the land, they threaten us, but we stand firm and say no. We have to defend the rights of the *comuna*. If we were corrupt, you’d see us driving around in fancy cars, etc. Our jobs are voluntary, and they are not easy” (C. Alvia, personal communication, November 2022). Other *comuna* Presidents shared similar sentiments noting that people in their position can make a lot of enemies, because you can’t make everyone happy all the time. Cristóbal commented, “you can see my car is falling apart, held together with duct tape. You have no idea how much money they (outsiders) have offered me because they want to buy some land in the hills around here. I don’t need any more money. This land belongs to the *comuna* and it is the pasture for our goats. But the developers claim it is in the name of progress” (C. Reyes, personal communication, July 2022).

Leo explained other complications of the role, stating that,

> When you sit at your desk and look at the stack of papers for *escritura* from the municipality you will see that there are many people who claim to have the same land – it creates large conflicts. And if some of those lands are within the PA, there's an even bigger conflict. If we can't resolve these conflicts locally, we can ask for support from the larger *comuna* organization in Manabí, or even in Quito (L. Alonso, personal communication, December 2022).

It took me a long time and asking many questions to understand what a land title *is* in *comuna* territories. Many people use *escritura* as a general term when talking about land titles, but it has several distinct meanings. My understanding is that both the *comuna* and the (MAGAP – Ministry of Livestock, Agriculture and Fishing) can grant land ownership papers, and there has been a movement in recent years of people going directly through the MAGAP to avoid the *comuna*. However, *comunas* do not recognize the *escritura* given by the state on what they consider to be part of their ancestral territory.

To resolve this discrepancy, in 1998, an agreement was reached that all land given *escritura* by the state up until this date would be considered a legal land title. Everything given *escritura* after this date would be nullified, and buyers could apply for a certificate of *usufructus* from the *comuna* instead. This means that the land does not officially belong to the owner but to the *comuna*; however, the owner can use the land and sell it through the *comuna* in the sense of transferring their land rights to another member. Cristóbal explained the complications of this process:

> There are now 37 *escrituras* on the mountain; 31 belong to locals in the area (*comuneros)*, but very few of the properties on the mountain have *escritura* because it is not permitted. There are still six that MAGAP granted where we have no idea who the owners are, and they are dividing and selling the land into five more land titles. We are protesting this because it is not ok. We are formally complaining that this should be illegal (C. Reyes, personal communication, September 2022).

Escritura madre, on the other hand, is an official land title that legally recognizes all properties within the *comuna* territory as ancestral lands. Any land with *escritura* prior to 1998 must be exempt. According to the Law of the Communes, once legally part of the *escritura madre*, this

land can never be sold or divided, and no new *escrituras* can ever be given here. Carlos Chuez clarified that "to this day Pacoche still does not have an *escritura madre*, so while all of the land was originally ours, over time we have lost most of it. Sectors like Santa Marianita, for example, are experiencing conflict because it has become an urban area over the years under the permission of MAGAP that grants these land titles. All the foreigners who live there – people with lots of financial resources, live on ancestral lands that once belonged to the *comuna* of Pacoche" (C. Chuez, personal communication, October 2022).

What is fascinating about this process and its development over time is where the protected area fits within these territorial disagreements. Leo explained that,

> *Escritura madre* does not include any land within the PA because, legally, the state owns all the land within the PA. For example, if Liguiqui wants to certify a property as part of their *escritura madre* but it falls within the boundaries of the PA, they cannot do it. The documentation has to come from the MAATE – belongs to the state – the MAATE is in charge of everything within that area. So, any permission people need to buy and sell land within the PA has to go through the MAATE – not the *comuna* (L. Alonso, personal communication, December 2022).

Carlos Chuez added that over the past five years, the *comuna* has been authorized to process *usufructus* applications within its territory—inside or bordering the PA. Thus, *comuneros* with the financial resources to do so ($80 USD per hectare) continue to apply for this documentation for their inherited properties on the mountain when they want to sell or apply for micro-credit from the bank.

Local Perceptions of Changes in Land and Labour

The transition to a protected area impacted human-nature relationships by shifting people's relationships with land and labour. The most dominant theme that came out of my discussions with community leaders was the commodification of land. Carlos Alvia commented that, "the biggest problem we have here is people from the community keep selling their land to those who

have money, so then they become slaves on their own land. So here we try and convince the people not to sell, and to protect the land instead. And to make it difficult for people to buy land in the PA, so they people don't want to buy there unless they are going to conserve it" (C. Alvia, personal communication, November 2022). Cristóbal added that,

> *El campesino termina decepcionándose de su propio tierra* [the farmer ends up feeling disappointed with his own land]. They can make $5,000-10,000 USD, so they end up selling their land, and often, they are very sad to sell it because they inherited it from their fathers. Those who are buying it don't know the mountain, and there is no respect; it just keeps getting worse. If you travel down the *Ruta del Spondylus*, you'll see in almost every property it says SE VENDE [for sale] because the new owner doesn't know how to live on the mountain, and it has become a business to buy the land cheap from the farmers and then turn around and sell it for double the price to another foreigner (which is driving up the cost of land around here so local people cannot afford to buy it anymore) (C. Reyes, personal communication, September 2022).

West (2006) asks us to pay attention to the ways in which land tenure relationships that are tied to identity and genealogy are changing, and, in some cases, disrupted due to transnational processes – such as the migration of expats and even the role of researchers like myself, who are attracted to biological hotspots like Pacoche. The sale of land to foreign buyers is a common story that emerges while speaking with smallholders. It is certainly something that Ramón and I whispered about often. While sitting quietly and listening for monkeys in the forest, we would occasionally chat about land politics in the area, land in the refuge for sale, and how people are often reluctant to sell unless they have a family emergency. Ramón talked about the land here as an "insurance policy" to cash in when you are in a bind. Many plots here in Pacoche, including the one we often camped on, were last tended by somebody who is now deceased or is very old and unable to travel or work their land. So, the properties are overgrown with remnants of bananas, *toquilla*, and oranges, which were once cultivated but are now wild and one with the forest. These 'abandoned' or 're-wilded' plots might be owned by the farmer's family or inherited but are no longer worked as many younger generations no longer have interest due to

the unprofitable and challenging nature of the trade. Ramón explained that while farming in this context may not be profitable, owning land – the freedom to come to the mountain and care for your crops – brings a sense of pride and identity for *montañeros* even if they can no longer physically travel to their properties. “Para nosotros es un orgullo para tener tierra nuestra” (For us it’s a great source of pride to have our own land) (R, Flores, personal communication, February 2022).

Cristobal often expressed his frustrations about the tensions between the state institutions that permit land transactions and the *comuna.* He once told me, for example, that “institutions like the municipality and MAGAP only care about money; they don’t care who is buying and selling land. So, you have a few people who buy up all the land and believe they are the new owners of the mountain” (C. Reyes, personal communication, September 2022). On another occasion, Leo explained how these “*terratenientes* (large landowners) take advantage of everything, at the expense of local people. And while these are processes of change, it’s a class hierarchy thing as well, people who know how to manipulate the system, so they do” (L. Alonso, personal communication, December 2022). These resentments towards large landowners and related infrastructure developments stem not only from the lack of inclusion in decision-making but also from the restrictions related to small-scale extraction of resources without permits, where farmers feel as though they are being targeted because of their lack of power and influence (Fiallo & Jacobson, 1995).

Many *montañeros* like Ramón refer to these new landowners as *millionarios* or ‘millionaires’, with an overarching undertone of mistrust towards outsiders with financial resources. Cristóbal explained how privileged (wealthy) landowners do not face the same restrictions as the local population. He stated, “they don’t get in trouble if they kill an ocelot on

their property, which shouldn't be permitted in the protected area. Where are the consequences for those in power?" (C. Reyes, personal communication, September 2022). He commented, "if you come from the city or elsewhere, you probably don't understand how things function here" (C. Reyes, personal communication, September 2022). While rare, these 'others' would be displayed in a positive light every now and then. For instance, Ramón shared, "the lawyer, he's a good guy though, he helped me find a way to re-connect my electricity when my *patrona* didn't pay the bill" – indicating the importance of acts of community altruism in breaking down these class-based 'us versus them' mentalities that permeate the sociopolitical landscape (R. Flores, personal communication, n.d.).

These conversations make me wonder if we are slowly returning to a royal menagerie model[17] of conservation, where, in the future, the remaining forest fragments spared from development will be owned by the wealthy. Models like these push smallholders, as in Pacoche, off their land and remove them from their means of production – and, consequently, their identity. Basset and Gautier (2014) encourage us to pay attention to these situations where resource access, control and management are shifting from the poor to the powerful and where local people are responding by reclaiming or refusing to relinquish control – such as the structure of the *comuna* as an alternative to institutionally controlled land ownership.

Changes in Cultural Practices

It is not just land that people fear losing as a result of changes precipitated by the establishment of PAs and rules governing access to their resources, but also the loss of cultural practices such

[17] The royal menagerie model is generally applied to a historical perspective of zoos, owned by the wealthy as ornate and exclusive displays of power and prestige (Cowie, 2018; Campbell, 2016).

as the processing of sugarcane (*la molienda*[18]). During one of our primate survey days on the Flores property, Ramón explained that if the government wanted to help *campesinos*, they should invest in programs and funding to help farmers expand their *canteros* (sugarcane fields). I explained to him that if farmers in Pacoche expanded their sugarcane fields, they would have to cut down many more forests because sugarcane requires full sun to grow properly. He did not have an answer for my comment, and just pushed it aside, shrugged and said, "yeah well". This situation indicates how, even after years of working with me collecting data on primates to promote their conservation, Ramón thinks about the forest differently than I do. In addition to the deforestation that would result from planting more sugarcane, the process of the *molienda* itself requires a large amount of hardwood as firewood to boil down the syrup to create the *panela*. The economic value of *panela* is also very low compared to the labour and time that goes into making the final product. Over the years, I have been invited to participate in nearly a dozen *molienda* practices, and what has become clear is that the process is more culturally than economically significant. From Ramón's point of view, the *molienda* is a social practice involving the whole family that supports the local economy and brings back fond memories of his childhood. His connection to the land is very much part of this connection to sugarcane as a symbol of his identity and what it means to be a *montañero* who continues his traditions in this particular part of the world.

Results from a structured survey in Pacoche in 2018 demonstrated that most study participants (80%) were not in agreement with PA regulations prohibiting the extraction of firewood, stating that harvesting stumps, logs, and branches as fuel for cooking and the

[18] The practice of turning sugarcane into *panela*, a raw cane sugar product, involves boiling down the *guarapo* or cane juice until it thickens into a paste (*raspadura*—and eventually, *panela* in its final state of solidification)

traditional *molienda* is a necessity for local populations (Britton, 2018). While certain hardwoods such as *guaba* (*Inga* sp.) and *cativo* (*Prioria copaifera*) are preferred for long and more intense burning times, most smallholders added that they only collect dead or dying trees as firewood for this purpose, and would never cut down a healthy tree, especially a *higueron* (*Ficus* sp.). As a result of the PA regulations, fewer *campesinos* practice the *molienda* these days, and those who continue the tradition tend to shorten the practice considerably from what once took an entire family weeks of work to accomplish to a few days of work carried out by hired help. These changes are reflected in changes to cultural practices of reciprocity – a central value of being a *comunero*. In one of our conversations, Cristóbal lamented over how things had changed from what they used to be:

> The mountain used to be the energy of all the people here, the *campesino* is a symbol of strength for all social life through the reciprocal exchange of products we grow and collect in the forest… For example, Pedro Castaño would return home from his property in the forest with hardly anything for his family because he would give everything away to people he met along the way – his wife wasn't pleased with him [jokes] (C. Reyes, personal communication, September 2022).

Like transitions in how the land is valued as family inheritance and source of pride in connection with the forest to becoming a bargaining chip that has inflated property costs in the area, these examples demonstrate how the economic value of land and natural resources is gradually replacing cultural value due to the PA and encroaching development.

Changes in Labour/Occupation

Other changes in labour are tied to the influx of the tourism industry. A total of 40% of participants shared that they thought the protected area was created for tourists (Britton, 2018), however data collected in 2018 for my MA thesis reported that the overall percentage of study participants working directly in the tourism sector was relatively low (Britton, 2018). Over the past few years, that percentage has risen as more expatriates and urban investors migrate to the

area searching for business opportunities, vacation homes, and rural oases. New restaurants, eco-farms, and lodges have opened recently, and tourist trails and activities have been expanded. This demographic shift offers additional employment for locals in the hospitality sector, as well as cooking, cleaning, taxi driving, property maintenance, security, etc. Despite these changes, the political climate has made the influx of tourists unstable, and opportunities remain limited. For example, in 2022, a new state-sponsored course to train local tour guides was initiated with 16 new graduates. However, with only two tourist trails in the PA, the *Sendero de Mono* and *El Faro*, there were few new employment opportunities, and graduates had to compete with veteran tour guides. As a result, the Director of the MAATE put all tour guides on rotating schedules to try to contain the chaos, a move that was not well-received by veteran guides, some of whom have been working their posts since the inception of the protected area in 2008. It is important to note that, unlike previous tour guides in the park, the new graduating class contained several local women, indicating a shift in gendered interest in working in the forest. During interviews, tour guides shared that they had begun the process of clearing a new trail to bring tourists deeper into the forest along Rio Mayo – one of the areas I used as a research trail where the critically endangered capuchin species tends to frequent. Of course, this process will require MAATE approval before any new trails can be officially established.

Interviews with business owners in the protected area also indicate a less rosy picture of the tourist economy, which is seasonal and thrives only on weekends and holidays. Some businesses depend almost entirely on the large cruise ship tour buses that periodically come through the area between August and December. Most restaurants and shops are closed during

the week due to a lack of traffic and security threats of extortion from organized crime groups[19]. Additionally, because of the constant humidity and dampness on the mountain, tourism infrastructure requires steady investment in maintenance, and without consistent flows of tourists, this upkeep is not often prioritized, leaving much of the existing infrastructure in dire need of repairs.

Commenting on recent changes in the local economy, Cristóbal noted that … "There are few *montañeros* left that still go to the mountain. Today, young people want the easy money and sometimes get caught up in narco-trafficking. The first thing youth want to do when they finish school is go fishing, they don't want to work on the mountain anymore" (C. Reyes, personal communication, September 2022). Ramón explained that years ago, fishermen also had land on the mountain. They fished in the morning a few days a week and worked the crops the other days of the week or in the afternoons; now it is more like one or the other (you either own land, or you are primarily a fisherman).

Perceived Benefits of the PA

In light of recent changes and challenges, study participants expressed mixed sentiments about the benefits of the protected area. Carlos Alvia recalled that the forest was drying up around 2008, but now he says you can see that it is recovering again. He outlined how the original management plan agreed upon by the *comuna* presidents was that the PA would benefit the region's youth by giving them opportunities to work as tour guides. Carlos was one of those

[19] While not the focus of this research, the rise in narco-trafficking and related criminal gang activity since the pandemic – particularly in the coastal region of the country – was a factor influencing the economy and employment opportunities available for young people. The new President Daniel Noboa declared a civil war on drugs in January 2024 to address the rise in violence and criminal groups through military force.

youths at the time and became one of the original tour guides in Pacoche, which has provided many opportunities for him and his family over the years.

Cristobal added, "before the protected area, most *montañeros* were hunters; they would hunt every weekend. But… [these regulations were] necessary because we were wiping out all the pacas, chachalacas, deer and ocelots, they were going extinct in this area" (C. Reyes, personal communication, July 2022). About 85% of the smallholders I interviewed in Pacoche in 2018 agreed with protected area regulations that prohibit hunting, demonstrating a huge shift for local populations in this regard. The most common justification for their willingness to comply on this front was that without animals, tourists would stop coming to the PA (Britton, 2018). However, only some agree that the PA brings benefits to the area. Carlos noted that "the community here in San Lorenzo claim that all the benefits of the PA go to Pacoche, but in reality, not one job in the protected area [referring to the park rangers] has gone to someone from Pacoche" (C. Chuez, personal communication, October 2022). When I asked Eluetario in our interview if he thought that the PA benefits the community, he responded in economic terms by saying,

> In reality, no. No one pays us for conserving it, even the area that is untouchable. The government should pay us – the comuna – to protect it, like the Socio Bosque program [referring to PES programs]…. Some people are getting paid for protecting forests in other areas, they get money from international NGOs. We used to make more money off of the *paja toquilla* and other products from the forest, now it's different…. In a perfect world, the *comuna* itself would be responsible for protecting the forest, but all the communities are so divided here so it is difficult. Every *comuna* needs to protect their own section and make their own rules (E. Mero, personal communication, November 2022).

This chapter has demonstrated how the celebratory discourses surrounding PAs and their emphasis on local participation in recent decades really play out in practice. The changes that accompanied PA management had direct impacts on local people's relationships with the land and natural resources, as well as their relationships with each other, and their connections to

cultural heritage. Study participants expressed frustrations and frictions brought on from these transitions, but also new opportunities for collaboration and participation in conservation action. The stories shared by community members living in and around the PA unveil the complex webs of human influence tangled up in conservation policies and indicate that while some benefits have come to the area, in reality, it is external actors such as NGOs, tourists, and wealthy business owners who benefit the most (Igoe & Brockington, 2007). In the next chapter I describe a particular incident and related stories that occurred during my fieldwork that reveal the complexities of power relationships between institutional players, PA residents, and myself as a researcher. My goal in recounting this story in detail is to shed light on the politics of knowledge sharing as well as the potential of local agency within a conservation context.

CHAPTER FOUR

Playing Politics: Knowledge, Power and the Role of the Media in Conservation Participation

This chapter uses the story of an incident described in my field notes to illustrate institutional control in action and relationships between state actors and local populations. Using the death of a study subject (*A. palliata*) as the catalyst for provoking change demonstrates how conservation *is* political and the unintended consequences of 'playing politics'.

The Electrocution of Felipe

It was 2:30 PM Wednesday, September 21, 2022, when we got the call from a panicked Ramón. A howler monkey had been electrocuted at the entrance to Pacoche Lodge. My heart sank. How could this have happened; we were just there this morning! And how could I not have noticed a dangerous wire? What individual was it… and from what group? In shock, Santi and I crammed our dirty, half-finished lunch plates into the fridge; there was no time to wash them. We threw back on the damp field clothes we had removed an hour earlier and scrambled to find the right gear to document the incident correctly. Do you have gloves? What about plastic bags, … a tape measure? Where is that damn luggage scale? We could use it to weigh the animal. Make sure you bring masks; we need to be conscious of potential disease spread. It was a mad dash, and I muttered under my breath, frantically stuffing things into my pack and scolding myself for not having an emergency bag already prepared. I banged my rubber boots on the floor to shake free any critters that might have crawled inside, pulled them on, still caked in mud, and ran out the door to join Santi, impatiently honking the horn from the road.

As we raced down the pothole-filled road in our beat-up 1992 Daihatsu, stalling at nearly every speed bump along the way, I thought how ridiculous that we have to rush to get there. The main reason for all the hustle was that we wanted to document the scene before the Ministry of the Environment, Water and Ecological Transition (Ministerio de Ambiente Agua y Transición Ecológica or MAATE) arrived. Despite my research permit and good relationship with many park rangers, we suspected that MAATE would show up and dispose of the animal, and we would never be able to access the incident data. When you find a wild animal that is sick, injured, or dead in the PA, the correct protocol is to immediately report it to the MAATE, especially when it is a large animal of critically endangered status like a mantled howler (*Alouatta palliata*). However, instead of calling the authorities, Ramón called us. This response has been a common occurrence in similar situations to date.

Ramón films everything with his phone. For years, whenever he witnessed something interesting, he sent me a video on WhatsApp to keep me in the loop and share his life with me, even when I was in Canada. This incident was the same. He captured shaky, poor-quality footage of the howler hanging from the power line and later contorting on the ground. It was horrible to watch and impossible not to react emotionally to the preventable death of a study subject.

As we pulled off the E15 highway into the gravel entrance to the lodge, Ramón, Adolfo (the owner of Pacoche Lodge), and Johnny (the maintenance worker living there with his family) stood over the body. The entrance to the Pacoche Lodge is a parking lot along the highway that feeds into a long, narrow driveway, once an ancestral public road for local farmers. A large green sign reading “Pacoche Lodge and Reserve” with a picture of a cartoon monkey hanging off the letters stands tall next to the parking lot, framed in a bamboo structure which holds it in place. The entrance to the lodge further down the 200m laneway was enclosed with a bamboo fence,

slats cut from the sides of the culms, held together with wire to keep intruders out. The double-door vehicle entrance is also made of bamboo. In fact, most of the outdoor infrastructure of the lodge is made of bamboo that requires replacing every few years as it rots quickly in the wet conditions of Pacoche.

I grabbed my gear and approached the scene, nervously aware that everyone was awaiting our arrival and expected that I knew what to do. I did not. I had never seen a dead monkey before, and looking at him lying there, stiff, canines protruding, eyes open, I felt overcome with emotion and completely flustered. I first explained that no one should touch the body without gloves and, if they had, to wash their hands. As it turned out, the incident occurred while a family of tourists was leaving, and one happened to be a doctor from Guayaquil. She tried to resuscitate the howler – to no avail – and was visibly very upset.

Ramón and Johnny explained how the howler had used the 20+ ft bamboo culms that had grown up along one side of the driveway as a natural bridge to access the *guaba* (*Inga sp.*) tree on the other side of the path. Howlers spend much time feeding on the leaves and long, skinny, pod-like fruit of this particular tree, locally referred to as *guaba de mico*. The fruit was not in season, but the leaves comprise a large portion of a howler's diet (Dias & Rangel-Negrin, 2014; Gómez-Posada, 2014). In the Pacoche Wildlife Refuge, like most bamboo-dense forests, there is little variety of native tree species (Ospina & Finegan, 2004), so a few tree types, like *guaba de mico,* form the majority of their favourite foods.

Somehow, the individual had managed to make it over top of the power line to reach the tree on the other side without electrocution. However, while feeding on leaves, he reached up unknowingly and grabbed the cable – that was that. The shock of the electrical current from the uninsulated wire was so strong it stopped his heart. He lay on the ground, both his hands charred

and frozen in a grabbing position. As we got a better look at him, particularly the blonde markings on his tail, we knew it was Felipe. He was one of the four adult males in a group of 27 howlers we call *Los Guapos* that move primarily throughout the edge forest around Pacoche Lodge and along the lower elevation of the Montana Verde trail. This group also has a juvenile female called "Limpy" that we once witnessed fall when coming down from the trees to access *guayaba* (guava) fruit on the ground. She now moves slowly, with a limp on her right back leg, likely broken from her fall. We have a lot of camera trap footage of this group crossing the Montana Verde road to access the fruit in the patch of forest on the other side. However, what befell Felipe and Limpy demonstrates that navigating these anthropogenic spaces can come at a high cost for arboreal species.

After calling the MAATE and alerting them to the incident, we all put on our masks and gloves, and Santi and Ramón helped move the body so I could examine it properly. My heart was pounding, and my voice in my hand-held recorder was shaky as I began documenting the essentials: length of body from head to tail, width of chest, missing teeth, other wounds, or botfly bites. Felipe appeared very healthy, and I photographed every part of his body. The final measurement involved placing Felipe in a garbage bag and weighing him with a luggage scale: 20.8 lbs – standard for a healthy adult male.

Based on our observations of this troop, Felipe was a more submissive member, lower in the group hierarchy, and was frequently found on the periphery. However, on some occasions, he was one of the first males to lead when crossing the road. We had also collected evidence of him mating with an unnamed adult female and rubbing his back on the same spot on a branch that the same female had previously scent-marked. While we were documenting Felipe's body, the troop remained nearby, scattered in the trees near the lodge's main building. They frequently wailed a

loud synchronized droning that consisted of a chorus of multiple females. A few adult males also chimed in, groaning in unison in what we assumed to be an act of mourning for their fallen troop member. Across the literature, primates have been documented exhibiting what has been described as vigil behaviours based on their proximity to a troop member's corpse for extended periods (Mittermeier, 1973). These reports are often supported by evidence indicating the relatedness of the subjects they involve (Gonçalves & Carvalho, 2019). According to Mittermeier (1973), an adult male howler (*A. palliata*) was reported to stay in the proximity of a female's corpse for five days, demonstrating a close relationship with the deceased. Fabiola, Johnny's wife who lives in the little cement house at the entrance to the property, said the noises made by the group when Felipe was electrocuted were so awful that she and her two children had to cover their ears and hide inside the house. This wailing went on continuously for at least half an hour. Once we arrived, the group retreated slightly deeper into the forest but continued to vocalize intermittently for over an hour. I wondered how a death like this would impact the group's social organization and regretted not having more consistent data on this particular troop.

As we finished our measurements, the MAATE arrived on the scene. Adolfo, the lodge owner, had called them, following our instructions once we arrived. A park rangers I had never met before walked up the driveway. He had been dropped off at the top of the road, hitching a ride on a local *camioneta* or pick-up truck taxi, the area's most common and economical form of transport. After introductions and explaining our hypothesis of how the howler had died, we discussed potential strategies regarding what could be done with the uninsulated cable and intercepting vegetation. As the main power line to Johnny's house, this cable crosses diagonally from the transformer on the other side of the two-lane road, cutting across the small island of forest edge between the road and land not owned by the lodge. This issue of ownership is an

essential factor in resolving this problem. In this tiny fragment, there is less than 5m of forest on each side of the highway, where *Inga* (*guaba)* and *Cecropia* (*guarumo*) trees grow, which entices the howlers to find a way to cross, putting themselves at significant risk. As a researcher, I wonder: in a forest full of foliage and many *guaba* and *guarumo* trees, why are howlers trying to reach trees in such a dangerous location? Research shows howler monkeys often take similar routes to access essential feeding and sleeping sites until those resources are depleted or the route is somehow disrupted (de Guinea et al., 2019).

The park ranger explained that his previous job had been with the electricity company, and we pondered how to replace or cover the wire most economically. Adolfo exchanged numbers with the ranger to discuss potential solutions. We all agreed that the only access point to cross the driveway was using the bamboo culms overhead; with the weight of a howler, you could easily see the culm bending and touching the cable. The best and most immediate temporary solution was to cut the bamboo down or at least keep it pruned so that the canopy connection was intercepted. Trimming other vegetation that brushes against the cable posts would also help ensure no access to cross here. The responsibility for this maintenance is a subject I will come back to later.

After a brief chat, the park ranger picked up the body bag to return to the office and properly dispose of it. He did not bring gloves, a plastic bag, or equipment to assess the animal. I wondered how it would have been done without documenting things ourselves. He also seemed skeptical that the animal had been electrocuted and kept asking us how we knew it to be accurate until Ramón showed him the video evidence. I inquired if they intended to do an autopsy and, if so, if I could access the data or be present at the examination. He responded aloofly, claiming he was unsure and would let me know. I have yet to hear from him. He left promptly, only about 10

minutes after arriving, with a plastic bag in hand, walking to hitch a ride back to San Lorenzo to drop off the body. I nudged Santi to offer him a ride so he would have a more secure way to transport the evidence, and the ranger gratefully accepted.

Once they left, I admit I was frustrated with the lack of professionalism, preparedness, and enthusiasm to act to find a solution. As everyone resumed their regular activities, I stood there with Ramón in the middle of the driveway, envisioning myself as a howler monkey and peering at the bamboo culms swaying in the breeze overhead. This past year, I have spent a surprising amount of time trying to think like a howler and anticipate their movements. I analyzed every possible crossing point that was so obviously a hazard that no one had done anything about. All aspects of our conversation while standing over Felipe's body were hypothetical. "Well, we could do this… and we should do that". But nobody did anything! The ranger said the MAATE would deal with the vegetation maintenance issue, but when? Why couldn't we cut down the intercepting culms and branches right now?

The problem was three-fold: 1) we are in a protected area where, on paper, the removal of any timber or non-timber product is prohibited, 2) the *guaba* tree and most of the uninsulated cable was on someone else's property and did not belong to the lodge, and 3) being in a protected area we must follow the correct protocol, putting the responsibility in the hands of the MAATE even while they expressed no urgency to resolve the situation.

Ten days passed, and action had yet to be taken by any party. My calls to the MAATE trying to secure a specific date and time to remove the bamboo proved unproductive. I was told to be patient, that "these things take time," and that the electric company, CNEL, had to be available to do the heavy lifting. During this time, Santi and I printed postcards picturing a healthy Felipe and a male white-fronted capuchin to distribute at a local community event in

Pacoche. The event was a rally for a mayoral candidate in the upcoming election for the city of Manta. During my field season, we did our best to attend every community event, especially in Pacoche. Handing out the postcards allowed us to introduce ourselves to more people, talk to them about our work and inform them about the most recent unfortunate incident with Felipe.

The *comuna* President, Cristóbal Reyes, who I referred to extensively in the previous chapter, was infuriated by the news. A stocky man with a short grey mustache (mid-lip) and buzz-cut of grey hair, his eyes and mannerisms were always very intense and animated. Identifying himself as Indigenous, he is best described as a man of the people who is well-connected in the area and is very passionate about ancestral territory and his cultural history. Cristóbal has supported our research since its inception, sometimes over-enthusiastically presenting us publicly as “the Canadians who have come to save the forest." I cringed each time he introduced us that way, and the introduction at this event was no different. He stood in front of an outdoor patio of around 150 people there to hear the political candidate speak. He pleaded Felipe's case to the crowd using extravagant language such as "murderers and "criminals" for extra emphasis to place urgency on the need for insulated wires in the protected area. While I always appreciate his passion and support for our work, he is sometimes prone to exaggeration. Of all the *comuna* members I have come to know in Pacoche, Cristóbal is one of the most outspoken. He is not afraid to speak out against corporations or institutions, and through networks in academia and the press he finds ways to have his messages heard. My impression of Cristóbal is that he is an innovative man who takes action and is tired of his people and their concerns being ignored by state institutions and people of power and influence. As a proud Manabitan with the spirit of a *luchador*, he finds alternative ways rather than going through traditional bureaucratic channels to try and provoke change. While this may mean using

confrontational language and sometimes even exaggerations, he uses the tools he has at his disposal to have his voice heard. His frustrations and use of tactics are understandable within the context of historical oppression and exclusion of the *montuvio* and Indigenous populations in coastal Manabí with whom he identifies. This contemporary marginalization continues colonial hierarchies, and the added pressures from large corporations, foreign investors, and urban expansion in the area exacerbate obstacles to his quest to protect his people and their ancestral land.

The day after the event, Cristóbal met us at Pacoche Lodge to observe the location of the electrocution and assist us in understanding the issue of land ownership of the property along the highway edge. According to Cristóbal, all land within this particular territory traditionally belongs to the *comuna* of Pacoche as ancestral land – citing the *Ley de las Comunas*. With this principle in mind, without knowing who the owner of the property was on paper, he permitted us to cut down the *guaba* tree and interfering bamboo culms to protect the howlers. He said, “if the MAATE has a problem, they can talk to me, this land belongs to the *comuna*, and it is our responsibility to take care of the wildlife there" (C. Reyes, personal communication, September 2022). Tired of waiting for bureaucratic processes and timetables to take action, and after two distressed phone calls from Ramón over the previous week reporting a group of howlers travelling near this intersection, with this permission, Santi and Ramón cut down the *guaba* tree. Later that day, with the help of Johnny and Gonzalo, a fellow *Pacochero* (an expert in bamboo who helps maintain the trails at the Pacoche Lodge), they safely removed the bamboo culms drooping over the power lines. This removal was not a simple task and involved some risk of electrocution. However, using their ingenuity and knowledge of bamboo, they were able to extract it without incident.

Afterwards, we all became hyper-aware of the amount of vegetation that had grown up along the sides of the highway – dangerously close to the powerlines. As we spoke about Felipe's story to study participants who live in the PA, they shared stories of howler monkey electrocutions they had witnessed in the past. According to Juan Delgado (JR, locally referred to as *Don Juan*), a well-connected American businessman and political player in the PA, the electricity company is obligated to trim back all the vegetation along the highway annually. They do this maintenance anticipating growth; however, cutting back this vegetation more than once a year is needed given the speed with which bamboo and other edge-thriving species grow. During this research project, the high frequency of howler sightings within 10m of the highway edge highlights the urgency of this issue.

The Unintended Consequences of Public Awareness and Engagement

To address these issues with the help of study participants, we created a short video to share on social media to educate the broader public about this issue and to ask for solutions to insulate the power lines. We made the video accessible in both English and Spanish and shared it widely across Instagram and Facebook. The short video was only a minute long and depicted images of a living Felipe feeding and travelling with his troop juxtaposed with images of his body post-electrocution. We were careful not to place blame on anyone in particular (i.e., the MAATE). Still, we did indicate that infrastructure in the PA should be built and maintained with the conviviality of people and wildlife as a priority. We never anticipated the consequences that would follow.

The video was released ten days after Felipe's death, and the response was overwhelming; with over 2,500 plays in Spanish within the first few days, the public reach was incredible! Within a matter of hours, we were flooded with comments of support and questions

about where donations could be made to help fund the insulation of the cables. After watching the video, JR contacted me – his tone was wrought with concern as he explained the political repercussions of the video's broad circulation. JR and I had built a friendship throughout my time working in the PA, and he always expressed a keen interest in my research.

The dissemination of the video reached the Ministry of the Environment's head office in Quito, and the local Director was under a lot of pressure to contain the situation. Even though the content never directly blamed the MAATE, the video was interpreted as “bad press” or even an attack on a governmental institution. We were asked informally to take it off social media and run any future plans to share content like this through the MAATE for their approval first. Our efforts were viewed as counter-productive to the cause because it did not pass through the "proper channels." In JR's messages, he provided some advice in a calm voice:

> Things here, particularly political, have to follow a certain protocol. You don't jump to the top; you have to work your way up the chain. If it comes from the right people properly, then it has credibility. You can be involved; you are getting your Ph.D. collecting data, you are the boots on the ground – you have credibility in that sense – but the insulation of the cables has a high cost to it, so you have to push it up the chain through making alliances in the middle, and favours are done through relationships with the people who work there. They'll call their friends (J. Delgado, personal communication, October 2022).

As the mediator between myself, CNEL, and the MAATE, JR called a meeting to discuss a solution. "We need to clear the air," he said. “We don't want other people entering and sensationalizing things." We met at his kitchen table in San Lorenzo, a small beachfront *comuna* in the middle of the PA, and JR served his famous Dos Monos coffee, grown on his 100-acre shade-grown coffee farm on the ‘mountain.'

The meeting was productive. The MAATE Director explained the national movement towards co-responsibility within the public sector to achieve sustainable development through respect for natural resources. She used this point to branch into why coordination between the MAATE and CNEL is a shared responsibility and referred to a previous collaborative project in

the PA in 2016. This project involved the installation of prefabricated braided ropes over a 600m stretch along the highway in the middle of the park to protect wildlife from coming in contact with powerlines. “This *cable trenzado* [braided cable] – was an administrative achievement," she boasted. She also confessed that the project was approved, without any previous data collected on wildlife electrocutions, as part of a political campaign in the area. She requested that CNEL invest in expanding this protection to the entire 22km of powerlines along the E15 highway in the protected area, phrasing it as a new opportunity for “us” to set an example. Due to the cost of such an endeavour – being double that of a standard cable – we collaboratively agreed to each take on a particular “homework task” as part of a work plan to start replacing cables in specific targeted areas of the park. In addition to the privilege of being included in such an essential plan of action, what was particularly memorable from this meeting was the sharp distinction, highlighted by the Director, between a ‘conservationist’ and an ‘animalist' approach or ethos. As she explained:

> We are conservationists because one thing is to be a conservationist, and another thing is to be an animalist. For example, one becomes an animalist when something in nature dies for some reason, and you want to save x individual, knowing that according to the veterinary protocol or the law of nature, that animal has to die or complete its cycle. And a conservationist is when you analyze the components of the situation or other related factors (Director, personal communication, October 2022).

While death from electrocution of powerlines is hardly a natural cause, she felt the need to distinguish between a conservationist and an animalist (animal lover) because of the political repercussions of the media coverage. In response to the video, she received dozens of concerned and even furious phone calls, some making exaggerated claims that “hundreds of howlers are being electrocuted." She explained that "someone got ahold of this video that wants to do damage to all of us. I am still hurt. We were all ruined. I know the video's objective was to raise

awareness, but it also created political pressure on the Ministry of the Environment and CNEL" (Director, personal communication, October 2022).

Reflecting on this meeting as a response to the video, in general, exposes the vulnerability of state institutions to public pressure and the power of images to incite action. With these achievements in mind, specific anthropological themes emerge from this situation that are worth examining – particularly regarding knowledge and power. While not its original intention, the video was seen as a threat to hierarchical power structures maintained through the exclusivity of participation, access to information, and boundaries that define what does and does not count as credible knowledge (Haraway, 1988). Including the public in this circulation of information weakens institutional control over the narrative. A similar circumstance was witnessed numerous times when smallholders would film or photograph roadside animal mortalities with their phones and be asked by authorities to put their phones away. From my perspective, the narrative that local populations are the drivers of deforestation and biodiversity loss is much more advantageous to institutions. It allows them to position themselves as key conservation actors and saviours of endangered ecosystems rather than sharing this responsibility and credibility with local people. Keeping things under state control in this way is a form of what Woods (1999) would categorize as "green territorialization." Woods (1999) describes this concept "as a way to explain the mix of motivations for protected areas…, the mechanisms for the green grab, and what it means on the ground politically in these contested forests" (Woods 1999:2). Green territoriality is intertwined with the concept of state territorialization in the sense that each seeks "to establish legal state claims over geographic space, whether to exclude some populations or to organize and control the extraction of economic benefits from the area" (Woods 1999:2, *also see* Peluso & Vandergeest, 1995). By contrast, a decolonial approach would

require attributing the drivers of biodiversity loss to systemic and broader political-economic causes including inefficient and inaccessible bureaucratic systems, the prioritizing of modern development and urbanization/expansion over natural resource protection, a lack of coordination between policymakers/enforcers and practitioners, poor allocation of resources from state actors, and, of course, the interests of large foreign corporations/enterprises and outsiders looking to make a profit.

Much of the dialogue and advice I received from the 'top down' regarding the video and my research, in general, has been to keep my findings to myself until I complete my study. However, this advice contradicts my methodological objectives of using a community-based approach, defined by its transparency, accountability, reciprocity, and co-design alongside study participants. The disregard of local people's contributions to conservation as "unscientific" and ineffective is bound by rigid definitions of conservation action and credibility (Berkes, Folke & Gagdil, 1995). Additionally, this advice perpetuates displays of historical legacies of power evident in the systematic lack of trust between state institutions and rural populations. Being advised to remain 'objective' through the "conservationist/animalist" distinction is one way of voiding the emotional-human response and viewing it as 'unscientific' or 'unprofessional'. Drawing these boundaries establishes a hierarchical position associated with formalized institutions as the gatekeepers of positivist knowledge – and, in this case, conservation practice. In her work on *Situated Knowledges*, Donna Haraway (1988) explains that what counts as knowledge is policed, and she reminds us to be conscious that "objectivity threatens collective historical subjectivity, agency, and embodied accounts of truth" (Haraway, 1988:578).

The concern with keeping information within a tight-knit circle and abiding by the correct bureaucratic protocol is that it enables institutions to exercise power and control over the

narrative being circulated for reasons not necessarily tied to the conservation of endangered species. Excluding non-institutional actors from participating in the conversation and devaluing their perspectives as lacking credibility are ways of silencing less formalized communication channels. While understanding how institutional processes function is vital to navigating the political conservation sphere, it also highlights the systemic ways in which certain excluded actors are disregarded and discredited for attempting to play the game.

Conclusion

The story of Felipe illustrates how bureaucratic processes sometimes function more to protect their internal structure and credibility than the wildlife they were initially designed to protect. Nature operates on a very different time scale than human-made institutions, and unfortunately, wildlife often ends up being the collateral damage of our inefficiencies. Whether ‘conservationist’ or ‘animalist,' it is our responsibility to find convivial ways to coexist with others, human and nonhuman alike, in a shared and endangered ecosystem. Perhaps we can meet these challenges by opening spaces for other types of approaches to practicing and understanding conservation.

The conservation of our primate relatives is inextricably linked to our own human relationship with nature and the political-economic and social contexts in which people live. The findings and projects addressed in the previous section acknowledge and address the barriers to conservation participation and the historical roots of some of these obstacles. These results also reveal study participants' resiliency, adaptability, and valued contributions to help illuminate the path forward through community participation in research and conservation action. Overall, this chapter has demonstrated that conservation is not only a political process fraught with negotiations and sometimes misunderstandings, but it can also provide opportunities for

collaboration between different actors and the creation of new ways of participating and thinking about the protection of endangered species and landscapes. The conservation of species does not exist inside a bubble but as part of the messy interconnections of human and nonhuman lives. Understanding the complex socio-cultural, economic, political, and historical realities of this particular biological hotspot provides a more holistic perspective of the conservation context and how best to move forward through honouring *montañeros* strong sense of regional identity in connection to the land and natural resources. The aim of the next two chapters is to explore an 'anthropology beyond the human', where human and nonhuman worlds collide—into the world of bamboo.

PART III:

Convivial Connections between People and Primates in Bamboo Landscapes

CHAPTER FIVE

Human-Bamboo Relations: Smallholder and *Bambusero* Perspectives in the Province of Manabí

By: Tamara Britton, Zoe Pearson, and Mina Moscatelli

In his novel *The Golden Spruce* John Vaillant (2005) discusses the importance of trees, particularly as a resource for the logging industry in the development of North America. He claims that "trees represent the bones of our collective body" (Vaillant, 2005:83) as an eloquent way of saying that throughout human history our species has been dependent, to varying degrees, on wood as a main source of fuel, light, transportation, shelter, clothing, and food. The same could be said for bamboo, particularly in tropical environments such as coastal Ecuador where bamboo is a commonplace material with a long history of human use. Today, the utilitarian value of bamboo as a building and artisanal material makes it a symbol of Ecuador's coastal region particularly in rural areas where it is used for just about everything, ranging from homes, fences, support beams, animal pens, shelters, posts, vases, lamps, and even furniture and bicycles, to name a few. Given its importance as a prime building material, we like to think of bamboo as representing the "bones of the collective body" of the coastal region.

Bamboo can also be viewed as a weed species, invasive and disruptive to the forest ecosystem. Despite human intervention, even managed bamboo groves maintain a certain natural unruliness about them. Bamboo does not typically grow in neat rows like cultivated pines and many other tree species do. Instead, it grows unpredictably, its rhizomes clumping or running, or *both* like in *Guadua* species. It sprouts up where it pleases, a lot like human beings. As its rhizome expands, it stretches out underneath the forest floor, at times poking through the soil,

invading open spaces in the canopy, searching for light, and pushing out other species, resembling our own human behaviour in many ways.

Anthropologist Ana Tsing (2019:33) argued that “we live in a world of weeds, a world of human ecological disturbance that stretches around the planet”. However, it is precisely this disturbance that provides new opportunities for things to grow, both ecologically *and* socially. This chapter will show that bamboo is much more than a weedy species. It is also part of a culture and an imagination, used for a remarkable number of everyday objects and exchanges. These objects, particularly those made from the raw materials of our immediate environments, are important signifiers of what makes us human. In the field of economic anthropology this can be referred to as the “social life of things” (Appadurai, 1988). Objects, like humans, might be described as having rich "social lives", meaning that they take on, and simultaneously perpetuate different roles and values. Appadurai (1988) encourages us to look at ‘things’, like bamboo, as essential to the social relationships and constructing identities of those participating in the exchange process.

In coastal Ecuador bamboo is a raw material with historical and contemporary importance to people, society, and ecosystems. As discussed in the introductory chapter, the commodification of bamboo has been promoted globally as part of the green economy. Many see commercial bamboo cultivation as a nature-based solution to provide climate smart income to those living in conditions of rural poverty (Lobovikov, et al., 2012). The same argument has been made in Ecuador for over 20 years now (Cleuren, 2006; Cleuren and Henkemens 2003; FECD, 2009; INBAR, 2018; MAGAP, 2019). While there are several (diverse) existing markets for bamboo, the promises of large-scale economic growth or poverty reduction through the development of a commercial bamboo industry have not been realized in any meaningful way,

despite ongoing efforts, desires, discourses, and actions. In this chapter we are less concerned with the prospects for development with bamboo (although that is where our research interests originated) and more interested in elaborating the various ways in which people in coastal Ecuador currently engage with bamboo—both in light of and despite this ongoing discourse about the promise of bamboo for rural and national development. In doing so, we recognize that the 20-plus years of development discourse surrounding bamboo have impacted those engagements, and the data is discussed in reference to these discourses. Human-bamboo relations matter for better understanding and respecting the "social life" of bamboo in this place, particularly given the context of the work done by implicating bamboo in discourses surrounding development. We are therefore concerned with recording the importance of bamboo in peoples' lives today, whether or not the speculative 'bamboo boom' ever comes to fruition.

In what follows we begin by explaining our research methods for this portion of the dissertation. We then present a brief description of the historical value of bamboo in coastal Ecuador. In the remainder of the chapter, we consider the role of bamboo in the lives of what we have found to be the two main actors in the story of human-bamboo relations—smallholder farmers and *bambuseros*[20]. We discuss each in turn, sharing the ways that the individuals associated with each of these groups discursively and materially produce their relationships with bamboo. In doing so, because it was relevant to findings on the relationships of people to bamboo, we address the potential implications of these relations for current and future development with bamboo, as well as the barriers that might impede such development.

[20] "Bambusero" – is defined by participants as a certain self-proclaimed collective identity or 'kinship' among anyone formally engaged in the bamboo economy sharing a passion and pride for bamboo development, and/or a preference for the use of bamboo as a material.

Data Collection

The data presented in this chapter are the result of multi-sited research and semi-structured interviews carried out in the coastal Ecuadorian provinces of Manabí and Pichincha from September 2021 to July 2023 (see the introductory chapter for more on the methodological approach followed by all authors). Interview participants were largely smallholder farmers and *bambuseros*, but other actors, such as local government officials, bamboo processing centre employees and bamboo homeowners were also interviewed. The interviews were conducted in Spanish by Tamara Britton, PhD Candidate, Anthropology and Centre for Environmental Sustainability, University of Western Ontario; Dr. Zoe Pearson, Associate Professor, School of Politics, Public Affairs and International Studies, University of Wyoming; and Mina Moscatelli, MA, during different visits to the region across the two-year period. Tamara conducted interviews across the entire period from September 2021 to July 2023. Mina and Tamara conducted interviews together and separately during November and December of 2021. Zoe and Tamara conducted interviews together and separately during the summer of 2022. All three authors are part of a larger group of researchers and non-profit experts from Ecuador, the United States, and Canada[21]. This research group has been working together on a four-year interdisciplinary project on the current ecological, economic, social, and political context of Ecuador's bamboo industry. The entities that have provided funding for this project include the Centre for Global Studies (CGS) and the School of Politics, Public Affairs and International Studies (SPPAIS) at the University of Wyoming, The Conservation, Food, and Health Foundation, The Social Science and Humanities Research Council of Canada (SSHRC), as well

[21] We thank our main collaborators Lucas Oshun and Xavier Haro-Carrión.

as The Department of Anthropology at the University of Western Ontario. This research has IRB (Institutional Review Board) approval through the University of Wyoming and the University of Western Ontario (*see Appendix A and B*).

History of Bamboo Use in Ecuador

Ecuador contains 42 of the world's bamboo species, eleven of which are endemic to the country, and four of which are varieties of the *Guadua* genus (MAG & INBAR, 2018). According to a land cover assessment study in 2018 by INBAR (The International Organization of Bamboo and Rattan) and MAGAP (Ecuadorian Ministry of Agriculture, Livestock and Fishing), the province of Manabí contains the highest quantity of bamboo, or 24% of all the country's natural bamboo resources. These groves typically grow along ravine edges, steep cliffsides, and are dispersed in small patches across smallholder properties, making them largely inaccessible for human extraction. Most of those within human reach are said to be dangerously overharvested (S. Triviño, personal communication, June 2022). Due to its extraordinary mechanical properties, as the third largest bamboo species, *Guadua angustifolia* is often referred to as "green steel" or "vegetable steel" and is commonly used as a timber substitute in many Latin American countries (Borah et al., 2021). In Ecuador, estimates value the domestic bamboo industry at approximately $90,000,000 USD annually (Añazco & Rojas, 2015).

The history of the preference for *Guadua* bamboo as a building material is tied to the cacao expansion period during the 18th and 19th centuries (Priego et al., 2018). Priego et al. (2018) claim that the influx of European settlers during this time influenced the mixing of bamboo and wood and gave rise to a new style of architecture, called "cacao architecture", that became particularly popular in the southern part of the province of Manabí, and so emblematic of this era and of the province's cultural heritage (Hidalgo Zambrano et al., 2023).

As mentioned in the introductory chapter, Ecuador became the world's largest producer of cacao during the late 18th to early 19th centuries (Pineo, 2008) which completely restructured rural spaces and expanded urban centres across the coastal region. As demand grew for the high quality cacao grown in Manabí, cacao development exploded in regions suited to its production (Zambrano, 2020). As Priego et al. (2018) argue, Ecuador's booming economy at this time brought the reformation of the Ecuadorian state and new cultural paradigms in the coastal region. These paradigms were thus very much rooted in the availability of raw materials and made visible through architectural styles during this period—highlighting the cultural connections between *Guadua* bamboo and cacao. Some examples of cacao architecture have been preserved as heritage buildings and exist today in the cities of Portoviejo and Jipijapa.

Using *Guadua* bamboo as a dominant building material for domestic structures was common across the Pacific coast of South America, from Colombia to Northern Peru, since before the colonial period (Hidalgo Zambrano et al., 2023; Moran Ubidia, 1985). Traditional *casas de caña*[22] not only used whole round culms as support beams but also culms sliced into strips, called *latillas* or *caña picada,* for the walls. These homes often mixed bamboo with locally sourced wood such as "Guayacan" (*Tabebuia guayacan*) and "Algaroba" (*Prosopis pallida*) for pillars, "Laurels" (*Lauraceae*) as a common choice for flooring, and *cade* palm leaves (*Phytelephas aequatorialis*) or *toquilla* straw (*Carludovica palmata*) woven together to form the roof. *Guadua* bamboo is still considered a staple material for construction, however as of the 1950s the traditional *casas de caña*, representative of the coastal region, began to be replaced by housed made of other building materials, such as concrete, that remain the dominant choice for domestic structures today (Cleuren and Herwig, 2006). *Casas de caña* have largely

[22] "Casas de caña" refers to traditional bamboo houses.

been phased out in urban areas and newer developments due to the risk of fire. In urban centres like Guayaquil and Manta, the use of the material has been prohibited according to building safety codes (Priego et al., 2017).

It is interesting to note that while “cacao architecture” was once linked to the emergence of a bourgeoisie class that grew in economic power and influence during the cacao “gold rush period”[23] (Pineo, 2008), since the introduction of newer building materials *casas de caña* have instead become associated with rural poverty. While some revitalization projects have aimed to protect old bamboo heritage buildings as cultural patrimony and part of the tourism industry in the coastal region, Priego et al., (2018:98) refer to traditional *casas de caña* “as "invisible heritage" because of their modern-day association with poverty and rural classes due to the commonplace and poor-quality reputation of the material. This is because like all other organic materials, bamboo requires regular maintenance to remain in optimal condition. Many of the traditional *casas de caña* that exist today, have not been well-maintained adding to the negative reputation of the material.

These historic examples demonstrate how the social life of bamboo has shifted according to socio-political and economic trends, taking on different meanings over time. This theme of the shifting value of bamboo will be revisited again in the upcoming sections. The next section uses an ethnographic approach to present data from interviews, and a community workshop on bamboo harvesting practices**.** These data are used to analyse changing relationships of smallholder farmers with bamboo in the coastal Manabí province and within the context of the Pacoche Wildlife Refuge.

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[23] Cacao was often referred to as the pepa de oro—or golden seed (gold rush period = cacao boom).

Smallholder Relationships with Bamboo in Coastal Ecuador

Smallholders are typically considered to be rural landowners who practise diversified farming on small scale farms (*fincas*) in order to meet subsistence needs and make a living from selling what they produce (Netting, 1993: 2). There is a large population of smallholders in Ecuador's coastal Manabí province, in both non-protected areas and protected areas, including the Pacoche Wildlife Refuge. Many coastal Ecuadorian smallholders self-identify as *montuvios* and/or *montañeros*[24], meaning a coastal Ecuadorian mixed-race "peasant" or farmer (Bauer, 2012) (Refer to introductory chapter for a more detailed definition.) This group of smallholders is important to consider because *Guadua* bamboo grows naturally on their rural properties. The following findings, which combine semi-structured interview data with detailed ethnographic stories provided by a few protagonists, highlight the relationship between smallholders and bamboo, showcasing the small-scale practices surrounding bamboo, the historical and cultural importance of bamboo, its environmental value, and the challenges or barriers that smallholders face as targets of bamboo development discourse.

Importance of Bamboo in Smallholder Livelihoods

Upon arrival at the Pacoche Wildlife Refuge there is something enchanting about the bamboo forests that make up much of the terrestrial protected area. Hidden beneath a blanket of mist and epiphytes, the bamboo culms tower over much of the vegetation, swaying in the breeze, cracking as they dance across the sky. It is a two-way street where the bamboo, mixed with other forest vegetation—such as enormous strangling figs and balsa trees—trap the condensation that

[24] A self-identified occupational term used specifically by smallholders in the Pacoche Wildlife Refuge who own or work agroforestry plots (on what they refer to as "the mountain") for primarily subsistence production and the harvesting of forest products.

rolls in over the coastal foothills. This moisture creates a constant rainy climate found here most of the year and makes the foliage thick and green; the ideal environment for *Guadua angustifolia* to thrive. These bamboo forests once extended much further than their current range and "earliest archaeological sites" have yielded evidence of the historical use of bamboo in the coastal regions of Ecuador (Parsons, 1991: 133). From these archaeological sites, we know bamboo has been harvested and used by humans dating back to pre-Columbian settlements in the area – frequently depicted in dioramas of the Manteña-Huancavilca (500–1532) culture at local museums. The region surrounding the Pacoche Wildlife Refuge is one of the longest-occupied regions of Ecuador's coast. Embedded within a rich cultural history, many *montañeros* proudly share that the entire old city of Manta was once built out of bamboo from the forests of Pacoche. The president of the *comuna* of Pacoche, Cristóbal Reyes explained,

> Prior to the 1960s there was no road through here connecting us to Manta, but all the products to support the growing population came from here in the mountains of Pacoche [referring to bamboo, *toquilla* straw, *panela* sugar, coffee, bananas and *yuca*, mostly]. Because there were no roads, all of these products had to be shipped by *balsas* (rafts) through Rio Cañas up the coastline. *Balsas* were made of up to 3 dozen bamboo culms, …the tip of the bamboo was cut into tips to break the waves and had the capacity to carry up to 80 dozen culms to Manta for the construction of homes and businesses". He continues, "Manta was a zone of sale for the area, all the buildings were made of bamboo —it was good money back then, and a major port for the local economy. There were many specialists in the area that were experts at cutting and selling bamboo that was vital for the development of Manta (C. Reyes, personal communication, September 2022).

Cristóbal was referring to the historical importance of bamboo as part of the collection economy (discussed in Chapter Two), based on an exchange of payment for the collection of natural resources, that continues today. This form of extractive agriculture was directly connected with the boom-and-bust cycles of products like cacao, *toquilla* straw, *tagua*, coffee and rubber, that historically marked the way of life for *montuvios* in Manabí and remained a dominant occupation in the area until the mid-20th century (Redclift, 1978). Other coastal Ecuadorian smallholders

agreed that bamboo plays an active role in their *viviencias* (livelihoods) and that it was directly connected to both their *historia* (history) and *cultura* (culture).

A proud *montañero,* Gonzalo owns several small plots of land in the Pacoche Wildlife Refuge where he cultivates bananas, plantains, coffee, cacao, and *toquilla* straw, but his most frequently used plot is where he harvests *caña Guadua*. Following Gonzalo on the short walk to his property, the gravel road descends into a muddy livestock trail, steep and full of slippery boulders. Inherited from his father, Gonzalo's property is tucked in behind a high rock wall that gradually slopes down into a deeper ravine. Smack in the centre of the *guaduales*[25] we must be careful where we step so as not to get a nasty thorn through our boots. When you come around the bend, beneath the shade of a gigantic *Ficus* tree, his property opens the canopy where over the years most of the large trees have been removed. Now, all that remains are bamboo culms connecting the few remaining old growth trees scattered around the property. The undergrowth here has been cleared, leaving stumps of cut down *caña* and thick roots of new growth pushing out of the soil. The ground here is covered with a coating of bamboo leaves that fall from the branches, and Gonzalo explained that if it weren't for the help of his sons—who do so begrudgingly—this land would not be maintained. Like many other farmers we speak with, he frequently shares that he wants to sell his land because it is just too much work for him and not enough payoff.

Gonzalo was one of the few smallholders in Pacoche who still occasionally sells *caña Guadua* and has been doing so for decades. In general, very few smallholders sell bamboo as a dependable source of income. Instead, they trade it with neighbours and friends for a small fee or at no cost, viewing it more as a *regalo* (gift) to be shared with others as needed. Nonetheless,

[25] A commonly used local term referring to *Guadua* bamboo groves also called *manchas* or clumps of bamboo.

Gonzalo's process, like the other smallholders we have worked with, is based on ancestral traditions and generational knowledge he learned from his father and grandfather. Many of the participants throughout Manabí stressed similar sentiments—that they had learned bamboo harvesting techniques and traditional uses for it from their ancestors, who passed knowledge down generationally, usually from a grandfather and/or father down to their young children. At the age of 66, Gonzalo is considered a local expert on the theme. We accompany him as he collects and drags out two six-metre culms he had cut the week before and left on the ground to drain. Despite the commercial regulations that state bamboo should never be left on the damp ground at the mercy of the elements once cut, nor should it be dragged to avoid damage (Durai & Long, 2019), this is the way smallholders have been harvesting bamboo here for centuries. Gonzalo brings his trusted mule María to do the heavy lifting, snuggly attaching one culm to each side of her saddle for the trek back to Pacoche. The culms lay in a pile of a dozen or so for weeks at a time, as he removes two each day (on days he has time off from his other work responsibilities) dragging them back home. Gonzalo uses his machete as a pointing device and demonstrates how and where on the culm the cut is made. "You cut here (indicating just above the second node), and on an angle like this" he says, tilting the machete on its side and gently striking the bamboo to show us. Looking around at all the stumps on his property, it is easy to see how he employs this technique. While Gonzalo is not much of a talker, based on other forest follows with smallholders extracting bamboo, it seems this was a common way of harvesting bamboo. Lupito, another proud *Pacochero*, explains that you cut on an angle so that the culm falls in the direction that you want. Other smallholders across Manabí had slightly different techniques for cutting down bamboo, stating it should be cut at various node (bamboo rings) lengths from the bottom. Some preferred to cut the bamboo at an *angulo* (angle) while others said it was better to cut it *recta* (straight). There was no one consensus about where and how to

cut down the bamboo plant amongst smallholders, however, all of the practices shared had been passed down from generation to generation and were meant to keep the bamboo plant healthy for future benefit and use.

Ramón, another *Pacochero,* shares his technique of cutting on an angle a little bit on both sides to make sure the culm does not split when it falls. This cut, done with a freshly sharpened machete blade, is nearing the last step in a selective process that begins with the lunar rhythms and tidal cycles. The practice of harvesting bamboo during the waning moon (*menguante*) was another point of consensus amongst coastal Ecuadorian smallholders that were interviewed in different parts of Manabí province. The age-old practice of performing agricultural activities according to phases of the moon comes from the belief that the moon controls moisture in the soil and is standard practice to ensure the longevity of the culm. A few farmers in Pacoche have the Old Farmer's Almanac, an annual publication that can be purchased in Manta at any agricultural supply store and contains valuable information on weather forecasts, planting charts, and astronomical data, etc. They share the information with each other about which days of each month are during *menguante* or the waning moon, a time when the tide is low, and correspondingly, so is the level of water inside each node. Generally, this only occurs for up to five days per month and even then, farmers will typically only do the harvesting early in the morning. Bamboo culms not only drain much of their water at this time, but also the sugars and starches that accompany the water are at a lower point (INBAR, 2010). Thus, cutting the culm at this phase during the moon cycle means that there will be a lower likelihood of sugars attracting insects (*la polilla*) that tend to eat the bamboo from the inside out. By following this regimen, also practised in other parts of the world, farmers can help extend the lifespan of a harvested culm. As treating the culms with borax and boric acid solution is a recently introduced practice

only used for some commercial bamboo, this lunar phase practice is the most economical and natural way to protect the bamboo from infestations.

Ramón demonstrated the water-holding capacity of a bamboo internode on one of our hikes. He slashed his machete carving out in V shaped nook into the stem cavity in the exodermis and motions to the trickle of water that streams out. He leaned forward and took a drink, saying ’you'll never run out of water here in the forest with all this bamboo around” (Flores, R., personal communication, n.d). He also mentioned how nodes can be used as portable water bottles called *canutos* for farmers travelling to and from their properties on the mountain. The importance of water in connection to bamboo was consistently mentioned by coastal Ecuadorian smallholders who repeated the message that “*donde está la caña está el agua*” (where there is bamboo there is water) (Mariana, personal communication, December 2021; Victor, personal communication, November 2021). Everyone seemed to know instinctively that bamboo is vital for maintaining water and humidity within the surrounding environment, and yet, no one could recall how they had learned the information shrugging it off as mere common knowledge.

Smallholders also report a number of other common practices inherited from their fathers and grandfathers that are considered to be important to ensure the health of the bamboo groves (*manchas*) on their properties. In both interviews and community workshops, smallholders commented that most youth in the community do not have knowledge of bamboo maintenance and harvesting like previous generations and are generally disinterested in learning because of the lack of profitability and the amount of labour required for these tasks. The cardinal rule when you ask any smallholder about bamboo harvesting is that the culm must be mature (*hecha*). Culm maturity is identifiable by the uniform dark green colour of the culm, the absence of white bands between the nodes, the presence of mature branches and leaves, and, most importantly, the

presence of lichens or white spots on the culm – as an identifier of age. While, commercially speaking**,** bamboo is said to be ready to harvest at around four to five years of age, and expired past seven years (INBAR, 2010), getting an age estimate from smallholders was inconsistent. This inconsistency is because the bamboo grows wild with low maintenance, unlike bamboo that is regularly harvested or from commercial plantations where management plans document the exact age of each culm. During a participatory workshop on bamboo harvesting with 25 smallholders in Pacoche, the consensus was that culms are ripe for harvest between two to four years of age.

We later learned that if the lichens begin to grow at "belly button height", that typically means the bamboo is commercially viable (Triviño, S., n.d). However, in humid environments like the Pacoche Wildlife Refuge, it is also possible that lichens grow earlier in the process in comparison to other ecosystem types. Harvesting bamboo too young not only results in a higher sugar and starch content and less structurally sound culms for construction purposes, but it also harms the bamboo plant as a whole over time. Cutting young culms results in future generations from the same plant growing much thinner in diameter and less plentiful. If this is done repeatedly, the plant will eventually stop producing altogether (Durai & Long, 2019; Londoño & Riaño, 2002).

Other common practices shared by smallholders in Pacoche (and elsewhere in Manabí) indicate the undergrowth **(***malesa*) around the bamboo grove must be cleared to avoid root rot from the dampness of the organic material. This also makes the culms more accessible and safer for smallholders as there are fewer places for venomous snakes to hide—such as the notorious *equis* pit viper. Clearing the undergrowth around the rhizome structure is done manually using a combination of a machete and a *gancho* (a hooked tool made from a branch). One tool is to cut, and the other is to pull the weeds aside to make sure there are no snakes hidden beneath. This

practice makes the forest in these areas look much more open even though in bamboo-dense areas little light reaches the forest floor, meaning that there is generally less undergrowth in these forest types. Smallholders also cut back or remove all the branches of their chosen culm, and those that are in the way, for better accessibility. The thorny nature of the *caña brava* makes it quite unpleasant to work with; removing these thorny branches makes the job much easier. Smallholders are careful to lift and dump the branches to the side as they work so they do not clutter their path and accidentally step on a thorn. Once the desired culm is accessible, the literature on sustainable *Guadua* harvesting (Añazco & Rojas, 2015; Durai & Long, 2019; INBAR, 2010) claims that culms must be extracted in a t-cross section or horseshoe pattern, targeting those in the centre of the grove and leaving the rest. Our observations confirm that while smallholders do not deliberately follow these guidelines they do tend to extract in a horseshoe like pattern. Also, because the quantities smallholders are removing tend to be low—up to a few dozen at a time usually—most culms in a grove are left untouched. This point is important because leaving some mature culms in each clump helps to protect the younger culms from weather damage. Sustainable harvesting guidelines state that only 30 to 40% of all mature culms should be harvested from each grove (INBAR, 2010). *Guadua angustifolia* is a clumping bamboo, but it tends to grow more spread apart than traditional clumpers (Londoño & Riaño, 2002). While some culms might grow side by side, the entirety of one grove can stretch over 10 to 15 metres in diameter. When removing culms within proximity of others, inevitably there are some casualties (Gómez-Posada, 2014). Given the 20 to 25m height of some pieces, they often get caught in the vegetation and need to be pulled down manually. This process does cause some damage to nearby culms and surrounding vegetation, but from my many observations of this activity in Pacoche, the damage is minimal and much of the forest regenerates very quickly.

Returning to an extraction site several weeks later there is little evidence except the leftover stumps.

Across all interviews, the average number of culms removed at one time was two to four *docenas* (dozen). Rarely did anyone report needing more than four dozen for a building project. Most of the structures built were smaller in size, used *caña picada*, or only a few culms here or there to replace rotten ones. Part of the reason for the low impact of this practice is that typically the harvesting job is done by one or two men, and the hauling by one or two mules. Given the restriction in days per lunar month adequate for harvest, there is not much time for the laborious task of larger orders. Women are often involved in the process back at the homestead in helping with the stripping and cutting of the pieces; no women in Pacoche are reported to participate in the harvesting of bamboo. In other parts of Manabí, women were generally knowledgeable about the harvesting process, but men were predominantly the physical labourers in practice.

Many study participants indirectly asserted their role in forest conservation through anthropogenic use, stating that the cutting down of old bamboo culms is crucial for overall forest health. They contend that if the stalks are left to rot, they will infect all the surrounding foliage, thus the regular maintenance of extracting older culms and cleaning up the brush around the base to help promote healthy forest growth. Perhaps the *montañeros* who extract bamboo in Pacoche could be said to have a similar convivial influence on forest structure as the howler monkeys that share these ecosystems. Howlers are often referred to as “forest gardeners” pruning the trees as they move through the foliage feeding and searching for young leaves and buds. Smallholders never directly connected their harvesting practices to sustainability; however, the highly selective nature of their work suggests that while *montañeros* are having an impact shaping the ecology of the bamboo forest, this impact is largely positive and intentional in how it encourages the growth of new culms on their properties.

Community Monitoring of Bamboo Forest Resources

On a typical Saturday morning, the four of us were sitting around a rickety wooden table under a brambly twisted *barbasco* tree in the Reyes backyard, drinking coffee and eating oranges from a neighbour. With roosters crowing, dogs barking, and one random giant turkey roaming the fenced in property, Cristóbal, Lupito, Santi and I talked about how a formal legal complaint was recently placed against a *montañero* for extracting bamboo from a public area along the river's edge. "You can't cut anything near water sources, or on communal (public) property, everyone knows this", Cristóbal asserted. As *guaduales* often concentrate along ravine edges they play a vital ecological role in regulating water sources and protecting riverbanks from erosion. These ecological benefits can be attributed to the interwoven rhizome structure of bamboo that helps to provide sediment retention and maintain natural retaining walls along waterways (Añazco Romero, 2019; Muñoz-López et al., 2021; Yiping et al., 2010).

Cristóbal explained that when there is evidence that someone has harvested bamboo in one of these "no cut zones", a complaint is reported to the President of the *comuna* for enforcement. However, the news also becomes local gossip where everyone has an opinion. The president personally visits the home of the accused and has a stern conversation with him about why this behaviour is not acceptable. But what is most embarrassing for the culprit is the rumour that he does not know how to cut the bamboo properly, gleaned from the fact that he cut bamboo in a "no cut zone", a transgression of common knowledge that makes him somehow disloyal to his fellow *montañeros* and his identity as part of this group. Lupito commented by saying that this behaviour is something that you would expect from an outsider, but from someone from here, it is unacceptable. On our hikes, Ramón would often point out areas where bamboo had been cut too young or improperly. He would say, "here Tamara, you can notice that they leave all these perfectly good pieces behind, what a mess. We would never do this; we would use the

whole culm". He would then later report his finding and the location of the grievance to the *comuna* president, to ensure that more people are on guard for outsiders coming in with motorcycles and "stealing" bamboo.

These examples illustrate how knowledge about harvesting practices is a signifier of ingroup identity both as a *montañero* and a *Pacochero.* This story provides an example of one of the ways smallholders act as the eyes and ears of the forest, because they feel a sense of personal responsibility and ownership towards the protection of the *guaduales* and associated water sources on the mountain (Basurto, 2013; Horwich & Lyon, 2007). It indicates the ways in which power can be redistributed through the community monitoring of natural resources and demonstrates how smallholders play a greater role in the conservation of the forest than what formal institutional paradigms tend to suggest. This example also indicates how relationships with bamboo have changed since the establishment of the protected area, which gave rise to a sense of communal responsibility to protect bamboo resources from outsiders.

In conversations with smallholders outside the protected area of Pacoche, a related sense of communal responsibility to protect bamboo resources also existed. Smallholder participants tend to pay attention to the less sustainable practices being used by their neighbours, taking note when it seemed like bamboo was being harvested in a way that disrupted the equilibrium of the natural environment. Practices like cutting down large amounts of bamboo or clear-cutting bamboo groves to make space for monocrops or pasture lands was seen as immensely damaging to both the human and natural environment. Smallholders tended to judge those that exploited bamboo harshly, driven by a deep concern for others' lack of respect and concern for nature. As in Pacoche, these harmful bamboo harvesting practices were noted as being used more often by outsiders who did not understand the vital and indispensable role bamboo plays within the environment.

Smallholder Identified Challenges and Barriers to Development with Bamboo

After all the conversations with smallholders in Manabí, there seemed to be a consensus that a bamboo market exists in Ecuador and there have been attempts to expand it, however, the smallholder role within this market remains unchanged. The historical uses of bamboo, to build houses, build various farm constructions (fences, animal sheds and pens, plant and coffee drying racks, etc) and miscellaneous items (butter holder, herb planter, poles, etc.) continue to be used by smallholders today. Similarly, most smallholders do not consider bamboo as a commodity resource of considerable economic value and they debated whether bamboo would be a good business venture even if the market expanded. For one, smallholders recognised that the amount of bamboo they would need to cut down in order to make any substantial money would be too damaging to the environment and therefore not worth it. Then even if it were possible to cut down huge amounts of bamboo and not harm the environment, their current lack of resources (e.g., large trucks) and the lack of local infrastructure (e.g., poorly maintained roads and the absence of bridges) would bar them from transporting this resource to market. There was also concern and questions regarding middlemen, who smallholders already consider to be the group that benefits the most in any commodity chain, since they have the power to buy goods from smallholders at a low price and then sell the product for a much higher price further down the commodity chain. Smallholders typically came to the conclusion that middlemen would be the likely victor of an expanded bamboo market, just as they always are, and always have been, within any large-scale commodity chain.

The Politics of Bamboo Harvesting in a Protected Area

At the end of November 2022, we hosted a community workshop for smallholders in the ethnographic museum in the *comuna* of Pacoche. The turnout was much better than expected, with 25 participants, most of whom had been interviewed on previous occasions over the years.

After serving homemade *empanadas* and cola (as is common at local events) we then switched gears to discuss the process of bamboo harvesting—a subject we had been asking many of them about one on one over the past few years. Together we worked on the creation of a bamboo infographic, documenting vital pieces of ecological knowledge about the various steps of harvesting bamboo handed down from generation to generation (*see infographic figure #6*).

(Figure 6: Bamboo infographic from participatory workshop, November 2022).

This activity livened up the participants and much of the time was spent trying to discern the correct age of a culm ready for cutting. I took notes and drew on the whiteboard as participants took turns calling out important pieces of information about the process. While I had heard all these steps many times before through interviews, this day was more of an opportunity for us to work on something together as a group and to create a space for sharing this information, and to highlight its value as cultural heritage. The benefits of a participatory approach to protected area (PA) decision-making are widely recognized across the literature (Andrade & Rhodes, 2012; Kothari, Camill & Brown, 2013; Lyman et al., 2013). For instance, Aswani and Weiant (2004)

explain that participatory approaches to conservation help to empower local people by legitimising their knowledge and connection to the land and creating an opportunity for them to participate in park management by sharing ideas and helping to find new strategies. The subject that inspired the most discussion during the workshop was that of the Ministry of the Environment regulations. Several participants shared that they "feel like criminals extracting bamboo" from their properties because the Ministry of the Environment prohibits the harvesting of any forest products. Findings from a survey done for my master's thesis in 2018 revealed that 45% of participants believe that bamboo cannot be extracted legally without a permit (Britton, 2018). While technically this assumption is true on paper (see MAE management plan, 2017), after numerous conversations with park rangers and the Director of the protected area, it appears that the subsistence extraction of *caña Guadua* is considered low impact and thus of low concern to authorities. "As long as it's only for personal use, it's not a problem. The real issue is commercial trucks coming in and clear-cutting bamboo illegally" (Director of Pacoche, personal communication, n.d.). However, trying to obtain a clear description of how many *docenas* smallholders can extract without a problem from the MAE proved impossible. After many discussions, "a few dozen" was the clearest allowance reached. It is understandable that institutional actors do not want to formally permit or encourage the extraction of bamboo for fear it will get out of hand and damage the forest. The politically correct response is that "it is always advisable to apply for a permit when extracting bamboo, no matter the amount, or at the very least request permission from the *comuna* president" (Director of Pacoche, personal communication, October 2022). Back at the workshop, one study participant's perspective on the matter is as follows:

> It makes no sense why the people who live here have to apply for a permit to cut down a few dozen [culms], when the MAE does nothing to stop the large trucks taking away all our bamboo. I am in agreement that it is important to protect our forest, but the people

> here know how and when to cut bamboo, people from outside don't care, and just take our bamboo to other places around the province (Anonymous, personal communication, November 2022).

This comment also speaks to the sense of personal responsibility felt for caring for bamboo groves as an identifier of in-group identity as a *montañero*. Fernando, a proud *Pacochero*, owns a large plot of land deep in the forest, not easily accessible by vehicle most of the year. He stands up from the back row of his peers and adds to the conversation of protected area regulations by clarifying to everyone that as long as they extract the bamboo manually by mule, the Ministry of the Environment does not mind, but if they use a truck for efficiency they will be stopped, and the bamboo will be confiscated. Fernando has a truck he uses for one of his many side jobs transporting leftover fish parts from the small coastal communities to the nearby city of Manta to be turned into fish meal. Although most smallholders in Pacoche do not have access to a vehicle, I explained that the reason for this enforcement is due to the law about transporting timber products that requires a *guía de movilización* or mobilization permit[26] from the Ministry of the Environment. This requirement is part of the National Forest Policy designed to promote the sustainable management of natural forests as a strategy to guarantee the rational use of forest products. However, when it comes to practice, even these regulations are considered a grey area for those working in the commercial bamboo industry. For instance, a commercial bamboo entrepreneur shared that:

> In Ecuador, bamboo is considered a non-timber forest product but there are no strict regulations on extraction practices as of yet, because it would mean more "work" for bureaucrats and, no one cares. [For example]… the "guía de movilización" is checked by authorities when transporting truckloads of bamboo, but other than that they usually

[26] To obtain this permit the applicant must: 1) Register online in the forest administration system (SAF) as an executor, 2) acquire a forestry license, and 3) carry a copy of both the permit and the license with them when transporting forest materials. These requirements are inaccessible for most smallholders.

> don't ask for any other paperwork. If they did ask for proof that the bamboo is sourced from a managed plantation, many truck drivers would just give the documents from any plantation with a registered management plan—even if they are expired—the authorities never actually follow up to see if you actually got it from there or not (Anonymous, personal communication, June 2022).

This example demonstrates how these regulations, while creating barriers for smallholders to participate more efficiently in the bamboo industry, are not deterrents for other actors at commercial levels of the supply chain who find ways around these regulations to continue to exploit the resource as they see fit.

During the community workshop many smallholders chimed in and gave their opinions about how the protected area regulations have impacted their livelihoods. It is important to note that everyone in the workshop positions the MAE as an authority figure; they *never* use the term *protected area*. "Before the Ministry of the Environment… many people in Pacoche and El Aromo lived off the sale of *caña Guadua*, but now we can't sell it anymore. So now many people are selling their land to *gringos* or people from the city because there is no money" (Eduardo, personal communication, November 2022).

An easy search on any bamboo development social media platform – the World Bamboo Organization or INBAR Latin America, for instance, reveals that a variety of community training programs on bamboo related themes have been offered across Ecuador since the late 1990s. While the impact of these programs is a theme this chapter will explore further in the following section, what remains unanswered is why none of these opportunities have been offered to populations living around arguably the biggest natural bamboo forest in the province—the Pacoche Wildlife Refuge. A systematic review of international bamboo development projects (Binfield, Britton, Dai, & Innes, 2023) uncovers that Manabí province was and continues to be a hotspot for these training sessions centred around the areas of Las Tunas, Jipijapa, Portoviejo, El Carmen and most recently Chone. Most of the themes of these courses are focused on bamboo

construction techniques, sustainable harvesting, reforestation, and the production of artisanal items, and are sponsored through collaborations between local municipal governments, INBAR and other large international development agencies (e.g., ACEID). One assumption as to why these trainings have not been offered in the Pacoche area has to do with the protected area restrictions on natural resource use. However, Pacoche is a relatively new PA, founded in 2008, and has historically been a hotspot for the domestic bamboo economy. Aligned with the criticisms voiced from study participants about natural resource restrictions, the fact that smallholders here have not received this same state sponsored training to demonstrate that bamboo is extracted according to international guidelines for sustainable harvesting seems like a missed opportunity to address both the environmental and social frictions between locals and state institutions. The fact remains that the populations surrounding the PA have been and continue to be excluded from participating in the bamboo economy, despite their rich ecological knowledge of low impact practices. This issue reflects a significant shift in land ownership that has been occurring over the past 10 years since the establishment of the protected area as more and more smallholders are selling their land (Britton, 2018). This shift is driven by the lack of profitability of these plots of land closely related to the protected area regulations but also related to shifts in the demand for common locally produced agroforestry products such as coffee, cacao, *tagua*, *toquilla* straw and *panela* sugar. Across all of these products, the quantities smallholders typically produce are low, and it is challenging for producers to gain market access. What we see in places like Pacoche, is that most of what they produce or extract is only for personal consumption and for circulation in reciprocal relationships with friends, family and neighbours. In protected areas like Pacoche, tourism is often promoted as an alternative source of income for local residents, while other existing occupations such as agriculture are further restricted through

park regulations (Britton, 2018). What is most ironic about these circumstances within the context of a bamboo-forest is the ways in which bamboo is continuously proposed as a pro-poor conservation-development 'win win' solution to improve rural livelihoods (Lobovikov et al., 2012). However, none of these benefits such as the training programs discussed above have been introduced in Pacoche. As a result of protected area policies, harvesting forest products like bamboo is no longer a profitable endeavour. Thus, many smallholders have returned to fishing as their primary occupation, are dependent on precarious day-labour jobs and/or are selling their land which would otherwise be inherited by their children (Britton, 2018). Unfortunately, as discussed previously in this dissertation, these outcomes are common consequences of protected areas. Social science critiques of a PA-based conservation model analyse how the creation of PAs can lead to changes in land-use rights through new legislation, enforcement, and privatisation (West, Igoe & Brockington, 2006). In the case of Pacoche, the establishment of a protected area is changing the way land is valued by some smallholders, where rural peoples' connection to plants, animals, ancestral identity, and autonomy as *montuvios* is gradually being replaced by the commercialization of land (c.f., Pfeffer et al., 2001; Tsing, 2003). As discussed in Chapter Three, the concepts of communal land rights and responsibility to the land are increasingly threatened as more and more land is privatized and smallholders sell their inherited land plots to wealthy expatriates and urban elites through municipal channels (c.f., Coad et al., 2018).

Finding strategies to address these complex conservation politics is no easy feat and requires a more convivial approach that pivots from villainizing resident smallholders as the drivers of biodiversity decline, to understanding the wider systemic causes. This shift will

necessarily involve recognizing and valuing local contributions to conservation from a more grounded point of view.

Bambusero Perspectives

We define the term *bambusero* as a self-proclaimed collective identity or "kinship", that includes anyone engaged in the bamboo economy, who shares a passion and pride for bamboo development, and/or a preference for the use of bamboo as a material. Many of the participants for this study either self-identified as a *bambusero*, or they described *bambuseros* as individuals who possess a certain competency working with the material that advances the industry. During interviews with actors across various sectors of the bamboo economy, those who identified as *bambuseros* described a responsibility to publicly disseminate information about the potential of bamboo in order to dismantle stereotypes and social taboos such as the idea that "bamboo is the poor man's timber". Thus, *bambuseros* collectively push similar discourses of the bamboo industry from different occupational perspectives. What connects them is an appreciation for working with this raw material and an interest in the development of the bamboo industry. For *bambuseros,* working with and promoting bamboo is part of a movement, representing the potential for sustainable development that is part of their history and cultural identity. There are other actors involved in the bamboo economy that are neither *bambuseros* nor smallholder farmers. This group can be defined as those who work with bamboo purely from a profit-making standpoint—the intermediaries who clear cut bamboo stands on people's properties, those involved in the *cuje* (support poles) market for banana plantations, those who transport poor quality bamboo to the border for export to bamboo, and so on.

Interviews revealed that the *bambusero* movement began in Manabí with a small group of experts inspired by bamboo pioneer Jorge Moran Ubidia's work on *caña Guadua* as a key part

of cultural heritage in the coastal region. His architectural expertise coupled with the historical knowledge of Libertad Regalado spurred the evolution of the *bambusero* movement later adopted by their students and mentees. The building of La Hostería Andaluz (an eco-friendly hotel) was another pivotal moment that brought together architecture students and builders as part of the *bambusero* community, later supported by INBAR. While still a tight-knit group, the movement now extends beyond builders and architects to other types of artisans and producers. Head of the Architectural Guild of Manta, and architect himself, Luis Cedeño explained, "INBAR supported us like a network, so a lot of the change seen today has to do with INBAR. They are an important actor, in terms of strengthening what was being done to help us fight to change the building norms about bamboo, especially after the earthquake. We fought for many years to change those building codes to approve the standards, specify and adjust them to meet regulations" (Cedeño, L., personal communication, May 2022).

Bamboo *maestro* (or master bamboo builder/carpenter) Polivio defined a "*bambusero* as someone who has been educated about bamboo". He referred to a specific building project, as many do in our interviews, and states, with a glow of pride, that you know it was made by *bambuseros* because of its sophisticated design—which he demonstrated in an impressive community centre built in the *comuna* of Las Tunas by the local *maestros*. He said, "*bambuseros* have the knowledge about the entire process" referring to the preservation of bamboo in this case (Pilligua, P., personal communication, May 2022). Another *maestro*, Delfur, explained that a *bambusero* can be anyone who works in construction with bamboo or who personally has a love for the material (Holgun, D., personal communication, May 2022). This concept of a love or passion for working with bamboo was a common theme across interviews with those involved in the industry. *Maestro* and artisan Olmedo, who makes beautiful furniture and crafts from

bamboo, talked about his professional journey explaining that "the more time [he] spent working with bamboo the more in love [he] became with the material, because it feels different. It has a certain harmony and closeness to nature that feels different than working with other construction materials, like cement. It's a different experience, and a pleasure that comes from discovering your creativity within it, that is, it also helps your creativity a lot" (de Peso, O., personal communication, May 2022). Architect and professor of design and construction Robinson Vega added that "bamboo is like an environmentalist's dream, it is a resource that can save the world, or that's what us *bambuseros* believe. We think of bamboo in terms of its ability to reduce carbon and reduce the perverse continuation of the use of cement" (Vega, R., personal communication, May 2022). In one of our interviews, a participant said that we "the researchers" are *bambuseros* too because of our interest in studying the material. Thus, the term itself is used widely across different occupations, but overall signifies a unique interest in this particular natural resource that creates a sense of community around shared socio-economic and environmental goals. The ways that *bambuseros* connect to this material describes another aspect of the social life of bamboo and how this commodity not only assumes a variety of uses across different scales, but also of meanings and deeper symbolic representations depending on the actor and their relationship with the resource.

Bambusero Relationships to and Interest in Bamboo

Entering historian Libertad Regalado's property from an urban neighbourhood in Manta was like walking from a cement desert into a beach hotel courtyard. The garden was lush and shaded with a bamboo gazebo-like structure. There was a mural on one wall of the house depicting pre-Colombian imagery and designs. As we sat at a long bamboo table, Libertad expressed a reverence for bamboo bordering on spiritual, which eventually we came to learn was

a common view held by many we include in the *'bambusero'* moniker. "For me *Guadua* bamboo is vital, is necessary," she explained, "I would say that nature in its wisdom gave us one of the best gifts—bamboo gives us everything, that is, it is useful for agriculture, for building your house, for building your furniture …" and for generating income through bamboo-based craft or artistic products (Regaldo, L., personal communication, May 2022).

The aesthetic experience of interviewing other self-described *bambuseros* varied from sitting in the clean, white, air-conditioned offices of architecture professors at Universidad Laica Eloy Alfaro de Manabí (ULEAM), to sipping passion fruit juice at a modern café in a shopping centre, to sharing a table at a pool-side patio, to sitting inside homes and structures decorated with bamboo details. None of these encounters took place within view of bamboo groves, yet bamboo was ever-present in the regard and warmth with which *bambuseros* spoke about the plant. There is no doubt these people are passionate about and regard bamboo with respect and promise. Unlike smallholder farmers, they did not talk about bamboo as though it were ubiquitous, expected—just part of the background to everyday life. Rather, their relationships to bamboo had been learned and developed with intention through formalized training over the years. The importance of bamboo in their lives is no less or more salient than it is in the lives of smallholder farmers—but it is different.

As Appadurai writes in the introduction to the "Social Life of Things," the meaning of commodities "are inscribed in their forms, their uses, their trajectories"—they are not only made meaningful by "human transactions, attributions, and motivations" (1988: 5). We see this clearly in the case of *bambusero*-bamboo meaning making (as in smallholder-bamboo meaning making). We characterise *bambusero* interest in bamboo broadly as an interest in the plant's historical-cultural-geographic importance, a reverence for the plant that exceeds its economic value, and its

modern potential to generate profit (or contribute to 'development') while satisfying environmental, practical, and aesthetic interests. These three general categories of interest in bamboo often overlap—most *bambuseros* are in part interested in bamboo's potential to generate income for themselves and/or others even as their passion for the plant and its ecological role is rooted in its other, non-monetary, values for them. *Bambuseros* are also often informed by research, education, and hands-on training in their work with and designs for bamboo—all have participated in INBAR or AECID/COPADE programs and activities, most have been instructors for INBAR, and many have travelled abroad (most commonly to Colombia and China) either with INBAR or as part of their schooling to learn more about bamboo. They have been socialised regarding the values they imbue bamboo with, in part by participating in such bamboo professionalisation activities, and by virtue of their close connections with one another. Indeed, the *bambuseros* we spoke with knew one another by 'one degree of separation' at most. In what follows, we examine these most salient *bambusero*-bamboo interrelations from *bambusero* perspectives.

Bambusero Interest in the History of Bamboo: Culture, Identity, and Place

Several *bambuseros* we spoke to regard the role and value of *Guadua* today at least partly in relation to its local historical importance in Manabí and coastal Ecuador more broadly. The architects we spoke with in particular expressed a connection with the material for building because of the history of construction and architecture with bamboo from the past, which was one of Miguel Camino's areas of study. Professor and architect Cristian Melgar explained,

> [Camino's] Doctoral thesis was on Manabí dwellings … an historical analysis of the housing that indicated that our ancestors, we are talking about ancestral civilizations … made their constructions with natural materials. We are talking about some wood, and bamboo, and we are talking about 900 BC (Melgar, C., personal communication, May 2022).

Robinson Vega discussed bamboo in terms of its historical-cultural importance, noting that

> Bamboo is very rooted in … Ecuadorian society, in the Ecuadorian culture for many years, right? … the oldest reference, at least, was that there was bamboo use in the Ecuadorian culture 3,000 years ago. So, and apart from this, and also in the rural world bamboo is very important for different activities especially agriculture and as a help and support for farmers … in general, most of the entire Ecuadorian coast and a part of the Amazon identify a lot with bamboo for the utility it provides in the rural world (Vega, R., personal communication, May 2022).

Also speaking to the role of history and culture in their contemporary relations with bamboo, *bambuseros* often lamented the reputation of bamboo as a 'poor man's material.' One *bambusero*, Architect Luis Cedeño, couched this in terms of bamboo's use historically: "ancestors did good things, there are other things that weren't so good … there was no standard … there was no technology, there was no knowledge, and a lot of bamboo constructions didn't last long" (Cedeño, L., personal communication, May 2022). He attributed this lack of technology and building standards or norms to the association of bamboo with rural poverty. Luis and other *bambuseros* are motivated at least in part by a desire to revalorize bamboo—to dissociate it from historical-cultural building techniques and make it popular as a modern building material with modern aesthetic appeal. At the same time, bamboo's association with the coastal rural past, and the fact that it is a local natural resource, is in part what makes it attractive to foreigners and wealthy urban Ecuadorians. *Maestro* Olmedo described the aesthetic that appeals to foreigners as "rustic cool" (de Peso, O., personal communication, May 2022), and *maestro* Delfur mentioned that he believes foreigners like to build with bamboo because where they come from is "more enclosed, a lot of concrete … and they come here to relax, [for] a little more atmosphere, more freshness" (Holguín, D., personal communication, May 2022). Like smallholders, *bambuseros* we spoke with are largely proponents of following the moon/tide cycle for harvesting as has been the custom for centuries, although some spoke about learning different techniques in a training or workshops. And as mentioned above, those involved in

higher output commercial bamboo enterprises did not follow the moon cycle approach. Still, there was a general sense of respect for the traditional methods of harvesting still practised by smallholder farmers—even if some *bambuseros* spoke of a need to modernise techniques in order to "industrialise" bamboo.

Bamboo Reverence and Connection

We entered Juan Carlos Salazar's main door from the sidewalk and stepped into a beautiful garden with small containers of various bamboo varieties dotted around the lush patio. Most *bambuseros* we spoke to talked about bamboo with passion, reverence, respect, and even love, but perhaps none more so than Juan Carlos. As we settled into his living room, which had large doors open to the outside patio and garden, he began to tell us how he came to work with bamboo. As an agronomist, he had been working on a reforestation project with *Guadua* and became impressed by how fast it grew and its capacity for absorbing carbon. Over time he began working on bamboo projects and collecting bamboo species from around the world on his property. He now runs a bamboo nursery, *Guambu*. He explained that eventually,

> … you feel more love for the bamboo plant, when you start to get to know bamboo it has this peculiarity that it no longer lets you go, because you always have ambition to keep learning … What else can be done with bamboo? There is this peculiarity—when you intertwine with bamboo you always want to learn something new and you don't stop, you don't stop, you always want to be in contact with your friends … researching, watching your plant grow, noting the growth (Salazar, J.C., personal communication, June 2022).

Like Juan Carlos, other *bambuseros* spoke about their love for bamboo (see quotes from Delfur and Olmedo above). Buenaventura, a bamboo furniture maker and one of the founders of a community based (now defunct) bamboo processing facility described his introduction to working with the plant, saying "I fell in love with *Guadua* bamboo" (Vera, B., personal communication, May 2022).

As mentioned in the introduction to *bambuseros* above, another way that some *bambuseros* described their relationships with bamboo included directly referencing 'passion.' A recent *bambusero* convert, Rufo, stated "The truth is that everyone who is interested in bamboo [laughs] has a passion for bamboo" (Flores, R., personal communication, June 2022). Roberto Mosquera, a *bambusero* who has worked promoting bamboo at the local political level in Santo Domingo and as an entrepreneur, stated, "…this is why I think bamboo has filled my expectations, not my pockets, ha ha, but it has filled something … really I do have a passion for working with bamboo …" (Mosquera, R, personal communication, June 2022). Many if not all *bambuseros* we met have incorporated at least some bamboo into their homes, illustrating its importance in their daily lives. Libertad talked poetically about how bamboo "gives her life" so therefore,

> If I say bamboo gives me life, [my home] must be made of bamboo. For that reason my house is made of bamboo, furniture made of bamboo, this is made of bamboo where you are, this table, here it is bamboo, this too [pointing]…(Regalado, L., personal communication, May 2022).

She also spoke about the "vital energy" provided by living in a bamboo house, "You are with an element that is alive … and you feel it, the energy is different" (Regalado, L., personal communication, May 2022).

Some of the *maestros* we spoke to were working on slowly adding bamboo elements into their homes because of their passion for and belief in bamboo, despite the challenges of doing so. As Olmedo explained, drawing attention to the economic position of *maestros*, he is working on slowly adding bamboo elements to his house (it was everywhere from the walls to the floor to the lamps and furniture in the upstairs of his home where we met). But it is difficult to make an all bamboo house if one is a *maestro*—you can only afford to add bamboo little by little as you earn money, but with bamboo building, adding little by little becomes a challenge because it exposes the bamboo to the elements. *Maestro* Polivio was working on bamboo maintenance on

his father's home when we arrived to meet with him. He told us that he buys the raw bamboo and cures and varnishes it himself to cut down on costs.

Economic and Development Potential and Benefits

Standing on a hill overlooking the agroforestry fields and forest beyond, with a two story, partially open-air, bamboo house in the centre of our vantage point, was nothing short of beautiful. The architecture of the home blended seamlessly into the surrounding vegetation, and particularly the bamboo stands planted intentionally around it. This was the home of Lucas Oshun and his Regeneration Field Institute (RFI). The first *bambusero* any of us met, it was Lucas who convened our group of researchers to study the role of bamboo in contemporary Manabí and its prospects for the future. Lucas' home is an impressive example of the epitome of aesthetically pleasing and modern bamboo building design, and it is at the centre of one of Lucas' livelihood activities—RFI hosts international students and local groups to learn about bamboo building/design and conservation/agroecology with bamboo.

All those we consider *bambuseros* are engaged in some way in earning profits from, or basing some part of their livelihoods on, bamboo. All would like to see an expansion and popularization of the bamboo economy. At the base of desires to see the bamboo economy expand is the plant's environmental benefits—its role in improving or maintaining environments/ecosystems and in providing a quickly renewable building material—and its ability to help buildings withstand earthquakes when used in construction. As Olmedo de Peso explained, "[Bamboo is a material] that is anti-seismic … [after] the earthquake there were bamboo structures and nothing happened to them, the cement structures …. some collapsed" (de Peso, O, personal communication, May 2022). It is therefore viewed as a building material that is appropriate to the location, good for the planet, and available in abundance—the perfect resource

with which to pursue and realize development goals for the region and Ecuador as a whole. Many *bambuseros* used the language of 'sustainability' in their explanations of the role for bamboo in Ecuador's future. For example, Cristian Melgar told us, "…in Manabí we have a lot of bamboo, a lot of natural resources in wood that we can take advantage of in a sustainable way" (Melgar, C, personal communication, May 2022).

Another major theme in discussions with *bambuseros* surrounding their interest in bamboo as a tool for economic development related to its aesthetic value, mentioned above. Some *bambuseros,* like Robinson Vega, are involved in the research and development of new building products made from bamboo exposed to industrial processing. Architects like Luis Cedeño and *maestros/*builders like Polivio Pilligua spoke with great pride about designs they had created or seen, whether entire buildings or intricate finish work.

For these reasons, all *bambuseros* we spoke to would like to see a greater role for bamboo in the economy and are interested in the development potential of bamboo locally, nationally, and globally. The focus of a person's desires for development with bamboo differed depending on their current relationship(s) to bamboo. Some people we spoke to, like architect and professor Cristian Melgar, would like to see more industrial development with bamboo. He spoke of the research taking place at various universities in Ecuador and clearly sees potential in industrial products of the kind that Robinson Vega is involved in developing, such as panels to be used in construction. Others are interested to see the building sector expand its use of bamboo. One of the most experienced and well reputed *maestros,* Manuel Mero, noted that it is currently foreigners and tourism that are driving bamboo building, and that the region is increasingly home to foreigners. He gestured as he spoke, "…look down there, up there they are all, they are all foreigners who come here, buy, and build their homes there" (Mero, M, personal

communication, May 2022). He and others would like to see the domestic bamboo building market expand and noted that since the earthquake facilitated the creation of a bamboo building norm in the Ministry of Housing and Urban Development (MIDUVI), there is more potential for construction with bamboo being regularised and backed by government agencies. Many *bambuseros* acknowledged that the Ecuadorian government had played an important role in the area of bamboo housing, however, most did not put much faith in the government when it comes to supporting and encouraging development with bamboo—despite state and local government discourses around bamboo's potential as a development tool, most see the future of development with bamboo as dependent upon private investment and companies. INBAR is the entity most involved in pushing bamboo development from an institutional perspective according to *bambuseros* like Juan Carlos who told us,

> There has been much more support from [INBAR] than from the government itself, instead INBAR is the institution that is always knocking on the doors of the government and saying 'please, bamboo is a resource in the region … please it has to be used' (Salazar, JC, personal communication, June 2022).

In the next section I will return to the topic of barriers to expanding the bamboo market, and how *bambuseros* would like to see those barriers removed.

Several people, highlighting *bambusero* interest in all things bamboo, want to see even more creative and expansive uses of bamboo in the future. Some notable examples include bamboo shoots for eating (Juan Carlos, who generously gave us a taste test) and ideas for a "Bamboo Route" bicycle tourism trail (Roberto Mosquero). *Bambuseros* we spoke to would also like to see an expanded bamboo economy benefit smallholders and the environment, and some were wary of expanding interest in bamboo because of the potentially negative effects it could engender. Manuel lamented, "…there will come a time when the bamboo will disappear" (Mero, M, personal communication, May 2022) and noted that it must be reforested. Coincident with

bambusero support for smallholders in their ideal future bamboo economy was the notion that if smallholders could see the economic benefit of bamboo, and managing and harvesting it well, that this would encourage them to grow more which would benefit the environment in terms of water conservation, carbon capture, and reforestation. Highlighting this, Kelly a young bamboo entrepreneur and cattle rancher told us:

> I dream of a value chain … that can improve the economy of the country because of the usefulness that this bamboo provides the world, knowing that is you buy bamboo you are helping producers that plant even more bamboo to stop the impact of climate warming … to be sustainable, … there is no option … we must be regenerative, we must do it, we must (Zambrano, K., personal communication, June 2022).

As discussed earlier in this chapter, there are several existing local markets for bamboo, however the promises of large-scale economic growth or poverty reduction through the development of a new bamboo commodity chain have yet to manifest in any meaningful way, despite ongoing efforts, desires, discourses, and action. The next section discusses the main challenges and barriers to the development of the industry divided into key themes and stories shared by *bambuseros* during our interactions.

Bambusero-Identified Challenges and Barriers: Bad Reputation of the Material Due to Lack of Quality Control

Lupito pulled a 20m culm over his shoulder, ants crawling down his neck, his shirt drenched with sweat, mud, and bloody scratches from the thorns. He dragged the culm into a clearing where he made a pile. Later he cut each piece with his machete into roughly 3 sections, separating the thinner top portion (*el cuje* or *rabo*) from the wider bottom (*la cabeza* or *patas*) and middle sections (*las trozas*) that are most desired for building. In the Pacoche Wildlife Refuge the bamboo grows wild, so each culm varies considerably in size and diameter, not ideal for commercial orders. Ordering a dozen (*una docena*) bamboos from Lupito to build a canopy

bridge for howler monkeys (see Chapter Seven) revealed some of the key differences between subsistence-sourced culms and those sourced to a bamboo buyer/builder. In Pacoche, one dozen bamboo culms costs $60.00 USD or $5.00 per culm to have them harvested and transported into town by mule. Originally, the bridge design required nine-metre pieces, as is commonly used commercially. However, culms of this size can only be transported by truck, and smallholders in Pacoche (and their mules) can only offer six-metre pieces or less. Naturally, culms being dragged by mule along the road for long distances are also more beat up, with cracks and splits that can threaten their structural integrity. However, most local building projects are small-scale and do not require that the culms be in perfect condition. Commercial bamboo demands are a very different story.

The most prevalent barrier to the development of the bamboo economy discussed throughout the interviews was the issue of quality control. As mentioned in an earlier section, bamboo continues to carry the social taboo as the "poor man's timber" and thus an association with rural poverty. According to participants, this stereotype persists within public imagination, and is one of the key issues *bambuseros* are committed to combating. Kelly shared that "the traditional bamboo homes (*casas de caña*) in rural areas that are found across the province are often over 50 years old. While bamboo that is well treated can last up to 100 years, often these homes are not properly maintained, which gives the material a bad reputation" (Zambrano, K., personal communication, June 2022). As part of the commercial economy, this reputation is reinforced if culms are not treated or harvested properly for modern building projects. Many study participants share stories of upset customers or contractors because the culms they ordered rotted too quickly or were damaged. A common problem is insect infestations (*la polilla*) that eat the culm from the inside out. Sixto stated that "nobody wants bamboo that has holes in it from

birds or that is too bent, etc., the clients tell me that this bamboo is no good and they reject it. They want a refund and I have to appease them because a bad reputation damages the market" (Triviño, S., personal communication, June 2022). During our visit to CENBA (Central del Bambú Andoas) a bamboo manufacturing plant, forestry engineer Jorge Macías led us around the warehouse demonstrating how bamboo is cured, stripped, sliced, dried, and glued as part of the process of creating bamboo laminate boards. Jorge, a gregarious and informative host, was pleased to show us around the facility and adds to the conversation on quality control by stating that "builders want proof that you provide quality bamboo, there is a lot of distrust so having a reputation of providing quality bamboo is very important" (Macías, J., personal communication, June 2022). One of the main issues of quality is brought up by *maestro* Polivio who shares that most of the wood depots you see on the side of the highway do not sell bamboo that has been properly harvested or cured. When people buy from these lumber yards, they are often disappointed with the quality and the longevity of the culms. Few people know how to cure the bamboo properly, so this leads to a bad reputation of the material. "Many people will tell me that they do not want to build with bamboo because they have heard it doesn't even last five years before you have to replace it" (Pilligua. P., personal communication, May 2022). Architect Robinson Vega believes that part of challenging this bad reputation is through contemporary designs that demonstrate the potential of bamboo (Vega, R., personal communication, May 2022). However, from Buenaventura's perspective on the subject, "as long as there is still a market for poor quality bamboo, no one cares about best practices of sustainable harvesting and curing, they just want to sell more and more" (Vera, B., personal communication, May 2022). These comments from *bambuseros* illustrate key differences between commercial and subsistence economies for bamboo in terms of the tendency to focus on quantity rather than

quality that has created significant barriers for the growth of the industry. Commercial bamboo standards require the culm to be in prime form, not only because clients expect the best quality materials, but also because anything less could lead to bigger problems for the project and a loss of revenue for the builder. Speaking with Sixto, a young bamboo entrepreneur and owner of a curing facility and construction company, we learned how trusting the quality of the bamboo is a real issue. Tall, and broad-shouldered, with bright eyes and a beaming smile to match his charismatic personality, Sixto is a bamboo artisan, who also trains students in bamboo carpentry techniques. He spent time explaining to us the realities of the sourcing part of his business:

> The bamboo loads that I order have to be large enough to fill a truck [meaning 400-500 culms in one load]... The culms go through several quality control filters before they arrive at the curing station to ensure that there are no young or damaged culms. The people loading the truck are instructed to check that culms are even in size, are the correct diameter, check that there are no holes, cracks, or splits, and also to ensure the colour and presence of lichens on the culms consistent with maturity (Triviño, S., personal communication, April 2023).

He continued by saying,

> it's common that many culms just barely pass the test—and are like ½ mature [2-3 years old] … when they are supposed to be between 4-5 years. Even with this filter system, inevitably we always get some culms back at the processing centre that are not useful (Triviño, S., personal communication, April 2023).

These circumstances he described are specific to sourcing wild bamboo — they do not necessarily apply to commercial plantations[27]. Sourcing wild bamboo is no easy feat. The following excerpt from my fieldnotes depicts these challenges:

> On our third and most remote field visit of the day, the sun was less intense in the sky, but my shirt was still soaked through from perspiration. Piles of recently cut bamboo lay scattered along the banks of the river, and I followed Sixto to inspect the merchandise. He pulled out his tape measure that was clipped to the belt loop on his jeans and measured the circumference of a few of the culms as well as the straightest centre section (*la troza*) of selected pieces. He asked the producer for culms of a certain diameter but also that they be as straight and undamaged as possible, noting that as you reach the top of each culm they tend to taper. "*Mira, todas son patudas*", he said, showing me each

[27] Most commercial plantations are found in the provinces of Esmeraldas and Pichincha and offer an introduced variety of bamboo called *Dendrocalamus asper* (or giant bamboo) – the largest of the bamboo species. Few plantations grow macana varieties of *Guadua angustifolia kunth.*

> culm is wider at the bottom and skinny at the top. For the order he needs to fill, these are no good, he needs them to be as uniform as possible.

This desired uniformity of culms is because most architects prefer that the bamboo be consistent in size to make building easier and more aesthetically pleasing. Architects interviewed for this study explain that inconsistencies of the native *caña brava* that dips slightly between nodes make building with this material more challenging because it leaves gaps, and clients typically do not like gaps. For this reason, a Colombian variety of *Guadua angustifolia*, referred to as *macana*, or simply *la Colombiana*, has been widely introduced in coastal Ecuador. As an architect and university professor by profession, Cristian clarified that there is less waste when you use *macana* because it is more uniform, so you don't have to cut as much off (Melgar, C., personal communication, May 2022). Planted widely as a part of government reforestation efforts in the early to mid-2000s, *macana* largely now grows wild outside of Manabí, from El Carmen, Quevedo, Santo Domingo, southern Esmeraldas, and Pichincha province (INBAR, 2010; INBAR, 2018; FECD, 2009). It differs from *caña brava* only in its symmetry and the straightness of the culm; structurally speaking both varieties are said to be comparable. Sixto commented that for his business, he began selling *caña brava* (which is found wild predominantly in Manabí), but later switched to selling mostly *macana* based on the demand from builders and architects. This has resulted in what he describes as a "monopoly for the introduced *macana* variety" (Triviño, S., personal communication, June 2022).

Lack of Consistent Bamboo Harvesting Protocol

Another common barrier to the development of the bamboo industry is the lack of consistent policies and controls regarding the harvesting of bamboo, which can also impact quality of the product. Cristian explained that "there is no formal regulation of *guaduales* in

Ecuador, like there is in Colombia. Here, even the plantation management plans are inconsistent and not well enforced" (Melgar, C., personal communication, June 2022). A few participants shared that landowners are offered easy money from intermediaries to clear cut their bamboo, and many take it because they want the area cleared anyways for their livestock. "People in rural areas still need to change their mindset, [meaning that there is a lack of awareness about the ecological impacts of clear cutting]... Most producers don't have the knowledge of how to sustainably manage their *guaduales* so it is difficult to source quality bamboo" (Zambrano, K., personal communication, June 2022).

To detail the process of sourcing further, Sixto made clear that anytime bamboo is sold commercially, someone like him will buy the *hecha* (mature bamboo) because that is what they are most interested in for construction purposes. However, that means that someone else can buy the rest of the culm (the top thinner curved part)—usually purchased to use as *cujes* in the banana industry, and another party needs to buy the *caña tierna* (young bamboo) usually sold to lumber depositories to make *caña picada* or used for scaffolding. He clarified that,

> Because it is more difficult to harvest only the mature culms [it is hard to access them amongst all the bamboo]… people just cut it all at once because logistically it's easier to extract. When you harvest bamboo too young it deforms its shape because it's not mature enough to hold the shape after it's cut down, so it has to be chopped up to be useful … People just want to sell as much as possible, sadly I have seen people leave the rest to rot, they don't care, at the end of the day everyone needs to eat. If we keep permitting [clear cutting] the culture will never improve. These practices mean that the business has no sustainable future, and people need to understand that (Triviño, S., personal communication, June 2023).

Sixto later added that,

> Often when you buy bamboo from a wood depository or lumber yard there is a mix of *caña hecha* and *caña tierna* sold there for this reason. It is not worth it for a farmer to sell bamboo if they have to pick out only the mature culms… And the loggers don't care about the long-term damage to the grove because they are only getting only 1- $1.50 per culm, so to them it doesn't matter they just cut it all down and sell as much as they can. They don't care if it compromises the health of the grove, this is why the supply chain is essentially screwed (Triviño, S., personal communication, June 2023).

In part due to the challenges outlined above, many smallholders do not sell their bamboo commercially and maintain it for personal use. On a small scale it makes sense that someone would pick out only the best culms to meet their own needs. While Manabí province apparently has the largest quantity of wild bamboo resources (INBAR, 2018), it is the opinion of many study participants that the bamboo resources in the province are disappearing because of overharvesting practices that are severely damaging the landscape. Other logistical concerns such as overall accessibility (bamboo tends to grow in remote areas along steep ravines), weather conditions, timelines, permits for moving the culms, and cost of labour, all impact the process of removing large quantities. The following section from my fieldnotes details the logistical challenges of sourcing wild bamboo:

> I bounce around in the passenger seat of Sixto's pickup truck as we pull off the main highway onto the dirt road that leads us into the mountains. He switches gears putting the vehicle in four-wheel drive as we plunge into a riverbed that intersects with the road. The water level is low enough that we can make it through—with a large splash, the tire treads spin as he hammers on the gas pushing us up the other side of the sandy bank. Through our many interviews and field trips over the years, one thing that stands out about Sixto is his infectious pride in his province and his people, confidently identifying himself as a *montuvio* as he walks sturdy and sure-footed with his feet firmly planted on the ground—determined to succeed. "Last time I was here", he said "I couldn't drive through this, and I had to get out and wade across". His client's property is located on the other side of numerous river crossings like this one, that snake back and forth across the hilly landscape. We are in the interior of the province of Manabí and in an area known as "Ayachucho", well over half an hour from the town, we continue our journey upwards. The road gets narrower with gaping divots on the left-hand side from heavy rains washing away the earth. He decides it is too risky to continue in the truck, so we find a flat area with tall grass to pull over and continue on foot. We pack up our gear and our backpacks, I slide into my rubber boots, and we begin the trek. We walked through a series of agroforest plots of bananas, citrus fruits, and cacao, mixed with tropical dry forest scrub, and reached a cluster of dirt bikes along the river where freshly cut bamboo lay piled along the side of the path. The valley was cultivated with a variety of polycrops with patches of bamboo clustered along the riverside, and teak trees planted up the steep hillsides all around us. Sixto used to source teak lumber years ago before he started working on his own business in bamboo, so these types of remote field trips are very familiar to him. He grew up working in the rice fields and cattle ranches with his father and often talks about his deep connection to the countryside and personal satisfaction with a hard day's work of physical labour.
>
> After introductions and pleasantries with the client and his employees, we are led down the steep sandbank and into the river —water nearly up to the top of my high boots. They discussed business while walking as I trailed behind trying not to slip on the slick rocks.

> After nearly 30 minutes of walking in and out of the river following a cattle path denoted by the footprints in the mud, we reached a sandbar where multiple clumps of bamboo clustered in separate *manchas* along the edge. Each was separated by at least 30 to 40 meters and was highly condensed. At a first glance it looked to me to be a monopodial species because it was so unified. But as we got closer, I could see clearly it was *caña brava*, with brambles of thorny branches entangled in every direction. I wondered to myself how on earth he extracts bamboo from such a remote location, especially if it were during the rainy season when the river is overflowing. The logistical realities of this particular industry are definite factors in the high price for labour and transportation, as well as the difficulty in consistent sourcing of raw material from producers.

High Cost of Bamboo and Lack of Material in Stock

This previous story involving the logistical challenges of accessibility connects to other main barriers *bambuseros* discussed, including the high cost of bamboo in comparison to other materials, and having enough supply in stock to fill client orders. Robert Mosquero outlined that "the complicated nature of the extraction, the rising cost of transportation, the cleaning and curing of the culms (borax and boric acid are more expensive now because they are not made here in Ecuador), all make bamboo more expensive than other building materials" (Mosquero, R, personal communication, June 2022). Polivio put this comment into perspective by adding that "people in other countries might value bamboo as a green material, but here it is not valued — people just say it is too expensive, but they don't understand the process that goes into it. Cement is much cheaper, and that's all they see" (Pilligua, P., personal communication, May 2022). While demonstrating the incredible high ceilings and cornering details in his latest yoga studio build, new bamboo carpenter Rufo confirmed Polivio's statement by saying that "a well-done bamboo house simply costs more to build, and it takes a lot more time to do so well than with a cement home" (Flores, R., personal communication, June 2022). From Jorge's experience working at CENBA, he said that "Ecuadorian bamboo products simply cannot compete with countries like China, because the cost of labour is so much higher here. We don't have the same advanced technologies, and so our products are in much lower demand" (Macías, J. personal

communication, June 2022). Due to these inconsistencies in the demand for quality bamboo, Jorge explains that most processing centres—and companies like CENBA—that have the equipment to make bamboo products like panels and boards, only function on a made to order basis. This means they rarely have bamboo in stock. From the sourcing of the raw material to the manufacturing of the final product, the process takes a long time, sometimes months to fill an order. As a government institution, CENBA is also limited by bureaucratic red tape that slows down the process of production. Jorge and other bamboo entrepreneurs in similar situations outline that despite these slow timelines, the current infrastructure of their companies does not have the capacity to meet a higher demand even if the industry were to expand. These examples demonstrate that while many participants claim there is a low demand for quality bamboo, even the demand that currently exists is not being efficiently met.

Lack of Bamboo Experts and Quality Trades People

An additional barrier to the growth of the industry is the lack of bamboo experts and reliable tradespeople to fill the need for labour. Sixto elaborated on these challenges in saying:

> Bamboo is still a niche market, so there are few jobs available, and when you actually need an expert builder, they are hard to find sometimes because they are on another project in the Amazon or in Guayaquil, they are very dispersed. Also, finding skilled and reliable tradespeople who are nearby is a serious challenge. In Ecuador, we have far more professionals, architects, and engineers than we do labourers and tradespeople (like carpenters). It's a real problem. It is difficult to sell the idea of bamboo to young people as a specialty, because there is little consistency in employment. People are looking for something stable (Triviño, S, personal communication, June 2022).

In adherence with building codes, construction using primarily bamboo is prohibited in urban areas, thus these types of projects take place in rural communities where fewer labourers are available. However, Rufo mentioned that "while the lack of available labourers is one thing, the other is finding people who want to work with bamboo, because it is a passion, it's not just any job. The person needs to be able to cut, measure and anticipate difficult angles, and it is hard

work. We need people who are not just willing to work, we need people with an artistic eye" (Flores, R., personal communication, June 2022). This comment relates back to the previous section on *bambuseros* as sharing a certain passion and respect for bamboo as more than just a building material, but also an extension of their cultural heritage and as part of a "green future."

To meet these demands for labour, international development agencies such as INBAR, AECID, and FUNDER have partnered with local governments in predominantly El Carmen, Chone, and other parts of Manabí to offer training in Sustainable Bamboo Construction. These types of workshops have been going on periodically over the past 20 years, and a few of the participants we interviewed for this study are graduates of these programs. Sixto added that sometimes he recruits people for his construction company who have recently finished the government sponsored training, but in general it is hard to find good people who you can depend on who are actually skilled at working in the art of bamboo. In reality, he claimed few of the graduates from these workshops find employment in this field, and most end up doing other things.

Other *bambuseros* commented on this challenge for new graduates, including Fernando who said, "there is a need to better connect public and private institutions to secure the investment needed to advance the industry and provide employment opportunities for those who are gaining the skills necessary to develop the economy" (Mendoza, F., personal communication, June 2022). While Roberto Mosquero agreed that in order to find solutions to push the industry forward, "we need a fusion between national public and private sectors," he also added that one of the fundamental problems is that "we Ecuadorians don't believe in ourselves, we always rely on foreigners to do everything" (Mosquero, R., personal communication, June 2022). This statement relates to the high dependency of the Ecuadorian government on external institutions

to provide the funding and impetus to make these programs possible. This reliance on foreign aid was discussed in detail in the Chapter Two section on the history of economic development policies and demonstrates the long-term impact of these legacies that have weakened state capacity to invest in the growth of their own industries.

Lack of Government Support

In direct relation to this dependency on foreign aid, the foremost concern among interview participants was the lack of government capacity to support the growth of a bamboo economy. This is evident at the policy level not only in terms of the need for the enforcement of sustainable harvesting protocols, but also the removal of restrictions in current building codes to allow for more bamboo projects. Between numerous critiques over government corruption and the current state of the economy post-pandemic, an overall lack of faith in the state was apparent across most interviews. From Kelly's perspective, "the state should provide incentives to promote sustainable industries like bamboo, but Ecuador, as a country, is not ready to "go green" yet, we still have a long way to go, and other priorities" (Zambrano, K., personal communication, June 2022). Jorge from CENBA added to this by saying that "the government doesn't have the resources to invest in developing the industry, such as the new technologies and research needed to advance, which fuels an overdependence on international NGOs and the private sector to push these agendas forwards" (Macías J., personal communication, June 2022). Some participants commented that due to the low demand for quality bamboo products, there is a slow return on investment for these projects "social projects don't make money, so where do you get the funding from?" (Triviño, S., personal communication, June 2022). As related to the previous section, this issue is part of the long-term impact of neoliberal policies in Latin America that have resulted in a weakened state capacity to provide necessary resources. Manuel Mero explained that another significant barrier to the development of the industry is "the high turnover

of government officials. By the time a project is finally approved, three months later new people are in office, and everything stops. There is a lack of coordination and continuity, so the process never matures and just keeps playing the same game over and over" (Mero, M., personal communication, May 2022). The current political climate in Ecuador surrounding ex-President Guillermo Lasso's declaration of *La Muerte Cruzada*[28] in 2023, and the current President Daniel Noboa's declaration of a state of internal armed conflict in early 2024 in response to rising gang violence, has created an unstable economic panorama for the near future. Thus, it is understandable why many of the participants interviewed for this study were sceptical of the government's ability to push the bamboo industry forward. Kelly's comment about Ecuador having "other priorities" seems to fit the reality of the current political climate, and it is unlikely that predictions of a coming 'bamboo boom' will manifest any time soon.

Conclusion

The purpose of this chapter was to explore human-bamboo relations, broadly defined, in contemporary Ecuador. Appadurai's "social life of things" concept was useful in analysing these relationships—inspiring attention to how the connections between bamboo and people exceed purely economic rationalities. Understanding bamboo-human relations is useful to shed light on the variety of meanings, roles, and values, associated with one particular raw material, and how, for some, bamboo has become part of a culture and an imagination extending far beyond its use as a commodity. Looking at bamboo from this perspective draws attention to the messiness of convivial connections that exist between human and nonhuman worlds and can help us to

[28] Called for the first time in Ecuador's history, *La Muerte Cruzada*—or mutual death'/ 'crossed death' is the name given to a mechanism governing the impeachment of the president of Ecuador and the dissolution of the National Assembly. The constitution of 2008 grants the President the power to dissolve the National Assembly, but only at the price of giving the electorate the opportunity to vote the President out of office.

navigate these complex socio-political landscapes towards more ecological and equitably sound strategies. These human-bamboo relations are important in—and inseparable from—the context in which over 20 years of discourses, actions, and policies have pushed the idea of *sustainable development with bamboo*, or the promise of bamboo as the source of a new commodity boom that might eschew the social and environmental failures of past booms in the region. Whether or not this boom ever comes, the bamboo-human relations described here will be key to the future of Manabí and beyond.

In sharing our research findings, we focused on who, for us, are the two main sets of actors in bamboo-human relations. First are the smallholder farmers who are often the owners of land where bamboo stands can be found and who have traditionally used bamboo for common building, farming, and animal husbandry needs. These actors typically do not see a role for themselves in a modern future bamboo industry because they are subject to the rules of the Pacoche protected area, or because they are too accustomed to being left behind in the commodity booms of the past and see bamboo as just one more local resource that would serve to enrich elites. Second are the *bambuseros*, or those people who share a passion or love for bamboo plants and are interested to see an expansion in modern bamboo development and building because of its 'sustainable' potential, historical uses, and practical value (anti-seismic properties) in coastal Ecuador. These actors are typically well educated in the traditional sense (higher education degrees obtained) and/or in bamboo uses (having taken part in training workshops, been mentored by others, or even having travelled abroad to China, Colombia, Mexico, and other countries to learn more about various uses and potentials of this fascinating plant).

Despite their differences, in many ways *bambuseros* and smallholder farmers who work with bamboo as part of their everyday lives and livelihoods are similar in their relationships with bamboo. Individuals of both groups we spoke to have an interest in bamboo that exceeds the purely economic. For example, smallholders share bamboo to help neighbours build a new fence, and *bambuseros* grow bamboo on their own properties or in their gardens for reason of aesthetic pleasure. Both groups maintain bamboo for its environmental benefits. Both groups will also be key figures if a future bamboo "boom" does come to pass; the *bambuseros* who are interested to see bamboo play a role in future economic development locally and for Ecuador more broadly, and who are likely to be key players in ushering in this future, believe that smallholders should play a central role in environmental management under sustainable bamboo harvesting models, and should benefit monetarily from future economic growth with bamboo.

Admittedly, our focus here has largely ignored the role of 'middlemen' and others who source and sell bamboo to satisfy (licit and illicit) Peruvian bamboo demand, lumber yards, and the banana economy's *cuje* needs. These actors are worthy of further research to better understand their roles in bamboo supply and demand, and the ecological outcomes of their bamboo extraction methods as their reputation is one of clear-cutting bamboo stands and damaging the ecosystems where they collect their product.

It is not only humans who relate with bamboo, however. The next chapter will take a resource partitioning perspective to investigate the ecological role of bamboo as a vital component of endangered primate habitats through an ethnoprimatological analysis of primate-bamboo relationships.

CHAPTER SIX

Primates and Bamboo: Resource Partitioning in the Pacoche Wildlife Refuge

A quick glance through social media and online conservation blogs reveals how public discourses around primate conservation have a tendency to focus on the ways in which human activities are causing devasting threats to wild primate populations. Viewers are flooded with media images depicting mass deforestation, Amazonian forest fires, palm oil plantations and catastrophic mining impacts on forest ecosystems. These shocking displays are often used to raise awareness and donations to support conservation causes. After all, 60% of all primate species are currently in decline due to anthropogenic causes such as these (Estrada et al., 2017). However, less frequently do these public discourses focus on the ways primate species are adapting to anthropogenic alterations to the landscape. There are many places on the planet where human activities have created new opportunities for primates to flourish, sometimes even in unexpected ways. For example, in the forests of the Pacoche Wildlife Refuge in the coastal province of Manabí Ecuador. It is in these shared spaces where this thesis is situated.

The previous chapter explored these shared spaces through an analysis of human-bamboo relationships both at the subsistence and broader provincial level – with a particular focus on the harvesting practices, and the social life of this commodity in relation to wider sets of cultural values that define the coastal region. This chapter takes things a step further by analyzing primate-bamboo relationships using an ethnoprimatological approach to demonstrate how bamboo harvesting in the Pacoche Wildlife Refuge can have beneficial socioecological impacts for primate species through resource partitioning.

Inspired by the book *Primate Ethnographies* (Strier, 2016), this chapter is based on the premise that people-primate socio-ecologies are interconnected in a web of interactions that are constantly shaping and being shaped by the environments in which we live. To explore this premise, I employ a combination of sociocultural techniques with opportunistic ecological observations of primates, an approach founded by Leslie Sponsel (1997) known as ethnoprimatology. Sponsel's definition of ethnoprimatology speaks to the need to blur the lines between the sociocultural and the ecological in order to investigate the interrelationships between species (human and nonhuman). More recent research by Malone et al. (2014), Setchell et al. (2017), Dore et al. (2018), and Urbani & Lizarralde (2020), employ this interdisciplinary approach to understand the complexities of multispecies systems within real world contexts. They argue that integrating ethnographic techniques and questions into primatology provides a more robust perspective to address complicated conservation issues. Sponsel (1997:144) identified 6 overlapping lines of inquiry to explore this interface including: 1) comparative ecology, 2) predation ecology, 3) symbiotic ecology, 4) cultural ecology, 5) ethnoecology, and 6) conservation ecology, which make up the foundations of this approach. Fuentes (2010:600) then expands these ethnoprimatological categories to include "mutual ecologies" that consist of both structural (i.e., related to the physical environment) and social (i.e., constituted by how different agents navigate space and create social networks). Thus, using bamboo as the connecting organism, this chapter will analyze the mutual ecologies of two endangered sympatric species, *Alouatta palliata* and *Cebus aequatorialis* (Duque & Gómez-Posada, 2009; Tomblin & Cranford, 1994) in the Pacoche Wildlife Refuge. To accomplish this aim, both qualitative and quantitative approaches will be interwoven to describe primate bamboo habitat use and provide an understanding of the ways in which this resource is partitioned across species lines.

Resource-partitioning, or the ways in which "similar species use the same resource in different ways without one pushing the other into extinction" (Griffin & Silliman, 2011:49), functions because different species have different resource requirements based on their ecological niches and feeding ecology adaptations. Investigating the resource partitioning involved in these socio-ecological relationships with one particular resource – the endemic bamboo species *Guadua angustifolia* – can help to shed light on potential eco-spaces of conviviality[29] between species that can support their conservation in increasingly human-dominated environments. As is common across the field of ethnoprimatology, it is the intention of this chapter to present the data through a continuum of outlooks and approaches for the study of human/nonhuman animal species/plant species, rather than a dichotomy of ecological versus sociocultural perspectives and data collection priorities/methodologies.

This chapter begins by outlining the previous literature on primate bamboo use worldwide to situate the topic within a broader comparative ecology context. Then, it proceeds to the methodology section, where the how and why of this study are outlined. The results and discussion sections are combined, displaying the ethnological findings through an ethological lens for *Alouatta palliata* and *Cebus aequatorialis* and concluding with the outcomes from vegetation sampling surveys. Finally, the chapter will conclude with a discussion that brings all components together in line with the abovementioned ethnoprimatological themes.

[29] *See* Büscher and Fletcher's (2020:283) definition of convivial conservation as an integrated approach of "living with" that challenges current political economic systems and finds collaborative grassroots solutions to conservation issues.

Primates and Bamboo

The over 1,700 species of bamboo worldwide (INBAR, 2018) exist as multi-dimensional bamboo groves that deliver critical ecosystem services[30] for a range of species (Yiping & Henley, 2010), including our closest living relatives – primates. These ecosystem services include erosion control, biomass production, carbon sequestration, and climate and water regulation, as well as habitat provision and canopy connectivity, where bamboo patches can provide and even host crucial food sources or function as habitat refuges for predator avoidance (Paudyal et al., 2022; Robelo & Buckingham, 2015; Muñoz-López et al., 2021; Yiping & Henley, 2010; Sheil et al., 2011; Di Bitetti et al., 2000). However, few mammals have a bamboo-dominant diet, and those species deemed as bamboo specialists, such as the giant panda (*Ailuropoda melanoleuca*) or the greater (or, hairy-eared) bamboo lemur (*Prolemur simus*), are considered to be of much higher vulnerability to climate change impacts due to their primary dependence on a very narrow set of resources (Eronen et al., 2017).

Due to its fast growth and self-propagating characteristics, some studies contend that bamboo's invasive qualities can, in fact, be harmful to species richness and even a threat to primate survival (Majumdar et al., 2015). For example, in Costa Rica, a reduction in the primate population was reported in the absence of adequate woody tree species due to the dominance of an invasive bamboo over time (Graham, Bulloch, & Lewis, 2013). Research by Ospina and Finegan (2004) shows that a consequence of bamboo competition is that it negatively impacts the density and richness of adult tree species. Additionally, the constant felling of bamboo culms

[30] As part of the neoliberal conservation paradigm that perceives the environment as 'natural capital', ecosystem services can best be defined as the benefits humans derive from ecosystems. The aim of this approach is that by attributing new values such as regulating services, provisioning services, cultural services, and supporting services that demonstrate the ways nature matters to human populations may, in turn, help to prioritize its preservation (Liu, Costanza, & Farber et al., 2010)

causes the plant to sprout and multiply, which enables it to outcompete many other species. Authors state that only fast-growing light-tolerant saplings can compete with bamboo, which would change the floristic composition of the forest to favour these species in bamboo-dense areas (Ospina & Finegan, 2004). Majumdar et al. (2015) argue that bamboo-dominated forests cannot meet the dietary requirements of most primate species, and thus, bamboo invasions must be controlled to protect the growth of primate-preferred tree seedlings. These findings were supported by Gómez-Posada and Orozco (2006), who found that plant richness and diversity of species in the diets of howler monkeys within a coffee-growing region of Colombia were low in bamboo-dense forests compared to forest formations without high bamboo density.

Also, in line with Majumdar et al. (2015), in other parts of Asia, Suárez (2013) notes that feeding on bamboo is not a common behaviour for most colobines. In the Phu Khieo Wildlife Sanctuary in northeastern Thailand, the Phayre's leaf monkey (*Trachypithecus phayrei*) only eats bamboo shoots for an average of two months a year, equaling less than 5% of their total diet (Suárez, 2013). Suárez demonstrates that the only time they come down to the ground to feed is during this infrequent behaviour. When they do so, they spend much time and energy breaking open bamboo shoots – signifying bamboo as a valued food source. A review of the literature indicates that feeding data on bamboo has only been recorded in three other Asian colobine species. Oates, Waterman, and Choo (1980) found that the Nilgiri langur (*Trachypithecus johnii*) in South India fed on 6 different woody shrub and bamboo species; Davies (1991) reported the maroon leaf monkey (*Presbytis rubicunda*) in Sepilok Borneo feeds on small amounts of bamboo pith year round; and Yang and Zhao (1991) found that 59% of the diet of the black-and-white snub-nosed monkey (*Rhinopithecus bieti*) in Jinsichang, Lijiang China, was made up of bamboo leaves – considered a rich protein source.

Several studies concerning African primates have analyzed the ways in which bamboo is a vital dietary component for some species. In Mgahinga Gorilla National Park in Uganda, research indicates that bamboo sprouts consist of 90% of the seasonal diet of mountain gorillas (*Gorilla beringei beringei*) and as a favoured food, up to 60% of the diet of golden monkeys (*Cercopithecus mitis kandti*) (Sheil et al., 2012). The Bale monkey (*Chlorocebus djamdjamensis*) in the Ethiopian Highlands also shows a high preference for bamboo forest habitat and depends predominantly on only one species of bamboo (*Arundinaria alpina*) (Mekonnen et al., 2022). Additionally, as bamboo specialists, greater bamboo lemurs (*Prolemur simus*) in southern Madagascar can process high amounts of cyanide found primarily in the shoots –relying heavily on a specific species of bamboo (*Cathariostachys madagascariensis*) for 72-95% of their total diet (Tan, 1999).

Studies on Asian strepsirrhines also indicate that the Javan slow loris (*Nycticebus javanicus*) shows a distinct substrate preference for both the tali bamboo (*Gigantochloa apus*) and sweet bamboo (*G. atter*) using these dense groves as habitat in highly fragmented human-modified environments. Slow lorises are also known to feed on the bamboo in some cases (Rode-Margono, et al., 2014). Other studies on this species indicate that bamboo plays an essential role as sleeping and resting sites (Dahrudin & Wirdateti, 2008). For these reasons, the amount of bamboo in a forest has a positive effect on the encounter rates of *N. javanicus* (Voskamp et al., 2014).

In the Neotropics, only *Callimico* is considered a bamboo habitat specialist (Izawa, 1979; Buchanan-Smith, 1991; Porter, 2001). Porter (2001) later confirmed this title through her discovery that two types of bamboo fungus unique to *Guadua weberbaueri* (*Ascopolyporous*) and (*Auricularia*) were essential dietary components for *Callimico goeldii*, comprising 48–63%

of the monthly diet, particularly during the dry season. Amongst other *Callitrichinae*, bamboo fungus was found to consist of 12% of the diet of *Callithrix aurita* (Mestre-Correa, 1995), suggesting that bamboo forests play an essential role as a food source for some platyrrhine monkeys. Dos Santos et al. (2012) found that while often considered a fallback food source, like with *Callicebus torquatus* (Heiduck, 1997), bamboo can also be used for opportunistic feeding, such as during a bamboo flowering year. Their findings state that up to 32.3% of the diet of the black-fronted titi monkey (*Callicebus nigrifrons*) in Brazil's Atlantic Forest was composed of bamboo seeds from *Merostachys fischeriana* - making up 90% of all seeds consumed over one year.

Many studies have also documented the importance of bamboo forests in *Callicebus* habitat preference (Kinzey & Gentry, 1979; Branch, 1983; Souza & Setz, 1995; Warner, 2002). For example, Warner's (2002) research in tropical lowland forests in southeastern Peru indicates that the dusty titi monkey (*Callicebus moloch*) was predominantly encountered in areas of high bamboo density. At the same study area in Terra Firme floodplains forest, Warner (2002) also found a high encounter rate of *Aotus spp*. in dense bamboo as daytime resting sites.

Bamboo-habitat use has also been documented across the literature on genus *Cebus*, particularly *Cebus (Sapajus) apella*. Field observations of this species using bamboo culms as part of an extractive foraging behaviour have been collected at several different sites (Izawa, 1978; Phillips, Grafton, & Haas, 2003; Gunst, Boinski, & Fragaszy, 2010). The individuals were observed foraging for insects, larvae or frogs embedded inside healthy *Guadua* bamboo culms. The identification and extraction of these difficult-to-access food resources involved a behaviour known as *tap-scanning*, an extractive foraging technique exhibited to gather acoustic information on the whereabouts of prey in woody substrates. This behaviour involves using fingertips or

tools such as rocks or nuts to tap on the culm wall and listen if there is something inside. Individuals are also said to employ a combination of visual, olfactory, tactile, and auditory clues to locate their prey during this process. According to Gunst, Boinski, and Fragaszy (2010), opening the culm is challenging; if they misinterpret the location of the prey the effort in tearing open the dense culm wall is futile. Thus, the mastery of these behaviours is generally reserved for adult individuals and the knowledge is passed down to juveniles in training.

Finally, research by Gómez-Posada (2014) evaluated the impact of commercial bamboo forestry practices on red howler monkey (*Alouatta seniculus*) persistence in bamboo-dense forest fragments in Colombia. While howlers there do not eat bamboo, they use the culms to travel between feeding and resting trees and occasionally sleep at night on thick horizontal culms. The findings of Gómez-Posada (2014) also reveal that bamboo harvesting did not directly impact howler behaviour, however the extraction of bamboo damages forest regeneration of seedlings and saplings - causing indirect impacts on howler food resources. Gómez-Posada (2014) states that minor changes in bamboo-harvesting practices in line with sustainable guidelines can significantly improve conservation benefits to howler forests where bamboo harvesting is ongoing.

The findings from this current study complement those of Gómez-Posada (2014) in demonstrating how low-impact harvesting can bring positive ecological benefits for arboreal species like primates. Additionally, while Gómez-Posada (2014) does mention howler monkey movement patterns in her research, the results presented in this chapter take this one step further by quantifying the frequency of use of bamboo culms by howler monkeys across behaviours and age/sex. Overall, a review of the literature demonstrates that few studies have taken a "bamboo-

centric" approach to examine the multitude of ways this forest resource is intertwined in the social and structural ecologies of some of the world's human and nonhuman primates.

Methods

This section of the project focuses on the ethnoprimatology of *Alouatta palliata* and *Cebus aequatorialis* in differing bamboo-habitat types and the frequency of use of bamboo substrate across behaviours. This research aims to understand the ways in which this forest resource is partitioned by different species to shed light on its ecological importance and conservation significance in the Pacoche Wildlife Refuge. To meet these objectives, this study utilized a mix of data collection techniques standard across the field of primate behavioural ecology – including focal point sampling, group scan sampling, vegetation sample plots, and arboreal remote cameras coupled with ethnographic techniques, common to the field of ethnoprimatology. The following section will outline these techniques, their applicability, and limitations before reporting the study results.

Study Area and Observing Schedule

This study took place in the Pacoche Wildlife Refuge from late September 2021 to early December 2022. With consistent primate behavioural data collection taking place 2 to 3 days per week from (September – December 2021, February – May, July – November 2022), for a total of 13 months. As both primate species are diurnal, the observation schedule took place between 7:00 a.m. and 5:00 p.m. Data collection days varied during the week based on weather conditions, the scheduling of other study activities, and the availability of research assistants throughout the study period.

Climate

The coastal strip of the PA experiences a semi-arid climate with dry scrub vegetation and low rainfall (less than 500mm/year) concentrated primarily between January and April, with an average daytime temperature of 24 ºC. However, only 5km away, the interior part of the PA experiences an entirely different micro-climate. Due to its positioning inland between the foothills and the convergence of two off-shore ocean currents, Humboldt and El Niño, this humid forest area where the study takes place receives light rainfall or mist (called *garua*) for most of the year and temperatures of less than 23 ºC with dense tropical forest vegetation (MAATE, 2017).

Altitude/Topography

The study area is located in the NE to the central part of the PA, ranging from (approximately 3 kms) north of the E15 highway to the highest topographic point in the interior, south of the highway. The altitude of the study area ranged from 100 to >300m above sea level in the forest sectors classified by the Ministry of the Environment as humid forest and agroforest, defined by steep hills and deep ravines along the riparian edge, dense primary and secondary vegetation, and small forest clearings for agricultural or settlement purposes (MAATE, 2017). It is along these ravines where most of the dense corridors of bamboo (*Guadua angustifolia*) are concentrated, often interrupted by anthropogenic disturbances such as roads or crops. In many cases, particularly along anthropogenic edges, bamboo clusters are intermixed with secondary forest vegetation in areas where deforestation had occurred in the past, and new growth has invaded and taken over.

Forest Classifications

In their initial management plan, the Ministry of the Environment (2009) classified the terrestrial section of the protected area into seven forest types: cattle pasture, dry forest, dry

scrub savannah, humid forest, agroforestry systems (coffee and sugarcane), and *Guadua* bamboo. I would argue they are missing transition forests between dry and humid zones and croplands where large forest areas have been removed to plant sugarcane and corn. Additionally, these classifications do not indicate secondary, degraded, or primary forests. As the purpose of this study is concerned with *Guadua* bamboo, I created my own classification system based on my own knowledge of the vegetation to encapsulate the different forest types found within the humid forest section of the protected area. Then, I divided them based on their location in interior or edge areas. Each of these classifications contains varying concentrations of *Guadua angustifolia.* Interior forests also contain some areas that could be classified as primary forests, while most types would fit under the secondary forest category due to the long history of human use in this area.

Table #2: Dominant forest type surveyed - study-specific classifications:

Interior	**Anthropogenic Edge**
Secondary Forest	Secondary Forest
Mixed Bamboo	Secondary Mixed Bamboo
Primary Bamboo Dense	Secondary Bamboo Dense
Agro Forest	Secondary Agro Forest

Sampling Methods

A total of 13 transects along preexisting trails were surveyed (*see figure 7 below for map of trails*). These were not randomly selected as distance or distribution sampling was not the aim of this study. Rather, trails were selected based on accessibility and an equal representation of anthropogenic and interior forests in areas where *Guadua angustifolia* bamboo is present. Using preexisting trail systems, including tourist trails, cattle paths, and farmer access roads, helped to facilitate movement in rugged terrain while following primate groups and to reduce disturbance to the forest (Ross & Reeve, 2011). Despite being a protected area, out of respect for local farmers, we only accessed public trails and those on which we had permission from the

landowner. We consistently rotated surveys between edge and interior trails. Anthropogenic edge was defined as <100 m from unpassable forest gaps without canopy connectivity (i.e., roads, deforested crop borders, human settlements) (Bolt et al., 2017). Samples were only collected off the trail when necessary to follow a group (Buckland et al., 2001). Trails were walked by 2 or 3 researchers together at an average of 1 km per hour (Ross & Reeve, 2011), stopping every 30 paces to check all surroundings thoroughly before proceeding.

(*Figure 7:* Map of Trails)

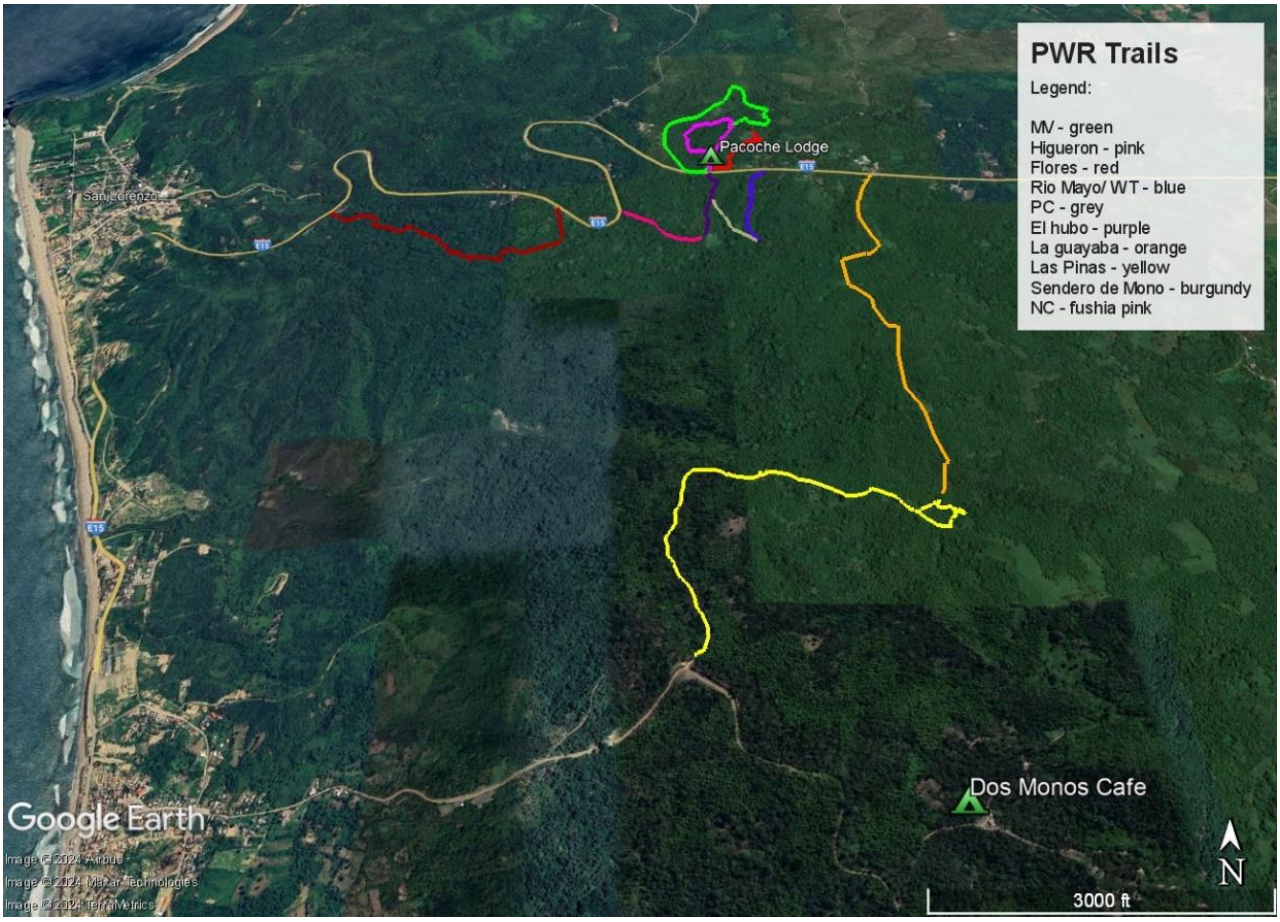


Table #3: Transects – trails:	**Forest Type:**
Pacoche Lodge (PL)	Mostly edge
Higueron (upper and lower)	Edge and interior
Cade (upper and lower)	Edge and interior
Montana Verde (upper and lower)	Agro edge and road
Flores Property	All agro edge
Water Tank	Mostly edge
Rio Mayo - (upper, lower)	Mostly interior
PC Property	All interior
El Hubo	Mostly interior
NC Property	Mix of interior and edge
La Guayaba	All interior
Sendero de Mono	Mostly interior
Las Piñas	Mostly interior

We collected the following data for each sighting: The date, time and GPS coordinates of the first group sighting (using a Garmin E-trex Touch 25), the forest type based on the predetermined classification system (above), edge or interior and trail location, a brief description of the weather, a group count or identification, the age/sex of the focal animal with a brief description for each sample, the focal animal's initial response to the observer, and the distance (m) and elevation from the researcher to the focal animal using a laser rangefinder (Halo XRT 6). The following sampling methods were chosen primarily based on the behavioural profile of each of the study species in line with the study objectives:

Focal Time Sampling - combines focal animal sampling (the most common method in primate research) and scan sampling. This method involves following a particular individual for a predetermined time to collect data on behaviours relevant to the study design – usually behavioural states[31] (Baulu & Redmond, 1978). It requires that an observing schedule of focal sample periods is adhered to, where samples are recorded only at predetermined intervals (Paterson, 2001; Teichroeb et al., 2021). The main benefit of this sampling method is that it

[31] "State behaviours have appreciable durations whereas event behaviours are instantaneous" (Altmann, 1974, p.231)

produces data that can easily be converted into frequencies and durations to understand certain behaviours in reference to other variables. Focal animal sampling is also a recommended method for conducting nearest neighbour studies to understand relationships between individuals (Altmann, 1974).

This project utilized focal time sampling for *Alouatta palliata,* where a sample of a focal animal was taken every 2 minutes, following the individual for total of 20 minutes per full sample. A stopwatch was used to keep track of this timing – with a vibration programmed every 2 minutes not to disturb the sample with an invasive noise. As the purpose of this study was to understand how primates are using different types of bamboo forests, only behavioural states were relevant to the study design focused on analyzing behaviour frequencies, and a longer inter-sample duration was chosen. Additionally, *A. palliata* spend much of their time resting or feeding in the same tree as other group members; thus, shorter sample intervals were unnecessary for this species. Sample sizes of ten, fifteen to twenty minutes per subject are standard across studies on howlers, where all ethogram behavioural state information is collected during this sampling window. For my study design, I focused on behaviours aligned with my ethogram, and if other activities, such as event behaviours, were observed, they were categorized as "other" and then described in the "notes" section.

A fundamental limitation with this sampling method in the wild is that it assumes that the observer maintains perfect visibility for the entirety of the sample. Of course, in practice, the researcher often loses sight of their focal animal or even group and thus must decide to abandon the sample and start over. The literature states that in preparation for this occurrence, the study should be designed to account for these lapses in time, such as including an "out of view" category in the ethogram and a predetermined requirement to count as a sufficient sample

duration (Ross & Reeve, 2011). For the purposes of this study, if the focal animal was out of view for more than three consecutive samples or the full sampling time was less than 8 minutes, the sample was discounted. For each “out of view” sample, an additional 2 minutes was added to the 20-minute total observation time.

Groups were not habituated to human presence, and focal individuals were chosen each time at random (Teichroeb et al., 2021), based on visibility, and at the end of each sample, a new individual was selected to begin again, generally rotating between male and female, adult and juvenile or looking for distinct features and movement patterns to be sure that the individuals would not be confused (Altmann, 1974). Throughout the duration of the study, some groups and individuals became identifiable based on unique features and characteristics and were later named by research assistants. Observer fatigue was avoided by taking a break between samples as needed. If visibility was favourable, generally, three sequential samples (or 1 hour of consistent sampling) were taken before the researcher required a rest (Paterson, 2001; Teichroeb et al., 2021).

For *C. aequatorialis*, a different sampling methodology needed to be employed for two reasons: firstly, as a species *C. aequatorialis* tends to be very quick-moving, and the groups under observation are not habituated to human presence and are very elusive, with a single individual rarely staying in view of the observer for more than a few minutes at a time. Thus, conducting a 20-minute focal sample of an individual every 2 minutes was not an effective method, and instead, group scan sampling was undertaken. Additionally, as the groups were not habituated, the majority of behaviours observed were not classified as behavioural states but as repeated event behaviours in the form of observer ‘threats’ or ‘stress behaviour.’ Thus, the ethogram needed to be altered to include this change.

Scan Sampling - is an 'instantaneous sweep' observation of all visible individuals – to determine exhibited behaviours at a given time. It is generally used to describe a group or sub-group and is most effective when identifying particular activity cycles, frequencies, or percentage of time of certain activities (Paterson, 2001). Scan samples are useful for producing data regarding social relationships, proximity, and association (Ross & Reeve, 2011). According to Altmann (1974), the observer should try to scan each individual for the same brief period. Paterson (2001) seconded this by explaining that it is essential that the scan intervals are consistent; thus, for *C. aequatorialis*, we took scans every 1-minute from when a group was encountered – either auditorily or visually and until the last group member was out of detection. Given the density of the vegetation, the interval length of 1-minute between samples was to take the time to try and count and identify group members, as well as to try and obtain the clearest view of the group as possible before taking the next sample. As this species moves very quickly, and the same individual rarely stays with the observer for more than a few minutes, the 2-minute interval between samples, as used with *A. palliata*, was inappropriate. Also, unlike the howler samples, which were focused on a particular focal animal for 20 minutes, this scan sample was conducted on the behaviour exhibited by the majority of visible individuals until the group was no longer detectable to gather as much data as possible. In line with focal time sampling, any other relevant details or behaviours not in the ethogram that were noticed during the sample were added under the notes section. In addition to behaviours, the same general information (date, time, climate, GPS location, forest type, distance, response to observer, etc.) was gathered at the start of each sample as stated above with *A. palliata*.

An Ethogram - is a fundamental inventory or catalogue of an animal's behavioural repertoire. They are not meant to be an exhaustive list of *all* behaviours and are constructed

based on the research questions being investigated (Paterson, 2001). Paterson reminds us that ethograms are mental constructs of the observer and are subjective interpretations of the focal animal's behaviour. The idea is that each category is designed to be distinct with as little overlap as possible, enabling a researcher to generate an overall representation of what they are observing.

This ethogram was developed after several hours of observation during a pilot study in Pacoche of the study subjects and partially borrowed from a previous study of mantled howlers (*Alouatta palliata*) in Costa Rica - La Suerte Biological Research Station during my field training in primate behavioural ecology in 2019, with the assistance of Dr. Laura Bolt (*see Appendix F for ethogram)*.

During the commencement of each sample, the age/sex of the focal animal was recorded. For scan sampling of *C. aequatorialis*, as the group was the priority, only information about age (i.e., juvenile or adult – based on body size and colouring) was recorded if a particular individual remained with the observer for much of the sample. Sex was rarely confidently identified for *C. aequatorialis*. The categories used to discern this information come from previous foundational studies on *A. palliata*, as follows:

Table #4: Age/Sex Definitions: (categories by Carpenter 1965; Glander 1980)

Adult male (AM)	3 + years (testes fully developed, stout-bodied and developed hyoid-sack) – out of natal group
Subadult male (SubAM)	1.5 - 3 years (not breastfeeding, but not sexually mature, leaves natal group around 1.5 years old).
Adult female (AF)	2.5 - 3 years + (larger bodied, out of natal group)
Subadult female (SubAF)	1.5 - 3 years (not breastfeeding, but not sexually mature, leaves natal group around two years old).
Juvenile unknown (J)/female (JF)/male (JM).	6 - 18 months (still breastfeeds but rarely, feeds and travels independently, rests with mother and stays within proximity of her).
Infant unknown (I)/female (IF)/ male (IM).	3- 6 months (starts feeding and moving independently; light or dark brown in colour, larger-bodied and curious/clumsy – does not stray far from mother, travels dorsally on mother).

Training and Data Logging

Data were collected primarily by the principal investigator and three research assistants trained in the abovementioned primate behavioural ecology techniques. One assistant was a local student intern from the nearby university ULEAM (Universidad Laica Eloy Alfaro de Manabí). The training process lasted a minimum of 2-weeks and consisted of interobserver reliability tests before the assistant was able to collect data without supervision. All data were recorded manually using a 'write in the rain' weather-resistant notebook and pencil and later loaded into a communal Excel file online. A clear outline of codes and formatting for the Excel file was shared with each assistant to ensure consistency in data logging (*see Appendix G for a sample of the primate data sheet*). This file was password protected and only shared with study group members, as landowner names and property locations were identified here. For safety, data were collected by observer teams (i.e., observer pairs or three observers if one was being trained). Walkie-talkies were also used between observers in case of separation while following a group. Generally, in pairs, while both were trained in the same methods, one individual (the field guide) was responsible for clearing trails, scouting for primates, group counts and IDs, and tree identification, while the other recorded much of the behavioural data. It is important to note that three Ministry of the Environment (MAATE) park rangers were also trained on this methodology, but their data collection was not consistent nor shared with the research team for this project.

Permits and Ethics Approval

To conduct research in a nationally protected area in Ecuador, a permit with the Ministry of the Environment, Water and Ecological Transition (MAATE) was acquired under the category for 'students and researchers' (non-commercial purposes) (permit number: MAAE-ARSFC-2022-

2149). All final study results are shared with the MAATE in accordance with our agreement. This permit also included permission to use remote cameras for primate monitoring as well as the collection of vegetation samples under the 'authorization for collection of biological specimens of species diversity' for tree species identification in a nationally registered herbarium in Quito. As this part of the research project is observational and does not involve any direct interaction with primates or biological samples, ethical approval apart from that obtained through Research Western for research with human subjects (Project ID: 111919) was not required.

Vegetation Sampling

In May 2022, we completed three 60 x 60 m plots, sampling three different bamboo-forest habitat types in the Pacoche Wildlife Refuge to identify the tree species present and document the concentration of bamboo at each location (*see figure 8 below*). The size of the plots was based on the vegetation sampling methodology I was trained in previously by FAO (Food and Agricultural Organization of the United Nations). The purpose of this sampling method was to understand the impact *Guadua angustifolia kunth* has on the floristic composition of different forest types where primate species share habitat. Some studies contend that bamboo's invasive qualities can, in fact, be harmful to tree species richness (Ospina & Finegan, 2004) and even a threat to primate survival (Majumdar et al., 2015). As this study is interested in primate frequency of use of *Guadua* bamboo, it is necessary to understand the diversity and concentration of woody tree species across a sample of dominant habitat types.

Botanic plot methods involve the measurement and identification of all tree species, in our case woody tree species, of over 10cm Diameter at Breast Height (DBH) related to the circumference (C) as DBH = C / 3.14 and measured at the height of 1.3 m (Ganzhorn, Rakotondranary & Ratovonamana, 2011) within a predefined area. Ganzhorn et al., (2011)

recommend plots over $10m^2$ for tropical forests, and state that for primate studies, it is common practice only to identify and measure all trees ≥ 10cm DBH. For trees with multiple trunks, we

(*Figure 8:* Map of Vegetation Plots)

measured each one and recorded it in the same data column. 60m plots were marked every 10m and in each corner with a post, using a clinometer and a compass to ensure a straight line despite the changes in topography/elevation. GPS coordinates were taken at the four corners of each plot. Once trees were measured and samples were collected, each was marked with biodegradable flagging tape before moving to the next (later removed upon study completion). To identify tree species, we first acquired the local name from our field guides and then collected samples from each unique specimen, treated and catalogued them at the Quito Herbarium (QNCE). Species were identified or confirmed by a botanist at the herbarium .

Site selection was decided based on the following criteria: 1) physical accessibility, 2) previous primate sightings, 3) representation of differing forest types, and 4) authorization from

landowners. After scanning the area of study, given the time available for this phase of the project (1 month), the team decided that three plots would provide an appropriate sample size for the bamboo-rich sector of the protected area (*see results section for site details*). Field leaders used data sheets for systematic documentation. They included the following information: Date, time, name of researcher, site number, forest type, sample number, common (local) name (identified by local research assistants), DBH, human use, primate use, phenological status, other species present, and other observations/notes (*see Appendix H for the vegetation data sheet*). These surveys were a collaborative effort alongside Dr. Xavier Haro-Carrion, a Geographer and specialist in vegetation mapping from Macalester College, who helped both to design and conduct the study, as well as analyze the samples. We hired three local field assistants to help with cutting transects, identifying tree species (local names), and collecting samples, and they were trained in vegetation survey techniques. We also trained a local student intern from the ULEAM (Universidad Laica Eloy Alfaro de Manabí).

Arboreal Remote Cameras

While not the primary method of data collection for this study, the use of remote cameras was intended to supplement physical observations and to confirm the frequency of primate presence in specific habitat types and crossings. When working with endangered species, the COVID-19 pandemic has shifted the way primatologists approach research design to minimize the potential for disease transmission (Hansen et al., 2022). Due to anthropogenic activities, arboreal taxa, like neotropical primates, are especially vulnerable to the impacts of habitat loss and forest fragmentation. In response, remote methods such as camera trapping have become an increasingly popular non-invasive technique for monitoring wildlife populations (Moore et al., 2021).

This study placed five remote trail cameras (Bushnell Core DS NO Glow) along known trail routes in order to capture evidence of primate habitat use (i.e., bamboo corridors, agroforestry crops and road crossings). Arboreal camera trapping is a much more complex sampling technique than in terrestrial environments, as there is more opportunity for interference from nearby foliage, a high level of expertise and difficulty achieving ideal placement, and often considerably more data processing involved in the process. Therefore, despite introducing bias into the study design, due to the uniquely challenging nature of camera trap placement in arboreal environments (Moore et al., 2021), known movement pathways, either through our own observations or local reports, were targeted as hotspots to increase the probability of detection (Gregory et al., 2017). Previous knowledge of primate behaviour and habitat preference was needed to guide camera placement, such as the height at which to position each camera based on the strata of canopy most frequented by the study species, as well as favourite feeding and resting tree species. The suitability and safety of the tree for climbing was also an important consideration and limitation for camera placement. The height at which each camera was positioned varied significantly based on previous observations of movement pathways, the topography of the site, and the structure and accessibility of the canopy.

Given the challenges of arboreal camera trapping mentioned above, the use of time-lapse modes was chosen for this study to improve species detection both visually and auditorily beyond PIR sensors (Laughlin et al., 2017; Schipper, 2007). Cameras were each programmed to record a 15-second audio/video clip every 15 minutes from 6:00 a.m.-10:00 a.m. and then again from 4:00 p.m.-6:00 p.m. during times when primates are most active. Cameras were also able to record based on motion activation. Given the high energy demand of the task, each camera was equipped with 6 AA lithium batteries and a SanDisk 64GB 170MB/s Extreme PRO memory

card. Through trial and error, this study found that alkaline batteries and memory cards with less storage space and slower MB/s (processing speed) were not functional for the video time-lapse mode setting on this camera model. Batteries and cameras were checked monthly and relocated if there were no primate sightings during that time. In most cases, cameras were moved multiple times throughout the project duration. A one-week test period conducting ground surveys was used to choose and evaluate each site to determine primate presence, identify movement pathways and potential feeding/resting tree locations to assess the most appropriate location to place each camera (Hansen et al., 2022; Moore et al., 2021; Gregory et al., 2014).

Data analysis involved downloading video content on an external hard drive and reviewing each recording for any sign of primate presence – visual or auditory. As the time-lapse feature produced four videos per hour, the number of motion-activated videos was also recorded apart from any variables that made detection difficult, like lack of visibility due to climate.

The most significant limitation to this method was the difficulty with camera placement and accessibility, as well as the climate conditions which damaged two of the five cameras beyond repair. The security of the cameras was also a limitation, which impacted where they were placed and how long they remained in certain locations. Additionally, using the time-lapse feature produced an overabundance of data, most of which was not useful, and it was not possible to review everything systematically as a supplementary method in this study.

Results: Primate-Bamboo Resource-Partitioning

This section uses an ethnoprimatological approach to present the findings from the primate behavioural surveys of both *Alouatta palliata* and *Cebus aequatorialis* through a frequency analysis across all samples. First, the frequency of use of *Guadua angustifolia kunth* is analyzed through a socioecological perspective to discover primate species patterns in behaviour, age, sex,

and preferences for different forest types that emerge from the data. Second, the results from the vegetation sample plots are presented in order to understand the composition of woody tree species within different bamboo-forest types and the impact differing concentrations of *Guadua* have on forest structure. The purpose of this "Results" section is to understand the ecological importance and conservation significance of this endemic forest resource for resident primate species.

Alouatta palliata

> The morning was cool and cloudy as we stepped out of our beat-up Jeep and parked just off the main E15 highway. The road was shiny and wet from the previous night's rain. The Pacoche forest was covered in its familiar misty haze as we loaded our gear on our backs for the hike. I carried 2 litres of water and lunch for the three of us while Santi had the camera gear and tripod – we each brought a lawn chair tucked under one arm, and Ramón carried the bag with our mosquito net – clearing the path with his machete as we descended on the Rio Mayo trail. This time of year (in February), the foliage grows very quickly, the forest looks lush and green and the undergrowth or *malesa* is typically cut down on smallholder's properties, so it does not interfere with their cultivated yields, giving better visibility for snakes, and of course accessibility. Aside from being very knowledgeable about forest vegetation and "mountain life," Ramón is a huge help clearing trails for us as we move about the forest, searching and following monkey groups, and helping us to access areas off the trail when we need to. Today, the mosquitoes are less terrible than usual, and I take a moment to thank Ramón again for clearing this trail and making it so much easier for us to move about. Often, the undergrowth is so high it is taller than I am, smacking me in the face as we push forward, sometimes with an unpleasant fiery sting from the *ortiga* stinging nettle plant. This morning, the forest is very vocal, with five different howler groups calling in the distance and the rufous-headed chachalacas squawking to each other with their overpowering cackles.
>
> As we enter the trail that I refer to as the “Watertank Trail," we encounter one howler group at 7:00 a.m. feeding in a large fig (*Ficus*) tree where they are commonly found. This group, which I called the "WaterTank Group," tends to move up and down this trail, sticking closely from one *Ficus* to the next. However, moving between these large, canopied giants is not so easily navigable in this highway edge habitat (classified as secondary mixed bamboo edge) with short, brittle secondary vegetation and large gaps cleared by *montañeros* for forest access. My boots slip and slide in the mud as I try to get a grip on the steep terrain to get a good view of the group. About 60m away, the WaterTank group moves in single file through the bamboo – bending the culms and snapping branches as they travel, one culm to the next. I follow them as they cross the trail overhead in front of me and disappear into the thick vegetation on the other side. The group moves quietly and very quickly, with two adult males leading and one trailing the rest.

The WaterTank group is a socially cohesive family of about 13-15 individuals, consisting of 3 adult males, one younger than the other two, five adult females – two with offspring, two subadult females, two juvenile females, and one juvenile male. What is unique and easily identifiable about this group is that the alpha male "Scarface" has a nasty gash splitting through both his lips, leaving his mouth open and lower lip disfigured. While many adult males in Pacoche have gnarly scars on their mouths, some worse than others – this one is by far the most ghastly. However, this male also has a distinct relationship with the juvenile male who follows him around like this sidekick. They rest together and are always in proximity, indicating a close bond (rare to see with howler males). These factors, alongside their location and movement patterns, help our team distinguish this group from others that overlap this territory on occasion.

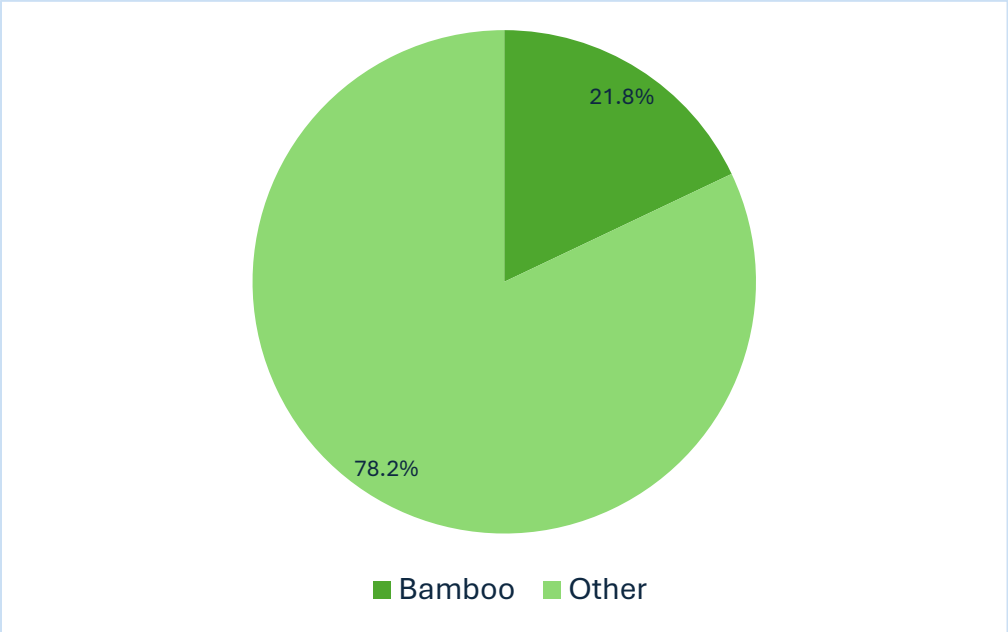
Due to the continuous sampling of the same 13 transects, six different howler groups (including the WaterTank Group) were identified consistently during the sampling process. Four groups were found predominantly in edge habitat (three of these in the forests surrounding Pacoche Lodge property), whereas one group was more commonly located in the interior forest, and "El Duo," or the pair of subadult males, was also primarily found in the interior. It is important to note that most of the samples gathered during the data collection process came from unidentified groups or individuals, as our methodology was not fixated on following specific groups. The difficulty locating and following groups in the forest interior, especially during times of the year when the foliage is thick, contributed to less ability to identify groups confidently and consistently in this forest type.

Table #5: Howler Group Sex/Age Composition and Forest Type

Group ID	Total	Forest	AM	AF	SubAM	SubAF	JM	JF	J (no ID)	IN	NB
Los Flores	7-9	Edge	2	3				2		2	
Los Guapos	17-20	Edge	4	7				3	1	4	
Los Alegres	26+	Edge	3	10	1		2	5		5	
Los Albinos	18-20	Interior	3	6			2	6		1	2
WaterTank Group	13-15	Edge	3	5		2	1	2		2	
El Duo	2	Interior			2						

Across a total of 4549 samples, howlers spent 21.8% of all samples using mature bamboo culms as substrate across all forest types and behaviours**.** Throughout this study, howlers were never observed using young or expired bamboo culms – likely due to their lesser structural integrity, flexibility and less developed composition with fewer branches and leaves to facilitate locomotion (*see figure 9 below*).

(Figure 9: **Percentage of *A. palliata* sightings in bamboo)**

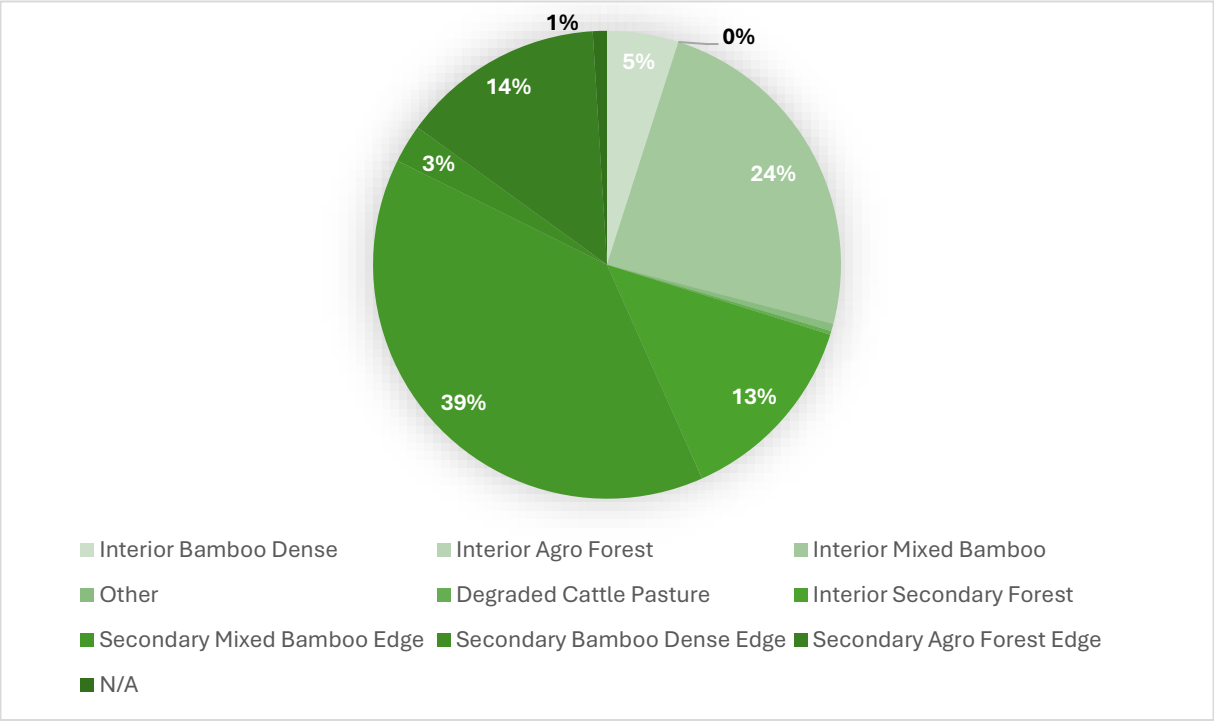


Bamboo-Forest Type

A frequency analysis across all samples indicates that the majority of all *A. palliata* sightings took place in Secondary Mixed Bamboo Edge (39%) and Interior Mixed Bamboo

Forest (24%). These two forest types were also where the majority of bamboo use was recorded (63%) (*see figure 10 below*).

(*Figure 10: A. palliata* forest use type)



The difficulties associated with arboreal movement through fragmented habitats is described in this excerpt from my fieldnotes:

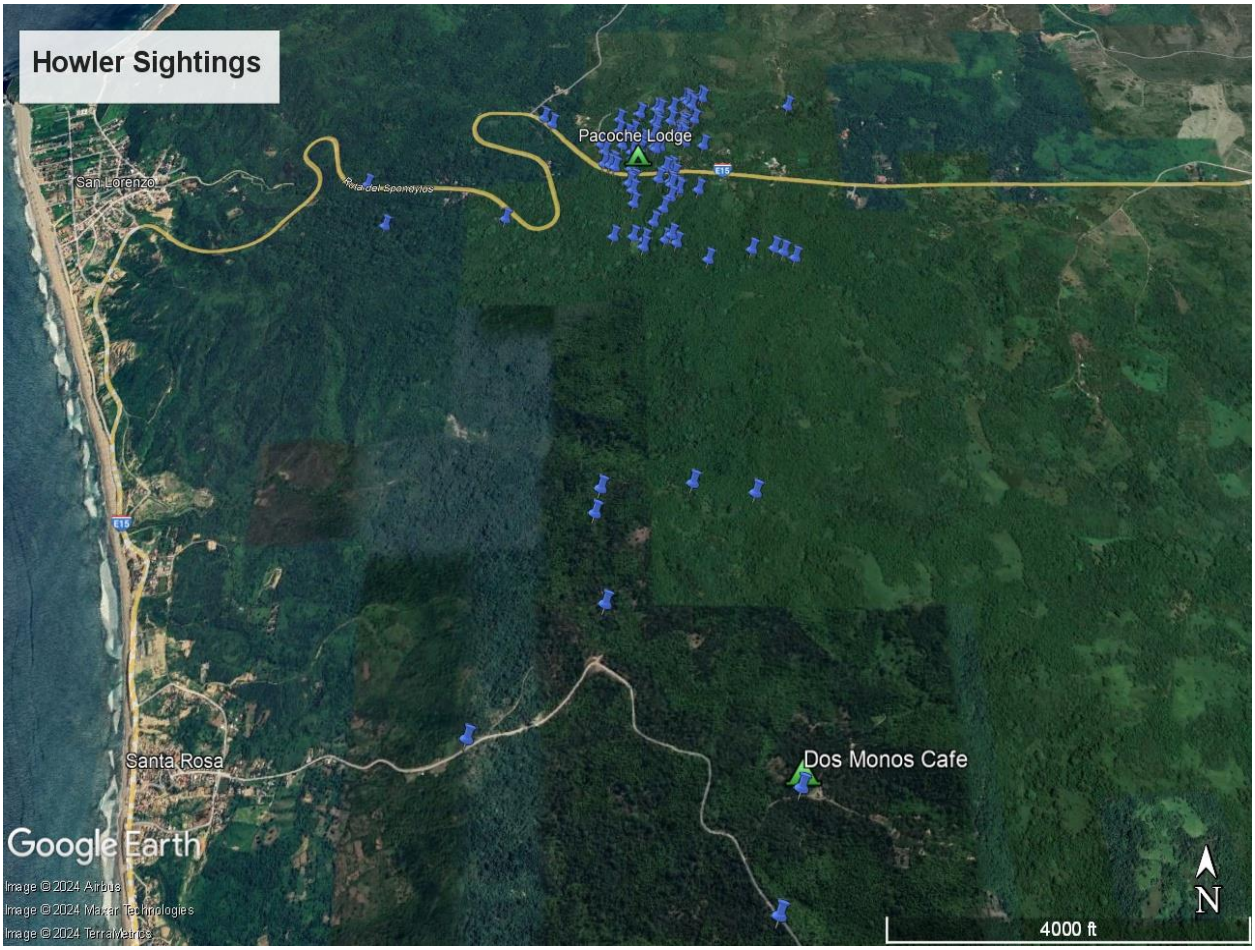
> Today, the Flores Group is travelling along the ravine agro edge, moving through loosely connected canopy with large gaps. Over the years, many large trees have been removed to make room for cultivated plants like pineapple, lemons, oranges, papaya, and coffee. At this time of the year (September), the foliage in most of the trees is sparse making travel by the monkeys through these agroforestry patches more challenging. The group is using *cade* otherwise known as *tagua* palm (*Phytelephas aequatorialis*) with its large fanned-out leaves to cross this gap between the balsa trees, as Rita (an adult female) makes the leap with baby Cheetah on her back - tail looped around hers like a monkey seat belt - the dry palm leaf bends, and snaps under their weight, as she scrambles to the interior part of the tree for safety. "She almost fell!" I call to Ramón, looking at the deep cliffside underneath that could have been their demise. At that moment, I realized that while howlers are arboreal specialists, as a terrestrial species, we humans have made their lives very difficult. After watching the juveniles make the jump look easy – landing on a different palm leaf than Rita – I followed the group to the NW corner of the property, where I later watched them use the flexibility of the bamboo culms to cross yet another

> gap to get to an undisturbed forest plot on the other side. "Much safer passage," I nodded to Ramón.
>
> We then decided to place a remote camera in the *toronja* (grapefruit) tree facing this natural canopy bridge (about 40m in front) to capture the frequency at which the howlers use this crossing. Unfortunately, after over a month of coverage between October 26 – Nov 26, 2022 (568 video clips), we only captured four videos of howlers using this "bridge" because the camera placement was not ideal. It is important to note that during these clips, they used the same route each time, mirroring the route we have personally observed them travelling. They likely used this route more frequently, but because the camera was set to time-lapse mode to record for 15 seconds every 15 minutes between 6–10 a.m. and 4–6 p.m. and was too far away from the crossing to be motion-activated, we would have missed any sightings that took place outside of these parameters.

Secondary Mixed Bamboo Agro-Edge Forest, like described here on the Flores Property, has much lower concentrations of bamboo than in other bamboo-forest types; however, *Guadua* continues to play a crucial role for arboreal species like howlers as natural canopy bridges to facilitate travel behaviours and group progressions. A notable exception across 'forest use types' was in the Interior Bamboo-Dense habitat, where considerably fewer howler samples occurred (5%). Here, the majority of the behaviour recorded was using *Guadua angustifoli*a (50.5%) because of the lower tree density present in this forest type (Gómez-Posada, 2014; Ospina & Finegan, 2004). The way that howlers use the culms to move through the canopy is described in this following fieldnote entry:

> Snap, pop, crack, creak, the sky-high bamboo culms rub together and sway in the wind overhead as I stand ankle-deep in the mud on the forest floor, staring up at these towering giants scanning the canopy for brown blobs in the foliage. Deep within the crisscrossing chaos of bamboo in the forest interior, I spot an adult male howler monkey travelling hand over hand between culms, pulling them towards himself as he glides gracefully, lowering himself down on the next culm – like an elevator. I watch him in awe with a kink in the back of my neck, nearly 30m overhead, navigating across a gap in the forest canopy with such ease.

(*Figure 11*: Map of *A. palliata* sightings)



Behavioural Samples

Across 40% of all samples, the findings indicate that bamboo habitat provides a valuable substrate for *A. palliata* to travel between feeding and resting trees. Howlers were frequently observed utilizing the flexibility of the culm to travel across forest gaps for more secure passage. According to my observations, adult males, females with offspring and older females would exhibit this behaviour, while agile juveniles preferred to leap. Individuals would use their weight to bend the bamboo and pull or drop themselves on the next substrate, using their prehensile tails as support. This movement pattern is illustrated in the following fieldnote passage:

> On a few occasions, I witnessed an adult female howler deliberately change her route, veering from the most direct path to choose another to join her group on the other side of

> a forest gap. In the first instance, on the Flores Property - the Flores Group adult female (Rita) with an infant (Cheetah) was feeding on the young leaves of a cativo tree alongside her juvenile female offspring (Mikita). The rest of the group crossed above her using the natural canopy bridge of bamboo while the juvenile female leaped across the gap from the feeding tree to the next - a small leap of a few feet and the most direct path from the feeding tree. Rita and Cheetah, instead, finished eating and retraced her movements, travelling out of her way to reach the same bamboo culm above used by other group members to cross the gap and join her group on the other side.
>
> The second time, this incident occurred on the Pacoche Lodge property near Johnny's house overtop of the driveway, which splits the forest canopy. An adult female (from the Los Guapo's group) was feeding in a large, canopied tree and advanced to the end of the main branch. Here, the smaller outer branches extended to loosely overlap with those of a neighbouring tree, producing a potential canopy crossing over the gap below. However, instead of crossing here, she retraced her movements and chose an entirely different route, using a bamboo culm to cross the space instead. Afterwards, I witnessed other group members crossing this same gap using bamboo culms from the same clump that arched over the driveway.
>
> It is interesting that despite other tree branches/foliage that also hang over to connect the gap, the entire howler group chose to cross only using the bamboo culms. I hypothesize that during this time of year, it is constantly raining, and the branches are wet; also, most trees are losing or have lost their leaves, and the foliage is generally sparse. Perhaps the branches are more likely to snap and break at this time of the year (as evident in large broken branches covering the trails), and thus, bamboo culms provide a safer, more secure means of crossing.

In line with these observations, De Guinea et al. (2019) argue that howler monkeys use habitual route navigation when moving from feeding and resting trees as an energetically efficient strategy. They explain how using the same routes allows howlers to develop mental maps of landmarks and the phenological state of food resources, which helps to reduce cognitive load for frugivorous-folivorous species like howlers, known to be energy minimizers. They also explain how the characteristics of different types of substrates, such as the thickness of branches and connectivity, are essential parameters to consider for primates to best conserve energy when moving through the canopy. The durability and flexibility of mature *Guadua* bamboo culms would undoubtedly meet these demands. The findings of De Guinea et al. (2019) help illustrate why howler groups in our samples in Pacoche showed similar patterns, repeatedly using the same routes and arboreal crossings.

During resting behaviours, individual howlers were commonly observed using both horizontal and vertical culms, while horizontal culms were more common for greater numbers of individuals resting in proximity. This substrate choice was considerably more common amongst resting samples collected in the forest interior (63%), which is important to note because these forest types also contain more large-crowned trees, such as from the genus *Ficus*, considered to be preferred resting trees for howlers across the literature (Milton et al., 1982; Serio-Silva et al. 2002; Bicca-Marques, 2003). Some of these behavioural patterns using bamboo culms are illustrated in the following fieldnote excerpt:

> Often, when I am taking samples around midday, the howler groups are resting – sometimes for hours in the same position. This is one reason why lawn chairs are an excellent investment. While most of these samples are taken in the shade of broad canopied trees where the howlers like to rest, mothers and offspring often near the interior of the tree crown, and singletons and males on the outskirts, there are many times when they are resting in the oddest of locations. For instance, it is also expected to see an entire family resting in a bamboo grove, exposed to the elements with culms blowing back and forth in the wind. Usually perched in a ball within 1-2m of each other, or in many cases, an entire family is resting together on the same horizontal bamboo culm – shoulder to shoulder. This culm is often exposed to the elements and used as a natural canopy bridge over forest gaps and between larger canopy trees. I often wonder why they choose to rest in such an open location – sometimes, perhaps to soak up the sun; other times, it is overcast and rainy, so I do not know. As they often travel in a single file, perhaps it functions as a rest stop point or lookout along the prescribed route to monitor visible food resources (*as suggested by* De Guinea et al., 2019).

In only 2.5% of sampled howlers used *Guadua* culms as substrate while feeding on nearby foliage of, predominately, *Inga* or *Cecropia* species in areas with lower canopy coverage or interior, bamboo-dense forest types.

In 45% of resting samples, adult males rested alone along the top 2-3m of the culm. It is estimated that this substrate choice could act as a strategic lookout point for vigilance and arboreal navigation (De Guinea et al., 2019), given the superior height (up to 25-30m) of these mature culms that tower above much of the surrounding vegetation. Howler monkeys are known across the literature to frequent the mid to upper strata of the canopy (Tomblin & Cranford,

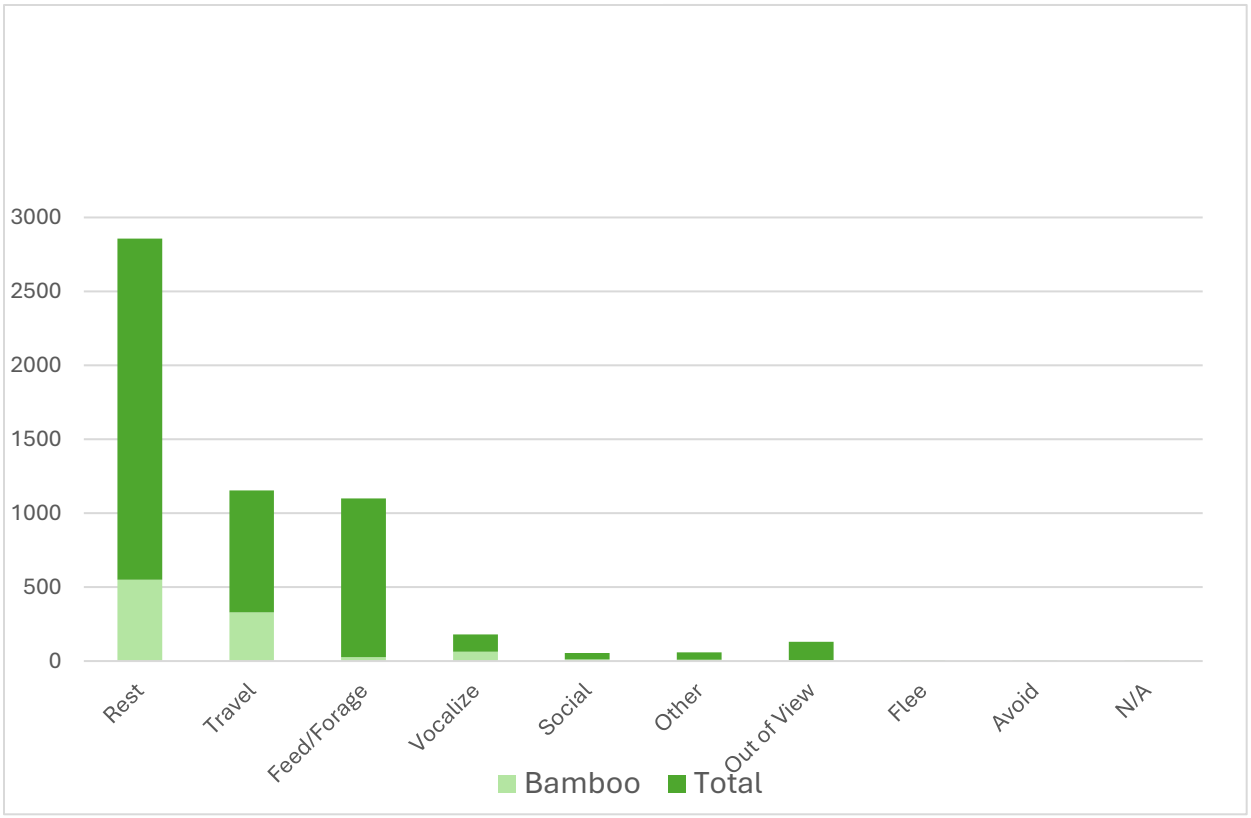
1994). Vocalization behaviour by adult males also favoured bamboo culm supports, with 53% of vocalization samples taking place again near the upper quarter of the culm. A detailed example of howler vocalization behaviour is outlined below:

> Hiking in the forest interior, where the trees are bigger, the bamboo groves are denser and stretch as far as the eye can see. We follow the La Guayaba route that later turns into "*Las Piñas*" – a trail made for smallholders to travel back and forth from their land plots, usually by mule. The ground at this time of year is knee-deep in mud, heavily pounded by livestock hooves, squishy and soapy as we slip and slide our way down the path, careful not to fall or lose a boot with every step. It is exhausting and messy, but out here, it is so quiet and peaceful. We come across the odd person en route, "*Primo*!" Ramón hollers; as we pass by, it seems everyone is related to him. We always stop to chat, and he likes to introduce me and ask them if we can have a "tour of their property". It is frowned upon to step foot on the land of someone you do not have permission from. So, he often used these impromptu encounters to let them know we are searching for monkeys and asked if they had seen them anywhere lately.
>
> Today, we are advancing closer to "*Las Piñas*"**,** where the bamboo is thicker, and the orange and coffee trees are more plentiful and closer to the path when we hear two male howlers vocalizing loudly back and forth. At the time, I did not know this was a territorial call, but the closer we got, the sound was almost deafening. Both males were perched at the top of bamboo culms on either side of the trail from one another – maybe 30m apart. One was clearly alone, a younger male – while the other was older and larger. The younger male looked afraid and scrambled higher to the tip of the culm as we approached. He sat there, huddled in a ball, howling at the top of his lungs intermittently for over an hour. Both males, at the top of the bamboo culms, were well above most of the lower canopy – positioning themselves at the highest vantage point possible for their territorial display. The more I watched, the more I noticed that about 20m further behind, the more prominent male was a howler group with several infants, all resting in the bamboo. Later, once the howling became less frequent, the more prominent male joined this group, and another male from his group began vocalizing alongside him at the "intruder" as if they were working together to get the point across that this other male should stay away.

Across the literature, howling behaviour is predominantly documented as a means of determining space between groups to avoid inter-group encounters (Bolt et al., 2019; Van Belle, Estrada, & Garber, 2013). Other functions attributed to this behaviour include: mate and infant defense (Holzmann, Agostini, & di Bitetti, 2012), predator deterrence (Camargo & Ferrari, 2007), and advertising fighting ability to other groups (Kitchen, Horwich, & James, 2004). Studies have also suggested howling behaviour is more frequent during resource scarcity due to increased competition over essential food resources (Bolt et al., 2019). The observation detailed

above appears to be in defense of mates or infants from a lone, outsider male, where selecting the highest point at the top of the bamboo culm could serve for vigilance and the flexibility of the substrate could provide for a quick escape, if need be. These fieldnote examples, coupled with the behavioural data from the focal time sampling, illustrate the frequency of use of *Guadua* bamboo and its function in howler monkey structural and social ecology across age-sex preferences in different bamboo-forest types (*see figure 12*).

(*Figure 12: A. palliata* Behavioural Samples)



Cebus aequatorialis

> I will never forget the first time I saw a white-fronted capuchin in the wild. Ramón and I were nearing the mid-point of an exhausting 18km hike on a local mule route called "La Guayaba." It was the 14th of June 2019, at 10:45 a.m. I was crossing the creek en route to Carlos Pinargote's property, where the La Guayaba Trail turns into "Las Piñas," when they appeared out of nowhere. With tears of happiness streaming down my face, I must have counted at least 20 capuchins as they encircled us completely; some came as uncomfortably close as 4m away. In response to a perceived threat, capuchins often engage in "mobbing behaviour" that involves repeated alarm calls and intimidation displays (Campos & Fedigan, 2014). Juveniles scrambled overhead, purposely

> positioning themselves above us to appear more threatening. The longer we stood there frozen and speechless, the more individuals began to appear out from the dense bamboo foliage that surrounded us, coming down the culms to display a nasty teeth-bearing at us. It was terrifying as individuals moved lightning fast, bouncing from culm to culm, breaking off branches, snapping them and throwing them down on the ground in an act of intimidation. My pulse raced, and every time I turned my head (and the rim of my purple Western baseball cap) to get a better look, the individual would shoot up the culm, and I received a startled bark and teeth-bearing sneer in return. Several juveniles looked as though they were eating the bamboo branches, but I think, in hindsight, they were just chewing on them anxiously to break them off. All the individuals in view were using bamboo substrate, most staying at least 10m away from us.
>
> Nearly an hour later, we were still standing there, me trying to stay calm and take notes in the most submissive manner possible, and Ramón keeping watch so that nothing fell on our heads. The vocalizations mainly were barking and chirping noises, the barking directed at us every time we moved, and the chirping between group members. Some smaller individuals were primarily greyish in colour, with white on the top of their heads, while others were larger and much more of a reddish brown with a blonde face and a darker underbelly. In the entire 2-hour encounter, I never saw one baby, and I am confident we only saw a portion of the group tasked with distracting us while the rest passed undetected. The literature claims that *Cebus aequatorialis* lives in groups of 5-20 individuals (Albuja & Arcos, 2007; Jack & Campos, 2012; Cervera et al., 2018). However, by the end of the observation, I estimated seeing at least 30 individuals, and it is likely the group was much larger. More than one group may have come together at this time. As we began to advance along the trail, several juveniles followed us for nearly 20 minutes until the forest edge drew closer. Then they vanished as fast as they had appeared. I knew after this first exhilarating encounter that I needed to find a way to study them. Now, after nearly two years of intermittent data collection, I have only had about three dozen observations, and that first unexpected one remains one of the longest.

In the Pacoche Wildlife Refuge, capuchins are not yet habituated to human presence and have reputation from the locals as bold, daring, and aggressive. In an ethnoprimatological study of perceptions of primates in 2018, I heard stories of capuchins as lewd and dangerous, sometimes even being reported to follow or attack people in the forest (Britton, 2018). More recent reports of capuchins in 2021-2022 continue with these themes and add stories of capuchins as mischievous thieves stealing people's clothes in the forest while they are bathing. When asked, local farmers in the protected area state that capuchins are rarely seen because "they do not like to be near people," reporting that there are fewer capuchins now in the forest than 10 or 20 years ago (Britton, 2018).

Their avoidance behaviour and threatening demeanour when encountered in the forest make them a challenging species to study. These behavioural characteristics coupled with the steep**,** rugged terrain and dense bamboo thickets the capuchins frequent, further limit opportunities for observation. With an estimated home range size between 507 and 561 hectares (Jack & Campos, 2012) and an estimated population decline of >80% over the past three decades (IUCN, 2021), it is no wonder there are so little data on *Cebus aequatorialis*.

C. aequatorialis Group and Subgroupings

The sub-group most commonly observed is called "Los Piratas," which consisted of 3 adult males, two juvenile males, and one adult female for a total of six individuals.

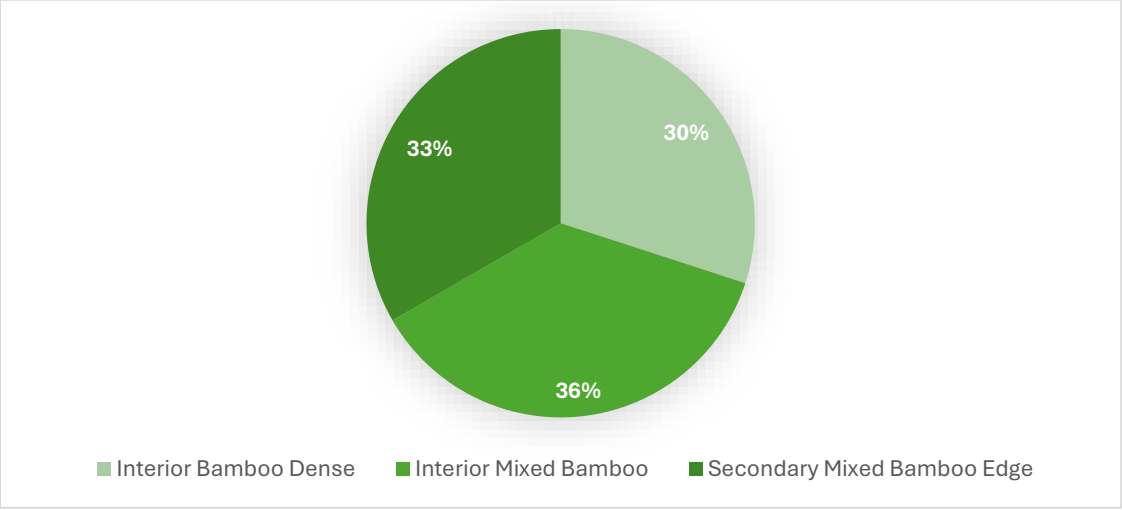
Table #6: *C. aequatorialis* Group Composition

Group: "Los Piratas"	**Sex/Age Estimate**
Barbosa (blind in one eye)	Adult male – alpha?
Bob	Adult male
Diego (sub)	Adult male
Porcelana	Juvenile male
JM	Juvenile male
Doc	Adult female - alpha

Alfaro (2007) notes that determining the size of a capuchin group is challenging because group members often travel very dispersed from each other. From our observations, we hypothesize that this smaller group is an offshoot team of 'scouters' that belongs to a larger core group. In several instances, the core group changes direction to remain unseen and finds an alternative route to pass us by while the subgroup approaches us and creates a distraction. We know this for two reasons: firstly, the subgroup consists primarily of males and no offspring, and second, through remote camera data, we know for sure that there are at least three adult females with babies in this group and at least two additional females have been recorded, as well as another two juveniles. This would bring the group count to 15; however, on several occasions when we

have encountered the group by surprise or through local reports, we know there are more unidentified individuals leading to an estimated total size of this group of between 17-27. Across the literature, facultative subgrouping[32] is rare among capuchins, as most groups are considered to have a stable composition. However, this alternative social structure has been documented in wild capuchins as a strategy in response to the seasonal distribution of resources (Lynch-Alfaro, 2007; Izar, 2003). Given the patchy distribution of fruiting trees in Pacoche, we know that capuchins ascend from the dense bamboo habitat along the ravine to feed on the cultivated fruit trees along the periphery. Many of these fruit trees exist on abandoned or infrequently accessed forest plots. The group travels between different agro plots feeding on the fruit in season (particularly oranges, mandarins, grapefruit, guava, soursop, bananas, star apple and sapote), then promptly returns to the safety of the bamboo. In 33% of samples, capuchins were observed in what we classified as "Mixed Bamboo Edge Forest" (*see figure 13*) while the group travelled to-from fruiting sites scattered amongst this forest type within 100m of the highway edge.

(*Figure 13:* Percentage of *C. aequatorialis* by forest type preference)

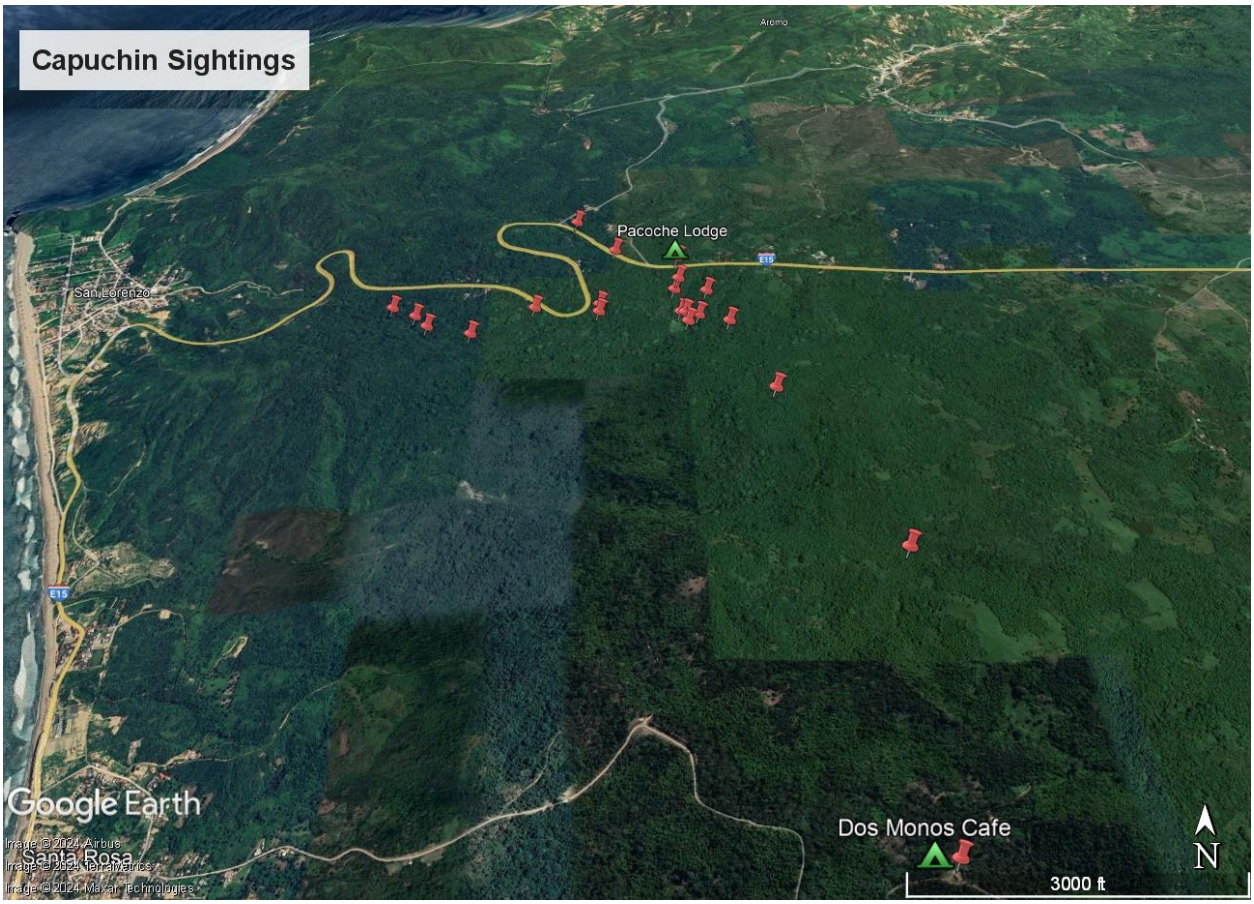


[32] "Facultative subgrouping" = when the size and composition of the core group changes by temporarily breaking into smaller social groups during certain behaviours such as foraging in response to circumstances like seasonal distribution of resources or scarcity (Alfaro, 2007)

Through our observations, we estimate there are two or three separate groups that overlap home ranges within the study area - one of which we know breaks into a smaller subgroup**.** This conclusion is also supported by community reporting of capuchin sightings in this same habitat type. Often, smallholders will see capuchins while they are en route to their land plots within the forest interior. Through our WhatsApp group, they later reported the sightings to our team. Unfortunately, through these reports, we rarely have exact locations, times, or group counts, and sometimes even the day of the week is unsure. Regardless, these smallholder participants provide an excellent base to estimate the home range of groups (*Los Piratas* is identifiable through the individual with the 'bad eye') and give us a rough idea of what areas to search more consistently for our own surveys.

The most southern sightings reported are in the vicinity of the border of the park near *La Solita* – but this was reported only once during mango season and, based on the distance, would undoubtedly be a different group than those we have observed in the northern part of the park – not personally observed and thus not included in our group count. The estimated home range limits of the observed two to three groups, based on local sightings, consist of the *La Tembladera* sector near *El Aromo* near the northern border of the PA, down as far south as the *Dos Monos* coffee farm and road on the route to *Las Piñas*.

(*Figure 14:* Map of *C. aequatorialis* Sightings)



Capuchin Habitat Preference in the Pacoche Wildlife Refuge

In order to improve our chances of finding these groups, I took some advice from *The Complete Capuchin* textbook (Fragaszy, Visalberghi and Fedigan, 2014), which advises that when attempting to habituate a group, it is best practice to wait at desired feeding or resting trees and watering holes to improve opportunities for observation. The literature also states that capuchins tend to favour primary forest habitats with large-crowned trees near water sources. Through walking the 13 transects previously discussed in the earlier section, we were able to identify key areas that contained all of these attributes in agroforest sections of the interior. Mostly abandoned and reclaimed by the forest ecosystem, these plots are ripe with a wide variety

of fruits, once cultivated and located beside steep ravines leading down to the creek system. The following excerpt from my fieldnotes describes the successes and challenges of this surveying technique:

> This new strategy, waiting for them to arrive in a strategic place with good visibility, so far has proven fruitful with almost every day we are here, we have had an encounter of some sort. The idea is to be here as often as we can so they get used to our presence and allow me to take more robust samples so we can learn their patterns. Each time, they have arrived from the southeast, along where the creek is found at the bottom of the ravine. We usually hear them coming from far away before they arrive because they are so noisy - snapping branches, leaves falling and chattering, barking, and chirping as they move through the forest, trees shaking like a storm is coming.
>
> Around noonish today, it started to drizzle rain, so we covered our backpacks with rain gear and used an oversized rain poncho like a roof on top of our mosquito net to keep us dry under the avocado tree. The rain lasted about an hour and afterwards came to a bright hot sun with loud sounds of bamboo sheaths loosened in the rain, falling off the culms around us and crashing into the foliage below, like crinkled plastic bags. Each time, we turned to see if it is capuchins. Psyched out again and again... My hearing has become so in tuned to forest noises, delicately listening intently for any sound representing a capuchin group. Each creek in the wind, the rustle of leaves, the snap of a branch, and I am alerted. There is a bird call (I do not know what species) that sounds precisely like capuchins and always gets me excited for nothing.

After so many auditory encounters from deep within the ravine, one day, instead of waiting for them to come to us, we decided to adventure down to Rio Mayo and search for the capuchins ourselves. The following section depicts the difficulty of the terrain and impromptu decision making that occurs during the survey process to try and improve our encounter rates with the elusive capuchins:

> Rio Mayo is more of a creek. Most of the year the water only trickles and is sometimes deep enough to cover the foot of my rubber boot, with small deeper pools clustered around rock walls where water pours out from in between the stones. This creek is not easily accessible; it is located in primary forest without any livestock trails connected to it (at least in this section of the forest). Nestled within these rocks are land crabs about the size of a child's fist and beige in colour to blend in with the leaf litter. Large snails and small minnows are also found along the creek, and Ramón turns over fallen leaves and branches with this machete, looking for freshwater shrimp he says he used to collect as a child. The forest here lower down in the ravine is dense and dark, the mosquitoes are almost unbearable, and the bamboo is thick and untouched. We see animal prints in the mud, "maybe an armadillo," says Ramón, motioning my attention to what he describes as a "game trail" or natural pathway of flattened vegetation made by animals, vaguely

> noticeable to an outsider like me. As Ramón tries to clear a path for us, I am hunched over, underneath piles of fallen rotting bamboo that lay across the banks, creating a low roof over the creek. As bamboo culms fall and rest on branches crisscrossed and tumbling onto the forest floor, we need to be careful where we step in dense areas as the thorns can go right through your boot. For this reason, this type of bamboo is called *caña brava*, referring to its "angry" spikes, which give the plant a wildness to be respected. After an hour and a half of hacking through the jungle, me ducking and squatting to get through small openings in the forest – both of us covered in sweat and mud and swatting mosquitoes, I tell Ramón I have had enough, and we return to our campsite. During our adventure, I am constantly searching for evidence of capuchins - half-eaten *tagua* fruit or flowers, animal prints, torn-off crab claws, smashed open snail shells - something that indicates why and where along this creek they frequent. They often emerge from this direction when we encounter them up above the ravine, and I want to uncover if they have a favourite spot where we can plant our camera trap.

When we were lucky enough to observe this species, our results across 30 in-person encounters indicate that capuchins in the protected area show a clear preference for interior bamboo habitat in 66% of all samples (*see figure #10 above*). These findings are consistent with the literature that states capuchins tend to prefer riparian edge and steep sloped forest zones (Tomblin & Cranford, 1994), which coincide with bamboo corridors in Pacoche. These forest zones are difficult to access because of the vegetation and topography and tend to be areas of low human disturbance, where a generation ago, cement water tanks/pumping stations and pipes were installed along the river to bring water to nearby communities**.** However, now these areas have been abandoned and rewilded. We hypothesize that capuchins frequent this forest type as a predator-avoidance strategy because predators such as ocelots (*Leopardus pardalis*), grey-backed hawks (*Pseudastur occidentalis*), barred hawks (*Morphnarchus princeps*) and tayras (*Eira barbara*) would be less agile in this dense-thorny vegetation.

In terms of predator avoidance strategies, the literature suggests that capuchins show a preference for sleeping site trees with a low probability of shedding branches (Di Bitetti et al., 2000), as well as for tall or emergent trees and increased protective cover. Coleman (2014) also states that predation risk can be decreased by increasing the ability to detect predators through higher visibility of the understory and higher vantage points to scan the landscape. Additionally,

Campos and Fedigan (2014) suggest that capuchins in Santa Rosa National Park, Costa Rica, tend to frequent high and middle forest layers and adjust their vigilance behaviour depending on the forest structure.

While Di Bitetti et al. (2000) found that bamboo forest was the least used forest type as sleeping sites for tufted capuchins in Brazil, the density of *Guadua angustifolia* groves in Pacoche would fit the requirements noted in the literature above for decreasing predator risk. For instance, the understory in these areas tends to be quite dark and dominated by bamboo biomass, with few short shrubs and trees because of the lack of light. This would allow for better visibility of predators at the ground level. Also, the height (up to 30m), flexibility and density of bamboo culms would allow capuchins to move quickly both vertically and horizontally for quick escape routes to the next culm. The following paragraph from my fieldnotes describes an observation of capuchins using bamboo substrate during a threat display directed at me.

> I headed back to camp, and there they were in my path - capuchins in the bamboo in front of me, 15 meters away. I crouched down and gripped my bamboo walking stick tightly as I took deep breaths and accepted that if they wanted to, they could rip my face off. I watched as two grayish juveniles passed overhead on a horizontal bamboo 'bridgeway'. One had a *tagua* nut in hand and was smashing it against the culm to make noise to try and intimidate me. After 10 minutes, slowly, one by one, they disappeared into the mixed bamboo vegetation, one juvenile male still barking at me as we both backed away from each other.

Additionally, capuchin tap-scanning was detected primarily through auditory cues, plus one personal observation of a capuchin using a *tagua* nut to tap-scan**.** We discerned that capuchins travel along these bamboo corridors that frequently coincide with deep ravines, 'tapping' on bamboo culms as part of an extractive foraging behaviour. Tap-scanning, also referred to as 'percussion foraging'**,** functions to gather acoustic information on the whereabouts of insects and frogs embedded in woody substrates by using fingertips or tools such as rocks or nuts to tap on the culm wall and listen if there is something inside worth breaking it open to eat. This behaviour

has been recorded in brown capuchin *Sapajus* (*Cebus*) *apella* populations in Suriname, Colombia, and Peru (Gunst, Boinski, & Fragaszy, 2010; Izawa, 1978; Philips, Grafton and Haas, 2003). Additionally, in other primates, the nocturnal aye-aye (*Daubentonia madagascarensis*) is well-documented for using its specialized middle fingers to perform this percussive behaviour to gather information on embedded prey (Erickson, 1991). It is through this foraging behaviour that capuchins are altering the forest structure as they tear open culms and extract bromeliads that are growing along the branches in their search for invertebrates and frogs. This next section from my fieldnotes describes an auditory encounter with the study group:

> Sitting in our make-shift camp in a new location, this time at the foot of Lupito's property on the edge of the gorge. We are surrounded by ripe cacao trees with bright red pods, bamboo, bananas, oranges, *tagua* and *chonta* trees. Unlike at the top of the hill, where we usually wait under the thatched *cade* roof, we do not have much of a view from here, but it is a great place to listen for capuchins that we hypothesize move throughout the bamboo along the riparian edge – popping out to forage on the fruit trees. It's 12:50 p.m., we have been camped out here all morning, and finally, it all pays off. It starts with a dim tapping noise in the distance – it could be just a woodpecker – but we listen more carefully. Tap, tap, tap, followed by a shriek, and we know it's them! It must be Barbosa's group down below in the gorge, tap scanning on the bamboo, searching for a snack embedded in the culms. We could hear several group members tapping at the same time. Sadly, they were too far down a dangerous incline deep in the dense vegetation**,** for us to be able to get a visual or to be able to approach them. This was quite often the case that we heard them well before we saw them. So, we waited patiently for them to make their way to us, as they often do. Unfortunately, today, we were not so lucky.
>
> Ramón later showed us how mature bamboo (*hecha*) can have small holes in the nodes where insects, frogs, and small snakes can hide. He calls these snakes *bejucas* and says that they are not dangerous. We try tapping the bamboo with a *tagua* nut to see if it sounds different. Sure enough, like a musical instrument, nodes with holes sound different than those without. It is reasonable to assume there would be a different sound if something were inside – something the capuchins have undoubtedly discovered.

These fieldnote examples throughout this section, coupled with the behavioural data from the scan sampling, illustrate the context of use of *Guadua* bamboo habitat types in the Pacoche Wildlife Refuge and the function of this forest resource in the structural and social ecology of *Cebus aequatorialis.*

Vegetation Surveys

The survey of three 60m x 60m plots representing three different bamboo-forest types within the study area were undertaken to address the following two questions: 1) What are the effects of bamboo groves (*Guadua angustifolia kunth*) on plant diversity in different bamboo forest types? 2) How does bamboo growth impact the forest structure of woody plant species?

Site Descriptions and Findings

Table #7 - Site 1: Rio Mayo - Secondary Agroforest located along a riparian edge zone in deep ravine, with moderate human disturbance, mixed-bamboo/deciduous forest and fruit cultivation. Total: 80; Trees Counted: 68; Tree Morpho-species: About 25; Bamboo Clumps: 12

Dominant Species Variety	**Cultivated**	**All other species ID**
Phytelephas aequatorialis	*Carica papaya*	*Ficus máxima*
Mauria heterophylla	*Persea americana*	*Ficus brevibracteata*
Guadua angustifolia	*Annona muricata*	*Urera caracasana*
Conocarpus erectus	*Citrus x sinensis*	*Cedrella odorata,*
		Vernonanthura patens
		Inga sp. 1
		Inga sp. 2
		Cecropia sp
		Sapium laurifolium
		Beilschmiedia alloiophylla
		Cordia alliodora
		Alchornea glandulosa
		Bunchosia hookeriana
		Carica cf. macrocarpa
		Myrcia fallax
		Ocotea cf. insularis
		Aegiphila alba

Table #8 - Site 2: Flores Property - Agro-edge, high human disturbance, degraded secondary forest, some bamboo clumps on the edge of the plot, bordering sugarcane mono-crops. Total: 155; Trees Counted: 152; Tree Morpho-species: About 16; Bamboo Clumps: 3

Dominant species variety	**Cultivated**	**All other species ID**
Myriocarpa stipitate	*Citrus x sinensis*	*Guadua angustifolia*
Phytelephas aequatorialis	*Annona muricata*	*Mauria heterophylla*
Vernonanthura patens		*Albizia guachapele*
Cornutia pyramidata		*Cecropia sp.*
Inga sp. 1		*Ficus vittata*
Conocarpus erectus		*Beilschmiedia alloiophylla*

Bunchosia aff. cornifolia		*Citharexylum svensonii*
		Cordia sp.
		Guazuma ulmifolia

Table #9 - Site 3: Pacoche Lodge - Cade Trail - Interior bamboo-dense mature forest, low human disturbance.
Total: 101; Trees Counted: 70; Morpho-species: About 17; Bamboo Clumps: 31

Dominant Species Variety	**Cultivated**	**All other species ID**
Myriocarpa stipitate	N/A	*Sapindus saponaria*
Bactris gasipaes		*Bunchosia aff. cornifolia*
Guadua angustifolia		*Licaria applanate*
Exothea paniculata		*Alchornea glandulosa*
		Pterocarpus rohrii
		Cordia alliodora
		Beilschmiedia alloiophylla
		Sapium laurifolium
		Cercropia cf. obtusifolia
		Cecropia sp.
		Cupania americana
		Inga sp. 1
		Cornutia pyramidata
		Myrcia fallax
		Ficus maxima
		Mauria heterophylla
		Phytelephas aequatorialis

The forest type where *Guadua* bamboo was most dominant was found in the interior mature forest plot with low human impact over the past 20 years (site 3). Here, findings indicate higher tree species richness, but lower tree density overall. Site 2 had the lowest density of bamboo and the greatest number of trees overall – but the lowest tree species diversity. These findings are in reference to Ospina and Finegan (2004), who state that only fast-growing light-tolerant saplings can compete with bamboo, which would change the floristic composition of the forest (Ospina & Finegan, 2004). While we do see this pattern across the three sites, it appears from our vegetation sampling exercise that the highest diversity of tree species is in areas of moderate human disturbance where the forest has been left to fallow, and *Guadua* bamboo is plentiful.

Unanticipated findings across all sites reveal that certain tree species, such as *Phytelephas aequatorialis, Cedrella odorata, Mauria heterophylla, Cornutia pyramidata, and*

Myriocarpa stipitata, all successfully thrive within or in close proximity to *Guadua* bamboo clumps. In many cases, even in the middle of a bamboo clump, tree species had a moderate to high DBH ranging from 50-265cm. As stated above, the thriving of these secondary edge species within bamboo groves is supported by research on bamboo forest composition (Ospina & Finegan, 2004). These results also show that favoured feeding trees for *A. palliata* such as *Mauria heterophylla*, *Myriocarpa stipitata*, and *Cornutia pyramidata* grow in close proximity to *Guadua* clumps, allowing for arboreal access to these species that can otherwise be isolated due to human activities. While the literature states that bamboo's invasive qualities can be harmful to species richness (Campanlleo et al., 2007; Majumdar et al., 2015; Ospina & Finegan, 2004), these findings illustrate that some tree species, in fact, compete well with *Guadua* bamboo and continue to thrive in these environments providing a range of feeding trees for primates. While further research in Pacoche is needed to determine the overall species richness of *A. palliata* diets, Gómez-Posada and Orozco's (2006) work in a bamboo-dense forest in Colombia argues that the diversity of species was low and in alignment with our general observations. Through our field observations in Pacoche, it is estimated that the frugivorous component of *A. palliata* diets is complemented by cultivated agroforestry species like *Citrus x sinensis*, *Annona muricata, Carica papaya, Persea americana,* and *Psidium guajava* found scattered throughout the landscape. Future studies to quantify the consumption of cultivated fruit in comparison to native fruit trees (for instance, from the *Inga* and *Ficus* genera) are needed to confirm these observations and understand the importance of cultivated fruit for howlers in bamboo agroforestry environments.

Finally, *Guadua* bamboo culms measured in site 3 (mature-interior forest) generally had a wider DBH and many more young culms (1-3 years) per clump than in the other two sites due

to the lack of harvesting in this area. These findings help us to understand how forest structure is impacted by bamboo growth and anthropogenic activities– of vital importance when planning reforestation projects using bamboo to improve forest connectivity for arboreal species like primates. While bamboo is not a common food source for primates in the coast of Ecuador, its fast-growth potential allows culms to quickly fill in forest gaps to provide vital 'bridges' for monkeys to move between feeding and resting sources. Future studies should test these theories and take the next step to conduct bamboo reforestation projects in fragmented areas, including riparian and anthropogenic edge zones such as roadways and pasture/croplands, to determine the conservation benefits of such strategies.

Discussion/Conclusion

Given the projections towards the development of the bamboo industry in the coastal region, and the social and economic value of this resource for human populations (as described in previous sections), the results from this chapter have outlined the additional ecological value and conservation significance of bamboo-forests for endangered primate species. The field of ethnoprimatology looks at human and nonhuman primates as active participants in the co-production and co-construction of each other's niches (though not necessarily in equal measure) within an interconnected ecosystem (Sponsel, 1997; Fuentes, 2010). Using bamboo as the connecting organism, this chapter has shown how primates, human and nonhuman, can partition the same forest resources in different, and even convivial ways that support their survival in shared environments. A review of the literature at the beginning of this chapter illustrated the importance of different bamboo species and forest types for many primates worldwide and how there is a great deal of variability and even vulnerability attached to these relationships. If we view howlers and capuchins in the Pacoche bamboo agro-forest environment through this same

agentive lens, we can see how the ways in which they interact with bamboo habitats are unique yet complementary. While each species utilizes a different ecological niche within the context of a bamboo forest, the data show how they are partitioning this same resource in different ways. For instance, the way primates move through the canopy matters. Where howlers were shown to frequent the upper bamboo culm for resting and vocalizing behaviours, capuchins tend to utilize the mid-section and are rarely seen at the very top. Based on their lesser body size and weight, capuchins do not move the same way as howlers that bend the culm and pull it towards them. Instead, capuchins leap from culm to culm; they scramble up and down, removing bromeliads that grow on mature culms as they forage, and breaking open older culms targeting their weak spots. Thus, for capuchins, the stability, durability, and branch composition of the substrate rather than its flexibility are the most important factors as they move about this habitat type. This example illustrates how differing structural properties found within the same resource, can benefit species in complementary ways.

Each of these primates are not passive players in this forest structure, but they are actively shaping it through their behaviours and choices as they navigate through the canopy. As frugivorous folivores, howlers are pruning the trees as they forage for leaves and buds to consume. They are very particular about their chosen leaves, often preferring young leaves that are easier to digest. As they move through the canopy, they help to remove old growth, making room for the new (Estrada & Coates-Estrada, 1993). Their excrement also disperses seeds and rich nutrients to the soil as they travel. In this sense, howler monkeys are often viewed in the literature and conservation education paradigms as “forest gardeners” (Estrada & Coates-Estrada, 1993; Feely, 2005). As omnivorous primates that consume insects for a high percentage of their diet, capuchins have a reputation for controlling insect pest outbreaks. For instance, in

Pacoche, capuchins may have played a role in controlling the invasion of the African land snail (*Lissachatina fulica*) that nearly devastated farmer's coffee and cacao crops about 3-5 years ago (Britton, 2018). Additionally, through their extractive foraging techniques and threat displays, pulling out bromeliads, breaking off branches and banging on culms with *tagua* nuts to show intimidation, capuchins are also impacting vegetation structure and encouraging new growth in different forest strata than their upper canopy favouring cousins, the howlers. These findings in relation to the previous chapters also illustrate the ways in which the mutual ecologies of endangered primates are embedded within the political-economic history of the area and will continue to fluctuate based on the market demand for forest products, such as bamboo.

Through a convivial conservation lens (Büscher and Fletcher 2020), it is remarkable the different meanings one resource can take on if we shift our perspective towards connections. If we think like a platyrrhine monkey, a bamboo grove or even a single culm transforms into something completely different than merely a commodity. Instead, it becomes, a reliable structural support to navigate across gaps in the canopy or to access desired food resources, a lookout point to rise above the rest of the surrounding vegetation and scan the landscape, a refuge from predators that allows for better visibility of the forest floor, a resting spot, a place for a cool drink, a provider of protein-packed meals – and the list goes on. When we take the time to notice and see through the eyes of nonhuman others, the landscape before us changes, and we can appreciate the intricacies of how everything fits together in a mutual ecology that supports us all. These shared perspectives supports the idea that in regions of coastal Ecuador with high rates of forest fragmentation, the sustainable use and reforestation of these bamboo forests and corridors should be considered a priority to promote rural livelihoods and the conservation of endangered primate species. The next chapter discusses the applied community participation component of this

research, which aims to find convivial strategies to primate conservation issues in the PA through local involvement. In doing so, it illustrates the challenges and rewards of a participatory approach to conservation that highlights the messiness of conviviality in practice.

CHAPTER SEVEN

The MonoMico Project: The Value of Flagship Species and Local Agency in Conservation Practice

This chapter describes the ongoing community-based initiatives undertaken by the MonoMico Project and how these activities reveal insights into both challenges and opportunities to improve conservation impacts in the Pacoche Wildlife. MonoMico was a name chosen alongside study participants that represents local terms used to describe resident primate species. *Mono* refers to the howler monkey (*A. palliata*), and *mico* is the word used to describe the white-fronted capuchin (*C. aequatorialis*).

Community Monitoring: "The Eyes and the Ears of the Forest"

Taking refuge from the burning sun, I stand in the shade of a guava tree and watch Ramón sharpen his machete on a stone with such care. Like his land, he inherited this essential tool of his trade from his father, and he takes great pride in preparing the blade for the daily task of clearing the brush from the forest trail. I follow close behind him as he wields his machete with precision, slicing through everything he encounters, unblocking the path. The ground is hard as we stomp past orange trees lining the trail, dripping with epiphytes and bowed over from the weight of the damp mosses clinging to every branch. Before heading deeper into the forest, we hack through the tall grass that has grown up along the roadside trail and stop to say hello to Segundo. As we approach the gate, Ramón hollers out his name, "Oye Seeegguuunnndooo," and two dogs, Molly and Toby, immediately charge at the fence. Segundo shakes our hands through the bars and unlocks the thick metal door.

Segundo is a fit middle-aged man, tall and broad-shouldered, from nearby El Aromo. He lives on this property (a restaurant under construction) with his wife, acting as a security guard/maintenance keeper. The owners live in Manta and rarely come by to check on the place. Like Ramón's occupation, Segundo maintains the grounds and works other odd jobs to support his family. He always greets us with a beaming smile and slips out to chat with us to fill in Ramón on the latest news. Segundo is attentive and keeps his eyes and ears open for sightings of howlers and capuchins. During our almost daily encounters as we pass by en route to the forest, Segundo shares dates and times of his sightings with us, as well as stories of his encounters. He often spots primates along the highway's edge and does his best to count them for us. I added him to our WhatsApp group, where various other *montañeros* from the area share sightings and stories about monkeys. Segundo's vigilance is a huge asset to our team, and he had called us several times when a howler monkey was hit by a car crossing the road. Santos is another valuable resource on the mountain, caring for a small restaurant property at the entrance of the El Hubo trail. He always looks for capuchins and calls us when he sees them. Several other 'guardians' in the area do the same, as do some tour guides and MAATE park rangers, who we check in with regularly. This network of 'boots on the ground' has helped track capuchin movement patterns and create spaces to get to know each other and come together to talk about monkeys.

Aswani and Weiant (2004) explain that participatory conservation monitoring approaches like these help empower local people by legitimizing their knowledge and connection to the land. For example, a community monitoring project in the Soloman Islands improved shellfish biomass, increased environmental awareness, and reinvigorated cultural management practices (Aswani & Weiant, 2004). Local people involved in monitoring can become "the eyes and the

ears of the landscape" and develop a better understanding of their place as global citizens (Basurto, 2013). Additionally, research by Becker et al. (2004) explains that monitoring biodiversity is not only a crucial component of any conservation plan but also that doing so through a community monitoring approach helps to encourage a sense of pride and ownership of local resources and improves participation in conservation activities. Becker et al. (2004) share a successful example of this strategy in Ecuador through the involvement of local people in monitoring fog capture and bird populations. They assert that this approach not only helped to build social capital for participants but also raised awareness about ecosystem services, the conservation status of local species, and the interconnections between conservation and sustainable development. This community monitoring project resulted in the creation of the *Reserva Ecológica Comunal de Loma Alta*, which protects over 1000 hectares of garua forest and vital watersheds in the coastal part of the country. According to Becker (2004), "the monitoring process at Loma Alta has changed how some local people perceive themselves. When we started working at Loma Alta, people said they were poor farmers with few options or 'people at the end of the road.' Now more people are expressing pride related to the community protected area and are talking about ideas for future work in nature tourism" (Becker, 2004: 2703).

Participants in the “MonoMico Project” often shared stories and asked me questions about primate behaviour, indicating interest in these species. For instance, the theme of infanticide in howlers came up a lot in discussion. Many wondered why male howlers practice this behaviour and if they only target male infants. These informal chats provide opportunities to hear their theories on why these behaviours exist and for me to share my scientific perspective. The frequency of these stories could also indicate that infanticide is a common occurrence amongst howlers in the protected area, likely due to a higher degree of home range overlap

(Kowalewski & Zunino, 2004). Participants regularly called us with information about other incidents involving primates, such as a sick or injured animal, howler sightings in urban areas or on the beach, and monkeys as pets.

Riley and Bezanson's (2018) work on ethics in primate conservation argues that building trust with local people is widely recognized as a crucial component of any successful project. However, these relationships take time to develop and must be based on mutual respect and culturally appropriate reciprocation. Thus, in the spirit of reciprocation for their trust in us, we did our best to follow up with every incident personally. However, sometimes the circumstances put us in difficult situations, particularly with the MAATE. While we insisted that they should always be called first, participants often downplayed the Ministry's authority in the protected area, commenting, "They won't do anything anyways" or "They never answer my calls." Others did not feel comfortable involving a state institution. These common sentiments reflect an overall feeling of mistrust, lack of faith, and a lack of voice regarding the MAATE and indicate the need for more community outreach with these populations.

Haraway's (1988) work puts these issues in context by saying that, in practice, park staff may need more institutional capacity and training on participatory methodologies. Also, based on colonial histories, they may have a long way to go to build trust with community members. Reconstructing these relationships takes time, organization, and careful planning, which should be prioritized in the face of urgent conservation issues. Thus, while the benefits of a participatory approach to decision-making and management are widely recognized across the literature, the extent to which this approach is practiced varies greatly. In line with Haraway (1988), the mandate of the MonoMico Project is to inspire awareness and engagement in primate conservation in the protected area. However, meeting these aims takes time, dedication, and

consistency. The history of the area and current land ownership conflicts demonstrate why many residents express resistance to outsiders and institutional representatives. With a revolving door of broken promises and considerable change over the past 15 years, one way of expressing agency is through the lack of participation and interest in conservation and development activities (Erazo, 2013). This strategy has been linked directly to the degree of compliance with park regulations; generally, the higher the involvement of community members in decision-making processes, the higher the level of compliance (Andrade & Rhodes, 2012).

For these reasons, taking the time to learn and respect local cultural norms and codes of conduct in the forest has been of central importance throughout the project. Values such as reciprocity, modesty, and participation in community events, such as funerals and *fiestas*, are highly prioritized. Study participants were always compensated for their time through gifts (such as baseball caps with a monkey logo to encourage feelings of belonging in the group), food and, in some cases, an honorary stipend. We also regularly shared photo and video content of primates with participants, asking for their involvement in naming unidentified groups and individuals and circulating the content with their friends and family.

Data from my MA research on local perceptions of primates indicated that howlers are viewed as “friends in the forest” and “calling to the gods to bring the rain” (Britton, 2018:65-66). These harmonious associations, coupled with their value in attracting tourists to the area, make the mantled howler an excellent candidate as a flagship species for the project. While the PA uses the image of a sea turtle as their logo, and much of the conservation attention in the park is on the much larger marine and coastal territory, howler monkeys play an important role in representing the terrestrial sector.

Lovett and Marshall's (2006) paper "Why Should We Conserve Primates?" argues that the similarity of primates to humans can help rally public interest in conservation. Primates have the potential to not only be an indicator species for overall ecosystem health but also as flagship species to inspire action. Flagship species are charismatic species that often act as an umbrella species to inspire awareness, action, and funding for the cause (Mekonnen et al., 2022). With 60% of all primate species threatened with extinction (Estrada et al., 2017), the conservation of tropical forests is directly connected to the conservation of primates (Chapman et al., 2020). Understanding local perspectives about the species chosen as the flagship is crucial because species that receive international attention might be viewed very differently in a local context. For example, while well known as a symbol for conservation across North America and Europe, chimpanzees are considered a pest species in specific African communities (Naughton-Treves et al., 1998). Research during my MA field season on smallholder perceptions of the white-fronted capuchin uncovered negative reputations of capuchins as destructive to orange and corn crops, as well as attributes such as being aggressive, bold, and daring (Britton, 2018). For these reasons, despite their Critically Endangered status, using *C. aequatorialis* as a flagship species in this context is not ideal.

Training and Knowledge-Exchange

An essential piece of the applied component of this project was training field assistants and raising local awareness about pressing conservation issues. To accomplish these aims, we created banners with primate facts to bring to community events (*see Appendix J*). We also gave out postcards of study subjects from our personal photography collection with facts and local sayings about primates printed on the back. Regular attendance at community events was vital in this project.

Raising awareness about the plight of resident primate species also involved knowledge-sharing opportunities by training local field assistants. Seven assistants were trained in primate behavioural and vegetation sampling techniques throughout different phases of the project. During these sessions, local knowledge of forest structure, vegetation types and seasonality, the location of fruiting trees, and other strategies *montañero*s used to track animals were vital components to the success of this research. Ramón had a remarkable eye for estimating distances -- nearly always exact with my rangefinder calculations. As I noted in my fieldnotes:

> Ramón sits in his lawn chair studying his notes in the write in the rain notebook I gave him. We have been working since last week on teaching him to gather primate data. Ramón recently turned 65 years of age and is very observant and patient; I think he will do an excellent job with a little more practice. He lives in the forest and sees monkeys nearby daily, so his assistance in gathering data more systematically will be beneficial for this project. He tells me he enjoys learning and likes the idea of being a scientist like me (fieldnotes, May 2022).

Without local assistance, verifying tree species in the field and accessing remote trails and properties would have been impossible. *Montañeros'* intimate knowledge of the mountain proved more useful than that of most park rangers, and their expertise and camaraderie helped me to feel safe while traversing remote locations. *Montañeros* helped predict the weather and taught me a great deal about medicinal/edible plants and codes of conduct between fellow *campesinos*. For example, certain trees and markers denote property boundaries -- unknown to outsiders like myself. Also, *montañeros* would lay a branch or leaf along the fence to indicate to the property owner that they passed by. While hiking, Ramón would routinely holler out into the forest to verify the whereabouts of others in the area and 'check in.' There is trust and respect between members of this community who watch out for each other and regularly report relevant concerns as they pass on the trail.

Working alongside smallholders also helped to point out evidence of game trails and leftover food remnants from primates, as well as accessing off-trail shortcuts to follow groups – all while learning about the history of the area through stories of their childhoods. Being seen on a trail deep in the forest with a *montañero* instead of a MAATE park ranger gave an entirely different impression to locals. Our presence was generally met much more openly and hospitably, with locals offering advice and assistance to a familiar face rather than a more closed-off response to a state authority figure.

It is important to note that protected area communities are not homogenous, and local people often have diverse sets of values, needs and interests that can contrast with conservation authority objectives. In fact, according to Brichieri-Colombi et al. (2018), while there have been many advancements toward a more participatory PA model, in most developing nations, the state-led exclusionary model continues to prevail. They explain that communities continue to be criticized for having insufficient capacity to organize, and bureaucracy has been reluctant to share power with local people (Horwich et al., 2011). In these parts of the world, changes in law and policy come very slowly, and their implementation is even slower (Brichieri-Colombi et al., 2018). These examples help to illustrate one of the central challenges throughout my research -- negotiating my positionality between local and institutional actors. They also support my decision to align myself with *montañeros* in my fieldwork so that I might better understand different ways of perceiving and practicing conservation.

Additionally, training locals in scientific techniques helped to create a sense of self-satisfaction for participants who felt they were contributing to a broader goal, which was later brought up in conversations with other community members. The experiences we shared collecting data and learning from each other became active points of discussion at local events to

spread the word about our work and create awareness and interest surrounding the value of primates in the forest ecosystem. These findings align with work from Shanee (2013), who states that local conservation action can improve self-esteem, social power and "moral superiority to the state" (p.421), resulting in what Horwich et al. (2010) describe as the "the contagion effect," or what happens when the sense of success and pride one group experiences inspires future initiatives in others.

Canopy Bridge Project: "Bridging the Gap" Through a Community-Based Habitat Restoration Approach

As was illustrated in the story of Felipe in Chapter Four, research findings from fieldwork in 2018, 2019 and 2021-22 indicate that one of the leading threats to primates in the PA is the forest fragmentation from the highway (*Ruta del Spondylus*). In addition to Felipe, wildlife collisions with traffic, as well as electrocutions from uninsulated powerlines, resulted in the injury and death of several primate study subjects since the commencement of this research. Additionally, social findings indicate frictions between local *comunas* and state authorities and the need for increased community outreach. Since 2021, we have been actively collecting data on preferred land crossing points where howler monkeys come down from the trees to cross the highway to determine the most suitable location for arboreal bridges (Gregory et al., 2017). With external funding from the Ned Jaquith Foundation/ The American Bamboo Society, a pilot project was undertaken in 2023 to address these challenges.

The Canopy Bridge Project, 'Bridging the Gap', employed the strength, flexibility, and local knowledge of *Guadua angustifolia* to address the problem of forest fragmentation in the Pacoche Wildlife Refuge through a community-based habitat restoration approach using two arboreal bridge prototypes. To accomplish these aims, I worked closely alongside *the comuna* President of Pacoche, MAATE, CNEL (the National Electricity Company), and a team of expert

builders, architects, engineers, *campesinos* and local youth to plan and execute the project. Arboreal wildlife bridges have proven a successful and increasingly popular tool to overcome forest fragmentation in recent years, providing an effective solution to avoid fatal accidents and permitting the safe movement of otherwise isolated arboreal species (Birot et al., 2020; Flatt et al., 2022; Gregory et al., 2017; Linden et al., 2022; Teixeira et al., 2013).

Since June 2023, we have hosted six community workshops for the design and construction of two canopy bridge prototypes. Including the core team of technicians and organizers, the number of participants for each workshop ranged from 11-14. Participants ranged in age from 17 to 65 and included smallholder farmers from the ancestral *comuna* of Pacoche, as well as local students and youth – few had previous experience working with bamboo.

The collaborative research approach emphasizes participation and action by seeking to create change through reflection and experimentation rooted in social history (Fortmann, 2008). This project chose to conduct the workshops in the ancestral *comuna* of Pacoche because of the long-standing positive relationships built with this community over the past few years as part of my Master's and Ph.D. research working with smallholders.

Within a participatory process, community members are co-researchers in the inquiry and action to address questions and issues that are significant to them directly. Local people have their own complex criteria for decision-making that can be misunderstood or misrepresented by other stakeholders; therefore, creating spaces for collaborative discussion and sharing of trial-and-error processes becomes a learning experience for everyone involved (Fortmann, 2008). Throughout the workshops, participants were actively engaged in decision-making processes during the initial design of the bridges and later construction phases. The benefits of this method in conservation research are illustrated in work by Waters, Bell and Setchell (2018). They

conducted a participatory action research project with shepherds in the Atlas Mountains of Morocco, which revealed diverse socio-cultural and political perspectives surrounding how shepherds interact with the environment and Barbary macaques. The applied approach I took during the bridge workshops was inspired by Waters et al. (2018) who argue that making people central to the project reveals hidden impediments to conservation, thus opening the potential to address these issues and harness local knowledge to make conservation goals possible.

Taking place in the Pacoche ethnographic museum (*El Museo de Pacoche*), the first weekend 13 participants received theoretical instruction about primate conservation priorities in Ecuador, primate ecology and ecosystem benefits, as well as the main threats to primate species in the Pacoche Wildlife Refuge. Participants included local university students (5) and youth (6) aged 18-22, as well as smallholder farmers (2) from the comuna of Pacoche. During this lecture, the solution of the canopy bridges was proposed. This session was complemented by a lecture on bamboo development and opportunities for employment in coastal Ecuador by a leading industry expert – Sixto Triviño. Finally, participants received hands-on training in bamboo construction techniques, including specialized joints, cuts, and fundamental building principles with round culm bamboo.

In the second workshop, the same cohort continued with the hands-on component by teaching participants about bamboo processing through an exercise preparing culms for the treatment pool and setting up the temporary pool itself. Additionally, in the afternoon, we conducted a roundtable discussion about the canopy bridge design, presenting an array of models from around the world and asking participants to decide upon two models we could use to outline the bridges in Pacoche. We discussed key factors such as cost, target species, and climate. Much of the conversation surrounded the choice of materials, with participants opting for the

most organic options. Half of the afternoon was spent discussing how to ensure the howler monkeys would actually use the bridges. Suggestions included provisioning the bridges with fruit, covering the bridge with leaves, and rubbing fruit scents on the bridge to attract them. With the durability of the materials as a primary factor in the success of this project, it was later decided to use polypropylene rope instead of hemp rope (proposed initially) and to not damage the load-bearing capacity of the structure by adding foliage or food products that would attract insects. As we brainstormed different design and logistical challenges together, the outcome from this first weekend not only enhanced participants' technical skills but also achieved a rough draft of the bridge designs to be built in the following sessions.

The second round of workshops, again with the same cohort, took place at the Pacoche *Casa Comunal* (or community hall), where the building process was initiated and completed over a series of five weekends. We began with the construction of bridge #2, as the group decided it was best to start with the largest, most challenging model first. Both models are currently being stored in the *Casa Comunal* until the installation phase can commence in summer/fall of 2024.

The bamboo was sourced from local smallholders to support the economy and invoke a sense of responsibility in acquiring the materials. This process involved learning at new vocabulary necessary for purchasing bamboo culms, as well as confronting logistical challenges such as the transportation of the culms to the processing/building site and ensuring we had the right size and quality for the job. Through these conversations and participation in the harvesting process, it became clear that sourcing bamboo in rural communities comes with a different set of parameters and practical considerations that were unfamiliar to our project technicians who were more familiar with the standardized commercial building industry. What we learned in the process influenced the bridge's design and the size of the culms used to build it, as only culms

under 6m could be transported traditionally by mule. Also, by necessity, the culms were not uniform in size as initially proposed in the design.

Including smallholder opinions on the size of the culms, and how, and when they should be harvested, provided practical considerations from local knowledge that improved the quality of the bamboo. Riley and Bezanson (2018) and Buruchara (2008) explain why processes like these are so important in conservation practice by drawing attention to the power dynamics involved in how research activities impact the community. They state that local processes of problem-solving or planning are also types of research outside of the academic context that should be recognized. Thus, this project recognized the need to share the opportunities with participants to create spaces for different kinds of knowledge to be heard. During the building workshops, participants offered excellent feedback about the process. For instance, participants were concerned about the knots' durability to connect bridge components. They suggested, instead, that we use a local knot (*nodo de cancho*) or piggy knot, common in the artisanal fishing industry. Additionally, to ensure the monkeys do not untie the knots, participants suggested sealing the ends by burning the rope with a candle - also a common practice in local communities. MacDonald (2003) argues that local knowledge must be valued for what it is rather than something to be extracted. This is elaborated on further by Bakels et al. (2016), who argue that how cultural values and ecological knowledge are represented in conservation management practices matters because it can lead to improved community engagement and insights into conservation opportunities.

In addition to the workshop sessions, we hosted biweekly planning meetings (12) for technicians, local organizers and institutional actors (6-10 participants) between March and September. Through these meetings, networks were built and strengthened across various

institutional and community levels, providing opportunities for *comuna* leaders to communicate their concerns directly with Ministry of the Environment (MAATE) leaders and negotiate the institutional requirements for the installation and monitoring phases of the project.

Little (1994) explains that the broader political context largely shapes how a community participates in conservation and development projects. He argues that decentralizing power is crucial to receiving meaningful participation in any community-based project. For instance, state-run systems of natural resource management can highly constrain the participation of locals because they often need more resources to effectively engage local populations (Brandon & Wells, 1992; Fiallo & Jacobson, 1995). These issues were challenging throughout this project as receiving permission from the Ministry of the Environment (MAATE) to build the bridges through a participatory community-based process was met with resistance. We were advised to hire outside experts to do all the building or risk damaging the integrity of the bridges, and this recommendation was frequently revisited during meetings. As community participation is central to this project, this advice was not taken, and participants were given a small stipend for their contributions to compensate them for their time. Additionally, despite considerable negotiations in defense of this project's methodology, the data collection and monitoring process of the bridges has been assumed by the Ministry of the Environment (MAATE), taking the responsibility out of the hands of local people, with the rationale that MAATE staff are trained in these techniques. Pena (2015) might have predicted this having studied how inclusive forms of participation are often designed or promoted as the main objective. However, in practice, political and historical structures continue to perpetuate exclusive forms of participation that result in only the dominant voices and interests being represented. To remedy this issue, we

divided the bridge project into two parts. The MAATE will monitor bridge one, and the comuna of Pacoche will assume the responsibility of bridge two.

Despite these institutional clashes in methodological approaches, I remain optimistic that the workshop component was a participatory process, and small-scale projects such as these can sometimes make the most long-term conservation impact (Brandon & Wells, 1992; Shanee, 2019). In line with study objectives, an increased interest in primate conservation was most certainly achieved through this process – as evident in participants' enthusiasm, constant involvement, and curiosity about the upcoming installation phase.

The project has recently been put on hold due to bureaucratic obstacles and the current political climate that have prolonged the timeline. The installation phase will likely take place in 2024 (pending additional funding from donations and IPS), and participants have expressed great interest in assisting with this final phase.

Conclusion

The convivial connections between people, primates and bamboo discussed throughout this dissertation have drawn attention to the power relations hidden within conservation practice and the potential for new more equitable ways of *seeing* and *doing* conservation through multispecies understandings. What has been communicated in the previous chapters is that conviviality is not a pristine set of egalitarian relationships or a goal to be achieved. Like the ‘natural habitats’ we are drawn to study in the 'wild', conviviality is a messy, tangled process of negotiation in constant flux in relation to human and nonhuman others. However, it is through an understanding of these convivial connections that we can see an alternative to previous conservation paradigms and a shift in how we look at our role in nature towards "living with."

Through the extension of an anthropology beyond the human, the ethnoprimatological approach used for this study, combining the biological with the social (Sponsel, 1997), has helped reveal the hidden impediments to conservation in one particular biodiversity hotspot. Chapter Two and Chapter Three analyzed the complex political-economic history of the province of Manabí and the messy negotiations, best intentions and misunderstandings that resulted during the creation of the protected area. Understanding this rich history helped to shed light on the motivations and allegiances of PA residents, as well as their expressions of agency in response to changing conditions since the inception of the refuge (discussed in Chapter Three). The power struggles over credibility and transparency or access to knowledge were revealed throughout the story of the electrocution of the alpha male howler Felipe (introduced in Chapter Four) and how institutional systems wield their political influence through the use of exclusive protocols. Conviviality challenges us to think about conservation relationships as deeply embedded within

socio-ecological and political-economic contexts that are in a constant state of transition. These complex histories and experiences have shaped how local people relate to their immediate environments and how they perceive the conservation initiatives led by external actors and authorities (MAE, NGOs, and researchers like myself). With this context front and center, placing local knowledge and participation as a priority throughout this project has helped to address some of the institutional barriers to conservation, including mistrust and ambiguity towards conservation leaders and the overall lack of representation in conservation decision-making and action.

Building on this institutional context of human-protected area relations, Chapter Five then took a deeper dive into the world of bamboo to understand the breadth of meanings and values associated with this nontimber forest resource of great and growing importance in the Pacoche Wildlife Refuge and across the province of Manabí. This chapter functioned to draw attention to the complexities of green developmentalist ideals (McAfee, 1999) that promote market solutions to saving the environment through the commodification of green alternatives, like bamboo. Using Appadurai's (1988) concept of the "social life of things," the study of human-bamboo relations revealed key differences between the subsistence and commercial bamboo economies and how bamboo is deeply connected to cultural heritage and identity on the Ecuadorian coast. Through the ecological knowledge of sustainable bamboo harvesting, smallholder farmers demonstrated their concern and commitment to environmental responsibility and how human use can actually help nature recover – by encouraging more bamboo growth and filling in forest gaps. This chapter also drew attention to some of the key barriers to smallholder participation in the formal bamboo economy and, so, to the development of a more robust bamboo industry in the region. Approaching bamboo as an organism that connects actors, this

chapter revealed how this nontimber forest resource is so much more than merely a commodity. It is part of the social life of study participants and, so, is relevant to what it means to be a *bambusero* or *montañero* in Pacoche. In a quest for conviviality that requires a restructuring of the current political-economic system (Büscher & Fletcher, 2020), focusing on the "social life of things", like bamboo, that are valued as more than commodities seems an important step.

This theme of conviviality is then elaborated upon in Chapter Six through an analysis of primate-bamboo relations through an ethnoprimatological lens in a bamboo forest. Understanding nonhuman ecologies can give us broader perspectives on how we relate to the forest environment. Thus, using a bamboo-centric approach, this chapter drew attention to the ecological value of bamboo as a vital component of primate habitats and the ways in which the partitioning of this resource is not only *shaped by* but is also actively *shaping* the forest ecosystem itself. The results of the study of the socioecology of both *A. palliata* and *C. aequatorialis* demonstrated how these two sympatric species partition the same nontimber forest resource in different and even convivial ways that support their survival in agroforestry ecosystems. Finally, in Chapter Seven, the ways in which primates can function as flagship species to rally public interest in conservation issues and action was explored through the applied conservation approach in the MonoMico project. The participatory component discussed in this final chapter involved the community monitoring of primates as well as a series of workshops (including the canopy bridge project), that focused on the complexities and possibilities of a community-based approach to conservation action.

Through focusing on the lived realities and interrelationships of people, primates, and bamboo in and around the Pacoche Wildlife Refuge and the province of Manabí, this thesis has highlighted the challenges and opportunities for conviviality between species sharing these

endangered landscapes. Within this brambly, tangled mess of thorny vines and powerlines, the ability to gradually adapt, resist, or participate becomes visible, shining through the gaps in the canopy all the way down to the forest floor, highlighting the frustrations and frictions that exist in these shared spaces, but also the potential for a brighter future.

> At the end of my field season, I was standing in the mud on the shoulder of the E15 highway (*Ruta del Spondylus*) with my rangefinder, bamboo walking stick, and notebook in hand. Peering out from under my purple Western baseball cap, I watched the MonoMico team measure the distance between two trees to calculate the placement of our new bamboo canopy bridge. This new project, an offshoot of my PhD work, would not be possible without the expertise and eager participation of the many local individuals who have become the heart and soul of our research squad.
>
> As I watched them extend the tape measure, I reveled in the sensation that things have come full circle since I first set foot in the Pacoche Wildlife Refuge in 2016. The highway that brought me here has been identified as one of the key conservation threats to the howler monkeys that call this fragmented forest home. Thanks to community reporting of howler roadside sightings, mortalities, and injuries over the past year and a half, we are now learning to navigate institutional obstacles together to find a convivial canopy solution to sharing space in these bamboo forests.

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Appendices

Appendix A: Original Ethics Approval – Western University

Western Research

Date: 18 July 2018

To: Ian Colquhoun

Project ID: 111919

Study Title: SHARED SPACES AND LOCAL PERCEPTIONS: EXPLORING THE HUMAN-PRIMATE INTERFACE IN THE PACOCHE WILDLIFE REFUGE

Application Type: NMREB Initial Application

Review Type: Delegated

Full Board Reporting Date: 03/Aug/2018

Date Approval Issued: 18/Jul/2018 13:38

REB Approval Expiry Date: 18/Jul/2019

Dear Ian Colquhoun

The Western University Non-Medical Research Ethics Board (NMREB) has reviewed and approved the WREM application form for the above mentioned study, as of the date noted above. NMREB approval for this study remains valid until the expiry date noted above, conditional to timely submission and acceptance of NMREB Continuing Ethics Review.

This research study is to be conducted by the investigator noted above. All other required institutional approvals must also be obtained prior to the conduct of the study.

No deviations from, or changes to the protocol should be initiated without prior written approval from the NMREB, except when necessary to eliminate immediate hazard(s) to study participants or when the change(s) involves only administrative or logistical aspects of the trial.

The Western University NMREB operates in compliance with the Tri-Council Policy Statement Ethical Conduct for Research Involving Humans (TCPS2), the Ontario Personal Health Information Protection Act (PHIPA, 2004), and the applicable laws and regulations of Ontario. Members of the NMREB who are named as Investigators in research studies do not participate in discussions related to, nor vote on such studies when they are presented to the REB. The NMREB is registered with the U.S. Department of Health & Human Services under the IRB registration number IRB 00000941.

Please do not hesitate to contact us if you have any questions.

Sincerely,

Katelyn Harris, Research Ethics Officer on behalf of Dr. Randal Graham, NMREB Chair

Note: This correspondence includes an electronic signature (validation and approval via an online system that is compliant with all regulations).

Appendix B: Ethics Approval – University of Wyoming

UNIVERSITY OF WYOMING

Vice President for Research & Economic Development
1000 E. University Avenue, Department 3355 • Room 305/308, Old Main • Laramie, WY 82071
(307) 766-5353 • (307) 766-5320 • fax (307) 766-2608 • www.uwyo.edu/research

May 5, 2022

Zoe Pearson
Associate Professor
Politics, Public Affairs, and International Studies
University of Wyoming

Tamara Britton
PhD Candidate
Anthropology
University of Western Ontario

Mina Moscatelli
Graduate Student
Politics, Public Affairs, and International Studies
University of Wyoming

Protocol #20220505ZP03306

Re: IRB Proposal *"The Burgeoning Bamboo Industry & Possibilities for Equitable Socio-Environmental Outcomes in Manabi, Ecuador"*

Dear Zoe, Tamara, and Mina:

The proposal referenced above qualifies for exempt review and is approved as one that would not involve more than minimal risk to participants. Our exempt review and approval will be reported to the IRB at their next convened meeting on May 19, 2022.

Any significant change(s) in the research/project protocol(s) from what was approved should be submitted to the IRB (Protocol Update Form) for review and approval prior to initiating any change. Further information and the forms referenced above may be accessed at the "Human Subjects" link on the Office of Research and Economic Development website: http://www.uwyo.edu/research/human-subjects/index.html. Please note that exempt protocols are approved for a maximum of three years. If your study extends beyond three years, or beyond the duration that is approved in your protocol form, please be sure to submit an update before expiration to extend the duration. If you are not able to submit the update in time, you will need to submit a new exemption request for the project.

You may proceed with the project/research and we wish you luck in the endeavor. Please feel free to call me if you have any questions.

Sincerely,

Nichole Person
Coord., Research Compliance, Research Office
On behalf of the Chairman,
Institutional Review Board

Appendix C: Ministry of the Environment, Water and Ecological Transition (MAATE) - Research Permit.

República del Ecuador

Ministerio del Ambiente, Agua y Transición Ecológica

AUTORIZACIÓN DE RECOLECCION DE ESPECIMENES DE ESPECIES DE LA DIVERSIDAD BIOLOGICA No. 2149

ESTUDIANTES E INVESTIGADORES (SIN FINES COMERCIALES)

1.- AUTORIZACIÓN DE RECOLECTA DE ESPECÍMENES DE ESPECIES LA DIVERSIDAD BIOLÓGICA

2.- CÓDIGO

MAAE-ARSFC-2022-2149

3.- DURACIÓN DEL PROYECTO

FECHA INICIO	FECHA FIN
2022-06-02	2023-06-02

4.- COMPONENTE A RECOLECTAR

Animal
Plantae

El Ministerio del Ambiente y Agua, en uso de las atribuciones que le confiere la Codificación a la Ley Forestal y de Conservación de Áreas Naturales y Vida Silvestre autoriza a:

5.- INVESTIGADORES /TÉCNICOS QUE INTERVENDRÁN EN LAS ACTIVIDADES DE RECOLECCION

N° de C.I/Pasaporte	Nombres y Apellidos	Nacionalidad	N° REGISTRO SENESCYT	EXPERIENCIA	GRUPO BIOLOGICO
	NEVAREZ PEREZ DIEGO JAVIER	Ecuatoriana		Profesor, Agropecuaria	Magnoliopsida
	MONTALVO ESPINOZA EDITH MARGELINA	Ecuatoriana		Master, Biodiversidad	Aves
	TAMARA LYNN HOLLY BRITTON	Canadiense	Master, Antrpologia	Candidata Doctoral, Antropolo	Mammalia
	GARCIA MERA GEORGE ADALBERTO	Ecuatoriana		Decano, Agropecuaria	Magnoliopsida

Appendix D : Interview Guide - Open ended questions

Obtain verbal consent; turn on recorder

Make note in your written notes at end of interview (don't ask all of these – only relevant):
Date:
Time:
Place:
GPS point:
Gender (if obvious):
Approximate age:

Demographics/Identity:

- What is your primary and secondary occupation? Cual es su ocupación principal? Tienes algun otro trabajo?
- Permeance of residency? Siempre viviste aqui? En…. Y su padre/y su abuleo?
- Ethnicity? Como usted se identifica? Como, negro, blanco, mestizo, indígena, montuvio, o cholo otro tipo de identidad?
- What does it mean to you to be a campesino? Para usted, que significa ser campesino?
- Comuna member or not? Why/not - what does it mean to you to be a member of the comuna? Usted es miembro de la comuna? Que signifca para usted ser comunero? O porque no?
- Do you feel a connection between the forest and your ancestors? Cuando usted se encuentra trabajando en el bosque, usted siente algun tipo conexion con sus antepasados?

Land Use Context:

- Do you own land? Is your property inherited or bought, how many plots do you have? Y mas o menos cuanto tiene tu propiedad? Y cuantas tierras tienes? Son parte de una herencia o usted las compro?
- Will your children inherit your land? Do your children work the land like you do? Por curiosidad, cuantos hijos tiene? Alguno de ellos le gustan trabajar en la montana? Piense pasar sus tierras a sus hijos o prefieres vender?
- What products do you cultivate, for sale or personal use? What product is the most lucrative? Has this changed over time? Are there products you use to produce that you do not anymore, why? Que productos cultivas? Siempre has cultivado eso? Por venta o por uso personal? Y de estos productos cual se vende más? Usted recuerde algún cultivo que intento sembrar y le fue mal? Y porque?
- How many times of year do you hold a molienda? *How much hardwood do you need for this process?* Cuantas veces al ano usted hace la molienda? Y cuantas días dura su molienda? Cuantas tachos normalmente producas?La panela es para vender o su uso personal? Y a usted le tocha alquilar el trapiche, te presta un amiga o es propio? Que cantidad de madera necesitas por este proceso? Y hay un tipo de madera que usted prefiere? Y como selecciones estos arboles?
- Do you have problems with certain animals eating your crops? If so, what kinds and what do you do to manage it? Algún tipo de animal se come sus cosechas? Que cultivo/ que tipo, y como lo evitas?
- What other problems impact your crop yields? Usted tiene algún otro problema con sus cosechas?

- Do you leave trees on your property – what kinds and why? Hay algun tipo de arbol que usted nunca cortaria? Porque?
- What other products grow naturally in the forest are useful to you – personally or for sale? Hay algun tipo de planta del bosque que sin necesidad de cuidarla usted usa?
- Do you hunt animals in the forest for food or medicine? Y usted se recuerda que tipos de animales casaban antes? Y alguno de esos servia como medicina? Y cual era lo mas sabroso? Y hora?
- Has the pandemic impacted your livelihood? - How? Have you made any changes to adapt? Y como cambio su trabaja en la pandemia? Osea como efecto en su trabajo?

Bamboo:

- Do you harvest the caña guadua on your property? How much/ how many hectares? Y usted tiene cana guadua en su propiedad? Mas o menos cuanto mieda las manchas? ¿Y cuanta cana usted más o menos corta al mes? En que no mas usted usa la caña? Y porque utiliza cana en vez de madera? Usted hace trueque con su cana?Y usted también la vende? Y en cuanto mas o menos la vende?
- Has anyone ever asked to buy bamboo from you? Y tal vez vienen comerciantes aquí de cana a quiere comprar su cana?
- How do you select what caña to cut/how do you cut it? Where did you learn to do this? ¿Y usted como sabe que cana debe cortar? ¿Y cuando la corta? ¿Donde usted aprendió de hacerlo así? Todo utilizan lo mismo técnica, o hay otras maneras de cortar la caña? Y se te ha ocurrido cortar todo en una sola? Porque no?
- Does everyone cut bamboo this way, or are there different ways to do it?
- Do you treat the bamboo before you use it? Y usted tiene alguno truquito para la cana para la dura mas tiempo o la uso normalmente así?
- How long do bamboo structures last before they need to be replaced? ¿Y más o menos cuanto tiempo dura una ramada y cerca o estructura de cana?
- Do you think people use bamboo (more or less) now than they use to? Why? Usted piensa que hoy en día la gente usa mas o menos cana que antes? Y porque?
- Do you think the way people cut/use bamboo has changed over the years? Y usted piensa que la manera que se cortan la cana ha cambiado durante los años? Ha aprendido algún nueva tecnicas?
- Is your house made of bamboo – why or why not? Y su casa esta hecha de caña, porque o no?
- Do you think bamboo is good for the environment? How so? Y usted piensa que la cana guadua es buena para el ambiente – en que manera? Y usted porque cree que hay tanta cana aquí en la montaña?
- Are there any animals you know what eat/use bamboo? Hay algún tipo de animal que usted conoce que comen o usan la cana guadua en alguna manera?
- Is bamboo a good business, why or why not? Usted piensa que la caña guadua puede ser un buen negocio, porque si o no?
- Are you interested in learning more about bamboo harvesting, processing, building etc? Y usted tiene interés en aprender mas sobre la cana guadua en un taller en el futuro?

ADD - For bamboo experts/entrepreneurs only:

- What types of bamboo are the most used? Cuales son los tipos de bambú los mas usados?
- What type of bamboo is the most in demand– why? Que tipo de bambu presenta la mayor demanda y porque?
- How do the properties of different bamboo types differ? Explica me como diferente tipos de bambu tiene diferente propiedades?

- Do you have a personal preference, why? Entre todos ellos, cual es el de tu preferencia?
- Where does most of the bamboo for tourism construction projects in the area come from? Usted sabe de donde vienen la mayoria de bambu para los proyectos de turismo en la costa?
- **What are the main challenges of developing a bamboo industry here in Manabí/Ecuador? Cual cree usted que son los desafíos mas grande de desarrollar al industria de bambu aquí en Ecuador/Manabí?
- Have you participated in courses on bamboo – why/why not - opinions. Has participado en algunos talleres o cursos de bambu, porque si o no?
- What is your opinion of the government initiatives to develop the bamboo industry in Ecuador? Cual es tu opinion de los initativos del gobierno para desarrollar el industria del bambu en el país?
- Who else should I interview if I want to learn more about bamboo in Manabí? Tienes alguna suguriencia de a quien puedo entrevistar para aprender mas sobre el bambu en Manabí?

Protected Area:

- Why do you think the government decided to make Pacoche a protected area? Porque usted piensa que el gobierno decidió de convertir la montaña de Pacoche el área alreador en un área protegida?
- What does this mean to you? Y esta decisión tiene alguna significado para usted?
- Why do you think they called it The Pacoche Wildlife Refuge? Porque piensas que se llama el Refugio de Vida Silvestre de Pacoche?
- Do you know where the Refuge begins and ends/ where the border is? Usted conoce donde comienza y donde termina las fronteras del área protegida?
- Are there different zones, or sections in the refuge? What are they for? Usted sabe si hay diferentes zonas en la área protegida y para que son?
- Do you think the PA benefits the people who live here? Why or why not? Usted piensa que la área protegida beneficia la gente que viven aquí, porque si o no?
- What do you think about the restrictions/permisos the government has made about the protected area? Do you agree/disagree – why? ¿Personalmente, estas en acuerdo o en desacuerdo con los restricciones y permisos en la area protegia?
- Have you ever participated in a meeting with the MAE? Why or why not? Has participado en alguna reunion con el Ministerio del Ambiente, por que si o no?
- Can you explain to me how someone gets a permit to harvest bamboo? Why would someone apply for this? It is common?
- What are the rules about building and buying land in the protected area? Does everyone follow them?
- How do you report something “illegal” in the PA? (Un infraction?) what is the process?
- Who do you think should be in charge of the Pacoche forest - why? Quien cree usted que debería ser responsable de la zona protegida?
- Has the protected area had an impact on your livelihood? Positive or negative? La área protegida ha tenido un impacto positivo o negativo por su familia?
- What do you think would happen to the forest if there were no more animals here? Que piensa usted que pasaría con el bosque si no hubiera más animales allí?
- Do you consider yourself a protector of the forest? Se considera a usted mismo un protector del bosque?
- Have you noticed a change in the forest since you were a child? Has notado algún cambio el en bosque desde tu niñez?
- What is different now? Que es diferente ahora?

- Do you manage the forest/your property the same as your father – or what do you do differently now, and why? ¿Usted siga usando las mismas técnicas ancestrales en el campo que te enseno su padre, o haces algo diferente?

Primates:

- How many different kinds of monkeys live here in the forest? Cuantos diferente tipos de mono hay en este bosque?
- How often do you see them? – when was the last time you saw them? Con que frecuencia usted los encuentras, cuando fue la ultima vez que has visto monos?/micos?
- How do you feel/what do you do when you see them in the forest? Como te sientes cuando encuentras monos en el bosque?
- Do you have any stories or memories to share about these monkey encounters? ¿Tiene alguna historia o recuerdo que nos quiera contar o compartir sobre estos monos?/micos?
- Do you think there are more or less monkeys in the forest now, then 5 years ago, 10 years ago, when you were a child? Usted piensa que hay más o menos monos en el bosque ahora y hace 5 o 10 anos atrás? Ramón siempre nos cuenta que antes aquí los casaban monos en la montaña, y usaban para remedios y incluso para comer, entonces… Usted cree que esa a ha cambiado hoy en dia, y porque? O usted cree que esta practica esta seguiendo todavia?
- Los monos o micos se alimenten de cosechas de otra personas? - de que tipo?
- ¿Alguna vez ha tenido problemas con los monos comiendo o dañando sus cultivos? Si es así, ¿qué haces para proteger sus cosechas? Tiene alguna recomendación?
- ¿Cuáles crees que son las mayores amenazas de los monos o micos aquí?¿Sabes lo que significa cuando un animal está en Peligro de Extinción?
- Have you seen a monkey on the ground before, how many times/where/why? Has visto alguna vez un mono o mico en el suelo, o cruzando la calle? Es comun, y donde? Porque piensas que bajan al piso?
- Have you ever seen a monkey hit by a car, or electrocuted? Where, how often? Has visto un mono o mico atropellado o electrocutado? Es común? Donde?
- Do you think monkeys make good pets? Why/why not? Usted piensa que los monos o micos son buenas mascotas?
- Have you ever had a monkey as a pet – growing up? Has tenido uno en tu casa?
- Do you know people who have monkeys as pets now? Usted conoce a alguien hoy en día que tiene un mono o mico como mascota? Es común? ¿Sabes qué tipo de riesgos existen para la salud humana al tener un mono como mascota en tu casa, o tocar o estar demasiado cerca de un mono en la naturaleza?

Tourism:

- Does the tourism industry here bring benefits/or problems to you and your community? Usted piensa que el turismo trae beneficio o algunas problemas aquí e tu comunidad?
- Why do you think tourists come here? Porque piensa usted que los turistas vienen aquí?
- Have you noticed a difference in the number of tourists in the past year – past 10 years? Has notado alguna diferencia en el número de turistas aquí en el ultimo 10 años?
- What changes have you noticed have occurred due to tourism in the area? Has notado algunas cambios aqui en el area por los turistas? Estas en acuerdo o no?

Land Politics/Ownership:

- Where does the name Pacoche (and Liguiqui) come from?
- Can you talk to me about the history of this land – when were the comunas founded?
- What is a comuna – what does it do?
- What does it mean to you to be a comunero?
- Does everyone in the comuna have Indigenous ancestry?
- How do you think being Indigenous here in the coast differs from in the highlands or the Amazon?
- Is there a political benefit to being a comuna? Where do the community resources come from?
- Is the comuna different than the municipality – explain?
- You mentioned once that: "cada vez somos menos" – what does that mean? Why are there fewer communeros than in the past?
- How many communeros are there in Pacoche? – is there a different sense of community between communeros and those who are not affiliated?
- What are some of the biggest challenges/limitations of the comuna system?
- Can you explain to me how the process of land ownership works here**?** Do most people have escritura now? Why or why not?
- Can you explain to me the process of buying/selling land here – how do you get escritura? Has this been impacted by the protected area?
- You mentioned once that all land purchased in the area that was not bought through the comuna is illegal because of a new law that was passed – can you explain this more?
- I also heard about another "new law" that states you cannot sell off parts of your land for others to live (one house per_____ha) is this true – can you explain it to me?
- Do most new people who buy land in the protected area go through the comuna? Why/why not?
- What kind of vision do you have for the future of your community?
- What would you consider to be the biggest challenges/problems here for your community?

Change over time:

- Has the landscape changed in the last 10, 20, 50 years? Describe to me what it was like here when you were growing up?
- Do you think the way people use/access forest resources has changed over the years? If so, how/why? Do you think people depend on the forest (more or less) now than they use to? Why?
- Have the products farmers grow on the land and the way they grow them changed over time? What has caused these changes?
- Was there always so much caña guadua in the forest – or has it expanded over the years? Do you think the way people manage bamboo has made it grow more?
- Have people here historically always used caña guadua for many things?
- Do you think caña guadua is of cultural importance to the people here? How so?

Appendix E: Bamboo Economy and Livelihoods Questionnaire – (Tamara, Zoe, Mina)

Obtain verbal consent; turn on recorder

Make note in your written notes at end of interview (don't ask all of these):
Date:
Time:
Place:
GPS point:
Gender (if obvious):
Approximate age:

A. Introductory questions (second level comments/questions are as appropriate/to remind interviewer things to consider in asking follow-ups):

1. How long have you lived here? ***¿Cuánto tiempo ha vivido aquí?***
    a. (If recent): what brought you here? Si es reciente, **¿Porque escogiste esta tierra?**
    b. (If a long time): how long has this land been in your family?***(Si es mucho tiempo): ¿Cuánto tiempo esta tierra ha estado en su familia?***

2. What racial/ethnic category do you most identify with? Circle one: Mestizo, Cholo, Montuvio, Afro-Ecuadorian, I prefer not to answer, I dont know. **¿Cómo usted se identifica? Mestizo, Cholo, Indígena, Montuvio, Afroecuatoriano, Blanco, Campesino, Otro, o usted prefiere no contestar, o no lo sabe.**

3. What is your primary/secondary occupation? **¿Cuál es su trabajo principal? Prompt: ¿Tiene alguna otra fuente de ingresos?**

4. What do you farm and harvest here for income? **¿Qué tipo de cultivo tiene usted que le genera más ingresos?**

5. What are the biggest environmental challenges you face? ¿**Cuáles son los problemas ambientales más grandes que encuentras aquí en su propiedad y el área?** *Prompt: regional or personal***:** *drought, flooding, pests, etc.*

    a. If yes, What, if anything, do you do to mitigate them? **¿Qué estrategias tiene usted para evitarlos?**

6. Has the pandemic affected your livelihood? How? **¿Cómo afectó a su familia la pandemia? Su comunidad?** *Prompt: Consider both negatives and positives, if they exist (see if bamboo comes up naturally)*
    a. *Prompt: community?*

B. Role of bamboo for growers (general, use, culture, etc):

7. How many hectares of your land is dedicated to bamboo? Why (ask more nuanced)? **¿Cuántas hectáreas de caña tiene en su propiedad?**

8. What type of bamboo do you have? *Prompt: caña brava, caña mansa, bambú gigante, o otro tipo?* **¿Qué tipo/s de cana son?**

9. Do you use the bamboo on your land? **¿Usted usa la caña en su propiedad?**
    a. ***If YES,***
        i. **Usted vende la caña por ingresos o solamente por usos personales?** *If personal move to #10*
            1. **IF THEY SELL: Con que frecuencia lo vende? Que cantidad?**
            2. *IF THEY SAY THEY SELL WITH REGULAR FREQUENCY - ASK EXTRA QUESTIONS AT END (Last section after other, #24)*
    b. ***No…***
        i. If they leave untouched, why? **Si, no.. porque? ¿Algunas razones ambientales o estéticas?** *Prompt: Any reasoning re: enjoying it/visually appealing/it holds water in the soil/other environmental reasons?*
        ii. *IF NO, SKIP TO SUSTAINABILITY SECTION (#17)!!!!*

10. What do you use it for? (might be addressed in previous) **Para que lo usa?**
    a. construction use? **construcción?**
    b. Do you use it as a raw material to build your house? Fences? Animal pens? Cujes? **¿La casa, muebles, bodegas, linderos o chequeros/ramadas para los animales?**
    c. To build furniture? Artisanal uses? **¿Algo artesanal?**
    d. Other applications? Environmental? **u otros usos ambientales etc?**

11. Do you think bamboo is important to your cultural heritage/connection to ancestors/place? **¿Usted siente algún tipo de conexión entre la caña/el bambú y sus antepasados? o cultural?**

12. Do you think the traditional uses of bamboo have changed? How? **¿Piensa que el uso tradicional de la caña ha cambiado? ¿Como?**

C. Management of bamboo & role in livelihoods

13. Do you manage your bamboo? *YES-Continue, NO-Skip to sustainability questions* **¿Usted maneja su mancha/cañal (guadual) de la caña/el bambú de alguna manera?**

14. Can you explain the process of harvesting and processing bamboo? Are there special techniques involved? (clear cut? Use of fire?) **¿Usted puede explicarme todo el proceso de cosechar hasta curar su cana? ¿Hay algunas técnicas especiales?**

    a. How did you learn to take care of/manage your bamboo? **¿Dónde aprendió a hacer esto? ¿Quién le enseñó?**

b. How do you select which culms to harvest? **¿Cómo seleccionar qué columnas están listas para cortar y cuando? ¿Hay un ciclo/tiempo de año para cosecharlos? Por favor explicamelo?** *Prompt: edad? caracteristicas?*
c. Do you use any agrochemicals? **¿Usted usa algún tipo de químico o pesticidas?**
d. Thinning? Do you clean/tend to the understory? Or something part of harvest process that relates to management? **¿Usted limpia la maleza alrededor de la cana para cuidar la mancha? ¿Qué otra estrategia tiene usted para mantenerlo?**
e. Why (do they make particular choices; to get at rationalities, e.g. environmental, cultural, practical, etc.)? **¿Por qué lo haces así? Para que funciona estes prácticas?**
f. Is this common practice? (neighbors, family) do things differently or the same? **¿Esas son practicas comunes? O otra gente lo hace de maneras diferentes?**
g. When was your last harvest? What quantity do you usually harvest? Does this change depending on the purpose of the harvest? ¿**Cuándo fue su última cosecha de caña, y cuantos cortaste? Esta cantidad es normal? O cambia todo tiempo (depende en qué factores?)**
h. Have these processes changed over time? Why? **¿Sus prácticas con la cosecha de caña han cambiado?**
    i. Prompt: **¿Usa la misma manera de sus abuelos? ¿Por qué?**

D. Sustainability / Biodiversity

15. Is bamboo good for the environment? Does bamboo play a role in environmental management/benefit on your property? In the region? Has anyone told you about other ways bamboo helps land or nature? **¿Usted cree que la caña/el bambú es bueno para el medio ambiente? ¿Por qué?**
    a. Water? **Agua?**
    b. Erosion? **Erosión?**
    c. Biodiversity? **Biodiversidad?**
    d. Landcover **Cobertura de vegetación?**
    e. Other: shade, other crops/animals, etc. **Otra: sombra, otros cultivos/animales, etc.**
16. Do you plan to increase the amount of bamboo you are growing for environmental reasons? Why or why not? **Tiene planes para aumentar la cantidad de caña/bambú que está creciendo por razones ambientales? ¿Por qué o por qué no?**

17. Do you know of any animals that use or eat bamboo in this area? **¿Conoce algunos animales que usan la caña/el bambú o comerlo en esa área?**

E. Role of bamboo in development (broadly)

18. Are there more opportunities to earn income from bamboo than there used to be? If yes, Why? What has changed? When did this change? **¿Hay más oportunidades ahora que antes, para ganar un ingreso con la caña/el bambú?**
    i. **If yes, por qué? ¿Qué ha cambiado? ¿Cuándo cambió?**

19. Are people growing bamboo for other reasons than to earn money? For other reasons? **¿Hay otras razones para cultivar la caña/el bambú, aparte de ganar dinero? Que son?** *Prompt: environment? medioambientales?*

20. Have you taken any training courses, or participated in any meetings about bamboo? Why/why not? **Ha escuchado o tomado algún curso de formación, taller, programa, o alguna reunión sobre la caña? ¿Por qué o por qué no?**

21. Have you heard of a micro-credit program for bamboo farmers in Manabí? Is this something you would be interested in, why/why not? **¿Ha escuchado sobre programas de microcrédito para los agricultores de la caña/el bambú?**
    a. **¿Tiene interés de tomar un programa de esos? ¿Por qué o por qué no?**

22. *Depending on above answers:* What is your opinion on these initiatives? **¿Cuál es su opinión sobre estos programas (del gobierno o ONHs)?**
    (need more info re: this, after a few interviews this will become more clear)

23. What barriers exist to selling more currently? **¿Qué dificultades o desafíos existen para vender más cana? Personalmente? En general?**

LAST SECTION:

F. Selling of bamboo & role in livelihoods:

24. Who do you sell your bamboo to? What do they use it for/do with it? Do you sell the whole culm or parts of it? **¿A quién le vende su bambú? ¿Para qué lo usan? ¿Usted vende el culmo entero o solo partes?**

25. How much is una docena worth? *Por culumna?* **¿Cuánto cuesta/cuánto ganas para una docena de caña? Este precio cambia dependiendo del tipo o el proceso de la cosecha?** Does the price change based on the type or conditions of bamboo? *Cured/uncured, harvested during minguante (low tide)*

26. Is bamboo farming a good business? Why or why not? **¿El bambú es un buen negocio? Recomendado? Porque si, o no?**

27. How much have you earned from the sale of bamboo since the beginning of 2021? How does this compare to previous years? **¿Cuánto dinero ha ganado por vender caña este año?**
    a. Does it make up a large portion of your income? **¿Eso constituye una gran parte de sus ingresos?**
    b. Is bamboo farming important to the local economy? Regional economy? **¿Usted cree que la venta de bambú es algo importante para la economía local aquí? En el región en general?**

28. Has the pandemic impacted the demand and/or price of bamboo? Has it played a different or more important role in your livelihood? **¿La pandemia ha afectado el impacto de la demanda o el precio del bambú?**

29. Do you plan to increase the amount of bamboo you are growing? Why or why not? **¿Usted tiene planes para incrementar la cantidad de caña que está cosechando? Por que si, o no?**

G. Primates

30. Have you ever seen monkeys on your property? If so, where, when? How many/how often - monos o micos? **¿Ha visto monos en su propiedad? If so, Dónde? ¿Cuándo? ¿Cuántos son? ¿Con qué frecuencia? Son monos o micos?**

31. Can you tell me about any animals that eat your crops, and how do you manage this damage? **¿Me puede decir algo sobre los animales que comer sus cultivos y cómo usted maneja este daño?**

32. Is it common to eat monkey meat in this area? If so, how are they hunted, are there specific dishes that use monkey meat? Medicines? **¿Es común comer carne de mono en esta área? If Yes, como lo caza? Hay platos específicos que usan carne de mono? Medicinas?**

33. Is it common to have a monkey as a pet in this area? **¿Es común tener un mono como mascota en esta área?**

*******Other**

34. Is it OK if I take a GPS point of your property to remember where this interview took place? **Está bien si tomo un punto geográfico en su propiedad para recordar donde ocurrió esta entrevista?**

Appendix F: Ethogram

Britton, T: Ethogram - *A. palliata* & *C. aequatorialis* Behavioural Ecology Monitoring (2021-2022).

Self *or Group* Directed Behaviours (SDB)	**Codes**	**Description**
Feed/Forage	F	Approach food; manipulate food (or water) with hands, feet, mouth; chew; swallow; move while intermittently consuming or manipulating food items; includes drinking
Extractive Foraging	EF	Tearing open branches and bark, exploring tree holes, picking/knocking/opening seeds and invertebrates in a destructive manner for consumption.
Travel	T	Move/travel along a substrate (not while feeding); can include climbing, jumping, walking, running, etc.; can be within same tree OR between trees throughout the canopy.
Rest	R	Remain in one location on substrate (no travel, feed, social behavior, etc.); eyes open or closed; may include slight repositioning, scratching self, momentarily looking around, etc.
Vocalization	V	Auditory expression directed towards own group members/ other groups or other non-human species/stimuli.
Object Manipulation	OM	Touching, playing with, moving, licking, biting, banging, breaking a non-food object.
Social	S	Includes *grooming* (G; run fingers/mouth along fur of another individual): *playing* (P; includes chasing, wrestling, playing with an object, etc.); a*ggression* and other *dominance behaviors* (A; fight, bite, lunge, attack, supplant, etc.); *submission* (SU; present rear end, flee, or pass underneath - avoid etc.); mating (M)
Other	O	Any behavior not otherwise included in ethogram.
Out of View	OV	Focal individual cannot be seen or differentiated from other individuals - three sequential OV's will constitute a termination of the sample.

Adopted from own observations and: (Bolt & Schreier, 2018).

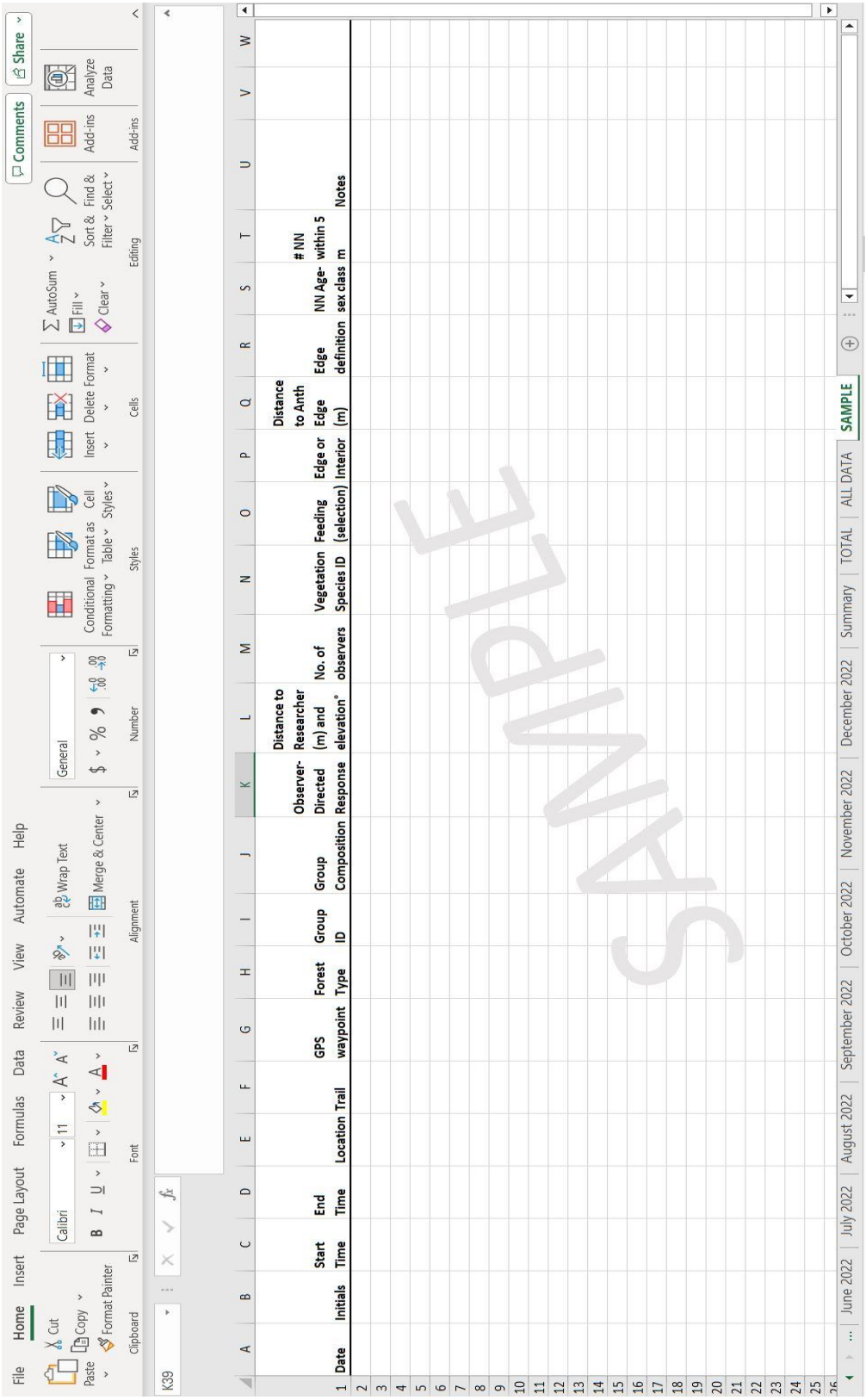
Observer - Directed Behaviours (ODB)	**Codes**	**Description**
Ignore	IG	After glancing or staring at the observer, individuals resume previous activity.
Monitor	MO	Surveillance of the observer; includes at least one of the following elements: staring, moving closer to obtain a clearer view of observer, peering at observer from behind a tree trunk, bipedal scan (BPS), bobbing and pacing while watching observer/s (looking around).
Avoid	AV	Upon detecting the observer, individual moves away and out of view at a normal pace.
Flee	FL	Upon detecting the observer, individual moves rapidly with or without alarm vocalization higher up into tree or deeper into forest out of view.

Britton, T: Ethogram - *A. palliata* & *C. aequatorialis* Behavioural Ecology Monitoring (2021-2022).

Threaten	TH	Observer-directed aggression; vocalizations directed at observers - includes bark (BK), howl (H), open mouth threat (OMT), yawn threat (YT), silent-teeth bearing (SBT), brow furrowing (BF), lunge (LU), bouncing (B), standing-erect posture (EP), and shaking branches (SH). Includes: Destructive-Aggressive Behaviour such as deliberate breaking branches (BB), throwing/dropping substrate and other forest materials (DR).
Collective Threat	CT	Coordinated group threats such as mobbing behaviour (MB), and overlord display (OVL); Many individuals excited; they emit and exchange numerous intra-group behaviors.
Stress	ST	Repeated vigorous self-scratching; deliberate aggressive behaviours towards other group members in response to observer presence; urination or defecation aimed towards observers or repeatedly; excessive pacing.

Adopted from own observations and (Hansen, 2017; in Thierry et al., 2000)

Appendix G: Primate Data Sheet (sample)



Appendix H: Vegetation Sampling Data Sheet

Estudio de Biodiversidad de Árboles en Bosques de Bambú

Fecha: _____ **Sitio:** _____

Hora: _____ **Tipo de Bosque:** _____

Nombre: _____

Muestra #	Nombre común	Circumf.	Uso Humano	Uso Primate	Estado fenológico	Otras especies presentes	Observaciones/Notas

1

Appendix I: ULEAM Agreement

Uleam
UNIVERSIDAD LAICA
ELOY ALFARO DE MANABÍ

Facultad Ciencias Agropecuarias

Intention letter
May 12, 2022

The Universidad Laica Eloy Alfaro of Manabi, through the Faculty of Agricultural Sciences, seeks to establish relationships and collaboration agreements in the fields of academic and scientific development with public and/or private institutions, both national and international.

In this case, the importance of cooperation is recognized as an institutional commitment and a matter of joint work to meet the common goals and mutual interests of the institutions, with the purpose of establishing and strengthening relationships that allow, in the short term, the signing of general or specific collaboration agreements that motivate inter-institutional cooperation contemplated in academic, research and linkage activities with Ecuadorian and international society for the generation of projects, scientific events and pre-professional applied activities.

For these reasons, through this Letter of Intent, the interest of signing an Inter-institutional Cooperation Agreement between Tamara Britton of the University of Western Ontario, Canada, Faculty of Social Sciences, Department of Anthropology and The Universidad Laica Eloy Alfaro de Manabi specifically established with the Faculty of Agricultural Sciences is to support this PhD study with the collaboration of the faculty and student research assistants. To meet the goals of this current project, ULEAM is also offering the use of the laboratory on campus for sample analysis and the advice and guidance of professors with the agreement to mutually develop and enhance the technical, technological, undergraduate and postgraduate careers of students.

This letter of intent may be amended by mutual consent or terminated by either institution giving written notice. It will have a duration of five years and may be renewed with the prior agreement of both parties.

Ing. George García Mera Mgs.
Dean of the Faculty of Agricultural Sciences
La Universidad Laica Eloy Alfaro de Manabí

FACULTAD DE CIENCIAS AGROPECUARIAS
Uleam
Manta - Ecuador
DECANATO

Tamara Lynn Holly Britton
Doctoral Candidate
Department of Anthropology, Centre for Environmental Sustainability
Western University, Ontario Canada.

Appendix J: Banners for Community Outreach - Primate Conservation Awareness


Capuchino de frente blanca
(Cebus aequatorialis)
¿Sabías que?
El capuchino Ecuatoriano de frente blanca se encuentra en la Lista Roja de la UICN de las 25 especies de primates más amenazadas en todo el mundo.
¡Son omnívoros! Comen frutas, nueces, hojas, insectos, pequeños animales como lagartijas, ranas, serpientes y huevos de aves.
Los capuchinos tienen el cerebro más grande que cualquier mono en América del Sur o Central y pueden vivir más de 50 años.
¡Usan herramientas! Los capuchinos son los primeros primates que no son simios que se observan usando herramientas en la naturaleza, como rocas para abrir nueces y palos para recolectar termitas.
PELIGRO CRITICO
¿Donde se encuentra?
El capuchino Ecuatoriano de frente blanca (Cebus aequatorialis) se encuentra solo en la parte costera de Ecuador, en áreas protegidas y reservas privadas donde aún existen grandes fragmentos de bosque primario –500 ha o más.
Principales amenazas:
Persecución por comer cultivos
Cacería y tráfico ilegal de mascotas
Deforestación por avance de la agricultura y ganadería
Pérdida de hábitat y fragmentación de bosques
Proyecto MonoMico
@_monomico_
MONOMICO
Western
UNIVERSITY · CANADA
Greenearth

Appendix K: Curriculum Vitae

Name: Tamara Britton

Education:

Ph.D., Sociocultural Anthropology (Environment and Sustainability) 2019 - 2024
University of Western Ontario, London, Ontario

M.A, Sociocultural Anthropology, & Environment and Sustainability 2017 - 2019
University of Western Ontario, London, Ontario

M.A., Immigration and Settlement Studies 2014 - 2015
Ryerson University, Toronto, Ontario

B.A (Hons.) Anthropology and International Development Studies 2010 - 2014
Trent University, Peterborough, Ontario

Honours and Awards:

- SSHRC Storytellers Competition - Top 25 finalist across Canada 2023
- SSHRC CGS-D (Social Science and Humanities Research Council of Canada) 2020 - 2023
- Ned Jaquith Foundation/American Bamboo Society - Research Grant 2023
- Michael Smith Foreign Study Supplement (SSHRC) 2022
- Robin Rigby Trust Grant for Community-Based Coastal Research 2019 - 2022
- Conservation, Food and Health Foundation - Research Grant 2021 - 2022
- Ontario Graduate Scholarship (OGS) 2019 and 2020
- Maderas Rainforest Conservancy Scholarship, American Society of Primatologists 2019
- CAPA Student Travel Assistance Grant 2018
- Regna Darnell Award for Fieldwork in Sociocultural Anthropology 2018, 2019, 2022, and 2023
- Graduate Student Research Award 2018 and 2020
- Environment and Sustainability Travel Award 2018
- WGRS Western Graduate Research Scholarship 2017- 2023
- Ryerson Graduate Fellowship 2014 - 2015
- Ryerson International Work Experience Fund 2015

Related Work Experience:

Course Curriculum Design, Engineered Bamboo Products 2023
University of British Columbia, *micro-credit online course*

Teaching Assistant, Anthropology of Zoos 2267B 2019, 2022 and 2023
University of Western Ontario**,** *London Ontario*

Teaching Assistant, WOOD 572C: Bamboo Science and Products 2021
University of British Columbia, *online course*

Teaching Assistant, Sociocultural & Linguistic Anthropology 1025F 2020
University of Western Ontario*, online course*

Teaching Assistant, Biological Anthropology 2226B 2020
University of Western Ontario*, London Ontario*

Teaching Assistant, Primate Behaviour 2265F 2018
University of Western Ontario**,** *online course*

Course Curriculum Design, Anthropology of Zoos 2018
University of Western Ontario**,** *online course*

Teaching Assistant, Sociocultural Anthropology 1025F 2017
University of Western Ontario, *London, Ontario*

Research Assistant, International Child Protection 2015 - 2016
Ryerson University, Toronto, Ontario

Research Assistant, Child Participation in International Child Protection Initiatives 2015
Ryerson University, Toronto, Ontario

Publications:

Binfield, L., **Britton, T. L.,** Dai, C., & Innes, J. (2022). Evidence on the social, economic, and environmental impact of interventions that facilitate bamboo industry development for sustainable livelihoods: A systematic map protocol. *Environmental Evidence*, *11*(1), 33.

Britton, T., L. (2023). Bridging The Gap Between People & Primates. BRU Magazine, Conserving Biodiversity with Bamboo: *Bamboo and Rattan Update*, 4(3).

Britton, T., L., & Annan-Aggrey, E., A. (March 2021). Joining Hands: The Decade of Action on the SDGs. *Alternatives Journal*, Western Student Editorial Series. https://www.alternativesjournal.ca/sustainable-life/joining-hands-on-the-sdgs/

Binfield, L., **Britton, T., L.,** Semple, K., & Dai, C. (April 2021). Bamboo Future. *Alternatives Journal*, Climate Change Series. https://www.alternativesjournal.ca/politics-policies/best-practices/bamboo-future/

Nichols, B., Umana, K., Britton, T., L., Farias, L., Lavalley, R., Hall-Clifford R. (2017). Transnational Information Politics and the Child Migration "Crisis": Guatemalan NGOs Respond to Youth Migration. *VOLUNTAS: International Journal of Voluntary and Nonprofit Organizations*, 28:1967-1987.

Active Professional Affiliations:

- Grupo de Estudios de Primates de Ecuador (GEPE)
- Bamboo Applications and Management Research Group (BAM) - *University of British Columbia, Faculty of Forestry*
- Regenerative Industry Think Tank (RITT)
- International Primatological Society (IPS)