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Human and Nature at Conflict: A case study of
Mauritius flying fox, *Pteropus niger*



By

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(NKNTAV001)

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Acknowledgements

This thesis was written for the fulfilment of my MPhil in Environmental Humanities at the University of Cape Town, South Africa. The subject of this thesis is related to the recent and on-going culling of the Mauritius flying fox, *Pteropus niger*, that started in 2015 in my homeland, Mauritius. The Environmental Humanities, with the myriad literature it encompasses, has provided invaluable insights and inspiration in situating this complex society-nature conflict, opening avenues transcending the society versus science versus politics barriers.

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This thesis was a steep learning curve for me as I not only learnt how to polish my research skills, but it gave me an insight into the dimensions of the worlds of conservation and agriculture as well as politics and economy, all through the multi-disciplinary lens of the environmental humanities.

Tavinia Naiken
March 2022

Abstract

The flying fox, *Pteropus niger*, an endemic old world bat species on the volcanic island of Mauritius, has been subjected to several culling initiatives since 2015. Government of the Republic of Mauritius, reacting to pressures from fruit producers opted for culling while conservationists argue that non-lethal strategies be adopted to deal with fruit damage caused by the fruit bats. This thesis presents qualitative research aimed at investigating this society-nature conflict in Mauritius. Interviews about the culling of the flying fox were carried out in 2017 in Mauritius, with a few conservationists and small-scale fruit growers. The significant findings were that despite each stakeholder having valid arguments, miscommunication and lack of mediation resulted in ineffective actions. A need for more eco-centric approaches that allow for sustainable development was identified. Reforestation and biodiversity conservation need to be included in the political and economic plans for the inclusion of the flying fox as part of the Mauritian environment. There seems to be a disconnect from Nature on the island on a cultural level that needs to be addressed as a long-term solution. Environmental humanities concepts such as multi-species thinking, political ecology, ecocentrism versus anthropocentrism, storytelling to create new ecological narratives and urban ecology are used to frame the discussion of this case study.

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List of Abbreviations

AREU	Agricultural and Research Unit
BBC	British Broadcasting Corporation
BPO	Business Process Outsourcing
BTI	Bertelsmann Transformation Index
CBD	Convention on Biological Diversity
CDM	Clean Development Mechanism
CIA	Central Intelligence Agency
CITES	Convention on the International Trade in Endangered Species
Climate-ADAPT	The European Climate Adaptation Platform
CMA	Conservation Management Area
COP	Conference of the Parties
COVID-19	Coronavirus Disease of 2019
EPA	Environmental Protection Act
EPZ	Export Processing Zone
ESA	Environmentally Sensitive Area
GDP	Gross Domestic Product
GPS	Global Positioning System
GSM	Global System for Mobile Communications
HEP	Human Exemptionalism Paradigm
IAS	Invasive Alien Species
ICT	Information and Communication Technology
IUCN	International Union for Conservation of Nature and Natural Resources
KNP	Kruger National Park
MCIA	Mauritius Cane Industry Authority
MUR	Mauritian Rupees
MWF	Mauritian Wildlife Foundation
NBSAF	National Biodiversity Strategy and Action Plan
NEP	New Ecological Paradigm
NGO	Non-governmental Organisation
NPCS	National Parks and Conservation Service
NTBNPA	Native Terrestrial Biodiversity and National Parks Act
RoM	Republic of Mauritius

SANParks	South African National Parks
SMF	Special Mobile Force
SPA	Small Planters' Association
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States Dollars

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Chapter one: Situating the environment in Mauritius as an island state: The colonial legacy, the society-Nature conflict and the Mauritius flying fox

1. 1. Introduction

A famous quote that often makes me pause states that “Mauritius was made first, and then heaven, and heaven was copied from Mauritius” (Twain, 1897:619). Indeed, this volcanic island, located some eight hundred kilometres off the east of Madagascar (CIA The World Factbook, 2022) is referred to as a paradise island and branded as such in myriad brochures and promotional materials. Yet, if we were to take Mark Twain’s quote within the context of his writing, it was more along the lines of “from one citizen, you gather the idea that Mauritius was made first and then heaven; and that heaven was copied after Mauritius. Another one tells you that this is an exaggeration; that the two chief villages, Port-Louis and Curepipe, fall short of heavenly perfection...” In fact, the duality in this statement situates Mauritius more aptly, positioning it instead as an island state full of layers that need to be unravelled to begin to understand the intricacies it embodies.

Mauritius is a small dot in the Indian Ocean which often requires a magnifying glass to be discerned on most world maps (Figure 1.1), if it is represented at all. But there is one map that Mauritius has adorned since conservation became a critical issue worldwide – albeit a disproportionate replicate of the island as it is – and that is the map of proportion of worldwide land mass and extinction rate (Figure 1.1). As discussed by Baider (2013), “Mauritius champions the world when mapping shows the relation of territory size and recent extinct species.”

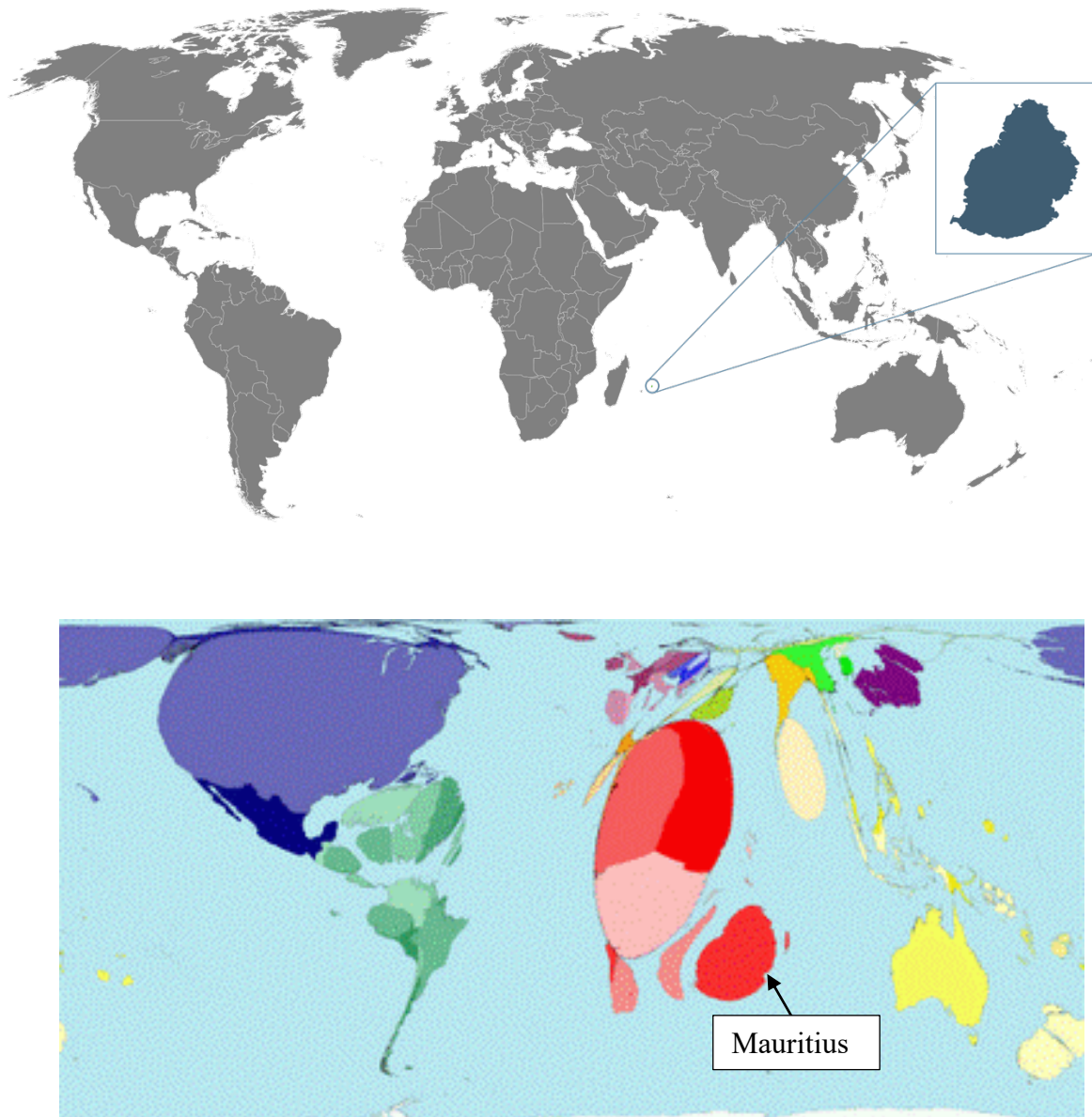


Figure 1.1 situates Mauritius in the map of the world. Top, by Kingroyos (2011) shows Mauritius on the world map in terms of geographical area and Bottom, by Baider (2013) depicts the “proportion of worldwide land mass size per country weight by species that became extinct after 1500DC. Mauritius is the large dark red island.”

Biodiversity loss and extinctions are a reality of the Anthropocene (Crutzen, 2006; Wagler, 2022). While extinction is typically a natural phenomenon, usually occurring at a rate of one to five species annually, this trend is perceived to have been aggravated in our contemporary world to reach between 1,000 to 10,000 times that background rate, with dozens possibly going extinct every day (Chivian & Bernstein, 2008; Hambler & Canney, 2013; Wagner et al., 2021). Biodiversity loss, though prevalent in all corners of the globe, is particularly concerning in an island ecology such as Mauritius. Vié et al. (2008:31) position the island state as ranking first

in the list of countries with the highest percentage of threatened and extinct mammals (63.6 per cent) and Mauritius has less than two per cent of good quality native forest cover remaining on the island (Forestry Service 2020), making biodiversity loss a pertinent issue in the Mauritian landscape. Furthermore, Mauritius as a small island state is particularly vulnerable to the impacts of climate change given its exposure to sea-level rise, warming air and sea surface temperatures, the increase in frequency and intensity of tropical storms and increasingly unpredictable weather patterns in terms of rainfall (Williams et al., 2020:549). This renders biodiversity on the island even more susceptible to extinction and underlines a necessity to align climate resiliency and adaption measures with biodiversity conservation efforts.

Following a massive cull of the endemic fruit bat, the Mauritius flying fox, *Pteropus niger*, since 2015 with the most recent in 2020, my first reaction, like many conservation-driven individuals, was to condemn the anthropocentricity of this endeavour, especially in the face of our already fragile ecosystems. The blatant disregard I perceived was present in the situation was highlighted by the fact that the first bat cull in 2015 resulted in the death of 30,938 flying foxes (Florens, 2016) and was superseded by a second cull in 2016 on the premise that the initial one brought about ten per cent increase in fruit orchard yields (Parliamentary Debate, 2016:50). The elements of this narrative depicted an incongruity between economic growth and environmental protection that I perceived warranted further investigation – complex layers in need of disentanglement.

1.2. Mauritius: A brief background

Mauritius is an independent nation since 1968 and is one of the three islands forming the Mascarenes (Thébaud et al., 2009:612) in the southern Indian Ocean, with a total land area (territories included – see figure 1.2) of 2,030 square kilometres and a population size reaching close to 1.4 million individuals (Statistics Mauritius, 2021; CIA The World Factbook, 2022). A key characteristic of Mauritius, relevant to the discussion set forth later in this thesis, is that the island never had a population of ‘natives’ or truly indigenous people (Schnepel and Schnepel, 2011:110). A glimpse into the timeline through historical accounts confirms that though Mauritius was temporarily appropriated by Arabs in the 15th century and Portuguese in the 16th century, the first real settlers on the island were Dutch navigators (Addisson &

Hazareesingh, 1993). The Dutch inhabited the island in 1598, given its prime location and for the abundance of prized black ebony that they could easily harvest for export (De L'estrac, 2007). Subsequently, they abandoned the island in 1710 since harsh weather conditions, especially in summer with devastating tropical cyclones, frequently destroyed their anchored ships and extensive development would have been required on the island to make it habitable (Humbert, 2005; Selvon, 2001).

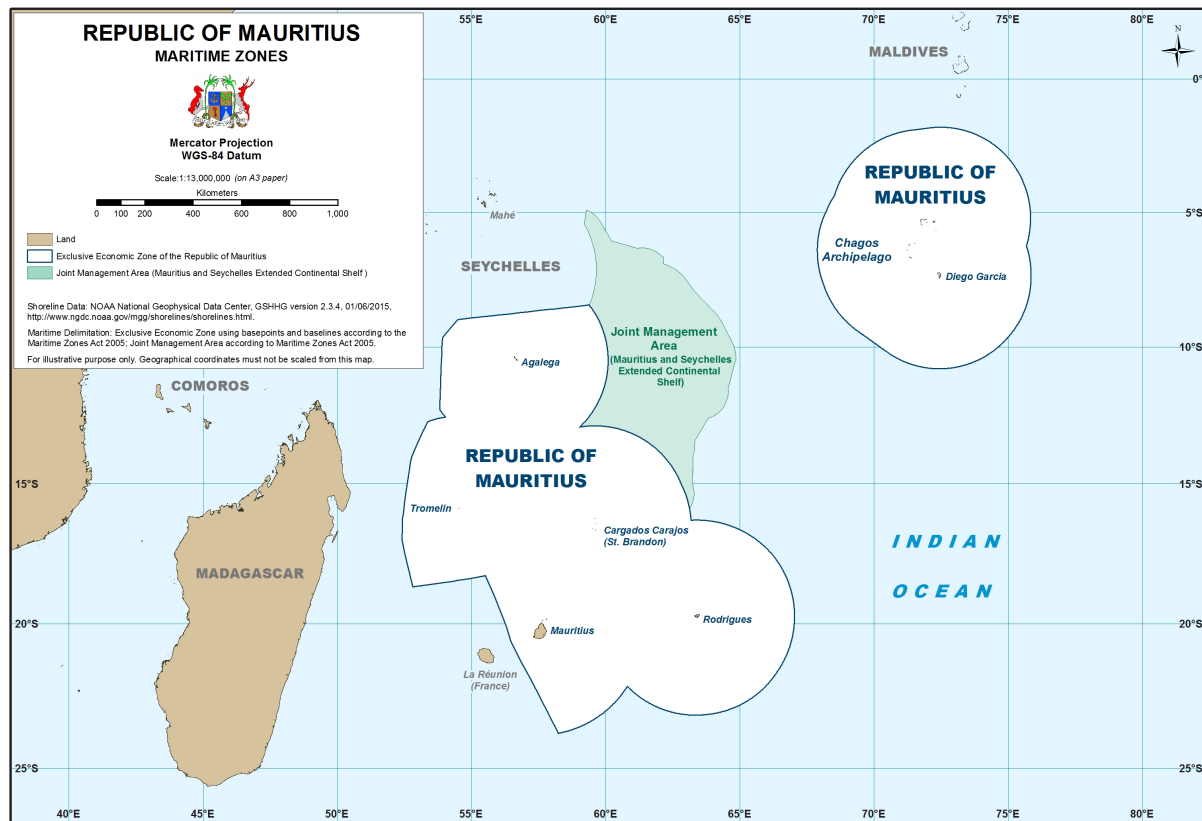


Figure 1.2 shows the Mascarene islands (Reunion, Mauritius and Rodrigues) as well as all territories of Mauritius (Republic of Mauritius, 2016).

The French came to the island in 1721 (BBC, 2014) and African slaves (Humbert, 2005) from West Africa, Mozambique and Madagascar were brought to the island to build the island's infrastructure, and plough the land (Humbert, 2005; Schnepel and Schnepel, 2011). The French colony thrived until they were driven out of the island in 1820, when the British defeated them in battle securing the island for Britain until the country's independence on 12th March 1968 (BBC, 2014). During the colonial change of power, more slaves were brought to Mauritius from various parts of the African continent until the abolition of slavery in 1835 (Schnepel & Schnepel, 2011). A "new form of slavery" was introduced under the guise of the indentured labour system (Tinker, 1974; Allen, 1999; Chazan-Gillig & Ramhota, 2009), much

of which originated from India, with some merchants coming from West India, China and some Arab countries (Schnepel & Schnepel, 2011). The first group of indentured labourers arrived in Mauritius in 1834 and were assigned to work mostly on the sugar estates. Mauritius currently consists of 48.5 per cent of the population as Hindu; 26.3 per cent Roman Catholic, 17.3 per cent Muslim, 6.4 per cent other Christian, 0.6 per cent other religion, 0.7 percent following no religion and 0.1 percent being unspecified (CIA World Factbook, 2022).

1.2.1. The environment in colonial era

While Mauritius was devoid of human life prior to colonial settlement, the biodiversity was rich and diverse. According to Thébaud et al. (2009:615), the three Mascarene Islands’ “biota exhibits high levels of endemism in many groups of related taxa.” However, Toth (1994:101) attributes the negative anthropogenic actions to as early as 1510 when a Portuguese ship visited the island for a brief stop-over and left in its wake, pigs, goats and cattle from Madagascar. The introduction of alien species was exponentially supplemented a few decades later when the Dutch arrived on the island. Coupled with the unsustainable deforestation was intensive hunting of the local fauna, which ultimately resulted in driving many species to extinction. Without a defence mechanism and instinctual flight reactions towards predators, Maas (2010) mentions that thousands of the flightless dodo birds, *Raphus cucullatus*, were hunted for food and given that they made their nest on the ground, their chicks and eggs provided an easy target for the introduced alien fauna to prey upon. As pointed out by Connell (2013:216), the influx of invasive alien species (IAS) correlated with an increase in endemic species threatened with extinction.

The French were the first to set in place “coherent environmental protection laws” (Noble & Costa, 1999:8), arguably laws entrenched in western ideologies and conservation based on the “Hippocratic and Physiocratic ways of thinking,” which recognise mostly medically based philosophies that implicitly deal with the relations between the wellbeing of humanity and the external environment (Grove, 1993:321). However, despite provisions in law that required land owners “to retain in forest 25% of all privately held land, to further retain forest cover on the steep slopes in order to prevent erosion, to undertake a comprehensive reforestation programme, and to create a fully staffed forestry service to enforce these regulations” (Grove, 1992 in Noble & Costa, 1999:8), agricultural development took precedence which resulted in massive deforestation and planted exotic trees like pine trees replaced indigenous ones (Toth,

1994:106). Further strain was placed on the island's indigenous biodiversity during the British occupation when sugarcane became one of the main pillars driving the economy (Toth, 1994:113).

1.2.2. Contemporary Mauritius

With no indigenous heritage to fall back on, Mauritius acceded to its position as an independent nation in 1968 with a broken legacy of embedded slavery, neo-slavery and a degraded environment. Over the post-independence years, Mauritius pursued development through the ideologies of its colonial roots and continued sugar production as an economic pillar which “accounted for 94% of all cultivated land” (Meisenhelder, 1997:281). However, threats such as frequent cyclones and pests emphasized the need to move towards new avenues and the Export Processing Zone (EPZ) became the new economic pillar in the 1990s (Meisenhelder, 1997:290). Today, Mauritius has transitioned its economy away from sugar and textile towards branding Mauritius as an alluring tourism destination (Soper, 2008:51) and embracing the advancement in Information and Communication Technology (ICT) which resulted in the development of a Business Process Outsourcing (BPO) trend on the island (The Economic Development Board, Mauritius, 2022).

1.3. The flying fox, *Pteropus Niger*

The *Pteropus niger*, commonly known as the Greater Mascarene flying fox or Mauritius flying fox (Figure 1.3) is currently listed as endangered under the International Union for Conservation of Nature (IUCN) Red List of Threatened Species (IUCN, 2022). While it is endemic to the Mascarenes and was previously found throughout the three islands, habitat destruction and hunting has limited the species to Mauritius (Cheke et Dahl, 1981) with a small population recently identified in Reunion Island, most likely representing a recent recolonization (Larsen et al., 2014). Mauritius, being an island of volcanic origin, lacks diversity in its naturally occurring mammalian species and the bats were the only mammals to naturally colonise it and “as a consequence, the Mauritius fruit bat, as the only extant frugivorous mammal, plays an important role in regeneration of the islands' native flora” (Oleksy, 2015), highlighting the importance of this mammal in maintaining plant diversity in the heavily fragmented forests of Mauritius.



Figure 1.3 depicts the Mauritius flying fox, *Pteropus niger*.

The bat controversy generated widespread attention especially in the international media and in the global scientific community and despite numerous activism efforts from pro-conservation bodies to try preventing the cull from taking place, a mass culling that intended to remove around twenty per cent of the government estimate of 90,000 individuals was launched on November 7, 2015 (Aldred, 2015). The Minister of Agro-Industry and Food Security in Mauritius rationalised the decision taken by the government to cull by saying that he received a significant number of complaints on the extensive damage purported to have been caused by the fruit bats affecting essentially mango and lychee productions (Parliamentary Debates, 2016:49). The rift between conservationists and the government as well as fruit orchard owners was widened even further when it appeared that the government had proposed amendments to environmental laws on the island with the aim of legitimising the cull (Florens, 2016). While previously biodiversity law (Wildlife and National Parks Act of 1993, 1994:s18(1)(b)), forbade “hunting of any wildlife by night” and did not provide any loopholes or reservation to override it, the new legislation (Native Terrestrial Biodiversity and National Parks Act of 2015, 2015 s26(4)) permits the “hunting of wildlife at night on the advice of the Director” of the National Parks and Conservation Service (NPCS). Wildlife, as defined under

section two of the current Act, refers to “a living creature other than a human being, a dog or cat, domestic livestock, or fish and other marine organisms.”

In fact, according to the transcript of the second reading of The Native Terrestrial Biodiversity and National Parks Bill in October 2015 (pp. 89), the Minister of Agro-industry stated that:

“Here I wish to bring an amendment to add a new sub section 26(4) to provide for the Minister to authorize the hunting of wildlife at night on the advice of the Director. We are all presently aware of the serious problems as regards to the endemic bats population which reached a large number and is causing significant damages to fruit plantations. However, because of its protected status and the legal provision prohibiting hunting at night, we are bound by the existing legal provision and cannot authorise culling at night. Hence this section will allow for a derogation to be made for hunting of wildlife at night in exceptional circumstances and where human life or national interests prevail. I wish to point out that human/wildlife conflict is an international issue and many countries resort to culling as and when such conflicts represent a threat to human life and agriculture where livelihoods of people are directly at stake.”

Even though a local group of independent conservationists attempted to thwart what they considered to be an appalling affliction and setback to biodiversity conservation on the island, through articles written in local newspapers (for example, Monty, 2015a), campaigns launched through Facebook and YouTube (Monty, 2015c) to build awareness and resistance and petitions (for example, Rainforest Rescue, 2015) were signed, their efforts failed to acquire enough support within the local community to stop the cull. Conservationists further tried to engender international reaction in the hope that it would spawn a positive effect and stop the cull, especially at the time when many of the female bats were pregnant or feeding their young (Arkive, 2016), by bringing the issue to the attention of international conservation bodies and media. *The Guardian* published an article to create awareness on the plight of the Mauritian bats (Aldred, 2015) while *National Geographic* posted an opinion piece on its website (Racey & Medellín, 2015). The IUCN Species Survival Commission (2018) released position statements to appeal “to the Mauritian Government to halt culling of the Mauritius fruit bat and make a strong commitment to the search for effective non-lethal strategies to address the conflict between the Mauritius fruit bat and fruit growers.” However, the responsibility to safeguard the surrounding environment lies with the local community first and foremost, which seems to be absent from the Mauritian landscape. This disconnect is further investigated and discussed in chapter four.

1.4. Study objective

The main objective of this study is to investigate the bat culling from a sociological and anthropological perspective and the nuances that exists. This thesis seeks to articulate the bat culling both in terms of sociology and how organisms' livelihoods shape and are shaped by political, economic and cultural forces (Kohn, 2007).

Following this main question, the sub questions identified are:

1. What are the pro-conservation discourses in the bat culling case in Mauritius?
2. What are the experiences of small-scale orchard owners regarding the bats?
3. Given the existing intricacies with different stakeholders having diverging views on the subject, can science, biodiversity and local communities find a mediating ground to enable a more holistic approach to environmental protection in Mauritius?

1.5. Rationale

In view of the emergence of multi-species ethnography with thinkers such as Kirksey and Helmreich (2010: 545) positioning it as a new genre of writing and mode of research where “creatures, previously appearing on the margins of anthropology – as part of the landscape, as food for humans, as symbols – have been pressed into the foreground in recent ethnographies,” the plethora of research and academic thinkers provide an alternative narrative through which the issue of the bat culling in Mauritius can be investigated and discussed. Studies of the society-nature conflict on the bat cull has mainly been focused through conservation and agricultural perspectives so far. This thesis includes multi-species thinking and argues the case study of the bat cull through a comprehensive lens of the environmental humanities concepts to present a more overarching view of this human-wildlife conflict.

1.6. Methodology and field site

The research for this thesis was undertaken in Mauritius between May 2017 to September 2017. A combination of primary and secondary data was used. While initially opting for a desktop analysis of online media coverage coupled with Skype interviews, I decided that this would not do justice to my research as use of communication technology would limit my sample and cause significant bias. In fact, while on site in Mauritius, I managed to contact several small-

scale orchard owners who do not have access to any form of social media and who provided me with some invaluable information and stories that I would have been unable to collect through other research strategies.

1.6.1 Key informant interviews

One-on-one interviews, in the form of key informant interview technique, were used for both conservationists and affected small-scale orchard owners. According to McKernan (1991:131) “the key informant interview technique is a variant of general interviewing with the special proviso that the interview is with an individual who possesses unique or specialised knowledge, skills or expertise within an organisation and who is willing to share these with the researcher.” Conservationists and orchard owners were uniquely placed to provide knowledge through more detailed responses than in a survey or structured interview.

Social media, online databases as well as personal communication and networking were used to create a list of potential respondents in the field of conservation. Once a list of eight potential interviewees was drawn, an electronic mail or some form of personal communication was sent to initiate interaction. The interviews were based on voluntary participation. Out of the eight, five were willing to participate in this research. The interviews were set face-to-face and recorded audio-visually in English or French depending on the respondent’s language preference. A semi-structured interview style was adopted, and a set of questions was drafted to maintain some consistency in the flow of the conversation and to help the subsequent analysis of the data (Appendix A). The duration of the interviews varied, depending on the level of interaction and enthusiasm from both the respondents and the researcher. The recordings were subsequently transcribed and translated into a Word Processing file.

To balance the conservationists’ views, I wanted to collect more insights on why others wanted the bats culled. The small-scale orchard owners, being more numerous and vulnerable, seemed to be more affected by the bats (De Chazal et al., 2019). However, the small-scale fruit growers could not be found on the internet. So, I visited the Agricultural and Research Unit (AREU) where I was given the contact details for the secretary of the Small Planters’ Association (SPA), Mr. Sunghoon Kreepaloo, who provided me with a list of fourteen small-scale orchard owners and their contact details. Five of the fourteen were willing to be interviewed and share their experiences. The interviews were based entirely on voluntary participation. A semi-structured

questionnaire with a set of interview questions was used (Appendix B). The interviews were carried out face-to-face at the respondents' houses or in their orchards and were recorded audio-visually in Mauritian Creole, the official dialect in Mauritius. The recordings of the interviews were subsequently transcribed and translated to English and for most part have been presented as such but in cases where the Creole words have contextual meaning anchored in local culture, the Creole words are used with a loose translation provided to maintain authenticity in the presentation of research findings.

1.6.2. Case study approach and participatory observation

The bat culling provides a case study approach to the broad human-nature conundrum existing on the island, allowing in-depth, multi-faceted explorations of the complex issue of human-nature disconnect and is particularly useful “when there is a need to obtain an in-depth appreciation of an issue, event or phenomenon of interest in its natural real-life context” (Crowe et al., 2011:1). Participatory observation has also been used in this thesis research. I accompanied many conservationists on walks in the forests and contributed to try to find bats' roosting sites. I participated in fruit harvests with some of the small-scale fruit growers, witnessing the various tactics employed by the orchard owners to protect their harvest. All these were aimed to provide deeper insights on the realities of both sets of respondents.

1.7. Ethical considerations

The interviews conducted for this research have ethical considerations attached to them. Since it would be preferable to use the names of the key informant interviewees to maintain the integrity of the finding, respondents have been informed that their interview is being recorded and it has been emphasized that the information provided will be treated with utmost confidentiality and used solely for research purposes. All the respondents were requested to sign a release form whereby they acknowledged their willingness to participate in this research and affirming that their answers can be analysed and freely divulged in the findings section of this thesis and that the interpretation of the data remains the sole propriety of the authors and the University of Cape Town. In cases where the interviewee could not understand or read English well, the content of the release form was explained to them clearly. The interviewees have been made aware that the recording was in progress the whole time and were afforded the right to privacy when they chose to keep some information off record. All interviewees for this

thesis were above 18 years old. While all respondents have provided their consent to be named and quoted in this thesis by signing a release form (Appendix C), care has been taken to anonymize statements perceived by the author to be controversial and/ or having a potential legal implication for the interviewees.

1.8. Theoretical framework adopted in this thesis

The theoretical framework for this thesis - given the complexity and multi-faceted dimension of the science, nature and democracy relationship in this study - considers several aspects of the environmental humanities. Since politics and policy making are central to the issue of the bat cull in Mauritius, environmental sociology and political ecology as theoretical frameworks provide invaluable concepts through which the study problem is examined. The relationship between society and nature has been a representative characteristic of environmental sociology since its inception and contemporary environmental sociologists are attempting to reconceptualise the nature-society relation by treating them as intertwined entities as opposed to separate ones (Bowden, 2017:49), in an attempt to bridge the often-dysfunctional relationship that prevails as highlighted by the bat culling in Mauritius. As discussed by Holleman (2020:12), “a revitalized environmental sociology is strengthening our capacity to understand and resist the expropriation of nature,” allowing us to identify key elements of the society-nature conflict and ways to overcome the obstacles of such conflicts.

The Mauritian approach to societal development cannot be explored in the context of environmental sociology without borrowing from the concept of “Human Exemptionalism Paradigm” (HEP) versus “the New Ecological Paradigm,” (NEP) particularly the assumptions regarding the context of human society (Dunlap, 2002:334-336). As discussed by Dunlap (2002:332), life in “industrialised societies created the impression that not only was the environment a source of inexhaustible natural resources, but also that humans could manipulate and control that environment to suit their needs.” These ideological underpinnings are further examined in chapter four to discuss the society-nature conflict in the bat cull on the island, by further including concepts of anthropocentrism and ecocentrism in the discourse.

The expropriation of nature is further made possible by the inherent, capitalist pressures to expand production and consumption and an exploitative economic model that is advocated for,

by many politicians globally, at the expense of the environment (Legun et al., 2020:2). Hence, political ecology is a crucial lens for the bat culling. While political ecology can mean “many different things to different people” with myriad “theoretical or methodological proclivities,” Forsyth (2015:103) aptly suggests that “at the heart of political ecology lies a series of tensions about how politics and ecology speak to each other.” Political ecology as a framework is, thus, pertinent to this study, especially in terms of conflict over natural resources, with orchard owners’ economic implications and threats to their livelihood on one side and a protectionist approach to conservation on the other.

Martinez-Alier (2002:73) defined political ecology as the “ecological distribution conflicts,” which Escobar (2006:8) argues is more than “conflicts over access to, and control over, natural resources, particularly as a source of livelihoods, including the cost of environmental destruction” given that it “exists in the context of economies, culture and forms of knowledge, outside the obvious ecosystem context.” Robbins (2012:20) proposes that political ecology, can broadly be understood “to address the condition and change of social/environmental systems, with explicit consideration of relations of power,” specifying that political ecology “explores these social and environmental changes with an understanding that there are better, less coercive, less exploitative, and more sustainable ways of doing things.” As discussed by Batterbury (2015:28-29), there are key themes in political ecology such as access and rights to resources, struggle and resistance against systems that seem to prevent people from making a living and profound changes in people’s way of life in terms of capitalism and commodification of resources amongst others. Such elements are important to the society-nature conflict discourse in the flying fox cull in Mauritius especially that the communities benefited from the support of policy makers making it an intricately political agenda while the ecological importance of the bats and the conservationists’ scientific findings were largely ignored.

Yet, other dimensions need to be included in the discussion to enable a fair distillation of society-nature conflict. The anthropological concepts of multi-species thinking, traditional ecological knowledge, cosmopolitics, extinction from a cultural perspective are all elements that provide the necessary framework to discuss the *Pteropus niger* cull on the island of Mauritius. Tsing (2012:144) states that “human nature is an interspecies relationship,” and that “science has inherited stories about human mastery from the great monotheistic religions” which have fuelled “assumptions about human autonomy and they direct questions to the control of nature, on the one hand, or human impact on nature, on the other, rather than to

species interdependence.” Multi-species (Van Dooren et al., 2016:3) as a framework not only accounts for human-animal studies but instead “focuses on the multitudes of lively agents that bring one another into being through entangled relations that include, but always also exceed, dynamics of predator and prey, parasite and host, researcher and researched, symbiotic partner or indifferent neighbour.” Extinction, mourning and ecological knowledge all form part of multi-species thinking. Deborah Bird Rose’s (2014:79) multi-species thinking in terms of Australian flying foxes proposes that “the most basic cultural narrative we need to disturb is the predominantly western idea that the nonhuman world is a place not only lacking mindfulness, but also lacking goodness.” Concepts from these environmental humanities scholars form the underlying foundation for this thesis discussion in chapters four and five.

These theoretical frameworks, while each with their own set of academic thinkers and scholars, are all intertwined in issues of human-wildlife conflict. Society, politics and nature are entities that need to be addressed together and the discussion of potential solutions to society-nature disconnect requires a concerted effort to engage dialogue. The analytical approach of environmental sociology allows the identification of the problem from the orchard-owners perspective, the political ecology framework is crucial to understand the underpinnings of broader political economic context, scientific research in environmental protection and the multi-species thinking provide a more-than-human approach to the conservation dilemma that the bat culling entails, thinking beyond the exclusive human narratives that position humans as the dominant species.

1.9. Thesis structure

To retain the essence of the environmental humanities’ multi-disciplinary approach, this thesis follows a combined structure that merges traditional academic research finding and presentation with a more literary form of narration and discussion. This first chapter has provided a historical background of Mauritius, situated the bat cull and the human-wildlife conflict around the latter which started in 2015 and has still not been resolved, as the study problem, and outlined the methodology used for this thesis’ research phase as well as the rationale for this study. Ethical considerations of this study and the theoretical framework pivotal to this study’s discussion has also been presented.

Chapter two examines the conservation discourses on the island, the views of conservationists on the bat culling controversy and their ideas on how to address the situation. It consists of excerpts from the different conservationists, and these are positioned within the current political, economic and social climate defining the island. Chapter three presents the bat culling narratives of the small-scale orchard owners, focusing on the stories that they shared and their perceptions of the bat cull. It traces the various issues such as fruit loss, the economic implications of non-lethal means to protecting their fruits and what they perceive to be the way forward.

Chapter four critically examines the discourses from both conservationists and fruit growers, focusing not only on the human-nature conflict but also on the intra-human conflicts in the bat culling case. Furthermore, it situates the debates between the two actors in a neo-liberal framework and within the political context. In chapter five, I reflect on the bat culling and on possible ways forward, borrowing from multi-species thinking, extinction and mourning as well as forms of narratives to frame my discussion. My aim in presenting this case study is to assess possible avenues for conservation of biodiversity in Mauritius that are more integrative in approach and would provide a more comprehensive framework for synergistic nature and human interactions.

Chapter two: The flying fox through conservation lens

While chapter one provided a brief insight on Mauritius as an island state and situates the study problem and methodology, this chapter examines the environmental issue of the bat cull in terms of conservationists' perceptions of the problem. A brief overview of conservation on the island from a historical context to the present is discussed, followed by interviews carried out with conservationists. Since local conservationists are the main advocates of non-lethal measures of addressing the fruit damage caused by bats, this chapter examines the fundamental conservation rationales and their discernment of the human-wildlife conflict.

2.1. Conservation in focus

In the early 2000s, I was afforded the opportunity of visiting sections of the forested area delineated for research purposes and therefore inaccessible to the average Mauritian citizen. Referred to as Conservation Management Areas (CMAs), these segments of the remaining forest have been fenced off to exclude *Homo sapiens* and other introduced species. In Brise Fer, I encountered the oldest CMA, which was a small, fenced zone within a larger fenced zone that I imagine could be a metaphorical museum display through which one could begin to view Mauritius pre-settlement era. Having hiked in the dense, dark non-weeded forest which is degraded and over-run by numerous exotic plants such as strawberry guava, *Psidium cattleianum* (Fowler et al., 2000) and animal species that were introduced either as domestic livestock (goats, cattle, pigs, chicken, guinea-fowl), game meat (mainly deer), anthropophilic species (rats, mice, house shrews, house geckos) or as domestic pets (cats and dogs) (Cheke, 2010); I was struck by how the dappled greenish hued air felt lighter and cleaner. I learned from my conservationist friends that the air in that particular area was indeed cleaner and not just my imagination. They explained that this could be proven by the lichens growing on the old trees. Lichens such as the old man's beard (*Usnea* species), which only grow in areas where the air is not polluted by toxic chemicals are thus quite rare (Perlmutter, 2010). While years later, I find myself reflecting on this notion of exclusion from an environmental humanities perspective, in that moment, I felt the rising urge to safeguard the little piece of native biodiversity left on the island.

2.2. The conservation legacy – colonial to post-colonial

As discussed by Safford (2001:584), while the island was an almost completely forested mass until 1638, “by 1990s, human colonists had brought about the loss of 95% of the native vegetation.” The French colonizers adopted the first set of coherent environmental protection laws (see chapter one). Prior to the 1760s, “the effects of colonial economic globalization were addressed on a piecemeal basis in order to protect local food, fuel, timber supplies and what were already recognized as rare island species.” However, Pierre Poivre, the ‘Intendant’ of Mauritius from 1767 to 1772, was concerned that “little thought was given for the future, resulting in potential over-exploitation of resources” and issued the ‘*Règlement Economique*’, to remediate what he perceived to be unsustainable practices (Mauremootoo et al., 2003). During the ensuing British takeover of the island, several environmental protection ordinances – all variations of the ‘*Règlement Economique*’ – were issued, culminating in the 1875 Ordinance ‘For the Conservation of Woods and Forests on the Crown Reserves and Plantations and Forests...’ but failed to move away from the tradition of “conserving or replanting forests for their perceived utility values and not on conserving native forests per se” (Mauremootoo et al., 2003). It should be noted that the 1875 Ordinance is what constitutes the foundation of the post-independence Forests and Reserves Act of 1983 in Mauritius.

The Forestry Service, under the Forests and Reserves Act 41 of 1983, as managers of the forests, is conferred the responsibility of determining land use and advising the government on the establishment of natural reserves amongst others. The Act does not mention indigenous fauna but rather addresses the forests as landscapes such as mountains, rivers and streams and some plant species. Wildlife was managed through the Wildlife Act of 1983. In more contemporary times, Mauritius has updated its legislation to accommodate the rising need to address environmental concerns. As signatory to international legal environmental frameworks such as the Convention on Biological Diversity (CBD), United Nations Framework Convention on Climate Change (UNFCCC), International Trade in Endangered Species (CITES), Protection of the World Cultural and Natural Heritage (World Heritage Convention) amongst others (Safford, 2001), Mauritius is bound by its pledge to promote biodiversity and sustainable development. Yet, as a developing country, it seems that Mauritius tends to often overlook this pledge and the dilapidated state of its biodiversity heritage (Figure 2.1), opting instead to focus on socio-economical ventures especially considering the 2015 flying fox culling.

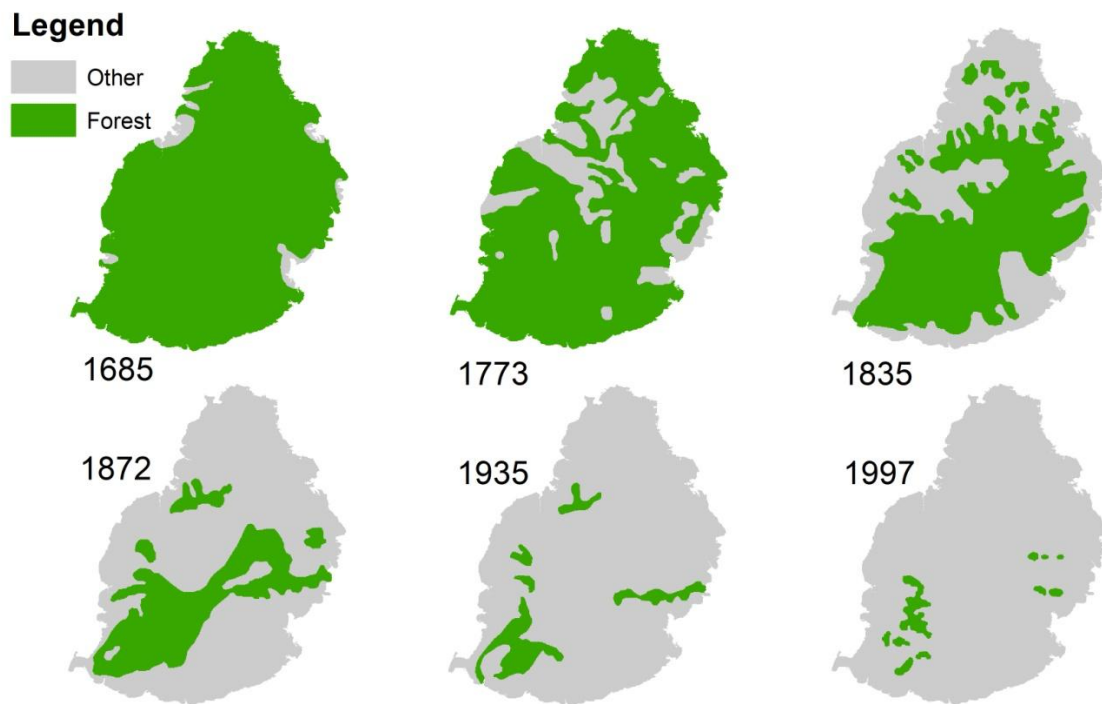


Figure 2.1 shows historical maps of the forest extent in Mauritius (Hinkamp, 2018:2), emphasizing the loss of forested area on Mauritius throughout colonization and after independence to 1997, when data was last mapped. These are the only maps in the database, with no new figures after 1997.

Non-governmental organisations (NGOs), particularly the Mauritian Wildlife Foundation (MWF), have spearheaded many of the biodiversity recovery. The Mauritius Kestrel, *Falco punctatus*, for example was brought back from the brink of extinction in 1974 from four individuals comprising of only one breeding pair, to an estimate of 500-800 birds (Nicoll et al., 2003). Arguably a conservation success story in Mauritius, such species-centred approach follows a protectionist approach to biodiversity conservation, a practice that is often costly (Florens, 2013: 40), which is anchored in “a history of human exclusion” (Ghazoul, 2007:565) and exemplifies a model akin to “fortress conservation” (Fletcher, 2010:171).

The Kestrel, like many species in Mauritius such as the Pink Pigeon, *Columba mayeri* and Echo Parakeet, *Psittacula eques*, have been protected in clearly delineated CMAs such as Brise Fer which exclude the presence of humans. CMAs, comprising of less than one percent of remaining mainland (excluding Mauritius’ outlying territories) native habitats of Mauritius, are characteristically set up “within well-preserved remnants of native vegetation where native plant diversity are greatest” (Baider & Florens, 2011:2642). This means that even though,

initially the areas were fenced off to prohibit damage done by the introduced alien deer and feral pig (Baider & Florens, 2011:2642), the exclusion expanded to accommodate a different breed of alien species – the local population who are now rarely in touch with the endemic fauna and flora within these areas, an underlying notion of dissociation explored further in chapter four of this thesis.

2.3. Conservation defined

The International Union for Conservation of Nature (IUCN, 2022:13) defines conservation as “The protection, care, management and maintenance of ecosystems, habitats, wildlife species and populations, within or outside of their natural environments, in order to safeguard the natural conditions for their long-term permanence.” In line with the IUCN, when conservation professionals were asked during interviews to define conservation, several elements were mentioned that expanded on the on-the-ground definition of what it means to conserve biodiversity.

Owen Griffiths,¹ Australian born, Mauritian citizen involved in conservation, business and ecotourism in the past 33 years, defines conservation as “to conserve, to protect things, to ensure that they are always there.” Vincent Florens,² at the University of Mauritius, further clarifies that:

“Conservation would be the long-term retention of biodiversity, so that species and systems – biological systems – can continue to exist and function.”

The conservationists primarily talk about protecting biodiversity, saving species from extinction and stopping the impact of humans but do not include humans as part of the solution but rather as part of the problem which could explain their inability to bridge the miscommunication gap between science and people. Myers et al. (2000) highlights how the number of species threatened with extinction far outstrips the available funding and resources and propose that one way of saving the most species at the least cost is by identifying

¹ Interview with Mr. Owen Lee Griffiths, Managing director of La Vanille Réserve des Mascareignes, on May 11, 2017, at La Vanille Réserve des Mascareignes, Rivière des Anguilles, Mauritius by author.

² Interview with Professor Vincent Florens, Senior lecturer in ecology at the University of Mauritius, on May 21, 2017, at Mahébourg, Mauritius by author.

biodiversity hotspots and adopting a ‘silver bullet’³ strategy to conservation in those areas. Mauritius is included in the Madagascar and Indian Oceans Islands biodiversity hotspot, one of the 25 hotspots identified worldwide (Myers et al., 2000), making it a critical spot for conservation actions. Indeed, Florens⁴ highlights how –

“Mauritius has had a lot of very severe conservation problems... and therefore conservation really started largely with species approach conservation to try to take a species which is on the brink of extinction and try to save it through intensive management.”

As noted by Griffiths,⁵ intensive management approaches encompass not only species conservation but also “that two per cent [of the remaining forest which] is being heavily challenged by invasive alien plants and animals,” and hence several measures had been taken to safeguard biodiversity such as areas of the remnant forest have been fenced off to exclude large alien mammals like deer and weeding of invasive alien plants have been carried out in native forests (Florens, 2013) in the past three decades.

Conservationists interviewed seem to believe that such strategies should serve as steppingstones as opposed to the end result of conservation. Florens⁶ emphasises that “gradually here’s another aspect which is going on – the ecosystem approach,” though he admits that one aspect of the approach lacking in Mauritius is community involvement with conservation. Christabelle Duhamel,⁷ Conservationist and Education Officer at Ebony Forest Nature Reserve, on the other hand, says that “while at the beginning [conservation] was about protecting the small area with fences...”, now there is a shift to a broader approach whereby “we are trying to [include] the public.” Tatayah,⁸ who oversees the conservation programmes at MWF, however, cited initiatives revolving around a predominantly species-driven philosophy mentioning that,

“Mauritius has been at the forefront of conservation... I think we’ve turned around probably more than a hundred different plant species that would have either gone extinct or would have been tinkering on the edge of extinction... Mauritius has become a textbook example for how we can actually not be defeatist about it [but]

³ The phrase silver bullet refers to an "action that cuts through the complexity of given situations and proposes an immediate solution, a seemingly miraculous fix to a problem." (The Phrase Finder, 2018).

⁴ Ibid., Vincent Florens.

⁵ Ibid., Owen Griffiths.

⁶ Ibid., Vincent Florens.

⁷ Interview with Ms. Christabelle Duhamel, Former Education and site officer at Ebony Forest, on May 17, 2017, at Ebony Forest, Chamarel, Mauritius, by author.

⁸ Ibid., Vikash Tatayah.

taking practical solution and making things better for the species, and the ecosystem as well.”

While Tatayah does mention the ecosystem, many of the examples he cited during the interview were about conserving species rather than community inclusion. According to Tatayah, work is only now being done to include the community in conservation efforts, citing mainly the bat controversy as the example of how MWF is partaking in building awareness. He seems quite confident that Mauritius will be able to overcome the human-wildlife conflict.

2.4. The flying fox of Mauritius

Despite Tatayah’s optimism based on other species’ success stories, the human-wildlife conflict in the case of flying foxes is particularly concerning to conservationists because of the fruit bats’ role as a keystone species, crucial to the maintenance of native forests on the island. As emphasized by Florens⁹, the Mauritius flying foxes “have a much larger ecological role compared to the biomass that they occupy in the system,” and the bats are crucial given –

“...quite a lot of plants which are pollinated by the bats because they seek to feed on flowers and nectar but they don’t eat all of it, they actually, transfer pollen, but most importantly seems their role as seed disseminators, as frugivores, and disseminating seeds is extremely important because of course without, plants will have a lot of difficulty reproducing...”¹⁰

In fact, Nyhagen et al. (2004) conducted a study which suggested that *P. niger* plays a crucial role in preserving the remaining biodiversity in the heavily fragmented Mauritian landscape. But it is also important to note that the flying fox population is still an endangered one given that their numbers are quite low (IUCN Red List, 2022) and culling the population further can render this keystone species functionally extinct besides the other problems like susceptibility to diseases, decrease in fitness both at individual and population level and decrease in evolutionary potential (Bouzat, 2010; Furlan et al., 2012).

But moving away from the ecosystem services role the animal has, Griffiths¹¹ further adds that “in the early evening, late afternoon, you look up and you see these fabulous animals flying around Mauritius. So, they are very important animals, according to me, psychologically they

⁹ Ibid., Vincent Florens.

¹⁰ Florens et al. (2017) also specify that about half of the woody native plants in moist-to-wet native forests comprises species for which the Mauritius fruit bat is an exclusive native vertebrate frugivore and seed disperser.

¹¹ Ibid., Owen Griffiths.

remind us of the wild...” He also sets forth a fundamental question pertinent to the discourse of multi-species ethnography by saying that he sometimes disagrees with the idea that “everything has to have a reason, a purpose... It just is, it’s there, it’s a fabulous animal and has its rights... to continue to exist.” Rights of nature have been widely asserted in the environmental humanities and the question of reconciling the fundamental rights of other organisms with human rights (see chapter four) appears to be at the heart of the human-nature conflict.

2.4.1. *The bat cull – The conservationists’ view*

Despite *P. niger*’s role in the ecosystem of Mauritius, the Mauritian government initiated a mass cull of the species starting in 2015. According to Vincenot et al. (2017:1368) “government figures suggest that at least 45% of the overall *P. niger* population of just over 90,000 individuals were culled during the two campaigns, illegal killing and incidental mortality of pups during the culls raises likely losses to over 50%.” The rationale behind the first cull in 2015 was that fruit orchard owners – commercial fruit growers as well as small-scale fruit growers – complained that in 2014, the crop damage caused by the bats was around 73 per cent for lychee and 42 per cent for mango (ION News, 2018).

However, Florens says he believes the cull to be more of a political decision, “In my opinion, the people who made that decision to cull the bats would have known beforehand that it would not work but it would work for them, for their popularity, as a political move.” In fact, Florens¹² explains that Mauritius –

“... had just changed a government¹³ and that new government was breaking off from what the past government was doing until then. They wanted to show courageous moves that the previous government has not been able to take. So that was a pretty good example that they could show because the previous government had been postponing and delaying and not doing any culling trying to devise other, reasonable measures to reduce the problem to the planters.”

This is not an unusual happening in Mauritius. Chapter four further explores the government’s role as a stakeholder in this case study.

¹² Ibid.

¹³ After the 10th of December 2014 democratic elections in Mauritius, the political parties *Movement Socialist Militant* (MSM), *Parti Mauricien Social Démocrate* (PMSD) and *Muvun Liberator* (ML) under the ‘*Alliance Lepep*’ banner replaced the previous leadership who had been in power for 10 years.

Tatayah¹⁴ also seems to share a similar insight mentioning that “the first time that there was a suggestion that bats should be culled in Mauritius was in 2002, although the cull happened in 2015 and 2016, the proposal was there for a long time.” Since 2002, the previous government attempted to curb the pressure by proposing other alternatives such as subsidized netting. Netting, if done properly by completely covering the trees, is perceived to be the most efficient method to prevent fruit damage (MWF, 2017). According to Aziz et al. (2016:416), shooting is not an effective means of mitigating flying fox damage to fruit crops since bats’ mobility implies that the bat will not stop foraging, making flying fox shootings an unnecessary persecution. While all the conservationists interviewed agree that there is a challenge in the conservation field between protecting the animal and looking after interests of people, they condemn culling as an ineffective recourse.

Tatayah¹⁵ indicated that MWF has been an active agent on the ground, meeting up with fruit orchard owners and providing guidelines on how to properly set up nets (Figure 2.2). The government of Mauritius, through the Food and Agriculture Research and Extension Institute (FAREI), offers a 75 per cent subsidy to enable fruit growers to purchase nets that they can set up in their orchards and are further provided guidelines on when and how to properly implement the nets (MWF, 2017).



Figure 2.2 is an excerpt from a video tutoring how to put the nets ‘properly,’ covering the whole tree to the base (Gueho, 2016).

¹⁴ Ibid., Vikash Tatayah.

¹⁵ Ibid., Vikash Tatayah.

Yet, notwithstanding the information worldwide that culling yields minimal result, the 2015 cull was initiated. Florens¹⁶ fervently questions the legality of the cull on the premise that,

“... the announcement of a cull came as a surprise, of course, because it was illegal. The new law was coming in, but that new law had a provision that you needed to have a technical committee set up and actually look into the matter and then recommending the culling. That technical committee was actually constituted the following year [in 2016], after the law was passed but the culling was already done by that moment...”

Indeed, it seems that the events surrounding the cull have unfolded in questioning circumstances. For instance, then Minister of Agro-industry had already decided to amend the law with a note to the intention of culling the bats without any scientific background information except for farmers' complaints (see chapter one). This amendment is reflected in the Native Terrestrial Biodiversity and National Parks Act of 2015 which replaced the Wildlife and National Parks Act of 1993 on October 23, 2015. The culling of the flying foxes was launched on November 7, 2015, a couple of weeks after the law came into force. While under the new Act, the Minister is required to appoint a special technical committee to advise the government on the necessity of the cull (section 36 of the Act), Florens argues that such a committee only convened in early 2016, thus the illegality that he puts forth.

Griffiths¹⁷ believes that while as a rule, conservation obviously should consider the interest of people, Mauritius is akin to Noah's flood and by default Noah's ark, whereby all biodiversity is right on the edge of disappearing, requiring a need to take a very focused approach on protecting the remnants of biodiversity. He argues that “if that means some individuals lose out, they might lose out but there's other ways of compensating them.” He personally is in favour of “an idea [that] if bats destroy a percentage of a fruit crop... [and that percentage can be demonstrated, that the Mauritian tax-payer, Mauritius as a whole, should compensate those fruit growers.” He maintains that though he understands that there is a human-bat conflict on the island, the situation is so dire for Mauritian biodiversity that one cannot always try to balance the two and says, “you have to choose for one rather than the other and in this case, we have to choose to protect Mauritian biodiversity.” Two themes that emerge in this reflection by Griffiths is the use of Noah's ark as an analogy and the binary opposition of people versus nature and the need to choose, which I argue (see chapter four) fundamentally shapes the

¹⁶ Ibid., Vincent Florens.

¹⁷ Ibid., Owen Griffiths.

environment-human conflict discourse. With science's separation from religion, the use of Noah's ark as an analogy can be contentious because while Griffiths is using the term to emphasise on the dire situation of biodiversity on the island and the need to conserve the remaining species threatened with extinction, he is borrowing the term from the Genesis flood narrative (Davidson, 2004), central to the great monotheistic religions that emphasize human mastery and exceptionalism (Tsing, 2012:144).

2.4.2. From disbelief of a cull to anger and distrust

In terms of building awareness to conserve the fruit bat, Florens¹⁸ comments that despite having had only one week of notice prior to the first cull in 2015, strategies adopted by conservationists have been mostly in terms of naming and shaming, protests and petitions. While, according to Florens,¹⁹ the petitions garnered more than 100,000 signatures, the government pursued the culling agenda despite scientific facts. This contemplation depicts the profound distrust and lack of cooperation persisting in contemporary narratives among science, nature and democracy. Chapter three will highlight the distrust of fruit growers towards conservationists and scientific methodologies and the government, even though the latter pushed forward the agenda of the cull.

Florens²⁰ also questions the official numbers of culled individuals saying,

“... many more animals were actually being killed... unseen and uncollected and therefore uncouned... Some would die of their wounds later on. This is something that we know from other such culling campaigns in Australia.”

He added that “hidden mortality,” the secondary deaths resulting from injuries, infections and inability to feed have not been counted. Florens added that illegal slaughtering by non-designated individuals was also a problem. “The government has made it very clear that it was supposed [to be] only the SMF [Special Mobile Force – the paramilitary unit in Mauritius] that should be culling these animals, but any, Tom, Jack and Harry were just culling [the bats] ...” He estimates that the culled number was possibly closer to 40,000 individuals in 2015 as opposed to the 30,938 individuals stated by the Minister. The second cull initiated in December 2016 over a period of two weeks increased the death toll by a further 7,380 flying foxes

¹⁸ Ibid., Vincent Florens.

¹⁹ Ibid.

²⁰ Ibid.

(Parliamentary Debates, 2017:38). A survey carried out by the National Parks and Conservation Service (NPCS) of Mauritius, completed in November 2017, had preliminarily established the number of bats to be 57,150 as of October 2017 (Parliamentary Debates, 2017:41).

But the counting method used in cases such as the bat population remains contentious. According to Vashist Seegobin,²¹ “how they counted the bats is per week... They went several places every Saturday, so one team here on Saturday, the next team another place the next Saturday... there are multiple counts.” Due to their wing structure and wingspan, Old World Fruit Bats, which includes the *Pteropus* genus, are notably strong flyers and can fly long-distances if resources are scarce or when dealing with patchy forest covers (Larsen et al., 2014; Palmer et al., 2000). A study carried out by Palmer and Woinarski (1999) on the black flying fox, *Pteropus alecto*, in Australia recorded bats travelling around 15 to 50 kilometres to find food. Oleksy et al. (2015) record that the female Madagascan flying fox, *Pteropus rufus*, had a home range of 28.1 kilometres and the males, a home range of 15.4 kilometres on average. It is thought that the *Pteropus niger* of Mauritius have the same flight patterns especially on the premise that the forest in Mauritius is highly fragmented, making food scarcity an issue. Counting bat numbers without actual tagging protocols means that there is no way of verifying when duplicates are being counted which would substantiate the scientific communities’ claim that the numbers proposed by the government have been grossly overestimated. While attempts have been made to contact the NPCS and the Minister to verify this statement during the research phase of this thesis, lack of response from the governmental bodies meant that this supposition could neither be validated nor disproved.

Alternatively, scarce food resources persist as a rationale for bats venturing into the fruit orchards. Gabriella Krivek,²² an ecologist who has completed a Master’s research on bats foraging sites in Mauritius says,

“I found that there are a lot more fruits in the weeded area [of the forest]... which is important for the bats and also I was looking at ejecta²³ [which shows that]... they prefer the weeded areas [more]; they don’t really go much in the

²¹ Interview with Mr. Vashist Seegobin, local conservationist, on May 21, 2017, at Mahébourg, Mauritius by author.

²² Interview with Ms Gabriella Krivet, conservationist, on May 21, 2017, at Mahébourg, Mauritius by author.

²³ Krivek (2017:8) describes Fruit Bat ejecta as “pellets created from indigestible fibrous fruit pulp, when the bats squeeze out juices by compressing chewed fruits between their tongue and palate.” Krivet mentions that ejecta are abundant underneath fruiting trees used by bats and can be easily collected without any need to capture and handle the bats themselves and thus estimate the food resources used by the bats.

non-weeded areas and those areas are also very dense, so the bats [prefer] to forage on the edge of these habitats because it's easier to move because of their larger wingspan, but they don't really go inside the [non-weeded] forest so it's much less useful for them as a foraging habitat... when they have a choice to go, for example, to these plantations where there is high abundance of fruits, then of course they will choose that rather than trying to go in these non-weeded forests."

While such an approach will not provide a 'silver bullet' strategy to conserving the *Pteropus niger* in the immediate conflict of human interest and environmental protection on the island, Krivek (2017:27-28) suggests that increasing native fruit abundance by weeding out invasive alien plants is likely to limit the fruit damage caused to commercially important fruits in the long-term and that in the meantime alternative methods such as exclusion nets, pruning, dwarf varieties, deterrent and decoy crops could be implemented.

Krivek²⁴ also underlines a fundamental issue in the environmental dialogue which is science in opposition to peoples' perception of a situation. Despite the scientific investigations that provide information, these data are rarely translated by the scientific community in ways that can be understood and accepted by the population –

"... my approach was good in a scientific way – I can tell them now that weeded areas are better for the bats and we should do weeding and this could be a useful information... but when I tell this to local people, they are not really [interested]. And the same for seed dispersal and pollination..."

She mentions how even some people working in conservation are unwilling to take actions against the cull:

"I found it very weird. There's a guy who's working with the National Park and I think he would like to protect the bats but, still, when I recommended [to] him that we should maybe try to tag the bats... he said that it doesn't make sense because there are so many bats and why should we do that?"

Her statement furthermore highlights a recurring problem that even workers in the field of environmental conservation are not all convinced that the bats should be protected, arguably because they might possibly be manual workers as opposed to being conservation scientists.

²⁴ Ibid., Gabriella Krivet.

Florens²⁵ and Tatayah²⁶ perceive that although there are some people who are for the cull, many are against it and that there is “a very vocal few” (Tatayah) “... who are very pushy about killing the animals” (Florens). Tatayah observes that there were pressures and complaints from the public going towards the Minister which formed the basis for the cull. But he maintains that –

“... what was interesting... and surprising... was the number of people who said we shouldn’t be culling the bats... we heard various views on it – there were, of course, the hard-line pro-cull people... and then there were those who were sitting on the fence in between and when the cull happened, quite a few of them said well, look actually we wanted to find a solution to this problem but we were not too keen about culling.”

While this statement might be true that most people are not specifically pro-bat cull, neutral by-standers who might not perceive that this issue is of concern to them result in little resistance to the culling. Personally, I know several people who while not directly advocating the cull still view the bats as pests. As Olival (2016:6) succinctly remarks, “bats are too often vilified and grouped by policy makers into a single biological unit” when the reality is that they are a diverse group of mammals with each species having its own ecological, evolutionary and life history traits that make it a unique and integral component of the ecosystem in which it is found. This further indicates the need for an approach to the issue driven by environmental humanities understanding of the situation taken up in chapters four and five.

2.5. Conclusion

The Mauritius flying fox appears to be the main species and the only endemic mammal remaining on the island in terms of functional role as pollinators and seed disseminators for many native plant species. Should the conservationists be correct in assuming that the numbers have been inflated in the population count, consequent culls might prove devastating to the species, rendering the population size to such a low count that it might become functionally extinct. In addition, research in other tropical areas such as the Pacific Island (McConkey et al., 2004:555) have shown that “severe tropical cyclones are a major cause of episodic mortality” in flying foxes as cyclones damage trees and “strip branches, leaves, fruits and flowers,” depriving the bats of shelter and food. With the emergence of more intense and

²⁵ Ibid., Vincent Florens.

²⁶ Ibid., Vikash Tatayah.

frequent tropical cyclones as an effect of climate change, the bats are likely to face harsher natural calamities that will dwindle their numbers even further and increase their vulnerability to extinction.

However, though it might be easier to point fingers at the orchard owners as the pitchfork brandishing angry individuals responsible for the mass culling of the endemic keystone species given their pressure on the government for remedial actions, it would be a simplistic version of the reality. Duhamel,²⁷ proposes that we go beyond the blaming attitude because if people “don’t know, then it’s not their fault. Every change takes time,” which is an interesting insight to view the situation from the other stakeholder’s perspective.

This chapter has situated one of the main problems of the bat cull in the society-nature conflict. While scientists might have facts, figures and statements to corroborate their position on the need to protect the bats, their reliance on numbers has the fatal flaw in that it needs to be anchored in a certain setting which is highly academic and interventionist for it to gain traction. But society works not simply on figures but also on emotion, psychology and economy; areas that conservationists have not or possibly cannot integrate in their understanding of the issue, accounting for the on-going distrust and miscommunication in the bat culling issue in Mauritius. Chapter three showcases how the orchard owners have their own understanding of the issue, which is as pertinent as the scientific repercussions.

²⁷ Ibid., Christabelle Duhamel.

Chapter three: Beyond the science towards a social perspective

While chapter two examined the bat culling from a conservation lens, it is important to have the perspectives of other stakeholders being affected by the bats to enable a more comprehensive interpretation of the society-nature conflict. This chapter investigates the situation from the viewpoint of small-scale orchard owners who are directly affected by the fruit damage caused by the flying fox and often do not have the resources to adopt the non-lethal strategies.

3.1. Bats versus humans

A few hundred years ago, *Pteropus niger*'s worse menace would most likely have been intense tropical cyclones (Cheke & Dahl, 1981; Kingston et al., 2018) but now they face anthropogenic threats more. In December 2018, the non-governmental organization (NGO), *Droits Humains Océan Indien*, sued the government of Mauritius for its decision of a third cull after prior culls greatly decreased the population numbers of the species (Bordenave, 2019). Yet, despite the flying fox being a keystone species that needs to be safeguarded from extinction (Florens et al., 2017), the realities and life pressures faced by small-scale orchard owners cannot be denied and need to be included in the bat conservation discourse on the island.

Wildlife culling has been practiced worldwide on the premise that it is a necessary management tool to alleviate human grievances brought about by the presence of such wildlife (for example, Wasserberg et al., 2009; Frank et al., 2015; Miguel et al., 2020). South Africa, for example, launched a programme through the South African National Parks (SANParks) that opted for elephant culling as a means of curtailing a potential destruction to vegetation in the Kruger National Park (KNP) in the late 1960s which brought about the decision to maintain the population at about 7,000 individuals, resulting in 17,219 elephants being culled or removed from the KNP between 1967 and 1996 (Van Aarde et al., 1999:287).

Furthermore, conflicts between humans and wildlife are bound to arise if the space is shared, given that most wildlife as well as humans are territorial beings (Greiner, 2012). As discussed by Knight (2000:3), “people-wildlife conflict is universally found” and “people-wildlife conflicts are relations of rivalry or antagonism between human beings and wild animals which typically arise from territorial proximity and involve reliance on the same resources or a threat

to human well-being and safety,” highlighting that people-wildlife conflict can result from either competition or predation. In the case of the bat culling in Mauritius, the conflict appears to emanate mostly from competition through reliance on the same resources – in this case mango and lychee primarily (Khan, 2019). We can also apply Knight’s (2000) “threat to human well-being” by considering that the bats cause financial harm directly, especially to small-scale orchard owners, which affect the latter’s overall well-being.

While culling is universally a highly controversial topic, the problem of competition for resources is real and needs to be addressed. This chapter highlights some key findings gathered during the research phase of this thesis in Mauritius in 2017. The interviews carried out with the small-scale farmers provided invaluable insight of their realities as well as their perception of the problem. As mentioned in chapter one, all interviewees were given the option of confidentiality and anonymity. However, they all agreed to sign the release form (Appendix C) for their names be cited.

3.2. Democracy in crisis

As an independent nation since 1968, which ascended to the status of a Republic in 1992, post-colonial Mauritius is a democratic system. On that premise, actions undertaken by the Mauritian government with regards to the bat cull might be termed a necessary action for the welfare of local citizens even though a healthy natural environment is necessary for citizen welfare as well (Ferreira & Venter, 2016). In fact, following the 2018 cull from October to December, the Minister of Agro-industry and Food Security in Mauritius stated in a media interview with ION News (2019) that “he needs to reaffirm that it is not the government’s intention to eliminate the bat but it is mostly an exercise to manage the population so that it doesn’t affect or cause damage to the fruit growers especially in the case of lychees and mangoes.” He further added that “fruit planters appreciated the move and that there has been an increase of lychees on the market after the cull which depicted that the measures undertaken yielded results.” This statement²⁸ by the Minister showcases the underpinning of the governance system whereby the voters are provided the space to voice out their problems while the non-voters, in this case the bats, are relegated to pests that need management and control.

²⁸ Interview given by the Minister has been translated as closely as possible from Mauritian Creole to English. Video link: <https://www.youtube.com/watch?v=tpRexZRUlfc> [January 9, 2019].

However, despite the attempts by the government to appease the discontent of that segment of the voter population, interviews carried out for this thesis showed a lack of trust in the government.

Mr. Jacques Laval,²⁹ one of the small-scale orchard owners interviewed, lamented what he perceives to be an inefficacy of the government from his point of view. According to Laval, a 71-year-old Mauritian who has had an orchard for more than 10 years in the southern part of the island, “*gouvernement pas prend nous compte*,” [the government is not interested in our welfare]. He highlights that the government gives them nets to put on their trees, but nets are useless. Mr. Guneshwar Laulloo,³⁰ a resident of Vallée de Prêtres in the north-western part of the island, who has been a small-scale fruit and vegetable grower for more than 30 years, says that they “have asked the government to come see and film the damage for themselves so the planters could be compensated for the fruit loss” but stated that no one has shown up to do so.

Mr. Sunghoon Kreepaloo,³¹ the current president of the Small Planters’ Association³² in Mauritius says that while he understands that “the bats have a right to exist like all life forms on Earth; on a small island like Mauritius the bats can become a nuisance if the population is too high.” From his perspective, a balance needs to be achieved that should be brought about by authorities. Kreepaloo³³ explained that they started talks with the government in 2015 that orchards needed to be safeguarded but due to external pressures [from pro-conservation individuals and groups], the government took a long time to respond to their appeal for a cull which resulted in almost 80 percent fruit loss in 2015, according to the planters’ estimates. He argues that the cull in 2016 was further necessary because even though they witnessed about 90 percent in flowering, the planters still experienced a loss of 60-70 percent in the yield due to bats. Another planter, Mr. Krishna Sewchurn,³⁴ from Arsenal in the north of the island,

²⁹ Interview with Mr. Jacques Laval, small-scale orchard owner, on May 16, 2017, at Rivière des Anguilles, Mauritius, by author.

³⁰ Interview with Mr. Ganeshwar Laulloo, small-scale orchard owner, on May 20, 2017, at Vallée des prêtres, Mauritius, by author.

³¹ Interview with Mr. Sunghoon Kreepaloo, from small planters’ association, on May 12, 2017, at Mauritius Cane Industry Authority (MCIA), Réduit, Mauritius, by author.

³² According to Mr. Kreepaloo, small planters in Mauritius are defined as those planters who have one to 25 acres of land that can be either sugarcane fields, vegetable and/or fruit growers, greenhouse and hydroponic endeavours. In Mauritius, land is measured in *arpent* or hectare. An *arpent* is pre-metric French unit of area and in the local context one *arpent* = 1.043 acres or 0.4221 hectare (International Monetary Fund, 2006:43).

³³ Ibid., Sunghoon Kreepaloo.

³⁴ Interview with Mr. Krishna Sewchurn, Small-scale orchard owner, on May 20, 2017, at Arsenal, Mauritius, by author.

mentioned that the small planters go to meetings and are promised that the authorities will take necessary actions to remediate the challenges they face but nothing is actually done to that effect.

Such statements by the interviewees depict both a belief that the governance system need to address societal issues given that politicians in power have been voted to work for the people and their welfare as well as a disillusionment in the actual functioning of the system. Furthermore, the planters' reactions have been used as a basis to initiate the bat culls, which are quick and appear productive but might simply be a political strategy to appease the citizens as opposed to a long-term viable and sustainable option. Political parties and governments are elected on a five-year mandate in Mauritius and accountability for the years in power need to be provided to the voters so that political parties may retain their parliamentary seats (Bunwaree & Kasenally, 2005). On the other hand, the silent citizens of the island in terms of non-human species do not contribute to the making of democracy on the island and hence, while most are afforded rights of existence and/or some form of protection according to the law of the country, their well-being and/or health is not usually considered when social or economic debates take place. Democracy and environmental protection seem to be more dissociated than ever in our current world, and democracy in its existing form might be one of the issues exacerbating the society-nature conflict prevalent in modern times, a concern explored more in depth in chapter four of this thesis.

3.3. The merits of non-lethal strategies

3.3.1. *Netting the trees*

Throughout the bat culling controversy in Mauritius since 2015, the pro-conservation stance has been to adopt non-lethal methods of managing perceived bat damage on fruits (see chapter two). One of the main strategies proposed by conservationists was netting the fruiting trees. As mentioned by Tatayah³⁵ during his interview,

“Culling the bat is not resolving the problem... but netting your trees, pruning your trees, harvesting your fruits at the right moment and not leaving [fruits] to [over-ripen] on the trees are far more practical solutions to [culling].”

³⁵ Interview with Dr. Vikash Tatayah, Conservation director at Mauritian Wildlife Foundation, on May 19, 2017, at Mauritian Wildlife Foundation Office, Vacoas, Mauritius, by author.

According to the interviewed planters, even though they expected the government to take action to decrease the fruit loss through the culling strategy, they also took measures that might potentially curb the damage they were facing. The use of nets has been one such strategy adopted that the planters argue is moderately useful in some cases but proves to be a costly alternative. Laval³⁶ explained that he bought nets in 2015 and originally thought of putting pipes and metal structures around his lychee trees prior to installing the nets over those structures. He opted, however, to veer away from investing in such structural protection especially since lychees ripen together in a short timeframe and he does not have a foreign market to which he might export his fruit yield. Laullooa³⁷ corroborated this statement saying that -

“... government tells you that you need to encircle your orchard, that we need to make it like hydroponic... we can't do that. It's difficult... and moreover, in my case, I don't own an orchard per se... sugar estates [lease] the orchard to us but we take care of the orchard...”

Since the land does not belong to him, it does not make sense, in his opinion, to set up permanent structures as it would be a costly method that will not necessarily benefit small-scale planters in his situation in the long term.

Kreepaloo³⁸ further highlighted that another problem in netting the trees, especially older, and thus, taller lychee and mango trees is that it usually proves to be a daunting task as the nets tend to break and he recounted how he was made aware of situations whereby people had been trying to put nets on their fruit trees and fell from heights, resulting in severe injuries. He stated that -

“...contractors are now available [and] offer their services for putting up the nets but this burdens the planters with an additional cost that many cannot afford.”

According to Laullooa,³⁹

“... [the orchard owners] pay between USD 27-35⁴⁰ (1,200-1,500 MUR) per person to cover three to four trees in a day and need four to five men to get the job done. Think how much this can cost us... And that too just to put [the nets] on, now we need to remove it as well otherwise it will affect the trees.”

³⁶ Ibid., Jacques Laval.

³⁷ Ibid., Ganeshwar Laullooa.

³⁸ Ibid., Sunghoon Kreepaloo.

³⁹ Ibid., Ganeshwar Laullooa.

⁴⁰ The Mauritian currency is Mauritian Rupees (MUR) and I converted to the US Dollar, using the exchange rate at the time of writing this thesis.

Out of the five orchard owners interviewed, four of them have adopted the netting practice without the use of metal structures to surround the trees. According to them, despite putting the nets fully over the trees and covering them to the ground as suggested, stretching the net with the use of poles and plastic bottles and in some cases securing the nets on the ground, they have witnessed bats going inside the net and a couple of them have conceded to personally knowing people who have culled bats when they found them on their trees under the nets, even though it is illegal to do so. During the culls in 2015, 2016 and 2018, the Special Mobile Force (SMF) teams were the only ones afforded the authority to carry out the execution but there have been many cases whereby individuals with fruit trees have taken matters in their own hands on the supposition that the authorities were not doing their jobs properly and that according to the planters, the nets provided are ineffective against the threat posed by the flying fox.

Whilst most of the fruit growers interviewed refused to set up nets over metal structures around their orchards mainly due to costs, one of the planters attempted to improvise and build a cheaper alternative of such a structure around his orchard. Mr. Rajen Suddul,⁴¹ transitioned from sugarcane plantation to orchard, especially lychees and some mangoes, over a decade ago. He said that he suffered from massive loss in his orchard over the last few years due to bats, estimating his loss to more than 80 per cent. According to Suddul,⁴² he had forecasted that his orchard would have generated a yield worth more than USD 2,286 (MUR 100,000) in 2016 but instead, he ended up with less than USD 572 (MUR 25,000) and he alleged that his profits seem to decrease year by year primarily because of bat damage. Having obtained subsidised nets from the government, Suddul initially adopted the conventional netting practices but explained that he also noticed that netting trees in that specific fashion was costly and continually unsuccessful. Suddul explained that he experimented with leaving the nets on after the fruiting period (to decrease the costs of re-installing them the following year) but the following fruiting season then yielded a far less attractive output. He surmised that due to the nets, trees might not be visited by their usual abundant pollinators. He also mentioned that leaving the nets on without first inspecting for holes and damage between fruiting seasons

⁴¹ Interview with Mr. Prithiviraj Ragen Suddul, Primary school headmaster and small-scale orchard owner, on May 13, 2017, at Chamouny, Mauritius, by author.

⁴² Ibid.

would be unwise as well as costly in terms of time and resources and he had to find another method of protecting his fruit trees from bat damage. Suddul⁴³ stated,

“I was thinking if I had to do sheltered farming in a professional way, it would be difficult in terms of money. Then I devised my own means, I thought of getting telephone poles that are rejects... the old telephone poles that get replaced. I bought those poles since they are treated wood and would last longer. I installed them all around my orchard. I then took ropes and tied them all around on the poles [as a grid], then sewing the nets together so that they can be placed over the structures.” (See Figure 3.1)



Figure 3.1 The four photos depict the installation made by Mr. Rajen Suddul, small-scale orchard owner, to protect his fruit trees from bat predation. Pictures above show the old telephone poles tied by ropes that he used to set up the structure. The pictures down (left) show the fencing around his orchard and down (right) the overview of the set-up onto which he drapes the nets during fruiting season.

Even though such a strategy by Suddul⁴⁴ shows an attempt to find a non-lethal solution for his orchard, its implementation for all orchard owners in Mauritius is potentially problematic. During the visit to Suddul’s orchard, it was clear that the structure in place would work for his

⁴³ Ibid.

⁴⁴ Ibid.

personal plot of land because of the relatively small size of his orchard (Figure 3.1). Suddul mentioned that he would need to pay workers to set up the nets after the flowering season, keep the nets on the structure for the fruiting season and then remove them once more after harvest, an additional cost that might be feasible for him but costly for other orchard owners. Also, his orchard being relatively young, the fruit trees are not exceedingly tall which makes such a project achievable. In addition, his already fenced orchard is found in a rectangular, mostly level plot (Figure 3.1) which acts as a good structure to tie the ends of the nets, effectively closing the orchard from bat or bird predation.

On the other hand, Laval's⁴⁵ orchard, for example, is found in an area that would make such a structure challenging. His orchard is found in a valley, on uneven terrain, a few meters from a river with a steep riverbank (Figure 3.2). The lychee and mango trees, amongst others were scattered throughout his land and would require individual framing of each tree to be successful. In Laullooa's⁴⁶ case, he has more than one orchard that he leases and uses for his crops, which renders it costly to adopt a sheltered farming structure, albeit an improvised one. It should be noted that Suddul⁴⁷ is the only planter interviewed who works the land as a hobby and has a full-time career in the educational sector that exposed him to more information than his counterparts who rely mostly on their plantations as a means of livelihood, bringing forth the idea that education and awareness is crucial to environmental protection on the island.



Figure 3.2 shows small-scale orchard owner, Mr. Jacques Laval's, orchard layout. The picture on the left shows some of his planted trees that grow on the riverbank and the picture on the right depicts how the land has a steep slope, given its geographical location in a valley.

⁴⁵ Ibid., Jacques Laval.

⁴⁶ Ibid., Ganeshwar Laullooa.

⁴⁷ Ibid., Rajen Suddul.

3.3.2. *Smoke, noise and light*

Suddul⁴⁸ mentioned during his interview that he believes the government could subsidise sheltered farming for small scale-orchard owners as a non-lethal method of bat damage control. However, since this has not been considered as a strategy by the government so far, other tactics have been implemented by the fruit growers attempting to minimise fruit damage from the bats. Suddul, for example, tried to use some ultrasonic pest control repellent in an attempt to repel the bats but without success. In Laval's⁴⁹ case, during fruiting season, he would net the trees but additionally use old compact discs attached to a pole at the top of the tree (Figure 3.3) with spotlights around to detract the bats. He mentioned how he also set up radios blaring into the night mostly around the lychee trees hoping that the noise would scare the flying foxes off but, again, to no avail. It must be noted, here, that the noise recourse was possible since Laval's orchard is situated in a valley with no immediate human inhabitation around. Laval perceives that the only tactic that worked efficiently is the burning of rubber but the bats, seemingly, come back as soon as the rubber smoke has dissipated and feed on the fruits before these even get time to mature.

⁴⁸ Ibid.

⁴⁹ Ibid., Jacques Laval.



Figure 3.3 shows the erected pole with discs, installed by small-scale orchard owner, Mr Jacques Laval. During fruiting season, he also connects spotlights at the base for the lights to reflect on the hanging discs to deter the nocturnal bats.

In 2017, Laval⁵⁰ mentioned that he succeeded to salvage some of his lychees and managed to recoup USD 412 (MUR 18,000) from his 21 trees. Nonetheless, he emphasised that the only way he was able to accomplish this was by burning rubber but given that he fell sick in the middle of the fruiting season (according to him, due to the rubber smoke), he could not continue

⁵⁰ Ibid.

this method of deterring the bats from feeding off his orchard and lost the subsequent fruits.

Laval emphatically stressed that,

“Without rubber, I cannot do anything but how much will I burn? [The] bats only stay away while [the rubber] is burning, then they come back. So, you need to burn rubber for as long as there are lychees on the trees which can be more than a month, up to 55 days.”

While Laval opted for the burning of scrap tires as a bat deterrent, this can cause serious health issues⁵¹ such as “asthma and respiratory complications, aggravation of existing cardiovascular illnesses, eyes irritation, cough and chest pain, nervous system depression, high blood pressure and subsequent heart disease, adverse effects on kidneys, liver, nervous system, cancer and inflammation of mucuous membranes” (Ziadat & Sood, 2014:2696). It also contributes to environmental pollution such as air pollution through smoke and volatile compounds (Horner, 1996; Carrasco et al., 2002; Ziadat & Sood, 2014); water pollution whereby any source of water can carry the oily decomposition as well as combustion residues such as zinc, cadmium and lead to nearby water bodies (Horner, 1996; Evans, 1997) (like in Laval’s case whose land is situated adjacent to a river); and soil pollution where the products of liquid decomposition penetrate the soil either immediately or gradually through leaching of ash and unburned residues following rainfall or other water entry (Horner, 1996).

Another orchard owner, Mr. Giandutt Gooroochurn, used a similar technique of burning to ward off the bats but used dry twigs, leaves and dry red chillies to create a smoke deterrent for the bats (*l’express*, 2016). In a news segment in December 2016, *l’express* – one of the local news media outlets on the island – showcased⁵² Gooroochurn’s endeavour to find a non-lethal method of protecting his orchard. The concerted family effort included living in a makeshift tent in the orchard for the whole duration of the harvest season, daily stacking up barrels with leaves, twigs and red dry chillies that would subsequently be burned at night until the early mornings followed by exploding firecrackers which help to temporarily scare off the bats.

⁵¹ Ziadat & Sood (2014) give a detailed version of how each component resulting from the burning of scrap tires affect the health of those inhaling the fumes directly.

⁵² Youtube Video Link, <https://www.youtube.com/watch?v=Kz4S8IF-QLo>, can be accessed to view the short news section on this family’s efforts to secure their harvest.

In Sewchurn's⁵³ case, he mentions that previously bats were deterred by light, but in subsequent years, they became accustomed and would feed even while the blaring spotlights were on, rendering light ineffective as a deterrent. Smoke and intermittent loud noises in the form of firecrackers instead of constant and repetitive noises such as the radio appear to be the current defence methods employed by most of the orchard owners. These require constant monitoring and input from planters, rendering them tired, sleep deprived and potentially have adverse effects on their health and well-being.

According to Kreepaloo,⁵⁴ many of the orchard owners spend more than a month in their orchards, living in that area day and night so they might be able to ward off bats as well as human thieves. He says,

“It's not just one person [staying in the orchard], it's at least 4-5 people, sleeping there in their tents and make-shift huts. They don't have a social life or proper sleep. They are not living their lives. You feel sad when you see them, so I believe we need to do something [about the bats].”

Welfare is a prominent necessity in our society and should not be devalued. However, in our anthropocentric world, economic growth has superseded both human and animal welfare. Unless the whole species is rendered extinct, the flying fox will continue to forage for food in human-inhabited spaces. Governance has a role to play in protecting both the environment and the people, a theme explored further in chapter four of this thesis.

3.3.3. Pruning the trees

In addition to netting, pruning has been suggested as a solution. Fruit tree pruning or hedging has been practiced for ages and is generally considered to be beneficial not only in controlling the tree size but to have a better yield in terms of fruit size, colour and other quality attributes such as taste. Ashraf and Ashraf (2013) discussed the benefits of summer pruning in many fruit tree species, especially in terms of a higher yield and better fruit quality in most cases. Asrey et al. (2013) conclude that pruning treatments contribute to better yield and quality in mango and Olesen et al. (2013) support the pruning of lychee trees. While, in theory, it provides a sensible alternative, a key issue has been highlighted by the orchard owners interviewed. Many of their trees are more than a couple of decades old and more than six meters tall.

⁵³ Ibid., Krishna Sewchurn.

⁵⁴ Ibid., Sunghoon Kreepaloo.

Also, despite being a long-term beneficial solution, pruning of such trees would mean that these fruit growers would experience little to no yield for a few years, which would affect their immediate sources of livelihood. Economic welfare appears to be once more a hurdle in the adoption of this non-lethal strategy. Furthermore, according to the orchard owners interviewed, smaller fruit trees do not hinder the bats from feeding since as stated by Laval,⁵⁵ “the bats crawl on the nets to get underneath and reach the fruits.” Hence, pruning would be indirectly beneficial, mostly by allowing better positioning of the nets around the trees enabling more useful coverage.

3.4. The cost to the planters

Economic benefit has been at the centre of this bat culling controversy in Mauritius since the first cull in 2015. According to Kreepaloo,⁵⁶ the small-scale orchard owners were repeatedly told to carry out netting and pruning to which they argued that such methods are ineffective techniques. He further indicated that they suggested during sessions with governmental bodies that –

“... the government take some progressive farmers and send them for some workshops in Réunion, for example, since the latter did have a bat issue previously, to see how they are navigating the situation [non-lethally]...”

But they failed to receive a response on the matter. According to Kreepaloo,⁵⁷ “[the small-scale orchard owners] would have all liked to get on board with non-lethal means but the problem is finance.”

While proponents of bat protection staunchly oppose the culling on the premise of species extinction, the concerns voiced out by the farmers are more immediate and relate to a more personal experience. Many pro-conservation individuals are not directly affected by the damage caused by bats and understand the larger implications of environmental degradation, accounting for their intensive campaign to halt the bat culling. But the farmers, on the other hand, are exposed to a situation where their livelihood is being threatened. Even though communities and cultures previously had an intricate connection with nature and understood

⁵⁵ Ibid., Jacques Laval.

⁵⁶ Ibid., Sunghoon Kreepaloo.

⁵⁷ Ibid.

the interdependence of human with nature (Escobar, 1998; Bridgewater & Rotherham, 2019), neoliberalism and the concept of trade has brought forward an economic aspect to life that requires conformity for survival as “economically it endorses the expansion of the market economy” and politically, “it implies that collective decision making should involve a constitutional state with limited substantive powers of economic and social interventions and a commitment to maximizing the formal freedom of actors in the economy and the substantive freedom of legally recognized subject in the public sphere” (Jessob, 2002:453). The market of neoliberalism “is not a natural given revolving around dynamics of exchange, but an artificial and fragile environment centred on logics of competition,” requiring “an interventionist state, to support and protect its existence and proper functioning” (Mavelli, 2017:497). According to Harvey (2005:160), capital-intensive modes of agricultural production have brought about the commodification of nature in all its form and escalated depletion of the global environmental commons and habitat degradation.

The orchard owners are not excluded from this economically driven framework. While they are being told that the bats need to be protected for long-term benefits of the environment, their realities and aspirations shape their perception of the animal. The pro-bat protection side of the debate is driven by a love for the flying foxes, stemming from an understanding of their role in the ecosystem while the pro-cull side views them as pests that are destroying their sources of livelihood. As discussed in chapter two, bats’ role in the ecosystem is beneficial for endemic and indigenous plants (Florens et al., 2017). But orchard owners do not believe they benefit from the species in any tangible and discernible way, hence making it easier for them to vilify the bat with the latter being hailed, as Laval⁵⁸ and Laullooa⁵⁹ stated, “the most destructive [of all fruit predators].”

In fact, Laullooa⁶⁰ revealed that he lost USD 11, 432 (MUR 500,000) in terms of profit from the fruit damage in 2017. Laval⁶¹ had 21 litchi trees in 2017 that he estimates “... yielded around 10,000 litchis each [which] when sold at USD 0.05 (MUR 2) each... brings a consequent profit [should he have had a bat free harvest].” But he professed to having made only USD 412 (MUR

⁵⁸ Ibid., Jacques Laval.

⁵⁹ Ibid., Ganeshwar Laullooa.

⁶⁰ Ibid.

⁶¹ Ibid., Jacques Laval.

18,000) in profit from his lychees, given that he fell sick, which he attributed to smoke inhalation from burning rubber.

When speaking in terms of economy and livelihood, the small-scale orchard owners lacked the collateral that would provide a buffer security should the crops fail to yield the estimated amount of income. As mentioned earlier, only one of the planters interviewed, Suddul,⁶² had a full-time job with a fixed monthly income, with his vegetable and fruit trees patch being a supplementary income rather than his sole source of livelihood. The others, while diversifying in both fruits and vegetables, were still highly dependent on the land. With the more pressing needs of providing for their families at the forefront of their realities, small-scale orchard owners prove more resistant to the environmental protection discourse, opting instead for a more personal and emotionally charged version of the situation, vilifying the creature they perceive embodies their woes.

3.5. The bats: Judged, condemned, and executed

In a court of law, at least from the human legal system's perspective, there exists the binary of victim versus perpetrator, innocent versus guilty based on sets of moral obligations and legal statements that determine whether an action is deemed harmful in a human-human narrative. Yet, in the case of non-human entities, species are rarely perceived as entities requiring the same rights. As discussed by Rose (2012:103), "western tradition has long dedicated itself to finding ways to distance humans ontologically and ethically from other creatures, and from other animals in particular." This has been clearly seen in many previous cases of flying fox conflicts that disconnect the bats from the people and sever potential ideas that co-existence might be possible and as emphasised by Rose (2012:101), "radical social exclusion, phrased in righteous banal terms, precedes and comes to authorise the species cleansing involved in expulsion." The opinion shared by the planters interviewed corroborate this sense of disconnect, perpetuating further a divide that results in the radical call for near extermination of a species.

While the planters admit that they also suffer from human thieves during fruiting season, they perceive it to be a mild problem that they can tackle but are adamant about the bats' prominent

⁶² Ibid., Rajen Suddul.

role in devastating their fruit trees. The planters refuse to believe that other animals could be responsible for fruit damage as suggested by the conservationists (for example, Florens & Baider, 2019; Tollington et al., 2019). Laval⁶³ mentions that “if a [bird] feeds on the lychees, it will be one. There are no other animals except for the bats that come.” And when asked about rats, he disagrees that they cause major damage saying that planters do have solutions such as rat poison when it comes to the rodents. Sewchurn⁶⁴ corroborates this statement and while he says that crows do come to feed on the fruits as well, he also maintains that crows do not cause as much damage. Overall, the orchard owners perceive that rats and birds do cause minor damage but are insistent that the other animals are insignificant in contrast to the bats which, they argue, make them spend sleepless nights and cause significant damage to their fruits.

Laullooa,⁶⁵ who has been a small-scale planter for 30 years, says:

“Bats are destructive – *dévasteur*. We don’t need to exterminate all, but they need to decrease. Consumers say that lychees are too expensive and that [planters] are being unfair/ exploitative – *pé fer dominair*. No! The bats are the unfair/ exploitative ones – *Non! Chauve souris qui fer dominair*.”

According to him, endemic bats are in the same league as exotic pigeons and,

“... pigeons were culled when they weren’t doing anything [harmful] in Mauritius but [the pro-bat conservation group] say that the bats which are worse pests should not be killed.”

In his opinion,

“If the bats eat everything, what will be left for us? They eat jackfruit, breadfruit. The bat is a ‘devastating’ animal. I say to cull, there are no other solutions.”

Disagreeing with numbers provided by conservationists, Kreepaloo⁶⁶ states that the planters believe that the number of bats must be above one million individuals. He says,

“And according to us planters, if a bat breaks 25 [lychees], it’s probably eating only five. So, if a bat comes, it can destroy a tree with 1,000 lychees within a week or less.”

⁶³ Ibid., Jacques Laval.

⁶⁴ Ibid., Krishna Sewchurn.

⁶⁵ Ibid., Ganeshwar Laullooa.

⁶⁶ Ibid., Sunghoon Kreepaloo.

When asked about the minimal increase in yield following the 2015/2016 mass bat culling, the small-scale orchard owners blamed a lack of government efficiency in the mode of the culling operation. According to several of the respondents, the SMF teams assigned to shoot the flying foxes were not carrying out their job properly. According to Laval,⁶⁷ they should have operated in roosting sites to cause the maximum damage,

“Nearby in Trou Cochon, there is a cliff with more than 3,000 bats... and I have told AREU to come and I’ll show them, but no one ever came.”

Laullooa⁶⁸ claimed that he witnessed, in some cases, the task force shooting maybe four bats down but then put forty as the official number which he cited as one of the reasons that the cull did not produce a more positive outcome.

When asked what further the government could do to help the small planters, Laval⁶⁹ says that the government should help them safeguard their lychees from the bats, even if it involves further culling, and provide them with a market to export their fruits. The perceptions of the small-scale orchard owners interviewed provide an insight on the rationale subsequently adopted by the government to launch another cull in 2018 which reduced further the numbers of the *P. niger* population.

3.6. Conclusion

This chapter has been dedicated to following the reasoning and emotional journey of a sample of small-scale orchard owners. Many of these fruit growers have tried different methods to deter the fruit bats from their livelihood income but to no avail, in their opinion. Many have incurred huge losses in their revenue due to bat predation. The small-scale orchard owners expressed cynicism towards the conservationists, all interviewees seemingly holding on to the belief that conservationists cannot know more than them the actual reality of the population size of the *P. niger*, given that they are the ones who suffer from the bats. Many of the fruit growers have at times, communicated a distrust in the government as well, believing the latter is not doing enough to alleviate their pains and help them recover from monetary losses every year. Chapter four of this thesis discusses the discrepancies that arise when conservation of species is challenged by economic livelihood of human beings and the position of governance

⁶⁷ Ibid., Jacques Laval.

⁶⁸ Ibid., Ganeshwar Laullooa.

⁶⁹ Ibid., Jacques Laval.

in the debate of human-wildlife conflict, using frameworks borrowed from political ecology, sociology and environmental humanities, expanding on the different issues that have been put forth by both the conservationists and small-scale orchard owners.

Chapter four: Where science and society clash in the bat culling initiative in Mauritius

4.1. Introduction

This chapter examines the conflicts between the conservationists and small-scale fruit growers, the diverging opinions that seem to arise, as discussed in chapters two and three respectively. Conceptual frameworks of environmental humanities such as politics of nature and multi-species thinking frame the discussion. The political aspect of this problem is a prominent driving force which cannot be ignored. So, discussion will also consider the governmental decision-making process regarding the bats, where applicable. This chapter's aim is to attempt to articulate the various concerns of the stakeholders in the bat cull and distillate the information to enable an outlook on the situation that is neither pro-conservation nor pro-growers but rather take a global outlook to the problem and potentially formulate a plausible feasible alternative.

Myriad human actions have shaped the island to its present situation – a widely recognized stable economy in the African Union with a seemingly good democratic system and high standard of living (Bertelsmann Stiftung, BTI 2020 Country Report — Mauritius, 2020:3). However, rather than adopting an approach that situates human within the biophysical environment for long-term sustainability, the system is one anchored in quick human-centred strategies that may bear long-term negative cost (McPhearson et al., 2021). While this thesis includes interviews from scientists on one side of the debate and small-scale orchard owners on the other, discussion pertaining to the issue of bat culling must be undertaken with the inclusion of a third key stakeholder, namely the government. Even though attempts have been made to contact the governmental bodies, no interview was granted and most of the information gathered from the government angle are from secondary sources such as news media articles and videos as well as governmental parliamentary sessions, as mentioned in the earlier chapters of this thesis.

4.2. Politics of nature

The anthropocentricity of society impacts the way humans interact with the environment. According to Catton and Dunlap (1978:42-43), Human Exemptionalism Paradigm (HEP) relies on the assumption that humans are unique among organisms in that humans have culture, and that cultural accumulation implies that “progress can continue without limit, making all social problems ultimately soluble.” Catton and Dunlap (1978:43) argue that HEP is flawed in approach given that sociologists have largely ignored “the fact that our society derived special qualities from past abundance.” In fact, Mauritius is such an example whereby nature, devoid of anthropogenic actions has evolved for millions of years to produce diverse resources that have been deemed abundant at the time of colonial rule (Gylfason & Zoega, 2006; Auty, 2017). However, many of these resources are now nearly or completely depleted due to the rapidity with which they were exploited.

Dunlap (2002:333) propositions that HEP views social, and by extension, cultural environments as crucial context for societal affairs but fails to take the biophysical environment as an integral part of society’s development and he advocates instead for a more integrative approach that emphasizes human reliance on the biophysical environment that “imposes potent physical and biological restraints on human affairs” accounting for the New Ecological Paradigm (NEP) perspective. NEP recognizes the ecological constraints put on human development and the reality that our society is bound by the environment it is anchored in and thus, requires careful consideration of ecological systems and other organisms within the system. The NEP scale outlines a baseline (Dunlap et al., 2000:433) for the evaluation of human ecological perceptions that might prove a useful framework for subsequent research in the bat culling controversy on the island, particularly should quantitative research (such as surveys) on environmental perception be undertaken as a follow up to this thesis findings.

However, nature conflicts tend to be more complex than just human culture versus ecology. Politics and the sciences tend to be intricately linked to these issues. Throughout the history of human civilization, scientists have had to shoulder the burden of proof. In the 16th and 17th centuries, scientists like Copernicus and Galileo were branded heretics by the church - the prevalent political system of the time - for proposing that Earth revolves around the sun, a theory now proven to be true (Leveillé, 2011). The concept of creation versus evolution is still widely discussed in the contemporary world, despite scientists like Charles Darwin’s

theory of Evolution (Darwin, 1859). Scientific studies are bound by the limitations of the experiment and, thus, conservation biology is one of the most divisive sciences since in many instances, exact number or definitive proof cannot be generated (Soulé, 1986). In the bat culling case, for example, bat numbers are measured as an estimate, since other techniques such as weather radar (Meade et al., 2019) or GPS/GSM tagging of the flying foxes (Oleksy et al., 2019) might prove too expensive and/or invasive (Sørås et al., 2020). Such challenges render scientific findings open to interpretation and in a country that is still embedded in anthropocentrism, the governance system opted for a pro-human approach as opposed to an earth-centred philosophy. Simultaneously, the scientific community also has a share of liability in the issue. The politics of nature does not only involve economy, capitalism, modernization and uneven distribution of resources but also addresses the subject of neoliberal conservation, the predominant way of doing conservation on the island, which arguably might be one of the indirect causes of the society-nature disconnect in Mauritius.

4.3. Your truth or my truth?

While interviewing participants, one key aspect seems to always commandeer the space; the attitude that the interviewee was right, but the other stakeholders were all misinformed, disillusioned or had their facts warped and were ignorant. Florens,⁷⁰ for example, mentioned how the “[scientists] tried to play on scientific facts which is something [they] realise of course the government is completely impervious to,” to get the government to halt the first and second cull. He added that the minister was saying that “... the conservationists are saying 55,000 and the planters are saying 300,000 and so what do we believe?” According to Florens, that is “completely dishonest,” because on one side stakeholders are just plucking numbers out of thin air while on the other side, scientific methodology, although not perfect, was used, which is a rational and verifiable method of having population estimates.

Indeed, on the other side of the narrative, many of the orchard owners have stated that they believe there are more than 55,000 bats on the island. Laval,⁷¹ for instance, estimates the bats as: “There is a cliff. If you look at the amount [of bats] in that space. It’s in the thousands!

⁷⁰ Interview with Professor Vincent Florens, lecturer in ecology at the University of Mauritius on May 21, 2017, at Mahébourg, Mauritius by author.

⁷¹ Interview with Mr Laval Larubarbe, small-scale orchard owner on May 16, 2017, at Rivière des Anguilles, Mauritius by author.

Three thousand, four thousand, five thousand, even ten thousand in that space!” This is further corroborated by Laullooa,⁷² who describes the numbers as: “In a tree, you can get thousands of bats hanging; almost like fruits on the trees!” While this might seem absurd from a scientific point of view, it should not be forgotten that though scientists are investigating areas of interest from an academic point of view, for the small-scale orchard owners, the bats are affecting their livelihoods. While numbers are indispensable in getting comprehensive and factual data, it seems conservationists have been unsuccessful so far in stopping the cull because they have tried to take a complex issue involving human fears and emotions and tried to assign a numerical value to the situation.

The disconnect between science and society prevails. In the case of the small-scale orchard owners interviewed, many have their orchards as their sole source of income (see chapter three). This implies that loss of mangoes and lychees for such stakeholders represents the challenge of being unable to feed their families properly or giving their children access to higher education. In such circumstances, in the orchard owners’ perceptions, whether the bats are at 55,000 individuals or a million, the damage is personal, and they want the species gone from their source of livelihood. The solution the government opted for was the culling - which would be immediate, serve to appease a portion of the voter base in their five-year, now going on a 10-year mandate and, in the short term, would be more cost-effective - albeit ineffective and with potentially long-term negative impacts on the island’s ecosystem and thus, resilience (McPhearson et al., 2021).

4.4. Non-lethal means

Conservationists have promoted non-lethal alternative to culling. As highlighted by Zimmermann et al. (2020), “orchards can be covered in nets, for instance, or trees can be planted in rows or pruned to stay small.” During interviews carried out for this thesis, scientists corroborated this statement (chapter two). However, the small-scale orchard owners are reluctant to accept netting and pruning as options. As mentioned in chapter three, small-scale orchard owners argue that pruning will make them lose consequent yield for a few years. In

⁷² Interview with Mr Ganeshwar Laullooa, small-scale orchard owner on May 20, 2017, at Vallée des Prêtes, Mauritius by author.

the case of netting, some fruit growers have tall trees or orchards in rocky and hilly settings that render net installation difficult and costly.

Once more, it is apparent that while scientists are viewing the situation through the long-term lens of environmental welfare and sustainability, the small-scale orchard owners are viewing the situation through the short-term lens of livelihood and survival, which is no less important. When situations arise whereby livelihood is threatened, many a time, human beings have opted for survival rather than environmental protection - the Covid-19 case worldwide being one of the latest whereby an abundance of plastic and medical equipment has been used to ensure human safety and well-being even though these are and will continue to have lasting adverse effects on the environment (Zambrano-Monserrate, Ruano & Sanchez-Alcalde, 2020).

In the bat culling narrative, stakeholders are at conflicting ideologies and each group appears to be attempting to make their stance heard the loudest in the hope that their version of the story will prevail. The political narrative revolves around pleasing the majority of their voter base, the science narrative appears to be the need to conserve the environment for future generations and the small-scale orchard owners' narrative is anchored in personal financial growth, individual needs and family well-being. When identified as such, the conflict becomes apparent given that these ideologies clash with one another on fundamental levels and compromises are necessary for any earth-centred development to occur.

4.5. Anthropocentrism versus ecocentrism

Deconstructed to the basic principle, the human-nature conflict arising in the bat culling situation stems from the opposing agendas of anthropocentrism versus ecocentrism. Anthropocentrism is based on the premise that humans alone possess intrinsic value and that all other living beings exist and are attributed value based on their use or their abilities to fulfil human needs (Goralnik & Nelson, 2012:145). It positions all environmental ethics, policies and decision-making as necessarily human-centred. Ecocentrism, on the other hand, takes a broader view to the concept of intrinsic value of organism. As discussed by Washington et al. (2017:Y-Z), ecocentrism “includ[es] environmental systems as wholes, and their abiotic aspect,” and encompasses “the ecological context for organism.” As Rowe (1994:2) highlights, “in the ecocentric view, people are inseparable from the inorganic/organic nature that

encapsulate them. They are particles and waves, body and spirit, in the context of Earth's ambient energy." Ecocentric ethics works on the principle that intrinsic value applies to all ecosystems, reflect a philosophy whereby Earth is one unified and cohesive homeostatic living organism, as set forth by Lovelock's (1979) Gaia theory.

I argue that, in the flying fox debate in Mauritius, the stakeholders fail to take an ecocentric approach to the issue, accounting for an incapacity to move forward in a manner that would benefit all parties concerned, human and non-human. According to Rowe (1994:3), we are so deeply anchored in the "cultural glasses of competitive individualism," that we fail to see the bigger ecosystem in which humans are embedded in. While attempts have been made to propose a sustainable development model on the island with the National Biodiversity Strategy and Action Plan (NBSAF) 2017-2025, it remains primarily an anthropocentric venture that is arguably at odds with the preservation of biodiversity.

According to the Minister of Agro-Industry and Food Security address' in the NBSAF (2017:iii), "Mauritius was the first country to sign and ratify the Convention on Biological Diversity in September 1992 and by so doing, gave a strong signal and a clear statement that necessary measures would be taken to protect our unique biodiversity." Ironically, this statement regarding national biodiversity has been placed in a document provided by the Ministry of Agro-Industry and Food Security. Agro-Industry is made up of two words that have often conflicted with environmental conservation: agriculture and industry. Agriculture in Mauritius is a colonial legacy of sugarcane plantations that had already subjected the island to massive deforestation. A reduction in native forested areas results in habitat destruction and limited food availability for organisms that are dependent on the indigenous flora for survival and the flying fox, the only endemic mammal on the island, is no exception. Putting the responsibility of biodiversity protection under the aegis of a governmental body whose objectives are primarily to promote agro-industry and food security poses a serious conundrum and a conflict of interest that has proven detrimental to the *Pteropus niger*.

While research for this thesis has demonstrated that orchard owners are pro-culling, it remains the onus of the democratic system to find solutions that are long term and potentially non-lethal. Policy makers' tasks should not only be about enforcing social justice, but also environmental justice given that adverse impact on the environment will have negative repercussion on people in the long-term (Hansel, 2018). However, despite the fact that daily

human life and the state of the Earth are intricately interconnected conversations on how to address these issues have so far, at least in the Mauritian context, been in separate discourses. Had an ecocentric approach been an integral part of governance, culling would not have been the solution. Opting for culling the bats shows one of several examples of an unwillingness to promote long term environmental sustainability. Unfortunately, the 2015 cull was the first of many, with subsequent ones occurring in 2016, 2018, 2019 and 2020 with 30,938 culled in 2015, an additional 7,380 individuals culled in 2016, and official bat deaths undisclosed for the ensuing culls (Zimmermann et al., 2020; Mauritius Wildlife Foundation Annual Report 2020, 2021).

4.6. Has the protectionist conservation approach failed the bats?

As discussed in chapter one and two, conservation in Mauritius started in colonial times (Costa & Noble, 1999:8). Fenced Conservation Management Areas (CMAs) have been formed for research purposes and to focus on protection of some endangered endemic birds and their habitats (Baider & Florens, 2011). The protectionist approach, arguably, form the foundation for the lack of understanding of environmental concern in the Mauritian landscape given the ideology entailed that the local population could only access the parts of the forest that were already highly invaded, with little indigenous fauna and flora. Often a stroll in the forest means a walk-through paths between the heavily invaded forest full of *Psidium cattleianum*, known locally as *goyaves de Chine* with not much else around given the degree to which the latter is invasive and hence detrimental to the local flora (Baider & Florens, 2011). The extent of the invasion is so prevalent that *goyaves de Chine* picking became an integral part of the Mauritian culture (for example, Beeharry, 2018). Lack of awareness renders it difficult to push environmental conservation to the forefront of political agendas. The layperson is not aware of the implications of biological diversity loss on the island and is more concerned with economical and societal woes as has been underscored by interviews with the small-scale orchard owners.

During the interviews, the disconnect felt by small-scale orchard owners was palpable. While they knew about exotic plants in their plantations, most of these locals are not well versed in indigenous flora. Though much more effort is now being made to raise awareness on native forest with many projects such as La Citadelle Native Re-vegetation Project (Friends of the

Environment, 2018) and Ebony Forest (Ebony Forest Mauritius, 2019a) being undertaken, the protectionist approach of fencing off areas is still a large part of the narrative. Community based conservation remains an elusive method of doing conservation on the island. Ebony Forest, for example, is an eco-tourism and eco-awareness venture covering some 16 hectares of weeded and planted endemic forest with a mission statement that seeks “to save endangered species in Mauritius, educate and raise awareness about the value of biodiversity and be a sustainable company” (Ebony Forest Mauritius, 2019b). While education and raising awareness are crucial to safeguarding biodiversity, environmental knowledge needs to be assimilated into the Mauritian culture for positive change. Conflicts without sustainable conflict resolution would arguably fail. Closing off natural heritage in the name of environmental conservation in the past and embracing a protectionist approach might have unwittingly created a greater disconnect between human and nature, a divide that cannot be easily breached by simply pushing forward more scientific data. I claim that the protectionist approach to conservation has failed the bats. By excluding people from their natural environment and treating conservation as a solely scientific endeavour, conservation might have inadvertently exacerbated further the anthropocentric attitude towards development in Mauritius.

4.7. A disconnect from nature

As it were, Mauritians do not have an intrinsic connection to the native fauna and flora of the island (Iranah et al., 2018). An island previously uninhabited, Mauritius cannot rely on indigenous knowledge to safeguard the connection to nature. According to Kohn and Reddy (2017), “the practice of coloniality usually involves the transfer of population to a new territory, where the locals live as permanent settlers while maintaining political allegiance to their country of origin.” I argue that this allegiance goes beyond political to cultural and religious. Mauritians are the results of displacement of people from various parts of the globe, many forcibly so during the slave trade and as indentured labour after the formal abolition of slavery in 1835. Hence, they had no prior relationship to the island’s natural environment. They were displaced *Homo sapiens*, as invasive and alien⁷³ as the exotic *goyave de Chine* that became part of their local culture. Without any familiar surroundings, they tried to push forward a

⁷³ Invasive alien species have often been cited as one of the biggest threats to endemic fauna and flora of islands (Baider and Florens, 2011: 2641).

semblance of belonging by introducing plants, belief systems, cuisines from their native lands. However, this meant that the population did not learn to grow with the environment around them over generations, which can account for such a disconnect with nature.

Many of the orchard owners consider the flying foxes as pests. For many, the bats are no different than introduced rodents. The fact that the bat has more of a claim on the land, given its inherent role in the island's ecosystem, is lost on a big portion of the population, accounting for why the cull could not have possibly been stopped by public intervention. Indigenous communities often spearhead many conservation actions. The Maori tribes of Whanganui in New Zealand fought to give their river the legal status of a human being because according to their beliefs, the river is a living being and hence should have "all the rights, powers, duties, and liabilities" of a legal person (Warne, 2019). An indigenous community in Versailles, Bolivia partakes in the conservation efforts to protect the Arrau turtle, *Podocnemis expansa*, because they can relate the turtle to their past, their cultural and ancestral values and knowledge (World Wildlife Fund, 2018). I reason that for displaced communities in Mauritius, the island was possibly viewed simply as a workplace, an extension of colonial rules. Such a mindset could further contribute to the society-nature disconnect.

This disconnect is further exacerbated by economic endeavours. Over the years, as coloniality became a concept of the past and the world experienced a shift towards globalisation, post-independence colonies like Mauritius were left with fragmented and dilapidated resources and natural legacies (Hinkamp, 2018). Rather than trying to reconnect with the natural environment, colonial legacy of capitalism was appropriated and the promise of neoliberalism as an ideology gained hegemonic power over the world's discourse and capitalism surged to the forefront of political economies in post-colonial countries like Mauritius. As propositioned by Harvey (2007:2), "neoliberalism is in the first instance a theory of political economic practices that proposes that human beings can best be advanced by liberating individual entrepreneurial freedoms and skills within an institutional framework characterised by strong private property rights, free markets, and free trade." The aspiration of the political system in Mauritius to promote free-market, trade and economic development while purporting to do so under the banner of sustainability fits into the larger arc of neoliberal framework. During the climate change conference, COP 26, in Glasgow in November 2021, while the Prime Minister of Mauritius made several pledges such as reducing carbon emission, promoting use of electric cars, promoting circular economy, smart agriculture and tree planting programmes (UNFCCC,

2021), he simultaneously appealed for more funds from developed countries by recalling “the commitment made by industrialized countries for an annual climate funding of 100 billion US dollars for countries vulnerable to climate change” (Le Matinal, 2021). Such approaches to environmental issues feed into the neoliberalism trend of financialization of nature, since “success is measured by capital accumulation rather than the ability to protect or enhance human and non-human-nature” (Gilbertson, 2021).

Furthermore, the privatisation of large proportions of the less than two per cent remaining forest also feeds into the neoliberalism trend. According to the NBSAP 2017-2025 (2017:18), “it is estimated that 25,000 hectares of forested land is privately owned or leased to private landowners.” While the NBSAP further highlights the need to expand protected areas, several forest restoration projects such as Vallée de Ferney, Bel Ombre, Case Noyale and Ebony Forest (NBSAP, 2017:18) are carried out by private organisation rather than the government. Hence, while the scientists argue that the bats should be protected for long-term conservation, the culture of exclusion that has formed part of the conservation narrative on the island fails to garner support and trust from the locals. However, given that all stakeholders partake in the neoliberal way of privatisation of resources, albeit with diverging objectives and purposes, the conflict fails to be addressed from an earth-centred perspective but rather becomes an anthropogenic debate on the legitimacy of each concerned parties claim on the situation.

While humans are entrenched in a circular argument, the bats remain at the mercy of human decision-making. The non-scientists are quick to assign the label of pest to the flying foxes and while some say they should be completely exterminated; others suggest that they could be put in a zoo or drastically decreased in numbers. On the other hand, conservationists are addressing the issue from a technical standpoint and rational arguments such as the bats being keystone species and their roles in the island’s biodiversity. The multi-species thinking is lacking from the current narrative, and I proposition that such an anthropological approach is necessary for cohesive actions.

4.8. Multi-species thinking

As discussed by Rose (2012:103), “our western tradition has long dedicated itself to finding ways to distance human ontologically and ethically from other creatures.” This distance makes it easy to objectify other creatures and subject them to the whims and desires of *Homo sapiens*.

An intriguing point made by Rose (2012:102) is that “there is fascinating, but thus far inconclusive evidence suggesting that the megachiropterans (flying foxes included) are actually primates” and “may be distant relatives of us humans...” Such a way of perceiving other creatures might open avenues for multi-species interaction. We have seen in the cases of charismatic animals such as rhinoceros and giant panda the degree of human involvement poured in their conservation (for example, Bottrill et al., 2008; Leader-Williams & Dublin, 2000; Kontoleon & Swanson, 2003; Dinerstein, 2013). With conservation initiatives, the elephant population in different countries have also increased and thus been subjected to human-wildlife conflicts. However, in several instances, non-lethal means of deterring the elephants from approaching and damaging agriculture and farmlands have been adopted for example in Zimbabwe, chilli-dung bricks are lit and smoked throughout the evening to create a smelly barrier while in Kenya, traditional knowledge formed the basis for a study on whether honeybees could be used as a natural deterrent and ‘guardians’ to protect trees from the destruction caused by elephant foraging that yielded positive results (King, 2019). The value of having an inherent connection to nature cannot be sufficiently stated. But animals like the flying foxes that our contemporary society has come to either fear or view as nuisances, especially in Mauritius where the inhabitants do not have indigenous traditional knowledge to focus on, are not given the same status making the preservation of such species more difficult. Rose’s approach to the flying fox predicament is anchored in Stengers’ (2005) concept of cosmopolitics, a model “articulated in an open and generous way that arises from a fundamental position that ‘we are not alone in the world.’”

The narrative adopted by Rose (2012) in scripting the role of the flying foxes is one that borrows from the eloquence of storytelling. Rather than simply stating facts, as has been done in the case of *Pteropus niger* in Mauritius, she takes the reader on a journey that depicts the bat as a creature with feeling and, in a sense, anthropomorphizing it. The ‘kiss,’ as depicted by Rose,⁷⁴ describes an interaction in nature that has been documented for decades by scientists but failed to transcend the boundaries of science to reach the layman, whose contribution and actions remain crucial to the success of biodiversity protection. As discussed throughout this thesis, the gap between science and people is one of the main reasons for the bat culling in Mauritius. The successful dissemination of information is reliant on the aptitude of the sender

⁷⁴ Rose (2012) makes use of evocative writing when mentioning the flying foxes, using the term kiss of life to show the mutualistic relationship that exists between the bats and the tree they pollinate, accounting for her use of the term kiss of life. It serves to give a human dimension to a non-human entity.

to push the appropriate messages and the capacity of the receiver to make meanings out of these messages, which currently appears to be at an impasse in the discourses of conservation on the island. The island's biodiversity might benefit from the re-positioning of conservation as a human duty. Borrowing from Rose's (2012) multi-species research and the way that she presented her case, I find myself reflecting on whether a different approach should not be initiated in Mauritius if we are to include the local population in biodiversity protection.

4.9. Extinction and mourning

Extinction is a cause of concern in our world. Over the past half-billion years, there have been five major extinctions and it is believed that there is a mass extinction currently under way, this time accelerated by anthropogenic forces on the planet (Kolbert, 2009). As discussed by Van Dooren and Rose (2014:1), in addition to being a historical and on-going process, extinction is "also one that is firmly grounded in a wide range of complex cultural, religious, economic and technological practices and systems." Extinction does not exist in a vacuum and is simultaneously driven by these factors and impacts on them as a result. Van Dooren's (2010) case of the vultures in India shows a synergy that exists between vultures and other species including human beings. Being 'obligate' scavengers, vultures rely exclusively on finding carcasses to eat and provide ecosystem services to human by 'taking care' of their dead and by concurrently keeping deadly pathogens such as anthrax in check since they have the ability to digest, and hence, are resistant to diverse pathogens and diseases (Van Dooren, 2010:130-2).

In Mauritius, bats do not share this kind of relationship with people. Even endemic plants rarely form such an intricate symbiotic relationship with the islanders (Gurib-Fakim et al., 2009:41), possibly as a result of the disconnect discussed earlier. Like the Hawaiian monk seal, who most likely knew nothing of humans until the arrival of our species some 1,500 years ago (Van Dooren and Rose, 2016), the endemic fauna on Mauritius evolved in a world without people and with limited predation and showed no flight response in the presence of our species. And akin to the Hawaiian monk seal, whose "lack of fear is part of what made them so vulnerable to ... slaughter" (Van Dooren and Rose, 2016:78), so was the fate of many of Mauritius' indigenous species.

There were three species of *Pteropus* inhabiting the island of Mauritius prior to human settlement (Nyhagen et al., 2004:491) and only one species remains extant today, and it is

currently being perceived as a nuisance in the contemporary Mauritian society. Birds were not excluded from this extinction pattern. One of the most infamous cases of bird extinction in Mauritius is the dodo, *Raphus cucullatus*. The last confirmed sighting is officially dated at 1662 (Roberts and Solow, 2003:245). According to Hume (2006:65), “the dodo of Mauritius has become one of the most famous birds in the world; probably more has been written about it than any other species.” Kitchener (1993:279) discusses the bird as being “the symbol of modern extinction.” Along these same lines, Bergman (2005:221) notes “the demise of the dodo has become a fixture of our language, and a symbol of the extinction of inferior animals. Expressions such as “dead as a dodo” and “go the way of the dodo” are frequently used to illustrate something that is truly gone and that remains only as a memory (Roberts and Solow, 2003; Bergman, 2005).

Yet, despite the prominence of the dodo worldwide, including in Lewis Carroll’s (1865) classic *Alice’s Adventures in Wonderland*, the bird fails to garner an immense sympathy in the local Mauritian context (articles such as Williams, n.d. and King, 2016 transmit sentiments of a lack of connectivity between the species and Mauritians). Van Dooren and Rose (2014) argue that mourning is key to addressing extinction. According to Attig (1996:107-8), “as we grieve, we appropriate new understanding of the world and ourselves within it.” Van Dooren and Rose (2014:2) rely on this idea to argue that mourning extinction is necessary to increase awareness “of our dependence on and relationship with those countless others being driven over the edge of extinction.” In line with this thought, bat culling in Mauritius fails to instil a sense of loss and mourning. The process of mourning seems confined mostly to the conservationists and that too, it appears more a sense of frustration than mourning the imminent loss of yet another species.

4.10. Conclusion

Mauritius has a history of extinction and extinct creatures that have never properly been mourned. Mourning is a personal process and implies a prior relationship to have been established for a loss to be felt. The flying foxes in Australia for example shared a relationship of kinship with the Aboriginal people (Rose, 1996). The vultures in India shared a form of relationship with the Parsee communities in India and Buddhists in Tibet (Van Dooren, 2010:130) whereby mutual benefits could be reaped from each other. The endemic fauna and flora in Mauritius do not have this privilege. I call this a privilege since emotional ties is crucial

in multi-species interaction. Individuals can be called upon to move away from anthropocentrism through reconnection with their roots and ultimately a reconnection with Nature. But how does one begin to reconnect with Nature and mourn it properly without a sense of kinship to the immediate environment? While the concept of mourning presupposes a change in attitude towards multi-species thinking, it must overcome the major hurdle of the dearth of emotional ties in the human-nature interaction in a context such as Mauritius.

Overall, economic, social, political, cultural and environmental agendas often have conflicting narratives and objectives, as discussed in this chapter. The bat cull is an ongoing controversy since 2015 and while many proposals have been made to halt culling, they fail to generate sympathy and actionable outcomes that break from the notion of anthropocentricity. Distrust between stakeholders is a crucial issue in the bat cull. In addition, we continuously see that the economic or capitalistic development supersedes the need to conserve biodiversity, sometimes to the extent of amending the sole clause of the law that offers minimum protection to a species. Furthermore, a disconnect from Nature makes it challenging to generate empathy and compassion for the bats. Chapter five of this thesis proposes a few short-term and long-term incentives and measures that could potentially be applied to the situation of *Pteropus niger*.

Chapter five: Thinking beyond the cull

5.1. Introduction

With a constantly developing world, humans encroach increasingly onto the natural environment relegating other species to the side-lines. As argued by Azis et al. (2021:1), even if there is “extensive documentation of the ecologic and economic importance of Old-World fruit bats (Chiroptera: Pteropodidae) and the many threats they face from humans, negative attitudes towards pteropodids have persisted, fuelled by perceptions of bats as being pests and undesirable neighbours.” This has been highlighted quite extensively in this thesis in the case of *Pteropus niger* in Mauritius. As argued by Florens & Baider (2019:62), the various culls since 2015 highlight that the situation has not been managed efficiently and instead “Mauritius has provided an example of how a planned intervention seeking to solve a situation of human-wildlife conflict has failed in its primary objective of increasing fruit growers’ profit and instead created new problems for biodiversity conservation like elevating extinction risk of a keystone species and worsened the existing problems like poaching while at the same time wasting already scarce resources devoted to conservation.” Despite many scientific findings that emphasize the inefficiency of the cull, the lethal means has been determined to be the best way to spend taxpayers’ money when it came to the issue of safeguarding the orchards of mango and lychee from the flying foxes (Parliamentary Debates 2015; Parliamentary Debates, 2016; Parliamentary Debates, 2017). This chapter will look at the possible short-term and long-term solutions to the bat cull in Mauritius.

5.2. Short term solution: non-lethal measures

From an environmental humanities perspective and on the premise that bats are sentient beings that should be afforded the right to live in their home environment, one is forced to look at the cull as an archaic and barbaric practice anchored in the anthropocentric and egocentric approach of the human world. As conservationists in Mauritius have highlighted many times, bats are keystone species that are crucial to the biodiversity of the island (Florens et al., 2017). While their role is undeniable, the species should be treated as an entity with a right to exist. Culling has many times been practiced worldwide because of the need to provide space and security to human settlement and because of wildlife encroachment on human communities

(for example, White & Ward, 2010; Guerra, 2019; Schell et al., 2020; Schultz et al., 2021) and, in the case of the Mauritius flying fox, to protect human property. Unfortunately, as a species, it appears we may have forgotten that we are just one of many of this world's tenants. Even though, as ecosystem engineers, we can appropriate the role of nature's custodians, fatal methods of species population control such as culling is rife with questions of morality and ethics (Dickman, 2010; Dubois et al., 2017), undermining the very nature of what human empathy, compassion and obligation should be.

Given the bats' inherent rights to be on the island, non-lethal ways of addressing the situation seem to be the short-term solution. As discussed in chapter three, the orchard owners interviewed were reluctant to opt for non-lethal means because in their opinions, there is absolutely no difference between a rat and a bat; and in the case of the former, they purchase very affordable rat poison at their local store to treat the problem. So why then would they not do the same for the bats? The concept of endemism would require understanding of the matter which small-scale orchard owners often lack. The concept they do understand is monetary loss or gain. And non-lethal methods of addressing the bat problem is usually costly for the planters, accounting for their unwillingness to do so (see chapter 3). In fact, according to a workshop report in 2019 regarding backyard fruit growers (De Chazal et al., 2019:9), it was noted that "although the objective of the workshop was to discuss conflict between backyard growers and the Mauritius fruit bats, most of the growers were predominantly concerned about yields in general and not the bats in particular."

While government offers subsidy to buy nets, there remains additional costs to the placement and removal of these that are often not factored in (see chapter 3). According to Florens and Baider (2019:62), the culling had diverted funds from government bodies including the National Parks and Conservation Services. These funds could have been used and managed by helping orchard owners set up their nets instead of the culling. In the case of fruit growers with large trees, a cost estimate could have been made of the loss they would have experienced during the pruning phase of their fruit trees and a compensation scheme could have been set up. One of the recommendations of the backyard fruit grower's workshop (De Chazal et al., 2019) was also to enlist the assistance of the Special Mobile Force and the Fire Brigade to help with the pruning. While workshops on adequate netting methods (such as how to fully cover different shaped and sized trees on different topographies) are necessary, the cost of netting could be further subsidized and include labour cost.

Many conservationists are endeavouring to work with fruit growers as can be discerned from the various workshops carried out (such as Mauritius Wildlife Foundation, 2017; De Chazal et al., 2019; Kingston, 2019) but comprehensive government initiative is of paramount importance for the successful implementation of the short-term solutions proposed. From a short-term economic standpoint, culling of a non-human entity requires less capital to achieve the same tangible capital-driven benefits. While international pressures from organisations such as the National Geographic (Nuwer, 2019) and the IUCN (IUCN Species Survival Commission, 2015; IUCN Species Survival Commission, 2018) can potentially help, domestic legislations are not bound by international pressures. This has been seen especially in the Mauritius flying fox culling case whereby the latter garnered much international attention since the first cull in 2015 (for example, Aldred, 2015; “Meet the Mauritius...”, 2018; Ittoo, 2018; “Cull push endangered...”, 2018; Dalton, 2019; Zimmermann et al., 2020) but the government still opted to pursue consequent culling in the following years (ION News, 2018). Furthermore, Mauritius is just one of the many countries’ whereby biodiversity is being destroyed in the guise of economic welfare and societal development (Bishop, 1993; Rands et al., 2010). Change needs to come from within and long-term solutions, while slow, are needed for long-term sustainability and environmental protection.

5.3. Long term solution

5.3.1. Reforestation and urban ecology

A concept that is intensely being promoted nowadays is the idea of reforestation and afforestation. Since forests can act as terrestrial carbon sinks capable of absorbing billions of tons of carbon dioxide (CO₂) yearly globally (Canadell & Raupach, 2008:1456), the UNFCCC promotes various afforestation (the conversion of a long-time non-forested land into forest) and reforestation (the conversion of a recently non-forested land into forest) project activities under the Clean Development Mechanism (CDM) (UNFCCC, 2022), thus their budding popularity (The European Climate Adaptation Platform [Climate-ADAPT], 2019). Tree-planting campaigns, activism to protect indigenous forests and re-afforest degraded forested areas are being promulgated to the limelight with regards to climate change and carbon sequestration (Becken, 2004; Jindal et al., 2008; Melkania, 2009; Malmer et al., 2010). Even

in Mauritius, as conferred in chapter four, programmes are being implemented for more trees (Friends of the Environment, 2018; Ebony Forest Mauritius, 2019).

However, tree planting needs to be done in a well-planned manner to render such endeavours effective. A short documentary entitled "How we get tree planting wrong," broadcasted by the *Guardian* online news, mentions that while there is a rush to plant trees because of carbon sequestration and climate change mitigation, there is a need to be careful of where the trees are planted. Choosing the right locations, right soil, right types of trees and right climate is necessary because it can otherwise exacerbate the issue (Toussaint-Strauss, 2021). Additionally, natural forests are more efficient than short-rotation plantation and monocultures at sequestering carbon, both in terms of stability of carbon capture and in terms of their ability to withstand dry seasons and droughts, which climate models have predicted will worsen with climate change (Columbia Climate School, 2020). Furthermore, a recent study by The Nature Conservancy (Wight, 2022) rehabilitating forested areas with native trees not only stores more carbon but also enhances biodiversity and the overall health of the ecosystem (Longley-Wood et al., 2022). Mauritius has several initiatives in place, mostly undertaken by private organisations, to rehabilitate forests with endemic and native plants adapted for the diverse locations' climate and geography. As an indirect consequence of such efforts, the bat might benefit from these initiatives through the creation of green corridors that could enable better foraging conditions and provide them with their inherent food sources, that are more resilient and adapted to the harsh tropical climates and hence better equipped to withstand the effects of climate change.

According to Florens et al. (2017) and Kingston et al. (2018), bats would be able to obtain food closer to their nesting sites if the forests were not as heavily degraded. As such, even though there is a lack of scientific data on the subject at the moment, there are hypotheses that suggest bats could be expected to be particularly sensitive to climate change due to a "high surface-to-volume ratio caused by their generally small body mass and large wing and tail membranes," which would make them susceptible to dehydration (Festa et al., 2022:3). Hence, as temperatures soar, accessible food resources in closer proximity to roosting sites would allow the bats to feed without flying long distances. While efforts are currently being undertaken to clear invasive alien species of plants from the forests which could potentially encourage less bat damage to fruit orchards (Krivet et al., 2020), past unmitigated development on the island

and the clearing of large expanses of forests for urbanization and economic development have rendered land for reforestation scarce (Hassen & Surroop, 2020).

Given the issue of urbanization, urban ecology could be included in land planning on the island (Hassen & Surroop, 2020). Currently, as discussed earlier in the thesis, environmental protection is under the aegis of the Ministry of Agro-Industry and Food Security, which poses issues of conflict of interests. A possible way forward could be to clearly demarcate environmental protection from agriculture through the establishment of a separate Ministry. While agroforestry is being assessed as an avenue for Mauritius – with agroforestry demonstration sites launched in 2018 at Pointe du Diable, Petit Sable and Daruty (UN Global Forest Goals, 2019) – to explore ways to modernize the agricultural sector in Mauritius and raise standards of food security (Government Information Service, 2019) as well as “enhance the livelihood of people through identifying, testing and adopting good agroforestry options in underutilized or abandoned agricultural land” (Government Information Service, 2021), the notion is anchored in agriculture. Urban ecology, in contrast, attempts to study the “biotic and abiotic structure and function” of urban spaces, “how the living and non-living parts of the environment relate to each other and the quantification of the flows of energy, materials and nutrients, etc. required to sustain urban system” (Hall, 2019:3). Urban spaces are incessantly shifting with dynamic cycles of development, construction, decay, demolitions and re-constructions. According to Diemont and Toland (2019:321), “although larger scale planning opportunities are important to consider for urban ecology, most physical intervention in the urban landscape occur at site level,” via “economic, social and programmatic goals of an owner, developer, and/or municipality.” Buildings are not required to have green spaces and it is currently a flexible business decision rather than an established rule (Teeluck et al., 2013). As Mauritius gets more densely built-up, spaces need to encompass green spaces that are in line with biodiversity conservation. The implementation of urban ecology in Mauritius could allow for more native flora to be planted in the densely populated areas.

In addition to reforestation and urban ecology, small fragmented and degraded forest areas near agricultural land could potentially be turned into rehabilitated forests areas. Unlike traditional agriculture, contemporary agroecology practices such as agroforestry, permaculture, aquaponics and smart agriculture allow for better yield at lower pesticide input while simultaneously making better use of land and space (for example, Witkowski & Medina, 2017; Shepon et al., 2018; Schneider et al., 2021). The government could identify degraded

agricultural land that could be reforested and provide incentives to individuals to start endemic gardens on selected plots of land, under the guidance of the National Parks and Conservation Service (NPCS), for instance. Households could also be encouraged to plant endemic trees in their backyards along with their netted fruit trees to provide an alternative for the flying foxes to consume.

5.3.2. Attitude change: A tale of the flying fox

Native reforestation suggested above requires an attitude change from the capitalism and anthropocentric driven agendas. Since political systems are reliant on the voter-base, voter perceptions and attitudes are crucial for change. In Mauritius, while some citizens are pro-conservation, many are entrenched in a more capital-driven narrative, as discussed in the previous chapters of this thesis. Changing perception is a slow process and requires the intervention of not just scientists but experts from myriad fields including the social sciences and the arts, which has, for most part, been absent from the discourse of environmental conservation in Mauritius.

This proposed connectedness to address the bat cull is not just reliant on the concept of multi-species thinking, of thinking beyond human. It borrows from the fact that we need to recognise the essence of conviviality. According to Nyamnjoh (2017: 262), “Conviviality is the recognition and provision for the fact or reality of being incomplete,” suggesting that if “incompleteness is the order of things, natural or otherwise, conviviality invites us to celebrate this incompleteness.” This idea works on the principle that we need to look beyond the belief that we exist as complete beings, to break the conditioning of superiority we tend towards, simultaneously as individual and as a species, to be able accept and reconcile our differences. An interesting statement made by Nyamnjoh (2017: 256) is “Consciousness can inhabit any container – human and non-human, animate and inanimate, visible and invisible.” This brings forth again our discussion of a more-than human approach to thinking of society, nature and governance. The recognition and awareness that we are incomplete parts of a constantly changing reality could allow human stakeholders in the bat cull to set aside their carefully constructed ideas of completeness and by work together to find solutions encompass a broad sense of well-being for human and non-human alike. Recognising that we all have a shared consciousness that we as human should learn, or re-learn, to connect to, should not be viewed as an abstract or esoteric idea but rather needs to be articulated through a conscious choice of

conviviality between traditional knowledge and modernity. Remembrance of our intricate link to nature and understanding human being's place in the bigger picture is key not only for the human stakeholders to have conversations with each other but also for the bats to be afforded a space in the public narratives as another stakeholder to be valued.

Rose's (2012) depiction of the flying fox (chapter four) is reminiscent of a tale I used to love as a child. My maternal grandmother, now ninety-one years old, was a sugarcane field labourer with a very hard life and no formal education. Yet, she had several interesting stories which she sadly does not remember anymore. I distinctly remember one about a bat. Surprisingly enough, when offering a description of the animal, rather than use the name, she would refer to the bat in her story as the 'king of flowers.' In her story, the 'king of flowers' opted to help a human despite his reserves about humans and his past experience of their greed. Now, I realise that she probably borrowed her stories from the Jataka Tales (Babbitt, 1935) and other Indian folklores that she might have learnt from word-of-mouth. By anthropomorphizing the bat, she gave dimension to the character which was re-appropriated in my child's mind to be a reflection of positivity.

Anthropomorphism not only gives non-human entities human form but also imbue these with thoughts, feelings and emotions that are essential (Barrett, 2011:21). While anthropomorphizing can be a dangerous tool when considering non-human entities, since "arbitrary anthropomorphism subsumes animals and fail to recognize their real-life autonomy from culture" (Scholtmeijer, 1999:252), creating stories and juxtaposing binaries seem to be the way that humans, as a society, make sense of the world. As suggested by Lowe (2012:320-321), "promoting alternate understanding of the mind of animals – e.g., the perception of sentience – will necessarily involve engaging and influencing the social imaginary to bridge gaps between the audience and the subject animal," since animal advocacy that relies on logic is confronted with the challenges of "public fascination with mediated spectacles." In fact, even in the Mauritius fruit bat case, while scientists tried to disseminate information on the bat cull in a logical informative way, they could not generate enough public support for the bats, as discussed in the previous chapters. Büscher (2021:4) suggests that even if environmentalists have intensified their "efforts to counter post truth with truth about nature, these will always amount to generic statement that say little about the precise details of the environmental crisis in specific places, the different interpretations of this truth, how they relate to other truths, and whether they may be mediated through environmental actions."

While many videos pertaining to the *Pteropus niger* cull have been circulated on the Internet by scientists since 2015, these have not managed to generate sufficient involvement and necessary support to halt the cull. On YouTube, for example, local conservationist Fabiola Monty has two short videos on the bat cull with facts and proposed alternatives (Monty, F. 2015; Monty F. 2018) and the most watched video has around 1,200 views (Monty, F. 2021). Another YouTube video created by Mies, R. (2015), entitled “Stop the Killing of Thousands of Mauritius’ Flying Foxes” and including an open letter to the government to appeal for a halt to the cull received some 2,500 views. On the other hand, a local filmmaker, Wassim Sookia, created a 13-minutes short film titled *Batmen*, which anthropomorphizes the bats and highlighted the issues of the cull and was also posted on YouTube, has been viewed over 234,000 times (Sookia, W. 2016). During the research phase of this thesis, Mr. Wassim Sookia⁷⁵ was also interviewed. A crucial point was that the filmmaker was not an activist for bat conservation but was trying to find a story for a competition he was participating in, and the bat cull was at the forefront of current affairs, which gave him the idea to explore the theme further and work a story.

In fact, as discussed by Duncombe and Lambert (2018:57), “for over 40,000 years, from cave-paintings in Indonesia up to the most cutting-edge conceptual work coming out of art schools today, artists have been using signs and symbols, stories and spectacles to move us,” since art tends to have an innate ability to translate “objective things – events, facts, ideologies – into stories, images, performances: subjective and poetic forms we can experience, feel... and remember.” Given that the bat culling has been an on-going controversy since 2015, scientists while looking at the conservation actions to be taken would have definitely benefited from enlisting the help of artists to disseminate their messages across. The suggestion is for conservation scientists to look beyond the science and understand that human-wildlife conflict cannot be addressed without appealing to fundamental human traits. Lowe (2012:320) points that “movements that emerge out of an empirical and philosophical tradition tend to overemphasize the weight that data and evidence alone play in influencing third parties,” laying emphasis on data and theory, thus ignoring the “roles played by emotional and/or visual appeals, thereby potentially alienating supporter[s].” This alienation can be inferred from the interviews carried out for this thesis and including the arts in the sciences, while ostensibly

⁷⁵ Interview with Mr. Wassim Sookia, Local filmmaker, on May 14, 2017, at Curepipe, Mauritius, by author.

long-term as a potential solution, needs to be included in the nature-society conflict discourse on the island. In fact, Van Dooren et al. (2016:11) suggest that “immersing oneself in multispecies world often necessitates forming collaborative teams to bring together complimentary skills and expertise,” and collaborative associations need to include multispecies scholars with the biologists and ecologists. We need to blur the rigid lines of science versus art to create mediated knowledge that allows responsible and ethical engagement.

Lowe (2012:321) proposed the term “sociological warfare” as a strategy to promote human understanding of the animal mind stating that the “primary impetus of sociological warfare is to communicate complex ideological messages to audiences with the intention of influencing the social imaginary itself.” Lowe (2008:70) describes sociological warfare “as a conflict that is intended to alter one or more aspects of the public moral imagination regarding at least one issue, practice or phenomena.” While the term warfare generally implies violence and might be quite loaded as a concept, in the case of human-wildlife conflict, whereby animals are culled using means such as rifles and other human weapons designed to cause fatal wounds and death, sociological warfare has the implications of being a weapon to retaliate against the violence inflicted on other species through means that are not physically violent but require instead an alteration of sociological perceptions through mediated spectacle. Borrowing from Debord’s (1967:7) concept of the spectacle as not simply a “collection of images” but “a social relation between people that is mediated by image” and Duncombe’s (2019:141-153) concept of the “progressive ethical spectacle” that he argues “will be one that is directly democratic, breaks down hierarchies, fosters community, allows for diversity, and engages with reality while asking what new realities might be possible,” we can create stories or spectacles that are ethical in approach and simultaneously serve the purpose of creating narratives that are beneficial on a multi-species thinking level, since non-human entities cannot create mediated spectacles for themselves and hence need to be created by humans for other humans (Lowe, 2018:227).

5.4. Overall thesis conclusion

When I started the preliminary research for this thesis, I was in Cape Town reading about the cull and, given my personal exposure to the scientific community on the island, my first reaction was anger and frustration at the lack of response from the population and the stance of the government on the bat cull. Bats in general engender positive feelings from me. More

recently, during a personal encounter with a species of endemic insectivorous bat on the island, I was moved by their social interactions and the fragility of their existence. The ecosphere for many such species is now rampant with human waste and humans are responsible for the environmental degradation of these organisms' living spaces. We have encroached in wildlife territories, relegating the previous resource users to the side-lines. As a scholar in the environmental humanities, I find myself reflecting on how we have done unto other species the same as colonial powers have done unto our communities. Displacement in the name of capital accumulation is a reality of the contemporary world. Yet, organisms do not have the ability or the voice to fight back in the human world, accounting for the importance of the work being undertaken in the environmental humanities departments globally.

Yet, despite my personal pro-bat stance, the people cannot be dissociated from the situation. Society-nature conflict exists because of society in nature and understanding the position of human victims are as important as understanding the plight of the non-human casualties. Multi-species thinking require a wider scope of understanding than what is currently being practiced on the island. While as a research project this thesis provides insights from an overarching perspective, the realities appear more complex. Change is never easy and requires efforts from diverse stakeholders concerned and maintenance of the status quo of anthropocentrism makes it difficult to build narratives that embrace a harmonious ecosystem balance. While I believe that the suggestions made in this chapter are feasible in Mauritius, there is a need for all stakeholders to come together, share information and partake in open discussions on more sustainable avenues for environmental protection. More research is indispensable to garner the different possible avenues to take and this research should be undertaken not only from a conservation science or agricultural science point of view but also through political science, economic, social and anthropological lenses.

This thesis is a qualitative research that could serve as a foundation to frame pertinent research such as exploring further the evaluation points of the New Ecological Paradigm (NEP) in the context of Mauritius as a developing island state as well as more qualitative research in the literary aspect of the storytelling suggestion proposed in this thesis. But what is clear is that currently, the *Pteropus niger* cull is still on-going due to an inability, or possibly an unwillingness to have open dialogues between various stakeholders concerned as well as a deep-seated association with capitalism and anthropocentrism. Potential conflict areas are focused on topics such as the economy, fair distribution of growth and the ability for

development without degrading the environment with sustainability planning conflicts being that “between equity/ social justice and economic development, there is the property conflict. Between equity/social justice and environment, there is the development conflict; and between the economic development and environment protection, there are often resource conflicts” (Smardon, 2019:71).” However, these conflicts, despite being challenging, can be overcome through dialogue and a desire to move to novel ecocentric approaches to development.

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Appendix A: Set of questions to guide the conservationists' interview

1. Can you please tell us briefly about yourself?
2. In a nutshell, how would you define conservation?
3. What are the main conservation approaches that have been taken in Mauritius, and according to you, what are their merits in the context of a developing island state?
4. Let's talk about the bats. Please tell us a bit about the Mauritius fruit bat, the conservation efforts surrounding them and the reason why conservationists seek to protect this species.
5. Yet, in 2015 and 2016, the government initiated a mass cull that is believed to have caused the death of over 40,000 bats on the island. The government appears to have reacted to pressures from farmers while initiating this. We see a case whereby farmers are on one side of the spectrum and scientists on the other. In your opinion as a conservation-driven individual, what is not working here?
6. Mauritius has been using protectionist approach to conservation i.e., fencing, removal of alien invasive etc. since the early 1990s. But this approach usually attempts to protect the environment by removing people from the equation. In your opinion, does this approach have any link to the human-nature conflict visible in the bat culling situation on the island in 2015 and 2016?
7. According to you, what is lacking, if anything, in the current way of communication about the environment?
8. What more, if anything, do you believe can be done to generate a better cohesion between nature and society in Mauritius?

Specific to Owen Griffiths

1. La Vanille serves as a key educational stop for locals and tourists alike. How has the reserve been going about to disseminate information about the bats specifically?
2. Have you found a keen interest from locals to learn about the species since the mass cull came in the forefront?
3. Any final thoughts you would want to share?

Appendix B: Set of questions to guide the small-scale fruit growers' interview

1. Can you please tell us briefly about yourself?
2. Can you please describe the problems you face concerning the bats especially during the fruiting season?
3. In your opinion, was the culling of 2015/16 necessary? Did it bring any benefit to you personally?
4. Conservationists say that it is not the bats but rather other animals like the rats that cause more damage. What is your opinion on this matter? Did you see other animals interested in your fruit trees?
5. Conservationists say that there are other means of protecting fruits without culling the bats such as netting. What are your thoughts on the matter? Did you manage to implement such structure yourself? If no, why not? If yes, any disadvantages?
6. The bat destroying fruits, was it always a problem you faced?
7. What can you tell us about the flying fox and its importance, if any, in Mauritius as far as you know?
8. In your opinion, is there any human-nature conflict on the island?
9. What more, if anything, do you believe can be done to generate a better cohesion between nature and society in Mauritius?
10. In your opinion, are the bats just a nuisance or do they have some benefits to Mauritius?

Appendix C: Template of release form for identity of interviewee to be disclosed in this thesis



ENVIRONMENTAL HUMANITIES SOUTH, UCT

RELEASE FORM Flying Fox Culling Thesis - Interview

I, _____ (Name), the Participant, of
 _____ (Address) agree to
 participate in and be recorded for the purpose of an academic thesis undertaken for the University of
 Cape Town and/or a short documentary centred around the culling of the Mauritius flying fox,
Pteropus niger, in Mauritius.

I agree to be recorded on the understanding that:

1. My name and likeness and opinions may form some of the subject matter of the above media output.
2. The author/producer/director may edit the contribution entirely at her/his sole discretion, and that the interview(s) will be edited, and the sequence of questions and answers may be juxtaposed with other parts of the programme mentioned above.
3. All copyright and any other rights (including moral rights) from my contribution are assigned to and shall be the property of the writer/producer/director as well as the **Environmental Humanities South department at the University of Cape Town (UCT)** in perpetuity throughout the entire universe.
4. **Environmental Humanities South, UCT** may reproduce my contribution in its various versions and associated promotional material, or any other reproduction thereof, and the finished material may be distributed throughout the world by any means and shown on any available format.
5. The author/producer/director shall not be obliged to use the contribution in any form or to provide a credit or acknowledgment to the Contributor.
6. I am not working for **Environmental Humanities South, UCT** and will not receive remuneration for my participation in and contribution to the work.

SIGNED BY THE PARTICIPANT

DATE

PHONE NUMBER

EMAIL ADDRESS