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Coral reefs, the house of fish [Miamba ya matumbawe, nyumba ya samaki] Perceptions of coral reefs in Southern Kenya

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Perceptions of coral reefs in Southern Kenya

Indy Koster

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Indy Koster

Research Master's Thesis Submitted to the Faculty of Humanities in Partial Fulfilment of the Requirements for the Degree of Master of Arts in African Studies (research)

Leiden University

African Studies Centre Leiden

Supervisors: Prof. Dr. Harry Wels & Prof. Dr. Annachiara Raia

November 2023

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Much like each polyp within a coral reef depends on the collective ecosystem, I relied on a multitude of individuals to bring this thesis to fruition.

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Abstract

In coastal Kenya, fishing and tourism mean that people rely heavily on coral reefs for food security and economic opportunities. Moreover, these ecosystems host the greatest biodiversity worldwide. Yet, Kenya's reefs face threats from local stressors, such as overfishing and pollution, while ever-rising global sea temperatures due to climate change lead to massive coral die-offs. The reef's decline risks not only biodiversity loss and socio-economic setbacks, but also threatens to erase a cultural heritage of communities deeply connected to its existence, as reefs shape and are part of cultural identities and lifestyles.

To combat the current loss of coral reefs in Kenya, the REEFolution Foundation initiated a reef restoration project in the Shimoni-Vanga seascape in Southeast Kenya. Typically, studies on coral reef restoration focus primarily on ecological aspects but often overlook the social dimension, though community support is essential for long-term success This thesis specifically examines the social dimensions of reef restoration through a gender lens, focusing on women's roles, perceptions, and connections to the reef in Shimoni, Kenya. Drawing from interdisciplinary approaches, including multispecies ethnography and African studies,—the research uses in-depth interviews to collect local narratives. These narratives reveal the significance of women's relationships with the reef while providing insights into socio-economic and environmental changes.

As human-reef relations are a two way interaction, the study of coral reefs within the humanities requires a rethinking of traditional earth-bound ethnographic methods, as reefs cannot be understood from surface observations alone. Hence, this thesis offers an innovative perspective on the definition of "fieldwork," by applying immersive participant observation—specifically, scuba diving—as an anthropological method, allowing the researcher to be physically present *with* and contribute to the data set of the coral reef.

The concerning state of our reefs calls for increased ocean-focused ethnographic research. This transdisciplinary thesis engages both the coastal community and the coral reef, emphasizing their interconnectedness rather than viewing them as two isolated entities.

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Chapter 1 – Introduction

From September the 26th until April the 19th 2023, I stayed at the REEFolution camp, located at Firefly Eco Retreat in Shimoni. Natural in colour and design, the REEFolution centre harmonizes with its environment, located in a coastal forest, it only takes a minute to reach the ocean. As you approach the shore, walk along the dive base and reach the jetty, you will be greeted by the powerful sounds and sights of the ocean, with its waves crashing and reflecting the sunlight, while the sea is playing hide and seek by appearing and disappearing, caused by significant tidal differences. During my seven-month research period, this unique location where land and sea meet, served as the foundation for my thesis. From there, I went to the nearby villages (Shimoni, Mkwiro and Wasini) to conduct interviews, but also visited the coral reef for (restoration) dives. As a result, the fieldwork carried out during these seven months remarks this thesis rather than the literature framework.

Figure 1 *View of the jetty (Photo taken by Indy Koster on January 21, 2023)*

Figure 2 *Camp site (Photo taken by Indy Koster on October 27, 2022)*

Introduction: thesis components

Within academia, a prevailing tendency can be observed, whereby humans and the coral reef ecosystem are treated as distinct entities, separated from each other. Consequently, a divide emerges on research about coral reefs between social scientists and marine biologists (McClanahan, 2011). However, there is this interconnected relationship between the coral reef ecosystem and reef-dependent communities, with the resilience and vulnerability of directly affecting each other (McCook et al., 2007). Furthermore, the environmental and conservation challenges that coral reef faces in the twenty-first century are intricate and interconnected, demanding a multidisciplinary and inclusive approach to effectively tackle them. With various global environmental initiatives, such as the United Nations Decade of Ocean Science for Sustainable Development, which specifically emphasise the conservation of coral reef ecosystems, it is necessary to embrace different perspectives (Bender et al., 2022).

In an attempt to bridge these disciplinary gaps, this thesis aims to employ a transdisciplinary approach and integrate multispecies perspectives to explore the intricate relationship between humans and their environment. Given that the coral reef is a non-human entity, the thesis is grounded in a multispecies approach, which seeks to incorporate non-human species and diverse intellectual frameworks into the field of anthropology, often referred to as "the species turn" (Kirksey & Helmreich, 2010). This turn involves decentring the human and embraces the inclusion of non-human sentient beings. As a result, this thesis will not solely focus on humans, but also positioning the coral reef as a living entity, an actor worthy of representation. However, this paradigm shift presents theoretical and methodological challenges. Therefore, the thesis adopts an exploratory approach, incorporating my passionate curiosity for the underwater world through participant observation, with scuba diving as one of my research methods.

Besides the transdisciplinary and environmental component, this research aims to include a gender component. The role of women in coral reef dependent communities is crucial and so far, has often been overlooked (Lau & Ruano-Chamorro, 2021). That is why, I interviewed mainly women in Shimoni and on Wasini Island to examine their perceptions on the coral reef and unravel the relationship between them and the environment, exploring how cultural practices, beliefs, and knowledge systems intersect with reef ecosystems.

Thus, in this thesis I am not only discussing coral reefs, nor am I solely focusing on women, but rather the relationality between them. Therefore, this thesis aims to bring these two spheres together, as it is this relationship that I intent to shed light on. The coral reef plays a significant role in my thesis. It serves as both the focal point of my interviews and the primary subject

deserving agency and representation. The explorative approach taken in this thesis, including participant observation through scuba diving, enables a first-hand connection with the coral reef ecosystem. By immersing myself in this environment, a deeper understanding of its complexities can be gained.

Coral Reefs: biodiversity guardians at risk

Thriving with an abundance of life, coral reefs nurture the highest biodiversity among all ecosystems on earth, which makes them one of the most biologically complex and ecologically valuable ecosystems of our planet. Coral reefs cover only less than 0.1% of our ocean floor, yet they are home to nearly one-third of the marine fish species (Rocha & Bowen, 2008) and even provide habitat for 25% of other marine life (Souter et al., 2021). Beyond these impressive biological features, the livelihoods of over 500 million people, spanning across the globe, are intimately intertwined with the existence of coral reefs, as they depend on these vital ecosystems for their sustenance and well-being (Hoegh-Guldberg et al., 2019). Coral reefs offer crucial ecosystem services to reef-reliant communities, encompassing the provision of food to meet dietary nutritional requirements, the support of livelihoods through fishing and tourism, carbon sequestration, and coastal protection (Moberg & Folke, 1999). The connection between reefs and human beings goes beyond ecological ties, extending deep into the realms of personal identities, lifestyles and social norms (Cinner, 2014).

Coral reefs emerge at the convergence of geological and biological realms, where rock and living organisms intertwine. Corals are categorized as animal species that reside in "colonies" composed of numerous sedentary organisms known as coral polyps. As explained by Sheppard et al., (2018, p. 39): ‘‘The unit of the coral is the polyp, which resembles a small sea anemone, to which it is related’’. These small organisms collectively create intricate structures that one knows as corals. Although corals are not classified as plants, they form a symbiotic relationship with *zooxanthellae*, a microscopic form of algae. These zooxanthellae reside within the polyps and supply them with essential nutrients through photosynthesis and acquire that corals get their vibrant colours. This symbiotic association not only benefits the polyps nutritionally but also accelerates the corals skeletal development, which is then utilized in the construction of a calcium carbonate structure to form colonies of hard corals (Helmreich, 2015, p. 53). The polyps of hard corals are the reef-building foundation and predominantly thrive in warm waters of the tropics which are often found at shallow depths, since the algae symbionts residing within the corals are in need of sunlight for photosynthesis. Thus, corals consist out of a complex

interplay of polyps, symbionts and colonies, each holding distinct temporalities and rely on one another for their existence (Sheppard et al., 2018).

However, the existence of coral reefs is under threat, and if this ecosystem does not survive, the consequences would be devastating for both marine life and coastal communities. In recent decades, the phenomenon of increasing waves of mass coral death, known as bleaching events, has been escalating in both intensity and frequency (Sully et al., 2019). During a bleaching event, the coral expels its symbiotic algae residing with nutrients, causing the coral to appear bright white in colour. Although the coral is not yet dead, it is in a stage of severe stress and vulnerability (Spalding & Brown, 2015). While some corals have the ability to recover, many of them lack nutrients or fall victim to disease, leading to their eventual demise (Glynn, 1984). The occurrence of widespread coral bleaching and subsequent mortality is a result from climate change, caused by the rapid accumulation of carbon dioxide, and other greenhouse gases in the atmosphere, that contribute to the rise in sea surface temperatures worldwide (Carpenter et al., 2008). Another global stressor is ocean acidification, since it can hinder the formation of calcium carbonate coral skeletons and therefore the growth of reefs (Cornwall et al., 2021). On top of that, individual reefs experience local stressors such as pollution, overfishing and destructive fishing methods (Hughes et al., 2003). Since the 1950s, the global coverage of living coral has witnessed a drastic decline, with approximately a 50% reduction observed. As a consequence, the capacity of coral reefs to provide essential ecosystem services has declined by half (Eddy et al., 2021).

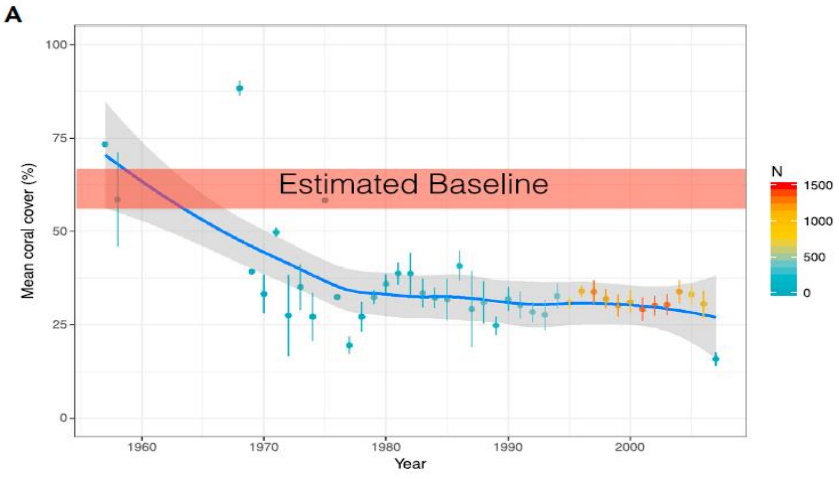

Figure 3 *Note. Taken from: "Global decline in capacity of coral reefs to provide ecosystem services" by Eddy et al., 2021, One Earth 4, p. 1279. "Global coral reef cover trends: (A) Global hard coral mean percent cover weighted by area of coral reef in each EEZ. "Estimated baseline" is the percent range for the 1950s indicated by experts in a global survey".*

Coral reefs: a multispecies entity

This thesis examines both coral reefs and reef-dependent communities, it does not prioritize the one over the other in terms of significance, and therefore I apply multispecies approaches. In general, multispecies studies engage a range of academic disciplines sharing a mutual goal of moving beyond the human-centred perspectives, which is far from a straightforward transition as it demands rethink of the relationship between humans and the world, along with the methods to examine it (Donna Haraway, 2008; Kirksey & Helmreich, 2010). Multispecies scholars look into the complex interactions between humans, animals, plants and microorganism and what they have in common is their focus on ‘‘a multitude of organisms’ livelihoods shape and are shaped by political, economic, and cultural forces’’ (Kirksey & Helmreich, 2010, p. 545). Coral reefs manifest themselves in multiple forms, functioning as polyps, symbiotic organisms, each with their distinct interdependent temporalities. Thus, coral reefs are not just a single unified entity, but are the ideal example of multispecies entities that serve as a haven for other multispecies populations, as the coral ‘‘displays a dynamic relationship between geology and biology, the animal and the plant, life and death, society and community’’ (Ette, 2017, p. 116). The multiplicity and the complexity of coral reefs is beautifully expressed by Braveman (2018):

> *Corals confuse and destabilize our categories: they are a cross between animal, plant, rock, microbe, and ecosystem; we sentimentalize them because of their beauty, despite the fact that they don't have a face or a clear sex and so we can't easily anthropomorphize them; (…). Reef building corals are animals, yet they photosynthesize; they make massive stony structures that can be seen from space, but they are tiny and, some claim, fragile creatures; they are sessile, yet travel long distances in their larval stage; and each has a mysterious symbiotic relationship with a particular strain of algae—who, under certain conditions, disembark from the coral cells, leaving them bleached and depleted. Individual coral polyps in a colony may differ in morphology and genetics, and some may be fusions of two or more genotypes. For the most part, however, polyps who belong to one colony have the same genetic composition—what scientists refer to as "ramets." Coral colonies are interconnected by living tissue.* (p. 11)

Following this line of thought, I do not focus on one specific type of coral, nor a specific fish species that are present around the reef, but rather perceive the coral reef as an entangled web of life within this research. Throughout history, ‘‘coral lends itself to metaphorical proliferation’’ due to its multispecies entity and connections between individual polyps, limestone skeleton, fish and other marine life (Prystash, 2012, n.p.). Coral reefs are often referred to as "rainforest of the sea" or "underwater rainforest" as they harbouring and immense diversity of marine life and are perceived as a barometer for diversity loss (Schuster, 2019).

Charles Darwin was one of the first who pondered about coral in his *Notebook 'B'* (1837-38), wherein he suggested the idea that coral communities could be perceived as a good example of how all forms of life are connected to each other (Prystash, 2012, n.p.). In the present day, scholars still use metaphorical references in order to address the interconnectedness of coral reefs. One of them is Ed Yong, who challenges in his book *I contain multitudes* (2016) the conventional notion of the individual as a single entity, emphasizing that humans and other organisms are, in fact, ecosystems composed of trillions of microscopic organisms. To illustrate his argument, Yong uses a metaphor regarding the functioning of our own bodies and coral reef ecosystems: ''We can compare the gut of a person with inflammatory bowel disease to a dying coral reef or a fallow field: a battered ecosystem where the balance of organisms has gone awry'' (…) Yong continues: ''A coral reef whose microbes are running amok because of pollution or overfishing hints at the turmoil that occurs in our guts when we swallow unhealthy food or antibiotics'' (Yong, 2016, p. 4). While our microbes may vary from reefs, the fundamental principles that govern within human bodies remain the same. Thus, his main point is that no life exists in isolation, neither our own bodies, nor coral reefs, all lives are constantly immersed in a microbial context and involve ongoing negotiations between species of all sizes.

Coral reefs and gender

The vulnerability to these ecosystem service changes is not identical, as coral reef-dependent communities, households, and individuals within them exhibit varying degrees of interaction, accessibility, and ultimately vulnerability to the impacts of coral degradation, that determine their unique experience of the reef (Cinner et al., 2012). Gender, along with other identities, plays a role in how people perceive coral reefs, and therefore how they relate to the reef. For instance, the spatial use of the seascape, access to reef resources, involvement in marine resource management and fisheries are shaped by gender, meaning the social and cultural roles, behaviours, expectations and identities that societies assign to individuals based on their perceived sex (Lau & Ruano-Chamorro, 2021).

The utilization of tropical seascapes, including coral reefs, differs between women and men. In many reef-dependent communities, women engage in gleaning for invertebrates in the intertidal zone and inshore reefs, whereas men tend to fish in deeper waters at the open ocean. As a result, women have access to different coral reef resources, as coral reefs flourish in shallow waters, and therefore they also obtain different knowledge about the reef that men do not have (Fröcklin

et al. 2013). Máñez & Pauwelussen (2016, p. 199), argue that: “as a result of their different roles, men and women are exposed to different environments, skills and experiences, and are therefore likely to develop gender-specific domains of knowledge” (Máñez & Pauwelussen, 2016, p. 199). However, as pointed out by Lau & Ruano-Chamorro (2021) there is still limited information available in terms of sex-disaggregated data, and research related to gender and livelihoods among coral reef dependent communities is relatively new.

The reason for that is the prevailing notion that fishing, which is the main source of income for reef-dependent communities, are throughout history perceived to be a male domain (Thompson, 1985; Máñez & Pauwelussen, 2016). For instance, Allison (2013) describes the physical environment and the specific culture of fishing communities as "maritime masculinities". Allision (2013) uses this term to illustrate the formation of a strong masculine group identity among fishermen, as a result of the gendered division of labour within fishing communities. Máñez & Pauwelussen (2016, p. 196), point out that there is a general view to perceive fishing communities as a “dichotomy of sexual geography”, in which land is traditionally associated with women and sea with men (Máñez & Pauwelussen, 2016, p. 196). Both "marine masculinities" and "dichotomy of sexual geography" refer to land and sea as gendered spaces.

Población and Niehof (2019) critically analyse this gendered spatial metaphor associating men with the sea and women with land, which is used by many social scientists as a framework to analyse the role of women in the fishing industry. The authors argue that this metaphor is deeply rooted in cultural and historical narratives, and it reflects and reinforces gender stereotypes and power relations. Therefore, the metaphor is "denying diversity" and highlight the need for more nuanced and context-specific understandings of gendered identities and relationships among reef-dependent communities. According to Máñez & Pauwelussen (2016, p. 193), most research assumes that fisheries operate within the public domain, which is typically male dominated. Consequently, the private domain, which is often dominated by women, receives little attention. Therefore, the role of women in fisheries, and in reef-dependent communities more broadly, is understudied and overlooked (Lau & Ruano-Chamorro, 2021).

Kenyan coral reefs

The coral reefs of Kenya are part of the world’s second-longest fringing reef, extending across the East African coast from Somalia to Mozambique. Kenya has the fewest coral reefs of the East African coast (630 km2), but they are some of the best protected and managed in the region

(Andrew et al., 2015, p. 17). However, also in Kenya there are increasing threats to the coral reef ecosystem due to ever-rising global sea temperatures, but also overfishing and pollution is are concerning issues (COMRED, 2018). During the El Niño-related coral bleaching event in 1998, which occurs when the equatorial Pacific is warmer than average, the entire Western Indian Ocean experienced significant impacts, causing devastation to Kenya's coral reefs with mortality rates ranging from 50% to 80% (Obura et al., 2002). In 2016, another bleaching event occurred whereby coral colonies in Malindi and Shimoni exhibited the highest incidence of bleaching and recent mortality. The vulnerable coral genera *Acropora* and *Pocillopora*, which dominate the coral communities in these protected areas, experienced the most pronounced levels of bleaching (Obura et al., 2017, p. 64).

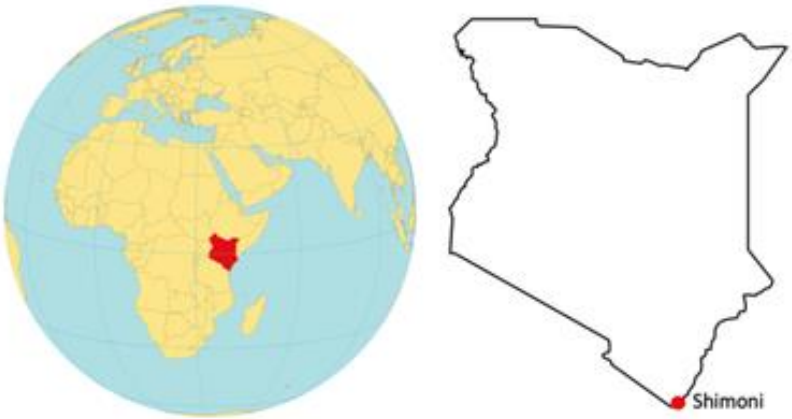

Figure 4 *Map of Kenya (Image by ReefSystems)*

In order to mitigate the growing environmental pressure, the coastal village Shimoni, is one of the starting points for coral reef restoration efforts in the Western Indian Ocean. In southern Kenya, near the Kenya-Tanzania border, in the channel between Shimoni and Wasini Island, the REEFolution Trust is based, and aims to preserve and restore the coral reef ecosystem through coral gardening in this area together with the local community (REEFolution 2023). REEFolution was founded in 2015, in collaboration with Wageningen University & Research (WUR), and with Pilli Pipa, a local diving operator, in order to develop effective reef restoration methods. One of these methods is coral gardening, which is a widely employed restoration technique that involves cultivating coral fragments in nurseries and subsequently transplanting them onto artificial reefs (ARs). This proactive management of coral populations is commonly utilized to expedite the restoration process, facilitating the recovery of a functional reef and its associated ecosystem services (Knoester, 2023).

When coral reefs thrive, their vitality and resilience extend beyond the marine environment, touching upon the lives, both human and non-human, of those who depend on them. Reef-reliant communities flourish alongside healthy reefs, benefiting from the resources and services the coral reef ecosystem provides. Conversely, when the reefs suffer, so too do the human communities intertwined with their existence. Although the decline of coral reefs is often portrayed as a significant symbol of the Anthropocene era and its impact on humanity as a whole, coral degradation primarily impacts the coastal communities that rely on and regularly engage with coral reef ecosystems (Schuster, 2019, p. 91).

Figure 5 *The location of Shimoni, Mkwiro and Wasini. REEFolution is based at Firefly Eco Retreat Camp in Shimoni (Google maps, July, 2023).*

As mentioned before, REEFolution works closely together with the local community in Shimoni and on Wasini Island, who depend heavily on the coral reef to support in their livelihood. In general, studies on coral reef restoration projects primarily concentrate on ecological and technical aspects but less on the social dimension while community long-term support is essential for succeeding of the project (Hein et al., 2019). For me, this community aspect, thus the human-reef relations, is one of the things that interests me. More specifically, I am interested in the role of women, and how they perceive and relate to the coral reef. According to Ochieng et al., (2023), who have recently researched gender perspectives on ecosystem services in coastal Kenya state that: ‘‘Typically in the coastal community, women are further marginalized from access to coastal and marine ecosystem services by cultural norms, taboos, and societal expectations’’ (Ochieng et al., 2023, p. 2). However, despite the

marginalization of women in accessing coral reef ecosystem services, it is essential to acknowledge their perspectives and contributions regarding this matter. Hence, it is important to incorporate their narratives within the scope of my thesis research, acknowledging their unique insights and experiences.

The existence and demise of coral reefs intersect with various critical aspects of the twenty-first century, encompassing cultural and material dimensions. These include challenges like species extinction, climate change, the pervasive issue of (plastic) pollution, and unsustainable fishing practices. I wonder what women in Shimoni and Wasini Island think about these matters. What comes up in their mind when I address the topic coral reef? What is the perception of those who glimpsed the wonders of the coral reef? Do they recognise the importance of protecting and preserving the coral reef ecosystem? Or does this underwater world remain isolated from them, known only for a few?

In this regard, this led me to the formation of the following **research question:** *In what ways do women in Shimoni and on Wasini Island perceive the coral reef?*

To support my main question, the following sub-research questions were asked:

SQ1: In what ways are women in Shimoni and Wasini Island perceive threats towards the coral reef?
SQ2: Which roles do women play in relation to the coral reef?
SQ3: In what ways can the coral reef be considered as its own agency, worth of representation?

In order to answer these questions, I literally dived into this subject matter, since my research took place in Shimoni and on Wasini Island, both on land and underwater.

Study sites

Shimoni

Shimoni is a small coastal village which lies off the southern coast of Kenya, 80 kilometers south of Mombassa and close to the border of Tanzania. Shimoni is located in equatorial latitudes (latitude: 4°38′51″ S Longitude: 39°22′54″ E) and therefore the time of sunrise and sunset are almost equal throughout the year. The road towards Shimoni village on land offers a journey through beautiful scenery. Along the way, one will pass by towering baobab trees, and

swaying palm trees. Shimoni is home to approximately 5000 people, with the majority of the population being Muslim, accounting for 70% of the total. The remaining 30% of the community identifies as Christian. (Shimoni / Wasini Island Community Profile, 2015). Shimoni has a rich history, and even though the village is quite small, many communities have settled in the village throughout the years.

Figure 6 *The main street of Shimoni (Photo taken by Indy Koster on April 4, 2023)*

The name "Shimoni" is derived from the Kiswahili word *shimo,* (cl. 5/6) which means hole, while the suffix *ni* specifies a place or location and therefore the meaning of Shimoni is "in the hole" or "at the cave" (Wynne-Jones & Walsh, 2010, p. 256). When one walks along the shoreline in Shimoni one can see these holes, which are naturally carved out by the tides of the sea into coralline stone. Some of these caves are almost five kilometers long and split up into an underground system of several tunnels (Abungu & Coret, 2021, p. 344). The name of Shimoni has a deeper historical meaning, since it refers back to the slave trade in East Africa during the eighteenth century, whereby enslaved people were kept and chained in the caves of Shimoni while they were waiting to be transferred by Arab dhows to Zanzibar (Whyne Jones

& Wahls, 2010, p. 248). Since 2000, the village has become a heritage site and a memorial for East Africa's slave trade (Abungu & Coret, 2021, p. 344).

Nowadays, Shimoni is known primarily for its proximity to the vibrant marine life and coral reefs of Kisite-Mpunguti Marine National Park (KMNP), that opened in 1973, following the rise of mass tourism along the Kenyan coast (Wynne-Jones & Walsh, 2010, p. 255). In 1978, the Mpunguti area was officially declared a Marine National Reserve Park (MMRP) due to conflicts among local fishers who were concerned about the loss of fishing areas due to the formation of the strict Kisite National Park. Kisite and Mpunguti are managed together as one conservation area, but they are subject to different regulations. In the larger Kisite-Mpunguti Marine National Park (28 km2), no use of marine resources is allowed, while in the nearby Mpunguti Marine National Reserve (11 km2), fishing with traditional methods is allowed, such as basket traps and hook and line fishing (Emerton & Tessema, 2001, p. 3). Since then, Shimoni became a popular destination for snorkelers and scuba divers. Therefore, ocean-related tourism is an important source of income for the villagers. Yet, the main economic activity for people to sustain their livelihood is fishing.

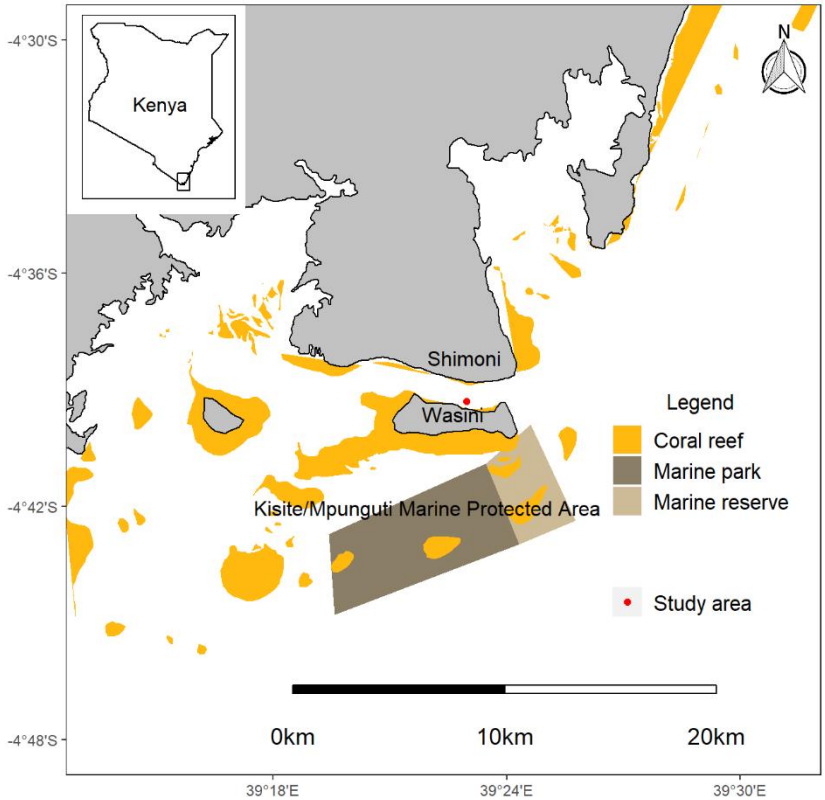

Figure 7 *Map of Kenya showing study area and coral reefs (orange). The Mpunguti Marine Reserve Park (MMRP) where traditional fishing is allowed (shaded light brown) and Kisite Marine National Park (KMNP), (shaded dark grey), which is a no take zone. (Map designed by H. Mwamlavya, 2019)*

Wasini Island

In front of Shimoni, at a distance of approximately one and half kilometers, lies Wasini Island. Wasini Island latitude is: 4° 42' 45" S and longitude: 39° 24' 53" E. The island is about five kilometers long and one kilometer wide and encompasses an area around 600 ha. There are only two villages on the north coast of the island, Mkwiro and Wasini village, which are almost equal in size and there live roughly 3000 people (Koki, 2017, p. 114). During the tenth century, Wasini Island was invaded by Arab settlers from the Persian Gulf states. At the same time, the island was briefly visited by Chinese traders. This period of history is reflected in the name of the island, as "*Wachini*" which in Swahili means "Chinese people". These Arab settlers left a lasting impact on the island, as 99% of its population is Muslim (Job & Paesler, 2013, p. 22).

The whole coastline of Wasini is surrounded by coral reefs, and even the island itself consists out of coralline stone as a remnant of the last interglacial period (Job & Paesler, 2013, p. 22). As explained by Job and Paesler (2013, p. 22), due to the coralline stone in combination with low precipitation and high evaporation rates, raining water cannot penetrate easily into the soil. Given the dense composition of the soil, in combination with vegetation that consists mainly out of dry forests and mangroves, farming on Wasini Island is very limited. This means that there is a heightened reliance on marine resources and makes fishing the main source of income and employment at the island. For that reason, more so than in Shimoni, people at Wasini Island depend fully on the ocean to sustain their living through fishing and ocean-related tourism (Tschentscher et al., 2023). One can only reach Wasini Island by boat and there are no tar roads or cars on the island. Therefore, the ties between Shimoni and Wasini Island are close, since resources such as food supplies and medicines need to be shipped from the mainland to Wasini Island. Moreover, most tourists operators are based in Shimoni, since tourists first come across Shimoni and from there go to Wasini Island or the marine park.

Even though there are only two villages on the island, both villages present distinct differences in terms of their respective socio-economic structures, despite their close proximity. Wasini village has been faster in economic development than Mkwiro village, because the former began earlier with ecotourism initiatives. For instance, in the last few decades, there have been some local initiatives to support tourism at the island such as Wasini Women's Group (WWG) and the Wasini Village Development Fund (VDF) (Job & Paesler, 2013, p. 23). The Wasini Women's Group began in 1985 by collecting seaweed and selling souvenirs. In 2000, the WWG opened a new tourist attraction named "coral garden" and offers a 1.5 kilometer walk along

coral fossils rocks (Job & Paesler, 2013, p. 24). Due to the success of the WWG, the initiative can support other women by providing micro credits so that they can start their own enterprise. As Job & Paesler (2013, p. 22) show, there are also more people involved in the tourist industry as compared to Mkwiro ‘‘In Wasini village,113 people directly work in tourism, and only five derive their income from subsistence farming or fishing. In Mkwiro, only 30 people are employed in tourism, while 162 people work in subsistence farming and fishing’’. Furthermore, the authors stated that Wasini village has a three times higher capita income per month.

As previously noted, in Mkwiro the tourist sector is marginal, and therefore fishing is the main economic activity in the village. The village is known for its traditional and sustainable fishing practices like the use of basket traps, in combination with more modern methods such as long lines and gill nets. It is important to note that Mkwiro and Wasini each have their own designated fishing areas, so the rules and regulations governing them also differ. Even in shared fishing grounds, there may be slight variations in the regulations between different areas (Tschentscher et al., 2023). This is because both villages are regulated by an different Beach Management Unit (BMU), which is a grassroots organization in Kenya that is responsible for managing coastal and marine resources in their local communities. BMUs are comprised of local stakeholders, such as fishermen, traders, and women’s groups, and are typically established by local government authorities. The primary aims of BMUs are to conserve, protect, and sustainably manage marine and coastal resources in their areas. BMUs also play an important role in promoting public awareness and education on the importance of protecting coastal and marine resources (Tschentscher et al., 2023). REEFolution works closely together with Mkiwro BMU, and since 2018 they collaborate together to enhance the condition of their reefs. However, REEFolution has no formal partnership with Wasini BMU, since Wasini already has their own coral reef restoration project.

Wasini Channel

The Wasini Channel is a narrow waterway that separates the mainland from Wasini Island. The channel is about 1,5 kilometers wide and spans a distance of approximately seven kilometers. The Wasini Channel is a biologically unique environment due to its relatively shallow depth and the abundance of coral reefs. One characteristic of the Wasini Channel is the tidal range, which can result in variations up to 4 meters in the levels of seawater surface (Knoester et al., 2019). The channel experiences two high tides and two low tides every day, with the highest

tides occurring just before and just after the new and full moon phases. The tidal range is much greater during the spring and neap tides, when the moon is closest to earth. Furthermore, the tidal range in the Wasini Channel has a significant impact on the marine life of the area due to its environmental conditions. During low tide, the shallow depth of the channel allows for the growth of seagrass, which provides food and shelter for a variety of marine species. The strong currents also help to flush nutrients into the surrounding waters, which helps to support a diverse marine ecosystem.

The seawaters of the Wasini Channel are additionally influenced by the monsoon trade wind system. The dry northeast monsoon, referred to as *kaskazi* in Kiswahili, prevails from October to March. The southeast monsoon, known as *kusi* in Kiswahili, is largely coinciding with the rainy season and blows from April to September (Emerton & Tessema, 2001). These monsoons affect the environmental conditions of the ocean, such as seawater temperatures, wave intensity and visibility.

Within the Wasini Channel, REEFolution aims to restore the status of the reefs by placing and monitoring artificial reefs. The dive spots where restoration activities take place are: "Firefly" (Shimoni site), "Pilli Pipa" and "Kikuyu House" (both Wasini Island site), this are also the spots where I did most of my dives with REEFolution. I asked Ewout Knoester, a PhD candidate from Wageningen University, who lives and works already for seven years in Shimoni, about the difference between those reefs, he explained to me the following:

> *All those reefs are very different, Firefly (Shimoni site) is super shallow and has a very high coral cover, these are values that you hardly see anywhere else, certainly not an overfished and unprotected reef. Pilli Pipa and Kikuyu House (Wasini site) are lower in coral cover and the reef is more sedimented, it looks a bit less like a "reef reef" than you would expect for a coral reef. We have done most of the coral reef restoration at the Pilli Pipa site, and there we are actually creating patches that look more like the Firefly site with all those branching corals, so we are actually adding that to the other site because we assume the reef used to look like that in the past and since it is degrading now, we try to add new corals there again.* (Interview Ewout February 27, 2023, Shimoni).[1]

These three dive sites are part of the bigger coral reef located in the Wasini Channel and are relatively close to the three villages (Shimoni, Mkwiro and Wasini) where I did my interviews.

[1] This interview was conducted in Dutch, my own translation. This holds for every interview citation of Ewout in this thesis.

So, when I asked my interviewees questions about the coral reef, I was referring to the coral reefs in the Wasini Channel. Moreover, these are the dive spots where I observed the coral reef by conducting participant observation through scuba diving, developing a new ethnographic method. In the next chapter, I will delve deeper into this explorative approach and other methods used for this thesis. Let me introduce you to my underwater world.

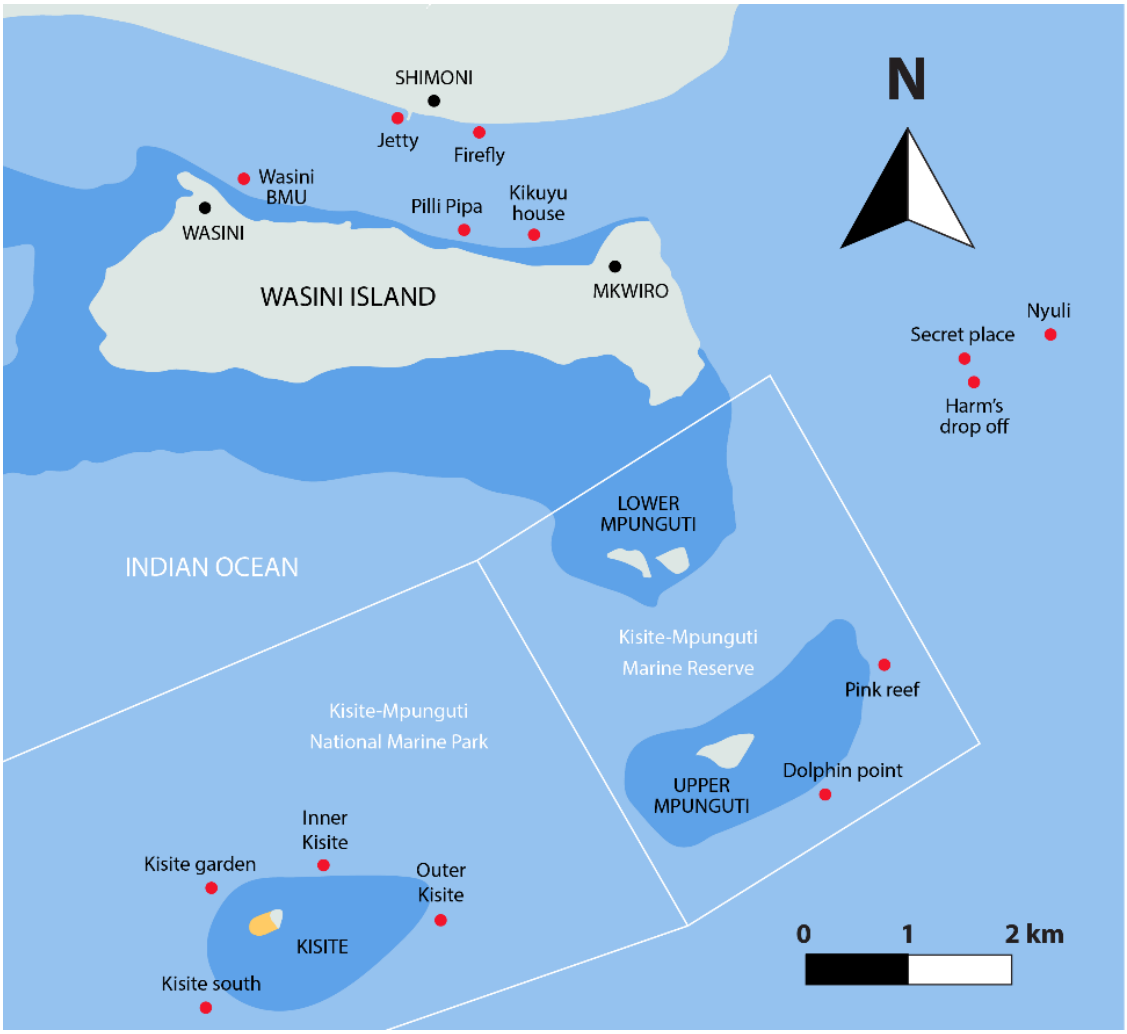

Figure 8 *Map of the dive sites in and outside the Wasini Channel. Firefly (Shimoni site, Pilli Pipa and Kikuyu House (Wasini Island) are the dive spot locations where REEFolution carries out reef restoration (Map designed by Vrijlansier, Guido Paap, REEFolution, 2022).*

Chapter 2 – Methodology: diving for data

This research delves into the perceptions and interactions of women in Shimoni and on Wasini Island with the coral reef. More broadly, it explores the intricate relationship between coral reefs and reef-dependent communities, and vice versa. Despite their interconnectedness, these two domains are frequently studied apart from each other. Much research is done about coral reefs, also in the Kenyan context, most by marine biologist, but also, even though to lesser extent, by social scientists and anthropologists. Let me turn to the latter, my own academic guild. Take for instance the book: *Ocean as Method: Thinking with the Maritime* by Menon et al., (2022), which introduces a new perspective on the humanities and social science. By delving into maritime networks within the realm of social and humanistic research, it offers a compelling alternative to traditional approaches rooted in area studies and national histories. In the face of growing concerns about global oceanic warming and rising sea levels, the authors of the book advocate for a paradigm shift, urging us to apply a more ocean-centric approach (Menon et al., 2022). Or a book centred specifically on the Kenyan coast: *Kenya Coast Handbook: Culture, resources and development in the East African littoral* by Hoorweg et al., (2000). Chapter 4 of the book, 'Marine Resources' written by Peninah Aloo focuses, among other ecosystems, on the fringing coral reefs stretching from Malindi to Shimoni along the Kenyan coast. For instance, it includes paragraphs that elaborate on the health status of these reefs, as well as their significant ecological and economic advantages. However, when it comes to research methodology, in both books, similar to many other, diving is noticeably absent from the array of methods employed to observe the reef. Yet, how can one truly comprehend the state and dynamics of these reefs without firsthand exploration? Is it because for too long there has been research done from an anthropocentric world view? Whereby thinking about the inclusion of non-human entities was not given to much attention, or seen as irrelevant? Moreover, it is noteworthy that the majority of ethnographic research has traditionally land-centred, while oceans constitute a vast 70 percent of the earth's surface (Steinberg, 2013). More ocean centred ethnographic research is particularly crucial considering the alarming state of our oceans and coral reefs at present.

In this chapter, I will explain the methods that I developed for this research. I will write extensively about how I include the coral reef, a non-human entity, into ethnographic research, by employing immersed participant observation through scuba diving. This explorative method is complemented with in-depth interviews, as my aim was to gain insight into the perceptions

of women in the villages of Shimoni, Wasini, and Mkwiro regarding the coral reef. I will also provide a more detailed account of how I connected with my interviewees, the interview setup, and the translation process of the interviews. As this chapter unfolds, I will reflect upon my own positionality as a researcher and how it influenced my data collection.

Beyond the shore: rethinking fieldwork in the underwater realm

The prospect of being "in the field" as a researcher can come along with feelings of uncertainty, even though you are well prepared with a thoughtfully designed research proposal, soon enough you will ‘‘finding out that the ‘field’ is a chaotic, hugely complex place’’ (Blommaert & Jie, 2020, p. 3). As a researcher, you embrace yourself into the realm of everyday life, but you discover that these daily experiences might not align with the structured norms of academia. However, it is a transformative experience, forcing the researcher to navigate and embrace the unpredictable nature of "the field" (Blommaert & Jie, 2020). Contemporary ethnographic fieldwork finds its roots in the late 19th and 20th centuries, as anthropologists began to gather firsthand data directly from the field. This shift towards immersive, firsthand research marked a fundamental shift in the practice of ethnography (Aktinson & Hammersley, 1998, p. 249). Most anthropologist today consider Bronislaw Malinowski, renowned for his landmark ethnography *Argonauts of the Western Pacific* (first published in 1922), as a foundational figure in the development of ethnographic fieldwork (Hoey, 2014, p. 3).

Nowadays, fieldwork is still widely regarded as the fundamental basis for solid research within the domains of social sciences and humanities. However, the traditional concept of fieldwork in anthropology has historically focused predominantly on land-based research (Helmreich, 2007). In other words, fieldwork implies the idea that one should stand with both feet on the ground, physically present in "the field". Furthermore, there is this common notion that conducting successful anthropological research through fieldwork requires interviewing and establishing relations with people, by studying cultures and communities on land. Yet, what does "fieldwork" mean in my study context? In my research, I drifted away from the conventional idea of fieldwork, yet still descending into the realm of everyday life, but combining it with an underwater setting as I was navigating through coral reefs. My exploration beneath the water’s surface not only introduced me to new species and immersed me in a new world, but also presented a new perspective on the definition of "fieldwork", by bringing in the underwater world and the coral reef ecosystem as a significant component. This expanded view

of fieldwork can lead to valuable insights on how humans interact with and depend on their environment, and vice versa.

Being "with" the coral reef

Helmreich (2015) emphasizes the pressing need to employ diverse methods to enhance our understanding of coral reefs and make them more legible: ‘‘coral is something to be read—for climate change, for potentially patentable genes, for representativeness’’ (Helmreich, 2015, p. 60). Schuster (2019) supports the claim of Helmreich: ‘‘The recent dire depictions of reefs across the planet indicate the need to make coral legible for coral’s own sake as well as for the sake of human existence’’ (Schuster, 2019, p. 87). Moreover, Schuster (2019) follows Helmreich’s call to make coral legible in different ways by employing the reasoning of thinking *with* and *as* a coral, which is based on multispecies approaches that stress the difference between thinking *with* as compared to thinking *about* another nonhuman life. He explains: ‘‘to ‘think with’ involves approaching nonhuman lives with a sense that curiosity and care are not just epistemologically wise ways of knowing these lives but also are the means by which to foster recuperative practices as collaborative among multispecies’’ (Schuster, 2019, p. 87). The preposition "with" is applied by many other multispecies scholars, for instance by Peter Wohlleben’s *The Hidden Life of Trees* (2016). In this book, Wohlleben suggests that we should think "with" trees, and acknowledge their intelligence, communication, and interdependence, in order to foster a deeper understanding and connection with the forest ecosystem.

In this example of the forest, one can walk on land and even through the forest to be "with" the forest ecosystem. However, in my case, what does it mean to be "with" the coral reef ecosystem? Unlike the forest, I cannot walk *through* or *on* the reef. First of all, because the ocean creates a natural dividing line to reach this underwater ecosystem and secondly, I would cause immense damage to the reef. However, I think that coral reefs cannot be understood from surface-observations alone. Therefore, I argue that the study of coral reefs by ethnographers requires a rethinking of traditional earth-bound ethnographic methods.

This is why, as a method, borrowed from anthropology, I applied immersed participant observation through scuba diving in order to be "with" the coral reef. Scuba diving offers a gateway into this aquatic environment, as described by Sheppard et al., (2018, p. 10): ‘‘The possibility of increased study, of course, followed on from the development of scuba equipment, which permits scientists to actually see reefs and their species directly and in close-up’’. Since

I am a certified scuba diver, I could immerse myself in the world of the coral reef ecosystem and it made me able to be physically present "with" the coral reef (Koster, 2023)[2].

Immersive participant observation

There are multiple definitions about participant observation, Bernard (2006) defines participant observation as follows: ‘‘Participant observation involves immersing yourself in a culture and learning to remove yourself every day from that immersion so you can intellectualize what you’ve seen and heard, put it into perspective, and write about it convincingly’’ (p. 344). As such, participant observation is often viewed as a human-oriented approach, and in general the method of participant observation involves *immersing oneself* within a *group of people* and studying their *behaviors, interactions* and *cultural* practices (Bernard, 2006). However, if we think beyond the human-centered approach of participant observation, it becomes evident that this method holds significant value in non-human contexts as well.

In order to observe non-human life forms like coral reefs, I would like to highlight the multifaceted concept of *immersion*, a word that holds a close connection in describing and defining participant observation. According to Stefan Helmreich (2007), an underwater anthropologist, who immersed himself in the culture of deep-sea oceanographers in a submarine: ‘‘Immersion has come to suggest being submerged in a space as well as becoming one with it, dissolving into it. Immersion does not immediately open up questions of how boundaries are produced and crossed’’ (Helmreich, 2007, p. 631). In addition, the author explains:

> *One way immersion functions as a rhetorical tool promising experiential “truth” is by eliding the question of the organization of space, of medium, of milieu—whether of an ecosystem or a social order—positing a fluid osmosis of environment by an emplaced participant-observer–auditor.* (Helmreich, 2007, p. 631).

Thus, Helmreich suggests that a researcher who is physically present and observing can immerse oneself in and integrate with their surroundings, regardless of whether the context is an ecosystem or a social setting. An important aspect of immersive participant observation is to “spend a great deal of time in a study context’’ (Hennink et al., 2010, p. 184). Therefore, it

[2] See my blog post. African Studies from an underwater perspective: diving for data. African Studies Centre Leiden. https://www.ascleiden.nl/content/ascl-blogs/african-studies-underwater-perspective-diving-data

was essential that I was often physically present in my "study context", which was underwater. For this particular research, immersion encompasses its interpretations, since I was literally submerged in a space, totally immersed by water, while observing and participating "with" the coral reef. To put this into practice, I brought my diving gear to fieldwork, instead of only a notebook like most ethnographers do. In summary, the diving gear consists out of essential equipment: a buoyancy control device (bcd), regulator, mask, fins with boots, a wetsuit and a diving computer.

Besides spending time in my study context - the coral reef ecosystem - I tried to operationalize my observations of the reef, and the reef restoration dives, through visual research. Therefore, apart from written fieldnotes, I took visual fieldnotes. As Marion and Crowder (2013) explain: "Just like any other field notes, the images you generate from observations, interviews, and participation are data that you can go back to, review and consult" (p. 28). More specifically, I took underwater photographs and videos[3] since they: "allow us a small window into lived realities that no other medium can provide. It shows processes and captures actions and words as they naturally occur in the flow of experience" (Marion & Crowder 2013, p. 68).

Spokespersons of the reef

Yet, I am aware that including non-anthropocentric participants in my research, and bringing in this new component of underwater fieldwork - which is mainly based on anthropological knowledge - is still somewhat uncommon and my approach is therefore rather exploratory. According to Kumar (2011), a study approach is exploratory: ''when a study is undertaken with the objective either to explore an area where little is known or to investigate the possibilities of undertaking a particular research study'' (p. 11). So, I understand that my research is highly exploratory, which may be seen as a limitation. However, not including the coral reef within my data analysis would leave a key protagonist out and is therefore no option.

Nevertheless, I have to say that sometimes I felt a sense of unease in this new role as I observed the coral reef through my own anthropological eyes. Through my studies, I am equipped with anthropological tools to understand human cultures and societies, but in this case, it also extends to perceive interactions between humans and the marine environment. Yet, when applying these "anthropological eyes" I approached my research with a curious and analytical perspective, looking at the social and cultural dimensions that might be intertwined with the coral reef

[3] All the underwater photos and videos are made by an action camera (Go-pro Hero 7).

ecosystem. While it is valuable to apply anthropological insights to understanding human-environment interactions, it may not fully capture the entirety of the coral reef ecosystem, especially lacking the ecological point of view. Therefore, my multispecies ethnography provides only a relative perspective understanding of the reef. However, during my stay at REEFolution, I worked and lived with Kenyan reef rangers, and marine biology students from Wageningen University, who have a deeper understanding of the coral reef from an ecological point of view. I did not come to know the corals in the same manner as they did, but through daily morning briefings at REEFolution, conversations at the camp, and most importantly, by diving together, they have taught me more about the ecological aspects of coral reefs and the marine species that live there (cf: Atkinson, 2022).

Considering my limited expertise as a non-marine biologist, it made sense to me to seek insights from the reef rangers who engage extensively with corals and know them very well. In addition to my personal observations of the reef, I adopted another approach inspired by Irus Braverman's book *Coral Whisperers: Scientists on the Brink* (2018). Braverman emphasized the significance of understanding corals through the lens of coral scientists who serve as spokespersons for the reef. Hence, I conducted interviews with the reef rangers, who served ''as spokespersons for their corals and hoping that the message of urgency, love, and grief would travel through me to a larger public'' (Braverman, 2018, p. 19).

Diving

In total I have done 56 dives in Kenya.[4] Sometimes I have done two dives on one tank, which my dive computer registers as two separate dives. Looking at the statistics, in total I have spent 2 days: 12 hours and 44 minutes underwater. Among these dives, my longest dive was 2 hours and 33 minutes, my deepest dive: 32.2 meter and on average my maximum depth during all these dives was 8.8 meters. The dives encompassed a diverse range of activities and sites[5]. I engaged in coral reef restoration dives, and I assisted with research experiments. One of these research experiment dives included a reciprocal transplantation study in the intertidal and subtidal zones with the objective of investigating any growth and survival trade-offs that might arise from relocating corals. Hereby I assisted with taking photographs from the coral fragments from two different angles: anterior/posterior and lateral/medial (Dado, 2023). Another research

[4] See appendix (p. 88) for an overview of all the dives I did (including: date, time, location, dive site, duration, depth, dive type).
[5] See figure 8 (p. 22) the map dive sites in the introduction chapter.

experiment diving activity involved the mineral accretion process, commonly known as an electric reef or electrified reef. This artificial reef is constructed using bio rock, a type of limestone that quickly forms in seawater on a metal framework through the precipitation of dissolved minerals facilitated by a low electric current (Visser, 2023). Hereby I assisted with placing coral fragments and cleaning the structures. Additionally, I helped with mapping the artificial reefs by the use of a flexible survey tape, with the aim to observe and document the growth, spread, and long-term survival of the artificial reefs areas (Goergen, et al., 2020, p. 25). Lastly, I did leisurely dives, including fun dives, deep dives[6] and enchanting night dives[7], which taught me a lot and added to my knowledge by allowing me to observe the reef at various depths and times. In the next paragraph, I will highlight the coral reef restoration dives that take place within the Wasini Channel by REEFolution.

Coral restoration dives

Coral gardening is a widely used approach for coral reef restoration, involving the establishment of a coral stock prior to reef restoration efforts (Knoester, 2023). The process of coral gardening encompasses two main phases: the intermediate nursery phase and the out-planting phase. The nursery phase plays a crucial role in the transplantation process, providing a safe environment for coral fragments to grow without disturbance. These small coral fragments are placed in a nursery structure, allowing them to mature to a specific size while experiencing the environmental conditions they will encounter in their final destination. Once the nursery phase is complete, the corals can be either reused and fragmented to continue growing in nurseries or transplanted to artificial reefs for restoration purposes (Rinkevich, 2014; Boström-Einarsson et al. 2020).

Filling a coral tree

One of the first steps of coral reef restoration is to hang small coral fragments in structures called nursery trees. In order to fill up a nursery tree, one has to get into the water and search for pieces of branching coral that are broken off and will not survive when left in the sand. These corals are collected in a basket and then transported to an empty coral nursery. The corals are cut into fragments of about 5 cm that are completely healthy. Only the tip of the wire cutter needs to be used to cut into a thicker branch of coral. Thinner coral fragments can be gently

[6] A deep dive is a dive deeper then 20 meter

[7] A night dive takes place after sunset, with divers entering the water when it is (almost) dark.

pinched and broken off. After this, one can attach each coral fragment in the coral tree with a loop (slipknot) made from fishing line. It is important that the loop is secured around the stem of the coral, so the coral tissue can easily overgrow the fishing line. Also, one has to be sure that the loop does not run around two branches, as then the branches will break when tighten the loop. Furthermore, one has to make sure that the same genotypes of coral (e.g. *Acropora tenuis* or *Porites cylindricaare*) placed in a branch (Guido Paap, Vrijlansier, REEFolution protocol filing a coral tree).

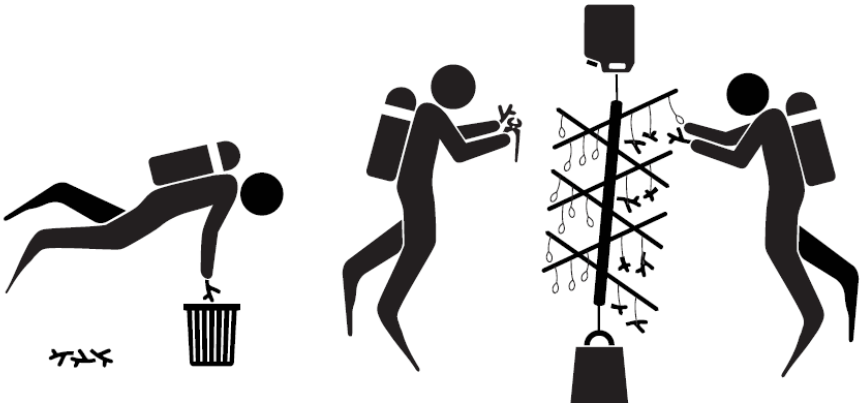

Figure 9 *REEFolution pictogram protocol: cleaning a coral tree. Designed by Vrijlansier, Guido Paap.*

Cleaning a coral tree

To prevent increased fouling on the nursery trees, and to make sure that the coral fragments can grow effectively, divers have to carry out cleaning activities. In order to clean a nursery tree, the first step is to remove barnacles by rubbing a wire cutter or rebar stick underneath the branches. The diver pushes the lines with corals gently aside so that the fishing lines will not break. The diver takes a coral fragment with two fingers and pulls gently so that the fishing line gets tight, and uses a toothbrush to scrub the fishing line so that it gets completely clean. To prevent coral damage, it is crucial to focus solely on brushing the fishing line and avoid direct contact with the coral. Additionally, if there is excessive fouling on the side branches of the coral tree that blocks sunlight from reaching coral fragments, then these parts can be cleaned with a hand brush (Guido Paap, Vrijlansier, REEFolution, protocol cleaning a coral tree).

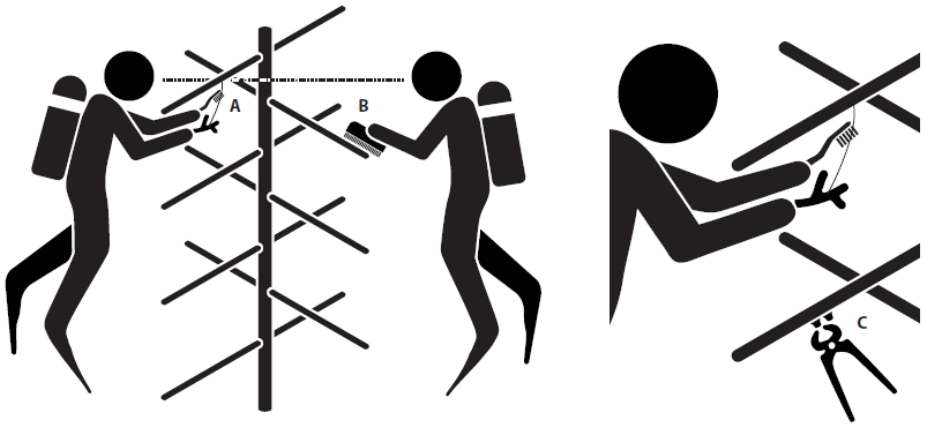

Figure 10 *REEFolution pictogram protocol: out-planting corals. Designed by Vrijlansier, Guido Paap.*

Out-planting coral

Once the corals have grown in the coral tree nursery, they are ready to be harvested. The boat captain hands over the crate with attached a jerrycan, which can be filled with water until it sinks. The diver cuts fragments from large coral colonies from the nursery with the wire cutter, and if possible, leaves a small fragment behind on the line so it can grow into a new colony. The size of the coral colonies may vary between fist and hand size. The diver collects the coral colonies and places them in the crate until the crate is full (about 60 coral colonies). The jerrycan is then filled with air from an alternative air source until the crate achieves neutral buoyancy. Two divers move the crate to the location where they planned to outplant the coral fragments. The crate is being placed on the bottom by releasing the air from the jerrycan. Each diver starts with out-planting by taking a coral colony and attaching it to the artificial reef using a tie wrap. It is important to out-plant the same species of coral onto one artificial reef. Moreover, it is important that each coral fragment is facing upwards so that it can grow towards the light and attached tightly around a stem: a coral should not be able to move. After out-planting the coral fragments, remove the ends of the tie wraps using the wire cutter and collect the remaining plastic ends in a mesh bag (Guido Paap, Vrijlansier, REEFolution protocol out-planting corals).

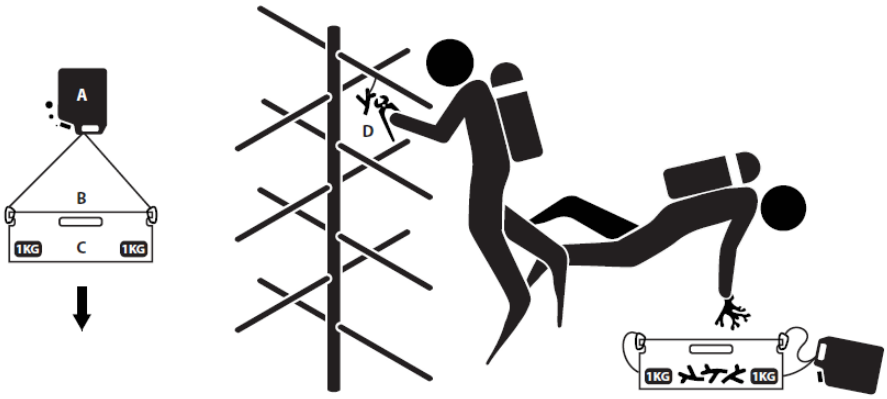

Figure 11 *REEFolution pictogram protocol: harvesting corals. Designed by Vrijlansier, Guido Paap).*

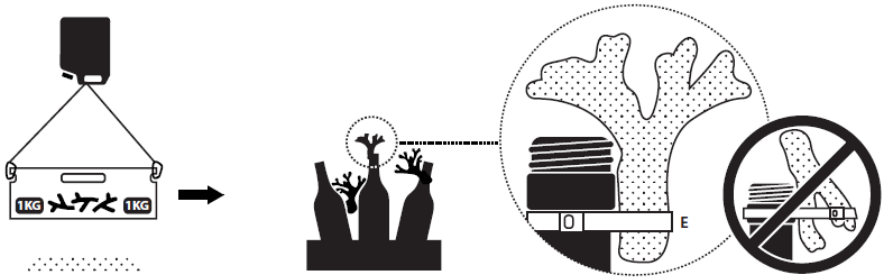

Figure 12 *REEFolution pictogram protocol: out-planting corals. Designed by Vrijlansier, Guido Paap.*

Figure 13 *Harvesting corals (Photo taken by Indy Koster on November 7, 2022)*

Beyond diving: other employed research methods

In-depth interviews are a useful method to identify ‘‘people`s own beliefs and perceptions’’ (Hennink et al., 2011, p. 110). Therefore, in-depth interviews are valuable for this research topic, as I aim to understand women's perceptions of the coral reef. Furthermore, in-depth interviews are also used to understand the contexts in which people live, such as socio-cultural, economic and ecological context of an individual. Since my study area is context specific, and my research aims to identify the perceptions of my interviewees that depend upon a specific coral reef, in-depth interviews as a method fit into my research. I opted for a semi-structured interview format, wherein I prepared essential questions and themes beforehand. However, I remained flexible to change the order of the questions and made space to address new topics while the conversation progressed. The semi-structed interview format allowed me to address the necessary topics during the interviews, thereby ensuring that the conversation did not feel overly formal to my interviewees.

Recruitment of interviewees was facilitated through mediated contact, involving translators who connected me with the community in Shimoni, and on Wasini Island. My first translator was Mwanaisha (25 years) a reef ranger from REEFolution, she introduced me to the women of Mkwiro where I have done my first 8 interviews. As Mwanaisha had other assigned tasks at REEFolution, I got in touch with Omar (24 years) later on, who became my second translator. Omar helped me with most of the interviews, in the period of early November 2022 till March 2023. Omar was an ideal translator since he was born and raised in Shimoni, and is widely known in the community. Moreover, Omar actively volunteered at REEFolution, and is the founder of several youth and women’s groups in Shimoni. Thanks to his network, I came into contact with many of my interviewees.

In the process of conducting interviews, I employed a mix of scheduled and random interviews. The planned interviews were organised, for instance introduction meetings with female members of the Beach Management Unit (BMU). Yvonne, the project manager of REEFolution arranged these meetings, which served as a platform for me to introduce myself as a researcher and present my research topic. These meetings allowed me to establish contact with the individuals who later become my interviewees. Besides scheduled interviews, Omar and I adopted a random approach to engage with interviewees. This method involved approaching individuals without prior arrangements or specific criteria. For instance, while we were walking through the village, I would express my interests to Omar in including certain perspectives or women who hold a particular ocean related job in my research. He would then suggest potential

contacts, and we would check if they were home and available for an interview. Similarly, while traveling together by boat to Wasini Island, Omar and I sometimes encountered interesting people with whom we engaged spontaneously in meaningful conversations without any formal interview setting. To document conversations, observations, and interview activities during my research, I employed the method of taking field notes. These notes were captured in both handwritten form in a field diary and digitally in an online format, sometimes in real-time but mostly completed afterwards. Field notes provide valuable means of capturing real-time observations and nuanced details during fieldwork (Hoey, 2014). My fieldnotes offer valuable insights, whether documenting interactions with participants, environmental conditions, or extensive dive logs, and they provide a contextualized dataset that complemented my other data collection methods.

Before going to Kenya, I followed a Kiswahili course, which proved helpful in breaking the ice and generally understanding the main points of the conversation. However, my level of Kiswahili was not adequate to conduct the interviews effectively. Therefore, Mwanaisha and Omar not only connected me to my interviewees, but they also helped me to translate the interview from Kiswahili to English and vice versa, for the interviews that I could not conduct in English. However, the employment of interpreters in anthropological and ethnographic research has been a topic of debate (Phillips, 1960; Gibb & Iglesias, 2017). The act of translating one language into another goes beyond a purely objective process, rather the interpreter possesses agency, and there are instances where the information conveyed from the researcher can be subject to filtration. According to Borchgrevink, (2003, p. 111), the impact on translation is not solely determined by the interpreters proficiency in English. Factors such as loyalties to the local community, or personal biases could also play a role.

During my interactions with interviewees, I encountered occasional challenges due to the presence of translation dynamics. The language barrier limited my ability to fully engage as a researcher, impeding seamless communication and understanding. As a result, the data collecting process was noticeably more complex and demanding. Nevertheless, while I acknowledge the potential for nuances to be lost in translation and reflect upon it, I relied on the expertise of my translators, entrusting them to provide the most precise and faithful translations possible. Furthermore, without their invaluable assistance and collaborative spirit, my research would not have been the same, and I would not have gained the community insights.

Who did I interview?

In my research on the perception of coral reefs, I chose to mainly interview women from the communities of Shimoni and Wasini Island, with the exception of a few fishermen included in this study. My primary objective was to include the perspectives and opinions of women within the context of coral reefs, recognizing that their perspectives may have been marginalized or overlooked in the past (Lau & Ruano-Chamorro, 2021). Just as I adopted an explorative approach to understanding the coral reef ecosystem, my interviewing method was similarly open-ended. I did not impose specific criteria based on age, profession, or educational background etc. Instead, I aimed to gather a diverse range of perspectives from women living in the three different villages, as their livelihoods and well-being are closely intertwined with the coral reef ecosystem. Thus, my interviewees from Shimoni and Wasini Island share a common dependence on the coral reef for their livelihood. This reliance varies in terms of intensity and interaction with the reef, as I interviewed women who fulfilled roles such as fish friers and sellers, policy officers, women involved in the Beach Management Unit (BMU), as well as women engaged in catching octopus, sea cucumbers and seashells.

In addition to interviewing women from the communities of Shimoni and Wasini Island, I also conducted interviews with individuals from REEFolution. Their expertise in coral conservation allowed me to understand not only their perspectives on the overall state of coral reefs in the area, but also their first-hand experiences with coral reef restoration efforts in the Wasini Channel. Additionally, I sought to capture their perspectives on the communities of Shimoni and Wasini Island, exploring how their conservation initiatives interacted with and impacted the local communities. By including the perspectives of those actively engaged in coral reef restoration, my research aimed to provide a comprehensive and nuanced understanding of coral reefs, conservation efforts and the communities they serve.

Throughout my research, I conducted a total of 33 interviews, capturing a wide range of perspectives. The age demographics among my interviewees were highly diverse, encompassing individuals from various age groups. The youngest participant was in her early 20s, while the oldest woman I interviewed was around 70 years old. During the interviews, I carefully addressed ethical concerns related to informed consent and confidentiality. Prior to conducting interviews, I explained the purpose of my study to my interviewees, ensuring they understood how their contributions would be utilized in my thesis. Additionally, I sought explicit permission from each participant to share their names in the research and to record our conversations for analysis for the transcripts. By obtaining informed consent and respecting

their confidentiality, I aimed to maintain the integrity of the research process while respecting the privacy and confidentiality of the participants.

Reflexivity: my own positionality

Regarding reflexivity of this research, I would like to reflect upon my position as a researcher and my research by presenting a rather long quote while staying close to the ocean component of this thesis:

> *It requires us to dive deep into the sea of other people's lives and find a way to swim with them. It requires commitment, endurance, constant improvisation, humility, sociality, and the ability to give oneself up to and for others. It also entails the ability to retrieve oneself and be prepared to rethink, from this position, everything one thinks one knows. And then it needs one to swim back to the shore and be prepared that this shore is almost always going to be different from the shore where one began.* (Shah, 2017, p. 53).

This beautiful quote captures the essence of my research journey, emphasizing the need for immersion, or in my case to dive into the lives and experiences of others, both humans and non-human beings. However, a challenge I faced is the uncomfortableness to venture beyond the safety of my familiar shoreline, thus the standard research methods as interviewing, etc. This was driven by the fear of diving into the vast unknown waters of applying multispecies ethnography and using my observations of diving as a research method. Many times, I found myself questioning: "Who am I to observe the coral reef solely through my anthropological lens?" Can I write about coral reefs while having no educational background in marine ecology? My insecurities seem to intensify, especially since I lived among individuals who possess extensive knowledge about coral reefs and marine ecology. Yet, to evolve and grow in my own academic thinking, but also to argue that within the social sciences "the social" cannot be assumed to be exclusively tied to human beings. Therefore, it was essential to overcome this fear, embrace new perspectives and dive literally into the depth of the sea, and expand upon multispecies approaches.

Secondly, ‘‘constant improvisation’’ underscores that doing research rarely follows a linear path. It often requires adapting to new circumstances and environments, rethinking approaches when faced with challenges or new information. Due to the pandemic of Covid-19 I chose to postpone my research. I took a gap-year and did an internship at the Ministry of Foreign Affairs

at the African desk in The Hague. After my internship, my life underwent a profound transformation upon arriving in Kenya. It encompassed not only a shift in attire from classy clothes to the daily comfort of walking on flip flops, but I also had to adjust to an entirely different lifestyle. For seven months, I embraced the experience of living in a tent, constantly immersed by the natural surroundings of a coastal forest. Living outdoors and being in nature was a source of great joy for me.

However, during my first weeks, I felt a sort of discomfort, not in the tent lifestyle, but primarily concerning the task of rediscovering my research path and returning to an ethnographic mindset. My research had been put on hold for an entire year, and I faced the task of adapting my research proposal, originally based on literature research, to align with the realities of the actual context. "The field" was so much bigger than I expected beforehand as through REEFolution I came in contact with so many interesting people and organisations. For instance, I interviewed some women at a seaweed farm in Mwazaro, a village 20 minutes away from Shimoni by motorbike. Even though I had very interesting conversations, I noticed that I drifted away from my geographic scope, and therefore also my actual focus, the coral reef. Doing research is a dynamic process, and as I needed to go back to the shore, I reflected upon it and narrowed down my scope and returned to the reef.

Finally, it is important to approach my research with humility, recognizing that my own positionality as a researcher whereby my cultural background, skin colour, and gender might impact the relations that I had with my interviewees and therefore influenced my data collection process. From the beginning it was obvious that through my non-Kenyan physical appearance, I was called *mzungu*, which is generally translated as 'White person' (Lukate, 2022). As I am a white person, people treated me differently, and sometimes that created a sense of discomfort within me. Yet, during my interviews, I noticed the interviewees thoughtful efforts to make me feel comfortable, such as offering me a chair to sit on. However, my intention was for them to feel at ease, and I would have been perfectly fine sitting on a *mkeka*[8]. Regarding cultural norms, I tried to make sure to dress modestly. Lastly, having followed a Western educational path, I am aware of being deeply entrenched in Western paradigms of knowledge (Krause, 2016). As an example, my perspective towards the coral reef ecosystem is shaped by reading scientific literature in the field of marine biology, which reflects my formal education that overlooked indigenous knowledge beliefs and perspectives.

[8] The Swahili word for a mat to sit on.

Overall, this chapter offered a new insight into how coral reefs can be studied as an ethnographic research method within the discipline of social sciences and humanities. As this part of my research was exploratory, it was necessary to give a thorough explanation of its purpose, scope and the methods employed to collect the data. By embracing a broader definition of "fieldwork", one that encompasses underwater exploration and engages with non-human entities, it offered an alternative way besides the conventional methods. This was coupled by discussing the value of in-depth interviews, as I aimed at understanding the perspectives of women in the villages of Shimoni, Wasini, and Mkwiro concerning the coral reef. The following chapter will provide a detailed overview of the collected data.

Chapter 3 – The coral reefs of the Wasini Channel

Within the waters of the Wasini Channel in southern Kenya, REEFolution aims to restore the coral reefs together with the local community, thereby ensuring to keep the ecological function of the coral reef ecosystem and the preservation of local livelihoods. At the heart of numerous coral reef restoration techniques, lies the two-step coral gardening method, which entails initially cultivating corals withing nursery structures and subsequently transplanting them onto the reef (Rinkevich, 1995). This two-step coral gardening approach is applied by REEFolution. In the first stage of coral gardening, the primary objective is to grow a small number of tiny coral fragments into a lot of bigger coral colonies on nurseries (Horoszowski-Fridman et al., 2015). There are many different designs for nurseries that are used to grow corals through mariculture, but REEFolution uses nursery trees. The second step of coral gardening is to outplant coral colonies that have grown in the nursery trees onto artificial reefs (Horoszowski-Fridman & Rinkevich, 2016). This is expected to help coral reefs recover by assisting important ecosystem activities, in the hope to bring back essential species and enhancing the corals ability to reproduce and grow (Hein et al., 2020). The artificial reef structures that REEFolution employs are among others, bottle reefs, metal cages, and layered cakes (Knoester, 2023).

Figure 14 *Artificial reef structure: bottle reef (Photo taken by Ewout Knoester)*

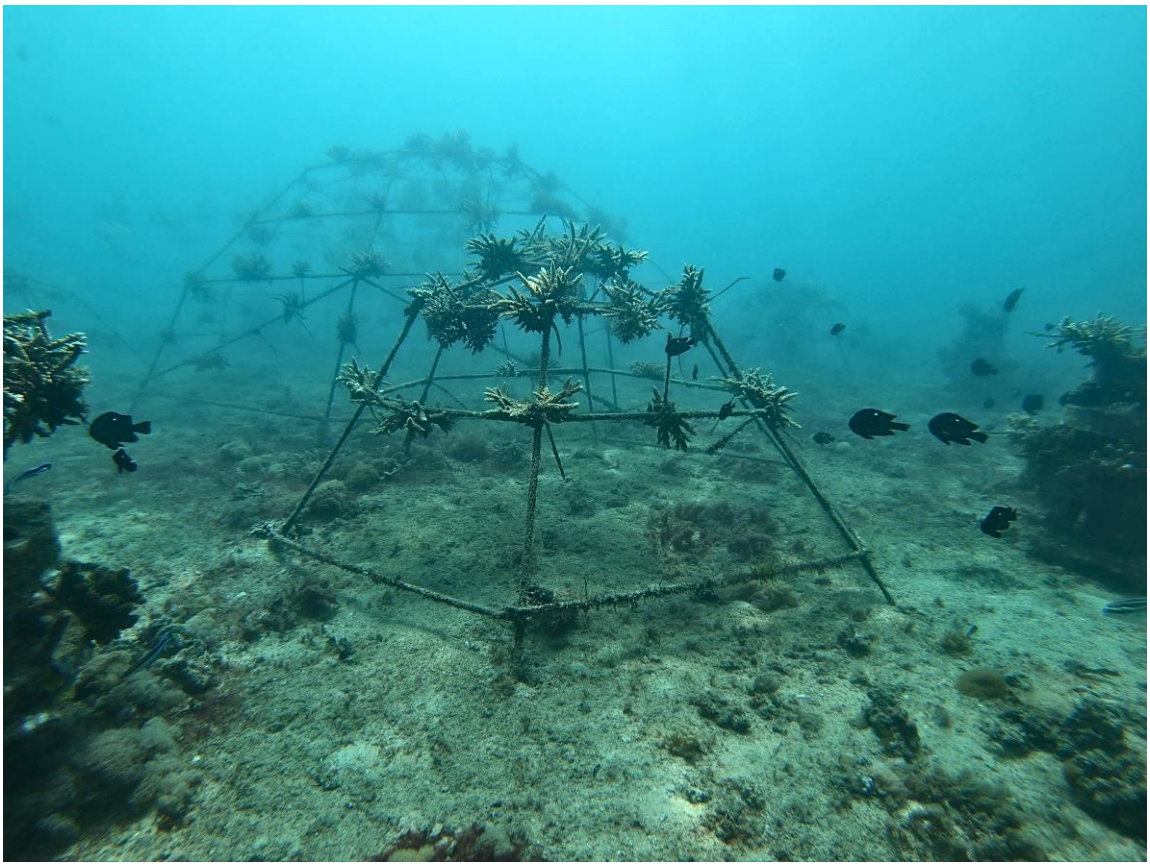

Figure 15 *Artificial reef: cage structure (Photo taken by Indy Koster on January 13, 2023)*

Figure 16 *Artificial reef structure: Layered cake (Photo taken by Ewout Knoester)*

Since 2015, REEFolution is active in the Wasini Channel engaging in coral restoration activities. I spoke with Yatin Patel, who is the dive instructor and manager of Pilli Pipa, the diving centre that provides logistical support for the diving activities of REEFolution. Yatin has been living and diving in Shimoni since the year 2000. I asked him about the changes he has observed in the reef since his first visit, and Yatin excitedly explained how the reef appears today in the Wasini Channel:

> *So it is a huge difference, a very huge difference man. The diving is so much more interesting with all the added coral structures and often we do a dive whereby we are moving from one structure to another structure whereas before we were diving in the same area but then along the edge of the reef or then we had to look very hard to see all the special things you know. The reef now it has changed a lot man. So if we start first with the dive site Pilli Pipa that is where we used to dive all the time. We had coral in the shallow waters so between four and six meters, there is some natural reef. It is not a continuous natural reef, and the reef appears in patches, so you have to go from one patch to another patch, but of course when you take especially experienced divers, they want to dive deeper, but there was nothing to see there. Now there is a lot of different fish, and a lot more than there used to be before and a lot of different species, because of all the artificial reefs that we have placed. So we are seeing things like snappers, sweet lips, butterfly fish, sometimes angelfish, like they were there but then only on the natural reef but now you can also see them when you go a bit deeper towards the artificial reefs.* (Interview Yatin, April 11, 2023, Shimoni).

Yatin's enthusiasm about the increased fish abundance in the channel corresponds with Ewout's explanation, who has been actively involved with the REEFolution project since 2015:

> *Well, I think that the biggest change is the presence of numerous REEFolution artificial reefs in the channel. The artificial reefs make up a significant quantity, particularly when you compare it to the natural reef. The artificial reefs now make up a considerable percentage of the reef in the channel, which is quite interesting. And there are now more and different type of fish, especially schools that you would not see at first, such as large schools of snappers, sweetlips, batfish, and they all hang around those structures and I did not see these schools in the channel before.* (Interview Ewout, February 27, 2023, Shimoni).

Ewout told me that since 2015 until now, in terms of surface area, almost half a hectare (5000 m^2) consists out of artificial reefs in the channel. During my stay in Shimoni, I had the

opportunity to observe certain areas of these artificial reefs structures. As I assisted with coral reef restoration dives, including harvesting and placing mature corals onto artificial reefs. In order to do that, I followed the PADI (Professional Association of Diving Instructors) specialty course "Coral Reef Restoration", which equipped me with comprehensive knowledge about the intricacies of coral reef restoration. This course had enriched me not just in terms of knowledge, but also my approach towards corals, how I perceive, observe, and during my restoration activities even touch them. Before this restoration course, my dives were solely recreational, involving reef navigation and species identification. In both type of dives (recreational dives and restoration dives), I was connected to and immersed in the reef environment. However, while diving, I noticed that they entail different conditions. In restoration dives, for instance, my emphasis shifts to maintaining buoyance, spending more time at one specific spot, rather than moving around to different reef patches and focus on broader surroundings. Most notably, during a restoration dive, my attention is directed towards tasks involving physical contact with corals, a practice which is not undertaken during leisurely dives.

Eva Hayward (2010) is a scholar who wrote about studying and physical contact with corals by means of working alongside marine biologists at the Long Marine Laboratory in Santa Cruz, California. Inspired by Donna Haraway's book *When Species Meet* (2008), Hayward undertook a multispecies approach into coral generation focusing on *Balanophyllia elegans*, commonly known as cup corals. By working with *Balanophyllia elegans* in the laboratory, Hawyard (2010) is constantly "touching" the coral cups, and she describe these interactions through the concept of "fingeryeyes": ‘‘I use *fingeryeyes* to explain the tentacular visuality of cross-species encounters and to name the synaesthetic quality of materialized sensation’’ (p. 580). Through this conceptualization, Hayward is emphasizing sensory experiences and the role of touch between humans and non-human entities: ‘‘To see, to feel, to sense, and to touch -"fingeryeyes" - slide into each other, making new prepositions of observation: seeing with tact; touching by eye; feeling from vision’’ (Hayward, 2010, p. 582). Hayward highlights the corporeal and sensory experiences of cup corals. She describes how these organisms use their tentacles to perceive and interact with their surroundings, emphasizing the intimate and affective nature of these engagements: ‘‘So when a coral's tentacles reached out to eat, and it "tasted" my fingers and retracted, a moment of sensitization, this was a provisional togetherness, a pulse possession, an instance of fingeryeyes’’ (Hayward, 2010, p. 585). By exploring the sensory capacities of cup corals, Hayward challenges human-centred notions of perception and contributes to a broader understanding of what it means to be a sensory being. It implies that the concept of

sensory perception extends beyond just humans and that various species, such as corals, may have different and equally valid ways of perceiving the world around them (Pink, 2015; Calvey, 2021).

Even though Haywards research took place in a laboratory setting, during coral reef restoration dives I also "touched" corals. Engaging with corals during a restoration dive is an experience that goes against the prevailing mindset of "look but do not touch". As I descend into the water, I see the coral nursery trees beneath me, and I am aware of my presence in this fragile ecosystem, especially that I do not harm the corals with my fins since the nurseries are quite close to each other. I see the small coral fragments hanging in lines, delicate and intricate, but they demand more than just casual observation. They invite me to think seriously about their existence, stories and biology, as I try to keep the multispecies lens in mind. Touching the corals in the context of restoration work, though done with utmost care and respect, allows me to commune a bit more *with* the coral fragments. It is a tactile connection that goes beyond the visual, allowing me to feel their presence in a tangible way. Yet, Hayward also posed that fingers are not the only things that make us feel something. Our eyes are connected to our body's sense of touch. Seeing things is connected to feeling them through other senses (Hayward, 2010, p. 582). As I am not the only one who is communing with the corals, as I encounter other species, small damselfish, known for their territorial performance (Ceccarelli, 2007) swimming around the tiny coral fragments. For them, and other fish species, the three-dimensional finger-like coral branches provide a perfect place for shelter and protection ‘‘either between coral fragments and/or under constructed structures’’ (Seraphim et al., 2020, p. 635).

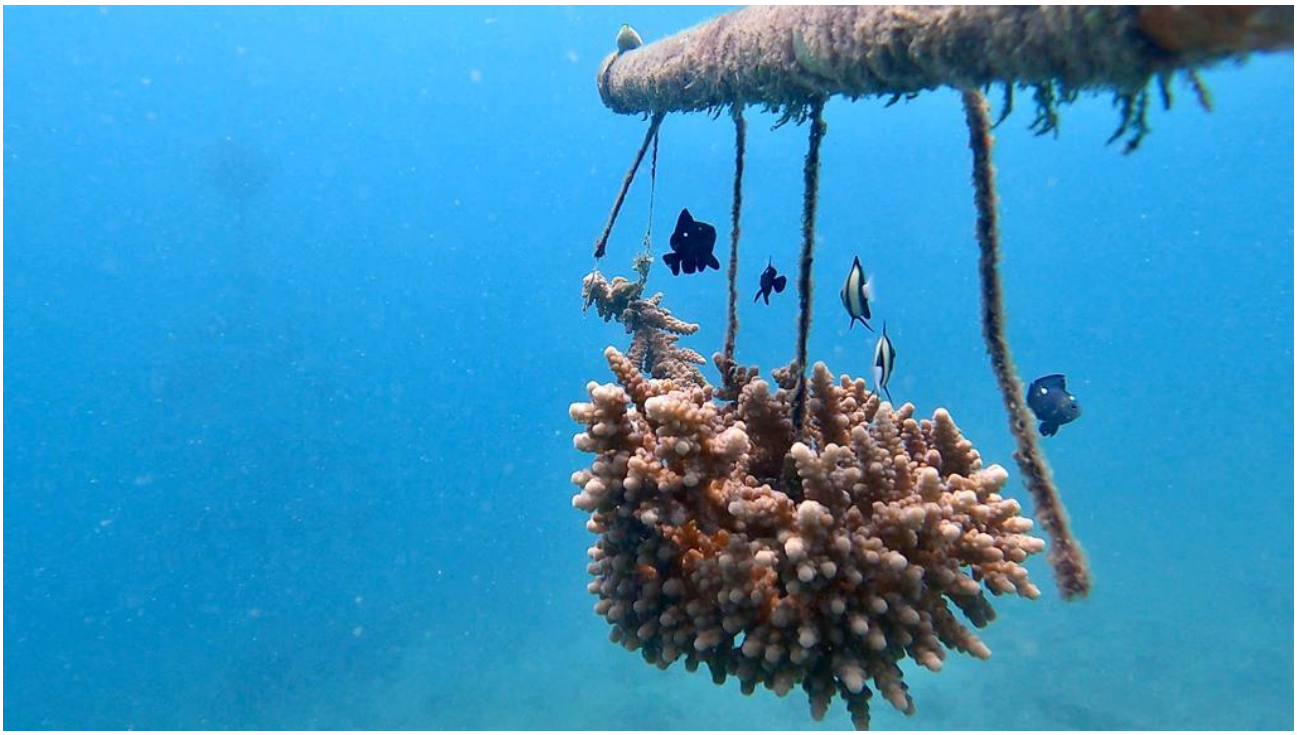

Figure 17 *Acropora coral fragments in a nursery tree with damselfish swimming around. (Photo taken by Indy Koster on April 17, 2023).*

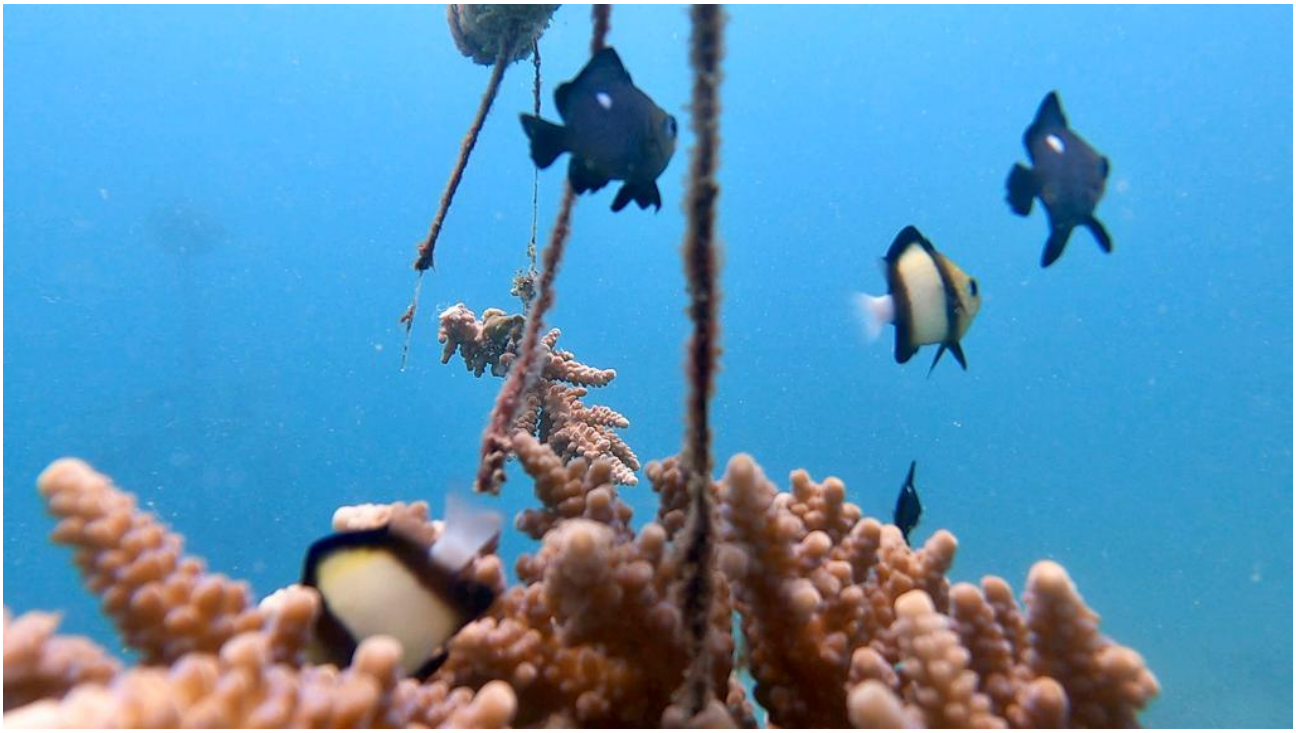

Figure 18 *Close-up photo of Acropora coral fragments in a nursery tree with damselfish swimming around. (Photo taken by Indy Koster on April 17, 2023).*

When discussing the ultimate objective of coral reef restoration, it goes beyond the improvement of livelihoods as it touches upon the discourse of caring, or also known as ethics of care' within the feminist social sciences and political theory (De La Bellacasa, 2012). The concept of care reveals itself through interactions with the world around us, ''as inseparably a vital affective state, an ethical obligation and a practical labour'' (De La Bellacasa, 2012, p. 197). Quoting the words of Van Dooren (2015):

> *As an affective state, caring is an embodied phenomenon, the product of intellectual and emotional competencies: to care is to be affected by another, to be emotionally at stake in them in some way. As an ethical obligation, to care is to become subject to another, to recognize an obligation to look after another. Finally, as a practical labour, caring requires more from us than abstract well wishing, it requires that we get involved in some concrete way, that we do something (wherever possible) to take care of another.* (Van Dooren, 2015).

Baruch Rinkevich was among the pioneering coral scientists advocating for active restoration by cultivating corals in ocean nurseries (Rinkevich, 2005), and the marine biologist advocated for ''the use of gardening as a guiding metaphor for coral restoration'' (Braverman, 2018, p. 116). Again, this metaphor encompasses aspects of caring as ''gardening is not performed for its own sake; it is, instead, a way to do something meaningful in the face of degradation'' (Braverman, 2018, p. 120). In other words, the act of gardening, or more specifically coral gardening, is not merely an isolated activity, but it serves a greater purpose, namely caring for the environment of the coral reef and trying to improve its degraded status. Killian Quigley (2021) expresses his care for the reef as ''a caring for colour'', in his view: ''Caring for the Reef may be, not first of all but not least of all, a caring for colour — a caring against chromatic disappearance and a caring toward chromatic repair'' (Quigley, 2021, p. 83). In essence, Quigley emphasizes the significance of preserving the visual colours of the reef as a crucial component. If the reef loses its colour, it might already be too late to repair it. Thus, if one cares about the colours of corals, one cares about the overall health of reefs (Quigley, 2021).

My experience described above of being with the coral is my perception and my observation. However, the question arises: what determines perception? The definition of perception is given as "a belief or opinion, often held by many people and based on how things seem" (Cambridge Dictionary, 2023). Perceptions are complex, when viewed from an individual perspective, elements such as one's level of education, age, gender and economic status can affect the way

how ecosystems, such as coral reefs, are perceived and valued, even among individuals within the same sector or living area (Woodhead et al., 2021). In this chapter, I try to convey my perceptions of coral, as outlined in the methodology, primarily based on firsthand observations during scuba diving. In the interviews I conducted, I also try to portray the coral reef. At times, the reef serves as a background setting, providing context within the socio-economic and ecological setting. The narrative involves an ongoing interplay between my personal observations and the insights shared by my interviewees regarding the reef and the surrounding sea.

However, there exists a distinction between depicting my interviewees and the coral reef. While I can cite and quote my interviewees, obviously, this form of communication and presentation through written language does not apply to the reef. The coral reef only conveys its messages to us in a state of stress, by expressing itself through indicators such as bleaching and declining coral cover (Quigley, 2021). On the coral bleaching as such, Irus Braverman writes: ‘‘The ghostly white spectacles of bleaching are the mesmerizing face of the encroaching mass death in tropical corals, their human-induced but self-orchestrated requiem’’ (Braverman, 2018, p. 79). However, the alarming message of a coral reef, is not limited to this specific location in southern Kenya, but its cry echoes globally (Hughes et al., 2017; Sully et al., 2019). This is why, rather than relying solely on quotations, I choose to present the reef through visuals, with the hope that they convey a more multifaceted understanding of the coral reef. These visuals may have a more profound impact than my words alone can achieve in describing the reef within this thesis.

Figure 19 *Bleached coral (Photo taken by Ewout Knoester)*

Oceanic dependence

At the moment I am waiting for Omar to accompany me to Wasini Island for an interview. Today the heat is intense, and I find shade on the ground near the Beach Management Unit in Shimoni, which is a good place to sit back and observe, since it is a gathering place for many fishers. In just fifteen minutes, I counted a couple of fishermen. The men occasionally paused for chats or ask about each other's catch, a few with their contentment evident. One carried an impressive fish catch on his shoulder, while another carried three octopuses with their tentacles trailing along the ground. My gaze followed the man with the octopuses, likely heading to their next destination. As I watch the movement, I am reminded of a recent encounter with an octopus during a night dive. Once a sight of wonder, now serving as source of sustenance. What strikes me most is the interconnection. The octopus here seems to hold a symbolic significance. Its presence not only influences the lives of fishermen and the local economy but also reflects the intricate connections between various species in this coastal ecosystem. Every aspect of life here is intertwined with the ocean and its services. (Fieldnote, December 6, 2022).

Coral reefs play a crucial role in supporting and sustaining economic activities in coastal regions worldwide. The health and the abundance of coral reefs directly impacts the productivity of fisheries and, consequently, the livelihoods of reef-dependent communities (Woodhead et al., 2019). Nestled in the Western Indian Ocean, both Shimoni and Wasini Island, boasts an exceptional ecological environment for artisanal fishing and ocean related tourism (Obura et

al., 2022). Its waters encompass a diverse range of marine habitats, from vibrant coral reefs and mangroves to inter-tidal flats and sea-grass beds, all surrounded by lowland coastal forest. This unique ecological setting serves as a haven for marine biodiversity (Emerton & Tessema, 2001). Due to the fact that this thesis focuses on coral reefs, I will only address this marine habitat. Even though all the marine habitats are connected, it goes beyond the scope of this research.

The fishing industry in Shimoni and Wasini Island is a large part of the economy due to the abundant marine life provided by the coral reefs and various habitats. Moreover, the soil composition is less fertile, characterized by limited soil cover dominated by coralline stone, especially on Wasini Island. In the wider area of Shimoni one can also find land related economic activities such as farming, livestock raising and the preservation of coconut and mango plantations (Tschentscher et al., 2023). Yet, both villages have embraced the fishing industry as the prominent economic activity, and therefore rely on services provided by reefs for their livelihood and sustenance. In addition to its ecological characteristics, the advantageous proximity of Shimoni to the port city Mombassa, one of Kenya's economic hubs, which is only a three-hour drive away, has facilitated the trade of fish (Emerton & Tessema, 2001).

To the residents of Shimoni and Wasini Island, the ocean and its coral reefs are not just a picturesque backdrop, it is the foundation of their existence. As I sat down with my interviewees, intrigued by their daily interactions with the marine environment, I posed always a simple yet profound question: ''What does the ocean mean in your personal life?'' Without exception, the response echoed the same sentiment, all voices affirming that they fully depend on the ocean and therefore the ocean means everything to them.

> *I just love the ocean and living next to it. I find it good because there is a lot of fresh sea breeze. The ocean offers us fish, we see fish, we have fish, we eat fish. The sea is a source of food, and also it is a source of income. When the fishermen come, they come with the fish, when the fish is sold the economy of Shimoni improves.* (Interview Agatha, November 11, 2022, Shimoni).

> *The ocean is all that I have, because my husband goes fishing and snorkelling tour guiding and that is all about the ocean. So, through the ocean we get income, and it helps to take my children to school. We are not farmers, so we all depend on the ocean.* (Interview Samira, November 25, 2022, Wasini).

> *So what the ocean means to me is like a source of living because my husband has to educate the children and then he has to go to Kisite for the snorkelling excursion and bring money home so that my children can go to school. And for my business,*

> *people have to go to fishing and fishermen have to bring me fish and eat here at my restaurant.* (Interview Hadiya, December 6, 2022, Wasini).

> *The sea is the place where corals grow so they have the initiative of coral restoration and coral plantation, so I like it because it is an opportunity to do coral restoration, and that is also a source of income.* (Interview Mkasi, February 16, 2023, Wasini).

> *The ocean is the place where I can sustain my needs, I go to the ocean and get fish and come back home, to prepare, fry and sell these fish.. Without the ocean I have nothing, I don't have children and my parents are not alive anymore, so basically it is just me and the ocean which me sustains to sell fish to get some money* (Interview Madia, January 16, 2023, Shimoni).

While these answers seem apparent, provision of goods and services from the coral reef ecosystem become particularly prominent. When they describe the services and benefits fishing on reefs, the significance of economic reef relations truly stand out. However, the ocean represents many things that go beyond the human experience, and was also presented as the belief that the ocean possesses an inherent worth as a component of God's creation:

> *So, for me the ocean is like decoration, like decoration as in a gift from God and it is like refreshment. I like it all and I really cannot think of another place then Wasini Island, because others are travelling from far so that they can see our ocean, but I am always around the ocean. Like when I need to travel to Shimoni then there is the ocean. I am surrounded by ocean, but for me it is a gift from God.* (Interview Chochi, November 25, 2022, Wasini).

The passage above touches upon the aspect of religion. It appears like the ocean represents more than just the power of God, but rather, the ocean merits an equal level of admiration as God. The majority of the residents in Shimoni and on Wasini Island are Muslim (Koki, 2017) and the ocean plays an important role in East African Islam (Uimonen & Masimbi, 2021). Besides that the ocean is perceived as a gift from God, sometimes my interviewees referred to God in the sense that God controls the fish populations (Lowe et al., 2019): "I think that God influences that there are less fishes"[9] and "I am not very worried because if the fish decrease or increase it has all to do with God and it is all God and his grace"[10]. Thus, the ocean is not merely a vast expanse of water for them, it embodies life itself, providing livelihood, hope and the means to survive.

[9] Interview Madia, January 16 2023, Shimoni.
[10] Interview Magahatibu, December 09 2022, Wasini.

Mahmoud Mau, a poet originating from Lamu, an island in the north of Kenya, expresses his deep connection to the ocean. In his words, he connects the sea (*Bahari)*[11] to the time he was in his mother's womb, thus portraying the ocean as a nurturing mother (Raia, 2019, p. 237).

***"Bahari kwangu mimi mbali nakuwa naipenda kwa ajili ya mazowezi, lakini piya bahari inanipa utulivu wa moyo na mapumziko ya roho baharini nahisi raha ambayo haielezeki labda ni kwasababu kuwemo baharini inaikumbusha nafsi yangu wakati nilipokuwa tumboni kwa mama nilipokuwa nikiogeleya katika maji yaliyonizunguka hali ambayo akili haikumbuki wakati huo lakini bila shaka roho na moyo unakumbuka hiyo hali labda ndio sababu yakuhisi utulivu ninapo kuwa baharini"* (Raia, 2019, p. 237).**	**"For me, I love the sea because of the water, but the sea also gives me peace of mind and rest of the soul in the sea. I feel a pleasure that is indescribable, maybe because being in the sea reminds me of the time when I was in my mother's womb, when I was swimming in the water around me, a situation that the mind does not remember. At that time, but of course the soul and heart remember that situation, maybe that's the reason why I feel calm when I'm at sea."**[12]

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The intriguing aspect of this poem is the connection that Mahmoud Mau makes between being in the sea and the time in his mother's womb. It represents a deep relation, not only between mother and child, but it extends to the idea that one can have a relational bond with the environment, suggesting that the natural world can nurture and sustain us (Raia, 2019). The ocean is like a nurturing mother, offering fish that sustains families and fulfils basic needs. This perspective aligns with the view of Amativ Ghosh in his book: *The Nutmegs Curse: parables for a planet in crisis* (2022), wherein he pleas for protecting ''all our relatives'', encompassing the entire spectrum of non-human beings, including animals and natural environments such as

[11] *Bahari* is the Swahili word for sea.
[12] My translation in English of Mahmoud Mau's poem.

oceans, rivers and mountains (Ghosh, 2022, p. 242). When we talk about relatives, we mainly talk about people, as well as in our thinking, however Ghosh questions in his book what happens if we label non-human beings as our relatives, are we able to think about our relatives outside of people? This broader perspective about perceiving non-human entities as our relatives and to care for the environment reminds me of an interview I had with a woman who was daily involved in near-shore reef activities such as octopus catching and seashell collection and an active member of the Beach Management Unit of her village:

> *It is important for women to be in the BMU this is because they are mothers. Women are known to be loving and caring, they can care for the community and for the ocean. For example, they can organize beach clean ups. It is helpful for them. They are the ones who can manage the BMU to collect litters, to organize themselves, and they can care as mothers for the ocean.* (Interview Shamari October 25, 2022, Mkwiro).

Although she is not directly talking about coral reefs, her expression extends beyond human caregiving to encompass a nurturing role for the community and the environment.

Reef relations

I have often questioned whether I can perceive the coral reef, a non-human entity, as part of our relatives. To be honest, I found it a hard question, and I am not sure if I have a definitive answer yet. However, I can say that I do feel a relational bond with the environment of the reef, and I feel emotions towards the reef, as they are a complex mix of wonder, admiration and concern. The latter, a sense of concern, arises when I think about the alarming state of coral reefs worldwide and the numerous threats these delicate ecosystems face (Hughes et al., 2017). The wonder and admiration stem from the intricate nature of the reef, its vibrant colours, different shapes and biodiverse marine life have imprinted themselves upon my memory. For me, it is an amazing experience to observe the incredible biodiversity while pressing myself into this environment. Being in a world where other species do not seem to mind my presence feels quite special. In the sense that on land, most animals tend to flee away, while underwater, especially among fish, I can observe them for extended periods, and they appear either indifferent or even curious (Bozec et al., 2011; Rahimi, 2020).

Returning to the question of whether I can perceive the reef as part of our relatives? One significant aspect is that I have physically been there, I visited the reef and all the species living there multiple times. Speaking of visiting relatives, in human relationships, a visit is often the

most cherished aspect among relatives. On the other hand, if someone does not make the effort to visit it can be burdensome. Have all my dives and visits to the reef expanded my circle of relatives? The coral reef was a place I truly enjoyed visiting, and if costs had not played a role, I would have loved to visit the reef more often. I have cherished every form of visiting the reef, including various types of dives, both during the day and at night. Moreover, in the same manner as I said goodbye to all the lovely people in the camp and in the villages, I also said goodbye to the reef. In my fieldnotes and dive logbook I described it as "REEFolution goodbye dives":

This morning I did two goodbye dives together with Yatin. The first dive we followed the same route on the Pilli Pipa side as we did during last Sunday's night dive, and we spotted the same big orange frogfish once more. The sense of familiarity was comforting, both in terms of recognizing the underwater structures and seeing our froggy friend but during a different time of the day. For the second dive, we went to Firefly site. As it was my "goodbye dive" it was nice to dive at both sites of the reef, Wasini Island and Shimoni. But it feels bittersweet, knowing that these were my last dives in the channel (hopefully for the time being).
(Fieldnote, April 18, 2023).

My fieldnotes above subtly recall a sense of connection, and perhaps even symbolize saying goodbye to our relatives. My fieldnotes also touch upon night dives, which was one my favourite type of dives. For me, there is something fascinating about night dives, exploring the hidden treasures and try to find cryptic fish like frogfish and seahorses is simply amazing. A night dive is a unique experience where the complete darkness forces you to concentrate more, allowing you to spot species you might miss in daylight. Furthermore, everything looks different at night compared to during the day. During the night, the reef takes on an almost candy-like appearance, with bright colours reflecting off the light from the flashlight: green, purple, pink, and orange.

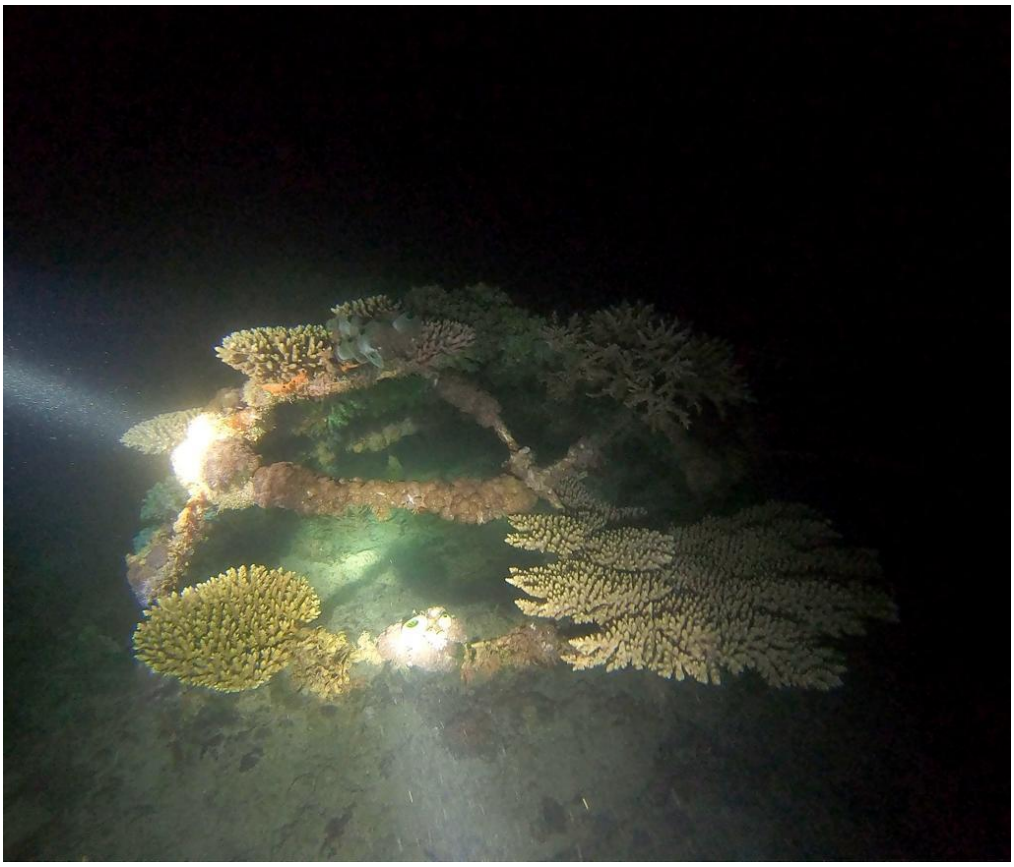

Figure 20 *Artificial reef during a night dive (Photo taken by Indy Koster on February 25, 2023)*

Figure 21 *Crab on an artificial reef during a night dive (Photo taken by Indy Koster on February 25, 2023)*

Deep dives are another type of dives worth noting. For instance, a deep dive that I did on February 12, 2023. We had planned to go to a dive spot outside of the channel, named Nyuli, but the ocean currents pushed us off course from our initial coordinates. For me, there is something special about looking down your fellow divers as you descend for a deep dive, into the deep blue, the tranquillity. When we reached a depth of around 30 meters, we encountered the reef. It did not look like a typical coral reef, instead, it resembled a mountain of sand with numerous anemones. I spotted many clown fish, some large groupers, parrotfish and an enormous ray, in size probably more than two meters. Every time I come across such massive species underwater, I am always astonished by their size and the fact that they thrive in the ocean. For me, a deep dive is truly a reminder of the hidden world beneath the surface, a world you normally would not visit, except through diving. Whatever is happening on land feels sometimes irrelevant when I am so deep down there. Conversely, the same can be said when we humans are on land, as some scarcely acknowledge the significance of events unfolding in the deep oceans.

Figure 22 *Descending on a deep dive (Photo taken by Indy Koster on February 12, 2023)*

Living by the tides

Upon my arrival in Shimoni, this place presented itself to me as a fishing village, as all the economic activities centre around the sea and her shore. Along the Shimoni jetty, one can always witness the constant movement of fishermen passing by. The jetty is a sight to behold with boats frequently docked. Most are local fishing boats known as "*dinghy*" in Kiswahili, but occasionally, vessels from Tanzania coming from the islands Pemba and Zanzibar also make appearances. At first sight, it might seem that the fisheries sector revolves solely around men, as they are prominently visible in the marine environment. During the day, fishermen prepare their boats, repair the fishing nets, and go actually fishing at the deep sea. Bwatumu, a fisherman from Shimoni, told me that fishermen locate the deep sea at the middle of Pemba (Tanzania), Mkwiro and Shimoni mainland. In his explanation: ‘‘With a motorboat it takes three hours to reach the deep sea and three hours to return. When you are at the deep sea you cannot see the land anymore, everywhere where you look you see the ocean’’[13]. Beyond the fisherman in the public eye, women have been active participants in various economic activities that are directly linked to the fishing sector in Shimoni and Wasini Island. These various roles create unique relationships and connections with the ocean, yet they all share a profound dependence on the same coral ecosystem.

At the end of October, I had my first introduction at the Beach Management Unit (BMU) in Mkwiro. Yvonne, the project manager of REEFolution, had arranged a meeting to introduce me to some female members of the BMU. In general, a BMU plays a crucial role in fostering organized community engagement in fisheries management. Members of the BMU are comprised of fishers, fish traders, boat operators and other stakeholders who have ocean-related jobs that rely on fisheries activities as their primary source of income. These units aim to ensure sustainable management and conservation of coastal resources (Tschentscher et al., 2023).

After the introduction at the BMU, I went to Mkwiro with Mwanaisha, a reef ranger from REEFolution. Mwanaisha helped me to contact the women of the BMU from the meeting that we had and with translating my interviews. Whenever Mwanaisha and I went to Mkwiro, we took a boat from the jetty in Shimoni. Due to the tidal range, the place where the boat would drop us off was always different, therefore I experienced different ways of coming towards Mkwiro. During high tide, the drop off was straight at Mkwiro beach, but during low tides we had to walk for quite some time over the ocean floor, while stepping on slippery stones, rocks,

[13] Interview Bwatumu (fisherman) January 25 2023, Shimoni.

and seagrass beds to reach the beach. During our low tide walks, Mwanaisha showed me that even the tiniest bit of water from the ocean contains life. She hardly ever walked straight to the beach, rather she was looking for different types of benthic organisms, such as seashells, sea stars, crabs and sea cucumbers that live on the ocean floor.

Figure 23 *Walking towards Mkwiro (Photo taken by Indy Koster on 26 January, 2023)*

Figure 24 *Walking towards Mkwiro (Photo taken by Indy Koster on 25 October, 2022)*

There is this idea of the ocean that it is accessible for everyone, and one can enter the sea whenever they want. However, when I started to conduct my interviews in Mkwiro, I noticed that the tidal range does not only affects the sea scape and attracts different types of marine life, but also determines who has access to the ocean and who has not.

All the women that I have interviewed in Mkwiro are part of the Beach Management Unit. Besides being a member of the BMU, these women fish octopuses, collect seashells and sea cucumbers to sustain their living and engage in a broader range of income generating activities. My conversations with them delved into the daily nature of their work. While the tasks remain consistent, the timing of these activities hinges on a variable that resonates with each response:

“it all depends on the tides”. Low tide provides most women access to marine services, since they are able to walk over the ocean floor and can search for instance octopuses. During high tide, certain activities become physically impossible. According to Ochieng et al. (2023), who conducted a study in the wider Shimoni area, women often encounter limitations in accessing the deep sea. This is primarily due to societal and cultural norms, along with concerns about the deep sea being perceived as a dangerous place. In contrast, men are allowed to go fishing in the deep sea and have access to sufficient equipment and gear (Ochieng et al., 2023, p. 14). Therefore, the narrative establishes a connection between tidal range and gender-specific activities around the reef. The tidal range, which refers to the difference in water level between high tide and low tide, plays a pivotal role in determining the activities permitted for both men and women around the reef, resulting in distinct roles and responsibilities. For instance, in the view of Hauzer et al. (2013) women tend to have direct interactions with corals as they typically engage in activities that require them to walk on reef flats and seagrass beds during low tide.

During low tide, one can see women walking along the shore all the way from Mkwiro to Wasini and the other way around. Since during low tide, octopuses can be found in tidal pools as they case small fishes or crabs who cannot come out of the pool. In order to catch the octopus, women search specifically for these intertidal pools, while they try to trick the octopuses out of their hiding place with a stick (Hauzer et al., 2013). I noticed that my interviewees do not categorize octopus fishing as a fishing activity, but always explained their job in terms of “catching octopus” or “octopus catcher”. As Omar explained to me, in Swahili they use the words "*kuchokoa pweza*" (hand collecting octopus) rather than *"uvuvi wa pweza*" (fishing for octopus) (Robertson et al., 2018, p. 40).

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Figure 25 *Octopus catching with a stick. (Picture taken by Indy Koster on February 24, 2023).*

Thus, I noticed that the women assume a central role at the shoreline, embracing a multifaced engagement with the ocean. They adeptly navigate a chain of activities, varying from octopus and catching, collecting seashells, but also take over the role of preparing the fish at the shore, as they clean, fry, and eventually sell the fish. The women who are involved in the latter activity are called *Mama Karanga*, which denotes women involved in the realm of small-scale fisheries, encompassing traditional fish vendors and processors who have become recognized for their signature of fried fish offerings at street markets and local restaurants in the coastal region of Kenya (Matsue et al., 2014). Most of the *Mama Karanga's* I have spoken to are based in Shimoni.

One of these women who is involved in small scale fishing sector of Shimoni is Purity, who waits the arrival of boats each day. Her role involves gathering the fish caught by fisherman, weighing them, measuring their length and writing down these data. Purity also affirms the

economic reef relations I touched upon before: “I got all my income out of the ocean, it is worth investing in the ocean, to get more back out of it”[14].

Figure 26 *Purity measuring fish (Photo taken by Indy Koster on November 1, 2022)*

Figure 27 *Purity weighing fish (Photo taken by Indy Koster on November 1, 2022)*

Coral perceptions

Shifting my focus from the demarcation between the shoreline and the deep sea, we delve into another captivating facet of the interviews, the profound perceptions women hold regarding coral reefs. The sequencing of this chapter seems to align naturally with my interview guide. As I first started to ask questions about their relations with the ocean, their job involving the ocean, the dependency on the ocean. Particularly in the early stages of my interviews, when I introduced the topic of coral reefs, there were moments when it seemed that my questions regarding coral reefs were not fully grasped.

[14]Interview Purity, November 1 2022, Shimoni.

Within the association of "coral reefs," lies immense significance, with people from varying backgrounds, education, influences and experiences offering personal explanations of what coral reefs embody to them. Once again, this prompts a reflection on my Western education, which has taught me to compartmentalize ecosystems within the framework of science, including the coral reef ecosystem. The scientific portrayal of coral reef ecosystems encompasses elements such as coral polyps, zooxanthellae, hard corals (*scleractinia*), soft corals (*gorgonians*), and beyond, these are all aspects within the realm of scientific education. However, I noticed that local knowledge is closely tied to a specific environment, and as a result, ontologies come into play. This sometimes led to my interviews discussing the ocean or the sea in a holistic manner, rather than specifically addressing the coral reef ecosystem as a distinct entity.

When I was asking about the importance of coral reefs or what coral reefs mean to them, two topics emerged, "ecosystem for fish" and "house of fish". In this section, I will briefly highlight some of these insights. The first topic centres around the crucial role marine life plays within the coral reef ecosystem, directly influencing the thriving fish populations. For instance, one member of the BMU expressed her viewpoint by saying: ‘‘I cannot describe coral reefs, but I know they are very important to conserve because if they are broken then fish cannot grow and have no breeding sites, so the coral offers like an ecosystem for fish’’[15]. Another perspective underscores the relationship between healthy coral reefs and fish populations: ‘‘Corals provide fish, if the corals are healthy the fish might also grow and which results in more kilograms of fish. So, if the corals are well kept, it creates a sustainable life’’[16]. Another interviewee adds:

> *So, I don’t have a lot of knowledge, but from the little knowledge that I got from seminars from the BMU, I know that* matumbawe*, so coral reefs, are the breeding places of fish. And you have to preserve and protect the coral reefs, because if you don’t then there are less fish breeding sides.* (Interview Mkasi, February 16, 2023, Wasini).

As "ecosystems for fish," coral reefs facilitate fish growth and reproduction, contributing to the sustainability of fish populations. This ecological perspective underscores the interconnectedness of marine life and highlights the dependence of certain species on the structural complexity and resources provided by coral reefs.

[15] Interview, December 6 2022, Wasini.
[16] Interview Purity, November 1 2022, Shimoni.

Coral reefs, the house of fish

Closely related to the former quotes regarding coral reefs as part of the marine ecosystem, other interviewees told me solely that coral reefs are ‘‘*nyumba ya samaki”* (the house of fish): ‘‘Coral reefs are in shallow water and act as a house of fish. The fish hide in the coral reefs then they may come out to get food and return in their house’’[17]. As translated by Omar, he told me the following:

> *She is aware that coral reefs act as structures, big structures, which are sometimes even bigger than the size of people and fish hide themselves there and they live there. So, for her it is a house of fish, lobster and other sea creatures.* (Interview Magahatibu, December 9, 2022, Wasini).

Perceiving coral reefs as houses for marine life covers the ecological importance of these habitats. The comparison drawn between coral reefs and houses underscore the protective and nurturing role that coral reefs play in marine ecosystems. This perspective reinforces the intrinsic value of coral reefs beyond their aesthetic appeal or economic potential. Some other interviewees described coral reefs as stones, yet one could also interpret that these stones form a construction of a house: ‘‘I know coral reefs as stones which look like pots in the ocean. And I know that there are beautiful fish living there’’[18].

> *So about coral reefs, I do not know the importance, but I know that corals are stones which have some little caves in them. Like during my childhood I used to do octopus catching, and then I came close to the corals and tried to get out the octopus. And corals I just see them as any other stones.* (Interview Ahadi, January 16, 2023, Shimoni).

These shared perceptions of my interviewees, portraying coral reefs as houses of fish bring to mind a conversation I had with Cindy, a reef ranger from REEFolution, as she described the ocean and coral reefs as a home. While the choice between "house" or "home" may differ slightly, both terms underscore the critical role that coral reefs play in supporting biodiversity and providing shelter for fish. These terms highlight how coral reefs are not just passive structures, but dynamic and essential environments for a wide range of marine life. Cindy beautifully explained to me:

[17] Interview, BMU member, November 4 2022, Mkwiro.
[18] Interview Madia, January 16 2023, Shimoni.

> *So, the whole ocean is like a home, if a species on land when is becoming extinct, the whole world goes crazy. I think it should apply the same to the ocean, and that's why it is important to restore the coral reefs, because those are homes. What we do here at REEFolution, for example when we restore a reef or we put a new structure today, the next day you can be sure that someone has made a home there. So, I feel it is really, apart from the textbook texts, coral reefs are a home. And I have seen it with my own eyes, and for me I have seen how important that is, because imagine on land, if I lose my house and then governments come and build houses and then refugees or people who have been displaced come in and can life there. I can imagine the feeling of your house being destroyed but now someone else made a new house for you. So, I usually imagine when we get underwater and we do coral restoration a fish is like; ''hey guess what guys someone made a new house for us", that is how I see it so I see the importance of it.* (Interview Cindy, January 5, 2023, Shimoni).

Cindy's metaphor of the ocean as a collective home resonates deeply with the interconnectedness of ecosystems. By comparing the creation of new coral homes to the provision of shelter for displaced individuals on land, she bridges the gap between human empathy and the intricate relationship within coral reef ecosystems. Her words capture a multispecies viewpoint that acknowledge the reefs not only as essential for human well-being but also critical habitats for countless other species. To some degree, this aligns with the principles presented in Paul Dobraszczyk's book *Animal Architecture: Beasts, Buildings and Us* (2023). While Dobraszczyk's work does not specifically focus on coral reef ecosystems, the underlying philosophy revolves around the concepts of coexistence between humans and animal species within their shared environments. Dobraszczyk introduces another way of thinking about the concept of architecture through the perspectives of species beyond our own, urging us to create environments and homes that take into account the needs and experiences of these other inhabitants (Dobraszczyk, 2023).

The parallel that is drawn between coral reefs and houses of fish reminds me of a couple of dives I did with the purpose of mapping the circumferences of artificial reef patches at the dive site Kikuyu House. For these dives, we had to apply the Restored Reef Areal Dimension (RRAD) method, which is a simple way to measure how much space the planted corals cover and how they have grown over time in a restored reef (Goergen et al., 2020, p. 25). First, we had to measure directly around the patches, involving the area where the physical planting of corals has been carried out. Thereafter, we had to measure the ecological footprint, which includes for instance coral fragments near to the artificial reefs that assumed to originate from

the out planting. The mapping process had already begun above the waterline, since we needed reference points on land to find our entry point to start navigating underwater. The two baobab trees, one grand and the other smaller, next to the stairs of Kikuyu House served as our landmarks. As we descended, the artificial reef structures appeared for us. We swam between all the different structures with our measuring tools (flexible survey tape and a whiteboard) in our hands.

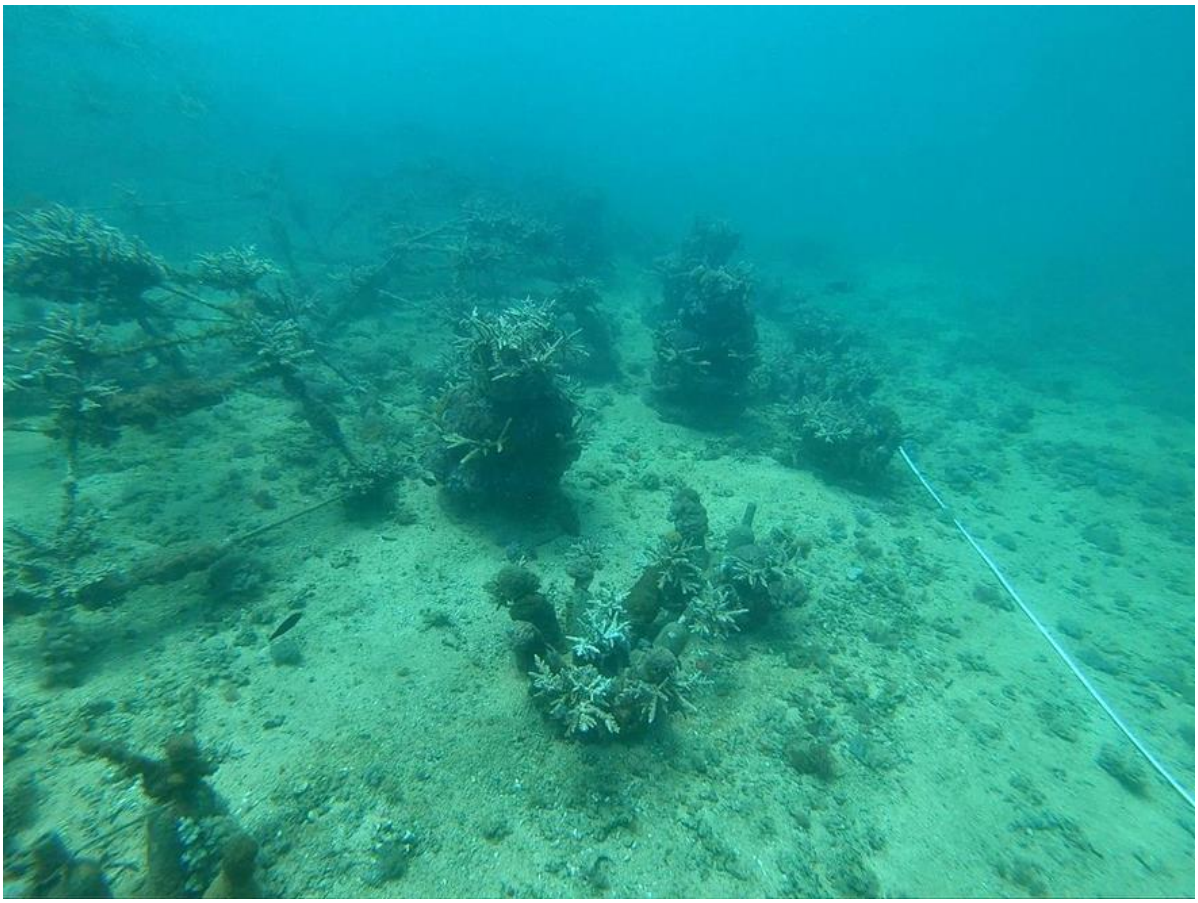

Figure 27 *Mapping the circumference of Artificial Reefs with survey tape, the white line on the right. (Photo taken by Indy Koster taken on March 1, 2023)*

As we navigated between the different artificial reef patches, it often felt as we were measuring not just the circumference of artificial reefs, but the boundaries of houses, even though the ocean is an open space. From my human point of view, especially the metal cage structures, look really like the foundation of a house. These artificial reefs, once lifeless structures, where teeming with life and had been transformed into thriving underwater habitats. For instance, I observed that there are usually some pufferfishes inside the large cages. In general, for me, it looks like bigger fish or schools of fish seem to prefer staying inside the cages, as they are

seeking shelter. On top of the cages, where out-planted coral fragments are placed, almost at the outer edges of the corals, there are more small groups of damselfish swimming around. To me it appears that different types of artificial reefs attract their own species of fish.

Figure 28 Fish on top of artificial reef (Photo taken by Indy Koster on April 18, 2023)

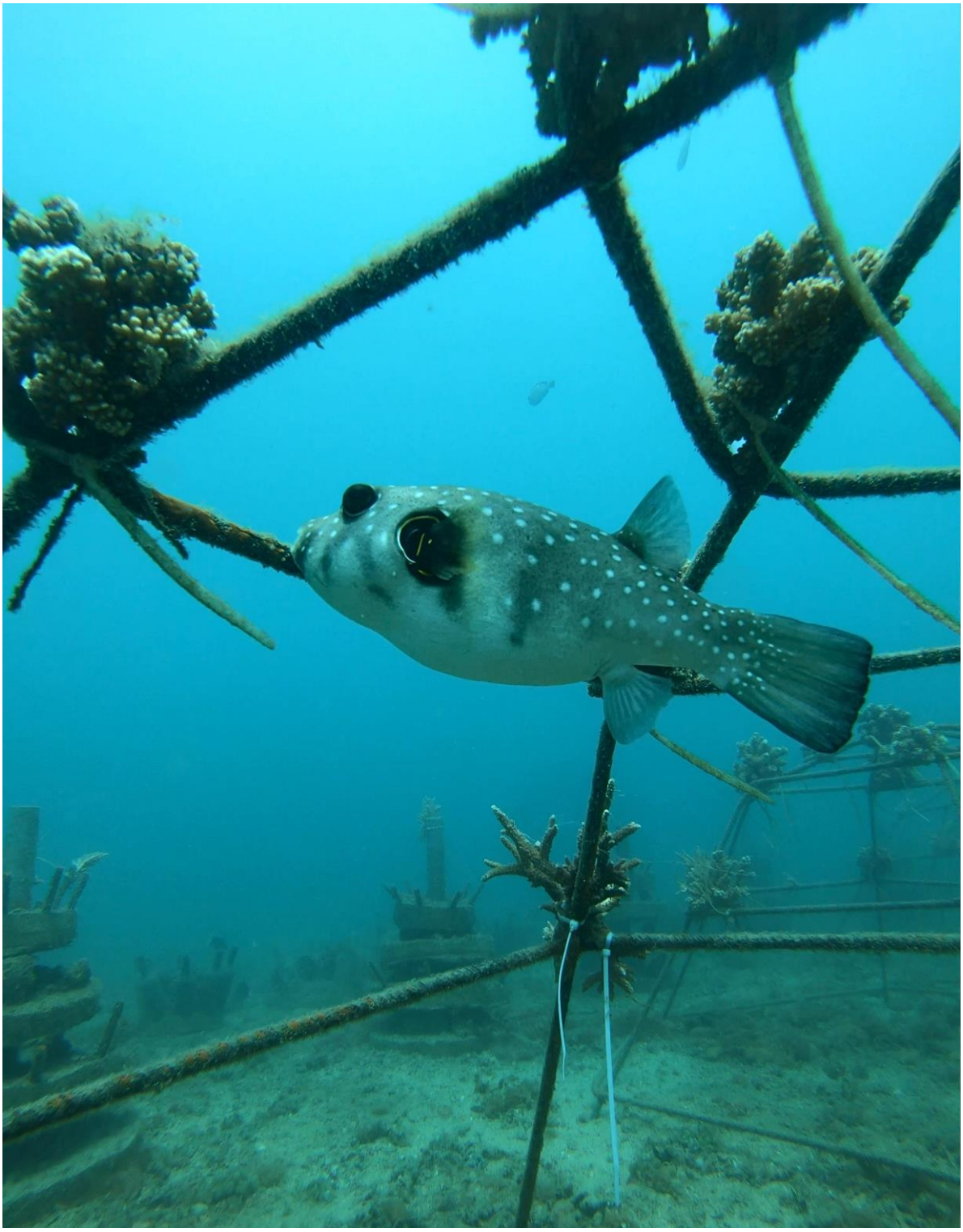

Figure 29 *White spotted puffer fish in a cage (Photo taken by Indy Koster on November 7, 2022)*

Figure 30 *A group of orbicular batfish in a cage (Photo taken by Indy Koster on November 7, 2022)*

As my conversation with Cindy continues, she shares her concerns with me, regarding the loss of these collective coral homes.

> *But now it is getting scary, because the ocean is dying, and the corals are a home to fish, and the ocean is a home to the corals, but if the ocean itself is dying, everything is going to be affected.* (Interview Cindy, January 5, 2023, Shimoni).

I asked her about what she thought are the biggest threats for the coral reef in Shimoni. According to Cindy:

> *It is climate change, because specifically in the channel we don't have commercial fishing methods, even though there are some destructive fishing methods that do not create a huge negative impact on the corals so I feel like that people right now are not the problem here in Shimoni. Even though they produce waste that ends up in the ocean, you know this area is not industrialized, but even though the waste ends up in the ocean it is still a small percentage, the ocean can take care of itself right now, but the way things are going, like urbanization coming in and climate change, it will get worse.* (Interview Cindy, January 5, 2023, Shimoni).

Cindy holds the greatest apprehensions regarding climate change. Yet, her fellow reef ranger Bulisa, adds on this and stresses the role of humans regarding threats to the coral reef.

> *Definitely humans and unsustainable use of marine resources, for sure. I mean, that's how we ended up where we are now. So, whether it's like localized threats like destructive fishing or unsustainable tourism, whether it's that or just like bad fisheries management or global threats like climate change or global warming, all that is just being enhanced and made more of a threat by humans.* (Interview Bulisa, January 24, 2023, Shimoni).

All the passages above from my interviews describe the coral reef ecosystem as a captivating world that is facing serious threats. Beyond its beauty, the coral reef stands as a delicate entity, extremely vulnerable to the impacts of the shifts brought about by climate change and human interference.

Reefs at risk

Transitioning to the perspectives of the local community I interviewed regarding threats to the reef; it becomes evident that sentiments expressed in the aforementioned passages are not limited to reef rangers and researchers alone. For the women in Shimoni and on Wasini Island, the reef embodies a way of life, a source of livelihood and as previously mentioned an economic symbol. As the tides of climate change sweep across our globe, the people who have lived with the reef for generations are now witnessing its transformation firsthand. Traditional fishing grounds are shifting, and once-reliable weather patterns are becoming unpredictable.

The primary threats to coral reefs frequently cited by the participants concerns climate change and overfishing. Overfishing represents a more localized concern and encompasses destructive fishing practices, as well as the presence of too many fishermen. As a woman from Wasini and a fisherman from Mkwiro, told me:

> *So, in the past there used to be very few fishermen and now we have a lot of fishermen, and they all use different types of fishing methods. So, there is an increase of fishermen, and there is a reduction of fish and overexploiting of the ocean.* (Interview Hadiya, December 6, 2022, Wasini)

> *You know in the past, very close the Kenyan border people, fishers from Tanzania were coming with bombs, they were putting it on the corals and then they destroyed the corals with dynamite fishing. Now they do not do dynamite fishing anymore, but the fishers from Tanzania still fish in our water, because when they are in Kenyan waters, they think the Kenyan rules do not apply for them, and there is no regulation.* (Interview Fahrid, January 27, 2023, Mkwiro)

However, the most captivating discussions surrounding reef threats revolved around the topic of climate change. My interviewees expressed their foremost concern regarding climate vulnerability, especially changes unusual seasonal patterns or extreme weather events. For instance, when I was asking about climate change, some of my interviewees mentioned the rising sea temperatures, and mostly the intensity of the sun becoming more severe throughout the years:

> *The ocean is not stable, so comparing to the past it is frightening sometimes. I don't know how to describe it, sometimes I mean the water becomes more in volume than normal. I hope you get it? But the high tide is way higher and there is more water volume now, so the sea water is rising.* (Interview Mkasi, February 16, 2023, Wasini)

Climate change causes big changes compared to the past. When we were young the weather was more consistent. So, when we go back to the young age, we used to see that the rain was enough and always in the same months. The season is in the proper arrangement, they don't change. Maybe you experience rainy season in May and April, those three months from March till May, but nowadays it can even prolong to July or August. So, the pattern is not determinable anymore, that is a change I do experience. In terms of the sunny season back in those days this season was quite short, but nowadays it is long, and it becomes warmer and warmer. If things are going on in the way we do experience right now, it is going to be worse. (Interview Madia Ali, November 15, 2022, Shimoni)

In the past the ocean was something good, very good indeed, but nowadays things are becoming worse in terms of catch. So I am not sure whether it is climate change or the methods they use for fishing, or if it are myths, but I think that people are usually saying that it is the climate, yeah in terms of climate I cannot go in detail, because I am not an expert but the seawater temperatures is normally too high, so you see due to the sun the ocean is experiencing a lot of instability. (Interview Fatumu, December 09, 2022, Wasini)

So tourist are no threat to the ecosystem, they rather appreciate the corals and then they provide money to us. So, tourist activities are no threat, but it is mostly the sun. So first the temperatures go up, then it gets really hot and so the water gets warmer. Then the fish go away and change from here to Pemba and they find cold waters there. (Interview Hadiya, December 6, 2022, Wasini)

For most of the people that are doing conservation, they know about climate change and the treats to the coral reef. But for those who are not involved in conservation, they experience climate change, but they do not know how it affects the ocean, they always say it is because of the intensity sun and they complain, hakuna samaki, hakuna samaki*, like there is no fish.* (Interview Asma, January 17, 2023, Shimoni)

As evident from the passages above, my interviewees are aware of the effects of climate change. For climate change they gave various explanations, such as the rising seawater temperatures and the intensity of the sun. To them, these climatic shifts result in unpredictable seasons and rough seas.

The moon, wind and sea are involved in a complex triangle relationship, all influencing each other. The moon is responsible for tidal differences, known as high and low tide, and the monsoon winds influence the currents and the wave intensity. Within the Wasini Channel, the monsoon winds also have an impact on the coral reef, sometimes my interviewees mentioned

this as a threat: ‘‘So *kaskazi* is worse for the corals because it breaks the corals because the waves are so strong in this period’’[19] and ‘‘The high tides and currents they break the coral reefs, so that is a threat. People are not a threat, because there is nobody who goes into the ocean and breaks the corals off’’[20]. Ewout explained the effect of the monsoon winds on the corals in more detail to me:

> *During* kusi *it is the rainy season so then the rivers will full up and overflow and this will also bring a lot of sediment to the sea. In this period the visibility during diving is just lousy and all the sediment particles also directly affect the coral reefs. The coral has to get the sand off again, because if it is covered in sand the corals get less sunlight. So* kusi *is a though period for the coral. At the moment it is* kaskazi, *and even though there is actually a weaker wind during* kaskazi*, here in the channel we experience more coral pieces breaking off because there is a big swell now, so while in other places there is often more damage during* kusi. *(a bit depending on how the reefs are located towards the wind). We here see more coral breaking off during* kaskazi. *Still on the other hand the conditions for diving are better before and around* kaskazi, *because there is more light and as a result better visibility. And then there is the period between* kusi *and* kaskazi*, this period normally starts in March, then there will be almost no wind and the temperatures will peak, so that is the moment there could be coral bleaching in warm years.* (Interview, Ewout February 27, 2023, Shimoni).

Moreover, the different moon phases also affect the sea, leading to the physical phenomenon of high and low tides. As mentioned previously, the Wasini Channel can experience extreme tidal differences. My fieldnote descriptions vividly recall an observation of extreme low tide:

“This week, we are experiencing an exceptionally low tide. For instance, yesterday around 11:43 AM, the low tide was measured at a point of -0.09 meters. Whereby the placed structures within the intertidal zone emerged above the surface, and many corals were completely exposed. Observing this scene feels surreal, as I often encountered these structures and corals while diving, and now due this natural phenomenon of tidal differences, they are not even surrounded by water.” (Fieldnote, February 23 2023).

[19] Interview Meyanga, 26-01-2023, Mkwiro.
[20] Interview Magahatibu 09-12-2022, Wasini.

Figure 31 *Exposed corals on the surface due to extreme low tide. (Photo taken by Indy Koster on February 22, 2023).*

Figure 32 *Extreme low tide (Photo taken from the jetty by Indy Koster on February 22, 2023).*

As I wrapped up my interviews, a question that frequently emerged was centred on the perspectives of my interviewees regarding the future of coral reefs. Some expressed uncertainty, citing their belief in the unpredictability of the future, or saying that only God can predict the future. However, one notable topic that emerged in connection to this question was the proposed construction of the upcoming fishing port in Shimoni. As some narrated their concerns:

> *So, I have the feeling that the future of the ocean does not look bright, with the coming of the fishing port there will be dredging and drilling of things so the ocean will be polluted, and the fish will run away, some will die, and it does not look good for fisheries.* (Interview Mkasi, February 16, 2023, Wasini).

> *Okay the future of Shimoni will be brighter, we will have economic growth. But one challenge is the ocean is in danger, especially with the port that is coming. Even though they say that they won't be dragging, it must be there, I mean how will you locate a ship in shallow waters, it is impossible you will have to let down your anchor, and that will definitely affect coral reefs. Most of the fishermen will drop their fisher jobs, so we have this open water fishing and then we do not have conservation operations because most of the people are concentrating on getting jobs, like simple jobs that are easy to get, instead of those that require interacting directly with nature. They will concentrate on the employment instead of the direct sustainable employment.* (Interview Asma, January 17, 2023, Shimoni)

Despite all the challenges and uncertainties, many also expressed hope, highlighting ongoing conservation efforts, such as the REEFolution project:

> *REEFolution is good because they grow corals and the fish lay more eggs, so that means more fish in the future, so I am very happy with the project.* (Interview Shamari, October 25, 2022, Mkwiro).

> *In the upcoming years we are expecting more productivity. This is because Mkwiro BMU is creating policies whereby they protect the reef and are saying do not fish here, do not catch octopuses, we call it* tengefu. *Like the idea is to have the area enclosed to have a breeding site and then fish will spread to other areas, so we are expecting more productivity in the future.* (Interview Mwafatime, October 28, 2022, Mkwiro)

> *If you take an example of a garden, you have your own garden at home, so you have trees, a lot of flowers, a lot of fruits and green leaves. So, it gives you a good feeling in your heart that you can let it grow, and that is the essence of life, fulfilling your heart full of happiness. So, the project is a good thing, when they let the coral reefs grow there will be a lot of fish, and when you see corals with a lot of fish you feel this happiness, because you know that in the future my kids might have fish as well.* (Interview Bwatumu, January 25, 2023, Shimoni)

In conclusion, this chapter has ventured into uncharted waters within the discipline of humanities and social sciences by adopting a multispecies perspective, reflecting the paradigm shift known as "the species turn" (Kirksey & Helmreich, 2010). The "species turn" calls for a broader perspective that includes the study of interactions between humans and other species, by emphasizing the interconnectedness of species and ecosystems (Kirksey & Helmreich, 2010). While this chapter is founded upon empirical findings rather than theoretical constructs, I have tried to incorporate diverse intellectual frameworks and perspectives from other multispecies scholars. For instance, Hayward (2010) showed by the introduction of the concept "fingeryeyes" that sensory perception goes beyond humans and that non-human begins such as corals also have their own ways of sensing and interacting with their environment, thereby attributing a form of agency to corals. The approach of Amativ Ghosh (2022) challenged me to reflect upon to perceive non-human beings, including coral reefs, as part of our relatives. What all these multispecies scholars have in common, is that they encourage a more holistic approach in order to address ecological challenges.

That is why, within this chapter, I have attempted to emphasize the element of care and why the coral reef is worth of representation. The data presented in this chapter have shown that the lives of women in Shimoni, Wasini and Mkwiro are fully and closely intertwined with the coral reef. In the light of this, I have sought to apply and write in the discourse of ‘ethics of care’, drawing inspiration from the feminist social sciences and political theory, as proposed by De La Bellacasa (2012). Throughout the narrative, there existed a continuous interplay between my personal observations and the perspectives shared by my interviewees concerning the reef and the surrounding ocean. In the final chapter, I will reflect more upon these narratives, answer my research question and delve deeper into my reflections.

Chapter 4 - Conclusion: Reef reflections

The phrase ‘‘Coral reefs are the house of fish’’ *(“Miamba ya matumbawe ni nyumba ya samaki”)* served as the source of inspiration for the title of my thesis, as these words capture the core essence of my research, not only for its rich significance but also because these words derived directly from the insights of my interviewees. In this regard, these words are rooted in the context of this specific coastal region in Southern Kenya where my research took place. Besides, it also touches upon my time spend at REEFolution, as the aim of reef restoration is to rehabilitate and rebuild coral reefs that have been damaged or degraded. By restoring coral reefs, REEFolution helps to restore ‘‘the house of fish’’. My research aims to understand and to explore in what ways the women in Shimoni and on Wasini Island perceive the coral reef. Occasionally during interviews, the reef takes on the role of a backdrop, contributing to the broader context of the socio-economic and ecological landscape. In this concluding chapter, I shall outline the central thesis argument and weave a narrative that illustrates the different reef relations in the context of multispecies approaches.

Economic reef relations

As I noted earlier in chapter three: ‘‘to the residents of Shimoni and Wasini Island, the ocean and its coral reefs are not just a picturesque backdrop, it is the foundation of their existence.’’[21] Within conversations about the ocean and its coral reefs, my data presented that the importance of economic value tied to the reef is quite prominent, the so-called blue economy. Nearly all women I conversed with perceived the coral reef primarily as a valuable economic resource, however they spoke in two discourses regarding the reef, which were interestingly intertwined. Firstly, the coral reef is perceived as a source of income with tangible economic benefits that can be witnessed. In other words, they view the reef as a place where they can derive economic value, through fishing related activities or tourism, therefore I propose to speak of ‘‘economic reef relations’’. Some of my interviewees approach their relation to the reef as a return on investment, almost like a shareholder perspective, whereby they believe that taking care of the ocean gives them economic benefits in return: ‘‘taking care of the ocean so that the ocean could take care of you’’ (Storme, 2023, p. 7). The livelihoods of the residents of Shimoni and Wasini

[21] See page 49.

Island depend on the coral reef ecosystem services. Their reliance is mainly narrated in a resource-centric perspective and reflects many facets of their relationship with the environment, often framed in terms of extraction practices, such as octopus *catching* and seashell *collection*. On one side, the values that they assign to the reef are functional and anthropocentric. However, given that the majority of people rely on fishing and tourism, breaking free from the extraction-based resource narrative entails diversifying their income sources.

Next to the functional descriptions of corals as important service providers for their livelihood, there is a contrasting discourse that emphasizes nurturing and caring elements for the reef. By describing coral reefs as ‘‘the house of fish’’, it sounded as a more intimate relationship and placed inherent value upon the reef. Besides, I noticed that women who are actively engaged at the Beach Management Unit tend to possess a deeper understanding of coral reefs and their ecological ecosystem functions. These women also expressed a greater familiarity with the specific restoration efforts such as employing bottle reefs, in contrast to women who were not actively involved at the BMU and knew little about coral reef restoration efforts. The resource and the caring discourse create an interesting paradox in the way one addresses reef relations. Furthermore, the coexistence of these two discourses highlights the complexity and multidimensionality of the interactions between the local communities and the coral reef.

From a community perspective, framing for instance policy regulations concerning reef related activities in a way that aligns with local ontologies could resonate more effectively with a wide range of people in various ways. The way people define their perception of coral reefs reflects the significance they ascribe to that relationship. For instance, when referring to coral reefs as the ‘‘the house of fish’’ (*nyumba ya samaki*), it can help foster a sense of connection and recognition as an extension of their community. Encouraging a caring discourse over a resource-focused discourse could be beneficial.

Shifting seasons

In general, the women expressed great concern to the risks that the coral reefs face. One thing that particularly caught my attention regarding perceptions of threats to the reef was that during our conversations of climate change, my interviewees specifically mentioned seasonal change. While reflecting upon this, Omar told me that when people talk about climate changes, they indirectly refer to the monsoon winds *kusi* (southeast monsoon) and *kaskaz*i (northeast monsoon) thus the change of seasons or weather patterns. In essence, this perspective itself

conveys not a strict interpretation of climate change, instead framing it rather in a context of changing seasons. I find this perspective intriguing, as it contrasts the conventional focus on long-term impacts and instead emphasized the immediacy of change. This viewpoint allows for a more tangible experience of transformation, one that can be sensed, witnessed, and lived within this specific local context. In contrast, the scientific discourse on climate change often appears to be too abstract and too distant according to my interviewees. In summary, the future still presents enormous challenges, notably coral bleaching driven by climate change, which remains a pressing global issue largely beyond the control of local communities. Despite this frightening global perspective, the efforts and the results of coral restoration projects such as REEFolution show us that paying attention to a specific local context still matters.

Before my time in Shimoni, I had not encountered the Swahili monsoon terminologies. Upon my arrival in Shimoni in late September 2022, I experienced the tail end of the *kusi* period, the monsoon wind typically spanning from April to September and resonating with the rainy season. My fieldnotes vividly recall the evening winds of September, as I watched the sunset, transitioning into a cool chill. Notably, the winds intensified as night fell. Progressing into mid-October through November marks the onset of short rains. From November onward, the weather became drier and sunnier. The arrival of *kaskazi* became evident as the temperature gradually rose, with this trend continuing until March. In January the wind was very strong, and the waves became more intense, which was partly a result of *kaskazi.* March marked the role of a transitional month between the two monsoons patterns, the wind came almost to a complete standstill, and temperatures reached their peak. In April, the temperature began to decline, signalling the arrival of the rainy season and transitioning into the *kusi* period. I was leaving Shimoni in late April 2023, at the start of the rainy season.

For future research, one could focus more in depth on locally relevant understandings of climate change and then investigate the implications of these perceptions on coral reefs. Taking into account the shifting monsoon seasons intensifying due to climate change, along with other factors perceived by my interviewees, such as rising sea levels and a warmer sea as a result of higher temperatures, there is the potential for these elements to impact the relationship that women share with the coral reef in the future. Therefore, I would advocate for a comprehensive year-long immersion in fieldwork, emphasizing the importance of experiencing the complete shift of seasons to gain a holistic understanding of the environment. The simple but actual reflections on climate change from the community perspective, are all valuable insights.

Being with corals

Alongside researching the perception of women in Shimoni and on Wasini Island, this thesis also introduced new insights into the diverse ways coral reefs can be studied and understood, opening up possibilities for more holistic and inclusive research methodologies in the realm of social sciences and humanities. By engaging being with corals through scuba diving and applying multispecies perspectives, I introduced a new way of conducting ethnographic research. Apart from the physical aspect of being within the coral reef ecosystem and directly experiencing their natural environment, one of the greatest challenges I encountered was contemplating the idea of being with corals and the profound connection with corals, by combining my own perceptions and those of my interviewees and translating these thoughts onto paper. Including coral reefs, a non-human entity, into my thesis, which primarily draws from multispecies approaches, remains relatively uncommon, that is why my approach was exploratory and presented my data in an empirical chapter.

Moreover, incorporating corals as a multispecies being prompted me to reflect upon our binary way of thinking, challenging many conventional approaches that are centred around an anthropocentric worldview. The framework of multispecies ethnography is important, because it allowed me to show how much the livelihoods of the coastal community in the wider Shimoni area and the ecological well-being of the coral reef are interwoven. While the multispecies lens poses theoretical and methodological challenges, I believe its most important aspect lies in its call for a new way of thinking. As we continue to face environmental challenges and the urgent need for conservation efforts, this trans-disciplinary and multispecies approach becomes ever more critical in promoting a comprehensive and sustainable understanding of our planets ecosystems. This becomes particularly important in a time of both despair and hope, where the devastating effects of bleaching coexist with ongoing reef restoration efforts ‘‘and how we might better care for our coralated communities and futures’’ (Braverman, 2018, p. 255). Perhaps, by reflecting upon this, and diving beyond the conventional shore, this multispecies perspective allows us to analyse socio-economic and environmental problems regarding coral reefs more in their entirety.

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Appendix

NR.	Date	Time	Location	Dive site	Duration	Depth	Type
1	11-10-2022	09:43	Kenya, Shimoni	Pilli Pipa	48:00	6.6 m	Coral reef restauration specialty course (1)
2	11-10-2022	10:53	Kenya, Shimoni	Pilli Pipa	54:00	7.0 m	Coral reef restauration specialty course (2)
3	11-10-2022	14:55	Kenya, Shimoni	Firefly	74:00	4.6 m	Coral reef restauration specialty course (3)
4	18-10-2022	10:31	Kenya, Shimoni	Pilli Pipa	30:00	8.6 m	Restoration dive (harvesting corals)
5	18-10-2022	11:35	Kenya, Shimoni	Pilli Pipa	20:00	9.0 m	Restoration dive (harvesting corals)
6	20-10-2022	18:04	Kenya, Shimoni	Firefly	71:00	12.6 m	Night dive
7	26-10-2022	10:18	Kenya, Shimoni	Pilli Pipa	57:00	7.2 m	Restoration dive (cleaning coral structures)
8	02-11-2022	10:53	Kenya, Shimoni	Firefly	83:00	2.4 m	Research experiment dive: potential growth and survival trade-offs (taking pictures)
9	02-11-2022	12:27	Kenya, Shimoni	Firefly	33:00	3.7 m	Research experiment dive: potential growth and survival trade-

							offs (taking pictures)
10	07-11-2022	10:48	Kenya, Shimoni	Pilli Pipa	18:00	6.1 m	Restoration dive (harvesting corals)
11	07-11-2022	11:38	Kenya, Shimoni	Kikuyu House	45:00	10.7 m	Fun dive
12	08-11-2022	16:34	Kenya, Shimoni	Firefly	86:00	3.0 m	Research experiment dive: potential growth and survival trade-offs (taking pictures)
13	17-11-2022	10:56	Kenya, Shimoni	Firefly	111:00	4.5 m	Research experiment dive: mineral accretion
14	18-11-2022	10:54	Kenya, Shimoni	Firefly	119:00	4.0	Research experiment dive: mineral accretion
15	02-12-2022	18:43	Kenya, Shimoni	Pilli Pipa	60:00	13.7 m	Night dive
16	04-12-2022	09:54	Kenya, Shimoni	Kisite Marine National Park	53:00	12.8 m	Fun dive
17	04-12-2022	11:07	Kenya, Shimoni	Kisite Marine National Park	46:00	8.8 m	Fun dive
18	07-12-2022	15:59	Kenya, Shimoni	Firefly	97:00	4.3 m	Research experiment dive: potential growth and survival trade-offs (taking pictures)
19	08-12-2022	15:59	Kenya, Shimoni	Firefly	86:00	2.8 m	Research experiment

							dive: potential growth and survival trade-offs (taking pictures)
20	13-12-2022	09:46	Kenya, Shimoni	Firefly	20:00	1.6 m	Research experiment dive: potential growth and survival trade-offs (taking pictures)
21	13-12-2022	10:16	Kenya, Shimoni	Firefly	31:00	2.5 m	Research experiment dive: potential growth and survival trade-offs (taking pictures)
22	13-12-2022	15:24	Kenya, Shimoni	Firefly	35:00	1.8 m	Research experiment dive: coral spawning
23	14-12-2022	15:30	Kenya, Shimoni	Firefly	123:00	3.3 m	Research experiment dive: mineral accretion
24	15-12-2022	15:25	Kenya, Shimoni	Firefly	121:00	3.4 m	Research experiment: dive mineral accretion
25	16-12-2022	11:33	Kenya, Shimoni	Firefly	20:00	2.7 m	Research experiment dive: coral spawning
26	16-12-2022	12:03	Kenya, Shimoni	Firefly	56:00	3.7 m	Research experiment dive: coral spawning
27	06-01-2023	09:47	Kenya, Shimoni	Firefly	153:00	3.1 m	Research experiment:

							dive mineral accretion
28	12-01-2023	10:17	Kenya, Shimoni	Kikuyu House	87:00	8.8 m	Mapping circumference of Artificial Reefs
29	13-01-2023	09:59	Kenya, Shimoni	Firefly	77:00	3.2 m	Mapping circumference of Artificial Reefs
30	19-01-2023	09:30	Kenya, Shimoni	Firefly	22:00	1.8 m	Research experiment dive: coral spawning
31	19-01-2023	10:17	Kenya, Shimoni	Kikuyu House	68:00	8.1 m	Mapping circumference of Artificial Reefs
32	01-02-2023	14:19	Kenya, Shimoni	Firefly	69:00	3.9 m	Research experiment dive: coral spawning
33	11-02-2023	10:30	Kenya, Shimoni	Kiste Marine National Park	80:00	6.9 m	Fun dive
34	12-02-2023	09:25	Kenya, Shimoni	Nyuli	42:00	28.7 m	Deep dive
35	12-02-2023	11:25	Kenya, Shimoni	Wasini	68:00	8.0 m	Fun dive
36	23-02-2023	10:24	Kenya, Shimoni	Kikuyu House	78:00	8.4 m	Mapping circumference of Artificial Reefs
37	24-02-2023	10:25	Kenya, Shimoni	Kikuyu House	70:00	9.7 m	Mapping circumference of Artificial Reefs
38	25-02-2023	18:59	Kenya, Shimoni	Pilli Pipa	62:00	14.9 m	Night dive

39	26-02-2023	10:13	Kenya, Shimoni	Kisite Marine National Park	58:00	14.4 m	Fun dive
40	01-03-2023	09:52	Kenya, Shimoni	Kikuyu House	85:00	10.3 m	Mapping circumference of Artificial Reefs
41	03-03-2023	18:55	Kenya, Shimoni	Pilli Pipa	82:00	13.8 m	Night dive
42	19-03-2023	09:38	Kenya, Shimoni	Nyuli	40:00	32.2 m	Deep dive
43	19-03-2023	09:38	Kenya, Shimoni	Secret Place	55:00	20.8 m	Deep dive
44	30-03-2023	18:56	Kenya, Shimoni	CMA (Mkwiro)	63:00	14.6 m	Night dive
45	02-04-2023	12:07	Kenya, Shimoni	Kisite Marine National Park	70:00	14.0 m	Fun dive
46	03-04-2023	09:47	Kenya, Shimoni	Kiste Marine National Park	75:00	10.9 m	Fun dive
47	03-04-2023	18:50	Kenya, Shimoni	Pilli Pipa	70:00	14.3 m	Night dive
48	04-04-2023	10:38	Kenya, Shimoni	Firefly	54:00	3.7 m	Restoration dive: outplanting corals
49	06-04-2023	15:30	Kenya, Shimoni	Firefly	64:00	4.5 m	Research experiment dive: coral spawning
50	07-04-2023	19:03	Kenya, Shimoni	CMA (Mkwiro)	74:00	14.0 m	Night dive
51	08-04-2023	18:26	Kenya, Shimoni	Firefly wall	73:00	14.6 m	Night dive
52	14-04-2023	10:19	Kenya, Shimoni	CMA (Mkwiro)	81:00	7.9 m	Restoration dive (outplanting corals)

53	16-04-2023	18:50	Kenya, Shimoni	Pilli Pipa	70:00	12.7 m	Night dive
54	17-04-2023	10:15	Kenya, Shimoni	Kikuyu House	63:00	6.6 m	Restoration dive (harvesting corals)
55	18-04-2023	10:12	Kenya, Shimoni	Pilli Pipa	45:00	13.1 m	Fun dive (REEFolution goodbye dive)
56	18-04-2023	11:38	Kenya, Shimoni	Firefly wall	49:00	13.9 m	Fun dive (REEFolution goodbye dive)