The Turtle Team: A visual ethnography of the human/non-human relationship and its influence on the creation of scientific knowledge in Costa Rica

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Abstract

This thesis explores the relationship between humans and non-humans within a sea turtle conservation organization in Costa Rica's Osa Peninsula. Through eleven weeks of in-depth visual ethnographic fieldwork, I investigate the influence these human/non-human relationships have on scientific knowledge production. The output of this research consists of an ethnographic film 'The Turtle Team' and this article. This research underscores the necessity of adopting transdisciplinary methodologies in which non-humans are integrated, which is crucial in the era of the Anthropocene. It provides a nuanced understanding of how human/non-human relationships shape the production of scientific knowledge in this team of conservationists and emphasizes the interwovenness of humans and non-humans. This research contributes to the existing literature on the Anthropocene and the nature-culture debate and I argue that the interwovenness of humans and non-humans should be discussed more within scientific research, especially in conservation biology.

[Key words: Anthropocene, nature-culture debate, conservation biology, human/non-human relationship]

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1 Introduction

When I traveled to Costa Rica during my gap year, I chose to participate as a volunteer in a Sea Turtle Conservation project for four weeks. During this time I learned about the many threats sea turtles face and the importance of their conservation. The dedication and hard work of the staff members, research assistants and other volunteers to conserve sea turtles was moving. This is where I got the inspiration and the connections to do this Master's Thesis. During this research, I could combine my interest in conservation biology and visual ethnography.

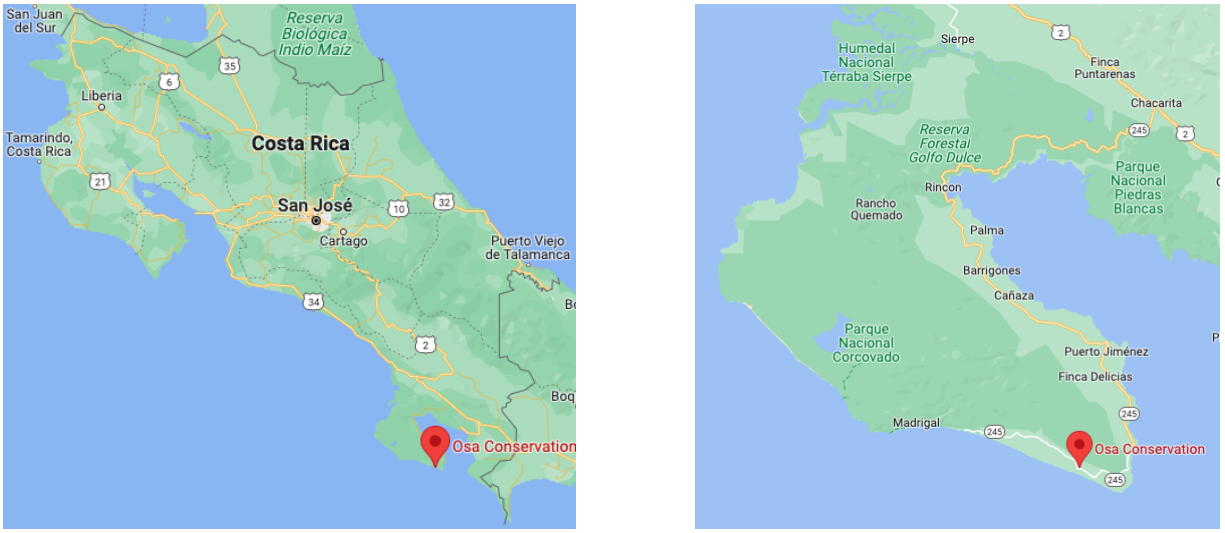
This research explores the human/non-human relationships between the members of a sea turtle conservation team and their environment in the Osa Peninsula in Costa Rica. It is based on three months of visual ethnographic fieldwork. I want to understand how human/non-human relationships influence scientific practices and the production of knowledge to address a need for new methodological and transdisciplinary ways in research during the time of climate change. The relationships between humans and non-humans became more apparent during the climate crisis. However, they are still often invisible in scientific research. The research question of this thesis is: How does the relationship between individuals of the sea turtle team and non-humans, influence the creation of scientific knowledge in the Osa Biological Station in Costa Rica?

This research is a visual ethnography. Meaning that this article is accompanied by an ethnographic film. The ethnographic film that I made, ‘The Turtle Team’, will show the work that was being done by the sea turtle conservation team and the process of creating scientific knowledge. From now on I will call members of the sea turtle team: conservationists. I chose to make a film because I wanted to be able to inform a great audience about sea turtle conservation efforts. This article is an addition to the ethnographic film to dive deeper into the underlying discussions on the Anthropocene and scientific knowledge. This article will also make references to the ethnographic film. The theoretical argument will be that the human/non-human relationship influences the scientific knowledge that is produced by the conservationists in different ways and that these influences should be discussed more in scientific articles and research reports to better understand the environment and to help future research.

To answer the research question and show how the relationship between the conservationists and the non-humans influences the creation of scientific knowledge, I will discuss three subchapters in the findings and analysis. These subchapters will answer and relate to the subquestions:

1. What is the relation between the individuals of the sea turtle team and the sea turtles?
2. What is the routine of the work of the members of the sea turtle team?
3. How do the members of the sea turtle team turn data into scientific knowledge?

This research took place at the Osa Biological Station. This station is part of Osa Conservation, a non-profit organization in the Osa Peninsula in Costa Rica. Osa is a peninsula in the southwest of Costa Rica and is named the most biologically intense place on earth by National Geographic and it is estimated that it houses 2,5% of the biodiversity of the Earth.[2]



Screenshot of Costa Rica and the Osa Peninsula of Google Maps, consulted on the 25th of January 2023.

Due to hunting, gold mining, logging companies and cattle ranching that caused deforestation, the biodiversity of the Osa Peninsula declined very quickly during the 20th century. As a response, Osa Conservation was founded in the 2000s.

Globally we are starting to see the negative impact humans can have on their environment. These impacts change ecosystems so rapidly that the past can no longer be used as a guide to the future (Mathews 2020). Impacts like biodiversity loss, endangered species and pollution of air, ocean and land. More and more efforts to conserve nature have been made in the past decades. Many protected areas have been established worldwide to protect wildlife on both land and ocean from threats like poachers, deforestation, fishing practices and more, as a response to these rapid changes. 'The Anthropocene' is a proposed name for a geological epoch in which humans have impacted global ecosystems. In the latest discussions on, for example, the Anthropocene and the nature-culture debate, the need to involve non-humans and other ontologies in these debates gained more attention (Tsing et al. 2019, Viveiros de Castro 2019, Mathews 2018, De la Cadena 2010, Mathur 2015, Tsing et al. 2021, Littlejohn 2020). In ethnographic films like *Leviathan* (Taylor and Paravel 2012) and *Golden Snail Opera* (Tsai et al. 2019) non-human perspectives are included. New conceptual tools are being created to think about these more-than-human social relations, like the 'Patchy Anthropocene' by Tsing, Mathews and Bubandt (2019).

[2] Consulted on the 8th of November 2022: https://osaconservation.org/about-the-osa-peninsula/

The turn in anthropology, to think more about human/ non-human social relations, and the debates on the Anthropocene, make it interesting to do an ethnographic study at Osa Conservation. At Osa Conservation they use the fairly new multi-disciplinary conservation biology, which goal is to study ecosystems of nature and earth to protect species diversity and the structure and function of ecosystems (Braje & Rick 2013). These ecosystems have been changed through human interaction. The science of conservation biology is young, inexact and still evolving (Lindenmayer & Burgman 2005: 6). So there is still a lot to learn about how to conserve biodiversity and a need to think critically and multi-disciplinary about conservation biology practices. So this complex biodiverse environment is a great place to study human/non-human relationships and how they influence the creation of scientific knowledge produced from conservation biology.

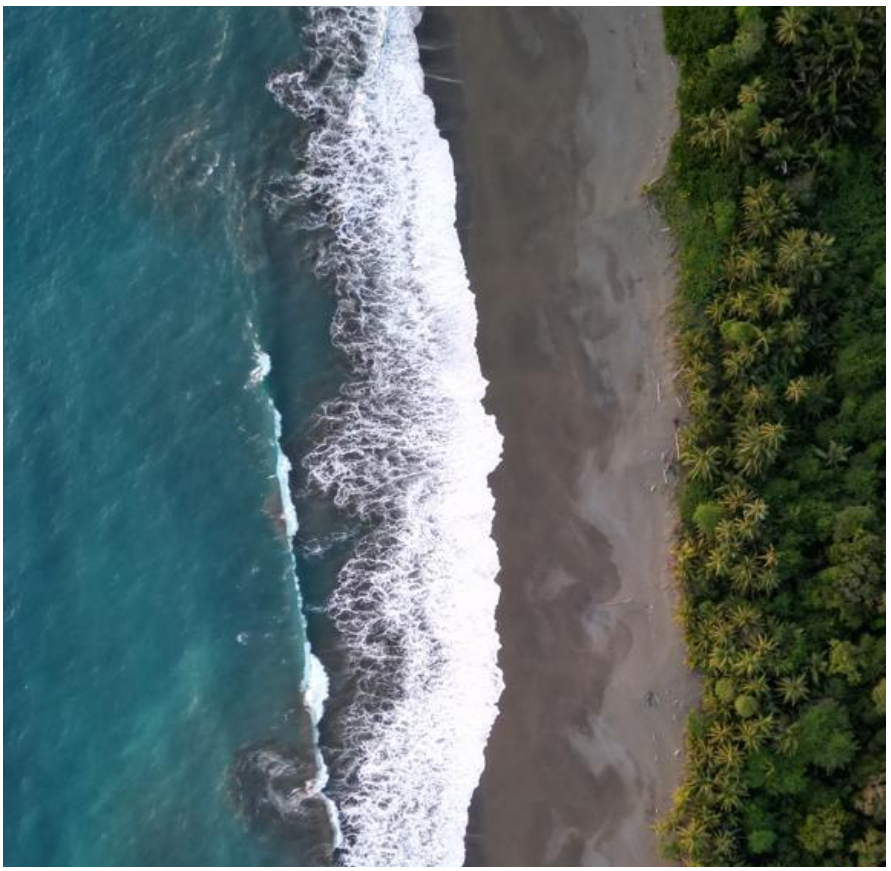
To better understand this research, let me first provide some contextual information on the fieldwork location.

1.1 Context

The Osa Biological Station focuses on the conservation of this biodiverse place and doing scientific research on sea turtles, wildlife and botany.[3] Their goal is to conserve the biodiversity of the Osa Peninsula by valuing a balanced ecosystem, helping create a scientific understanding of the importance of the ecosystem and its actors and spreading this knowledge through education and training.[4] Thus this organization is not only working on applying conservation efforts but also focuses on doing scientific research to get a better understanding of the ecosystem and sharing this with locals and with the world through scientific articles. Hereby, the organization tries to regain the balance in the ecosystem.

Within the campus are four different programs: Sea Turtle Conservation, Wildlife Conservation, Botanical Exploration and Restoration. Each program has short-term interns (three months), long-term interns (six months) and permanent research staff members. From time to time volunteers help out in multiple programs and some visitors use the hiking trails or are stay in the cabins on campus. This research will focus only on the Sea Turtle program, its interns and Bárbara, the Sea Turtle Conservation Coordinator and researcher.

[3] Consulted on the 14th of October 2022: https://www.instagram.com/reel/Ci0n4WAABnJ/?igshid=MDJmNzVkMjY=
[4] Consulted on the 16th of January 2023: https://osaconservation.org/mission-vision/



Drone photograph of Piro Beach by Paul Bonfils.

The conservationists mainly operate on Piro Beach, a beach that is part of the vast land that Osa Conservation owns, which is located at a twenty-minute hike through the jungle from the station. The team consists of Bárbara, the permanent coordinator and researcher, and multiple interns from Europe and the United States of America. The team's composition changed during the fieldwork of this research, because of the rotating nature of the team.

The beaches on the Osa Peninsula are mainly visited by two species of sea turtles: Olive Ridleys and Green Turtles. According to the IUCN Red List of Threatened Species, The Olive Ridley Turtle has a decreasing population and is assessed as vulnerable (Abreu-Grobois & Plotkin 2008). The Green Turtle also has a decreasing population and is assessed as endangered (Seminoff 2004).

Photograph of an Olive Ridley turtle by Adriana Gonzales.

Photograph of a Green Turtle by me, Amber Tolboom.

It is estimated that only one in a thousand hatchlings makes it to adulthood.[5] After hatching, 25% of the hatchlings do not survive the first twenty-four hours (Gyuris 1994). The global decrease in sea turtle populations is caused by poaching, entanglement in marine fisheries, and degradation and changes of both marine habitats and nesting beach habitats by, for example, global warming, plastic pollution and new buildings (Abreu-Grobois & Plotkin 2008, Seminoff 2004). Besides these threats, the nesting beach of Piro Beach also has another great threat. Due to hunting on the Osa Peninsula, there was a loss of apex predators, like pumas. This resulted in other predators, like raccoons and coatis, being able to grow in numbers and the ecosystem losing balance. These great numbers of coatis and raccoons eat the turtle eggs and cause very high predation levels on Piro Beach. In just the first ten hours after laying, 22% of nests are predated on Piro Beach.[6]

The most practiced method in Sea Turtle Conservation globally is beach monitoring and having a hatchery or nursery. These practices are important because they involve long-term monitoring and safekeeping from humans and other predators. So beach monitoring, also known as 'morning census' within the sea turtle conservation team at Osa Conservation, is indeed the main and most frequent activity that is being done. During the morning census, sea turtle tracks, predated nests and new nests are recorded. During a certain period of time, sea turtle eggs are collected if possible and brought to the hatchery for safekeeping. This is called relocating and this is necessary on this beach because of the very high levels of predation. On Piro Beach, there are almost no poachers.

The hatchery of Osa Conservation on Piro Beach.

[5] Consulted on the 26th of September 2023: https://www.seeturtles.org/baby-turtles
[6] Consulted on the 29th of September 2023: https://www.instagram.com/p/CqeXCUvAwAf/

Furthermore, the hatchlings that hatched during the night are released from their baskets in the hatchery and protected by the interns, volunteers, or visitors on their way to the ocean against predators, like crabs and hawks, which could be lurking on the beach. Data on turtle tracks, nests and hatched nests are collected through observations, measurements and excavations of hatched nests by mainly the interns. This data is needed for the experiment that is being done in the hatchery and is used to create scientific knowledge about hatchling success and the spread of diseases between nests in the hatchery. The research aims to see how diseases, like fungi, bacteria, maggots, and mites, spread between nests and influence the hatchling success using different distances between the nests. This scientific knowledge can help global Sea Turtle Conservation because models for the relocation of sea turtle eggs to a hatchery are not based on previous scientific research (Chacón 2007: 47). So, this research can confirm that the often-used structure in hatcheries is working well for the conservation of sea turtles or it can provide a better structure.

Next, I will discuss the conceptual framework regarding debates around the Anthropocene and conservation biology with a focus on the human/non-human relationship. After gaining a better understanding of these debates I will discuss the findings of this ethnographic study and analyze them to show the need for new ways in research to include the human/non-human relationship.

2 Conceptual Framework

To understand this research, it is important to understand some theories and concepts before diving into the findings. The concepts and surrounding debates I want to use to analyze the findings are the Anthropocene and conservation biology. Conservation efforts are made because of the impact humans have on the ecosystem. Thus the Anthropocene is an interesting concept. Furthermore, the Anthropocene has created interesting debates about doing research and including non-humans in research. Conservation biology is the type of research that the conservationists use and it looks into landscapes, including humans and non-humans, that have been impacted by humans. Therefore these concepts are partially interwoven and a good basis for understanding this research on the human/non-human relationships and its influence on scientific knowledge.

2.1 Anthropocene

As I have discussed in the introduction, the Anthropocene is a proposed name for a geological epoch in which humans have impacted global ecosystems. 'Anthropo' is Greek for human and 'cene' means recent or new.[7] The Working Group on the Anthropocene proposed the mid-twentieth century as a start date because of the many measurable anthropogenic changes, caused by the 'Great Acceleration' (Davis & Todd 2017: 762). During this period the atomic bomb was created, overconsumption and the increase in the use of natural sources started and non-biodegradable waste production increased (Davis & Todd 2017: 765-766). Now, no place on Earth is unaffected by humans and our technologies (Latimer & Miele 2013: 17).

Davis and Todd discuss how the concept of the Anthropocene has its flaws because it does not indicate differences between governments, peoples and geographies and their different roles in the human impact on global ecosystems (2017: 766). It gets rid of the questions of power and suggests that all humans are equally involved in climate change (Davis & Todd 2017: 763). However, some have had a greater influence than others, like petrochemical companies and their investors and profiteers, and the investors and profiteers from colonialism (Davis & Todd 2017: 765). Furthermore, the term is problematic because it does not differentiate between world views and economies (Davis & Todd 2017: 768). It has quite a Eurocentric framing. Davis and Todd (2017) propose 1610 or the beginning of the colonial era as a starting date of the Anthropocene. This way colonialism is recognized to be responsible for the current environmental crisis (Davis & Todd 2017: 763). This opens up the concept beyond the Eurocentric framing it currently has and beyond the European and Western epistemology that is currently used (Davis & Todd 2017: 764). By criticizing and using the Anthropocene in this way, Davis and Todd (2017) hope that the concept of the Anthropocene can traverse the social and natural sciences and humanities and try to untangle the existing systems of

[7] Consulted on the 6th of October 2023: https://education.nationalgeographic.org/resource/anthropocene/

power, ideologies, economies and world views. Thus, the Anthropocene is a very interesting concept for this ethnographic research on conservation biology, where multiple disciplines are used to understand the environment (see Chapter 2.3).

2.2 From Anthropocene to Paradigm Shift

The debate on the Anthropocene pushes anthropology in new directions and challenges us to look at our study anew (Tsing et al. 2019: s187). It can be seen as a wake-up call for anthropology to reinvent our analytical and observational skills and focus on the intertwined human and non-human histories (Tsing et al. 2019: s188). The Anthropocene overlaps with climate studies when discussing the climate crisis and the human influence on this crisis. Anthropology's first contributions to climate studies were locally focused studies on how people understand and experience climate change (O'Reilley et al. 2020: 14). O'Reilley argues that the current state of climate anthropology moves beyond both the local and particular and the anthropocentric and phenomenological approaches (ibid.). It offers new approaches that use an expansion of perspectives mostly focusing on the social relations between nonhumans and humans (ibid.). Humans are part of many webs that are constructed by many factors, both human and non-human (Geertz in Tsing et al 2019: s187). To study humans and their lives, it is important to also look at their environment. In a time of a global environmental crisis, studying histories and structures of multispecies webs and more-than-human landscapes needs new methodological and transdisciplinary ways (Tsing et al. 2019: s187). This means looking at and thinking about systems differently (ibid.). This is something anthropology is good at.

Tsing, Mathews & Bubandt (2019) propose the conceptual tool of the 'Patchy Anthropocene'. The patchy Anthropocene notices multiple kinds of landscapes and uses multiple kinds of systems-making to understand it (Tsing et al. 2019: s187). In research mostly only one kind of system-thinking is used, like the Anthropocene as a system in Earth system science, or political economy as a system in social science (ibid.). They argue that in understanding the patchy Anthropocene, multiple systems should be used (ibid.). These systems consist of ecological modeling, political economy and alternative cosmologies (Tsing et al. 2019). These systems have elements in common but can also gain from each other (Tsing et al. 2019: s190). More-than-human social structures can be noticed in two dominant landscape forms according to Tsing et al.: 'modular simplifications' and 'feral proliferations' (2019: s189). An example of a modular simplification (similar to ecological simplification) is a plantation (Tsing et al. 2019: s187). At a plantation, the species diversity is simplified or reduced to the crop wanted by the plantation owner. An example of feral proliferation is a plantation-encouraged disease (ibid.). This disease thrives now that the conditions for its growth are improved.

If I were to implement this idea in the field of this research, which is mainly Piro Beach on the Osa Peninsula, a modular simplification could be the environment losing its apex predators due to

hunting, gold mining and deforestation. A feral proliferation could be the increasing population of coatis and raccoons. In their turn, they eat the turtle eggs and decrease the chances of survival of the hatchlings, which makes sea turtle conservation at this beach even more necessary.

Anthropology has had a great focus on the concepts and cosmologies of our interlocutors (Tsing et al. 2019: s188). This way, focussing on the landscape through our own observations (in combination with conversations with the interlocutors) has been lost (ibid.). Mathews (2018) argues that by using multiple methods when researching more-than-human landscapes, like your own experience of noticing and walking, archival research, oral history, natural history, landscape walks and interviews, we as anthropologists can learn to notice multiple 'throughscapes'. Throughscapes are landscape patterns or patches that have partial overlap and are interwoven but have different histories (Mathews 2018: 392). Every throughscape has its own storyline: a history with different actors that can change over time due to relationships with each other, with a different beginning and with differently emerging spatial patterns (Mathews 2018: 407).

At Osa Conservation this could entail the storyline of different actors of the jungle, having certain relationships with each other in a balanced ecosystem, that then change over time when different kinds of human impacts change the circumstances and relationships. Landscapes develop through encounters between humans and non-humans (Tsing 2015 in Mathews 2018: 289). These non-humans include soils, disease organisms, trees, animals, air, water and microbes (Mathews 2018: 386, Latimer & Miele 2013: 7). Non-humans at Osa Conservation in Costa Rica include sea turtles, sand, coatis, bacteria, fungus, maggots and weather for example.

Thus, the Anthropocene challenges anthropology to reinvent our skill set, including non-humans in understanding social and landscape structures. The Anthropocene also confronts us (Viveiros de Castro 2019: s297). Humans who have been creating new technologies for understanding and maybe even manipulating the Earth to our needs are now confronted with the idea (and practice) that we possibly cannot stop nature from changing and negatively impacting our lives, like rising sea levels, more wildfires or less access to food. Changes that come from our impacts as humans on global ecosystems.

With the Anthropocene and the rapidly changing Earth, we have entered a new era that seems to cause a cosmological paradigm shift (Viveiros de Castro 2019: s296). What is being taken into account when describing a 'world'? Which humans and which non-humans? Through whom is the world described and does this give a complete 'view' or should we also stay critical? Viveiros de Castro argues that thinking about the Anthropocene requires a radical form of ontological pluralism, even 'ontological anarchism', to show that the Anthropocene consists of different modes of existence that have an always unstable coexistence (2019: s298). This also includes recognizing the agency of non-organic life, like stones, fictional characters and hurricanes (ibid.).

Viveiros de Castro argues that this is the right time to begin to translate indigenous ideas into the language and conceptual vocabulary of the philosophical and scientific discourse in the Global

North (Viveiros de Castro 2019: s304). The idea of ontological pluralism, where concepts of multiple peoples are used, requires respect of and attention to difference (Viveiros de Castro 2019: s305). Viveiros de Castro argues that within anthropology the productive difference between concepts of different peoples must be found and that this is the only way to properly discuss the Anthropocene world (ibid.).

He argues that this radical form of ontological pluralism is needed on the side of both anthropology and biological, ecological and geophysical sciences (Viveiros de Castro 2019: s305). In anthropology, this means understanding different ways of thinking about and living in the Anthropocene by different peoples (ibid.). In biological, ecological and geophysical sciences this means mapping out and researching ecological simplification, registering effects both intentional and unintentional of socio-, bio- and geo-engineering and gaining new insights in the mutually beneficial relationships and interdependence of life forms (ibid.). There is no universal quantification or totality (Viveiros de Castro 2019: s306). Viveiros de Castro sees this as a sign of ontological anarchism and a reminder to always allow the possibility for other ontologies (ibid.).

All beings are made and unmade through, and with other beings and materials (Viveiros de Castro 2019: s298, Latimer & Miele 2013: 9). Even though these relations might be implicit, not permanent and invisible, these 'attachments' are still important (Latimer & Miele 2013: 9). Some of these relations are validated by science and others are not (ibid.). Contemporary science generally only acknowledges the mind's relation to logic and thrives on denial of much of its relations and attachments (ibid.). Shifting the focus to the relations and attachments between beings and materials or humans and non-humans shows how everyone, including scientists, is always acting in a more-than-human world which can create a more inclusive understanding of the social and how knowledge is produced (ibid.).

The event of the Anthropocene corresponds to a critique, mainly used within humanities, against the dualism in epistemology between 'nature' and 'society', where these are seen as clearly different objects of research that belong to either the natural sciences or the social sciences (Bogusz 2023: 4). Nature proposedly includes everything but society or the human, and society proposedly includes everything but nature (Bogusz 2023: 6). This is a debate and a critique that has been going on for a long time.

Discussing and understanding the Anthropocene and mainly nature's future within natural sciences means also needing to asses data for climate change and biodiversity loss, caused by human society (Bogusz 2023: 6-7). So culture or society is discussed in these studies in natural science but is not an integral part. However, discussing the Anthropocene within social sciences, nature and non-humans are not only discussed but are now even becoming an integral part of the foundation of society (ibid.). This creates an asymmetry between these disciplines. The distinction between natural and social objects of research becomes more complex when discussing the Anthropocene.

The Anthropocene as a term is a success for research on environmental-human relations and is a great starting point for interdisciplinary collaboration between social and natural scientists (Bogusz 2023: 5). Interdisciplinarity means the collaboration between two or more academic disciplines (Bogusz 2023: 7). The Anthropocene stands for the effective entanglement of nature and society and should be noticed in practical knowledge exploration in interdisciplinary research (Bogusz 2023: 4). Thus, society and nature should both be noticed in research. Latimer and Miele argue that relations between humans and non-humans affect practices and processes in the production of scientific knowledge (2013: 7). Latimer and Miele propose the radical move of giving attention to affect and attachment between actors in research, which changes the terms of engagement in order to deconstruct the dichotomies, like subject-object and human/non-human (Latimer & Miele 2013: 10). These dichotomies derive from the dichotomy, or the polarizing, of nature and culture (ibid.). The dichotomy and division of nature and culture, thus also including the human and the non-human, proves inadequate knowledge of sociality, but also misleads how knowledge is produced within science, including human sciences, social sciences and life sciences (ibid.). Researchers of all disciplines establish their work in context-making collaborations, which could be called 'worlding' (Tsing in Bogusz 2023: 15). Fieldwork knowledge is acquired through interactional involvement of the object of study (Bogusz 2023: 17). It is a relational process through experimental enactments, consisting of conflicting epistemics, ontologies and values (ibid.). 'Good' science is a matter of being open to, recognizing and promoting in research how the relations between humans and non-humans affect what and how knowledge is produced (Latimer & Miele 2013: 12).

In summary, the Anthropocene is an interesting concept to look into social structures because it is a landscape where the natural and the social, the human and the non-human, are effectively intertwined. It requires new ways to look at these social structures using different disciplines and also critiquing existing disciplines to open up research to include non-humans and to understand the complex human/non-human social structures.

This is exactly the basis of this research: using anthropology to look at the landscape of Osa Conservation where humans and non-humans are intertwined in a complex social structure in which conservation efforts and scientific knowledge production take place. I will analyze this complex social structure and how it influences the creation of scientific knowledge. Furthermore, I will argue that these human/non-human relationships should be more visible in scientific outputs.

2.3 Conservation Biology

So I have discussed the Anthropocene, the new exploration of more-than-human landscape that includes both human and non-human social structures and the change that is happening and needed in research. This research is focused on a specific multidisciplinary field: conservation biology. Conservation biology occupies itself with the management of biodiversity and it is an applied science

(Lindenmayer & Burgman 2005: 5). Biological information is needed to be able to make decisions about natural resource management and conservation (ibid.). However, conservation biology not only draws from ecology and biology but also from many other disciplines, like animal behavior, demography, geography and sociology (ibid.). Thus, conservation biology could be seen as a multidisciplinary field or a meta-discipline (ibid.). Conservation biology deals with very complex issues when using broad generalities while the application is often very specific to a certain landscape or one or more species (Lindenmayer & Burgman 2005: 5-6). For example, a certain structure for a sea turtle hatchery is applied worldwide but sea turtle hatcheries are used in many different cultural, economic and natural landscapes and for different sea turtle species that differ in hatchling size and depth of the nest.

Environmental management practices can be done anywhere in the world. They reflect ethical and social attitudes that can change over time (Lindenmayer & Burgman 2005: 8). Different views on nature or conservation can influence applied conservation practices. Many attitudes motivate conservation: from utilitarian value, to ecosystem service value, to scientific and educational value, to cultural and spiritual value, and recreational value (Lindenmayer & Burgman 2005). So there is a lot to take into account when trying to participate in conservation efforts or environmental management practices. Conservation efforts that ignore the social and economic context are most likely to fail because they can be seen as ill-considered and naive (Lindenmayer & Burgman 2005: 20). Decisions made in conservation cannot be seen separately from issues of political and social development (Lindenmayer & Burgman 2005: 26). The interrelated and changing factors of the social, ecological, ethical, political, technological and economic all play their part in conservation (ibid.). For conservation efforts to be effective, the following things need to be made aware of by practicing conservation biologists: the social and economic context of the decision-making, what individuals could gain or lose from the decisions and how ecosystems are valued and perceived (ibid.).

When studying anthropology we are taught that reflexive practices and openness are very important in ethnographic research because of the complexity of the social which we as ethnographers are a part of (O'Reilly 2009: 189). Conservation biology research seems to use the format for biology reports often while it is a multidisciplinary field. The discussion section of a research report in behavioral sciences and biology generally discusses three things: an analysis of the sources of error in the data, incorporation of previously found knowledge and suggestions for further study (Hailman and Strier 2006: 75). The analysis of the sources of error in the data was previously the only matter that was discussed in the discussion section (ibid.). However, now this part is too often overlooked while it is a very valuable addition for future related studies (ibid.). According to Hailman and Strier, the hallmark of a good study is a short discussion section (2006: 76).

When conservation biology applications are applied uncritically, they can create poor conservation outcomes regarding biodiversity (Lindenmayer & Burgman 2005: 6). This highlights the complexity of conservation biology application and the need to stay critical. Furthermore, it

emphasizes that this fairly new discipline and its science are inexact, still evolving and young (ibid.). Mistakes are made and there is still a lot to learn about how to conserve biodiversity and how to improve the management of ecosystems (ibid.). However, as a meta-discipline, this is part of its evolution (ibid.). Furthermore, it is also part of the natural process of science, because science is a work in progress (Lindenmayer & Burgman 2005: 6, Gordin 2021).

Thus, a lot of different factors influence conservation biology research and its application, making it a complex multidisciplinary field that is still evolving. This makes it an interesting topic for ethnographic research. This ethnographic research looks into how the Sea Turtle Team conducts scientific research on sea turtles using conservation biology. It focuses on the complex social structure of humans and non-humans and how this influences the creation of scientific knowledge at Osa Conservation. In the upcoming chapter, I will discuss the methodology of this research.

3 Methodology

3.1 Research process

This research is based on eleven weeks of fieldwork at Osa Conservation in Costa Rica from mid-December 2022 until mid-March 2023. During this stay at the Osa campus, I was both a short-term intern of the sea turtle conservation team, doing 3-4 morning censuses a week, and doing my visual ethnographic research. The year before I had worked one month at another sea Turtle Conservation project on the Caribbean coast of Costa Rica. Here I was inspired by the hard-working biologist, research assistants and other volunteers. The turtle season at the Caribbean coast was over during the time my fieldwork had to take place so I asked my friend, the Biologist in charge of the project if she had any contacts at Sea Turtle Conservation projects on the Pacific coast of Costa Rica. At this coast, the turtle season would take place during the time of my fieldwork.

I got in contact with Bárbara of Osa Conservation through Instagram DMs. We exchanged emails and planned an online meeting. I had to change my initial plan to research the poaching community because poaching was not very active on this beach. The special thing about this location was that it was not only an organization where conservation practices were applied in the field, like all conservation projects I heard about, but it also had a research station and published scientific articles on conservation. This combination became the interest for this research. Bárbara and I had two or three online meetings and then it became official I would do my research here. In return, I also had to be a short-term intern and work three months as part of the team. Furthermore, I had to pay the same fee as the others to be a short-term intern. Paying to be an intern or volunteer is quite normal in Costa Rica from stories I have heard and projects I have seen.

This study is a visual ethnography, which entails that it also uses visual ethnographic methods and consists of both this written article and a multimodal output: an ethnographic film. A visual ethnography does not purely use visual methods but is always used in combination with other methods (Pink 2007: 21). The visual methods pay attention to the visual aspects of culture (ibid.).

The ethnographic film I made is called ‘The Turtle Team’. The film focuses on the process of the work of the conservationists and the process of creating scientific knowledge from the data from this fieldwork. Bárbara is still working on the scientific article, so the film and this research do not cover the process from start (getting data) to finish (publishing a scientific article). It focuses mainly on the fieldwork, getting data and the first attempts to make sense of the data. Furthermore, it shows the human/non-human relationship between the interns, Bárbara and the sea turtles in their way of talking about the sea turtles, reacting and talking to the hatchlings and a sea turtle and their motivation to do this work.

This written article is an addition to the ethnographic film. Its purpose is to dive deeper into the research topic and provide more information and more vignettes to make a theoretical argument

about how human/non-human relationships influence the production of scientific knowledge and that this should be discussed more openly in scientific articles. It will also make references to the film in this process.

3.2 Positionality and Ethics

Ethnography is an approach to representing, experiencing and interpreting society and culture (Pink 2007: 22). The knowledge that comes from the process of ethnography is based on the experiences of the ethnographer (ibid.). Ethnographic knowledge is produced through the intersubjectivity between the informants, context and the researcher (Pink 2007: 24). This relationship produces a version of reality that is negotiated (ibid.). Pink argues that ethnographers need to be aware of the construction of their identity, how this identity is understood by the people they work with and how they represent themselves to interlocutors (ibid.). The identity of an ethnographer and how an ethnographer represents herself to the interlocutors influences the ethnographic knowledge that is produced by the encounters between the researcher and interlocutors (ibid.). Furthermore, how we see as ethnographers is predetermined (MacDougall 1999:2). We gain knowledge through our senses that are organized through cultural and neural conditioning (ibid.). Therefore, as an ethnographer, I am aware that this research is a negotiated version of reality and therefore it is very important to reflect on my positionality.

I am a white Dutch young woman who speaks Dutch, English and a bit of Spanish. Many of the fellow interns from the sea turtle conservation team were from Europe or the United States.[8] So the main language used among the interns was English. However, the majority of the more permanent staff members of Osa Conservation, like Bárbara, were from South America or Spain and therefore mainly spoke Spanish. The majority of interns who were part of the team during my fieldwork were young women, from the age of 18 until the age of 27. I was in the same position as the other short-term interns: we all paid the same amount to be there, we all did 3-4 morning censuses every week and we all were there for three months.

Because I was in the same position and as much part of the team as the other interns, this was a very interesting way of doing research. In the beginning, I could ‘play dumb’ to get information, because I actually did not know how to do the work and I also needed to learn as an intern. After a few weeks, as interns, we were expected to be able to do the work without any help and to be able to teach new interns what needed to be done. Now I could not really ‘play dumb’ anymore to make people explain their ways, or at least not to the full extent. Being a part of the team and doing the same work also made it easier in a way when I was filming, because I knew more of what to expect and where to point my camera.

[8] The positions of interns and volunteers were mainly filled by people from the Global North. The more permanent staff did have some locals, but was also mainly filled with people from South America and Spain.

When I brought the camera along on a morning census it seemed like the interns, Reece and Jojo, were very aware that there was a camera present. They seemed to be on their best, energetic behavior. Furthermore, they sometimes asked me if they needed to explain a certain process, even though I knew the work routine. It seemed like they were aware that the eventual audience of the video recordings has no experience in Sea Turtle Conservation. I was very aware that they seemed more energetic and explanatory during these morning censuses than at times without the camera. My initial thought was: what if this is not representative of other morning census experiences? Even though this might be the case in some ways, the camera brought along a version of reality that was very useful and interesting, especially for the informative nature I intended the film to have.

Another interesting aspect of the fieldwork and the relationship between the team, other colleagues and me, was that we were all living on the same campus. This campus was quite remote. The closest town was Puerto Jiménez, which was located a one-hour drive from the campus. There was only one road connecting Puerto Jiménez to the other side of the peninsula. This made transportation quite expensive. So everyone was living at campus almost 24/7. As a researcher, I found this difficult. I could not step away from my research topic, I was living among it. The line between the role of researcher, friend and fellow intern quickly became vague because of this interesting and intense living situation. When writing this article it sometimes felt uneasy to call these people my interlocutors. This is a common thing for anthropologists. The relationships that develop between anthropologists and the people they research based on long-term research become familiar and intimate, like friendships, causing discomfort with words like interlocutor (Pink 2007: 38). As I discussed earlier, knowledge is produced between researcher and the people they research, so it is not a kind of extraction of information, but more a kind of collaboration.

This brings me to another important topic to discuss and reflect upon as a visual ethnographer and especially in this interesting division between the role of researcher, friend and fellow intern: ethics. My main objective was to be open and honest regarding my work.[9] Every week we would have a team meeting and I reminded the other interns and Bárbara that I am also conducting research by writing things down about the team and the work they do. By doing this and by asking for permission multiple times, I tried to always engage in obtaining informed consent. I would openly write down notes after the morning census while sitting at the table where others were working on data or other projects. If they would ask if I was writing about the work I would answer honestly. Sometimes that led to a conversation and I got more information on a certain topic. When I was reading about visual ethnography and others would ask me what I was reading about and what visual ethnography actually is, we would have a conversation about it. When I was filming or practicing with film and other interns were curious I would show them the camera and also openly discuss how difficult I found it sometimes and that I was also still learning. When something interesting but personal was said that I

[9] Consulted on the 25th of October 2023: https://americananthro.org/about/policies/statement-on-ethics/

wanted to write down, I would specifically ask permission to write it down. In these ways, I tried to stay open about my work and also be open to their opinions or perceptions on, or interests in this research. Furthermore, I tried to make my results accessible.[10] Thinking about ethics in visual research entails thinking about the relationship between the researcher, interlocutors and audience (Marion & Crowder 2013: 6). Where are the images shown and how are the images interpreted by the audience? While working on finishing the ethnographic film, I wanted to take their opinions and also their permission for the montaged images into account, so I have sent them the Rough Cut of the film, the trailer I made and finally the final cut of the film. This way I gained consent and by insisting on their perceptions and opinions on the film, I tried to make sure I did not have total control over the images.

3.3 Methods

During the fieldwork I used multiple methods to gain visual ethnographic knowledge about the experiences of the interlocutors.

3.3.1 Participant Observation

The main method of ethnography is participant observation (O'Reilly 2009: 150). An observer is an outsider, writing and listening to what is being said while not necessarily fully participating in the conservation or activity (O'Reilly 2009: 151). A participant is a group member, taking part in conversations, emotions and activities (ibid.). Participant observation therefore has a tension and needs to be carefully considered (ibid.). Being a short-term intern and part of the team was a good way to do participant observation. As I was part of the work routine, I could make many observations. I participated in doing the morning census, releasing the hatchlings from the hatchery and doing excavations of the nests in the hatchery. In the beginning, this was more passive and I watched how they worked while they sometimes explained the work to me. Later this became more of a conversation and I wanted (and needed) to learn how to do the work, where I asked questions to gain a better understanding of details. In the end, I knew how to do the work and I also wrote down my own sensorial experiences while doing the work. I wrote down how I felt during the activities of participant observation like beach monitoring and made notes about the space, the sounds, the language used and my interpretation of body language. To which extent the participation goes is a key issue to reflect upon (O'Reilly 2009: 152). Participant observation can take place as four positions: a complete observer, an observer as participant, a participant as observer or a complete participant (Gold in O'Reilly 2009: 153-154). The last position has a risk of 'going native' and losing any sense of objectivity (O'Reilly 2009: 154). While I was as much of a participant as the interlocutors, living

[10] Consulted on the 25th of October 2023: https://americananthro.org/about/policies/statement-on-ethics/

and working in the same conditions, I argue that I still tried to create a bit of distance on some occasions to be able to observe and be a participant observer.

So (participant) observation is the main source of knowledge in ethnography. However, observation cannot solely make an ethnographer understand everything, so other methods can be used to clarify certain aspects.

3.3.2 Semi-structured interviews

After having observed the ritual of the work routine and participated in this work, I gained a basic sense of understanding. I wanted to figure out the meaning of certain parts of the work routine through semi-structured ethnographic interviews. The first interview was conducted after a few weeks so I did not seem too aggressive to the interlocutors and was led by my first observations instead of being possibly misled by an interview (Gobo 2008: 192). From my notes of the observations, I made a semi-structured list of topics I wanted more information on. The interviews were recorded, so I could watch them again and use them in the ethnographic film. The semi-structured interviews helped me understand the motivation and inspiration of the conservationists to do the work. Furthermore, it helped me understand the thought processes of the actions during the work routine.

3.3.3 Video recordings and observational cinema

Video recordings were an important method of this research. Because the work activities lasted a few hours and I wanted to represent this work in the ethnographic film, I chose to only choose a few mornings to film the full morning work routine. Thanks to previous participant observation and interviews I was able to anticipate what was going to happen and what was important to capture on film. A video is ethnographic when the viewers assess it as representing ethnographic information (Pink 2007: 98).

The purpose of the ethnographic film ‘The Turtle Team’ is to be informative. Observational cinema or observational filmmaking tries to resemble the narrative of the protagonists of the film with none or very little narrations outside their awareness, like voice-overs (Lawrence 2020: 20). It is attentive to subtle things that are embedded in everyday processes, like gestures and reactions, using long takes and detailed scenes (ibid.). As I was filming during the morning work routine I would try to intervene as little as possible and try to capture Reece and Jojo’s strategic and emotional responses to the environment and their social surroundings. Observational filmmaking does not entail that filming is simply an instrument to conduct data as objectively as possible (Carta 2015: 2). Holding a camera implicates subjectivity, since the person holding it chooses to point it at certain things, leaving other things out of the frame, and choosing when to press record. Observational filmmaking is more about being close to the interlocutors and being involved in the everyday processes of their lives (ibid.).

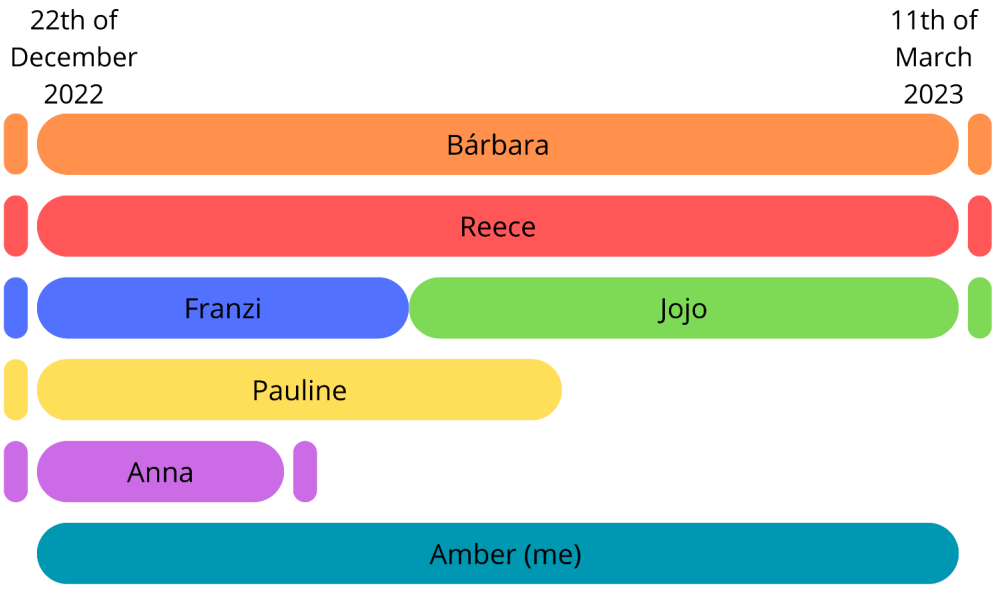
4 Findings and Analysis

In this chapter, I will answer my research question: How does the relationship between individuals of the Sea Turtle Team and non-humans influence the creation of scientific knowledge in the Osa Biological Station in Costa Rica? I will answer this by discussing topics that are linked to my sub-questions.

4.1 Analysis of the relationship between conservationists and the sea turtles

4.1.1 Motivation and inspiration

The team during my stay at Osa Conservation consisted of the Sea Turtle Conservation Coordinator (Bárbara), one long-term intern (Reece) and multiple short-term interns (Anna, Franzi, Pauline, Jojo and me). The team constantly changed formation because the short-term interns stayed for three months and all arrived at different times.



Representation of the formation of the Sea Turtle Team during my stay.

Bárbara has been the Sea Turtle Coordinator since March 2021. She studied Biology in Spain and she wanted to dedicate her life to the conservation of threatened species after she fell in love with wildlife during a project on the Galapagos. She finished a Master's degree in Conservation of Biodiversity, after which she went to the Galapagos again to work with tortoises. When she started to look for jobs in the conservation of threatened species, she found out that Costa Rica had many Sea Turtle

Conservation projects. She started working with Sea Turtles on the Caribbean coast and she fell in love with sea turtles.

In an interview, as I asked her why the conservation of sea turtles specifically, she answered: “Not only are they a charismatic species like everyone loves a hatchling or everyone gives a like on Instagram when there is a sea turtle, but [...] they are a threatened species and it’s just so rewarding to work for their conservation because you know that they contribute to the ecosystem in a really big way. So with every small thing that you can do, you are not only trying to protect one species but also many more that depend on them.”

In her first year as the Sea Turtle Coordinator she mainly worked in the field doing beach monitoring and the relocation of eggs. She explained that she is ambitious and wants to create the biggest impact possible. According to Bárbara, this means applied conservation for sea turtles, working with the community by giving workshops, presentations and doing field trips and also doing research. Applied conservation for sea turtles is often on the beach, like beach monitoring and relocating eggs to the hatchery, because this is the easiest and most accessible way. However, the biggest threats are beyond the beach, like plastic pollution and fishermen. Thanks to the interns and volunteers she can focus more on these aspects.

Reece was a long-term intern, which meant he was a member of this team for six months. Being a long-term intern at Osa Conservation entails having more responsibility by being Bárbara's right-hand man, as Reece once called his job in an interview [00:13:12-0013:15], not paying for accommodation and food and getting paid a small amount of money every month. He studied Environmental Studies and Geography with a minor in Conservation Biology [00:08:34-00:08:52]. He loves being outside and observing nature and explained that everyone in this field has a moral drive to protect nature. He has done a lot of seasonal jobs or internships in the environmental field, always in conservation or at the very least working outdoors. With these jobs and internships, he wants to gain experience in traveling, working in conservation and exploring the world. Furthermore, he wants to gain a spectrum of knowledge about how conservation works. One of his main interests is the conservation of endangered species. This in combination with his obsession with turtles from a very young age [00:09:54-00:10:16] made him choose this internship eventually.

Jojo was a short-term intern that just finished high school in Scotland and now had a gap year before she would start studying Environmental Geoscience [00:10:50-00:11:25]. She always had a heart for Zoology and therefore wants to take it as an extra degree. She would like her future career to remain conservation-oriented. However, she does not know yet which profession this might entail. As an example, she mentioned an environmental lawyer or a wildlife veterinarian. However, she has always known she wanted to work with animals. Jojo found Osa Conservation through a recommendation by her sister. Jojo looked into the wildlife team and the sea turtle team and chose the sea turtle team because of the possibility of a three-month internship instead of a six-month internship and because she has always loved sea turtles [00:11:25-00:11:44].

All members of the team, including Franzi, Pauline and Anna had the initial or main motivation to do this internship because of the conservation of endangered species. Some have had a greater affection towards sea turtles than others, but overall everyone liked sea turtles. Anna also had a gap year after her high school education, like Jojo, but she was at Osa Conservation for a full year, being a short-term intern for all teams consecutively.

It was clear that the conservation of sea turtles was the main priority of this team. I will show this in a vignette:

> During the team meeting on the 5th of January, Bárbara, Reece, Pauline, Franzi, Anna and I discussed the visit of Roldán. Roldán is the Scientific Director of the Sea Turtle Conservancy and has a lot of experience with Sea Turtles. One of the things he told Bárbara was that fish are the most active in the morning, which meant according to Roldán that we have been feeding the fish when we release the hatchlings during sunrise. During this meeting, we discussed the new possible options for morning censuses. Bárbara started by giving two options: 1) making a hole in the mesh of the hatchery wall, which gives the hatchlings that hatch during the night a chance to crawl out of the hatchery by themselves, or 2) keeping the hatchlings that hatch during the night in the hatchery until the next night to release them. The first option would mean that perhaps other predators could get into the hatchery more easily and predate the nests. The second could mean that the hatchlings could lose a lot of energy. The room fell silent and everybody was thinking about the best option. Bárbara suggested another option: 1 or 2 people doing the morning census and recording the turtle tracks and 2 people going during the night to release the hatchlings. She asked if everybody agreed and everybody answered: yes. 'Everything for the turtles', Reece said. Franzi said that it broke her heart seeing the hatchlings get snatched by the birds and fish by acting out the snatching of the hawks and the eating of the fish with her hands and pouting her lips. After this decision, we started brainstorming about the logistics. What time should everybody start and what is the most efficient route? Bárbara said she would ask a fisherman at what time the fish get active before putting this new plan into action. Furthermore, Bárbara told us that when there is a tour, it would be best to start at 5:00 AM, like we have done so far, because tourists or visitors are less likely to wake up earlier and the impact that we can have on them is bigger than helping the hatchlings in the hatchery.

This new plan would mean four people had to work every night. At this point, the team still consisted of six people, but in a while Anna, Franzi and Pauline would leave, and the team would become smaller. This meant that there would be fewer people to fill the shifts. Even though the work was already tiring and new plans would mean that nights would be broken up even more or the tiredness could get greater, the motivation to hopefully help the hatchlings not get eaten by fish was greater than the comfort of the daily routine. Bárbara did say that our health is also important, so it was finding the right balance within the team between the impact on sea turtles and everyone feeling

comfortable enough to do the work. This comfortableness seemed to depend on how many people you could do the work with (alone or with two or more), what time the work took place (in the dark night, during sunrise or when the sun was up) and how tiring the working hours were. When the team got smaller a few weeks later a new balance had to be found.

The team was very adaptable. New information or events would occur and during team meetings, it was discussed how to act next. How great the impact on the conservation of sea turtles was was always a priority. With new routines, sometimes questions arose about whether we were really doing a good job and having a positive influence on the conservation of sea turtles because we were intervening with nature. This would be discussed among interns and during team meetings.

For example, because of predation within the hatchery, the excavation of a nest would be right after hatching instead of two days after hatching. Normally, the 'excavation babies' would have more time to perhaps be ready to be released and clime above the surface. Now the team had to dig them out and release them immediately to try and protect them from the predators. Some would still have part of their umbilical cord and there were conversations about feeling bad for those hatchlings and discussions if this was really the best way.

4.1.2 Interaction

During my previous sea turtle project experience I had only seen gigantic Leatherback Turtles and relocated their eggs to a hatchery but never saw the eggs hatch. The first hatchling I saw was at Osa Conservation and it was a wild solo hatchling on the beach crawling towards the sea. My initial thought was: 'Wow, what a tiny adorable being.' I was not the only one who felt drawn to this small creature thinking it was cute and adorable. I have heard the word 'cute' many times during my stay. Words like 'cute' were used to describe the hatchlings but there were also many times the conservationists were talking to the hatchlings, calling them 'cute' or saying encouraging things during the hatchling release.

For example, Jojo said 'Yes, I believe in you' to a hatchling. Afterward, she turned to me and said in a high-pitched voice: 'Look at him go, Amber. I am a proud mom.' She was saying these encouraging words to a hatchling that we had dug up from an excavation that was surrounded by maggots and still had a piece of its umbilical cord.

Besides, flattering and encouraging words, there also seemed a need to protect the hatchlings. For example, one day Franzi went to the beach with a tour. Normally hatchlings cannot be picked up by people on a tour if not necessary. Furthermore, hatchlings could never be picked up without gloves. After the tour, she came back and told the other interns during breakfast that the people of the tour did try and pick up some hatchlings. During Franzi's storytelling, she said in an angry and protective voice: 'Do not touch my babies.' However, she did not say this exactly to the people of the tour but to us, like she was thinking this during the tour and needed to vent to us about this frustration.

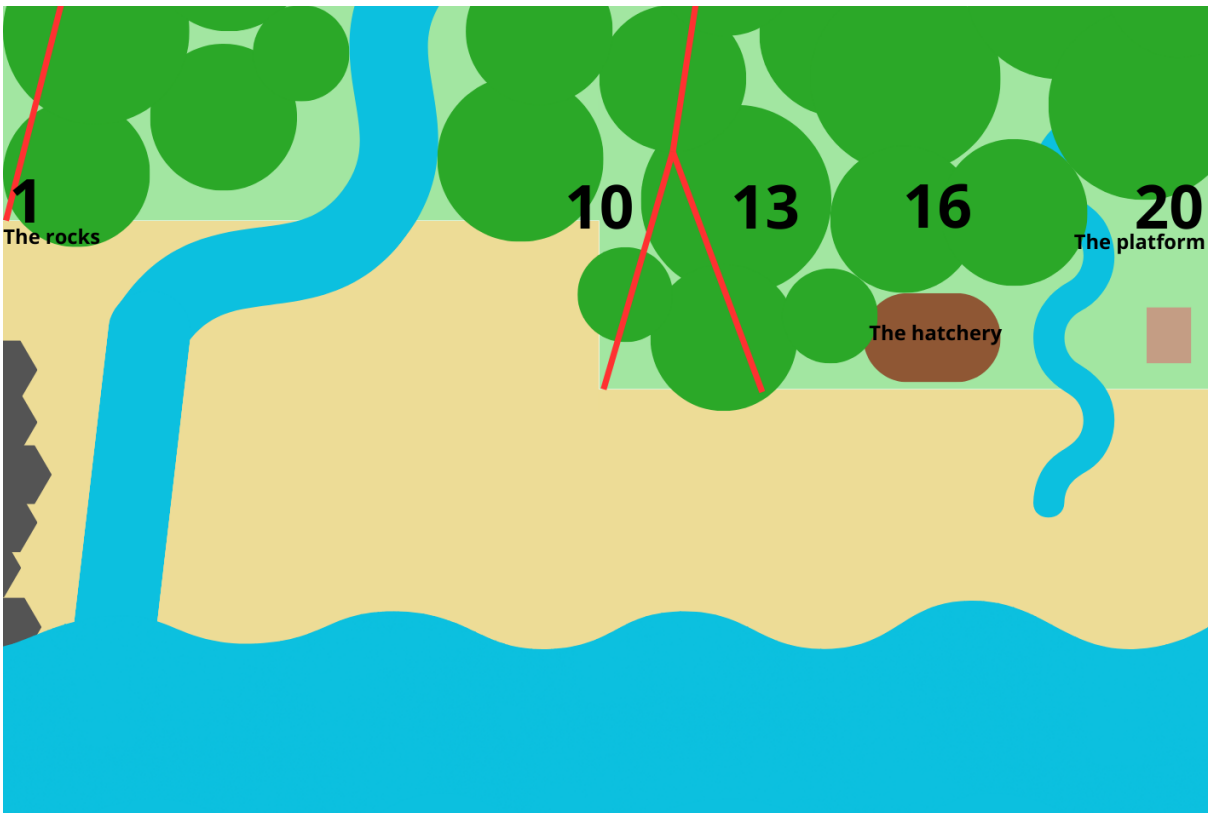
Besides protective language, there was also physical protection of the hatchlings. The amount of time that could pass from the moment of collecting the hatchlings from the hatchery, releasing them on a spot on the beach and the slow hatchlings actually making it to the sea, could be around an hour or more. When the sun rose during this time, a new danger for the hatchlings appeared: birds of prey and crabs that try to snatch hatchlings and eat them. We were told by Bárbara and other interns to never stand with our backs toward the birds because they would try and attack at any moment. When this happened, I have seen interns, including myself, run and scream toward the birds in an attempt to scare them away.

This part, consisting of the motivation, inspiration and interaction answers the subquestion: What is the relation between the individuals of the sea turtle team and the sea turtles? The motivation for doing the work seems to come from a broader care for endangered or threatened species. Some team members have a greater affinity to, or history with sea turtles than others. However, all team members tended to call the sea turtle hatchlings ‘cute’ and have a protective attitude over the hatchlings.

4.2 Analysis of the work routine

4.2.1 Order of Work

The ethnographic film ‘The Turtle Team’ covers the sub-question: What is the routine of the work of the members of the sea turtle team? In the film, the fieldwork images are separated and spread throughout the film in three categories: hatchling release, excavation and morning census. However, every morning all these actions took place consecutively. The order of these tasks changed during my stay. In the beginning, the order did not seem to matter a lot. Excavations were easiest in daylight. The same goes for the morning census. The morning census had to be done from Sector 1 to Sector 20, covering about 2 km of Piro Beach. Once the sun came up, it became very hot very quickly, so you wanted to be as temporarily on the beach as possible once the sun was up. In the beginning, we started at 5:00 AM. We would arrive at the beach by 5:30, the moment the sun starts to rise. Sometimes, we would start at Sector 1, do the morning census until Sector 16, where the hatchery is located, release the hatchlings during sunrise or shortly after, do the excavations in daylight, do the rest of the morning census to Sector 20, and then the work was done. Sometimes we would walk straight to Sector 16, do the hatchlings release and excavations, one person would do the morning census to Sector 20, and then altogether, depending on the number of team members that were present, do the morning census from Sector 16 to Sector 1, and we would be done with the work.



Representation of the area where morning census, hatchling release and excavations took place, inspired by a map Reece once drew during an interview. The red lines are pathways from the station to the beach.

With the previously mentioned new information about fish being active during sunrise, hatchling release had to take place earlier in the dark. This often meant beginning at 3:00 AM, going straight to the hatchery, releasing the hatchlings in the dark, starting excavations in the dark with a headlamp to be able to release the 'excavation babies' before sunrise and start the morning census around sunrise. So over time, because of new information, the hatchling release got a greater priority.

4.2.2 Getting Data

In the ethnographic film 'The Turtle Team' numerous data points are collected and discussed. The data that is used to create a scientific article is the data from the hatchling success experiment. So I will focus on the data used in this experiment.

The hatchery has many rows of relocated nests. In this experiment, some rows have nests that are placed closer to each other than other rows. The goal is to assess if the hatchling success is less when nests are placed closer to each other than is advised in the globally used hatchery structure (Chacón 2007). This guide advises a 1-meter distance between nests (Chacón 2007: 59).

The hatchling success rate of a nest is based on a comparison between the number of relocated eggs, counted during the relocating and the burying of the eggs, the number of eggshells and the number of released hatchlings counted by the interns or Bárbara during an excavation and

hatchling release. An eggshell means that a hatchling has fully developed and has crawled out of the egg. Other possible finds during the excavations are unbroken eggs (eggs that have not hatched and will most likely not hatch), broken eggs (eggs that have cracks in them, have not hatched and will not hatch), pipped alive eggs (a hatchling that is alive and just broke through the egg with its head), dead pipped eggs (a dead hatchling that did start to break out of the egg before its passing), dead hatchlings and of course alive hatchlings (both below the surface and above) that will be released together with the alive pipped hatchlings once they have crawled out.

In this part, I want to understand this more-than-human landscape and the influences of both humans and non-humans on the data. There are probably other influences or patterns I have not picked up on or that have a different interwovenness, but the influences I will discuss are based upon my own experience of noticing and walking as an anthropologist and a short-term intern, interviews with members of the team, oral history and landscape walks.

First of all, it is good to know that many members of the team arrive with little knowledge about sea turtle conservation methods and doing research in conservation biology. Every member learns how to do the fieldwork by joining other interns who have been a member of the team longer than they have. So knowledge on how to do the work and how to collect data is passed on from one member to the other.

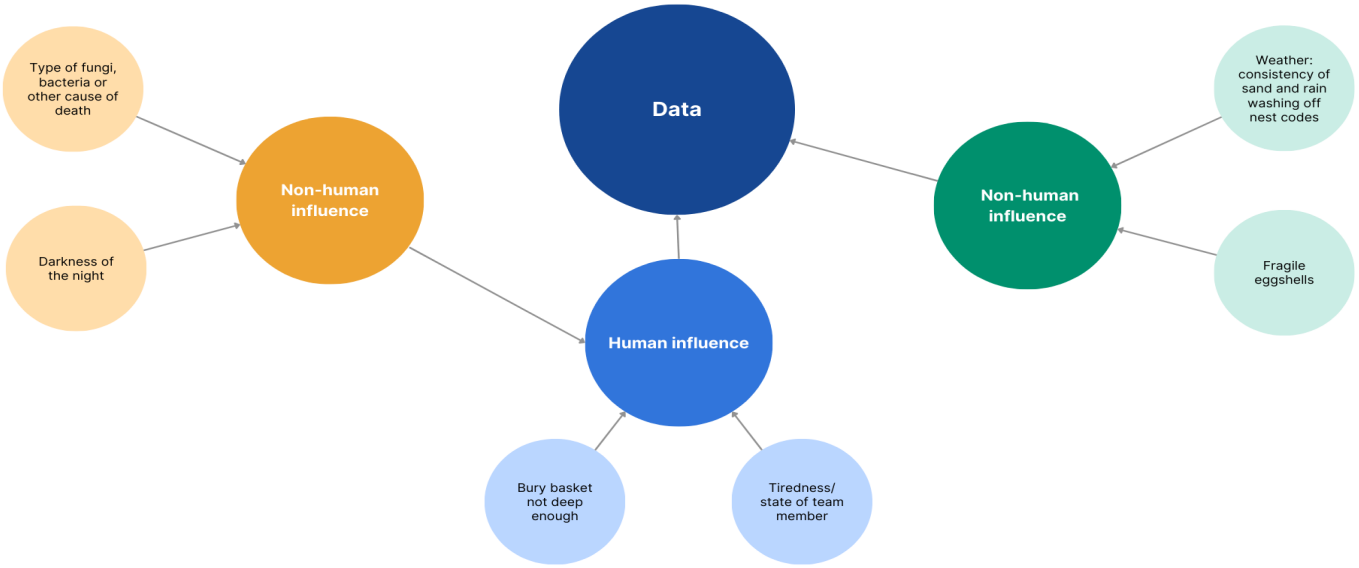
Even though I am describing a more-than-human landscape and trying to show how interwoven the relationship of humans and non-humans is, for the next section I will divide the types of influence into non-human and human to be able to explain this interwovenness as clearly as possible.

Let us first start to discuss non-human influences on the data. First of all, the weather can have a great influence on collecting the data. It influences the consistency of the sand, which is the base of the field where the work is being done. Digging up the eggs from the sand during excavation can be difficult when the sand keeps caving in and covering up the buried eggs. In order to collect all data from the nest, all eggs need to be dug up which can be difficult when the sand keeps caving in because of dry weather. Another very important influence on the data is the eggshells that are difficult to count [00:19:58-00:20:39]. Because the eggshells are very thin, fragile and have been in the sand for a while when they are dug up during an excavation, they can easily fall apart. For the experiment, it is necessary to know the number of eggshells in combination with the number of hatchlings of a nest to be able to assess the hatchling success. The eggshells falling apart make it harder for the members of the team to count the number of eggshells. Lastly, the nests all have a label with the nest code on them. When there was a lot of rain, the marker from the labels washed off a bit, making the labels harder to read. Noting down the right nest code is very important because otherwise, the collected data is incorrect.

Secondly, let us discuss the human influences on the data. The hatchery can be seen as the field-based laboratory of the conservationists. The conservationists maintain this laboratory. This

maintenance consists of opening the door made from a plastic canvas, closing the door against predators, burying the eggs and the baskets that protect the eggs from flies and getting data from this experiment. When a basket is not buried deep enough by a conservationist, hatchlings that crawl to the surface can crawl out of these baskets towards the fence of the hatchery. When multiple nests hatch during that night, no one can establish precisely from which nest the loose hatchlings are from, influencing the data on the hatchling success. Furthermore, when the door is not closed well enough or baskets are not buried deep enough and crabs or other predators come inside the hatchery, a nest can get predated and data of the nest will be lost. Lastly, the work is quite intense. The working hours are long and start very early, making the conservationists have an unstable sleep schedule. Tiredness was common and the energy levels of the members could differ every shift. This sometimes seemed to influence the work. I noticed, that when I was very tired, I would work slower and maybe less thoroughly while analyzing the eggs of the excavation for example. Forgetting to write down some data points, like the depth of the nest, also happened now and then. Understanding if this came from tiredness or forgetfulness is difficult. Overall, the state of the conservationists seemed to influence the thoroughness of the work of data collection.

Lastly, I want to discuss some non-human influences on the conservationists. First of all, analyzing the eggs during an excavation and assessing what caused the egg to not hatch was not always as obvious. This is seen in the film when Jojo and Reece are analyzing the eggs from an excavation [00:16:46-00:18:55]. The knowledge to analyze the eggs was passed on from Bárbara to the interns and from intern to intern. However, Bárbara admitted that she sometimes also finds it difficult to analyze the eggs and know exactly what is inside. Black spots inside the egg meant fungus and red spots meant bacteria. However, sometimes there were different color spots, like pink or orange [00:18:33-00:18:41]. Assessing the eggs using knowledge that uses clear distinctions, sometimes did not fit with the found reality, making the analysis hard and the data perhaps not always right. Pink spots could be written down as fungus by a conservationist as an educated guess, while in reality, it was bacteria for example. This influences the data on the cause of death of the embryos. Secondly, when the routine of the work changed to earlier hours, this meant that the excavations needed to be done in darkness unlike before. The darkness made it more difficult to see the eggs and analyze them.



Representation of influences on the data.

So, many things could influence the data. Non-humans like soil, eggshells, rain, fungi, bacteria and darkness influenced the data directly or first influenced the humans which influenced the data. Humans, the conservationists, could influence the data by burying the baskets in the hatchery not deep enough or their state could influence the thoroughness of the data collection.

4.3 Turning data into scientific knowledge

This part answers the subquestion: How do the members of the sea turtle team turn data into scientific knowledge? After collecting data and coming back from the beach to the station, data had to be uploaded on an app called Jotform that contained pre-made forms. As a team, initially, we had two work phones that contained Jotform and a GPS app for coordinates. One phone was lost in the field during heavy weather and crossing the river. Sometimes our personal phones were used to write down data, when, for example, multiple nests hatched and the work of collecting the hatchlings, getting the data and preparing the excavation was divided between conservationists or when the single work phone was not charged and we had to use our own.

After a tiring few hours of work on the beach, the team would come back to the station. After breakfast, the data needed to be uploaded so that Reece could organize the data into different data sheets. Reece called himself the primary data manager [00:12:48-00:13:00]. He would take the data on the nests and turn it into rough hatchling success data. Having data written down on multiple phones could be confusing. The conservationists sometimes forgot to upload the data and went for a

nap after breakfast, so Reece could not start working on the data sheets. Sometimes a wrong nest code was written down, because of labels that were difficult to read for example. Reece had to talk to the other team members and figure out which nest code it actually was. There was a certain logic to the rows and codes so by asking where the nest was located and which nest should be close to hatching he could often figure it out.

As I discussed before, counting the eggshells could be quite difficult. Eggshells meant that a hatchling had successfully hatched and therefore this information was an important part for the hatchling success rate. When the total of eggshells, broken eggs and unbroken eggs was the exact amount of the number of relocated eggs to this nest, it was the best data a nest could have (100%). However, sometimes, this number would be smaller or greater than the actual amount of relocated eggs that were in this nest and the hatchling success rate would be, for example, 159% [00:13:28-00:13:46]. Bárbara told me the most important information to get right for the experiment during a morning on the beach was the number of eggshells, unbroken and broken eggs. Here is a short vignette to show another example of incorrect data:

> On the 24th of January I was working on my own research at the same table as Reece in the Pavilion. Reece was working on the data and he was sitting across from me. Suddenly he put his hands together above the keyboard of his laptop, seeming to ponder about something. I asked him what was up, on which he answered: “The data is fucked, as usual.” He explained that there was a nest that had more than a hundred counted eggshells, while the nest actually had around sixty relocated eggs in it. He explained that probably something had gone wrong with writing down the nest code.

This nest would be seen as not reliable and would not be used in the outcomes of the scientific article. So unreliable hatchling success data could derive from wrong nest codes or wrongly counted number of eggshells, unbroken eggs and broken eggs.

In the scientific article, the data that will be used is restricted to only the ones that have very little to no “human error” [00:13:52-00:14:00][00:20:41-00:20:50]. Meaning, only data is used where the total number of eggs counted during an excavation closely matches the relocated number of eggs pre-excavation. According to Reece, a lot of “human error” is involved in science and data collection [00:19:37-00:19:43]. When I interviewed Pauline, we talked about what is good research according to Biology, Marine Biology and Conservation, which she has studied at university. She said that research is good when there is a lot of repetition and when it is a long-term experiment. She used the experiment of the hatchling success as an example because of the many nests that are used making the research have a lot of repetition. Furthermore, it is a long-term experiment and before her arrival, she saw that a control group was used, which she argued is also a sign of good research. She did say that tiredness might influence the work, that the experiment is not perfect and that the data could improve. However, she did not seem fazed about this and used another example of an internship where the data collection was very chaotic and still a formal scientific article was published from this data.

Bárbara and her colleagues from Osa Conservation are now working on the manuscript of the scientific article using the data collected in the past year. The collected data by Bárbara and many interns who have come and gone was organized by Reece, the long-term intern and after I left perhaps other team members. Then the organized data was assessed to see which data could be used in the writing of the scientific article, to be able to produce trustworthy and reliable scientific knowledge.

5 Conclusion

To conclude, this research explored the human/non-human relationships between individuals of the sea turtle conservation team and their environment at Osa Conservation and how these relationships influence the creation of scientific knowledge. In the conceptual framework, I discussed how the Anthropocene challenges anthropology to review our study and look at complex human/non-human social structures. Furthermore, I discussed how the Anthropocene also corresponds to a critique against the long-lasting dualism of nature and society which is used in many scientific disciplines. The Anthropocene shows the interwovenness of the natural and the social, the human and the non-human. This interwovenness requires new methodological and transdisciplinary ways in research to look at these complex social structures. Lastly, I discussed conservation biology which researches a landscape that has been impacted by human influence in the time of the Anthropocene, in order to manage and improve biodiversity. Conservation biology is a new, evolving, complex multidisciplinary field, making it an interesting site for ethnographic research.

This research contributes to the existing literature by analyzing the complex social structures of humans and non-humans in a fieldsite where scientific knowledge is created by using the still-evolving conservation biology. It answers the research question: How does the human/non-human relationship between individuals of the sea turtle team and non-humans influence the creation of scientific knowledge in the Osa Biological Station in Costa Rica?

The conservationists and the non-humans that are part of the environment where the conservationists live and work, are very much interwoven and influence each other. The scientific knowledge that is being produced is also influenced because this knowledge is produced through the interaction and social relations between the conservationists and non-humans during data collection. However, often the produced scientific articles in conservation biology use the structure of biology reports, structuring it in a way where possible errors and the many influences are not extensively discussed. Fieldwork in conservation biology does not take place in a human-controlled laboratory but exists in a complex landscape where there are complex social relations between human individuals, between humans and non-humans and between non-humans.

In this research, I showed these complex social relations and how this can influence the data and therefore partly also the scientific knowledge that is produced in the form of a scientific article. The data is filtered to be able to produce trustworthy scientific knowledge. The conservationists seem to recognize that the fieldwork is complex and can contain biases or human errors, but also believe that the produced filtered scientific knowledge can still be trustworthy.

I have discussed the complexities and difficulties of doing conservation biology fieldwork and getting data, like the fragility of the eggshells and the state of the conservationists. Furthermore, I have discussed the personal relationship between conservationists and sea turtles. However, these complexities, difficulties and this relationship will probably not be discussed in the conservation

biology article of Osa Conservation to the extent that I have done in this ethnographic research, even though they are very visible during the data collection. So why not make it more discussible in the actual scientific article to reflect upon it? This can make the research more reproducible. Furthermore, this can contribute to a better understanding of landscapes, environments and their complex social relations, but also help future conservation biology studies to improve their research methods.

Further research can be done on conservation biology to explore the complexity of human/non-human relationships in the field. This research is based on eleven weeks of fieldwork. A more long-term research could follow the production of scientific knowledge from beginning to end: from setting up the research to publishing a scientific article or even the time after, when the research is presented in other ways. Furthermore, there are probably other influences or patterns that I have not picked up on or that have a different interwovenness. Further research could map out these relationships, influences and 'throughscapes' even more in more long-term research. Furthermore, I discussed that Viveiros de Castro argued that indigenous concepts should be taken into account when discussing more-than-human landscapes (2019: s304). It would be interesting to do research and also give a voice to locals and how they understand the landscape. Further research on the interesting field of conservation biology would be a good way to improve conservation efforts by collaborating with researchers from other disciplines. This is because, as I discussed in the conceptual framework, many factors need to be taken into account for conservation efforts to be effective, like the social, ecological, political, technological and economic. Anthropologists have a great skill set to research this topic. However, in collaboration with other disciplines, it would create a more comprehensive research, especially in the time of the Anthropocene.

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