

Modelling Human Wellbeing for Fisheries Management:
Science, Extraction, and a Politics of Nature in Walvis Bay, Namibia

by

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List of Abbreviations

ANC	African National Congress
BCC	Benguela Current Commission
BCLME	Benguela Current Large Marine Ecosystem Programme
CCN	Council of Churches in Namibia
COSATU	Congress of South African Trade Unions
CPUE	Catch per unit effort
CTD	Oceanographic instrument that tests for conductivity, temperature, and depth
EAF	Ecosystems approach to fisheries
EEZ	Exclusive Economic Zone
GDP	Gross domestic product
ICES	International Council for the Exploration of the Seas
ICJ	International Court of Justice
ICNAF	International Convention for North Atlantic Fisheries
ICSEAF	International Commission for South East Atlantic Fisheries
IFQ	Individual fishing quota
IMF	International Monetary Fund
IQ	Individual quota
IRD	Institut de Recherche pour le Développement
ITQ	Individual transferable quota
MA-RE	Marine Research Institute at the University of Cape Town
MBA	Master's of Business Administration
MFMR	Ministry of Fisheries and Marine Resources
MPA	Marine protected area
MSY	Maximum sustainable yield
MUN	Mineworkers Union of Namibia
NAFAU	Namibian Food and Allied Workers Union
NANSO	Namibia National Students Organisation
NASAWU	Namibian Seamen and Allied Workers Union
NBC	Namibian Broadcasting Corporation
NFCPT	Namibian Fish Consumption Promotion Trust
NFI	Namibian Fishing Industries and Fishermen's Workers Union

NMRC	National Marine Research Centre
NRC	National Research Council
NUM	National Union of Mineworkers
NUNW	National Union of Namibian Workers
TAC	Total allowable catch
TUCNA	Trade Union Congress of Namibia
SWA	South West Africa
SWAPO	South West Africa People's Organisation
UNCLOS	UN Convention on the Law of the Sea
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UN FAO	Food and Agricultural Organisation of the United Nations
WRI	World Resources Institute
WSSD	World Summit on Sustainable Development
WTO	World Trade Organisation

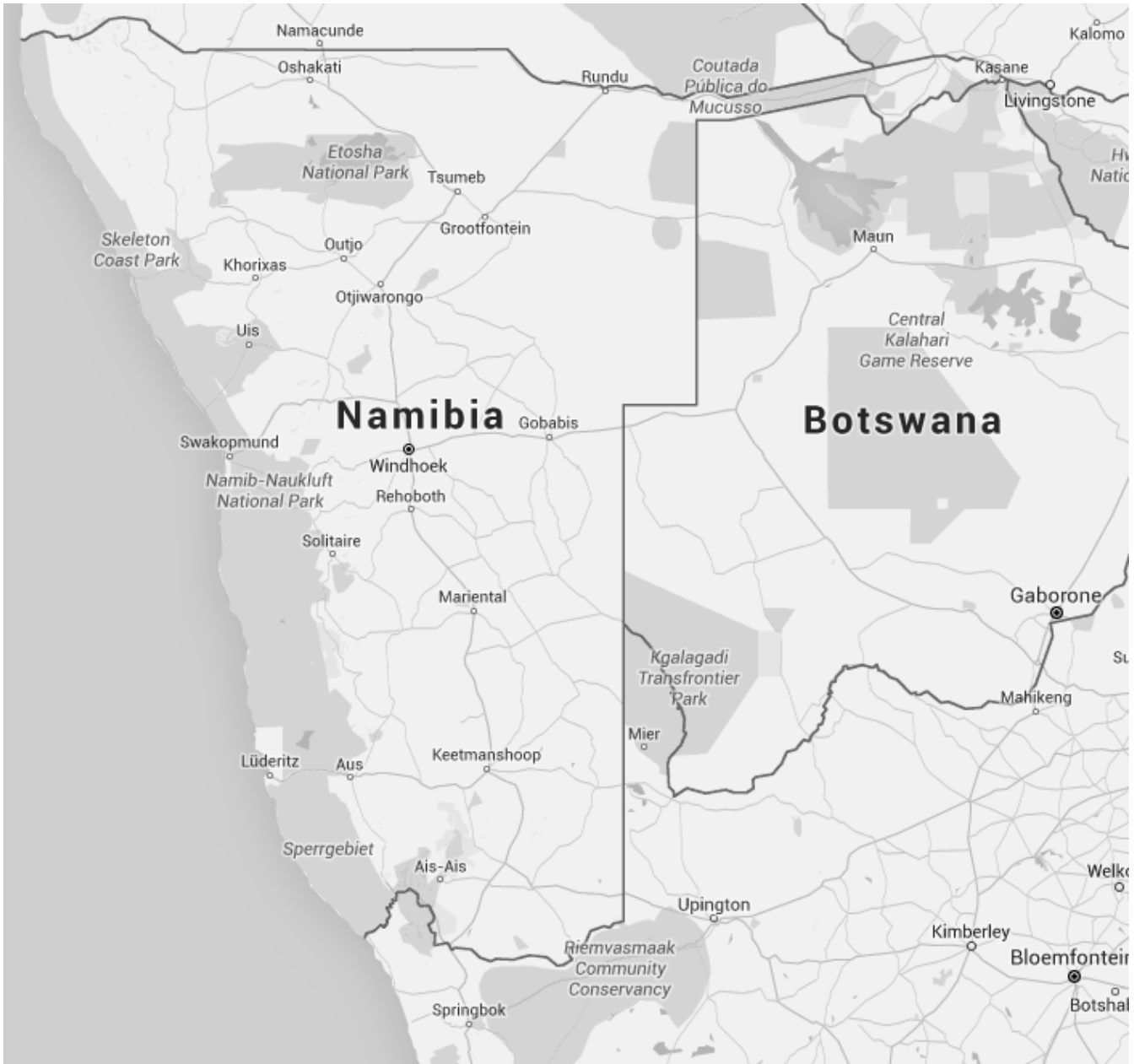
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Fig. 1 Map of Namibia



Source: Google Maps 2016



Fig. 2 Map of southern Africa with ocean currents

Source:

[https://commons.wikimedia.org/wiki/File:Marine species distribution reference map Southern Africa.png](https://commons.wikimedia.org/wiki/File:Marine_species_distribution_reference_map_Southern_Africa.png)

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Abstract

Based in Walvis Bay, an industrial fishing town in Namibia on the west coast of southern Africa, this thesis argues that via the logic of neoliberalism, relations between scientific knowledge production, historical labour practices, and political decision-making emerge as a way of managing people and nature in uneven ways. Scientific modelling practices in the form of stock assessments, maintain traction as the technological solution for managing natural resource extraction in Namibia. As such, the dissertation explores the efficacy of computer models in the industrial fishing sector and considers how breakdowns between the scientific, social, and political knowledge worlds can be usefully brought into the conceptual model of the fishery for management. With a shift towards a more inclusive management framework that considers the policy issues as well as translating broad goals into measurable objectives, comes a shift in the logic of what fisheries management is meant to mediate and achieve. The logic is no longer as straightforward as producing an estimate of the amount of fishable biomass, but now must account for market conditions, changing technologies for fishing, and a changing climate and ecology.

The human dimension is framed around the concept of wellbeing which in fisheries management emerges as an umbrella term for the social world that is reduced through the logic of neoliberalism to the measurable, enumerable, and indexable social and political implications of the use of Namibia's natural resources. As one of few ethnographies of Namibia and the only one thus far to address the fisheries sector as a site of study, this dissertation investigates the increased dependence on scientific models in the Namibian hake fishery despite declining fish stocks and increased urban poverty and inequalities. The research contributes to the limited studies done on the political economy of Namibia and the rise of fish as national resource in the postcolony. It investigates the relations at risk in everyday life in Walvis Bay and re-imagines the framing of humans and nature for transformative practices of environmental and economic justice.

“We never get a relevant answer if our practices have
not enabled us to produce a relevant question”

– Isabelle Stengers, *Diderot's Egg*

“Representation no longer exists; there's only action”

– Gilles Deleuze, *Intellectuals and Power*

Introduction: the making of nature in Namibia's hake fishery

When people ask me what it is like to live in Walvis Bay, on the edge of the African continent in a country whose land mass is over 824 000 square kilometres with roughly two people per square kilometre, the word that comes to mind is “extreme.” Namibia embodies extremity, in its landscape, the openness, and the loneliness, an anchor to something so beautifully desolate that it fills one with both a sense of wonder and intense sorrow.

I first visited Namibia in 2010, arriving at a time that was both the start of winter and the start of the FIFA World Cup that was held in South Africa that year. I arrived at the tiny Walvis Bay airstrip on the smallest plane I have ever travelled on. The flight from Cape Town had traversed the west coast of southern Africa for two hours, tracing the west coast of South Africa, crossing the mouth of the Orange River that marks the border of the two countries, then following the dunes of the Namib Desert to a bay that, until Namibian independence in 1990, had been de facto part of South Africa itself, so that apartheid South Africa could enjoy unfettered access to its lucrative fisheries.

Namibia is other-worldly in its dramatic landscapes and remoteness, and there were many times during my stay when I felt as if I was in a science fiction story. The 2015 blockbuster *Mad Max: Fury Road* was filmed in the region during my stay, a film that captures the post-apocalyptic feel of the landscape, which is unforgiving and always shifting. The Namib is one of the oldest deserts in the world. Yet on the edge of the desert the symbols of modernity and progress rise up from the ground in the form of large shipping containers, fishing vessels, and oil rigs in need of repair. The symbolism of these structures reflects a city and country in transition, a society that is pushing the limits of progress and growth to earn a place in the globalised circuits of exchange.

*

Walvis Bay is an industrial marine town situated around a natural deep water port on the Atlantic Ocean, bordered by the rising sand dunes of the Namib Desert. The name of Walvis Bay is the Anglicisation of Whale Bay from Afrikaans, and is so-named for the rich marine life that teemed in abundance there. The fishing boom of the 1930s marks the history of Walvis Bay's ties to the political history of what was then called South West Africa, when South African colonial rule began. Because of its fishing potential, Walvis Bay industrialised quickly. Fish factories were built

en masse as South Africans, Spanish, and Soviets pillaged the seas in the nutrient-rich Benguela Current, the stream of cold Antarctic water running up the coast of Namibia.

One of four major eastern boundary upwelling currents in the world (Hutchings et al 2009), the cold Benguela is rich in nutrients and organic material, offering pristine fishing for a variety of predatory species. The nutrients of the cold Benguela Current are microscopic organisms that fuel and feed the food chain and turn the Namibian seas a frothy green. The intense colour signals the presence of life and nutrients, deriving from the surging forces underneath the surface of the sea, the organisms that need stimulation and agitation, and the energy of the current itself that sustains the ecosystem. Its colour is life.

The early half of the 20th century is remembered as the glory days of fishing in the region, and the fishery for small pelagic fish peaked in abundance with sardines and anchovies. At the height of the boom, numerous production plants processed sardines and anchovies at full capacity, causing the smell that Walvis Bay is still known for.

The east wind brings hot temperatures from the inland desert and with it the sand that blows offshore and sends nutrients back into the ocean. The wind is an important feature of an upwelling system because it distributes the water across the top layer of the ocean surface which results in water rising from beneath the surface to replace the water that is being moved away (Hutchings et al 2009). Winds also come from a southerly direction, where the salt marshes are, and bring a sulphurous smell. Northerly winds bring the rather unpleasant smells from the fish factories along the industrial beachfront that runs along the northern edge of town and the stretch of coast where the guano-harvesting platforms are erected to collect the nutrient-rich seabird droppings. The west wind comes in off the ocean and contributes to the dense fog and mist that adds to the eerie moods of Walvis Bay. The mists are a regular morning feature in Walvis Bay and they are heavy with salt that silently erodes the built environment. In just under two years of living in Walvis Bay, my trusty Toyota suffered from barnacles of rusted metal on its exterior, the rust growing quickly and efficiently across the underbody of the vehicle.

When the fish factories are busy and the winds sweep in from the north, the smell of fish envelops the town in an expansive cloud. People often joke that the smell from the fish factories is the smell of money. Today, this statement is made more in a gesture of nostalgia amongst managers who remember the rogue and bountiful days of fishing of years past, along with the early canning facilities. Walvis Bay does have a reputation for the smell of fish and fish processing, but it is really only noticeable during a few days throughout the year when the northerly winds blow just right and the factories are at their busiest.

The history of the infrastructure of fishing is directly linked to the history of colonialism and labour practices that defined the colonial period. During the colonial period of the 20th century, black labourers were brought to the coast to build the infrastructure for the fishing empire as well as to construct the railway lines to open access between South Africa and the main hubs in the colony. At independence, Namibia's democratic government inherited severely depleted fish stocks in the small pelagic fishery (sardines and anchovies). The hake fishery was also severely depleted due to the largely unregulated fishing that took place under South African colonialism. Other species of fish, too, are a part of Namibia's legacy of fish harvesting, and are located politically and socially within its colonial history.

Un-regulated exploitation of the small pelagic fisheries (sardine and anchovy) led to stock collapses in the 1960s, from which the species have never recovered (Paterson et al 2012, Kirchner 2010). With the demise of the small pelagic fisheries, which transform the nutrients of the current into food for the predators, there is today an overabundance of nutrients. Along with an intense drive to globalise and industrialise the fishery at independence, the development of a highly capital-intensive, government-regulated, top-down management framework was set out from the start. The development of the Exclusive Economic Zone (EEZ), the Ministry of Fisheries, and the drafting of the fisheries management plans, occurred as the shifts in power relations and government bodies were also changing. The design of the fisheries legislation aimed to look after both the natural resources and their potential benefits to Namibian citizens who had been historically excluded from any participation in the fishing industry during colonial rule. The challenges for fisheries management today are rooted in how the country inherited environmental, social, and political devastation at independence.

South West Africa (SWA) in the 1930s was marked by a fishing boom and the rise to power of the apartheid South African government. Until the 1930s, the colonial rulers of SWA had been the German Republic and their reign ended with the First World War. During the post-war League of Nations proceedings in 1922, German territories were divided among Allied nations. Governance of the territory of German South West Africa was entrusted to Great Britain and was to be implemented by the Republic of South Africa. SWA had been classified as a fourth-tier territory, that meant it was ranked as lacking the resources for self-governance. However, South Africa quickly took the territory as its own despite their given role to promote the building of governmental bodies and infrastructure toward autonomy under a title of trust given by the United Nations. It became the perfect space for the South African government to expand Afrikaner wealth through fisheries (van Sittert 2002). Indeed, central to the apartheid project was the control of access to lucrative commercial species and fisheries through the

issuing of exclusive use rights (ibid). The result was a fivefold effect on the fisheries, “dressed up in the discourse of rational scientific management and national interest,” but amounted to “monopoly, dispossession, politicisation, delegitimation and resource collapse,” (van Sittert 2002:45). South Africa took full opportunity of the marine resources off the coast of Namibia during the apartheid years.

The port of Walvis Bay thus industrialised quickly and many fish factories were built as South Africans, Spanish, and Soviets pillaged the small pelagic (sardines and anchovies) stocks in the nutrient rich Benguela Current. South Africa put into the place a contract labour system designed to benefit white colonisers and settlers. Thus, in fisheries as in other industries, black labour became the foundation on which fishing empires were to be built.

In the Oshiwambo language the word *okabolo* is the term used to describe the contract labour system that the South African colonisers used in Namibia. The contract labour system saw naked men herded like animals into a room where they were weighed and measured and then assigned a classification from A – C. The three classifications stood for different work; A was for work in the mines, B was for domestic work, and C was for work on the farms. After the doctor examined each man for physical health, they were given a piece of lead with the assigned classification on it. The piece of lead was a man’s ticket to work; one could not work without that piece of lead hanging from one’s neck. Once each person had been physically evaluated by a white physician, they were given a piece of lead to hang around their neck that designated their work status and in which sector. The contract labour system simultaneously exploited labour power from workers and extracted surplus value from the land and sea. The expropriation of nature turned nature into capital and commodities to benefit white settlers and the colonial state. The classifications of black bodies for particular kinds of work in the mines, domestic sphere, or on the farms, was part of the project of turning nature into capital so that it too could be classified, contained, measured and commoditised.

The colonial period was one of immense industrial growth and the building of infrastructure such as railways and factories, linking similar supply towns on the continent. The Swakopmund-Windhoek railway was the largest infrastructural work completed under German rule before 1904. With the expansion of railways, the building of dams and roads, and water-boring practices, the German colonisers set into motion the physical, administrative infrastructure that would enable them to exploit the economic potential of the colony of SWA. These developments were carried out entirely on the backs of the black labourers for the direct benefit of the white settler farms, as they built both the infrastructure and were the labour force on these farms and in the growing urban centres.

The limitations of history are crucial to understanding the relationship between labour, capital, and nature in present day Namibia, as such a relationship enacted specific material conditions that are now sedimented into the fisheries. What emerges from a historical past premised on the racialised economy of cheap black labour to establish industries and infrastructure for the benefit of the colonisers, derives from the contract labour system that remains very much linked to the historical processes of exclusion and exploitation.

*

The liberation struggle in Namibia arose out of the humiliation and dehumanisation of the contract labour system and was a rebellion against the injustices inflicted upon them (*Paths to Freedom*, 2014). The Namibian liberation struggle, like many of the liberation struggles on the continent, was a fight against the dehumanisation and exploitation of black bodies for the growth of capitalism and the promotion of a hierarchical state based on race. It was a decades-long, violent fight against the apartheid government of South Africa whose racialised labour practices were at the heart of the struggle.

The year 2015 marked twenty-five years of independence in Namibia, yet the momentum of the liberation struggle has slowed down amidst a new discourse of neoliberalism across the African continent. The young Namibian government is caught in the influx of development aid and foreign loans for quick gains that results in severely short-sighted and limited economic growth for the majority population. The social and economic exclusions that propelled the liberation struggle are now the norm rather than a site of action. Namibia, despite being uninhabitable in many parts of the country, has much to offer in its wealth of natural resources, particularly in the fishing industry.

Since the collapse of the small pelagic fishery, the main species targeted and caught in Namibian waters have been *Merluccius capensis* and *Merluccius paradoxus*, commonly known as hake. *M. capensis* refers to shallow-water hake and *M. paradoxus* refers to deep-water hake. Both types of hake are bottom-dwelling species and differ only in morphological terms that are quite hard to detect (Wilhelm 2012). *M. paradoxus* was only recognised as a separate species long after exploitation began and *M. capensis* dominated the initial phase of commercial catches (Wilhelm 2012). Because of this, the two species are assessed and managed as a single stock in both South Africa and Namibia.

Recent estimates indicate that the hake fishery is in decline and there are efforts within the fishing industry to expand the horse mackerel fishery. The horse mackerel fishery receives

the most quota allocations of all the commercial species, which include monk and sole. There are also allocations made for the growing aquaculture industry, namely for farmed oysters. Hake remains an important species because of the high market value for products as well as its role in providing employment through sea based and land based operations.

Namibia is also a mineral-rich country with access to mines for uranium and diamonds that contribute to the country's overall wealth. With a small population of around 2.3 million people and this degree of wealth in natural resources, a question remains painfully obvious: why is Namibia consistently at the top of the list of countries with the highest income distribution disparities worldwide?¹

*

The goal of this project is to understand the ways in which science, economics, and governance perpetuate a legacy of exclusion and control. The scientific and technological framework of fisheries management struggles to accommodate the notion of the human dimension that is currently represented through the lens of wellbeing. Fisheries management is at an impasse in terms of actively pursuing the goals of the management plans for the hake industry that include addressing community health and wellbeing in the context of Walvis Bay. The core of my research asks why this is the case and addresses the limitations to the current ideations of fisheries management as a tool for redress. In order to begin to ask this question, it is necessary to understand the environmental and social history of Namibia's fishing industry. Central to these histories is the rise of capitalist nature that favours technical efficiency and economic productivity based on a particular approach to scientific objectivity (Latour, 2004). Here, the structures of the knowledge economy also lay claim to the definitions of *nature*, *resources*, and *environment* that are embattled in the schisms of capitalism and democracy. Extractive industries are an extremely relevant site in which to go looking for exclusion and control, especially when much of the work is done offshore or behind gated premises which is the case in Namibia's fishing sector. As such, in order to understand the fishing industry, it is necessary to examine the mechanisms that generate, activate, and produce information for the purpose of fisheries management at social, political, and ecological levels.

¹ According to data from the World Bank, Namibia's Gini coefficient has dropped significantly from the beginning of the 21st century where it was given a 70+ rating and now sits at around 61 (2009). Namibia is considered a middle-income country but it is important to note the ambiguities of such statistics because the small population coupled with relatively high GDP per capita favours the middle income bracket however much of the wealth in the country is in the hands of a few. The majority of Namibian's citizens are living at or below the poverty line and the unemployment rate is around 50%. (http://databank.worldbank.org/data/reports.aspx?Id=4524060c&Report_Name=Gini).

The current turn in fisheries management globally is a shift towards holistic processes in which the totality of the fishery includes a variety of organisms, human actions, knowledge, and technologies. The Reykjavik Declaration of 2001, of which Namibia was a signatory, marked the formal adoption of a commitment to ecosystems approaches to fisheries management at a global level (Roux and Shannon 2004). It reflects a shift to standardising fisheries management globally, and “requires nations to base policy related to marine resource exploitation on an ecosystem approach” (Browman et al 2004:273). In order to address the complexities of marine ecosystems as well as the management framework, the new conceptual model is built on strategies that promote innovative science and practices that attempt to address myriad factors that affect all areas of the fishing sector.

There are a host of challenges to a globalised approach in that “marine ecosystems are difficult to define, having no apparent boundaries, and lacking the clear objective or purpose that can be ascribed to more tractable biological or ecological entities (e.g. individuals or populations),” Browman et al note (2004:273), making a case that a marine ecosystem is a fluid and dynamic space in which water, nutrients, and organisms work together to keep a functioning biological system in place. The active components range from the microscopic bacteria, phytoplankton, and zooplankton, to the fish, mammals, and birds, all of which are highly dependent upon each other, and all have their own life history traits. Food webs are thus in constant flux which adds to the complexity of ocean ecological systems.

One of the major shifts in fisheries management in the past couple of decades has been the shift from single-species stock assessment to an ecosystems approach to fisheries management (EAF) that incorporates stock assessments with ecosystems models. Such a shift emerges out of the realisation that the fishery is much more than ensuring the sustainable catch of a targeted species. While this might seem intuitive, the single species stock assessment model has prevailed this long because it is so entrenched in the bureaucratic decision-making institutions in which its calculations yield the total allowable catch figure that is also known as the TAC.

Historically, the TAC has singled out a single species of fish as the target species. Through the processes of research fishing surveys followed by computations of the data collected, its total biomass is calculated. Biomass simply means the total amount or weight of organisms within a specified area. It is not about counting each and every fish, but serves as an estimate of the weight of the targeted stock within the boundaries of a specific national fishery. For Namibian hake, the stock includes individuals of more than one species where *M. paradoxus* and *M. capensis* are considered to be part of the same stock. Stock is also differentiated from

species, and determined by region. For example, hake caught off the coast of South Africa are the same species as the hake caught off the coast of Namibia but are considered part of a different stock. What this points to is the processes of clustering of individual fish into one abstract concept of state-based biomass. As such, the calculations produce specific information about the stock, which in turn is used within the stock assessment model itself. Notwithstanding the push to an EAF-managed fishery, the stock assessment model remains the prominent force in fisheries science in Namibia, and indeed globally, as well as in its management framework.

The Namibian fishery began with the exploitation of sardines as the historically dominant species, but after extensive and unregulated fishing from 1960 to 1977 which saw catches average 580 000 tonnes per year, catches plummeted to a mere 46 000 tonnes per year in 1978. Other stocks were also affected: the 1960s and 1970s were the height of the hake empire in colonial Namibia, with the exploitation of the hake resources beginning in 1964 (Paterson et al 2013). Between the years 1964 to 1976 the hake fishery was largely unregulated and catch records show an average of 500 000 tonnes of hake landed per year (Kirchner 2010). Lack of regulation, together with the number of foreign vessels operating at the time, has led some scholars to speculate that there was significant underreporting on the landings data, as there were no formal mechanisms in place to ensure transparent and accurate catch reports (Moorsom 1984, Kirchner 2010, Paterson et al 2014).

As the fishing vessels were pillaging the seas off the coast of Namibia in the rich Benguela Current, the need for processing and packing facilities on land became a priority. The factories were built by black labourers who were moving to, or being forced to move to the coast where the fishing enterprise was in desperate need of physically able bodies in the construction sector. Workers' bodies, in that context, by definition black, were also needed in the factories, for processing and canning and commodifying the fish that passed through their hands.

Foreign fleets amassed huge economic wealth during the glory days of fishing when the ocean was pristine and regulations non-existent. With the decline in fish stocks for hake in recent years, the TAC has been set at a relatively conservative level, around 150 000 tonnes per year, with the hopes that the stock will recover (Kirchner 2010; 2014). Land-based operations are entirely dependent upon the sea based operations; if there are no fish caught there are no fish to process. However, the factories are constantly undergoing renovations and expansions, and it is estimated that over the years 2007 and 2008 the fishing industry invested around N\$ 200 million in factories and fishing vessels, including processing facilities and new factory technology, acquisition of vessels, cold storage facilities, as well as properties (Kirchner 2010). All of this

happened despite the global economic crisis and the limited hake resource. In addition, over-capitalisation means lower wages and tax breaks for companies (Paterson 2013).

Namibia's fisheries management must address these issues within a sector that faces ecological, political, and social unevenness. The situation highlights the impacts of exclusion, and demonstrates why a management regime change is so difficult to implement. In Namibia, exclusion continues to be a common thread in the fisheries context. Exclusion in the fishery extends into the everyday lives of the working class, and generates frictions in how the fisheries science project produces different kinds of information that often serve to extend rather than unmake colonial practices.

Fisheries modelling is part of a suite of fisheries management practices that have been redesigned for the information economy. They include metrics, algorithms, and logistics, and produce both statistical probabilities and value in fisheries science and management. Thus, fisheries' modelling becomes the nexus point of fisheries science, marine ecology, capital, national economies, and the struggle for community health and wellbeing in marginalised societies. It is this nexus that is the focus of this study.

Statistical models generate specific information about particular real life instances. Statistical models in practice are thus embedded in particular political and economic logics as part of the scientific project of natural resource management. The statistical models for stock assessment serve an extractive logic and as such are designed to provide an answer to a specific question: how much of the targeted species is at maturity and can be extracted? As such, it is assumed that the statistical model will generate a determination of stock size based on economic concerns.

By contrast, the global fisheries management paradigm has seen a shift towards an ecological approach to managing fisheries that requires states to adhere to the new global standards for fisheries management. These standards follow from global governance structures emerging from the international governing bodies such as the United Nations Food and Agricultural Organisation (UN FAO), the Southern Africa regional Benguela Current Commission (BCC), and the International Council for Exploration of the Sea (ICES). Their history is complex. The 1970s saw the implementation of international laws for fish exploitation that gave exclusive fishing rights to fishers of coastal states. With this shift in international laws for commercial fishing came the introduction of Exclusive Economic Zones (EEZs) as part of the adoption of the 1982 UN Convention on the Law of the Sea (UNCLOS) (Oelofson1999). The EEZs serve to territorialise the fishing grounds off the coast of nations that signed onto the convention. In the Namibian case however, the convention served to benefit the colonial power

which at that time was apartheid South Africa because EEZs were not recognised due to South Africa not having legal mandate. In retrospect it is clear that the convention was severely misused as stocks within what would have been the EEZ were overfished with little control and restraint from the governing bodies (ibid). South Africa was able to capitalise on the high yield fishing in the area during the apartheid years with little limitations on extraction. South Africa mainly fished the sardine stocks, while the hake stocks were exploited mainly by the Spanish and the Soviets.

Today, Namibian fisheries management seeks to both amend the practices that allowed foreign fleets to overfish in Namibia and also attends to the present day challenges of fisheries management when stock abundance has hit a plateau, or is in decline. At present, governance structures centre around practices that rely on the increased privatisation of fishing rights and quota allocations coupled with the notion of autonomous actions of nation-states in their efforts to develop a management system that addresses issues specific to that country. Despite claims that the political stance on Namibia's fisheries since independence takes into consideration the long-term gain and sustainability of the resources (Oelofson 1999), the opposite seems to be happening, which is seen most clearly in the political decision-making that supports short-term gains rather than long term plans.

Part of the friction in managing the fishery on a day-to-day basis while developing long term plans for the future stems from the absolute power of the Minister of Fisheries to allocate the TAC for each stock. This kind of power is not unique to the Namibian situation but rather a feature of fisheries management structures worldwide. There is a constant urgency to set the TAC for each season as that number then determines all of the other activities related to the fishing season such as the act of fishing itself, processing, shipping, and consumption. While the TAC is relevant for keeping the factories running, the boats out at sea, and fish in the shops; it also has consequences for the longevity of the fishery, and is often subsumed within the notion that the TAC must be set at a high-enough level to ensure that the economic operability of the fishery is not disrupted. It is interesting to note that in Namibia, the Minister's scientific advisory board assists in the decision-making process and oversees the reports presented each year; however, the TAC for the season (yearly cycle) is set by the Minister as a single individual. The trend now is that there is an increased reliance on statistical analyses and outputs of the labour force to address the required components of the EAF, as part of adhering to the global standards for fisheries management, which leads problematic assumption of a cause and effect relationship between the daily operations of the fishery and industry's role in addressing the human dimension component of the EAF framework. The common argument for industry is to

state that in order to keep employees employed, they need to be granted a certain amount of quota. However, as will be discussed at length in the following chapters, the premise of work itself in the fishing industry is tenuous and often functions on hierarchies and mechanisms of control. The uncertainties that frame the notion of work in the fishing industry are part of a larger argument about the exploitation of labour alongside the rise of capitalist nature in the postcolony. In other words, modern fisheries management is tasked with a responsibility to attend to a historical legacy of exclusion in a moment of political-ecological rupture in late capitalism. One way that fisheries management seeks to grasp these abstractions is through the use of models as technological interventions to grasp the uncertainties in the fishing sector that stem from seasonal regimes, a changing global climate, shifting market demands, and decreases in the fish stocks.

As one kind of conceptual model for fisheries management, the EAF emerges as a toolkit to address the myriad challenges of managing the fishery in such uncertain conditions. The EAF is a distinct feature of the FAO's work in developing practices for responsible fisheries management that address issues of sustainability, economic, and social concerns (FAO 2003, Garcia 2005). The EAF is based on the over-arching goals to "balance diverse societal objectives, by taking into account the knowledge and uncertainties about biotic, abiotic, and human components of ecosystems and their interactions and applying an integrated approach to fisheries within ecologically meaningful boundaries" (FAO 2003). The approach of the EAF intends to foster the use of existing management frameworks and improve their implementation. In addition, the EAF reinforces ecological concerns within the framework (Garcia, 2003).

The EAF attempts to cluster multiple aspects of the fishery (i.e. stock biomass, employment, governance) as part of a holistic approach. However, there is a perpetuation of the separate domains of ecology and the social and political aspects. When the domains are separated it is clear how these logics do not fit neatly alongside each other, and is perhaps one of the core reasons why they remain separated in the management paradigm, despite efforts to dissolve the categorical rigidities. Computer models have been one way to address specific issues relating to a particular domain, as seen in the stock assessment model as part of the ecological domain. While fisheries management according to EAF should include outputs from both the stock assessment model and the ecosystems model to form the basis for decision-making, the stock assessment remains the dominant rationale.

My research in the Namibian hake fishery follows three major modelling systems (stock assessment, ecosystems, and an EAF conceptual model) and illustrates how they operate in relation to fisheries management. I look specifically at how the EAF framework attempts to

incorporate the notion of human wellbeing. Fisheries management in Namibia points to important shifts in thinking around how to manage the hake fishery in an increasingly volatile social and ecological context. The stock assessment model focuses on only one target stock, in this case hake, and its potential abundance in the environment; ecosystems models simulate ecological processes in order to project *what if* scenarios, such as the potential for recovery of stocks if fishing strategies are altered (Roux and Shannon 2004); the EAF management model developed by the FAO is designed to inform decision-making with regards to social and ecological objectives but maintain the distinct categories of ecology, social, and governance. The expansion of both scientific and management modelling techniques to include human and social elements requires a critical investigation into how the human dimension is conceptualised within a precarious regime of natural resource management, computer models, predictions, and algorithms.

The human dimension in Namibia's hake fishery remains largely external to the stock assessment and ecosystem models in its relevance for managing the Namibian hake fishery. In addition, it is important to note that at the beginning of this project the human dimension of the Namibian hake fishery had not yet been modelled. A computer model of the human dimension in the fisheries context is thus a thought experiment that speculates on the possibility for the human dimension to be modelled, a possibility that must exist within capitalist framing of nature and within the neoliberal framing of post-liberation political power. The task of this project is to investigate how the human dimension is currently represented in the EAF framework and then expand, rework, and examine how it can be better formulated within a fisheries management paradigm that would be more capable of addressing historical injustice. The work presented here is a suite of questions about what it means to be well, on both an empirical and metaphysical level, and how multiple variations of wellness are mediated through the conceptual model of an EAF. A computer model and its numerical parts *manage* messiness and complexity, generating formulas and assigning values to represent specific objectives. The study explores the possibility for computer models to include and make visible human wellbeing in a way that does not reify its components into things that may be conceptualised in ways that are antiseptic and formulaic. What emerges from these questions of wellbeing, scientific abstractions, and ecologies of care is a multi-layered nexus of material and historical trajectories that come to (un)make the extractive landscape in postcolonial Namibia.

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Namibia is an expansive and desolate swathe of desert, dune, and sea. Walvis Bay is best described as a marine industrial ecology, making it part of larger processes of globalisation, food economies, and supply chain towns that continue to emerge across the African continent. Such economies render out-of-the-way places like Walvis Bay globally significant in their position within these webs of goods, labour, and information. A materialist approach can be useful to frame the fishing industry in Namibia. Materials follow these routes of exchange and subsume social and political life under global capitalism, even in a place as remote as Walvis Bay. This study, therefore, is an ethnographic account of Walvis Bay's fishing industry, one that is part of globally unequal economic relations and in consequence is marked by severe social inequalities, political limitations, precarious living and working conditions, and a decline in natural resources.

Namibia's stance toward natural resource extraction is entrenched within broader historical legacies of racialised economies and colonialism. Walvis Bay is a space in which power structures merge with knowledge structures, in which specific kinds of knowledge hold certain authority in the political sphere. Namibia's colonial history meant that at independence the country inherited severely depleted fish stocks, coupled with a lack of local institutional capacity to address the issues of recovery, both for the country's resources as well as in the transition to a democratic nation. Modern fisheries management assumes fisheries scientists and the governing bodies adhere to international, global standards. However, there remains an uncomfortable friction in how politics, science, and the state continue to exclude much of Namibia's population and the benefits of the fishing industry are unevenly distributed. For capitalist constructions of nature, the natural world conceives of nature as something to be privatised. Such conceptions are at odds with the declaration of both Namibia's constitution and its national fisheries policy that natural resources belong to all citizens of Namibia for the benefit of society as a whole. The separation of nature and culture, and science and politics needs to be addressed in order to reframe the basis for understanding the marine industrial ecology of Walvis Bay. The city's troubled history coupled with its presence along the Benguela Current and its position in southern Africa makes it an ideal site for ethnographic study. There is an urgency to engage with the technological, scientific, and political facets of the fishing sector and bring them to bear on the fishing industry, so that environmental futures for Namibians can be imagined.

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This is a study of the challenge to incorporate the human dimension into a management model. At best, the management model is a conceptual model that recognises the fishery as distinct

categories, and one that is limited in its conception of the human dimension as a scientific category. Computer models are new technologies in fisheries and if their design must include the human dimension then in the case of Namibia's hake fishery, this requires including both the labour of the workers to extract the fish (alongside developments in fishing gear technologies), as well as the lives of workers whose experiences are currently excluded from the framework for fisheries management. The so-called ontological turn in recent years within the humanities has called attention to many of the intellectual debates around knowledge and knowing and raises important questions on how to merge philosophy, science, relations, and public participation. Theoretically, such scholarly work assists in framing this study as a thought experiment into the feasibility of a 'hardest case' of statistical modelling. The human condition is not something easily represented by numbers, algorithms, and formulas, precisely because of the metaphysical abstractions of affect, relationality, and despair that are present amongst the living under late capitalism.

Since no such study has been done before in the context of Namibia's fishing sector, this research charts these (e)merging currents as the historical narrative intervenes in the temporal *present* of fisheries science and management. The technoscientific sphere of statistical models, numbers, biological organism and ocean currents are part of the materiality of life under late capitalism in the postcolony. Walvis Bay is a unique urban site and holds a distinct position within the global flows of capital, and there exists a special set of conditions that change the relationship between humans and the ecology in which they exist (Callaghan 2015). The land of Walvis Bay is particularly hostile to human habitation, yet the city has been constructed atop the dunes in order to create a site to support extractions at a strategic point on the coastline. The conditions of Walvis Bay amplify the ways in which the physical environment mirrors the social environment and vice versa. Within this dynamic space, where the flows of energy, matter, and information are in constant circulation, understanding the forces that shape human action, economics, and political decision-making becomes paramount. This research explores the collective and individual struggles that renew human interactions with the material world, its non-human inhabitants, and organic forms of life marked by the technoscientific management of the environment. The narrative of Walvis Bay, of an industrial marine port town at the edge of the African continent is the point of entry and indeed a difficult case study to begin to ask how the human dimension is conceptualised, represented, and modelled within the fisheries management paradigm. It is not clear yet whether such a dimension can indeed be modelled through the computer and if so, the extent of its impact and inclusivity.

The question remains, what does it mean to be human in such contradictory and uneven moments (environmental, political, economic), and how can this reflection support a reworking of the paradigm of fisheries management that is trying to be holistic in scope? My analysis emerges from a lineage of liberation struggles and philosophies from the underside of modernity (to borrow from Maldonado-Torres, 2008) in order to re-align the social expulsions of oppressed communities. In this way, I expose how understandings of the intensified shifts in the capitalist expropriation of the material world generate particular productions of nature in which the logics and economies of neoliberalism result in the commoditisation of life itself, both human and nonhuman. In this way, the final question is how such an ethics can be usefully drawn upon to develop an alternative framework that could potentially be modelled in the virtual realm.

The Latin American modes of liberation and decoloniality² provide a philosophical point of departure for my discussion on modes of liberation in Namibia, namely the idea that for decoloniality to be an action, it must address alternative imaginaries of history and agency, as well as form the structures for a political public in which citizens are willing and able to participate. The term 'wellbeing' comes from global assessments of life quality in places of increased inequality. As a conceptual tool, it falls short to mediate and engage with the modernist tropes of the global sustainability movement. In times of austerity, the list of signifiers and terms that are used to describe and underscore the severity of the crises we find ourselves in continues to expand. Signifiers such as wellbeing are used to subdue the growing unease around issues of environmental and economic crisis. The result of such tactics tends to de-escalate the devastating impacts that the economy and environmental degradation are having on communities whose life worlds are at risk every day because of uncertain conditions.

To incorporate the human dimension and the necessary social factors into the EAF framework is not an easy task. It is not simply about mapping the material conditions of Kuisebmond township where the majority of black workers reside, onto the scientific model. There need to be requirements for dutiful and inclusive approaches to address the social factors and their limitations in the virtual realm since they have not yet fully been addressed in the material world. The differences in the expected outcome of a computer model to produce organised and accessible information and the aspects that are designated as key indicators to determine such information are again, caught in the space between virtual and reality, nature and

²The work of the decolonial thinkers in Latin America offer an important theoretical intervention in the debates in Namibia (and southern African extractive landscapes) around liberation, democracy, and development. In this study, I draw from Dussel's (1985, 2012) work around philosophies of liberation as well as his Marxist approach to social theories of development.

culture, science and society. The dissonances are also part of the current frame of modern fisheries management in the postcolony.

Several decolonial scholars of Latin America, such as Nelson Maldonado-Torres (modernity/coloniality), Catherine Walsh (development/postmodernity), Aníbal Quijano (coloniality of power), and Enrique Dussel (transmodernity/empire, philosophy of liberation), provide useful theoretical interventions into processes of becoming and wellbeing in postcolonial, post-liberation societies in transition. Their work enables the question of: how is wellbeing contextualised and analysed within spaces of conquest, empire, and stark inequalities? It is necessary to localise the abstract term “wellbeing”, and in this study this is done through extensive ethnographic research within the township of Kuisebmond and the neighbouring township of Narraville in Walvis Bay. These two townships are generally defined by their racial composition, with Kuisebmond being the black township and Narraville, the coloured township³. These distinctions, remnants of the apartheid regime of South Africa’s white nationalist government that put into place policies of racial segregation and hierarchy, remain solid signifiers in the social dynamics in present day Walvis Bay.

In the Oshiwambo language the notion of wellbeing, a good life, and success is linked to the way of greeting each other. The greeting in Oshiwambo is notoriously long, with each party going back and forth with each other, not only asking about the health of each other but also of family, extended family, and other relations. From what I could gather through my conversations with a native Oshiwambo speaker is the notion of wellness permeates the linguistic function of the greeting. It essentially forms the basis of the greeting and is used as a way of expressing respect (through asking about one’s family and extended family). For example, *oulinawa*⁴ translates as *are you well*, and *uukulinawa* is a response meaning *I am well, I am healthy*. The notion of wellness is decidedly situated within broader linguistic formalities, and it seems that it is used very generally within spaces of greeting and respect. On the other hand, to express un-wellness, is to invoke the phrasing *uunkundi*, meaning that one is not well, doing poorly. This extends to all areas of life, from material conditions to emotional health, and within the structures of the

³ A note on terminology: throughout this dissertation I will use racial terminology to describe groups of people in Walvis Bay. These terms are how individuals refer to themselves and others, and whilst they are remnants of the colonial and apartheid periods of Namibian history, they are important social significations on how race remains such a defining feature of contemporary Namibian society. Therefore, ‘black’ will refer to African people, ‘white’ refers to those of European descent (such as German, Spanish, Afrikaner), and coloured refers to those of mixed race. See Trotter (2008) for further explanation using the South African experience which is, ultimately, an extension of the Namibian experience, and the two countries use the racial language in the same way.

⁴ The following descriptions of greetings in the Oshiwambo language are based off of conversations I had with native speakers. One participant who volunteered to work with me is a former Peace Corps language instructor and was instrumental in helping me with questions regarding the Oshiwambo language.

greeting such expressions emerge. People are far less forthcoming with these expressions of (un)wellness outside of the greeting. Whilst the use of wellness in the greeting signifies a need and desire to be well, for most people the deeper meaning of this centres on the relational and the material; having a social net of trust and kindness, but also the capacity to participate in practices of consumption. In other words, wellness extends outwards through the relations and socialities that underpin the terrain of an industrial urban centre, but also within a collective sense of desire, satisfaction, and agency within such spaces haunted by historical exclusions and traumatised collective memory.

Philosophers and anthropologists of science such as Bruno Latour, Isabelle Stengers, Elizabeth Povinelli, Donna Haraway, and Manuel De Landa have been pivotal in the scholarly realm of science studies and environmentalisms, each coming to the problem of capitalism, scientific objectivity, and knowledge systems and their arrangements in different ways. An important intervention in this zone of late capitalism in which institutional and political structures contribute to what Saskia Sassen (2013) calls ‘expulsions,’ or the foundations of a logic that places inclusion in opposition to expulsion within the framework of global capitalist society, the mechanisms that not only expel and exclude certain groups of individuals and/or species but do so in a way that is not entirely visible. This is symptomatic of life lived at the margins of society and aptly describes the dynamics of social life in a marine industrial town such as Walvis Bay. The strength / contribution of Sassen’s work here will be to anchor the development of the idea of expulsions, from economies, to land, to politics, and its potential to assist in understanding how inclusion and expulsion function together to create breaks and maintain continuities within the global order of late capitalism.

Aimé Césaire, Frantz Fanon and ongoing work dedicated to the study of blackness and black bodies will guide this study in its humanistic endeavours for a decolonial approach to science studies and an anthropology of extractions. I dig into the ways that institutions command knowledge, power, and conservation within the technoscientific sphere. I question how these structures are necessary for the function and dynamism of social life in Walvis Bay, and probe the uncertainties of life in a marine industrial town. Such uncertainties are highlighted through statistical and numerical representations of measurement, predictability, and control. In the work of Césaire, colonisation equals thingification. This point is developed through his study of colonisation in which “no human contact, but relations of domination and submission which turn the colonizing man into a classroom monitor, an army sergeant, a prison guard, a slave driver, and the indigenous man into an instrument of production,” (Césaire 1972:42). It is precisely this foundation of reduction coupled with the uncertain terrain of transition that haunts

Namibia. When Césaire wrote that “more and more the word promises to be an algebraic equation that makes the world intelligible,” he was writing in defence of the poetics of experience, and by stating that “poetic knowledge is born in the great silence of scientific knowledge,” he was making greater claims to the dissonance between the reduction of the world and people to things (as part of the colonial project) and the spaces for resistance to such reductions. In the same way that Fanon (1961) writes that the world is divided into compartments and the world cut in two is inhabited by two different species the colonial context is one rife with contradiction. By this Fanon refers to how colonialism renders two types of people, the colonisers and the colonised in which those colonised are reduced to less than human. Fanon also remarks that part of what defines such originality within the colonial context is how economic reality and inequalities, as well as the differences in ways of life never come to mask the human reality (Fanon 1961). Therefore, to examine closely the topography of colonialism, “it is evident that what parcels out the world is to begin with the fact of belonging or not belonging to a given race, a given species,” (Fanon 1961:39). Coloniality then, is the legal and economic referent of racial difference and this difference was the naturalising feature of colonial relations. In other words, the idea of race was used to maintain the power structures within economic, social, and political spheres in the colonies. Such is the “compartment” for Fanon and “thingification” for Césaire.

Decisions are made based on the statistical probabilities and measurable objectives of within the management framework. Therefore, this study seeks to re-configure the current social and political framework for fisheries management through a careful examination of the key computer models and categorisations at work. It is an experiment of thought, certainly, but also a commitment to reveal the discomforts of global supply chains, migrant society, and the various ways that people are making sense of this chaotic world. Central to this framework is the attention to the historical implications of Namibia’s liberation struggle coupled with the rise of austere fiscal and social policy that is embedded in a political discourse of late liberalism. Such a layered framework tends to obfuscate the many different and strategic ways that people relate to their history, environment, and resistance to the institutional barriers that the majority of Namibians face. These barriers manifest most clearly in the high unemployment rates, access to material and economic mobility, health and education. An alternative environment-making process shows the need for new labour politics as part of a provocation of the dominant scientific modes of enquiry, and a localising of the abstract term *wellbeing* through an ethnography of Walvis Bay.

The arguments in this study are presented in specific steps in order to address the range of interlocking concerns outlined above. The first three chapters of the dissertation provide a glimpse into contemporary fisheries science as it is practiced in Namibia's hake fishery. The second half of the dissertation grapples with human wellbeing as an anthropological concept, and distinguishes how anthropology and fisheries science are both connected and separate within the overarching objective of transforming what we know about the environment and how we exist within in it. Chapter 1 "An ecosystems approach to fisheries management in the Benguela Current," provides an introduction to the management model of an EAF which frames the core questions of this study. An EAF emerges from the UN FAO's attempts to integrate multiple dimensions of human and biophysical components into one overarching conceptual model in which quantifiable indicators are developed to measure the effectiveness of the management model. The paradigm shift from single species stock assessment *as* management, to a more holistic in scope framework of EAF is slow to materialise in Namibia. An EAF is thus presented first, in general terms, to provide background and to set up the research questions that guide this study.

Chapter 2 "Doing fisheries science in the postcolony: a paradigm shift," introduces statistical modelling as the underlying logic to manage the hake fishery. Despite the expanded management model of an EAF that seeks to address the social and ecological impacts of fishing whilst maintaining its efforts to practice *good governance*, the stock assessment model remains the authority for fisheries management in Namibia's hake fishery. This chapter explores the legacy of the stock assessment model and charts how computer models emerge as the technological intervention in the privatisation and enclosure of natural resources. Their use also points to a shift in the governance structures for national resources that emerge alongside the shift to democratic state-building. Starting from the assumption that models are limited and produce partial truths, I engage with the stock assessment model through its life cycle. The first step is to understand the theoretical conception and implementation of the stock assessment model as it grounds the study and its critique via a thorough explanation of the modelling process itself. This chapter draws from the fisheries science literature, namely that of the international maritime governance community, to trace the emergence of Namibian fisheries science. To understand the emergence of models and modelling as the new technology for fisheries management, I localise and contextualise single species stock assessment in its history and current uses in Namibia.

Chapter 3 “Contemporary fisheries science: conceptualising human wellbeing as model-able,” demonstrates an exercise in hardest case modelling, in which the separateness in method of fisheries science and qualitative ethnography emerge. First, the chapter explores the role of the stock assessment model in relation to an EAF to fisheries science. Statistical modelling relies on specific practices to collect, collate, and compute data into information for fisheries management. Data thus contributes to both the making of information for decision-making as well as providing the basis for what is known about the biophysical environment. This chapter looks carefully at the shift towards a more inclusive management paradigm that demands a holistic approach to understanding the dynamics of the fishing industry and in doing so, opens the space to re-imagining the human dimension to attend to the historical social exclusions as they manifest in the present. It presents alternative imaginaries of wellness, noting how they manifest in the Namibian situation in specific ways, by looking at the emergence of the term “wellbeing” in the realm of fisheries management, most importantly in the conceptual model of an EAF. The computerised decision-support tools require quantifiable data in order to function, and based on my fieldwork I was able to work with Dr. Barbara Paterson⁵ to design a knowledge-based decision support tool. The knowledge-based decision support tool is built from an indicator framework that is then run electronically. In essence, what we did was to put the EAF conceptual model to the test by using a computer model to model the management model. The task that Barbara Paterson and I undertook to re-structure the indicator framework for human wellbeing is presented in the figures and reveals the important indicators as clusters and through their relation to the others. Following the nascent and rudimentary experiment of clustering sets of relations as observed in the hake fishery, Barbara has already been able to run this indicator framework through a computer simulation, with the outputs of her computer model included in the figures. While this is only a bare electronic model, it begins to illustrate how modelling wellbeing can be done in a way that attends to the myriad ways of capturing wellbeing in Walvis Bay. This chapter provides a conclusion to the first half of the dissertation that is concerned with the workings of contemporary fisheries science.

Chapter 4, “In search of wellbeing in Walvis Bay: an anthropological approach,” begins the second half of the dissertation whose focus is on the anthropological conception of human wellbeing in Walvis Bay. Through ethnographic methods, as distinct from fisheries science, this chapter searches for human wellbeing in the strangeness of Walvis Bay. The industrial ecology of

⁵ Dr. Barbara Paterson (UCT & St. Mary’s University, Halifax) is co-supervisor of this study. We initially met during my fieldwork on fisher’s knowledge for my MA in 2010. Based in Walvis Bay during my fieldwork for this study, she is an integral part of the research. As a modeler who has developed decision support tools for the pelagic fisheries in South Africa, her work on indicator frameworks in Namibia is directly linked to this study on computer models and EAF.

the town itself presents a host of signals that would lead one to believe that wellbeing cannot exist. The stories of Meme Teresia and other close friends in Walvis Bay illuminate the ways that wellbeing must come to mean something else than the prescribed indicators within the development agenda. Before wellbeing can be attributed to a category within the management framework and modelled by electronic devices such as statistical models and software, a clear definition of wellbeing must be conceived that is particular to Walvis Bay (and more broadly Namibia). I had to first go in search of wellbeing in Walvis Bay, where I explored the social textures of the town to better grasp the strangeness of asking about wellbeing in a place like Walvis Bay. Such spaces are marked by a social landscape that is so fragmented by its colonial history and uneven development practices, coupled with the assumption that wellbeing is part of a dualistic framing of poverty at one end and wellbeing on the other. This chapter documents why this is a problematic framing by magnifying life under capitalism in Walvis Bay in the stories, experiences, and analysis of the town presented here. My fieldwork was conducted with the assumption that it would be used to develop the EAF framework further. It illustrates why adding a layer of the human dimension and human wellbeing within fisheries management is problematic given the current structure.

Chapter 5 “Cheap empire: labour, nature, and capital,” presents a discussion on the relationship between labour, nature, and capital. The electronic and statistical models in fisheries management that contribute to the expanded EAF framework remain the authority for fisheries management. Efforts to include the human dimension into the EAF framework are incomplete and insufficient. This chapter explores why this should be so, starting from the juncture of labour, nature, and capital. Much of the attention given to the human dimension has been done through avenue of employment, and specifically through the employment statistics which give neither an accurate nor vigorous account of the human dimension as such, because the human dimension is much more than the number of jobs created. This chapter asks what it means to think about integrating the human dimension in the management model given that the structural inequities are so massive that they cannot be addressed easily; notions of wellbeing tend to be reduced and simplified into easily quantifiable logistical measurements, such as employment statistics, household incomes, cost of living rates, that serve to justify the extent at which the growth of the fishery is promoted, that also has implications for the biophysical and social worlds; the EAF conceptual model is now being expected to act in the social world through its inclusion of the human dimension when fisheries managers are trained to feel their work as separate from society; and given that the EAF model itself is part of a neoliberal suite of interventions specifically designed by markets for markets, and not for liberation.

Chapter 6, “Reassembling the social and ethical responsibilities of industrial extractive fisheries,” is an intervention in the conceptual model of an EAF. This chapter argues that the reason why an EAF has been slow to materialise in Namibia is due to the framing of the questions that an EAF sets out to answer. In other words, in order to get relevant answers, the sets of practices that enable relevant questions must first be established (Stengers 2011). The problem of an EAF stems from the presupposed conditions that assume human wellbeing can be made quantifiable through indicators. Measuring human wellbeing within an EAF also assumes that an EAF has already been implemented, and thus the question is how to measure its effectiveness with very little empirical data. Because an EAF has not been implemented in Namibia, the paradox of modelling human wellbeing within a framework that exists only as a framework, points to a dissonance in the practices of asking about wellbeing in a place like Walvis Bay. This chapter offers a different way of conceptualising human wellbeing that is premised on processes of becoming and emergence and argues for a reassembling of social, ethical, and scientific practices for natural resource extraction and management that are situated within a framework of postcolonial science.

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The study sets out to explore the concept of human wellbeing in Namibia’s hake fishery. My aim with this project is to understand the ways in which certain organisation of information, experience, and affect, contribute to a management regime for natural resources that seeks to address the human dimension through the problematic conceptualisation of human wellbeing. In order to do that, I first had to grasp the relevance of the stock assessment model as a mainstay in modern fisheries management. From there, I examine the now-expanded modelling landscape in which ecosystems models, stock assessment models, and an ecosystems approach to fisheries management form the current framework for decision-making. I will also therefore engage with the limitations of these models. Through my analysis of these practices emerges the challenge of incorporating the human dimension into the management modelling framework in a way that fosters sets of relations rather than reducing them into metrics and quantifiable data sets that further abstract notions of wellness and wellbeing. Wellbeing in the context of Walvis Bay is marked by unevenness and contradictions as everyday life under capitalism in extractive landscapes is precarious yet functional. Wellbeing studies thus need more nuance and long term engagement to fully grasp the action that is needed in such uncertain spaces.

The concept of wellbeing is part of larger structures of governance that conceptualise the

human dimension as a category that can be modelled within the framework for an ecosystems approach to fisheries management. In order to understand how and why wellbeing is being called upon to represent the human dimension in the management framework, the study first had to look back at the history of doing science in Namibia and the development of models for fisheries science, which still dominate in the management framework. The study also sought to explore the rise of computerisation, algorithms, and logistics as the technological solution to incorporate the human dimension into the management model and the problems that emerge from this approach to indexing human experiences. To ask questions about wellbeing in a place such as Walvis Bay requires much more attention to the social, economic, and political context in which wellbeing is situated. Because of the massive inequalities that mark Namibian society, wellbeing cannot be used casually or as an overarching category in which the entirety of the social world can be encompassed. The main questions guiding this research were: first, how is the notion of wellbeing conceptualised in Namibia's fisheries management processes? Second, what are the limitations to the idea of wellbeing with regards to addressing the social and environmental devastation seen in the marine industrial ecology of Walvis Bay and the Benguela Current? Third, what is the feasibility of incorporating the concept of wellbeing into the conceptual models for management which may in turn generate computerised models to measure the effectiveness of an EAF in Namibia's hake fishery?

Extractive industries in particular are exemplary in the way that they operate in the space of scientific nature and dominant political structures. Together, these modes of knowing and action can be conflated in dangerous ways where exploitation (of the human-physical environment) is a necessary component of such processes of extraction. In this way, whilst nature may be uncertain, society remains rooted in that objectively certain realm, a complex tension between studying science and being a scientist, a researcher oneself. In Namibia, human wellbeing emerges as site of contradictions and ambiguities which are only slowly being recognised in its difficulty to be quantified into the computer model. In those contradictions is the lingering sense of being as bare and exposed as the sand dunes. It is that spectre that haunts the everyday in Walvis Bay.

Chapter 1

An ecosystems approach to fisheries management in the Benguela Current

“The stock assessment model is a forecast, and a better model depends on more accurate assessments. The model extracts data for knowing and no model is better than the data you put in. While the fisheries management plan is the result of a political process, the stock assessment processes are purely scientific, meaning they are outside of the domain of politics.”

--Presentation from Danish modellers to industry, introducing a new stock assessment model – Walvis Bay, Namibia October 2013

Fisheries worldwide are in a state of crisis (Bavington 2009). In Namibia, all areas of the fishing sector see effects from the decline in fish stocks, overfishing, climate change, and the resulting new management regimes. The ecosystems approach to fisheries (EAF) in Namibia emerges out of the Food and Agricultural Organisation of the United Nations (UNFAO) initiatives to utilise knowledge-based models, or expert systems, to manage fisheries more holistically (FAO 2012). Part of a global paradigm shift, an EAF is broadly comprised of a series of binding and voluntary arrangements, agreements, conventions, and codes that seek to address the interactions that occur across ecological, social, and political levels (Shannon et al 2006, Garcia 2008, FAO 2012). The rollout of an EAF for the management of Namibia’s hake fishery was designed with the intent to expand the management framework to consider wider ecosystems interactions that include multispecies interactions and anthropogenic factors.

An EAF is thus both a managerial technique as well as a conceptual model, through which fisheries managers seek to generate a holistic representation of the biophysical places and discursive spaces of contemporary global fisheries (Bavington 2009). In the southern African region, centuries of unrelenting industrial extraction of marine life that include whales, Cape fur seals, and a variety of fish species has left the expansive nature of biophysical fisheries in a state of disarray (Roux and Shannon 2004). Fisheries science, the lynchpin for fisheries management and stock assessment modelling, becomes increasingly “fractured and subdivided over the forms of knowledge and modalities of intervention that make for effective fisheries management. Fisheries experts increasingly emphasize complexity and uncertainty while counselling passive adaptation and coping strategies to transform and reinvent fisheries management” (Bavington 2009:99). Against the backdrop of increased criticism on fisheries science is the largely

uncriticised idea of management itself. As Bavington rightly notes, “proposals for new forms of fisheries management change and proliferate rapidly in the contemporary context, but the idea of management largely escapes critical engagement,” (ibid). The lack of critical engagement with the very notion of management underpins the broader questions of industrial fishing practices and the suite of neoliberal interventions that have come to dominate the state of industrial fisheries worldwide, marked by free market strategies for maximum profit.

This chapter introduces the logic and rationale of fisheries management for the hake species in Namibia. The key actors are presented here along with a timeline of fisheries management from the colonial period through to the present day. The chapter will introduce the assumption that fisheries management in Namibia’s hake fishery can be successful because of a progressive constitution, Namibianisation policies as part of reparative strategies for social change, and the continued development of fisheries science and technologies. Against the backdrop of modern fisheries management in Namibia is a social and political narrative of Walvis Bay that tells a parallel story of inequalities, uncertainties, and harsh living and working conditions. One of the core questions to this study asks how fisheries management mediates and dictates action in the physical and socio-political sphere of extractive industries. The purpose of this chapter is to chart the emergence of an EAF in Namibia’s hake fishery and point out the important management regime changes. In doing so, the chapter begins a discussion of the interaction between EAF and modelling, as EAF aims to replace the single stock focus that has been the mainstay of fisheries management with the introduction of management initiatives that consider the wider ecosystem interactions that include human-ecosystem and multispecies interactions. In order to implement an EAF, the need arises for objectives and indicators that essentially make possible the management actions. To do so, fisheries management relies on the EAF as a managerial model and stock assessment as a scientific model of the natural world to address the myriad challenges of monitoring and predicting the state of fish stocks and their value for future generations of Namibian citizens. As Sian Sullivan notes, “the contemporary moment of global crisis in both ecological and economic spheres is thus also the moment wherein ‘nature’ is being consolidated, metaphorically and literally, as ‘natural capital,’” (Sullivan 2014:2). Sullivan goes on to argue that because of the discursive shift in the conceptualisation of living nature as if it is indeed capital, and of monetary value, and the consequences that arise from the economisation and further capitalisation of nature (ibid).

In the southern African region, fisheries are a mainstay of coastal communities and form the base for a variety of activities related to fish harvesting and processing in the coastal towns and cities that stretch along thousands of kilometres of coastline (Smit & Rushburne 1971, Moorsom 1984, Callaghan 2015). Namibia's fishing history is unconventional because Namibia is largely known as an agrarian country. Along the coast, the hyper-arid Namib Desert extends along the entirety of the northern Benguela (Roux and Shannon 2004). The Namib Desert's inhospitable conditions mean that the coast has always been sparsely populated and there is no evidence that the country's indigenous populations ever practiced artisanal fishing or were involved in subsistence fishing (ibid). Prior to German colonial rule from 1884 – 1914 (Paterson et al 2013), the Namibian tribal groups were invested in cattle farming and in seasonal crops such as mahangu, a type of millet. The arrival of large-scale fishing practices for the hake species in Namibia corresponds with South Africa's mandate over the area that began in 1920. Coastal life is a relatively new phenomenon in Namibia, to this day underpinned by migrations to Windhoek and Walvis Bay and other urban centres in search of work in industry, in response to drought, poverty, and lack of opportunities in the rural areas. South Africa's colonial presence increased the demand for fish and they were able to draw on a population of unskilled black labourers within the apartheid economy to fulfil the labour demands. The result was the contract labour system based on the racial hierarchy of apartheid.

Namibia gained independence from South Africa in 1990, and inherited severely depleted fish stocks and a non-functional fisheries management framework (Kirchner 2010; Paterson et al 2013). The framework only loosely followed international conventions and, as discussed in the introduction, these frameworks had been easily manipulated to benefit powerful players like South Africa, Spain, and the Soviet Union who were able to maximise their fishing potential in the area. The hake fishery now spans five decades and the hake resource remains the most important commercial demersal (bottom dwelling) fish species (van Der Westhuizen 2010). During the 1960s and 1970s, at the peak of foreign exploitation of the hake resource, total catches were logged at more than 800 000 tonnes in 1972, before the first control measures were put into place as a result of the International Commission for the Southeast Atlantic Fisheries in 1975. The first control measures required the use of a minimum mesh size (for fishing nets) and the allocation of quotas to each member country participating in the hake fishery (ibid). In addition, total allowable catches were introduced as another type of control measure in 1975 (Roux and Shannon 2004). Once Namibia gained independence in 1990, the new government

took control of the fishing activities in Namibian waters with the Fisheries Policy in 1991 and the Sea Fisheries Act of 1992 that provided for the control measures to be enacted (ibid). However, despite a gradual increase in hake biomass between 1990 and 1993 due to conservative management strategies during those years, the hake stock has been in decline since 1993 (ibid). The hake fishery is managed on the basis of the TAC that is set based on the rate of increase or decrease in the overall size of the resource.

The hake management plan was devised and implemented in accordance with the debates in natural resource management and fisheries science at that time in the 1990s, that were focused mainly on single species stock assessment and international standards as defined by organisations such as the UN FAO and the International Commission for South East Atlantic Fisheries (ICSEAF), despite the latter not officially representing Namibian interests. ICSEAF was formed in 1969 and the first working session was held in 1972 (Paterson et al 2013), and was modelled on the International Convention for North Atlantic Fisheries (ICNAF). ICSEAF was structured as a forum in which scientific advice was shared and regulatory measures could then be established (Paterson et al 2013). However, the UN Council for Namibia was not a member of ICSEAF while South Africa held the same status as the other 16 member states. ICSEAF controlled the hake fishery in Namibia from 1976 and allowed for open access exploitation by its member states that resulted in drastic decline in hake populations (Wilhelm 2014).

In the 1990s, a shift in global fisheries management began, and the framework expanded so that a more systems-based approach was taken to ecological functioning. What mattered were no longer solely the targeted single species, but also food webs, human pressures, and the changing climate. An EAF was adopted as the fisheries management framework in Namibia and reflects a global trend in ecosystems-based fisheries management that more firmly envisioned the fishing sector as an integrated whole, made up of essential life support systems of the marine and coastal areas (Bavington 2009). The EAF framework that exists in Namibia (and South Africa and Angola) falls in line with the conventions of the UN FAO and their responsible fisheries initiatives that aim to address the social, economic, and ecological sustainability of the world's fisheries. The UN FAO's guidelines require adherence to international law that set out the rights and obligations of signatory states to ensure the protection and sustainable development of the marine and coastal environment and its resources (Cochrane et al 2004). In line with the new international EAF framework, a number of treaties and conventions sought to operationalise new objectives and translate them into a practical and feasible approach. These included the National Research Council (NRC) of the United States of America (1999) which introduced the idea of individual fishing quotas (IFQs) as a new instrument under which harvesting privileges

are allocated to individual fishermen (or individuals). The underlying assumption of IFQs is that they help to address the serious social, economic, and biologic issues rose by depleted fish stocks, and can provide consensus for fish harvesters, biologists, economists, and policy makers (Mace 2001). Out of these initiatives, the UN FAO developed the EAF framework for fisheries management to include an expanded conception of what they called “the human component” to be read and interpreted alongside the existing framework. Now, fisheries management is tasked with addressing the interplay between the ecological, social, and political categorisations of the fishery as a totality.

An ecosystems approach to fisheries management in the northern Benguela

The EAF for Namibia’s hake fishery exists in concept only. While there is a drive to implement an EAF in Namibia in accordance with the international paradigm shift in fisheries management, in Namibia (and elsewhere), there is little actual implementation of such an approach. In essence, an EAF should correspond with the larger framework developments of the FAO and is a result of the rationale of the FAO as an international organisation. The FAO described EAF and its rationale as follows:

The purpose of an ecosystem approach to fisheries is to plan, develop and manage fisheries in a manner that addresses the multiplicity of societal needs and desires, without jeopardizing the options for future generations to benefit from the full range of goods and services provided by marine ecosystems. An Ecosystem Approach to Fisheries strives to balance diverse societal objectives, by taking account of the knowledge and uncertainties about biotic, abiotic and human components of ecosystems and their interactions and applying an integrated approach to fisheries within ecologically meaningful boundaries. Cochrane et al 2004:11

In southern Africa, a regional EAF project was launched in 2004, under the auspices of the Benguela Current Large Marine Ecosystem Programme (BCLME). The start of this project came as an offshoot of the commitment to implement an EAF by 2012 that was made by signatory nations at the 2002 World Summit on Sustainable Development (WSSD) in Johannesburg (Paterson et al 2015). The move to an EAF has been met with a myriad of challenges in its implementation. One of the key reasons for a slow implementation process is that it requires a rethinking of fisheries management (ibid). For much of the 20th century, fisheries management relied on stock assessment science and modelling to predict and configure both the rate of

recovery of a fish stock and consequently the annual total allowable catches. With a move to an EAF, fisheries managers, scientists, fishers, and other key stakeholders are directed to think beyond the stock assessment model and its results, but remain limited in their course of action because the stock assessment model still holds precedence.

The FAO promotes an EAF as the definitive management model for fisheries and development in Namibia. An EAF draws from three different discursive spaces that are meant to contribute to the totality of fisheries management with respect to the EAF framework. An EAF for Namibia's hake fishery is framed around the stock assessment model and the data that informs the model such as catch rates, sample lengths of fish harvested, and fishing pressure. Ecological data informs the ecosystems model (computer) that tells us about the health of the ocean such as sea temperature, salinity, and abundance of nutrients in the fishing zones. Each component of the EAF plays a role in the management regime's decision-making processes, such as setting of the TAC, quota allocations, and value of the resource.

Traditional fisheries management logic assumes that the productivity of fish populations is largely independent of the physical environment and social-ecological changes (Paterson et al 2014). In the old paradigm, fisheries science assumes that the recruitment of new fish can be predicted based on the size of the adult population and that the size of a fish population can be manipulated through fishing pressure (Paterson et al 2015). Management has thus focused on the regulation of fishing pressure (such as the number of boats, size of fishing nets, quotas) and determining the total allowable catch (TAC) (Pauly et al 2002, Bavington 2009).

It makes sense that at independence in 1990, Namibia's strategy to develop the fishing industry was framed within international standards for resource extraction while also putting into motion initiatives and policies that gave the newly formed Namibian government full autonomy in managing the marine resources. In 1990 the new Ministry of Fisheries and Marine Resources (MFMR) took over management of the fishery and immediate measures were taken to close fishing to all foreign vessels along with the enforcement of a 200-mile exclusive economic zone (EEZ). The White Paper of MFMR was set out in December 1991 (MFMR, 1991), to be enacted in the new Sea Fisheries Act by 1992 (MFMR 1992). The initial policy documents were updated with the Marine Resources Act in 2000 (MFMR 2000), and Namibia's Marine Resources Policy in 2004 (MFMR 2004). If Namibia was to emerge as a global player in fish harvesting, they would need to establish a management plan that could be recognised and legitimated within the global scientific and economic systems. The post-independence platform of MFMR to manage the fishery would set the stage for the current iteration in fisheries management in Namibia.

The emergence of an EAF as part of the management platform demonstrates a shift to

expand the conception of the hake fishery beyond single species stock assessment, yet the implementation of an EAF has been slow to materialise in practice. Part of the issue is the continued reliance upon single species stock assessment as the definitive method for determining the health of the hake population in Namibian waters, coupled with the rise in bio-economic practices that set out to determine the value of the hake stock as it relates to the maximum yearly threshold for fishing the species (the TAC). The EAF framework expands the notion of the fishery and recognises inter-species interactions and anthropogenic factors that contribute to the overall health of the ecosystem. However, one method for determining the health of the hake population for fishing practices in Namibia remains dominant and that is the single species stock assessment model.

From single species stock assessment to an EAF in Namibia's hake fishery

As Roux and Shannon noted in 2004, “traditional single-stock assessment tools usually remain the best available tools for short-term tactical management decisions. They have the advantage of incorporating more details on age and size structure of the fished stocks and on gear selectivity than is normally possible in ecosystem models, and they provide reference points for single stocks” (Roux and Shannon 2004:88). The stock assessment model became the anchor of fisheries management in part because of the need for short-term management decisions coupled with widespread sector efforts to capitalise on the hake resource despite its severely depleted state. To date, Namibia's fisheries have been managed almost entirely via single species stock assessments (Roux and Shannon 2004). Larger ecosystems interactions, trophic interactions, competition, and predator-prey relationships are not taken into account in the management procedures despite Namibia's stated commitment to implementing an EAF. Namibia was a signatory to the Reykjavík Declaration on Responsible Fisheries in the Marine Ecosystem in 2000 which marked a formal adoption of a commitment to ecosystem approaches to fisheries management at a global level (FAO 2001; Roux and Shannon 2004).

Modern fisheries management in Namibia assumes that fisheries management can be successful largely in part because of Namibia's Constitution, which states *inter alia*: “The State shall actively promote and maintain the welfare of the people by adopting policies aimed at [...] the maintenance of ecosystems, essential ecological processes and biological diversity of Namibia and utilization of living natural resources on a sustainable basis for the benefit of Namibians, both present and future,” (Constitution of Namibia, 1990). The enshrinement of the principles of natural resource (including fisheries) utilization in Namibia's Constitution is a testament to the

importance and necessity of the fishing industry for the country, which is reliant upon the wealth of natural resources such as marine resources, minerals and precious metals. The development of the commercial fisheries in the northern Benguela region until Namibian independence in 1990 is marked by the sequential exploitation and depletion of the three most important stocks in the area: sardine in the 1960s, Cape hake in the 1970s and horse mackerel in the 1980s (ibid).

Stock assessment models are utilised increasingly as part of a global trend of fisheries crises in which vast amounts of fish are harvested in stark contrast to the recovery of fish populations. Fisheries science, of which stock assessment modelling has been a mainstay, evolves parallel to changes in the technological interventions developed in the realm of algorithms and algorithmic culture. The single species stock assessment model for hake forms the basis for decision-making processes that decide how many fish within the projected total stock are mature enough to be fished out of the ocean whilst ensuring that the remaining population continues to grow and reproduce. As such, a model is a simplification of reality which takes data collected at the beginning of a season, and subjects it to various mathematical manipulations, to simulate what is likely to happen.⁶

An EAF broadens the spectrum of how we think about the fishery. However, the stock assessment continues to hold authority in decision-making processes. The clearest example of the power of the stock assessment is in the setting of the TAC. I experienced a full fishing season in Walvis Bay, that runs from approximately from January to October. In January, the research surveys are conducted by the Ministry of Fisheries as a first step in collecting data for the stock assessment model. The research surveys (which will be discussed further in Chapter 2), coupled with historical data and data from the commercial vessels help to generate a figure, called biomass, that is an estimate of the total mass of the hake stock, in weight. From that figure, age structures are determined that extrapolate how much of the total biomass of fish is at maturity and can therefore be fished. The TAC is the final configuration of the first two steps and is the numerical representation of the total fishable weight of mature fish that scientists estimate can be extracted, while ensuring that the remaining population will continue to reach reproductive maturity. Without a TAC and the subsequent allocating of quotas to fishing companies and/or individuals, there can be no fishing activity, based on the fisheries policy. To understand the significance of the stock assessment model within fisheries management in Namibia's hake fishery is to recognise the decision-making strategies that are in place to set the TAC and the quota allocations process. Without them, no fishing occurs, no factory work

⁶ From Lecture 1 in the course Advanced Spatial Analysis and Visualisation, University College London found here: <http://www.spatialcomplexity.info/files/2012/01/MRes-Lecture-1.pdf>

occurs, and no fish is available for consumption. In theory, an EAF takes into account other species than the target species (such as orange roughy, angelfish, jellyfish, and others) and the impact that fishing for hake has on the Benguela ecosystem (Roux and Shannon 2004).

However, these accounts are secondary and tangential to the direct link between stock assessment, TAC, and fishing activities.

One strategy to coordinate and streamline the objectives of an EAF into a concrete platform is to develop measurable objectives in the form of indicators. The EAF framework for Namibia's hake fishery aims to develop measurable objectives in the form of indicators under each of the three overarching management categories: ecological wellbeing, human wellbeing, and governance. In short, an EAF aims to address the interplay and relationships between the ecological, social, and political spaces of the fishery. The human dimension, or the social and political spaces of the fishery, is an important avenue in which to explore the evolving nexus of fisheries management in the postcolony, amid increasingly precarious work and living conditions.

The development of a human dimension in the EAF framework for managing Namibia's fisheries has been slow to take form. In 2010, the Benguela Current Commission (BCC) in collaboration with the UN FAO launched a project to investigate the human dimensions of fisheries management in the southern African region (South Africa, Namibia, Angola). In a transdisciplinary report on integrating the human dimension of an ecosystem approach to fisheries management in the BCC region, recommendations were made towards the collection and analysis of information on the human dimensions of fisheries in the Benguela Current region with particular emphasis on EAF. One of the key findings in the report, which was written as a collaboration between researchers and fisheries managers, stated that data on the human dimension in the three countries of the BCC region was incomplete and fragmented in scope (Paterson et al 2015). In Namibia, where the focus is on large-scale industrial fisheries, data collection by the Ministry of Fisheries has been largely focused on macroeconomics and rights allocations with some social and economic data being collected through the national census, the municipalities of Walvis Bay and Lüderitz, and local NGOs (ibid). Although Namibia's fisheries policies have been recognised globally for being both scientific and socially sensitive in their drafting, the current ecological, economic, and social realities in Namibia reflect a situation of crisis where the hake stock has been slow to recover; employment opportunities have stagnated, and much of the wealth from the resource circulates within the top echelon of Namibia's political elite (Kirchner 2010; Paterson et al 2013).

The current policies in Namibia's fisheries management framework are not sustainable (Paterson et al 2013). Some scholars suggest that in the Namibian government's efforts to

combine neoliberal economics and social equity, a development dilemma has been created in sectors such as agriculture and manufacturing (Kaapama 2007, Winterfeldt 2007). Such dilemmas are also evident in the fisheries sector where Namibia's fisheries policies had the potential for development along an export-driven trajectory, but their architects opted for a neoliberal model instead which favours growth and market-driven corporations with the assumption that profits will trickle down to benefit the majority population of Namibians (Paterson et al 2015). Corporate wealth and industry profits work against the broader, local initiatives for development, reparations, and employment, and result in a management regime in which the social and economic inequalities are perpetuated by the very structures that are meant to combat them.

In Walvis Bay, industrialisation was part of the post-independence development plan for fisheries from the start. In the absence of existing small-scale fisheries, the focus was on infrastructure development, on the factories for onshore processing at the industrial scale. The development plan (MFMR 2004) assumes two key points: first, that Namibia's colonial history exploited labour of the black Namibian population resulting in severely unequal conditions today. One way that the fishing sector can attend to this is through employment opportunities at the onshore processing facilities. The second point is the expectation that the hake stock will recover, despite current fishing pressures, to ensure the longevity of the fishing sector. However, the current situation in Walvis Bay is one of over-capacitation of the factories that process fish. Where the hake industry has the infrastructural capacity to process over 300 000 tonnes of hake, the management plan for the species estimates that only 150 000 to 200 000 tonnes of fish can be caught if the fishery is to be sustainable (Paterson 2015). As it stands, there will never be enough fish to catch for the factories to process at full capacity, which means that in practice they run at a built-in loss, which reduces both taxes and wages. This is a massive flaw in the design of the fishing sector since independence and it carries severe consequences for Namibia as a whole. An EAF is an attempt to address the unevenness of the management plan as it relates to the fishing sector, such as highlighting the discrepancies between the policies as they exist in theory and how they manifest in the everyday operations of the fishery.

Since 1998, the FAO has promoted an EAF as the definitive management model for fisheries and development in Namibia. In broad terms, the EAF is a management framework that aims to address the relationships between the ecological, social and political spaces of the fishery. A successful implementation of an EAF management framework in Namibia requires the fisheries management landscape itself to be restructured to ensure that the tenets of an EAF are specific to Namibia and that spatial and temporal scales are aligned. An EAF in Namibia is presently at an impasse because of fundamental flaws in capacity together with institutional

rigidity, and the continued authority of stock assessment within the management model. An EAF is a regime change for fisheries management, and its implementation in material terms has been slow to take off. However, the management model operates under the assumption that an EAF has been implemented, and utilises the indicator frameworks as tools to support the infrastructure of management that remains rooted in stock assessment models. For that reason, this study forms part of a wider research project led by these limitations, and works to develop a new conceptualisation for the Namibian hake fishery that incorporates the human dimension of the fishery according to the EAF framework through the work on the ECOFISH project of which this study is a part. The focus of that study has been to integrate different forms of knowledge into a coherent assessment approach for of Namibia's hake fishery (Paterson et al 2015). It is part of a larger suite of goals such as improving the current knowledge of basic ecosystem processes; improving the current stock assessments; and incorporating knowledge of stakeholders in the management of fisheries.

If human wellbeing is to be one of the definitive management pillars for an EAF, the notion of wellbeing needs to be explored in relation to the historical and material conditions in which it arises. Human wellbeing exists as a continuum, as an abstraction from the living world in which it operates and is assigned to represent. Wellbeing is thus not the telos of human existence, but reflects action, participation, and work that is nuanced and particular while also fraught with contradictions and ambiguities. At the core of human wellbeing, as part of the human dimension of the industrial ecologies of Walvis Bay, relationships need nurture to be well and to flourish. Wellbeing is thus a story of resistance to the forms and frames of capital that seek to reduce wellbeing to financialised economic models. As Joseph Stiglitz, Amartya Sen and others have argued, gross domestic product, or GDP, as a measurement of the wellbeing of societies is severely limited given that GDP overlooks economic inequality and does not factor environmental impacts into economic decisions (Stiglitz et al 2010).

By contrast to neoliberalist accounts of economic health, wellbeing may be argued to be more in line with Argentinian philosopher Enrique Dussel's argument in an *Ethics of Liberation* (2012) as a material ethics that affirms life, in all its forms, and that the recognition of that life is the central moment of existence and resistance. In a place like Namibia, where the physical environment is tied so intricately to the everyday lives of Namibians, understanding the material conditions in which people come to live well in the world, and the forces that shape the environmental and social history, amplifies wellbeing as a notion that links the essence of life and life giving with the struggles of belonging, hope, and liberation.

Since the 1990s, the concepts and principles that underpin the idea of an EAF have been evolving (Paterson et al 2012). However, the earlier documentation on an EAF in southern Africa gives little explanation of what the human dimensions are defined as. Thus, EAF is generally defined in human-ecological terms that are broad generalisations and hard to assess given the current measurement tools (ibid). In recent years more attention has been given to addressing the questions and challenges raised by the development of the human dimension within fisheries management. For example, in 2010 the UN FAO produced a technical paper and a technical guide that focused specifically on aspects of the human dimension titled ‘Human Dimensions of the ecosystem approach to fisheries.’ However, fisheries managers, government officials, and researchers are debating how to incorporate the human dimensions with regards to implementing an EAF (Paterson and Petersen 2010). Part of the challenge is developing the EAF framework in such a way that it can be modelled electronically in order to monitor and evaluate the progress of implementation, based on the establishment of measurable indicator framework and reference points, (Paterson & Petersen 2010).

Human wellbeing in the fisheries context generally falls to the background given that the stock assessment still rules the game. However, small steps are being made to address the interplay between ecological wellbeing and human wellbeing under the auspices of governance. Fisheries management, in the efforts to implement an EAF in Namibia, relies on indicator frameworks to measure management objectives. The production of measurable objectives is what operationalises a simulated or virtual assessment. In a similar vein of the stock assessment model that currently relies on formulae developed by computer scientists in order to provide predictions and outputs in numerical form of the human dimension, the parameters and thresholds of the measurables need to be set and defined. In other words, there needs to be a standard by which to measure whether the model is achieving what it sets out to do. As such, the EAF framework relies heavily on the availability of indicators, which are monitored and evaluated against reference points, i.e. targets or limits, and relate to specific management objectives (FAO 2003, Dengbol and Jarre 2004).

An EAF can be thought of as a theoretical model that attempted to structure management (in terms of objectives and measurable outcomes/indicators). Indicators are the empirical data that inform the conceptual model for fisheries management. Indicators provide the standard metric by which the management framework prioritises and engages with the goals of natural resource management in Namibia. As Serge Garcia notes, “the role of indicators and

reference values is as fundamental to an EAF as it is to conventional fisheries management,” (Garcia 1996). In addition, “an EAF is an integrated approach, and the availability of a set of ecological indicators and reference values is a necessary, but not sufficient, condition for its implementation,” (ibid). In other words, ecosystem indicators and reference values can range in scope from biological, ecological, technological, economic, and social/cultural, with the one core demand being that they relate to objectives and constraints. What often happens is that because of the often contradictory and frictional nature of indicators, objectives, and constraints, is that what appears to be a constraint on one of the two conceptual axes of sustainable development (human and ecosystem wellbeing for example), often appear as objectives on the opposite axis (ibid). To overcome this kind of impasse in the development of an EAF is to identify constraints as objectives, marked by pre-identified relevant indicators and reference points that mark a target, limit, or threshold (ibid).

Knowledge-based decision support systems have been put forward as an important tool for fisheries management as a way to integrate indicators into a coherent evaluation framework (see Jarre et al 2008, Paterson et al 2007, Jarre et al 2006). Central to the implementation of EAF “is the concept that people, in this context those engaged in the fishing industry, do not operate outside of natural systems. If we hope to invoke the wise management of our oceans, the sustainability of people’s livelihoods needs to be considered, along with the broader impact of fisheries management decisions on fishing communities,” (Paterson and Petersen 2010:282). In the EAF literature the three management objectives are treated as separate dimensions (see Garcia et al 2003, FAO 2003, FAO 2005, de Young et al 2008, FAO 2008).

The development of the human dimension in the EAF framework for managing Namibia’s fisheries has been slow to materialise. In 2010, the Benguela Current Commission in collaboration with the UN FAO launched a project to investigate the human dimensions of fisheries management in the southern African region, in South Africa, Namibia, and Angola. One of the key findings of this project was that data on the human dimension in these countries was incomplete and fragmented in scope (Paterson et al 2015). In Namibia, where the focus is on large scale fisheries, data collection by the Ministry of Fisheries has been largely focused on macroeconomics and rights allocations with some social and economic data being collected through the national census, the municipalities of Walvis Bay and Lüderitz, and local NGOs (ibid). Although Namibia’s fisheries policies have been recognised globally for being both scientific and socially sensitive in their drafting, the current ecological, economic, and social realities in Namibia reflect much more uncertain and unequal conditions.

One of the key reasons an EAF has been slow to materialise is that traditional fisheries

management logic assumes that the productivity of fish populations is largely independent of the physical environment and social-ecological changes (Paterson et al 2014). In the old paradigm of single species stock assessment for fisheries management, fisheries science assumes that the recruitment of new fish can be predicted based on the size of the adult population and that the size of a fish population can be manipulated through fishing pressure, such as putting restrictions on net size (Paterson et al 2015). This type of logic results in a legacy of fisheries management guided by the scientific advice of the stock assessment. Management has thus focused on the regulation of fishing pressure (such as the number of boats, size of fishing nets) and the determination of the TAC (Pauly et al 2002, Bavington 2009). In South Africa's sardine fishery, which was long thought to be a success, is now at its lowest catch records since 1989. Both examples show how management can be complicit in the decline, and even collapse of a fishery.

At present, the principles and concepts of an EAF in the Benguela region are becoming more commonplace, but are far from being implemented. Especially the development of human dimension indicators is still in an early phase. Objectives and indicators for human wellbeing have been developed for specific industrial fisheries in South Africa (Jayiya et al 2008, Paterson et al 2010) and the Benguela Current region (Paterson and Petersen 2010). Because the development of the human dimension into an indicator framework is still in such an early phase, the management plan for Namibia remains vague with regards to indicators for human wellbeing. The objectives of economic efficiency and benefits for Namibians are made clear in the management plan but it is unclear how human wellbeing might be measured with regards to these objectives. In other words, the concept of wellbeing that began to materialise in the 1990s as established by the UN FAO proposed indicator framework for human wellbeing within the EAF management plan (MFMR 2012, FAO 2003) yet the usability within the local context of Namibia's hake fishery is yet to be determined. In essence, the UN FAO espouses the EAF model for fisheries management theoretically, but real-life application is still very much in progress. Again, part of the challenge is to develop the indicator frameworks with the intent to measure and track the progress of implementation with the use of decision-support tools and numerical modelling technologies.

Today, fisheries management in Namibia, in their efforts to implement an EAF in Namibia as part of the development agenda of the FAO, relies on the indicator framework to establish whether the management objectives are being achieved. The production of *measurable* objectives and indicators is an important step towards the development of computerised decision support models (virtual tracking tools) for EAF. The computer model can only produce

information if measurable indicators and thresholds are defined. There has been only one attempt to integrate the human dimension into a computer model in Namibia, through the use of a knowledge-based decision support tool (cf. Paterson et al 2015), with the aim to guide managers in situations that are notably uncertain (Paterson et al 2007).

In 2013 a group of Danish fisheries scientists came to Walvis Bay to present a new kind of stock assessment model to interested industry folks and researchers such as myself and Dr. Paterson. As mentioned earlier, there is currently only one stock assessment model for work on the Namibian hakes. The presentation was to introduce a completely new way of stock assessment modelling that these colleagues had been developing in Denmark. The quote from the Danish modeller at the opening of the chapter that “the stock assessment model is a forecast, and a better model depends on more accurate assessments. The model extracts data for knowing and no model is better than the data you put in. While the fisheries management plan is the result of a political process, the stock assessment processes are purely scientific, meaning they are outside of the domain of politics,” is attributed to Mr. Jensen, a statistician who has been developing this new stock assessment model. His comment about the stock assessment model being outside the domain of politics reflects a certain way of thinking about the formalisation of data through the language of mathematics as preceding any form of political thought. This statement came after a question regarding the political nature of the TAC in Namibia, a significant number that tells industry how much fish they will be allowed to catch that year and as just discussed, the site where the economics of the fishery confront the biophysical components of ecosystems modelling in how the fishery is managed and the quotas allocated.

The TAC is a function of the MSY (maximum sustainable yield, currently estimated between 230 000 – 280 000 tonnes) and the base case (virgin biomass) whereby the TAC cannot increase or decrease more than 10% in any year in order to prioritise stock recovery (Kirchner 2010). The logic here is strictly biophysical; however, the consequences are not. The logics of modelling practices (stock assessment, ecosystems, and management) show how multiple models operate in overlapping areas but with varying degrees of authority and with different sets of expectations. The relationship between the stock assessment model and the TAC is reflected in how the stock is (re)assessed each year with new data input into the same model to produce a specific outcome (TAC) that is then recommended to the minister’s advisory board. Ultimately, the minister has full discretion when it comes to setting the TAC for each year.

Mr. Jensen’s lack of interest in discussing the political effects that the new modelling technique would have on the industry hinges on his claim that his work is to develop a model

that is unbiased. To further his point, he stated that to postulate on the political implications could bias the model, and that he did not want to know about the political climate as it might influence his role as the modeller. The context here is extremely important. What he is effectively saying is that by omitting certain claims and expectations in developing the model, the model can remain in the objective space of mathematics. However, the stock assessment model does operate with political and social implications and to ignore socio-political parameters implicitly denies the interconnectedness of the fishery and the role of the stock assessment model in times of slow stock recovery and increased economic and social crises.

The presentation demonstrated a clear indication of how the stock assessment model, as objectivist science divorced from human societal processes, continues to hold much authority within the management of fisheries. The numbers it produces are also deeply embedded in the sets of practices that determine how the fishery operates. This has major implications for the people working in the sector and for the growth of Walvis Bay as a hub in the global food economies. The fisheries sector is the interface of fish, industry, and people as they form particular sets of relations along a spectrum of power and authority. The fisheries sector in Namibia is thus not assembled very well, which the claims made by Mr. Jensen attest to. Knowledge production is a political process, and the three types of models at work in the fisheries context are in reality knotted together rather than operating in separate disciplinary domains.

The stock assessment model remains the basis for decision-making and governance structures in Namibia's hake fishery and is an argument that emerges from the interlinked practices of the three kinds of models in action. An EAF draws from both the ecosystems model that is able to represent the food chains and the potential disruption of fishing effort on the ecosystem and stock assessment model and feeds into the management framework. The methods and data for both the stock assessment and ecosystems model are well tracked and documented. Their establishment within the scientific community and management framework is quite clear. This leaves the human dimension. What is it and how does it relate and inform the other two dimensions?

The visiting Danish modellers were concerned with the numerical representations of hakes as objects to be counted and translated through the technological apparatus of the stock assessment model. Their interests were not in the scope of the human dimension nor the EAF paradigm as such. Rather, their concern was to hone the stock assessment model and push the limits of new ways of doing it. Given the task to include the human dimension into an EAF and the lack of resources available to address such a task, introducing a new stock assessment model

is perhaps an unnecessary move for management. If Namibian fisheries management is to work towards a more holistic approach, the strategies and technologies that become part of the management framework need to be accessible across the three domains. That particular visit illustrates well the problem: that implementing an EAF is very difficult where government scientists and international fisheries researchers, however well-meaning, work in isolated situations. That noted, achieving a different regime of disciplinary interaction is very difficult in the knowledge economy where scientific objectivity, technological efficiency, and economic profitability evolve through exclusions, both material and political, or what Latour calls the three sisters or three conjoined divinities (Latour 2007). The ways in which fisheries models produce information begins with the abstraction of the physical reality into data. For the human dimension, this plays out differently, as the human experience in a place like Walvis Bay cannot be abstracted through the same methods. Part of this comes from the intentions and expectations that underpin the human dimension. In turn, consequences arise in a variety of ways due to the limitations of such practices, and an EAF does attempt to address the different expectations. However, increased ecological and social devastation seen in the everyday lives of people who are living in the marine industrial ecology of Walvis Bay, the focus of Chapter 3, points to a crisis in governance of the economy and the ecology of industrial settlements along the coastline.

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In broad terms, scientific models are both actor and participant in creating realities. Models, statistical and conceptual, are both reasoning devices and technological interventions. Models such as the stock assessment are actors in the sense that they generate certain assumptions and understandings of how to frame phenomena that occur. As participant, the stock assessment model engages with the formal structures of governance to define nature for natural resource extraction. History produces specific conditions in which statistical models operate. There are many different stock assessment and ecosystems models at work all over the world; in Namibia for example, there is currently one stock assessment model for hakes, which even differs regionally as it is different from the stock assessment model for hakes in South Africa. Therefore, it is important to state that the discussion of the models here refers to a particular case of practises that are typical for fisheries management globally but that the actual computer

models themselves are specific for Namibia. They are not even the same across countries in the region.

The current fisheries management framework in Namibia deploys the term human wellbeing as an umbrella term for the social, economic, and political worlds. The expectation is that wellbeing is a category to be measured by quantifiable indicators. The logic here implies that wellbeing exists on a sort of spectrum, where poverty exists at one end and is decidedly un-well or not well and at the other end, in direct opposition, exists wellbeing. Such a dualist conception of wellbeing simplifies wellbeing into "either/or" categories and assumes wellbeing cannot and does not exist in the context of poverty. Wellbeing as a concept emerges from modernist tropes in an age of austerity in which notions of individualism, efficiency, finance and resilience reign supreme. In this way, wellbeing is part of the suite of neoliberal interventions that mark the development agendas for intergovernmental institutions such as the UN FAO, World Bank, and sustainable development goals. Much of the discussion on wellbeing comes from the global development and humanitarian paradigm that argues for sets of practices that cater to markets, technological solutions, and individual efforts for mobility⁷.

The Millennium Ecosystem Assessment was developed in 1998 from meetings held at the World Resources Institute (WRI) in collaboration with the United Nations Environment Programme (UNEP), the World Bank, and the United Nations Development Programme (UNDP) with the main goal to create a new international assessment process for policy-makers. The idea was to establish a framework to meet the needs of policy-makers based on scientific information that links ecosystem change and human wellbeing.⁸ As such, ecosystems are distinguished by a distinct relationship to the wellness of human beings. This idea emerges out of the international intergovernmental framework of development. The executive summary states: "human well-being has several key components: the basic material needs for a good life, freedom and choice, health, good social relations, and personal security. Well-being exists on a continuum with poverty, which has been defined as 'pronounced deprivation in well-being,'" (ibid).

The current debates in fisheries management showcase the challenge to implement an ecosystems approach to fisheries management. Because the objectives of this approach often require conflicting trade-offs and the setting of targets and limits relies on value judgement, the decision-making process itself involves the participation of a select few individuals (Paterson et

⁷ See for example, OECD 'Measuring Well-being for development' <http://www.oecd.org/site/oeecdgfd/>; 'Institute for Development Studies' in the UK <http://www.ids.ac.uk/idsresearch/poverty-inequality-and-wellbeing>; and the United Nations Sustainable Development Goals <http://www.un.org/sustainabledevelopment/blog/2015/09/sustainable-development-goals-explained-good-health-and-well-being/>.

⁸ Available online at: (<http://millenniumassessment.org/>)

al 2007, Prigent et al 2008). Management then, is about people and their role and relationship to fisheries governance, not alongside them or with them, whether they are a factory worker, an industry executive, or a fish harvester.

Currently, the human dimension and as a result, human wellbeing, is framed in the EAF management framework through employment statistics. Job creation serves the management objective that attends to how the fishing industry benefits the lives of Namibians who had previously been excluded from fishing. Job creation is also the fall back justification for the expansion of the sector both economically and ecologically (for instance the opening of the horse mackerel fishery and oyster farming). The management objectives however, result in major contradictions within the system of capitalism that requires the sustained exploitation of labour power coupled with increased pressures on the biophysical environment. The results have the potential to be catastrophic. The assumption is that if people have jobs, they are living well. Employment certainly factors into the material and social world making in the industrial town of Walvis Bay, but it is not a definitive marker for the metaphysical grappling of what it means to live well given the extreme circumstances that exist as part of the everyday experience in Namibia.

In 2012 new fishing rights were issued in the hake sector. The fishing rights are given for seven year periods, so this was the first round of new rights holders since the White Paper was amended in 2004. The hake sector's onshore processing facilities are already much greater than the amount of fish that can be processed each year. However, the application process for fishing rights requires a business plan that must include a plan to address the social and economic mobility for Namibian citizens. Urban poverty and unemployment are categories central to the human dimension, but much of the discussion around the issues links directly back to the business plans generated with the purpose to acquire fishing rights. I heard from a variety of sources that most applications for fishing rights include plans for onshore processing facilities in the business plan to address the unemployment issue. Despite the well-known understanding that there are more than enough processing facilities in relation to how much fish is caught and processed each year, these inclusions in the business plan are reduced to mere lip service. Namibia's industrial hake fishery is part of an underlying logic for fisheries management that assumes a specific relationship between labour, nature, and capital. In a place like Walvis Bay, where the industrialism of the town itself marks its place in the global chain of food supply, commodities, and labour, the urgency to develop practices that foster relationships rather than reduce them is central to the project of fisheries management in the postcolonial moment in Namibia.

Chapter 2

Doing fisheries science in the postcolony: a paradigm shift

“Managing fisheries is hard; it’s like managing a forest, in which the trees are invisible and keep moving around.”

--John Shepherd, earth systems scientist, unpublished lecture at Princeton University, ca. 1978

“It is value that brings universes into being.”

--David Graeber (2013)

The coastline of Namibia stretches 1 500 kilometres from the southern border with South Africa to the northern border with Angola (Kirchner et al 2012). The desert coastline is known for its highly productive ocean water and a combination of persistent equator-ward winds, low water temperatures and abundant plankton blooms that are definitive features of the Benguela system, one of four major eastern boundary upwelling systems (ibid). The Benguela Current is home to a robust concentration of nutrients due to the cold water and the debris that blows into the sea off the sand dunes to form the upwelling current that distinguishes the major upwelling Benguela Current (Roux and Shannon 2004; Hutchings et al 2009). Biodiversity in this area of the ecosystem is minimal, which means that while there isn’t much variability of species and life forms, the system is distinct and important because of its nutrient rich production that provides the basis for the food chain. In essence, the Benguela Current is the base of the food chain and without its nutrient-rich waters; the rest of the ecosystem would be unable to flourish.

This chapter explores the relationship between an EAF, single-species stock assessment, and the creation of value within the scope of resource management. The technicalities of the stock assessment model will be discussed, as well as how that approach still defines fisheries management despite the global shift towards an EAF. The interplay and relationship between the stock assessment model and the management framework demonstrate how the stock assessment model is the only formal input for fisheries management in the context of Namibia’s hake fishery post-independence. To understand the role of the stock assessment model for the hake fishery is to recognise how value is generated and to trace how the stock assessment infiltrates the entire nexus of fisheries management. The notion of value becomes a pivotal concept in the case of Namibian hake, as it is a fundamental management objective.

In June of 2012 I enrolled in a Winter School course hosted by UCT’s Marine Research Institute (MA-RE) and the French Institut de Recherche pour le Développement (IRD) to

acclimate myself with the major threads of scientific modelling that dominate the current paradigm of oceanographic modelling in southern Africa. In the course we were introduced to six different methods of oceanographic modelling, each targeting a different area of ocean productivity⁹. While six methods were presented, I will focus on the use of ECOPATH and ECOSIM, as these methods have been used to model the Namibian marine ecosystem and are relevant to this study.

First in the modelling course was an introduction to numerical oceanographic modelling, which simply put, deals with the physics of the ocean. The physics of the ocean is important to understand in relation to food chains, ocean currents, the impacts for transport/shipping routes, and climate patterns and weather. Oceanographic modelling works at the macro level (whole ocean dynamics and currents) and the technologies involved to gather data range from satellites to gliders to research vessels. Oceanographic modelling is used to simulate the largest possible range of ocean physics and the changes it incurs on the planet.

Then, we had a practical session to work with the modelling software. Next, we were introduced to modelling the biogeochemistry of the ocean, i.e. the changes and interaction of and between chemical, biological, and geographical constituents at different time scales. Biogeochemical modelling is used to understand how anthropogenic impacts and changes in variability in the chemical constituency effect the chemical composition of the ocean. Importantly, modelling these interactions focuses on the changes caused (chemically) by human forces and the effects this has on the microorganisms and ultimately on the equilibrium of the ocean.

A session to learn ICHTHYOP came next, which is a tool designed to study the effects of both the physical and biological factors of ichthyoplankton (fish eggs and larvae) dynamics. It incorporates the most important processes involved in the early stages of fish life: spawning, movement, growth, mortality and recruitment (Lett, Verley et al 2008).

Next, we were introduced to the concept of marine protected areas (MPAs). MPAs are an important component to the EAF framework. MPAs are areas of the ocean where all human activities are prohibited. These are generally areas that have been overfished and the closure of the designated area is meant to allow for recovery of flora and fauna. To model MPAs allows scientists to study and track ecosystem dynamics without the anthropogenic factor. It occurred to me that the concept of MPAs clearly exemplifies the nature as outside of society platform for marine and coastal management, and that this line of thinking is present in areas that are not

⁹ Unless otherwise cited, the following descriptions of the different modelling techniques refer to materials presented during the course. I wish to provide a basic overview of these models for examples of the varying degrees of scale that scientists work within. It also shows just how specific each area of expertise is.

directly related to fisheries but relevant to goals of the preservation and management of coastal areas. MPAs protect a section of the ocean and allow scientists to make observations of organisms and processes without anthropogenic pressure.

The next modelling technique presented was the OSMOSE (tool) and the modelling of fish population dynamics. Fish population dynamics are vital to the stock assessment model and much of the conceptualising of data is similar. Unlike most stock assessment models, the OSMOSE model is a multi-species model meaning it incorporates a variety of fish species and other marine creatures (squid, seals, seabirds). OSMOSE is a sophisticated software package used specifically to model fish population dynamics. In Namibia however, OSMOSE is not used.

Ecosystems' modelling in southern Africa has evolved to contribute to a greater understanding of large marine ecosystems interactions while also providing detailed analysis within the framework of an EAF in the Benguela region. In 1998, the Directorate of Resource Management of the Ministry of Fisheries and Marine Resources activated the 'Ecosystem Analysis Section' with a threefold agenda: first, to study the effects of environmental variability on the living marine resources; second, to explore the potential of biological indicators of changes in the ecosystem; and third, to develop guidelines and provide scientific advice to implement an EAF (Roux & Shannon 2004). As part of the implementation of the Kyoto Conference Plans of Action, funding from the Government of Japan at the end of 1998 helped to initiate the project 'Trophic interactions in the Benguela ecosystem and their implications for multispecies management of fisheries,' in Namibia. The project aimed to construct an improved and updated dynamic ecosystem model of the trophic flows of the northern Benguela, and to facilitate the development and evaluation of multispecies management techniques for Namibia's marine resources (Roux & Shannon 2004). Initial data collection for the project targeted the dietary data from selected predators such as Cape fur seals, shallow water and deep water Cape hake, and other predatory species (*ibid*). In order to balance the ecosystems model, the ECOPATH with ECOSIM modelling approach was used. The general argument was that the structure of existing ECOPATH models of the region (*cf.* Jarre-Teichmann *et al* 1998; Shannon and Jarre-Teichmann 1999) should be modified in order to tailor the model to the fishing scenarios to be tested (Roux & Shannon 2004). The result was an updated ECOPATH model that described the trophic flows in the northern Benguela in the late 1990s. The model has since been further updated and modified (*cf.* Moloney and Jarre 2003).

ECOPATH models are used to model the Northern Benguela, providing a static, mass-balanced snapshot of the system. ECOPATH relies on two main equations, bio-energetic

balance and ecosystem balance (Shannon et al 2004). For example, to model stock dynamics in the southern Benguela, the following equations are used by Shannon et al (2004):

Bio-energetic balance is expressed in the equation:

$$\text{Consumption} = \text{Production} + \text{Non-assimilated food} + \text{Respiration}$$

Ecosystem balance is expressed in the equation:

$$\text{Production} = \text{Predation loss} + \text{Catch} + \text{Other mortality} + \text{Exportation (net migration)} + \text{Biomass accumulation}$$

The following figures help to explain the process of ecosystems modelling in the context of the Benguela Current ecosystem (Fig. 1), which relies on analysis of the food web (Fig. 2)¹⁰.

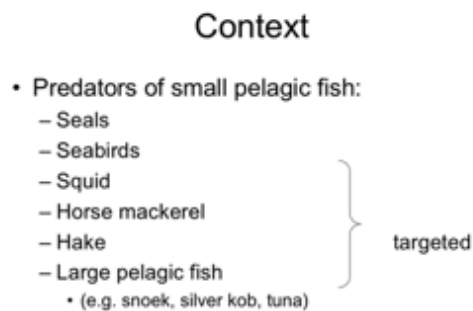


Fig. 1

¹⁰ These figures are part of a group presentation for the certificate of completion of the E2E Modelling Course. The presentation was conducted by K. Draper, J. Maggs, and M. Wilhelm and the figures presented are credited to these authors.

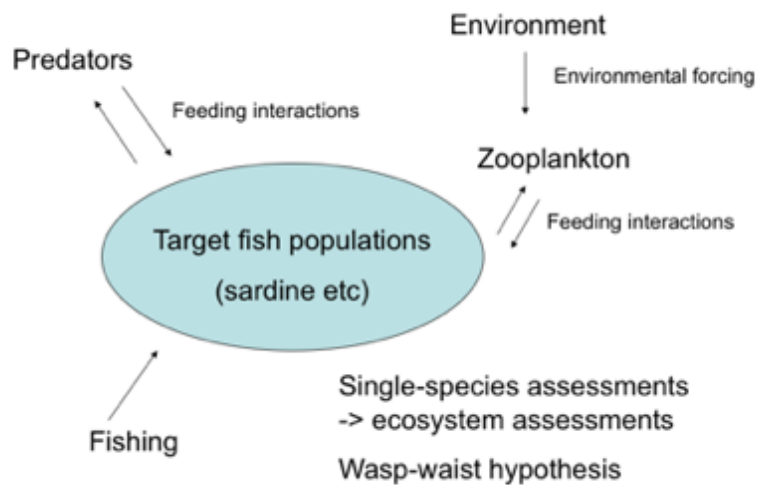


Fig. 2

The ECOPATH model is useful in the Namibian context because dynamic simulations of the possible ecosystem effects of altered fishing strategies can be explored with this particular suite of modelling technologies (Roux & Shannon 2004). ECOPATH is an important tool, particularly through the lens of an EAF because it helps to model ecosystem dynamics based on food web interactions between the various organisms in the sea. To be able to model these interactions is important for an EAF because it provides context that extends beyond the accounting of fish biomass that is at the heart of the stock assessment model. In addition, ecosystems models are an important piece of the puzzle as it is precisely these trophic interactions that sustain the nutrient rich upwelling current and are central to predicting the changes in population of the targeted fish (in this case, hake).

Sailing with the RV Mirabilis

The work of marine scientists and ecosystems modellers is essential for providing the ecosystems context for the entire fisheries sector. The work of the scientists, who are government scientists, surveys the ocean at different intervals to test for the signs of a healthy ecosystem, one that shows the nutrients, equilibrium, and fluidity of a functioning microbial seascape (Roux & Shannon 2004; Shannon et al 2004). In March 2013 I joined an oceanographic research survey trip to observe the ocean scientists at work on the research vessel. Even though they were not working specifically in the hake sector, their work was very much a part of establishing information about the health of the ocean, the abundance of nutrients for the food webs, and in

tracking changes in the ocean that stem from anthropogenic forces such as fishing. Drawing from my experiences on the research vessel and on the fishing vessels, I locate the stock assessment model, the ecosystems model, and the managerial ecosystems approach to fisheries management within the technoscientific realm of computer models for management and ultimately political decision-making.

The RV *Mirabilis* is a shiny new research vessel sponsored by the Finnish government. The oceanographic modelling surveys are conducted bi-monthly throughout the year. In March of 2013, I joined the team of oceanographic scientists based at the Ministry of Fisheries and Marine Science on the bi-monthly research cruise. Being on the research vessel was already a stark contrast to my experience on the hake trawler vessels I had sailed with in 2010 when I had pursued research for my Master's dissertation (Draper 2011). The fishing vessels are chaotic, loud, dirty, and cramped. Being on the *Mirabilis* felt like a luxury cruise, with state of the art equipment in the medical room, in the laboratories on board, and even in the cabins that had brand new bunks, fresh linens, and clean toilets in each cabin. I could shower if I wanted, something I didn't dare do on the fishing vessels, not least for the fear I would come out dirtier than going in, as well as the worry about privacy on a boat full of men. On the *Mirabilis*, the cook, Martha, happily offered to cook eggs to order in the morning where we would gather in the ample mess hall space. After filling ourselves with our breakfast of choice the scientists moved about their business with a smooth routine. The *Mirabilis* was expertly organised. Everything had a place, there was a protocol for how each procedure was carried out, and given that these surveys are a regular part of their job, the atmosphere was very casual yet methodical. Everyone knew their role, there was an air of routine and particularity. In a way it was comforting, in the sense that the stakes were much different than those that drove the fishing vessel.

On both the research and fishing vessels, data is collected to provide information about the dynamics of the ocean, such as in the oceanographic modelling course I took. From my experiences on the research vessel and the fishing vessels, I observed a similar way in which data is collected, even though there were different technological devices utilised. For example, there is a similar precision in the geographical location of each trawl net that is cast by the fishermen, and in the precision of each drop of the CTD device on the research vessel. The CTD is a device used to take water samples that test for conductivity, temperature, and depth at different levels in the water column. To make comparisons about data collection processes on the research vessel and the fishing vessels, illustrates the context in which computer models in action correspond to the EAF management framework.

Richard, one of the scientists who specialises in phytoplankton dynamics, very quickly took an interest in my participation on the research cruise and invited me to sit with him in the lab on-board while he explained his role in data collection and analysis. He explained that the CTD device's main function is to take water samples at strategic intervals in the water column (depth) and then detect how the conductivity and temperature changes in relation to the change in depth. Conductivity means how well a solution conducts electricity and is directly related to salinity. In sea water, salinity is the concentration of salt and other inorganic compounds. For the ocean scientists, salinity is one of the most basic forms of data collected and it is combined with temperature data to determine seawater density which is crucial to understanding major ocean currents.¹¹

The CTD looks like a large, round metal frame that aluminium bottles are slotted into. The bottles look a bit like oxygen tank bottles but slightly thinner and shorter. Each bottle can be set to collect a water sample at a specific interval, which means with each drop of the CTD, all of the scientists who need samples will be able to specify at which depth the CTD can collect water samples for them. Two women scientists, Susie and Selma, were the ocean chemists on the *Mirabilis*, so they tested water for salinity, chlorophyll, nitrates, oxygen, and sulfates.

Richard's specialisation was in phytoplankton, therefore he took his water sample and then looked at even smaller samples, essentially drops of ocean water, on a slide under a microscope. He allowed me to look as well, and he would count the microorganisms that showed up in the sample and then run them through a cumulative database. The microorganisms, the plankton and phytoplankton, are the life source of a nutrient rich ecosystem, the foundation of the food chain. The presence of these microorganisms indicates the health of the ecosystem and the forces of the ocean current (the Benguela Current). The sea along the coast of Walvis Bay often has a green tinge to it, almost frothy, that can be odd looking to a first time observer. However, the green tinge comes from the presence of microorganisms, in other words, nutrients, that makes the Benguela distinct as a nutrient-rich upwelling system.

The experience on the *Mirabilis* was quite futuristic, with the strange looking devices and the laboratory floating along in the vastness of the open ocean. As Latour had followed soil scientists in the Amazon in order to understand the practises of science by following and detailing every moment through which observations were transformed into data (1999), I was on the *Mirabilis* to follow the scientific practices of collecting sea water data in order to understand the production of certainty for oceanographic modelling. The production of certainty with regards to the stability of the ocean is the result of multi-disciplinary interventions drawing from

¹¹ Unless otherwise cited, the descriptions here are from my field notes during the research cruise.

chemistry, biology, and physics, along with specific technologies (CTD, microscopes, vessel), that allow seawater samples to become the foundation for what the language of management and governance calls ecological wellbeing.

Anthropologist Stefan Helmreich's monograph *Alien Ocean: Anthropological Voyages in Microbial Seas* also addresses the collection of microorganisms alongside marine biologists and their transformation into political entities within certain institutions. His work explores the ways in which the boundaries of the sea are imagined in the sciences, and contribute to the ways in which the ocean and what it contains are sites of great uncertainty as well as become part of knowledge frameworks for establishing policy interventions. In other words, Helmreich focuses on the spaces that are usually out of sight and reach: the sub-visible world, the deep sea, and areas outside of national sovereignties. His text asks how to represent these realms, and how to imagine human presence as constantly negotiating these realms. The task of building the sub-visible worlds as a representation in the visible world is crucial as part of the sets of practices that generates projections about the longevity of fishing in Namibia's waters.

For the scientists on-board the *Mirabilis*, the fluid seawater becomes concrete scientific data through the practices that generate a scientific reality from the physical sample. For Helmreich the ocean as a fluid landscape makes landfall in an entirely different form than from its collection point. The marine research voyages that both Helmreich and I participated in, liken to Latour's following of the soil scientists in the Amazon, and are an important exercise in the making of data, inputs, and certainty that are the basis for the computerisation of ocean data into the ecosystems model.

A study such as this that attempts to understand the practices of scientific modelling and ultimately asks about the feasibility to include humans into a conceptual model. The conceptual model utilises computer models for the majority of decision-making processes. How the sets of scientific practices generate different forms of data within spaces of abstracted phenomena that are mediated by technological devices forms a reality, or a representation of reality that comes to be ordered through the same mechanisms that generate scientific certainty. In other words, the practices of science, in the laboratory, generate forms of data that are embedded in the very truth claims they are creating through the practices that assume a certain reality as such. For Helmreich and his study of microorganisms and life in the deep ocean, and the scientists working on the *Mirabilis*, what emerges from the structures of scientific enquiry is a multi-species world in which the production of knowledge about nature is one of history and sets of practices that are part of the processes of scientific indexing.

To treat the ocean as the object of study and the data collection process as the methods in which to understand it as separate, is to disregard the relationship between scientific practices as part of the making of nature. For instance, the microorganisms that I viewed under the microscope looked like floating blobs of material. I knew that phytoplankton is important for understanding the health of the ocean as these organisms are the base of the food chain, but their appearance underneath the microscope to me, when I had no training in how to evaluate or attribute meaning to any aspect of the organism, was not more than to recognise its existence. For Richard, phytoplankton takes on a much more detailed meaning and when he looked under the microscope, he knew exactly what he was looking for and why. He was looking for abundance, shape, and pigment, all of which carry certain thresholds for which to make assumptions about phytoplankton production in an upwelling system. Criteria, like abundance, shape, and pigment are scientific constructs. The thresholds that determine what is abundant (or not abundant) are scientifically imposed on the organism. The scientific constructs then, are the mechanics for the reworking of the ocean into data.

As the *Mirabilis* zigzagged along the 24th and 25th parallel, there were two teams of four scientists that would alternate eight hour shifts day and night, working around the clock to collect the sea samples and depending on their role, analyse them straight away. I began to see the research vessel as a microcosm, as an extension of the sea, the scaling in, level by level. From the zoning in of the ocean, vast as it is, through a sample of the water at different transects and at different depths, a sort of triangulation occurs in which the multi-dimensional space of the ocean is reworked into a figurative form through the practices of the scientists. These processes in turn, generate data sets that feed directly into the oceanographic model that represents the dynamics of the ocean in this particular area of the ocean in which the production of nutrients contributes to the overall health of the ocean, and affects all of the species which rely on robust ocean productivity.

The success of a computer model to produce specific information depends on the quality of data that feeds into it. Data is perhaps the most crucial part to the modelling process and something that was echoed to me during interviews with the stock assessment scientists in Namibia. When sailing on the RV *Mirabilis*, I was able to connect the theoretical underpinnings of the modelling course with the real life application and data collection out at sea. The pieces, thus begin to coalesce. Life forms become reworked into data through a process that imposes scientific constructs onto the organism, which is then processed in the model and then output back into the world where it again, affects life forms. The outputs of the computer models have real political power and affect many people, organisms, and ecosystems. The models used within

the scope of fisheries management rely on information collected from a range of sources such as the physical ocean, previous research surveys, and qualitative research (although this area is severely underrepresented), and within this context the managerial framework grapples with the particularity of the Benguela Current's expansive flux of interactions and the concrete necessity to manage fishing activity and the consequences this has for human-nature interactions. Given the background to the ecosystems models to provide context for the stock assessment model, the next section examines the stock assessment model in the Namibian hake fishery.

Counting fish

In 1990 at independence, the fish stocks off the coast of Namibia were severely depleted and the newly elected government was tasked with establishing scientific infrastructural support to address recovery. The SWAPO government sought assistance from the scientific community in South Africa to develop a fisheries science protocol under which to guide the newly formed Ministry of Fisheries and the National Marine Research Centre. One individual, Dr. Carola Kirchner, was with the Ministry of Fisheries and Marine Resources from the beginning, acting in various roles of research scientist for fisheries management until her departure in 2012.

Dr. Kirchner has been a primary actor in the history of fisheries science and management in Namibia. Dr. Kirchner joined the Ministry of Fisheries as a fisheries scientist in 1994, only a year after the institute had been established. She would fill the role as Namibia's stock assessment scientist until her departure in 2012 when she took a post as Secretariat of the Pacific Community in the field of stock assessment and modelling in Nouméa, New Caledonia in the south Pacific. Dr. Kirchner's work as a stock assessment scientist with the Ministry of Fisheries provides a unique look into the development and implementation of state fisheries science post-independence as she was involved as a scientist from the beginning. Her involvement began at the inception of the Ministry of Fisheries, and her work has taken her out to sea as a researcher, into the laboratory as a computer modeller, and as a government employee. Our discussions began with a conversation on her career history, as a way to begin thinking alongside the development of the stock assessment model in Namibia and more broadly the Ministry of Fisheries as the governance structures for natural resource management. Her insights begin to show the frictions that emerge within the development of fish as national resource and the role of government to manage the resources. I was interested in her thoughts on how the role of science, the models for fisheries science, and the outputs of the computer models relate to the notion of the human dimension.

When fisheries management began in Namibia it was largely based on UN FAO training. The scientists were taught how to measure fish, determine length frequencies, and how to turn length frequencies into age frequencies. The scientists were taught the importance of age frequency, concepts such as natural and fishing mortality, and the critical elements necessary to determine the abundance and health of a stock. In essence, these are the very basics of biological modelling¹². Once the basic concepts and skills had been mastered, the scientists were taught statistics and how to develop the survey designs, and the nascent fisheries science group was born. Since there was very little infrastructure during the colonial period for fisheries science and management, these scientists were tasked with learning about ocean dynamics and fish behaviour, establishing the determining factors of stock recovery in Namibia and developing a management framework that relies on the stock assessment model in generating the TAC number. On the topic of the stock assessment model in action, Dr. Kirchner remarks that in the beginning,

the skills taught weren't even close to what you need to know really, to run the models. Now, I just do normal assessments with predictions. We set a TAC but there is a certain risk to that TAC. The minister can decide he will take a higher risk, and give a higher TAC, or a lower risk. That's his decision at the end. There was a time when we had a more complicated system, but it's actually pretty straight forward, what we do, and we don't change it from year to year. If the model were to change from year to year, the Ministry doesn't like it, because then things are not understood anymore. If you keep it the same, the new data gets put in, and you reassess the stock. We work with adaptive management as well and you can see whether your model is actually working or not because you are able to see how the stock reacts to the advice that you have given, in terms of how much is actually caught.¹³

Dr. Kirchner alludes to the complex network of fisheries management in which stock assessment modelling still forms the basis for industry knowledge and participation, and the government arm of the Ministry of Fisheries. Much of her experience is tied to the politics around fishing quotas and who is given rights to fish, which is directly linked to the goals of the stock assessment model for management purposes, and also as pre-configured within the TAC itself. In other words, the TAC is a politicised knowledge object as well as an indicator to the

¹² Interview with Dr. Carola Kirchner 13 November 2012, Swakopmund.

¹³ Interview with Dr. Carola Kirchner 13 November 2012, Swakopmund.

modeller that the computer model is correct, or at least outputting values that are in line with industry objectives. The fishers are also implicit in corroborating these (re)presentations of stocks that together form the knotty realm in which these relationships are assembled, within the framework of an EAF.

In my conversations with Mr. Kathena and Mr. Kainge (hake biologists), they spoke about their role in data capturing and synthesising, building on the existing data and outcomes for the current year but not changing their methods. The accounts from these two scientists revealed a formulaic nature of the assessment, and the entry point to incorporate the human dimension is opaque within the scope of frameworks for management, it becomes clear why the challenge to bring the human dimension into these practices is so difficult.

Many challenges were discussed in relation to the usability of the stock assessment model, the data collection processes, and the legacy of stock assessment science in the management of the hake fishery today. It became clear through these conversations that the management framework relies significantly on the stock assessment for decision-making, with increased efforts in predicting the value of the hake biomass for each year. Firstly, stock assessment is a method to account for the amount of the fish in the sea and how much can be caught. Dr. Kirchner's experience, particularly with her MBA thesis, sheds light on one crucial significance of the stock assessment in terms of bio-economic value of the hake fishery. In other words, the stock assessment model is also used to determine resource rents, which are the fishing industry's economic profits.

Resource rents in the hake fishery were the topic of Dr. Kirchner's MBA thesis which she completed in 2010. Her work sought to understand how the hake resource, as a public resource, can generate surplus value from fishing that will accrue to the people as a whole. It is assumed that after profit-to-industry has been netted out, the government steps in as the distributor of the additional generated income from fishing (Kirchner 2010). The additional income from fishing is assumed to come from the government's taxes and levies scheme on fishing rights, catch landings, and petrol tax. However, the fishing industry does not operate in such straightforward terms nor does it have similar goals to that of the management framework. In essence, management and industry have to work together because international trade and fishing standards require such a relationship. In order to understand their relationship better, the stock assessment must be understood both in its operation and in how it is used in the management framework.

Stock assessments rely on data from a variety of sources. Data comes in the form of catch recordings from commercial fisheries, data collected during the research surveys to

corroborate the catch recordings from commercial data, and data location, size, and abundance collected by the fisheries observers. Part of the stock assessment logic is to make one believe that there is a 'stock' that exists in the ocean that can be counted and assessed. Such an assumption is part of the traditional paradigm of fisheries science that singles out a target species (hake) to determine its biomass (weight). From there, the total biomass is used to determine the maturity cycles of that particular species. Once the maturity cycles were established, the stock assessment model computes how much of that biomass was at an acceptable maturity level for extraction. The maturity levels are used to ensure that there are enough juvenile fish left to continue to grow to maturity so that they can reproduce. The stock assessment model produces the most comprehensive estimate of the state of a fish population as it exists in real time, and to what degree the human pressures of fishing will disrupt the health of that stock. The stock assessment model explicitly considers how the data and catch rules can be input into the computer model to produce information that meets management objectives.

The National Marine Research Centre sits right on the coast in Swakopmund. I first met with stock assessment scientist Mr. Kathena here, along with fisheries scientist Mr. Kainge, who also works with the stock assessment model and specialises in hake biology. The two scientists are in the role of stock assessment modellers in Namibia, which they filled after the departure of Dr. Kirchner in 2012. Barbara is also present for the discussion, and the four of us sit together in Mr. Kathena's second floor office, with his computer humming in the background. I start by asking Mr. Kathena a general question of how the stock assessment model works and he describes the model as an age-based model. An age-based model converts the data from the surveys, log sheets, and commercial observers into age¹⁴. Age refers to the age of the fish, because only fish at a certain maturity should be caught. In theory, to ensure that the younger fish will still have time to grow into mature fish before they are caught, length requirements allow the overall stock to reproduce and recover from the fishing pressures. Therefore, the data required for the stock assessment all relates back to age data.

Mr. Kathena explains that data comes from three main sources: survey data (fish lengths and otoliths); commercial data from the logbooks (number of bins caught and fish lengths), and ageing data (derived from the otoliths) that is established by the hake biologists in the laboratory. Each year (usually in January) a commercial vessel that is owned by one of the Namibian companies is commissioned to the MFMR for a period of several weeks to survey the hake fishing grounds. The industry crew operates the vessel and the MFMR scientists are on board to collect sample catch at age data. Since hake is a bottom dwelling species, trawling is the main

¹⁴ Interview recorded with John Kathena, Paul Kainge, and Barbara Paterson on 8 August 2013

method of fishing that Namibian vessels use to catch hake, which means nets are dragged along the bottom of the ocean and in essence, scoop up everything that comes within the range of the open net. When the survey vessels go out to collect data, they will do a short trawl of about one hour at different transects in the ocean. After each trawl, the scientists on the vessel take size measurements of the fish, group fish into classes according to size and keep track of how many fish are caught for each size class. The total number of fish per size class is called length frequencies.

Data collected from the log sheets adds to the catalogue of information that will feed into the computer model. Each commercial vessel is required to keep log sheets on-board and report the data to MFMR. The log sheets keep record of how many bins of hake (and other species) are caught in each trawl. On board all fishing vessels that go out to sea are fisheries compliance officers who work for the Ministry of Fisheries. The fisheries observers keep record of the sample length frequency of each catch and check that the recording of catches by the skipper on the commercial vessels matches what is observed coming in with each trawl. In theory, there should be 100% observer coverage, i.e. one observer on each vessel.

Age data is a third set of data needed for the stock assessment model. Age data is calculated on land in the laboratory once the length frequency from both the commercial and survey data has been collected.

Notes on ageing

The two main components to determine the age of a hake are the length frequency and the length key. The length frequency refers to a sample measurement of fish caught and the length key is the range of length derived from all the data. Once the length frequency and the length key are established, they are converted into a numerical age by linking the length of the fish to the number of otolith rings counted in the fish. Otoliths are small bones in the skull of the fish that can be seen and counted under a microscope. The basic method for age determination using otoliths consists of reading the bands that form around the core of the sagittal otolith (Wilhelm 2013). The assumption is that one band forms per year (ibid). Hake biologists do all the laboratory work to determine the ageing for each year. Hake reach maturity at three to four years, which hake biology estimates based on the reproductive stages of the fish caught. Maturity is determined by the reproductive stage of a fish, i.e. one that has just laid an egg, or has an egg in the developing stage or one that is about to be released. In terms of the length of the fish, hake biologists look for fish that are at least thirty-six centimetres long, as this is the accepted

length that indicates at least 50% maturity. To be considered fishable, the fish must be at 50% maturity.

Notes on survey data

The annual sample surveys also collect the otoliths (fish samples) used to age the fish in the laboratory once back onshore. Crucial to the ageing process is to collect maturity data and length data. Maturity data refers to how many fish are at which stage of maturity. At the end of a survey, there are approximately 1,000 length frequencies to be converted into age frequency. The main objective of the survey is to collect data on the maturity and abundance of the hake biomass. Fishable biomass is important because that essentially translates to the fish that will be harvested and processed. The surveys are designed to determine the biomass of the hake stock, with the length frequency underpinning the notion of maturity as well as being the tool of measurement. To be clear, biomass is an abstraction of single fish that exist independently in the sea. The transformation of a single fish into the abstract form of biomass occurs in the process of lumping together species based on age and weight, and just as with the size classes a key is used to translate the number of bins into metric tonnes based on an estimate of the weight of one full bin. On wetfish trawl vessels (such as the ones I sailed with and the main fishing vessel for hake currently), there is no sorting or measuring of fish, only the gutting and chopping off the heads of the fish which are then packed onto ice to be sorted at the factory. The length frequency serves as a placer of sorts, since the ageing cannot be done on-board but only at a later stage in the lab. Instead, the scientists collect otoliths from the sample trawls and eventually they will be able to determine the age based on the otoliths and the length frequency. The scientists will sample a percentage of the survey trawl to both measure (for length) and to collect otoliths. Lastly, the scientists will develop an age length key which is a range. For example, for a fish that is between one centimetre and 10 centimetres, the age is approximately one year¹⁵. The scientists thus establish the age and abundance (how many there are) of the entire hake population. From the length frequency, they compute the age for yearly cohorts so that they can know for each year that there are X amount of fish in cohort age group 1, X amount in cohort age group 2, and so on.

Notes on commercial data

¹⁵ Interview recorded with John Kathena, Paul Kainge, and Barbara Paterson on 8 August 2013

Commercial data comes from the information recorded during all trips to sea and is reported for all companies. The fisheries observers on-board assist in the commercial data collection. The fisheries observers ensure that the data that is recorded by the skipper into the log book is true to what the physical catches are by doing visual surveillance of the fish that is landed on the vessel. Fisheries observers do not collect otoliths because they are not trained to do so, but will occasionally measure fish lengths if there seems to be a discrepancy on size. For example, on one fishing trip I was on, the fish that was caught were too small and we had to move fishing grounds. The commercial data also provides the catch per unit effort (CPUE) data, which is calculated from the fish tonnage caught during each trawl. CPUE is a vital piece of the formula for the calculation of biomass. It is the result of the total biomass of fish caught divided by the amount of effort required to harvest the catch. In other words, it can be expressed as the amount of fish caught in kilograms divided by the amount of time spent at sea to catch that amount. CPUE is important for many reasons, but the main one is its role in the calculation of the total biomass of a stock. CPUE is also loaded with assumptions. CPUE is an indirect measure of abundance and the assumption is that if CPUE goes down, abundance goes down; if it stays static then abundance also stays static and fishing can be considered sustainable. This assumption is problematic because CPUE is standardised and assumed to be constant, not taking into account that fishing gear and technology can become more efficient or that fishers get better at finding fish. What this means is that CPUE can remain constant (indicating constant abundance), until it is far too late.

Assessing the stock with a statistical model

The stock assessment model can be run once the age structure indices and CPUE have been standardised. The next step is to look at the biomass. The total biomass of the hake population translates to an estimation of “how much fish is out there at sea,” (Kathena 2013). Essentially determining biomass is an exercise in counting fish, but fish in its abstracted form. The scientists talk quite candidly this way, of the fish out there in the sea and how many there might be. Scientific abstraction is a tactic that normalises the impossible task of actually knowing how many fish there are in the sea. The abstraction occurs when a singular notion of fish is flattened to become part of a total biomass. While it is impossible to conceptualise fish as singular organisms that we can account for, the idea becomes more manageable when they are seen as a mass grouping or that there are many parts to make the whole. Biomass too, is already an abstraction from the single fish out at sea because it assumes there is a fish stock or population,

and that population can be converted into weight or mass. TAC is measured in thousands of tonnes and fisheries management can't count the number of fish that makes up a tonne. The fish are summarised into their weight, and instead of measuring each fish, it is the weight of the biomass that becomes crucial. In this way, fish biomass is more easily accessible, it provides a simpler approach to calculations. And importantly, the fish are abstracted into a metric, ready for commodification. The essence of scientific management is that the living fish are hidden in "biomass." Ultimately, biomass is the estimate of a population of species (or lumping) of fish in the sea. The stock assessment model is able to tell the fishing industry how much of the total population within the given biomass can be fished. The stock assessment model determines which portion of the biomass is at maturity.¹⁶

The databases for the stock assessment model are all interlinked and need to be setup in a way that reflects standard procedure. The scientists' role includes standardising the databases. For example, how they calculate the biomass is standard each year. The figure outputs will vary from year to year, but the calculation is the same. The scientists rely on the scientific community for peer review as well as international standards for stock assessment to ensure their practices are in line with the global standard. It is important for the Ministry of Fisheries to have their stock assessment model and methods validated by the international community. Because fisheries are in such a state of distress worldwide, the management and governance of them tends to be what gains attention in the public scope. It also puts stock assessment and fisheries science under pressure both from an industry perspective as well as from a scientific perspective. Mr. Kathena remarks

there are scholars reviewing our methods and our methods are published in international journals. So when I step out to go on the boat, I know that the methods that we use, to conduct the survey and assess the stock, that it's internationally accepted. Otherwise, it's useless.¹⁷

Mr. Kathena's statement points directly to the influence of the international standard to validate the scientific methods for stock assessment. It also shows how the structures in place adhere to the idea of continuity, premised on the logic of 'this is how it's always been done.' This logic does make sense in terms of tracking the stock assessment over time, but with the expanded management framework wherein the stock assessment should only be one component of the

¹⁶ Interview recorded with John Kathena, Paul Kainge, and Barbara Paterson on 8 August 2013

¹⁷ Interview recorded with John Kathena, Paul Kainge, and Barbara Paterson on 8 August 2013

overall management framework, it is necessary to revisit the model's history and its limitations in the current moment.

The challenge for management is in the deliberate design of an EAF to achieve an acceptable trade-off between conservation of fish populations and harvest thresholds that can be sustained over the long-term, with some flexibility over time. The particular logic that underpins the management framework will be explored in the next section, as I examine the stock assessment model's role within the management framework, under the auspices of an EAF as the definitive management model.

The logic and use of statistical models for fisheries management

The first steps for the newly formed Ministry of Fisheries in the 1990s focused on recovery of the fish populations that had been overfished during the colonial period. The hake fishery in the northern Benguela emerges in the 1950s but only became significant with the arrival of distant-water fleets in 1964. Un-regulated exploitation of the hake resources during this time resulted in the decline of hake populations beyond a sustainable limit (Paterson and Kainge 2014). In the 1970s, catches peaked at over 800 000 tonnes but was followed by a sharp decline (Paterson and Kainge 2014). At independence in 1990, the government drastically reduced the catch limits to 60 000 tonnes in order to allow the stock to recover (Ministry of Fisheries 2004). Dr. Kirchner explains that more than twenty years later in 2010, the hake spawning stock biomass is considered to be at about 80% of the values recorded in 1990 and only 12% of the values recorded in 1964 (Kirchner et al 2012). In other words, the overall biomass of the hake stock (total population of hake in weight) today is not even at what it was at independence, let alone what it was during the peak fishing period of the 1970s.

There appear to be two main logics that underpin the current moment of fisheries management in Namibia. First, that the data input into the stock assessment model is bound by both the legacy of fisheries science in the postcolony and the subjectivities of the modellers to make value decisions. Second, the stock assessment model operates within a space of power and authority that assumes a certain set of outputs for political decision-making. The stock assessment scientists work under a great deal of pressure that stems from industry, government, and the scientific community in order to produce viable, detailed analysis and predictions for the hake fishery. In addition to the scientific pressures to adhere to international standard methods for stock assessment coupled with the pressure from industry from an economic angle, the stock assessment scientists are first and foremost representatives of the government. As such, their

role is to provide information to the Ministry of Fisheries and to fisheries managers, so that consultations can be made with the various stakeholders about why the TAC is set at a certain tonnage. The information thus leads to the quota allocations, total allowable catch numbers that determine how the fishery will be able to operate since the quota allocations are given for each year. The computer model is thus the technological intervention in the form of statistical analysis that mediates the human dimension and the ecological and governance dimensions. The information produced through the computer model directly impacts who gets to fish, how much they get to fish, and for how long they get to fish for that season. If the computer model is accepted as a technological intervention that amplifies the role of stock assessment within an EAF, the next logical question is how a computer model can also serve to amplify the role of the human dimension within an EAF.

In Paul Edwards' book *A Vast Machine: Computer Models, Climate Data and the Politics of Global Warming* (2010), he interrogates the role of models and the issues with the use of 'verification' and 'validation' of models. The challenge is the abundance and scope of information, as seen in the climate data and science, which are used to answer questions related to global governance. He argues that data is made global through three kinds of processes: data models, which are used for measurement to combine information from a variety of sources; simulation models for weather and climate; and reanalysis models, that work to recreate climate history through archival weather data (Edwards 2010).

In a chapter titled "Parametrics and the Limits of Knowledge," Edwards takes on the task of addressing uncertainties within models. In modelling ocean dynamics, as I learnt in setting up a basic model during the oceanographic modelling course I participated in, one is working with specified values, as part of the sets of instructions of code that the modeller designates and reflects the attributes of the system, in this case the ocean dynamics. In the case of the stock assessment model, the data is directly linked to the values of the statistical analysis such as mean or variance. In order to provide the best advice, the scientists must begin with accurate data. However, at this point, the scientists are already working in a space of assumptions, such as with the problematic assumptions of CPUE (Paterson and Kainge 2014), and standards with regards to the values generated by the statistical component of the model as well as in the model's role in confirming the assumed interactions of the system. The age length key is based on estimates and assumptions, the measuring of catches based on how many bins they fill translates into biomass, and therefore each of these processes relies on preconditioned assumptions. The modeller is tasked with the role of working with the data, the computer model, and the results in such a way that the value judgements of determining what is included and what

is left out. All of these involve judgement calls, and falling back on standard practices. Value judgements are made to ensure that the best possible data is included, and these judgements in essence determine what to include and what to leave out. We can assume judgements will be made by the scientist/modeller every year when the stock assessment is done. Each year, the scientists have to develop the unit of scale for the model, which specifically compares individual fish to biomass and works out how to represent the trophic interactions as energy transfer. They also determine the level of precision to execute the model proficiently. In essence, the scientist must account for what limits will be set for the statistical analysis that determines what values are passed from one set of instructions to another.

The global standard for stock assessment science also serves as a way to ensure that methods and results are valid as the international scientific community can verify them, as mentioned by Mr. Kathena previously. Scientific practices and scientists evolve as they go, in constant negotiation with the historical legacy of scientific practices. In Namibia, much of the attention to global standards is a result of both the development trajectory of the country within the framework of the UN, IMF, and World Bank as well as from the line of positivist thought that relies on processes of reduction. Such thinking derives from the idea that society should be structured along a rational scientific line to produce certain types of behaviour central to human progress while also integrating nature within a capitalist framework. Such a trajectory marries knowledge and expertise (from leading countries) with development models, which further implicates the relationship between science, society, and politics. This is particularly evident in the Namibian case. It is also clear how carefully these relationships are both fostered and curated within the scope of government science. For example, the scientists learn the language of the stock assessment model and participate in the data collection. However, they are also quite removed from the political spaces in which their results become very active. They are not part of the evaluation process of the models that they engage with but rather fulfil a government role to produce information regarding the health of the hake stocks, which will be used in setting the TAC. Ultimately the goal is to maximise on profit, which can only be calculated once the TAC has been set. To follow the flow of information that stems from the stock assessment model as it enters into the public domain most clearly elucidates the problem of expanding the management framework beyond the stock assessment and why there has not been much traction to get there.

Fisheries science operates as sets of practices that contribute to the decision-making politics of resource management in Namibia. Lewis Gordon notes that science “is more at home with rationality than it is with reason,” which points to modern science’s allegiance to the assumed truths of laws of nature (Gordon 2011:97). What occurs is a sustained effort to colonise reason itself, through the production of dualist categories. In the fisheries management framework this manifests in the efforts to manage fisheries from an ecosystems approach with the intention of a more holistic and nuanced scope. As such, stock assessment is deeply entrenched in a system of authority, control, and over simplifications. In the paradigm shift to overcome the limitations of the stock assessment with regards to broader ecosystems interactions and considerations, EAF is held by the international fisheries community to be one of the most effective possible interventions. However, decline in fish stocks worldwide and a global crisis of capitalism has resulted in the tendency toward market-based solutions that are rooted in quick technological fixes and free market ideals. Such approaches are insufficient in maintaining the holistic, relational, and long term strategies that an EAF advocates for. Value and value-making becomes a key turn in the way that the fishery is conceptualised. For anthropology, as David Graeber has written extensively on (2001, 2013), value has come to be many things over the course of history yet the feeling remains that there exists out there something that can be called value or values, and that all human beings organise in some sense, around the pursuit of them (Graeber 2013). For Namibia’s hake fishery, value has become synonymous with monetary value; something has value because it is profitable.

The relationship between capitalism and natural resource management rests on the idea that nature exists outside of society and can be commoditised in global markets, following a line of thought that subsumes nature to markets. Such a framing of nature allows for the continued separation of people from their environments and their work, as it inserts systems of exchange into ecologies and provides an institutionalised framework for the messy relationships that underpin extractive industries. These separations of society and ecology mark the social texture of Walvis Bay in its moment of environmental crisis and increased social inequalities.

Part of the problem with an ecosystems approach to fisheries management is its continued reliance upon the stock assessment model. Whilst the framework calls for an expanded approach that takes into account many vital features of the industry (i.e. jobs, local fish consumption, benefits for Namibians), the sets of practices that garner the ultimate power and authority remain within the scope of stock assessment science. In other words, stock assessment

continues to be the driving force for management in that it is the deterministic tool for setting the TAC. As discussed in the previous two chapters, the underlying logic of fisheries management relies on the output of the stock assessment model, a numerical valuation of the hake biomass and subsequent fishing activities (both sea and land based operations) which generate profit.

The stock assessment and statistical modelling of fish stocks serve to improve decision-making strategies with respect to the scientific and economic stability of the fishery. The challenges are considerable, and it is important to remember that an EAF in Namibia has not yet been implemented. With regards to management objectives, fisheries managers have to figure out a way to develop management strategies that can account for the three different dimensions that make up the EAF framework: ecological wellbeing, human wellbeing, and governance. In expanding the stock management paradigm, managers are now tasked with accounting for a growing number of objectives and increased pressure on the scientific processes that ground the management goals. So far, the strategy has been to recognise that the commercial fishery is multi-layered and dynamic and includes people, politics, and nature, but the only knowledge input into current fisheries management is the stock assessment.

The challenge with the expansion of the management paradigm in theory means that there are now multiple statistical models as well as the conceptual model of an EAF that must work within the same technoscientific space. Prior to the paradigm shift to an EAF, the stock assessment model's outputs were the basis for management. The stock assessment model cannot be the same computer model that addresses the social and governance component. The computer model for stock assessment is specifically designed to work in the language of fisheries science which is why there is emphasis to implement an EAF that can fulfil the role to strategically incorporate the social and governance components into a computer model. It is important to remember that an EAF has not yet been implemented so these questions circulate in a largely speculative realm. The questions that arise are important as they challenge why the implementation of an EAF has been met with so many challenges. In the difficulties to implement an EAF, one of the core questions is whether an EAF can achieve its aims though the objectives remain stuck in the three separate dimensions. A modernist approach to fisheries management can neatly separate the different dimensions of human and ecological wellbeing and governance that perpetuates conflicts in how scientific abstractions generate specific information that can lead to frictions in the broader landscape of how to do fisheries science in the postcolony within the framework of an EAF.

The stock assessment model is crucial to management because it is used to consider scientific evidence alongside market-based strategies and economic factors. Not only is stock assessment a determining feature of the health of the ecosystem and the hake stocks, but also frames the economic viability of the fishery. The logic is to establish a trajectory in which the fishing industry can work across a range of possible future conditions for maximum economic benefits. The stock assessment model provides information to decision-makers about the maximum amount of fish that can be extracted from the sea and it sets a threshold in that regard. The relationship between the biological component and the economic component of fisheries science was the focus of the MBA dissertation developed by Dr. Kirchner (2010), in which she shows how management objectives can be manipulated to justify an increase in the TAC for economic purposes. Fisheries science thus becomes the site at which policy and politics, ecology and biology, and economics meet. For example, in 1990 it was estimated that Namibia lost 50% of the economic returns from fishing to foreign fishing in the area (Sumaila and Vasconcellos 2000). Due to decades of overfishing with little regulation by foreign fleets, at least 50% of potential profits and any subsequent tax levies, were being diverted abroad, with little concern for the sustainability of the fisheries. Thus, at independence Namibia inherited altered fishing grounds and an ecosystem that was functioning well below its productive capacity (Roux and Shannon 2004), a situation that exemplifies the difficulties faced by many African countries after decades of extractive industries set up by colonials. The collapse of the small pelagic fishery also contributed to the ecosystem flux as one of the main food sources within the food chain was now depleted, which is one of the key reasons for the altered ecosystem structure and the shift in functions. The result was slow recovery of the larger species populations and a disruption in the availability of food sources within the food chain.

For nations that rely on their fisheries for economic reasons, their efforts to manage their fisheries focus on the maximisation of resource rents (industrial profits) at a local level (Kirchner and Leiman 2014). However, despite the fact that most fisheries management regimes have moved from open-access policies to a regime of effort control that is intended to reduce economic inefficiencies and to increase the overall profitability of the industry, these forms of control proved inefficient due to the fault line between individually rational behaviour and the ideal behaviour that would maximise collective profits. As Richard Cowling argues, “as logical extensions of the Homo economicus mindset, markets are also assumed to behave rationally, ever adjusting to financial perturbations in a way that sustains economic growth,” (Cowling

2014:148). If the markets are left to their own devices, everyone will benefit. Cowling goes on to state, “of course, this is nonsense. There is no such beast as *H. economicus*, markets can collapse spectacularly and economic growth that fails to consider environmental externalities will surely bring the World to its knees,” (Cowling 2014:148). The thrust of Cowling’s argument, as an ecologist, is that in the neoliberal era, humans and human activities are the unambiguous lords over nature and it is human behaviour, based on individual choices, that determines the fate of ecosystems (ibid). In the fisheries context this speaks to what Bavington describes as “managing to endanger”, in which management relies on the production of a certain kind of knowledge that can effectively be used to solve the urgent economic and political problems associated with fish landings, fluctuations, and global market instabilities (Bavington 2009:102). Take the example of the privatisation of the resource through the introduction of individual quotas. In theory, allocating property rights to the resource in the form of individual quotas (IQs) would spread out fishing over a long-term period and would also ensure sustainability of the resource (ibid). The goal would be to simultaneously achieve sustainability and rent maximisation if individual quotas are in the hands of the fishers best able to profit from them (ibid). In recent years there has been a turn to the idea of *Homo economicus* as a rationalisation for a kind of behavioural economics that renders humans as being able to make infinite rational decisions. However, this line of thinking tends also to allow for the sustained exclusion of human beings from the market and indeed, as part of the market itself.

Capitalism produces a particular accounting for nature that is economic, and since there are multiple versions of nature it is difficult to hold to the idea of one nature, especially when individuals are granted accommodations based on political and social elitism. In the case of the Namibian hake fishery, there are two explicit versions of nature: one economic and one ecological. Perhaps there is also a third version of nature in this case, that of statistical nature that is represented by the stock assessment itself. In addition, in Namibia where much of the economic incentives arise under the umbrella of job creation and employment, the goals and objectives become much less clear. Accurate determination of the TAC thus becomes crucial as it sets the tonnage in each individual quota. In practice, this operates as a system bound by a set of predetermined rules between industry, scientists, and the state, based on the statistical catch at age model of the fishery that can be updated regularly to provide stock estimates (Kirchner and Leiman 2014). The stock assessment model should be regularly improved, and critical to the operation of the process is a commitment by industry and the state to follow its prescriptions (ibid). In addition, the logic of management must address how the fishing sector can best redress the injustices of the colonial past for today’s population of Namibian citizens. The question is

whether it is possible for Namibia to decolonise its fishing industries using the conceptual tools of Homo economicus, which assumes a figurative human with infinite abilities to make rational decisions.

I attended many meetings that brought together a variety of stakeholders, and while the meetings were almost always held in good faith, the discussion for action with regards to human wellbeing were never explicitly discussed. The outcome of such meetings focus on the TAC and quota allocations as the main concerns for the parties present are how they can acquire more quota that in turn allows them to fish more and results in more profits. The fishing industry in Namibia is indeed a functional corporate machine. A capitalist logic has thus superseded the scientific logic in terms of the management framework. In this way, capitalist logic operates as a blinder where one is unable to see the other kinds of considerations such as human wellbeing. Therefore, wellbeing bears the brunt of monetarised nature, implicit in the project of neoliberal actions marked by the enclosure and privatisation of public resources. In these management meetings, what became clear was how monetarised nature becomes a problem of both paradigm and approach, and that in order for human wellbeing to extend beyond Homo economicus, a different model of personhood and human praxis (to borrow from Sylvia Wynter) is needed to open the issues up differently. As Katherine McKittrick (a scholar of Wynter) states, “being human is a praxis of humanness that does not swell on the static empiricism of the unfittest and downtrodden and situate the most marginalized within the incarcerated colonial categorization of oppression; being human as praxis is, to borrow from Maturana and Varela, ‘the realization of the living,’” (McKittrick 2015:3-4). It is clear that the liberation struggle in Namibia has been epistemologically co-opted and globally reincorporated into the Western world system, a system that is now in its postcolonial, post-apartheid yet still (neo)liberal configuration.

Within a capitalist logic for fisheries management, statistical models and conceptual models become part of the scientific project *for* capitalist accumulation. The logics for resource management in Namibia are changing within the context of an EAF and contributing to the increase in technical and managerial governance systems that have been put in place. In a move to make up for the consequences of plundered resources during the colonial period, the Namibian government developed the hake fishery at the industrial level with visions of an infinite resource that could be exploited at high levels. The idea of fish as national resource for the benefits of Namibians that was present in the development of the Ministry of Fisheries as well as part of the new constitution of Namibia is lost in the logic of capitalist accumulation in which the fisheries science project becomes complicit. Both scientific and governance strategies are at the mercy of global markets and a neoliberal logic of natural resource management.

The stock assessment model is the basis for fisheries management. Both are part of a management paradigm that aims to manage social and political expectations for maximum economic benefits. The logic of capitalism is embedded within the very structures of the management framework and is what takes the model and the science behind it directly into the political and public arena. There, fisheries science generates a technoscientific space in which politics, as a set of practices that contributes to decision-making, confronts science in the public domain. The stock assessment becomes a tool to ground decision-making strategies and forms the nexus point where society, nature, wellbeing, and conservation meet. To think differently about fisheries science in the postcolony, requires a recognition of the social, political and cultural inheritance of the idea of financialised nature, as it has emerged out of the liberal political ideals that marked the turn of the 20th century.

As part of decision-making processes within the fisheries context, scientific expertise becomes the basis for the management of expectations. The authoritative role of the stock assessment and its output of the TAC is bound by the capitalist logic that assumes the longevity of resources and the desire to maximise profits now. Fisheries science in the scope of a capitalist logic forms the structures for decision-making. For their part, the scientists are tasked with establishing the stock assessment model that will determine the (abstract) total amount of fish in the sea, as a biomass of organic material, and the percentage of that amount that can be fished and still leave enough for future fishing cycles and allow for stock recovery. The shift from single-species stock assessment to an EAF requires the management model to incorporate more variables and uncertainties in its conception. From a stock assessment perspective, this can cause unease and discomfort as more variables, more limits, and more value judgements are necessary for the goals of fisheries management to be achieved, when the principle concern for corporate fisheries is with how much quota they will be granted which translates to profits for the company. As Kirchner notes, the most common request from companies to the Ministry of Fisheries is an increase in quota (Kirchner 2010). The usual argument that industry presents to the Minister of Fisheries is the “claimed excess capacity of the fleet and factories, the Minister being threatened with looming retrenchment of workers if the TAC is not increased,” (Kirchner 2010:9). These appeals are in stark contrast to the way that the fishing sector has overshot the capacity for onshore processing facilities as part of the argument for job creation. The expectation is that the hake stock will recover, despite current fishing pressures, to ensure the

longevity of the fishing sector. However, the current situation in Walvis Bay reflects a hake industry that has the infrastructural capacity to process over 300 000 tonnes of hake, the management plan for the species estimates that only 150 000 to 200 000 tonnes of fish can be caught if the fishery is to be sustainable (Paterson 2015). As it stands, there will never be enough fish to catch for the factories to process at full capacity, which means that in practice they run at a built-in loss, which reduces both taxes and wages. This is a massive flaw in the design of the Namibian fishing sector since independence, and it carries severe consequences for the country as a whole. An EAF is an attempt to address the unevenness of the management plan as it relates to the fishing sector, such as highlighting the discrepancies between the policies as they exist in theory and how they manifest in the everyday operations of the fishery.

There is some reluctance from decision-makers to address the increasing uncertainties of the fishing industry. There is also more reliance on modellers to produce specific sets of information about the species populations, the ecosystem, economics, and employment (to name but a few). In the current fisheries climate, stock assessment scientists only operate within the realm of the scientific abstractions of fish populations, biomass, and fishing effort. Their work implicitly cordons off these components, despite the shift in managerial practices to foster the relationships that exist across the sector. Few people are aware of the inner workings of the fishing industry beyond the information made available for public consumption. Kirchner writes that while “economic information is provided by right-holders as part of their quota applications, the functioning of the hake industry is extremely complex and secretive, and interrelationships between the various stakeholders are opaque,” (Kirchner 2010:9-10). The result is an asymmetry of information between companies and the Ministry that is fertile ground for unanswered resource management questions. To date, there has been no formal study to investigate the roots of some of these problems (ibid). In addition to the disaggregate and secretive nature of the fishery, highly specialised knowledge regimes are tailored for the experts, as seen in the operation of the stock assessment model.

Information about how to address the implementation of an EAF remains fragmented and incomplete. Part of the problem is that there have been no developments in terms of methods and data collection for an EAF that are consistent over time. Because an EAF is still a relatively new phenomenon in Namibia, the human dimension defaults into the field of economic and demographic statistics. For example, the human dimension is generally conceived of as the statistical data in the form of (un)employment, income brackets, education level, size of household, and HIV/AIDS prevalence. However, there has been little to no critical engagement with the data that extends beyond the development discourse of poverty alleviation.

Furthermore, it has yet to be established how these factors can be made to work within an EAF-informed statistical model or indeed if that were achievable, whether it would offer the most holistic approach to manage the fishery. Indicator frameworks begin to help mainstream the information into formulations that point to areas that can be accessed in and disseminate the results within the broader public. However, the fishing industry continues to rely on the underlying theoretical framework that links statistics and power to a capitalist logic of accumulation.

Scientific expertise along with a particular relationship to capitalism remains the basis for governance and control of Namibia's fishing industry. The logic of fisheries science within capitalism provides the basis for political decision-making, public awareness, and the terms under which the management goals are contained within the scope of the hake fishery. The current management framework faces an important yet uncertain future in how to wrestle with the frictions of a management paradigm that relies on elements of the authority of the old regime of fisheries science. The implications of this manifest in how the stock assessment model tends to function as the gatekeeper where specific decision-making processes and recommendations can pass through.

Science, statistical models, and management models: a historical approach

With the increased reliance upon statistical data and analyses, technoscience become part of the political sphere as both mediator and actor. Predictions emerge out of the fisheries assemblage as a knowledge object that carries immense authority. They are perceived as objective, scientifically verified, and generally un-contestable. They also underpin the decision-making processes across the fisheries sector. The model generates predictions and certainties, drawing from the data collected about the ocean and the stock to generate an idea of how the Benguela Current is functioning. A numerical representation of the target stock is then generated in the form of biomass. Informational outputs are generated via the chosen model to produce a number that indicates the extractable stock, which is the total allowable catch. The prediction is that if a certain number of fish are extracted from the sea during the fishing season (one year), then the stock will remain above a threshold in which it can recover for future seasons of fishing. In this regard, there will always be an underlying speculation. If the same parameters (roughly) are used, the results should be fairly predictable and they should also fit within certain output parameters. The stock assessment model for example, uses the same parameters that were established in the

1990s, and part of this is consistency of data and to maintain a data series across time, and the scientists also remarked that it continued that way because it is the way it has always been done.

Predictions then become the mediator for the expectations of the fisheries assemblage, as they are the reference that serves as the basis for decision-making and policy. What is happening with regards to implementing the ecosystems approach to fisheries, is that predictions are being required before the necessary data sets are established. There is an expectation for the model to determine outcomes, yet there is a patchiness in how the value-decisions are made. For example, in how value decisions are made subjectively and that subjectivity also becomes part of the process. This is what Isabelle Stengers (2008, 2010) means when she insists on the need for not only good scientific theory but also sets of practices that allow for the necessary questions to emerge. Perhaps it is not about finding solutions to pre-determined questions but rather the more important task at hand is to develop the questions that can be more useful.

Like countries elsewhere on the African continent, resource management in Namibia is faced with the challenge of restoring ecologies while benefitting from them, while inheriting a legacy of extractive approaches to nature and labour. In order to grapple with an EAF framework that brings the human dimension into the equation, it is necessary to understand the historical trajectory of labour practices, unregulated fishing practices, and the invention of capitalist nature. These factors are crucial to the success of extractive economies both during and after the colonial period. Today, the management paradigm separates the domains of what needs to be controlled, monitored, and governed without recognising that these tactics are in many ways remnants of practices of control and domination over people and nature during colonialism. The relationship is of course not explicitly linear and the management framework today is not synonymous with colonialism. The point is that there are certain sets of conditions within in which people and nature are expected to exist, and the relationship between them is mediated by an interface where they may not even register -- that is, the interface of capital, science and state. Within that nexus, statistical models provide the technological mediation that serves to verify and validate the abstractions of science in the knowledge economy framed by capital, and justify official governance decisions. Therefore, science is not rendered as separate from capital, but rather science as part of the knowledge economy is framed by the concerns of capital. The stock assessment model is the textbook example of science working for capital within the modern fisheries management paradigm. An EAF seeks to restore ecological concerns while also calling attention to the sets of relations underpin the fishery and move within and across the ecological and human dimensions. Without a different model of personhood to that of *Homo economicus*, and without a different model that renders nature-as-capital, an EAF is

unable to conceptualise transformative questions and therefore unable to foster transformative practices.

If fisheries management takes seriously the task to manage fisheries for future generations, environmental justice and economic equality, one first step is to decouple the technological interventions from ideals of holistic management. Instead, history plays a crucial role in that it locates fisheries science and resource management in Namibia within the scope of colonialism, labour, and the emergence of capitalist nature. In order to understand the trajectory of both resource management and democracy in Namibia, a country that relies significantly on the wealth of its natural resources, looking back can help to elucidate how and why the practices of resource management evolved in the ways that they have.

Post-1990 and the fall of the Berlin Wall, the new global promises of neoliberal dogma played out in the transition to democracy in Namibia, very quickly leading to the erasure of liberation politics as the basis of the struggle once SWAPO came into power. As in neighbouring South Africa, the voices of the liberation struggle and the commitment to overthrow the colonial powers was lost in the adoption of neoliberal fiscal and development policies at independence. As Leys and Saul note, “the paradox of ‘liberation without democracy’,” that seems to stalk SWAPO’s development could be the result from the process of struggling for liberation, particularly through armed struggle, that ultimately generates political practices “that preconfigure undemocratic outcomes,” (Leys and Saul 1995:5). This is an incisive observation. If democratic outcomes have been severely squandered due to the very nature of the political strategies of the liberation struggle, undemocratic practices certainly affect how the government is to develop the management of its national resources.

In the efforts to manage the hake fishery in a way that addresses the social and ecological impacts of fishing and promote practices of good governance, statistical modelling emerges as the technological intervention to support the privatisation and enclosure of natural resources. The valuation of the fishery also happens through these technological interventions, in which the TAC is set and the resource rents calculated. The turn to technology, and specifically the use of stock assessment models, ecosystems modelling, and managerial models points to a shift in the governance structures for national resources that emerge alongside the shift to democratic state-building. The main limitations of statistical models are that they cannot be as holistic in practice as they are in theory and therefore can only be expected to produce partial truths. The main role of the statistical model in the historical and political generation of information about the fishery is its role to generate numbers. The numbers are inherently embedded within the social and political arrangements of resource management and are assumed to act as determinants for the

decision-making processes. Nature and labour under capitalism become open to numeration within the scope of management practices that continue to rely on the stock assessment model as the basis for decision-making. In other words, social and ecological wellbeing are mere additions to the already highly efficient use of the stock assessment model for management that operates within the market driven neoliberalism of Namibia's political institutions.

To frame nature in the language of governance systems is problematic not least because it renders nature as open to commoditisation, to be parcelled out within a global system of extractive economies. Latour's AIME project addresses how specific concerns thus bring certain aspects of the real to the fore and bring them into political, discursive, and socio-natural existence (Latour 2014). The concerns of the fisheries managers and company owners bring to light very. The stock assessment model (as part of the governance system for hake stocks as a national resource) operates in a twofold manner: to be the determinant of management actions but being perceived as outside of the decision-making processes. The stock assessment model is both highly politicised yet its political weakness is that the politics involved in the scientific processes the produce stock assessment are not seen or understood. It is clear that stock assessment has a key role in decision-making, yet the invisibility of the politics involved is problematic. The politics of fisheries science and management enact specific material and political conditions which are seen in the high unemployment rates, urban poverty, poor working conditions, lack of political participation, and uneven development that mark Namibian society today. The material conditions are part of the historical conditions of colonialism and capitalist nature that mark the 20th century political project. In this fisheries context, the authority of fisheries science is in the practice of the stock assessment model. To frame the stock assessment model within neoliberal nature shows how it is embedded in historical and material forces. The historical and material forces that emerge in Namibia's fishing industry are linked to the histories of colonialism and the expropriation of nature.

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This chapter examined the stock assessment model and its relation to the EAF framework and the creation of value in the context of both the historical and current management framework in Namibia. What becomes clear is that computer models, fisheries science, and technology are not entities that exist solely on their own, in separate objective domains, but are generated out of specific material and political conditions that relate to particular conceptions of nature and

society. The fallacy of such modernist conceptions arises out of the deterministic efforts of computer models that are expected to produce statistical certainties about the natural world, whilst relying on dualistic thought processes, favouring quick technological fixes and market based solutions that remove the human element from the very conceptions of nature.

Formulations of capitalist nature are limited in how they frame the management framework and assume that computer models such as the stock assessment model can generate information that becomes the authority for decision-making processes. The schisms that continue to fracture the marine industrial ecology of Walvis Bay reflect a management paradigm that has yet to consolidate the ideals of democratic science.

The practices of science in Namibia's fisheries sector are part of a legacy of global standards for the management of both national resources and collective experience. In attempts to localise a vast swath of data and unknowns into a formulation of certainty and hard numbers and these standards become the authoritative voice of reason for natural resource management. The historical context of Namibia is crucial to understanding how a legacy of colonial power over nature, people, and knowledge corresponds with the expropriation of nature and the current moment of crisis within the capitalist system. Such a trajectory allows for expertise to dominate the realm of fisheries science and management in Namibia, in the form of the stock assessment model. At independence, the Ministry of Fisheries, through a series of decisions and alliances, worked closely with partners to establish the science that underpins management decision making procedures today that relies on the exploitation of labour and resources at high costs for Namibia's people as seen in the everyday lives of the majority of the population. The concept of a management framework that is inclusive cannot be universal. Part of the reason why management plans are so difficult to implement is because they are at odds with the very objectives subsumed within them. As the next chapter will show, the challenge is to incorporate wellbeing as a universal indicator into the management regime shift. In addition, to require the human dimension as part of the management paradigm shift presents a paradox in that the framework does not have a base structure for how to include the human dimension beyond the statistical data collected through census surveys. The relationalities of the human dimension materialise in ways that are not separate and not easily enumerated. The following chapter examines how the model produces knowledge objects, and how this challenges what Marx described as the "weakness of the abstract materialism of natural science, a materialism which excludes the historical process," (1981:494). Such a challenge, I propose, emerges in the paradoxical nature of the scientific model and the turn toward the human, the *Anthropos*, in the challenge of the *human dimension* in the managing of Namibia's hake fishery. The human

dimension as such, is most clearly elucidated through an analysis of labour within the context of fisheries management in Namibia. The relationship between labour, capital and nature in the hake fishery exemplifies the historical limitations of the assumptions of why fisheries management should work in Namibia despite the reality of fisheries management that is firmly rooted in a suite of neoliberal interventions at work for the markets that does little to address the colonial and racialised history of fisheries in Namibia.

Chapter 3

Contemporary fisheries science: conceptualising human wellbeing as model-able

“My turn to state an equation: colonization = ‘thingification.’”

-- Aimé Césaire, *Discourse on Colonialism*, 1955

“Western nature-culture constructs ... revolve around the notion that the one domain is open to control or colonization by the other.”

--Marilyn Strathern, *No Nature, No Culture: The Hagen Case*, 1980

How can human and social data come to be modelled virtually, amidst the assumption and expectation that social data generated and input into the fisheries management model is another layer atop the existing layers in the nexus of an EAF?

This chapter unpacks the making of human and social data for Namibia’s hake fishery (and lack thereof), and proposes that to address what is known as “the human dimension” in the field, requires a recasting of the relationship between humans, the social and environmental worlds they share, and the technological interventions designed to measure, predict, and enumerate value. In this chapter I open questions in relation to human data with the goal of teasing out the challenges posed by a management framework that relies significantly on the assumptions and expectations of data that underpin scientific modelling practices. Expanding on the empirical material of fisheries science research and the practices that inform such research, the concept of human wellbeing is made model-able, to a limited extent, and completes the first of half of this dissertation, that is the empirical study of the workings of contemporary fisheries science.

If fisheries management is serious about conceptualising the human dimension, this chapter offers an ethnographic approach to better frame the notion of wellbeing in Namibia. The challenge is to bring humans into modelling frameworks for an ecosystems approach to fisheries management without reducing people, environments, relationships, and their experiences into de facto objects, numbers, and statistics. The hake fishery remains a site of hope and redress, and my approach is curious with the aim of opening up approaches that can engage the struggle to generate wellbeing in Namibia’s industrialised marine ecology. In the second part of the chapter, I offer an intervention and experiment with the making of an indicator framework where Barbara and I re-imagine the current indicator framework for the

human dimension of EAF and attempt to assemble a different framework that works to amplify the sets of relations that hold together the fishery. It is an attempt to offer a different framing of the human dimension that does not fall into the trap of homo economicus but rather attends to the environmental and economic justice at stake.

The idea of “a human dimension” poses questions about the potential for an EAF to address social inequities, which continue to define the everyday lives of Namibian citizens. Can the human dimension be modelled electronically? Is human experience reducible to boxes and arrows? Since the ecosystems approach to fisheries management is still in its conceptual form, these questions are crucial in thinking through how to assess, enumerate and incorporate the human dimension into fisheries management in a way that does not render humans once again as objects, as was the case in the colonial and apartheid eras.

The challenge of the human dimension

New studies in anthropology speak to algorithms as actors in new forms of social life and in the knowledge economy (Seaver 2012, Wark 2015). In the fisheries sector, the algorithm serves to generate a kind of authority in the form of the TAC. To link this type of algorithmic culture of certainty in the stock assessment model (and broadly the use of ecosystems models for ocean dynamics), to the conceptual model of an ecosystems approach to fisheries requires exploratory thought into the efficacy of such a modelling framework. To break it down from the abstractions of human dimension and wellbeing, it is useful to think about the basic functions of a simple model. It requires a conceptual idea of what is to be modelled, it requires data to feed into the model, and it requires some kind of electronic or virtual representation of the all the different components mediated by the production of a physical model in the form of a mathematical formula for computing. This is how meaning is attributed to the model outcomes; by linking together these base elements.

The human dimension, as a site of study in the fisheries context first means that life experiences and material conditions are to be brought into the management framework as part of the paradigm shift towards an EAF in the region. In 1994, new fishing rights were allocated for periods of four, seven, and ten years. In 2002 the rights application process was renewed. The Sea Fisheries Act set out the desirable criteria for new rights holders in the following ways: first, the applicant should be a Namibian citizen; second, the applicant’s company beneficial control is vested in Namibian citizens; and third, the applicant should have the ability to exercise the right of exploitation in a satisfactory manner. The duration of rights is dependent on the

extent of Namibian ownership, which is meant to encourage Namibian participation and long-term capital investment in the industry (Kirchner 2010). However, determining Namibian ownership is often opaque because foreign ownership can be maintained through preferential shares, proxy ownership, and cross ownership (Manning 1998, Melber 2003, Sherbourne 2010, Kirchner and Leiman 2014). An additional bureaucratic limitation is in how rights are accessed, meaning that fundamentally, quota holders are not allowed to transfer their rights to anyone else in order to ensure that the criteria outlined above is met and empowerment strategies followed. Because the hake fishery is large-scale and industrial, there is a high cost of entry into the sector in terms of vessels, crew members, and processing facilities. What happens is that the quota holders sell their quota (fishing rights) to fish processors or other companies in a 'leasing' agreement, which has much in common with the formal individual transferable quota scheme which permits the buying and selling of individual quotas (Kirchner and Leiman 2014). While these practices are not formally recognised as legal under the fisheries legislation, because of the high cost of entry into the sector the government is in tacit agreement of quota transfers (Draper 2014). What this essentially means is that someone can apply for fishing rights because they fulfil the criteria as set out by the Ministry of Fisheries and once they are granted fishing rights they can turn around and sell those rights to other companies or individuals who were not granted rights with that income going into their hands directly. The TAC is thus hugely powerful because it tells industry how much they can expect to profit that year from fishing effort. It is for these reasons of TAC and quotas that the stock assessment model remains so powerful within the management framework.

The current practices confront a wide range of people, organisms, thoughts, technologies, and policies that define the fisheries sector. These are not inert or static. With the paradigm shift to an EAF for fisheries management, expectations also change with regards to both the kinds of computer model outputs as well as in the new area of the human dimension. Therefore, the human dimension within the modelling landscape presents a hardest case of modelling. The implementation of an EAF as a managerial framework has been met with a variety of challenges. The next section explores the hardest case of modelling through the lens of the human dimension and looks at how the sets of practices that produce data *on* nature, are part of a particular way of doing fisheries science in Namibia and require technical expertise that is specific and precise, even when assessing microbes in the open ocean. Data *from* nature magnifies how the management framework incorporates the human dimension as a category that can modelled virtually.

The concept of wellbeing from the outset is premised on an international development

assumption of top-down implementation of policies that rely on the capturing of economies and institutions in developing countries into the hands of the rulers of the global economy. These rulers appear in the form of a triad of governance institutions including the International Monetary Fund (IMF), the World Bank, and the World Trade Organisation (WTO). The power that these institutions have is a result of globalisation in which their strategic aggression in the developing world is affecting the everyday lives and material conditions of people across the world (Peet 2009). Governance as such, is in a state of crisis. The literature on human wellbeing in Namibia's hake fishery is patchy and incomplete. Preliminary research, data collection, and analysis has been written up in initial reports for the UN FAO (cf. Paterson et al 2012, 2015), but there is limited published scholarship on the subject. Human wellbeing is situated within the context of international government organisation strategies, particularly in the vein of development.

The EAF management framework places poverty and wellbeing in opposition, and thus fails to see technology as a political force which results in an inability to see politics as a material force. Indeed, such frameworks have a problematic conception of materiality as such. Wellbeing as a concept in the fisheries sector emerges from international standards and frameworks for systems based natural resource management. These frameworks combine indicators (measurable objectives) from the three overarching categories of ecological wellbeing, human wellbeing, and governance. The frameworks are inherently committed to measurable objectives which results in the enumeration of data, which feeds into the modelling projections, as seen in the practices that contribute to the existing models for management (i.e. stock assessment model, ecosystems model).

The human dimension seems to be at odds with the computer models of stock assessment and ecosystems model despite the merger of all three components into the EAF framework. An EAF must dissolve the power entrenched in the stock assessment model's role as management, and reassemble the sets of relations in the fishery that can address the three core domains from a relational and material standpoint. The stock assessment model remains so powerful because it is so firmly entrenched in the institutions and bureaucracy which determine the sets of practices that underpin the management framework. The stock assessment's power is in its production of the TAC, which in turn determines how much of the hake biomass is designated as fishable. Only those who have been granted fishing rights can exploit the hake resource. Quotas are granted to rights holders and designate how much that company, individual, or collective can fish. Fishing rights and quota are integral to the participation of Namibian citizens in a sector that they were previously excluded from. The relationship between

quota (as a result of the stock assessment model) and the human dimension (who gets to fish) is important.

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Human behaviours and experiences must first be understood in their context outside of their potential to work as part of any kind of electronic or statistical model. Models, as a technological intervention, make and un-make contexts of uncertain circumstances under increasing pressure to make an ecosystems approach to fisheries initiative work. They also require quantifiable data in order for the model to be able to measure the success or failures of specified goals. The institution of science in a postcolonial climate of algorithmic culture formulates the practices for decision-making through the language of mathematics. As a cluster of expert knowledge, fisheries management forms specific relations to society in the midst of such extreme uncertainties in order to evaluate the impacts of scientific practices.

Human beings face obscurity from the data that goes into models, particularly the experiences that need to be captured within the current framework that are representative of the hake fisheries operations at present. Employment statistics for example, do not give any indication on the safety of the work, worker benefits (and lack of), housing allowances, and wages. The aims of this project seek to avoid falling into the trap of exceptionalising humans but points rather to their expulsion from the models as a result of their inability to be captured as data. The history of Namibia is a violent one, and the liberation struggle was a decades long battle for land, sea, and soul. Namibia is a very young country and much, if not all of the momentum that led to independence in 1990 has been lost in a discourse of neoliberalism with quick financial gains from mining and fishing and severely dysfunctional public services. Political and social transformation is ongoing. When the ecosystems approach to fisheries framework was introduced in 2002 in the southern Benguela (Namibia, South Africa) it came with an important message: “models need to be based on sound science, and it is important to understand that the ultimate aim of many of these models is to assist in decision-making. The potential implications and use of scientific advice in the implementation of management decisions should be carefully considered when modelling,” (Shannon et al 2002:6). More than a decade later, ‘sound science and scientific modelling’ continue to drive fisheries management, and the implementation of an ecosystems approach faces many challenges due to the historical relationship of nature under

colonialism and a new imaginary of nature that will benefit Namibians and include rather than exclude them from decision-making processes.

The *Mirabilis* research vessel is an example of the kinds of negotiations that exist in the context of conservation, data collection, and scientific analysis. The computer models generate knowledge objects within certain sets of parameters and through specific sets of practices. It also is a knowledge object itself. The work of Manuel de Landa helps to show this relationship between simulations, representations and the virtual. What is useful from de Landa's work is his approach to computational simulation as being non-linear, and one that follows a path of emergence rather than deduction (de Landa 2011). One of the key points de Landa makes in *Philosophy and Simulation* is that simulation is always a reproduction of an epistemological understanding, which for the fisheries context the stock assessment model reproduces a pre-conceived notion of biomass through an understanding of fish stock populations that can be measured by weight. The understanding being of course, that it is impossible to know how many fish exist in the sea.

Statistical models such as the stock assessment are a variation of simulation and form the initial structures in which to engage with the virtual world. Since the scientists cannot spend their lives at sea collecting data, they engage practices that assist them in generating a virtual representation of the ocean based on the data that they have collected. And as I learnt in the modelling course, the computerised ecosystems model emerges at the intersection of the phenomena that occurs in the ocean and the technological intervention of the computer model to generate a virtual representation. In this way, computer models are creating meaning through the stringing together of symbols and data. The value decisions of the scientist/modeller are to help to create the thresholds, parameters, and limitations of these relations. Without clear objectives such as phytoplankton productivity, catch at age data, and stock abundance, the computer model has no further use than as a representational tool.

Dr. Kirchner and I talked about the usefulness of the stock assessment model in the hake fishery, a fishery that is extremely disaggregated and the goal of everyone is to catch a maximum portion of the TAC. Because hake is the main species caught in Namibian waters with the onshore development facilities tailored to this species, the stock assessment is becoming more obsolete because of changing management demands, such as incorporating the human dimension. Dr. Kirchner remarks on the use of the TAC (and stock assessment science) as *the* logic of fisheries management:

I feel that, and I have changed my mind over this issue over the years, that the result of the stock assessment is really taken too seriously. They say that the TAC is the ultimate number and they don't look at other other factors. As you know, I believe that one should also actually model the socioeconomic benefits as well in order to get a better picture. I did some of this for my thesis work for my MBA, but it's not used. It should be, and the economics section of the Ministry of Fisheries should have somebody that's capable of doing that. Even if it's not used so much in the recommendation, but as information available there. These models should be in place because when the Minister makes a decision that is different from the recommendations, then the decisions should be modelled to see what the risk involved is when he takes this decision.¹⁸

Dr. Kirchner went on to express her concern for the deeply embedded logic of the stock assessment model as a determinant in the processes of administering rights and quotas in the increasingly disaggregate hake sector. She also pointed out that the memory of the fishing industry is very short. She remembers when the previous Minister of Fisheries would sometimes set a higher TAC but wouldn't hand out the quota. She states that "this was a smart political move, but he was still listening to the scientists. The hard part is when the industry says that they have a good catch rate, but they are only comparing it to two or three years ago. They are not comparing those rates to when the fishing was really good. Right now it's the best it's been in the last ten years or so, and the stock appears to be increasing. When it increases, the costs of fishing will go down, and there is a chance for industry to make decent money. But they don't see it like that. As soon as the costs of fishing effort (CPUE) goes down, they immediately think more boats, more time, more petrol, and more people to catch that higher TAC. They will have good catch rates, but not for long. If the TAC stays as high as it is now and they catch that, in four years time the hake resource is going to be in serious trouble."¹⁹

The great challenge then, is how to render humans and human experiences as sets of data that can be parameterised and modelled in the virtual realm, a realm that is so familiar with and relies on the logic of the stock assessment model. As Dr. Kirchner and I discussed, the stock assessment model determines the TAC value that in turn determines how the human dimension is conceptualised within the management framework. From both an economic angle in which humans are the labour in which to operate vessels, process fish, and manage the company, as

¹⁸ Interview with Dr. Carola Kirchner 13 November 2012, Swakopmund.

¹⁹ Interview with Dr. Carola Kirchner 13 November 2012, Swakopmund.

well as being those who are most dependent upon the recovery of the hake population to ensure that the fishing operations can continue.

The same sets of practices that are at work on the RV *Mirabilis* or in Swakopmund at the National Marine Research Centre cannot be the same sets of practices used to address the human dimension within an EAF. The limitations of such an approach are revealed in the relationship between the collection of data that emerge as internally linked to questions about the practices of scientific experience, authority, and decision-making. The stock assessment and ecosystems models are at an advantage here because they have distinct sets of practices that contribute to the collection of data and the running of the data through the computer model to generate outputs, virtualisations, and/or representations. No such structures exist for the human dimension. Before any computer model can be run, input data must first be constituted. Designing a framework for the human dimension in Namibia's hake fishery is still very much in its nascent form. If the use of computer models is premised on the constitution of knowledge objects, they are conditionally bound to description and articulation by means of signs and interpretation, which is at the discretion of the modeller. In Namibia, Barbara Paterson is tasked with developing the human dimension as a category that can modelled. My work with her in developing the indicator framework for the human dimension (Paterson et al 2015), and what is presented here, also contributes to that task.

Models in action: predictions and governance

The next section will focus on the broader tenets of an EAF for management to think around how to shift from the conceptual model to a model that can dissolve the entrenched power structures and stock assessment model authority in the decision-making and management practices. Importantly, the focus needs to shift on the everyday interactions and lived experiences of Walvis Bay residents, most of whom have a connection to the fishery in some way. Walvis Bay, as a marine industrial ecology, is experiencing rapid growth coupled with a government that has been courted by global capitalism. This means changes that are occurring in all areas of Namibian life, from employment, housing, education, health, and in the scientific institutions. Scientists are working in increasingly uncertain times, particularly those working for the Ministry of Fisheries, as fishing makes up such a large part of the domestic industry.

The data sets that figure into the human dimension currently are slippery, not well established and defined, and resist being categorised neatly. To think about the human dimension is to think about the desires, actions, needs, and material conditions in which people

engage in the everyday. At this point, the model is conceptual and in a state of becoming that is fundamental to the process of decision-making, because of the expectation of what it will produce (data, information), yet it is very much still a part of the scientific process as somehow outside the political realm. The management model is becoming a vehicle in which governance structures come to be social and environmental controls, and their use in the fisheries sector is a political one as much as it is a mechanism for producing knowledge about the state of the ocean, the fish stocks, and the health of the ecosystem.

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The transformation of the stock assessment model alongside the conceptual model of an EAF into an integrated fisheries management framework should magnify the issues such as rights, allocations, market demands, and the human dimension are part of knowledge making practices that underpins the governance arm of management. Statistical models by design are a way of simulating reality so that abstractions such as value, interest, desire, and power can be formalised within the language of algorithms. Part of their appeal is their ability to simplify complexities and enumerate objects for organisation and control. However, to take seriously the efforts to incorporate humans into modelling for management, it is vital to carefully consider in what ways humans are both part of the model, in its formation as tool and the operation of (simulation, virtual representation, formula, computer model, calculation) and as sets of relations in Walvis Bay's marine industrial ecology.

In this way, modelling is a set of practices that explores the question of what is feasible, and focuses on efficacy rather than validity or truths out there. The structures of (state) fisheries science and governance are top down, the industry must negotiate with an elusive government each year, and the workers are in consistently more vulnerable positions. My task in this chapter has been to grapple with three types of models in practice to assess their historical limitations in moving forward with the task of how to develop a conceptual model in which the human dimension is an established fixture for generating meaning in the management of the fishery. To do so “centres on how a multitude of organisms’ livelihoods shape and are shaped by political, economic, and cultural forces,” as well as the “becomings – new kinds of relations emerging from nonhierarchical alliances, symbiotic attachments, and the mingling of creative agents,” (Kirksey and Helmreich 2010). The coexistence of statistical and conceptual models (ecosystems, stock assessment, EAF) and their work as part of management practices points to a policy framework that is disordered, and assembled insufficiently for the task at hand. The next

chapter looks at the relationship between nature and capital to address the limitations of conceptualising the human dimension within the current management framework.

The previous chapter raised a series of questions with regards to the relationship between labour, nature, and capital in order to illustrate why neoliberal valuations of nature and the concomitant reduction of human wellbeing to specific measurable, remains unable to address the underlying structural issues. The management model has yet to elucidate the relationship between labour and capital as it manifests in the social realities for Walvis Bay residents. An exploration of the everyday life of Walvis Bay means an interrogation of the material conditions in a place of uncertainty.

When I first began this project I was sceptical and uncomfortable with the widespread and casual use of the term “wellbeing.” In my initial talks with managers, fishers, and scientists there was an ease to which the term “human wellbeing” cropped up in most of the conversations about fisheries management. It is clearly becoming part of the conversation that reflects the paradigm shift that coincides with the shift towards an EAF. During fieldwork, my discomfort around the term human wellbeing stemmed from my own uncertainty about what the term means, particularly in the context of Walvis Bay’s urbanism that is marked by severe inequalities, HIV/AIDS, and lack of basic public services. If I pressed industry folks to expand on their use of human wellbeing, the responses were general, vague, and made mention of “jobs and job creation.” The assumption is that there is a direct correlation between jobs and wellbeing because jobs provide income, access to markets, food, and basic services. Of course, the narrative is much more nuanced.

Numbers, algorithms, and statistics have become the new authority that guides the commitment to metaphysical and scientific dualism. In other words, to work with both statistical and conceptual models with the goal of the latter to be able to encapsulate sets of relations as data, raises the question of how to transform static categories into typologies of relations that are dynamic. Human wellbeing is a category limited by the goal to reduce sets of relations into non-generative data for fisheries management (i.e. employment statistics, HIV/AIDS rates, literacy). Statistical models manage and neatly package inputs to generate outputs. The design of the statistical model is to manage complexities through the abstraction of phenomena into the universal language of mathematics. The challenge is to identify specific sets of relations and scenarios as they exist before abstraction. Once that information is identified as an aggregate of social relations in the hake fishery, there can be cohesion in how to collect and process the sets of information in a way that makes sense for an EAF. The main problem with an EAF in Namibia is that the development of the framework rests on too many assumptions about

marginalised communities that rely on natural resource extraction. The assumptions and logics that underpin the EAF framework are based on a suite of neoliberal interventions and are in general, removed from the everyday life and complications of Walvis Bay's marine industrial ecology. To explore how ecologies of wellbeing manifest in Walvis Bay can then point to a re-imagining of the sets of relations that form generative processes to grasp more clearly how and why the fishery operates as it does. The next section explores the possibility of wellbeing within the context of Walvis Bay, and begins to hone in on the challenge to generalise and categorise the notion of wellbeing within the uncertainties that mark everyday life.

Developing the knowledge based decision support tool to model human wellbeing

Towards the end of my fieldwork I had collected journals full of notes and stories, recordings of events and interviews, surveys and questionnaires, and drawings from key participants in the hake industry that illustrate their vision of the fishery. The material I collected on human wellbeing in Walvis Bay needed to be put into conversation with the EAF framework and more pointedly, to the knowledge based decision support tool that Barbara was developing. My data is largely qualitative and I needed to think about how I could piece together the sets of relations in a way that might speak to the information already available. From there, Barbara and I could attempt to re-work the framework with the goal to be able to input our data into the computer model for human wellbeing. Barbara and I re-ordered and re-worked the EAF indicator framework based largely on my fieldwork, which at that point was drawing to a close. We completed this experiment as an attempt to think about what an expanded human wellbeing indicator framework could include. Central to our experiment was to amplify the sets of relations that make up the fishery rather than delineate, dilute and reduce them within the specific de facto categories. The challenge is to keep the particulars hinged to the broader abstract structures such as wellbeing and governance. Therefore, crucial to the success of the experiment was to keep the establishment of a set of indicators for the computer model in focus.

The knowledge-based decision support tool is the joinery within the computer model and virtual tool. The role of the tool is to produce outputs based on the re-worked indicator framework. In essence, we were putting to test the FAO's conceptual EAF model to see what results might be produced based on a careful and considerate collection of data on human wellbeing in Walvis Bay that emphasises the sets of relations rather than de facto categories or domains. In doing so, our approach directly disrupts the idea of measurability, which is the *de facto* ordering of the world today. Barbara suggested we experiment with the conceptual map for

designing the model by working specifically with the human dimension component of the EAF framework with the goal of restructuring the rigid, prescriptive indicators that provide the foundation for management plans. By presenting goals and objectives that represent a global standard, at the local level industry has more room to obfuscate and negotiate their responsibilities as outlined in the broad strokes of the management framework.

Barbara and I offer a first attempt to reformulate the category of the human dimension within the EAF conceptual model. The first step is to conceptualise the wellbeing framework as composed of sets of relations and that all areas of the fishery are interlinked across the sector. Next, we had to concretise what the sets of relations are, and we started by listing out all of the important indicators that would guide our re-configuration of the human wellbeing arm of the EAF framework. Figure 1 shows the framework we started with.

Figure 1²⁰

human dimensions of EAF				
Institutional <ul style="list-style-type: none"> • policies/legal framework • access/use right • participation (fishers, fish workers) • community level institutions • interactions between different policies • linkages with other institutions (e.g. other ministries, universities, NGOs) • enforcement & compliance • social research • capacity building 	Social <ul style="list-style-type: none"> • gender, age • social cohesion • religion • values, beliefs, perceptions, attitudes • goals and aspirations • livelihoods, practices, options, strategies • health • education • food security • rights/duties of fishers • Namibianisation 	Economic <ul style="list-style-type: none"> • poverty • employment (income level, quality of employment) • alternative economic opportunities • trade & markets (post harvest) • distribution of benefits/risks • access to credit • cost of production • flow of benefits 	Cultural <ul style="list-style-type: none"> • local knowledge • customary fishing practices & institutions 	Political <ul style="list-style-type: none"> • power structures (objectives and goals of different stakeholder groups) • policies shaping distribution of costs & benefits (equity) • political stability of the country • transparency of the decision making process • accountability of decision makers

We started with the indicators listed in Figure 1, and added additional indicators that emerged from my fieldwork. The indicators were developed by a regional working group formed by a regional FAO/BCC collaborative project, and signify the ongoing grappling of fisheries sociologists in the region, and speak to the difficult in deciding what the human dimension is and or should include. We wrote the indicators down on coloured pieces of paper and pooled them into a pile. In order to dismantle some of the rigidity of the categories we did not any of the indicators to existing categories such as institutional, social, political, economic or cultural. We began the exercise with different indicators in the fisheries discourse such as health, education, transport, family, employment, and skills as seen in Figure 2.

²⁰ Framework for the identification and integration of human dimensions of EAF into fisheries research and management in the BCC (Paterson et al 2014).



Figure 2

Next, we clustered the relations that we saw as frictional and/or relational. We treated each indicator as inherently relational to each, meaning that they were not bound to a specific overarching category and could also occupy multiple nodes, similar to the connector joint in construction. By focusing on first on putting down all of the indicators we could think of (and there were a lot), we were trying not to limit ourselves with any prescribed framework but to grapple with both the thought experiment of imagining a different type of model completely, coupled with the exercise of specifying important facets of everyday life in the town of Walvis Bay.

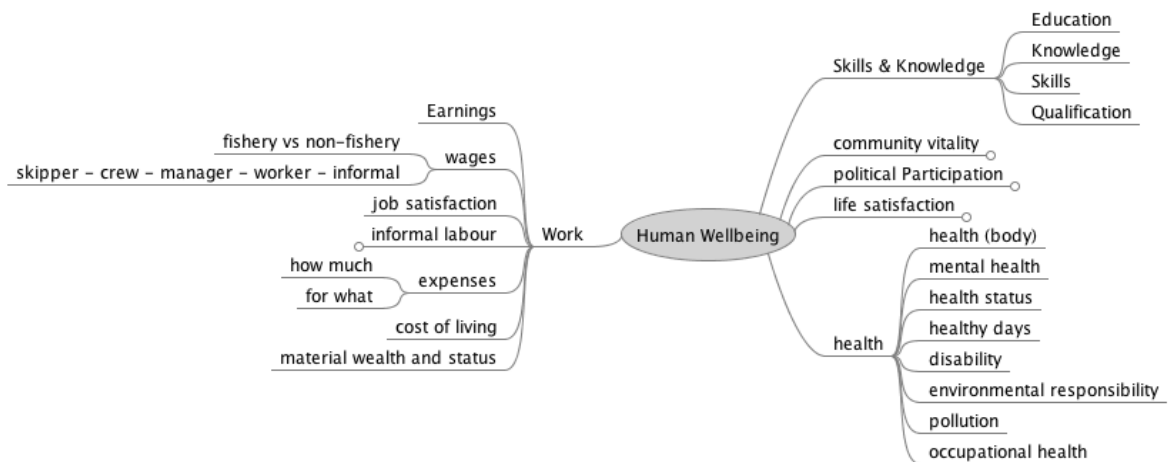


Figure 3

After we had written down all of the indicators that we found relevant, we began the organisation of the information, as it needs to be malleable and workable and make logical sense in a broad way. We began to cluster the various indicators, meaning grouping them by their impact on other indicators, whilst trying to allow for the flexibility to move between clusters. The linkages are very important in the way we think about the fishery, as it links political participation to quota allocations for example. The linkages allow for the entire holism of the

fishery (or as close as we can get), and matches the sentiments that the parts exist within the whole.

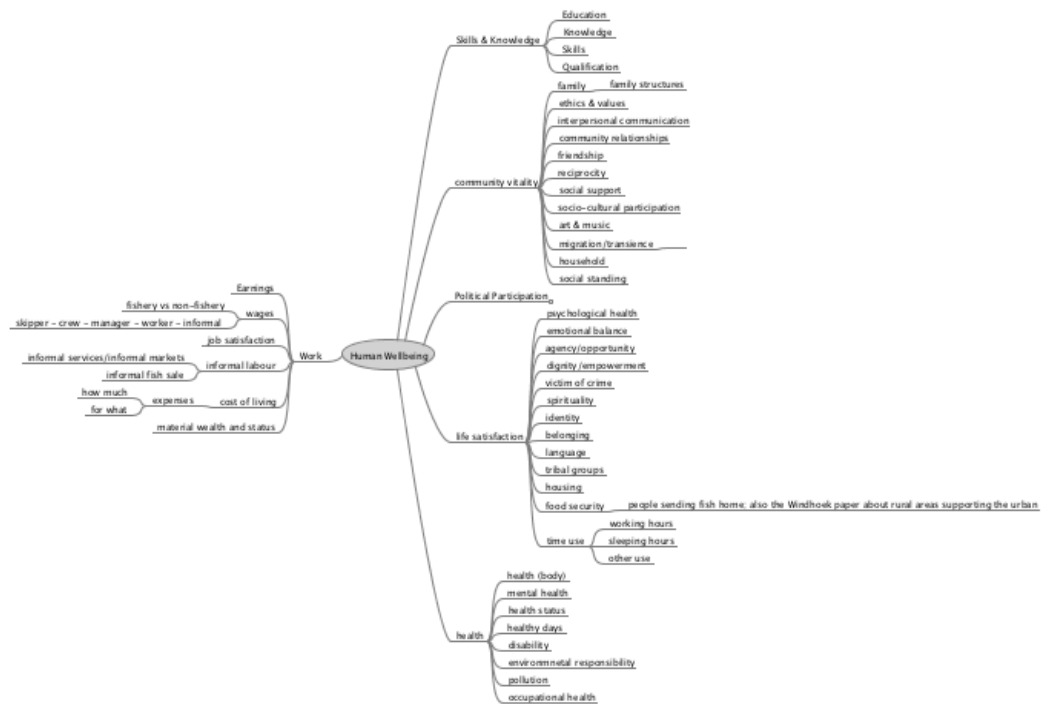


Figure 4

The exercise was interesting especially due to the differing of strategies that Barbara and I applied in our logic. Many times we found ourselves with very different ideas of how we wanted to cluster our indicators. We took the time to discuss what it was we were trying to achieve on a broader level, or at least where each of our thinking was with regards to the bigger picture. We are fortunate because we had the time to dedicate to this thought experiment, and ultimately we came up with a very detailed web of design, our cluster of clusters that go beyond the traditional indicator framework rigidities.

From these preliminary experimentations came the realisation that the notion of wellbeing is entangled in nearly every aspect of social and environmental life in Walvis Bay. Causality then, is brought in to question in that the linkages that can be made within and across the different clusters are not causal linkages, meaning X leads to Y, but rather generative relationships that move beyond *de facto* categorisations and singular domains.

Temporality also plays a part in the sequence of wellbeing as a mode of enquiry into the

exploration of the human dimension for fisheries management. From our initial re-configuring of the data sets that can feed into the modelling loop, what we saw was the limitations of conducting sound science within increasingly politicised social and ecological pressures. If the fisheries landscape is largely mediated by concepts and categories that are internalised and unprovoked in their foundations and practical applications, they risk being categorised as 'natural'. There is nothing natural about fisheries management just as there is nothing natural about the idea of fish stocks. The constructs that underpin modern fisheries management rely on the validity and verification processes of mathematical and statistical analyses in order to predict behaviours. Human behaviour is much harder to predict precisely because of the material and affective influences that exist in a place like Walvis Bay. It is also what makes the site such an interesting site for study.

While Walvis Bay is certainly framed within the notion of a postcolony, the literatures on post-colonial science fail to address the ontological matters at hand in this research. Postcolonial studies and postcolonial science in the context of this study are limiting in their often preoccupation with identity. I am interested in elucidating the ways in which the material conditions of Namibia shifted under the auspices of independence, and tracing why a young country would so eagerly adopt a neoliberal agenda specifically as it pertains to extractive industries. While the postcolonial literatures do offer ways of thinking through the social and political shifts in the fight for liberation, they can also be limited in their attention to the ways that the sciences themselves are fraught with colonial underpinnings at an epistemological level. In Sandra Harding's text *Sciences from Below*, the author reveals how, from different perspectives, scholars such as Latour and Ulrich Beck can provide useful resources for rethinking the modernity versus tradition binary and the effects this binary inflects into the production of scientific knowledge. There is a lack however, in the discourse around the trajectory of science studies, the philosophy of science, and science in action, that interrogate the very practices that purport scientific methods, and ultimately do not take postcolonial critiques into account. Harding attempts to reckon with these lacunae in the scientific debates, and makes the case for postcolonial science studies and their vital contributions. Indeed, what is useful about Harding's work is the call to amplify the ways in which Western conceptions of modernity, coupled with the historical and epistemological bases of Western science, also informs the empirical knowledge traditions of the global south. Stengers also offers new ways of thinking about how to ground engagements with postcolonial science literatures, and her 1990s book *Power and Invention: Situating Science* is a key text with which to ground engagements with postcolonial science literatures, in order to steer a different course. The course being that

wellbeing exists as both a connector and separator within the framing of fisheries techniques and science, while also contributing to the foundational questions of living and being well in the face of adverse material and environmental conditions.

Walvis Bay is a site that demands approaches fisheries management that can take into account the disaggregate nature of the fishery. The research that informs policies has direct consequences to all areas of the fishery, even if those linkages are lost in separation of labour, science, technology, and politics. It was my intention to experiment with the ways that data is collected, made measurable, and standardised. In essence, I needed to understand how life and life matter are indexed through the logistical practises of statistical metrics. The current frameworks tend to index poverty through the resilience and humanitarian discourse that favours individualism within communities who experience great traumas in ways that allow for little change to occur. In addition, the logic of the humanitarian development framework places the responsibility for transformation in the hands of those most affected. The next section discusses the difficult relationship between wellbeing and marginalisation in Walvis Bay given the extreme uncertainties of life and life giving under late capitalism.

Chapter 4

In search of wellbeing in Walvis Bay: an anthropological approach

As an anthropological point of study, wellbeing emerges within the scope of a nuanced expression of the human condition. Understood as an anthropological concept, wellbeing is performed in both in its presence and absence; perhaps even it is being ‘othered’ in within everyday life in Walvis Bay. To conceptualise wellbeing in the marine industrial ecology of Walvis Bay is a challenge given its multiple possible permutations within the wide scope of everyday life and the more linear scope of fisheries management. Very quickly wellbeing risks abstraction from the context in which it is meant to both affect and represent. Working anthropologically, this work explores the ways in which people living in the strange microcosm of industrial Walvis Bay experience life in spaces that are both reduced and negated.

The premise for wellbeing emerges out of a history of violence, colonialism, and exploitation that contribute to the current material conditions for life experiences. This chapter argues that the relations between environment and society cannot also be contained within separate domains for the purposes of a holistic management framework, especially one that claims to expand the historical trajectory of single species stock assessment as the foundation for fisheries management. In this chapter, I examine how the discourse of neoliberalism, as a product of the liberation struggle, produces particular extractive relations between Walvis Bay, the hake fishery, and the extension of these practices in the everyday lives of Namibians. I aim here to show that the concept of wellbeing has yet to fully engage with the particular sets of relations that form Walvis Bay’s marine industrial ecology, due in part to the adoption of a suite of neoliberal interventions post-independence Namibia, that enabled highly institutionalised and large scale operations in the hake fishery. Wellbeing, as an anthropological site of study, is a concept that is shaped by the institutional structures, such as labour laws, Namibianisation policies, and business models for new ventures, joint ventures, and expansion of the hake fishery. Already constrained within these structures, I try to interrogate wellbeing from a place that challenges the a priori assumptions of human wellbeing as part of a manufactured management paradigm. Working in this way, wellbeing is situated within the processes of industrialism and urbanism that mark the everyday lives of residents and the social and political history of labour in extractive fisheries in Namibia. In order to conceptualise what nodes of life can effectively contribute to an expanded management framework, wellbeing needs to be explored first within the context of everyday life in Walvis Bay, before the particular areas can emerge as components of the management framework, and ultimately used as part of a computer

model for fisheries management. If indeed the ultimate goal is to produce an indicator framework in which components of ecological wellbeing, human wellbeing, and governance align in decision-making practices, wellbeing as a category is severely limited as it currently stands.

At first glance Walvis Bay seems like a sleepy seaside industrial town that is sparse and remote. The quietude can be unsettling and hard to get used to and one needs to adjust to the daily pace of life that moves a little bit slower. The town often has strange smells that emanate from the fish factories, the guano-harvesting platforms, and the salt marshes. The lagoon is bordered by a walkway that runs from the business district, where there are restaurants and bars along the water, to the edge of town that leads out to the salt refinery and the lighthouse. The sunsets are breath-taking and on any day one can experience a diversity of wildlife such as flamingos, jackals, and dolphins. The flamingos which feed along the lagoon are an odd sight to a newcomer, as they wade in the shallow low tide. It takes about ten minutes to drive from one end of town to the other, and to walk from Kuisebmond to the lagoon takes about an hour. The industrial area is full of nondescript buildings, heavy machinery, and plumes of smoke and steam rise up and drift out over the ocean or across the dunes. The sand gets into every place you can imagine including books and beds, and there is a constant grittiness. To explore how the discourse of fisheries management, aligned within a history of single species stock assessment and a capitalist framing of nature produces a kind of fisheries science in the post-colonial moment, is to notice the uneven, unequal, and complicity of national resource management practices in maintaining institutional structures of power in the form of scientific knowledge as a basis for capitalism, and a neoliberal approach to public goods and services and post-liberation politics. Fisheries science discourse centres on the ideas of conservation, sustainability, and markets, while an anthropology of wellbeing centres on accessibility, stability, and a politics of the everyday in postcolonial Namibia.

Urban discontents

The wind is cold, cutting through my hooded sweatshirt and creeping its way to my skin. My hair whips around and I pull my scarf tighter around my neck. The wintry sky has turned a distant hazy indigo and as the sun goes down early, the first stars are dull in the cold dusky wind. It's not even 19.00 and I'm surrounded by drunk people. I sip on a Bell's whiskey and Sprite, chasing the warmth of the alcohol as it goes down my throat. The palms, guarded and hovering above us, creak and groan as the wind tries to disrupt their anchor. Narraville's Albatros Road is a hub of activity on weekend nights. Cars of varying degrees of status and modifications pull

through the clusters of people milling in the street. I can't see any other women around; I feel out of place yet welcome. What is going on here? Where are the other women? Across the street a seemingly defunct club stands shadowy and sad. The shebeen next door sells dumpies²¹ through its barred windows. Trash swirls through the air and sand gusts catch me off guard and smack me in the face. I'm cold. Friendly banter and shouts drift across the howls of the wind and sand. Just another Saturday night in Walvis Bay. Drinking, smoking, and talking about women. It's my first time to Narraville as a spectator, having spent most of my time in Kuisebmond township, on the other side of the highway. Narraville is the coloured township, Kuisebmond the black township. These distinctions reflect the omnipresent racial sentiments and segregations. Walvis Bay is one of the most racially segregated and racially charged towns I have been to. But tonight in Narraville, I feel less alienated than on other nights out, an almost acceptance. Almost. – Field notes, May 2013

The day was hot and dusty when I arrived on Sandwich Street in late morning on 21 March 2013. The east wind was blowing and brought hot, fierce, gusts that blasted particles of sand and rubbish into my face. The usual coolness of the Atlantic mist immediately evaporates when the east wind howls, angry and unforgiving. I greeted the neighbours that live at the front, near the road, and walked through the sandy pathway to the back. Four shacks are constructed in what is essentially the front house's backyard. Meme Tresia and her family live here and share the space that the four buildings offer. The brothers stay in one shack and the sisters in another. I duck in through the doorway to Meme's shack, my eyes adjusting to the dim light inside. I see her bright smile and a distinct laugh fills the air as my friend Darya and I exchange hugs and the traditional Oshiwambo greetings with her:

Wa lapo Meme –

Eh –

Nawa –

Eh –

Wa lapo Meme –

Eh –

Nawa –

Eh –

I spent the rest of that morning and most of the afternoon in Meme's home, with her sixteen-

²¹ Dumpies refer to quart size bottles of beer. They can be shared amongst several people or consumed by a single drinker. Glass deposits are given for the empty bottles, so empty bottles are collected in crates.

year-old son Phillip translating from Oshiwambo, and Darya to help translate in Afrikaans. We had brought kapana²² and vetkoek²³ along with cool drinks and crisps, and we all sat in the small lounge area while the television played muted in the background. People drifted in and out of the open door and the flies buzzed greedily on our sweat and empty food packets. That day marked the twenty-third anniversary of Namibia's independence. It was technically Autumn but the east wind made it feel like mid-summer. The small television sat on top of the wobbly wardrobe and was switched to NBC (Namibia Broadcasting Corporation), and was playing a historical piece on the liberation struggle. I stopped briefly to watch a scene on the battle at Omugulu gwombashe, which was the SWAPO base set up in the north as war between SWAPO and South Africa became a reality towards the end of the 1960s. In July 1966 the International Court of Justice (ICJ) failed to declare the South African occupation illegal and SWAPO stated that this relieved "... (our people) once and for all from any illusions which they may have harboured about the United Nations as some kind of saviour in their plight ... we have no alternative but to rise in arms and bring about our own liberation," (Wallace 2011:268). On 26 August 1966, South Africa's military forces discovered the base at Omugulu gwombashe and launched an attack. South Africa easily won the battle but the collective memory of the events of that day has come to symbolise much more. The day is historicised as the start of the liberation struggle and armed war against South Africa (Wallace 2011). Omugulu gwombashe was also the physical site of the start to a bloody war in the north and the reign of widespread terror, attacks, harassment, and arrests.

Namibians have a way of speaking that often conceals deeper meanings and emotions. Perhaps the most untouched, quieted topic of discussion is people's experiences, understandings, and perspective on the liberation struggle. A sense of deep silence surrounds the violent history that is not a part of history curriculums in schools in Namibia or in South Africa. There are a handful of scholars who have done extensive work in Namibia (cf. Cleaver and Wallace 1990; Wallace 2011; Melber 2007, 2014; Soggot 1986; Saul 1995). When I asked people what they remember life to be like before independence, their answers were vague and mentioned life in the rural area, homestead life and little contact with the outside world. However, when probed a little further, what emerges is a deeply rooted sense of 'holding it inside', an emotional sensibility

²² Kapana is the local name for meat that is cooked over open fire. The meat can be spiced and seasoned, and in Walvis Bay is sold informally on the streets in Kuisebmond as well as along a couple of the paths that lead to the industrial areas. I would go up to the seller (could be male or female) and ask for N\$10 – N\$50 worth of meat (depending on for how many people). Kapana is essentially a kind of street barbecue and is cooked whilst you wait, then chopped into smaller pieces and wrapped in newspaper.

²³ Vetkoek is dough that is deep fried in cooking oil to make a kind of pastry. In Namibia, it is usually eaten along with kapana and isn't seasoned. It comes from the Afrikaner tradition and is widespread in townships in Namibia and South Africa. There is usually a woman selling vetkoek alongside the kapana sellers and they usually cost N\$1 each.

of resistance to outward expression. As Meme Tresia explained, “when you experience suffering, it is a part of life. You must suffer first, and that suffering is life.”²⁴

Meme Tresia is from a village in northern Namibia. She left the village and migrated to Walvis Bay when she was just a teenager. She was orphaned in childhood and raised by other family members that resulted in her drifting from one village to another. When she became pregnant at age fifteen she decided her only chance was to try and make it to Walvis Bay. She heard talk of people in Walvis Bay who were making it there, getting jobs, and having money to purchase a house or car. She remembers, “We started hearing things, people who would leave and come back. Telling us stories of what it was like there. What they saw. We became curious, and then we also wanted to be there.”²⁵ Because she had spent much of her life without much support, no formal education, and was pregnant with her first child, she felt she had nothing to lose. Most of the information about the urban sites such as Walvis Bay and Windhoek that circulates in the rural areas is in regards to jobs. The staggering unemployment rate in the country means everyone is looking for a job.

Meme Tresia remembers the moment in life when everything changed. Her life experience has not been easy. Long term exposure to abuse, hunger, sickness, and an unrelenting sense of responsibility for the lives of others, she was drawn into the dream of Walvis Bay. Despite the hardships that systemic violence and abandonment have thrown in her path, she is able to reconcile her struggles internally with her own acceptance of life’s interventions. Meme remembers how quickly her life changed when she met a foreign aid worker in the north. Meme had already relocated to Walvis Bay but was in the north visiting home. The foreign aid worker befriended her and was able to assist her back in Walvis Bay. The encounter with the aid worker was the divine intervention for Meme Tresia. All events that followed pushed her into a new realm of the living. Meme’s life wears hard on her body and her strength shows in the tautness of her skin and on her weathered hands. Meme Tresia is a well of being, and she has a thoughtful depth in how she understands her place in the world and how she relates to other people. Her story is one that reconfigures the human condition through the ability to think about the pursuit of life and life giving. Walvis Bay looms out of the mist and sand as a beacon of hope. Upon arrival however, the city can be harsh and landscape unrelenting. Meme’s story is one of many similar stories I heard in my time in Walvis Bay. The fight for visibility, opportunity, and human connection that is mediated by the harsh industrialism of Walvis Bay.

²⁴ Interview with Meme Tresia 21 March 2013, Kuisebmond.

²⁵ Interview with Meme Tresia 21 March 2013, Kuisebmond

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Once I became familiar with Walvis Bay, I began to notice the subtler ways in which people and place often converge in unfamiliar ways. I began to enter many disparate spaces, navigating my own place as an outsider, a foreigner, but also as a resident of Walvis Bay. I became aware of the different attitudes and activities that occur throughout the city, at different times. I lived in a granny flat on Peter Mueshichange Street in what is called 'town.' Town is made up of a grid of residential streets that form off the town centre itself, where the majority of shops and businesses are located. I could easily get to the business centre in just minutes. Going north leads to the industrial area which is bordered by the Kuisebmond and Narraville and is the way to Swakopmund. Going south leads to the affluent Meersig residential area that borders the lagoon. Further south lies the salt marshes which spill out into the dunes. Going east will lead straight into the desert and dunes, and is the route to Windhoek which is approximately 350 kilometres away.

The social structures of Walvis Bay town centre, Kuisebmond, and Narraville are arranged strategically within these areas. As mentioned, Kuisebmond is the black township, Narraville the coloured township, and the town centre is both businesses and a majority white residential area. To travel between the different areas is an interesting exercise in listening and talking. Between language barriers and racial undertones, I was acutely aware of how I presented in these spaces. I never felt unsafe, but I did always feel the outsider, a feeling that I was honestly never able to shake. I had friends and colleagues in all areas of Walvis Bay, but spent much of my time in the industrial area where the fishing operations are and in Kuisebmond.

I met Phella in 2010 when I was doing fieldwork for my Master's Degree. He works for Cadilu Fishing as a fleet manager for the company and oversees all activities related to the operations of the fishing vessels. He is responsible for making sure the vessels that go out are adequately equipped with ice, food, gear, and crew, and he oversees the re-fuelling process. When the vessels come in he ensures that offloading of catches follows protocol. While the vessels are at sea he is in constant communication with the skipper and monitors the fishing from land. He and I have shared a friendly working relationship for many years and he is integral in my project. He openly commented on and analysed the industry, and he organised my participation on fishing trips. Phella was my go to person whilst I was in the field, an invaluable resource for many of the questions I had about the inner workings of the industry itself. A black Namibian/Angolan, Phella lived in Narraville. The first time I was invited there, I was surprised

at how different the social dynamics were from both town and Kuisebmond. I felt an immediate sense of acceptance and even though my Afrikaans was less than useful, I still felt very much included. I was also struck by the ways in which people expressed their personal insights into their own place and existential moorings in Walvis Bay. I had not experienced the same kinds of discussions with my friends in Kuisebmond. The openness to talk about life's uncertainties was a welcome surprise. In Narraville, humour was often used to make sense of a lot of the anxieties that were shared in terms of work related issues, marriage and families, and finances. These anecdotes are presented here as a reminder that there is power and purpose in describing, in witnessing as much as in theoretically ordering the world.

As I stood with Phella and his friends in the street, listening to house music pump out of car speakers against the constant revving of engines, I had to smile. I was, in a way, crossing invisible boundaries, provoking on one level what it means to be bounded by space, time and history. And, along with my friends and peers, I was learning to make sense of the absurdity of life in such a distinct place as Walvis Bay, on the edge of southern Africa. There lingers a sense of melancholy I feel, that such a beautiful place as Namibia can harbour so much suffering and unrest, a place still haunted by its many ghosts. A frontier town in many ways, it remains a beacon of hope for those coming from specific historical conditions, yet the ruggedness and isolation can get under one's skin. The use of drugs and alcohol in particular, reveal a desire to numb and relieve oneself of the tragedies of the everyday. Death is a constant presence, one that contrasts quite starkly with the sea, and the upwelling Benguela Current, one that is nutrient rich and teeming with microscopic life.

My friend Darya was working as a volunteer at the Kuisebmond Community Centre where she ran an after school programme for children, most of whom were HIV positive. The children ranged in age from 3 to 17, and were at various levels of schooling. However, age and school level are another form of indexing that often hide the realities of a broken education system and very little institutional support. My friend Tio, for example, was 16 years old when I met him as a shy, lanky kid at the Centre. He was the oldest one there. Tio is polite and always thought to offer his help. I quickly became very close with Tio and would often visit him at home on the weekends and go for walks around Kuisebmond. Tio wanted to build computers. His prototype was a very old IBM desktop that barely worked, but he was determined to learn its inner workings. Only later did I realise that Tio, despite being in grade 9, could barely read. He could fix a computer, but he struggled to read a novel. We started taking walks to the library and spending some time there in the afternoons to read and do homework. I owe much of my integration into the community to Darya and her always bright outlook toward people despite

the everyday challenges and emotional exhaustion one can feel working in difficult environments.

One can feel quite alienated in Walvis Bay, but with time, amidst all of the discomfort and estrangement, one develops and nurtures the relationships that underpin us as humans, and our need to connect. I was fortunate to have a network of very close and wonderful people to support me. They are an eclectic group of people, but they are part of the reason that makes doing long term, ethnographic fieldwork and research worthwhile. In retrospect, I was probably more miserable in Walvis Bay than I thought. But the misery only came later. At first, I often felt like I had time travelled or I was suspended in a kind of dream experience. From the morning mist, the rather monotonous movement of people through town, and the glaring reality that I always stood out, I definitely needed an adjustment period. In the mornings, the mist from the sea hangs overhead, in a cool shadow, obscuring the light, until the sun finally burns through, and the mist lifts, giving way to sharp sunlight that warms the sand and dries the moisture from the air.

Walvis Bay is a frontier town and it attracts different types of people, each on their own path to discovery and success. The stories and experiences that I heard from friends, fishermen, government officials, sex workers, and children amongst others, were slowly taking form as part of my exploration into the messiness of the human condition. Although I didn't think of it as such at the time, I was building an inventory for the constitution of wellbeing in the context of Walvis Bay. In each story I heard, each interview I did, I gained a sense of how people navigate the murky terrain of transience, uncertainty, hope, and desire. Walvis Bay thrives in its contradictions and people are able to find an understanding of the world they are in despite the continues markers of excess for the Namibian elite.

As a researcher, I had to navigate the tumultuous social dynamics of Walvis Bay through my own experiences of living and working there. I spent just under two years in the field, and in that time I began to understand the ways that research is contextually rooted in actual experiences and in ideas that underpin a way of doing anthropology that focuses on the individual in situations. The story of migration, movement, and flux is an important component of the postcolonial experiences of Namibians. Movement is a dimension of human life, exemplified in the experience of the migrant body, held in tension with the notion of home, a homeland, a place of origin. My friends were in a band and one of the members, Gerson, wrote a song called *Kulila mo mondesa*²⁶, which translates roughly as place, home, homeland. He sings in both English and Oshiwambo. The first verse of my favourite song of his goes like this:

²⁶ Used here with permission from the artist.

*I wrote a letter
I address it to my Grandma
Says my mother want me to go and live in the city
The year was '95 and since then I've seen it all
Lies betray your hatred, start shaping my life
I pray that when I go, dear God brought me this miracle
My road which is the Savanna*

*Chorus
Kulila mo mondesa
Kulila mo mondesa
Kulila mo mondesa*

The song is written as a letter to his grandmother at the time of transition just after independence, and describes his journey, as embodied in so much of the shared Namibian experience, from the north to the city in search of a different life. The second verse is sung in Oshiwambo and describes the shared experiences of Namibians through their being connected through the symbolic umbilical cord of the Kalahari Desert. The symbolism of the Kalahari is that it birthed generations of families and tribes, many of which are now part of present day Namibia. The song ends with the line –

*We are like the river that flows from the wind
This place is for you and for me*

At the core of my work to explore wellbeing is a commitment to piece together the (in)congruous elements of the strange industrial landscape of Walvis Bay. Central to my exploration is to understand the fishing industry as experienced through the lives of the people that are both directly and indirectly affected. At the core of contradiction is difference, and these differences shape the experience of life and life sustaining practices in post independent Namibia. What I saw, heard, and felt contribute to my own analysis and experiences, and I soon realised that things are often not what they seem. Precarity is a very real component in Walvis Bay where employment opportunities and a sense of social and political stability mark the current moment. Like South Africa, Namibia has a human rights based Constitution that

declares a national commitment and obligation to utilise the country's resources "for the optimal social and economic development of all Namibians."²⁷ However, the daily struggle of Namibians reflects a different experience. The stakes are high in Walvis Bay and as conditions become ever more precarious, life, and the affirmation of life and life giving, form the realisation of the living (McKittrick 2015). In Walvis Bay, the realisation of the living affirms the life of mutually constitutive beings and illustrates that life is not infinite, that resources are finite. Namibia's history is marked by colonialism and unregulated extraction of natural resources. Together, these historical forces have shaped not only how fisheries science is done in Namibia, but also very tellingly demonstrates how these legacies of oppression coupled with the evolution of capitalist nature have resulted in Namibia's current social and political structures.

Life under capital in a marine industrial ecology

The sandstorms that blow piles of sand into houses, under doorways, sparing no corner or crevice, are a metaphor for the exposure that this supply-town has within global markets. Walvis Bay has an emptiness to it, from the isolation and vastness of the landscape, yet it maintains its position as distinctly within the globalised world of extractive economies. Within such economies is a dissonance between the industrialism of extraction that exists alongside the conservationist and tourism agendas. Walvis Bay as link in the global supply chain economy surfaces a kind of surrealism, or surrealistic vision in its position in a global network of similar supply-towns stuck in extractive economies.

Namibia's hake fishery is situated within the broader network of the global food economy and sees nearly 90% of Namibian hake exported to South Africa, Europe, and the USA. Namibia is also situated within broader economies of tourism and conservationism. Namibia's tourism industry is founded on the biodiversity and physical landscape of the country. It attracts the landscape and wildlife photographers, nature minded folks who want to experience safari, and the sheer beauty of pristine physical geography and landmarks. With its German colonial history, there is a noticeable presence of German and other European tourists, and Swakopmund in particular caters to them via German bookshops, bakeries, delis, and brauhaus-style restaurants.

Walvis Bay is a city whose residents come from many different backgrounds and most residents speak multiple native languages, with the dominant languages being Oshiwambo,

²⁷ The Constitution of the Republic of Namibia:
http://www.gov.na/documents/10181/14134/Namibia_Constitution.pdf/37b70b76-c15c-45d4-9095-b25d8b8aa0fb

Afrikaans, and English. There are also native Otjiherero, Nama/Damara, and Kavango speakers, where there are multiple regional dialects for each. In addition, there are also Spanish, Portuguese, and German speakers, as a result of colonial linkages and the global economy, whereby Namibia's natural resources remain very much a crucial link in the extraction and circulation of resources. In recent years, Namibia has also seen an increase in the Chinese population, as the trade agreements that emerged out of the liberation struggle allow for Chinese migrant work in Namibia. Fishing vessels and workers from Russia, Thailand, and the Nordic countries are also present at the fishing docks and in Walvis Bay town centre when vessels come into the harbour after fishing trips.

Many people I spoke to referred to 'looking for a job' or of being told 'there are jobs in the factories' meaning the fish factories, and someone always knows someone who might be able to help you get a job. Each day on Ben Amathila Road, named after one of the fathers of the liberation struggle and SWAPO, there is a queue of people that line up outside different companies. They arrive in the dark of dawn and wait to see if they can be hired for that day if the factory is particularly busy. Such practices reflect the uncertain and unprotected labour scramble, and also point to exploitation of labour that enables accumulations elsewhere. Many will walk away each day, with no job and no money, only to return diligently the next day, hoping, waiting, and praying.

In Walvis Bay, I see a partial truth in terms of how the remnants of Namibia's colonial past present a reality in which certain individuals and people are constantly undermined by those who would prefer to retain their power. However, the argument is also not simply a racial reduction that valorises the black body, but one that engages the question of "coloniality in lived experience and not only in the mind," and "approaches from the perspective of racial and colonial sub-alterity," (Maldonado-Torres 2007:242). This presents an existential contradiction in how to situate oneself within the matrices of power still in existence as well as in a state of resistance through the desires curated and nurtured by capitalism. The contradictions of life on the margins are also framed in terms of how people make sense of and generate certain relations and status.

It would be easy to identify the Namibian experience within structures of political and economic arrangements solely, as a grouping of individuals who subscribe to the social mechanics of communities on the margins. In Walvis Bay you hustle, and if not you miss out. The idea of desire as being produced through the circuits of capitalism only goes so deep into the industrial ecology of Walvis Bay. Instead of abstracting desires, contradictions, and unwellness, I had to re-think how the effects of social, political, and economic forces on individual

lives could potentially become a part of the modelling framework in which I was trying to work with.

From the outset life in Walvis Bay looks like a fairly straightforward example of a society in transition, one marked by severe inequities and newly formed government who test their power and authority at the expense of the majority of citizens. However, the effects of transition, capitalism, desire pan out in unexpected and less obvious ways. As I spent extensive time in the Kuisebmond and Narraville communities I was able to witness the underlying social dynamics in places where history and modernity meet. Contingencies are the primary sources of the contradictions of life and are the textures that enable and disable, provide, and deprive. As I navigated the contradictions throughout my fieldwork, I began to see and understand the existential moorings of life under capitalism.

Life under capitalism is not easily translated into a language that a computer model understands. A computer model is underpinned by the abstractions of phenomena and the formalisation of abstractions through simulation. The design of the model works with the algorithmic formulas that assign values to specific abstractions. To take seriously the motion for an expanded management paradigm as well as the betterment of lives, requires a careful and critical exploration of the possibility for models to include and make visible the human condition in a way that does not reify its components into *things*, antiseptic and formulaic. Instead, the model would emphasise the experiences and material conditions that shape Walvis Bay through sets of relations that are dynamic and uncertain. Such a shift points to what Jason Moore calls the double internality in which “the mosaic of relations that we call capitalism work through nature; and how nature works through that more limited zone, capitalism,” (Moore 2015:1). The double movement, or double internality of capitalism through nature and nature through capitalism forms part of what he calls a new paradigm of world ecology in which the task is to put the post-Cartesian worldview to work on modernity’s structures of knowledge, dominant relations of power, and (re)production.

The entanglement of power, production, and perception and within the paradigm of world ecology shows that history is not understood from the hierarchy from above but “as the fundamental co-production of earth-moving, idea-making, and power-creating across the geographical layers of human experience,” (Moore 2015:3). The crisis of capitalism is not singular, but multiple, and manifests unevenly and asymmetrical. The rhetoric of capitalism assumes a rational world in which the freedom of choices determines one’s ability for economic mobility, social gains, and the ultimate shot at “the good life.” Contrary to conventional wisdoms, jobs do not necessarily equate to quality of life nor to opportunities for upward

mobility. I see this as a major flaw of the current management framework, that has honed in on employment, as jobs and lack of jobs are a very real concern for Namibians, yet as a de facto category for decision-making, there is a disjuncture in the roll out of management goals.

Within the competing industries of resource extraction, tourism, and conservation, there is a surrealism that surfaces in the way that the former depends on the possibility of extracting surplus value from labour, fishing vessels, and harbours where economy and ecology come together. In turn, this throws into stark relief the very idea of wellbeing in the context of extraction, as an indicator within such an economy. The contradictions also surface in the way that wellbeing comes to mean a functioning household ecology in which services are supplied. In addition, the industry is framed as the benefactor of successful household ecologies. The industrial marine economy however, produces just the opposite. In this way, Walvis Bay emerges as stark and alienated as the landscape it is built upon. The captive markets that result in national debt, very little distribution of wealth, and uncertain employment opportunities are symptomatic of the capitalist development agenda that Namibia adopted at independence. The national project of resource extraction has meant rapid growth and expansion, and uneven ways of monitoring such growth and the ecological and social consequences of such decision-making processes.

Scholars have taken on the project of conceptualising the distinct relationships that form within the current moment of climate crisis. For example, Erik Swyngedouw conceptualises the relationship between water and society as inextricably linked to form what he calls the hydro-social cycle, which points to “how hydro-social transformations are imbedded in and infused by class, gender, ethnic, or other power struggles,” (2009:57). The formation of extractive relations is thus bound by the discursive practices that inform them. In another example, specific discourses around hydraulic fracking, a highly contested practice of accessing natural gas from the shale rock deposits underground, are also embedded within the discourse of new energy, alternative energy, and the cost-benefit approach to extractive practices that produces specific extractive relations. Finewood and Stroup, draw from the case study of hydraulic fracking²⁸ to argue that on the one hand, the use of neoliberal benefit-cost analysis constructs water as one input into the hydro-social cycle in which risk becomes the defining feature of decision making, whereas on the other side of the debate exists a much more complex narrative about water that is decidedly noneconomic in its terminology (Finewood and Stroup 2012). Just as in the analysis of fracking, fisheries managers in Namibia should consider how the enterprise of fisheries are

²⁸ Hydraulic fracturing, or fracking, is an extraction technique that improves access to natural gas that sits within pores of shale rock deposits underground, a technique that is invasive and exploratory as well as providing quick gains in times of energy shortages (Finewood and Stroup 2012).

discursively framed within capitalist environmental frameworks. Namibia has a troubled colonial past, and to imagine alternative approaches requires movement in and between the radical humanism of lived experiences of the oppressed (to invoke Fanon). The project of resource extraction as a capitalist project is evolving at a different pace than the project of resource extraction as a long term vision of development for the Namibian people. Such a disjuncture produces extractive relations that are increasingly embedded in the language of neoliberalism, and wellbeing as a category for holistic management, where wellbeing is transformed into measurements, such as the percentage of Namibian ownership, the demographics of labour, and the rate of employment.

The elusive goal of being able to electronically model the human dimension, and more specifically human wellbeing, is part of the larger conceptual and practical use of the human dimension within the fisheries management discourse to represent the category of social and political relationships. The representational category of human wellbeing poses a set of expectations that assume the computer model can produce measurements of wellbeing that can be used to measure the management objectives of an EAF. As representational categories, the management framework addresses social inequalities and economic benefits through the enumeration of human behaviours in the computer models that produce statistical outputs that measure the successes of the management objectives.

The computer models that are currently available for use within the EAF paradigm for Namibia's hake fishery are now also called into use to generate specific kinds of information about phenomena that occurs out in the world, namely the social and political world. Barbara and I attempted to rethink and re-organise the kinds of information that could potentially form the basis for a computer model of EAF that is expanded to include the social and political dimensions. As the management model currently exists, an EAF remains largely conceptual, underpinned by the stock assessment models that continue to play an extremely large role in determining the TAC. The stock assessment models and the role of fisheries science in the contemporary moment continue to hold authority within the decision-making for fisheries management. The development of any kind of computer model for the human dimension is very much in a nascent state. As such, the electronic model was then built by Barbara, which involved deciding which of our indicators to keep. An indicator is only as beneficial as the data behind it. with, and our efforts to reconfigure those components into a framework that is both expanded and particular. The fuzzy logic model that Barbara developed in her prior work in the Namibian hake fishery became the site of experimentation at which to grapple with the seemingly irreconcilable goal of including the human dimension into the management model without

reducing the human dimension to measurable variables to produce an outcome. Our laboratory became the kitchen table and we challenged ourselves to a thought experiment where we asked ourselves, what could ultimately be the best case scenario for modelling the human dimension within the given framework of an EAF?

The use of computer models in fisheries science and management activate a certain kind of logic that inform policy but do not necessarily represent the material conditions in which they operate. In other words, the work presented here must also be a part of the very structures it attempts to study. In this way, a type of inversion occurs where the research unearths the sets of relations that generate meaning instead of meaning being attributed to presupposed conditions. The idea is that the results will also feed back into the decision support tools that are developed simultaneously, and provide concrete linkages between the objectives of the conceptual model (EAF) and its ability to produce tangible information with regards to the sets of relations that span across the entire sector. The conceptual model is required to produce information and within the institutionalised framing of fisheries science, the model will also inadvertently produce actual extractive relations between fish, fishers, economies, and time. A different imaginary emerges when multiple realities become part of the structures that define the relationship between nature, history, and capital. Moore refers to this structuring as the web of life, whereas Stengers invokes a cosmopolitical vision in which to reconfigure the sets of relations that sustain and also deprive, the marine industrial ecology that is Walvis Bay.

Stengers (2011), as part of her cosmopolitical vision, discusses an ecology of practices that begins to take seriously the possibility of practices disentangled from authority, from competition for power and legitimacy, and performance through divergence. Authority in the fisheries context throws into stark relief the effects of neoliberalism in extractive economies. The Minister of Fisheries, when setting the TAC for the year, relies on the authority of the stock assessment model to inform him of the threshold at which the maximum amount of fish can be extracted. Here, stock assessment science, political decision-making, and value are utilised as tools that tighten the relationship between nature, capital, and authority. Without the historically entrenched authority of stock assessment science, fisheries managers and ultimately the Minister of Fisheries, would have a different basis for fisheries governance. Stengers argues that 'slow science,' is a way to think critically of the plural ways to be in and understand the world. Computer and conceptual models are interventions to address the role of the sciences as deterministic tools that reduce experiences, sever relations, and erase subjectivities. In other words, holistic management has only just begun to address the categorisations of the human dimension of fisheries management in ways that seek to dismantle some of the structural

authority of fisheries science and governance in Namibia's hake fishery post-independence.

A capitalist vision of nature was adopted at independence, in a way that reflects a national politics for Namibians after decades of colonial oppression. However, the way in which the democratic political project so willingly adopted the neoliberal vision, gives insight into how a country that has a wealth of natural resources has betrayed the majority of Namibians by excluding them from participatory politics and reduced them to potential labour power. The surface level work of holistic management is most visible in the labour laws, the quota allocations, and rights allocations. In addition, the core concern for management is to manage the expectations of the TAC and the distribution of quota.

Slow science can assist in disentangling the effects a capitalist vision of nature and how it shapes the social reality of the fishing community and Namibia at large. Specific computer model designs inform the conceptual model for management and decision-making practices connect the practice of science and research to practices of thought. An environmentalism in the hake fishery that encourages the design of models that emphasise a variety of relationalities to express a capacity or willingness to experiment with new relationships, experiences, environments, and interests can offer a way forward to manage fisheries in the postcolony. Throughout my work Barbara and I have kept an ongoing dialogue between my work as an ethnographer and her work as a modeller. This puts us in a unique space in which my research has been able to evolve as it was put into conversation with her knowledge based decision support tool. In turn, her work as a modeller benefits from the input into the development of the indicator framework.

One of the great lessons in working directly with a modeller is that I was able to see the subjectivity of the model. From the kind of information collected, to the ways that data is organised, to the inclusion or exclusion of that data into the computer model, all of these steps require the modeller to be making judgements along the way. The interesting part of working together with Barbara was that in our thought experiment, we are not working toward a definitive objective or output, but rather we are interested in the very ways in which information, data, and knowledge are performed within the realm of fisheries management.

The process of experimenting with the structures and limitations of an EAF conceptual model in order to develop practices that could eventually contribute to a computerised EAF model, resulted in a profound sense of disconcertment. And as Helen Verran rightly emphasises in Stengers' work is that "we need to understand that entities emerge in the standardized practices of scientists actually *participate* in the specific comparisons underway," (Verran 2011:65, emphasis in the original text). Only once we are able to recognise the role that science and the emergent practices of scientists that require, those interested in the performance of knowledge

through scientific practices, can we begin to grapple with the ethical and political challenges of the sciences. To work alongside Barbara, whose background is in computer science, provided an opportunity to observe how the modeller herself imparts specific value judgements into the formulation of a computer model.

Previous chapters discussed the role of computer models to produce results that are often based on false assumptions about objective scientific practices. For example, the stock assessment model assumes there is an actual hake stock that can be counted and assessed. Authority assumes the representational power of a computer model to scientifically determine the amount of hake in the ocean. Control within the industry hinges on the authority of representation. Authority is part of the legacy of colonialism and fisheries science in Namibia that speaks to the global standards of modernist bureaucracy that relies on categories that separate the natural world from the social world. All of these points can frame the need to discern and interrogate the ways that eventfulness, tense, and ethics assist late liberalism in achieving its penetrative work (Povinelli 2011). There is an a priori assumption as to what wellbeing means that often places it as an abstract opposition to poverty, which further promotes a framework of separation and dualist thought.

The challenge is to disrupt the a priori status of wellbeing as a de facto category in opposition to poverty. The management framework that places poverty and wellbeing in opposition, fails to see technology as a political force which results in an inability to see politics as a material force. Indeed, such frameworks have a problematic conception of materiality as such. Wellbeing as a concept in the fisheries sector emerges from international standards and frameworks for systems based natural resource management. These frameworks combine indicators (measurable objectives) from the three overarching categories of ecological wellbeing, human wellbeing, and governance. The frameworks are inherently committed to measurable objectives which results in the enumeration of data, which feeds into the modelling projections, as seen in the stock assessment model.

To situate human wellbeing within a performative analytical framework can conceptualise human wellbeing as the point at which fisheries science and anthropology connect and separate. The limitations of human wellbeing as something which can be modelled vis-à-vis fisheries science models have been discussed at length in the preceding chapters. An ethnography of Walvis Bay begins to unearth the efficacy of both the concept and actual experiences of human wellbeing in Namibia. I was able to utilise parts of my fieldwork data even before I had left the field, to experiment with the conceptual model of EAF. The disconcertment that arose for me, was the feeling that I while I was actively committed to a

different vision of the EAF model, I found myself wondering if I was not merely reproducing the indicator framework from the position of the status quo. Our new indicator framework was certainly expanded and particular in the kinds of data that would be useful to include in the EAF management model. In our attempts to generate an indicator framework for human wellbeing for an EAF, Barbara and I were able to sketch a design for a knowledge based decision support tool that takes into consideration the sets of relations in Walvis Bay that contribute to the material and existential conditions of wellness, as understood from qualitative data collection over the course of eighteen months.

The disconcertment I felt while reconfiguring the indicator framework stems from a discomfort in the ways that comparison can and is used to further indebted science to industry. The stories I collected in the field traverse a range of experiences, ones that felt shared and specific, but also point to a larger conversation about the current state of the global economy. Despite my initial sense of tragedy and desolation, Walvis Bay has emerged as a vibrant, industrial point along the expanding nexus of supply chain towns across the African continent. How do stories, subjectivities, and experiences inform a conceptualisation of human wellbeing and the human dimension? Will the stories of resistance, of slow-burning passion for life and living, and stories of pain and suffering become lost within the structural ordering of variables, outputs, and measurability?

To address the sorts of frictions that emerge through the production and translation of information into computer models, feels both uncomfortable yet urgent. It is uncomfortable perhaps because of the urgency coupled with the inclination to want to include everything so as not to discount anyone's experience. Because the computer models rely on the input of the best data to produce the best results, it felt a bit strange to compress the experiences I had been collecting in the field into data sets to be input into the computer model via the knowledge based decision support tool. However, the knowledge based decision support tool can improve, and because of the experiences of the modeller, in this case Barbara, who is committed to designing a computer model that addresses the complicated nature of indexing human wellbeing. Our efforts to design a knowledge based decision support tool that is critical of the assumption that the human dimension can be encapsulated in a few keywords, such as employment, health, and education, is self-reflective and incomplete. Fisheries management needs to move towards a framework of inclusion, one that centres on the sets of relations and mutually constitutive components of Walvis Bay as a marine industrial ecology within the limits of capital.

The surrealism and disconcertment that exists in trying to locate a comparison of the practices that inform the questions of fisheries management in Namibia is compounded by the

continued practice of industrial fishing alongside the warnings of stock decline and ecosystem health. The urgent questions are thus resolved through the authority of fisheries science and the predictions that emerge from the often bad-faith comparisons of fisheries science. For example, the Minister of Fisheries allocates a specific weight of fish catches to designated players in the industry, with a total amount calculated as the threshold for sustainable yearly catches. The minister can also exercise full discretion and allocate more or less tonnage, in the form of fishing quotas, for a given year. Fisheries management has thus become the foundation on which neoliberal decision-making occurs. While Namibia's Constitution touts a commitment to ensuring that all Namibians have access to food, shelter, employment, and healthcare, and whose natural resources are meant to provide for all citizens, what I experienced in the field points to a vision in which Namibian workers become the sites at which to extract surplus value from labour. In turn, this throws into stark relief the very idea of wellbeing in the context of extraction, as an indicator within such an economy. The contradictions also surface in the way that wellbeing comes to mean a functioning household ecology in which services are supplied. In addition, the industry is framed as the benefactor of successful household ecologies. The industrial marine economy however, produces just the opposite. The captive markets that result in national debt, very little distribution of wealth, and uncertain employment opportunities are symptomatic of the adoption of neoliberal development goals at independence. Perhaps what is most useful to emerge out of this study, is the recognition that it is precisely around the concept of human wellbeing that fisheries science and anthropology both connect and separate. The disconcertment and difficulty with the connection and separation should inform the practices that can be utilised to further the goal of fisheries management for all of those involved in and linked to the fishing industry in Walvis Bay. Meme Tresia, my friend Gerson, the hake biologists, Dr. Kirchner, Barbara, Tio, Darya, and myself were all connected by sets of relations underpinned by our shared experience of living in Walvis Bay. We are all linked to directly and indirectly to the fishing industry and despite our disparate life experiences, we were able to find the connections to sustain relationships and inform how we think and live our humanity.

Ecologies of wellbeing: efficacy, life expressions, and buen vivir

At the forefront of an ethnography of wellbeing in the fisheries sector is the challenge to at once define wellbeing and question what it is that makes life worthwhile. Existential anthropology presents a lens in which to engage such questions. The idea of wellbeing in the fisheries literature has become somewhat of an empty signifier and contributes to the erasure of subjectivities and

the severance of the sets of relations that give wellbeing traction in fisheries management. To render reality as singular flattens the ways of to understand and experience the metaphysical cosmos and thus directly affects how we order and engage with reality. As Law and Lin note

In the Western tradition an originary and potentially continuing chaos is treated as a threat to be repelled by order. Reality becomes a single cosmos, with a specific and coherent form, shape and motion, whilst the stuff of reality, ordered into shape and form, is inert or indeterminate in and of itself. So what is an explanation? To explain is to move away from what is described to the description itself. It is to displace, a characteristic of what Hall and Ames (1995) call ‘second problematic’ knowledge. Some other consequences follow. For instance, history is teleological, driven by underlying causes. Again, since the cosmos has a single pattern explanatory consistency is not only possible but it’s also important. Further, since explanation involves explicating underpinning principles, differences are often handled by appealing to explicit meta-level abstractions. The result is that in the Western tradition, clarity and definition are valued. They help to deepen understanding and resolve explanatory differences. (2009:10-11)

To borrow from William James, the idea of pluralism is to invoke a pluralist world, or a cosmopolitical world. Difference and alterity are part of a generative process of disconcertment, as Helen Verran has argued (2013). Verran’s argument for showing the nature of difference and seeing through numbers is particularly compelling for this study in that the reality of logistics and algorithms in the model’s processes of reductions can give false consciousness to the reality of what those numbers represent. The orthodoxy of numbers allows for a baseline prediction to emerge, concretising the otherwise abstracted nature of numbers themselves. In this way, to cultivate disconcertment is to argue “that metaphysics, institutions and subjectivities are mixed together and mutually supportive of one another in the generation of knowledge spaces, hegemonic and otherwise,” (Law and Lin 2009:12). How can the efficacy of life emerge within these knowledge spaces, ones that are situated within historical processes of domination and in frameworks that are at odds with the generative capacities of life? What are the ways to bring the metaphysical underpinnings of scientific enquiry to bear on the very existential question of wellbeing?

The Walvis Bay experience for me was one of existential discontent, of struggle, and ultimately a recasting of how life is lived. Meme Tresia’s experience is just one example of the kinds of stories I heard during my research, and the fundamental question to wellbeing is a

question of life and life giving in the human and biophysical worlds. The internal spaces where anxieties and hope spring forth from are in tension with the complex and often ambiguous relationships with others that can camouflage the world's harshness. Capitalism thrives in these areas of ambiguity, hope, and anxiety. The accounts of survival that so many Namibians embark upon when they migrate from the rural areas in hopes of building a new and different life for themselves, reveal a mode in which individuals subject themselves to the existential dissatisfaction of being human in a capitalist world that has rendered them invisible yet demands their labour power for others to flourish.

Life in Walvis Bay is uncertain, punctuated by moments of rupture, transformation and rebirth. The stories of many friends and acquaintances I met in Namibia share a common narrative of movement and hope, disappointment and survival, but most poignantly, they are stories about what it means to be human in a world of ever increasing inequalities, racial divisions, and exclusions. To explore the terrain of wellbeing from an existential perspective evokes a humanism that is missing from the fisheries paradigm's turn towards the incorporation of the human dimension. In this way, the stories show the complexities in trying to capture what it means to be well, and thus the difficulty to input such abstractions into the management model frameworks.

As such, I frame my argument around inclusion rather than human exceptionalism to avoid the risk of trapping the latter in the discursive space of anthropocentrism. Life in Walvis Bay is centred within a narrative of struggle in marginalised communities who rely on the environment and its resources for life and life giving. The managerial solutions to fisheries management presents the model as an efficient means of social and political control, one that, intentionally or not, is complicit in perpetuating matrices of power that are situated within Namibia's colonial history.

The next chapter will expand on labour, capitalism, and the non-politics of power matrices, and show how labour forms a key intervention in the processes of relationality, as well as contributing to a sense of being in the world. Moving beyond the empty signifier of wellbeing is to dwell on the human condition, and emerges from a web of life that extends beyond the parameters, metrics, and statistical probabilities. Temporality, marked by movement reflects the in-between spaces in which events unfold, child becomes adult, life gives way to death and death gives life.

In a non-teleological way, time is the essence of experience, the mixture from which we craft our existence. People in Namibia like to talk about 'in those times,' which is an affectation for either life back in the rural areas before they migrated to Walvis Bay, or the time before

independence. The stories, underpinned by the common thread of movement and desire, span across generations and families and land. These stories illuminate a struggle for humanism and of nurturing the relations that exist in the marine industrial ecology of Walvis Bay.

To think through the porous boundaries of the fishing industry, of collective wellbeing, and in imaginings of the future, disconcertment must be welcomed. It is precisely this feeling of crisis and discomfort that can disrupt the status quo. The knots of history as the canvass of experience in the postcolony are what slip through the porous boundaries of nature(s). Efficacy and measurement generate a disconcerted friction, but one that is quite useful. Where measurement abstracts the experiences, the messy configurations of life on the margins, efficacy abstracts in a different way as it is grounded in the idea of propensity or potential rather than what needs to be reduced. A key intervention in the study of wellbeing is to dissolve the assumptions of what constitutes wellbeing in order to avoid the prescriptive modes of thought that tend to dominate in policy related work.

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The idea of life expressions exposes the ethical nature of the human condition in that “we never have anything to do with another human being without holding some portion of his life in our hands,” (Løgstrup 1971:58). This is a delicate yet highly ethical statement about the nature of people and the depth of our relations with each other. Løgstrup also remarks in his philosophy of ethics that, “as ways of taking care of others, the expressions of life fulfil the ethical demand – before the demand has even made it felt. The sovereign expressions of life are therefore more fundamental ethical phenomena than the demand that derives from them,” (Løgstrup 1971:2). These existential phenomena are complex in their own right, and the challenge remains in how to make sense of such complexities within the scope of an EAF for the management of people and nature in postcolonial Namibia.

To focus efforts to incorporate the human dimension into a modelling framework that broadens the particulars disrupts the idea that there are different dimensions of the fishery to be managed and that they operate outside of the others. Since the ecological dimension has traditionally been the domain of natural science, the question is how to achieve the paradigm shift necessary in order to move from prior measures of management policies that rely significantly on the science of the stock assessment model and the information it produces.

One strategy is to work toward a framework that activates the imaginary where economic incentives are subordinated to ecological criteria, human dignity and social justice, a strategy that

draws from the notion *buen vivir* in Latin America. Catherine Walsh frames the emergence of *buen vivir* in the Andes region of South America as an alternative to the Western capitalist principle that links living better with more development (2011). She argues that “for many, it is, in essence, the ‘paradigmatic’ (not just paradigmatic) frame against which the Global South in general and Latin America in particular have both measured themselves and been measured,” (Walsh 2011:15). Her statement shows how the development frameworks are linear in their efforts in enclosing both the human condition within parameters of modernity under the auspices of progress and civilization. To disentangle modernity from its underside, that of coloniality, again speaks to the matrix of global power that hierarchically classifies populations, their knowledge, and their lifeworlds ‘paradigmatically’ along a Eurocentric standard.

In Namibia’s hake fishery, the decision to develop at an industrial scale speaks to this narrative of modernity guided by Western principles of progress. Growth, and in particular the potential for economic growth within capitalism, becomes the mode in which extensions of power relations materialise. In this way, the notion of development signals more than material progress and economic growth but is also marked by a western model of judgement and control over life itself.

In the Andes region of Ecuador, Walsh tries to understand how the emergence of *buen vivir*, meaning living well or collective wellbeing, can be used as the guiding principle for an alternative development strategy. Importantly, in the 2008 Constitution of Ecuador, such a strategy “is defined as the organized, sustainable, and dynamic ensemble of economic, political, socio-cultural, and environmental systems that guarantee the realization of *buen vivir*,” (Walsh 2011: 15). The liberation movements across Latin America present alternative imaginaries of wellness that manifest in particular material and political conditions such as in the rise of socialist and populist governments, and increased solidarity across the geopolitical lines that link indigenous politics with a 21st century environmentalism that is anti-imperial and anti-capitalist.

As Callaghan (2015) rightly argues, there are unique ecological and material circumstances in which to arrange the sets of relations in Walvis Bay. As such, these sets of relations form certain existential risks in health, work, and pleasure. Transience is a major influence in Walvis Bay’s urbanism and its role as a port city along the coast of southern Africa. The town is a hub of both local and global movement of people, goods, ideas, and disease. The city is distinct in its segregation of the different townships and areas in town. Here, invisible borders still function as mechanisms of control, they are remnants of the apartheid state that separated and limited the movements of people, within the town. People told me of growing up in Walvis Bay near the lagoon, where the black population lived, whereas now the majority of

the black and coloured population have been pushed to the outer limits of town into the townships of Kuisebmond and Narraville. In the next chapters I chart how the contract labour system and subsequent apartheid state became the apparatus in which black bodies were moved across the country at the service of the colonisers. Such movements also marked the commoditisation of nature and the expropriation of land and sea during the fishing boom. In many ways, a search for wellbeing charts the ethical and existential dilemmas that interrupt and define different lives, including my own. Movement thwarts the existential angst of stagnation, of standing still, and slipping backwards.

As Ghassan Hage notes, movement as agency, “is when people feel that they are existentially ‘going too slowly’ or ‘going nowhere,’ that is, that they are somehow ‘stuck’ on the ‘highway of life,’ that they begin contemplating the necessity of physically ‘going somewhere,’” (Hage 2005:471). The road most commonly taken by Namibians is one away from the limits of rural life. Either by choice or consequence, the B1 highway is a symbol that marks the movement of people from the hub of the three O’s, Otjivarongo, Oshakati, and Ondangwa in the rural North. The highway is a quintessential thoroughfare in the history of capitalism on the rural-urban migration route. The role of chance grounds one’s agency and action and is at the heart of migration for many Namibians. The lure of the city as the urban oasis for opportunity amidst the backdrop of drought and a dying cattle industry, paves the way to Walvis Bay. Once there however, circumstances are different and pose a whole new set of obstacles. In the context of poverty, the mechanisms that link people, organisms, work, and desires are central to understand how specific relations foster specific kinds of being and engaging with the world. In a fractured landscape marked by the exigencies of the colonial labour system, racial divisions, and increased uncertainties, wellbeing underpins the relational, material, and affective conditions of life in Walvis Bay.

Chapter 5

Cheap empire: labour, capital, and nature

“Men make their own history, but they do not make it just as they please; they do not make it under circumstance chosen by themselves, but under circumstances directly encountered, given and transmitted from the past.”

Karl Marx, *The Eighteenth Brumaire of Louis Bonaparte*

Labour, and the food system in which fisheries form an integral part, lie in the shadows of the knowledge economy. In Namibia, the limitations to integrating human wellbeing into the management framework are in the massive structural inequalities in Walvis Bay that cannot be addressed simply nor with quick fixes. A human dimension has yet to be fully realised within the scope of an EAF, one that is dominated by the stock assessment model despite clear limitations for the management of Namibia’s hake fishery. This chapter grapples with the historical, material, and social trajectory of industrialism in the hake sector, a sector that employs upwards of 10 000 individuals and is a main contributor to Namibia’s gross domestic product (Sherbourne 2010; Kirchner 2014). Labour becomes a focal point in understanding the relationship of capitalist nature within the scope of postcolonial industrial ecologies. Within the scope of the labour movement in Namibia and in particular the valuation of labour within the hake fishery comes the challenge to establish an indicator framework for human wellbeing. To do so requires a recasting of how to think about the human dimension and to develop concrete indices of what constitutes human wellbeing in Walvis Bay.

Empire on the cheap

The commercial fishing industry in Namibia was built on the exploitation of black labour through a contract labour system. Today, the distribution of wealth and resources sees the majority of the raw materials leaving Namibia permanently. The Namibian economy relies heavily on mining, agriculture, and fisheries as its main sources of income, foreign exchange, and employment (Sherbourne 2010). Fisheries face an additional layer of uncertainty in that fish stocks are prone to collapse (Kirchner 2014). Given that fishing occupies such an important place within the Namibian economy, its management is crucial. To think about human wellbeing

in such a context where the management model itself is implicitly directed at improving market relationships with justice, seems an almost impossible task. Labour, capital, and nature form a particular kind of relationship in Namibia's fishing sector, and in its current conceptualisation, the EAF management model itself risks becoming part of a neoliberal suite of interventions specifically designed to work for the markets and losing touch with the liberation struggle that arose out of resistance to the contract labour system.

The Namibian context poses questions around how the use and abuse of human labour enacts specific material conditions in the fishing sector. Today, the material conditions manifest in the structural inequalities that mark Namibian society post-independence. The question for fisheries management is how to address the conditions as part of the management paradigm with the goal of establishing a framework in which they can be measured. Employment data has become the de facto category that frames the human dimension for fisheries management: yet there is a dissonance between employment data for management and the current state of the labour movement in Namibia.

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When individuals seek employment opportunities and new prospects in urban centres, they face systemic challenges in securing work. Uncertain employment options contribute to exploitative recruiting tactics and seasonal or other forms of temporary work. Kuisebmond township is strategically located near the industrial zone, the area of town where the fish factories and jetties are housed. Paths are worn through the soft sand and hardened by the continuous footwork of those travelling to work. I spent many days walking these paths, particularly during the peak travel times, when people 'knock off' around five in the evening. In a place where it often feels eerily empty and quiet, these times are busy and loud with a flurry of people moving along in brightly coloured uniforms. Hair nets are a common accessory, indicating work in a fish factory, where hygiene and sanitary practices are highly monitored for quality control. People are eager to return to their homes, change out of the heavy work overalls, and prepare supper or have a beer. Alcohol consumption is a common pastime, and in Kuisebmond there is a lingering smell of stale beer in the streets and empty quart bottles stack up outside the many shebeens, or informal drinking establishments. A product of a consumptive economy, poor living conditions, and migrant labour, alcohol is an escape. Time passes slowly in Walvis Bay, and at the same time it is highly linked to the working day and hours, ticking slowly towards the hour where one can

knock off. In this sense, the urban centre can be both an oasis of opportunities, as the welcome sign indicates rather (un)ironically, or a haven of escapism and uncertainty in the urban centre. For those coming from the rural areas, it can be overwhelming and alien.

Poor, black labourers migrate from the rural areas in search of work only to face not only a lack of jobs but proper labour laws that regulate outsourcing, contract labour, seasonal/temporary labour, working conditions, and wages. When South Africa began to govern then South West Africa in 1921 as a result of the League of Nations mandate at the end of World War I, the colonial powers carved up Germany's former territories and distributed them amongst themselves (Wallace 2011). Under the auspices of a 'sacred trust of civilisation' the South African administration was to 'promote the utmost material and moral well-being and social progress of the inhabitants,' (Wallace 2011). However, South Africa went against the League of Nations mandate and quickly began exercising total control over the Namibian people and implementing the structures of segregation that would come to be known as apartheid. Thus, at the moment when many other African countries and postcolonial thinkers were beginning to overturn colonialism, Namibia, or SWA, was taken up into a new colonial order; a home-grown southern African version, the coloniality of the Apartheid state.

The documentary *Paths to Freedom* (2014), presents the liberation struggle in Namibia through extensive interviews with many of those who fought as Freedom Fighters in a decades-long armed liberation struggle against the South Africans, culminating in independence in 1990. The origins of the liberation struggle are particularly relevant in the current moment because of their shared focus on labour. Since labour is at the core of Walvis Bay's industrialism and growth, it is difficult to accept approaches to fisheries management that tend to only regard the number of jobs created. The history of Walvis Bay and the people that came to inhabit it, whether by choice or by force, are entangled in a complex relationship to the extraction of natural resources and the opportunities for life improvement in the urban centre. The value of work has already been reduced significantly within the quantifications of extractive economies and logistics. In the Marxist sense, the shift to waged labour and ultimately the creation of class, marks the turn toward a specific valuation of labour and nature within the scope of capitalism.

The fishing empire was built upon the simultaneous extraction of the marine resource and the land-based operations that were built by the extraction of labour power from the collective of black African bodies during the colonial period. The fishing empire is not as stable nor lucrative as it once was. Indeed, it is beginning to crumble, as fish populations worldwide have collapsed or are in slow recovery. The experience of black Namibians however, remains entrenched in a system in which cheap labour is continually extracted and exploited, and seen

most clearly in the seasonal/temporary work, non-contract work, low wages, lack of employment benefits, occupational health hazards, and industry hierarchy in which workers are consistently made invisible. These observations contribute to the argument that the post-industrial dystopia that emerges from an empire made on the cheap is a result of the relationship between labour, capital, and nature. The vulnerability of the fishing empire is reflected in my own experiences of scepticism and distrust from many company executives about my interest in the fishing industry. From the workers, I sensed and felt an outright fear and discomfort, especially in certain situations where there were managers, human resources representatives, or supervisors present. The tactics of control that industry uses to silence workers coupled with the government's complicity in promoting employment opportunities no matter the quality and permanence, leaves little room for workers to engage in wage negotiations, decision-making procedures, or to make a case for labour violations.

I experienced these tactics as I sought to interview individuals early in 2013 at one of the larger hake companies. Due to a combination of miscommunication and the disaggregated company structure, I was in contact with both Human Resources as well as the company manager himself directly. My interactions with HR, in which a representative assumed I wanted to conduct interviews on the spot despite my explaining to her that I was only enquiring about the possibility of future interviews with workers, meant that I quickly found myself in a situation where workers had been called out of their daily activities to speak to me. When the company manager found out about this he became very concerned about my intentions, wanting to know who had referred me there, and about the confidentiality of certain aspects of the fishery.

My experience with this company is telling in how the operations of each company are physically behind gates, a symbol of both the wealth that exists within the gates protection and the enclosed nature of the industry itself. Companies do not make it easy to access the premises. The invisibility of the workers is very much apparent once on the premises, further demonstrating the secretive nature of the industry, with much scepticism and doubt about interests in the company, particular when it comes to workers. It also speaks to the legacy of 'thingification' à la Cesaire, in which the workers become non-subjects in their role in the expropriation and commoditisation of nature. Yet, in the management model the workers are lumped together to form the employment data that becomes the basis for the human dimension.

Andre Goodrich writes on the particular relationship between the worker, nature, and materiality in South Africa (Goodrich 2013). His work resonates with my own with regard to the relationship between nature, labour, and work. In conversation with Marx's "Estranged Labour" essay, Goodrich describes how the external world becomes the space in which the materiality of

the labourer's work manifests, which results in the appropriation of nature and the deprivation of the means of life for the labourer (ibid). This double restriction leads to the increased incorporation of the external world into the capitalist framework of appropriation, via the labour of the worker, which sees the worker's labours further removed from the means of life of labour itself. In other words, the work of the labourer ceases to provide the means of life as nature is appropriated into the domains of commoditisation and governance. In this way, Goodrich argues that Marx "does not abstract a single [version of] nature from the multitude of human experience. Rather, he foregrounds that experience and in so [doing?] suggests a multitude of natures prior to any capitalist incorporation" (Goodrich 2013:20). Further, "what Marx only implies ... is that, if appropriation of the sensuous external world through labour threatens to destroy the very means of life for labour and the worker, then regulation is needed to stave off or manage and distribute the consequences of production's assault on this means of life. The flow of value through production of commodities – pure exchange value – in the imperialist and nationalist eras, in other words, threatened the existence of the material conditions that were the means of life of production itself" (Goodrich 2013:21). Namibia's fishing empire came to be through the simultaneous extraction of raw materials and the exploitation of labour to harvest those materials.

In the fisheries context this clear in the way that the hake sector was developed under the colonial structures and the effects that this has today in Walvis Bay. The industry is built on the labour of the majority black population for the benefits of the political elite and foreigners (historically) and the means in which the black worker is able to access the global markets is severely limited. Imperial nature then, emerges out of the appropriation of nature as a de facto category for consumption, through the work of the black worker. As Goodrich argues "under late capitalism production has become the means of the sensuous external world's continuing life. To say this is to point to a profound shift in the production of 'nature' as something ostensibly separate from society and representing a first great divide at the heart of the modern ontology" (ibid).

The marine industrial ecology of Walvis Bay is marked by estrangement and describes the relationship between workers, fish, and capitalist nature. The ways that the conditions in which capitalist nature manifest in Walvis Bay are most clearly seen through the lens of labour, where "political economy conceals the estrangement in the nature of labour in that it ignores the relationship between the worker (labour) and production" (Marx 1975:325). Moore proposes that nature is always in capital, and thus capitalism is always within the scope of historical natures (Moore 2015). He argues that the relations of capitalist accumulation reveal the dependency of

accumulation and the exploitation of labour on the appropriation and (re)production of cheap natures, such as raw materials, food, and labour power in the Namibian case.

For Moore, the relationship between capitalism and nature comes down to the idea that, “capitalism is not an economic system; it is not a social system; it is a way of organising nature” (Moore 2015:2). Breaking through the modernist ontology of nature as separate from society is no easy task given the current environmentalist landscape. In this landscape there is a surge of neoliberal solutions for environmental issues such as in the arguments that want to turn nature into capital through the capitalisation of labour power, individual commodities and products, land, sea, and territory. To do this, brings an attitude of directly market-mediated social relations carving out discrete entities of ecology, the social and human dimensions, and governance rather than trying to dissolve some of the categorical boundaries in order to see the more relational ones. Moore’s argument centres on the idea of the web of life which he defines as “nature as a whole: nature with an emphatically lowercase n. this is nature as us, as inside us, us around us. It is nature as a flow of flows. Put simply, humans make environments and environments make humans – and human organization” (Moore 2015:3).

Colonial aggressions are what made Walvis Bay and are what underpin the experience of labour in the present moment. The widespread exploitation of labour that keeps workers in a position of near powerlessness and part of the world making in which nature is being capitalised on is part of a distinct industry hierarchy. The hierarchy is thus mediated through the labour unions, which have their own histories and political leverage today. The relations between the labour unions and the fishing industry are fragile and contentious. The Labour Act of 2007 outlawed labour brokerage, which since the colonial period had been the only way for black labourers to obtain work. The roles of the unions, particularly those that have no alliance with the ruling government, are seen as a necessary annoyance in the overall functioning of the fishery. Labour and industry are certainly at odds with each other, deepening the historical conditions of exclusion and exploitation upon which the current industry operates.

The disaggregate nature of the hake sector further contributes to how labour and unjust labour practices are subsumed within the realm of logistics, which sees the black worker as part of an indexing process of employment statistics that is incorporated in the management framework. From a management perspective, because of the shift to incorporate the human dimension into its framework the sets of relations between fish and the workers are entangled in similar processes of commoditisation in a multi-species web of life. In other words, labour power drives the industrial growth of the fishery at a cheap price whilst the capacity to process the resource on land continues to expand despite economic crisis and declines in fish stocks.

Industry is in a position of needing to present to management (government) that the benefits of the fishing industry are indeed circulating back into the communities and for the general population, because after all, the fish resource is considered a public good. What this shows is the objectification of life into commodity which happens via the models and their production of knowledge objects in the form of data and statistics (catch and employment). The management framework's three pronged categorisations of ecological wellbeing, human wellbeing, and governance become umbrella terms that align with the enclosure of life forms into enumerations. Now, post-independence, workers no longer have to wear lead pieces around their necks or hold work passes to move freely within the country. Instead, through processes of capitalist sciences the worker, the black labourer, experiences an extraction of labour that is mapped onto the quantified self within the management model as part of the objectives of measurement, evaluation, and commoditisation. The structural inequalities that not only built the fishing empire during the colonial period but that define Namibian society today are so massive that they cannot be addressed simply by patching over issues such as employment with the language of human wellbeing.

Capitalism and the fantasy in the hold

The relationship between labour, capital, and nature in Namibia emerges out of a trajectory of colonialism and natural resource exploitation. An additional layer to the 'hold' or relationship as such is seen in the collective control and domination of the black body under colonialism, and in the contemporary moment of capitalist logistics. Fisheries managers are now being asked to incorporate the human dimension into the management model that is specifically designed to manage the economic interests of the resource for the public. Therefore, the management model is a product of the neoliberal interventions in resource management that separate nature and society.

The MFMR recognises the fishing associations (such as the hake association), as the formal voice for the individual fishing sectors, while the Confederation of Namibian Fishing Associations provides the national voice on commercial fishing issues (Paterson et al 2015). Industry participation in the management of the fishery relies on mechanisms to facilitate participation by focusing on key 'stakeholders' who usually fall into the category of rights holders or company representatives, in other words, business administrators (ibid). All fishers and fish workers are considered company employees and are represented by various trade unions. As such, fishers and fish workers do not actively participate in fisheries management (ibid). Today,

the main function of the trade unions has been to represent the workers in a tripartite arrangement between labour, capital, and the state (Jauch 2007).

Otilie worked at Talanam Fish Processors as a quality control officer when I first met her. Since I departed Namibia at the end of 2013, Talanam Fish Processors was acquired by the Walvis Bay fishing company Omualu Fishing. Talanam was Spanish owned, and was therefore unable to acquire fishing rights, which excluded them from being able to fish, so they chose to operate solely as a processing facility. They had to rely on processing fish for various companies that either didn't have their own processing facilities or were unable to process all of the catches that were coming in. This arrangement was not viable for the company and they faced bankruptcy. They were then acquired by a company that has fishing rights and can thus be allocated quota. Otilie assisted me in interviewing factory workers at Talanam, and invited me into the factory to see how it all works. Talanam Fish Processors was located in the industrial zone of Walvis Bay, but not along the jetty. Like all companies in the fishing sector, Talanam's facilities were gated, and as I pulled up to the compound on Twelfth Street, I had to park outside the gates and walk over to the guard who allowed me in. I met first with Marvin, the factory manager who is a lovely coloured man who I liked instantly. He explained the way that Talanam operated, and about the immense pressure on him as the factory manager to keep the factory operating with the highest efficiency and lowest costs to the company.

The workers were only guaranteed work if there were fish to catch, and as Marvin told me, it is crucial to make sure the fish is processed efficiently by keeping the factory functioning at the lowest possible cost to the company. Because of the schedule of fishing, vessels may arrive back at the dock in the middle of the night or at irregular hours. Workers then must report to the factory and work their shifts until all the fish is processed. This often means that during busy times, workers are on twelve hour shifts, overnight shifts, back to back shifts, essentially expected to work to process the fish around the clock once it comes in. There are no protections for the workers with regard to hours or overtime, they are paid on a per day basis, which could be anywhere from an eight hour shift to a twelve hour shift or more. This is not the case for all factories, but across the board the factories cannot be known for their generous wages or pristine working conditions. The management framework remains one of exclusion, shown in the country's average 50% unemployment rate with nearly a third of the population earning an income below N\$ 262 per month (Kirchner 2010, Sherbourne 2010).

Human capital then, in the context of the labour practices in extractive economies, “departs from the strategic subject of neoliberalism, generalising through self-infliction the departure that subject ritually imposes upon its exiled interiors and making of itself a porous

object that still talks like a subject, as if in some burlesque enactment of philosophy's dream of the ultimate reconciliation," (Harney and Moten 2013:90). It is for this reason then, that human capital cannot be strategised, or managed, in any traditional sense (ibid).

Over the course of my fieldwork, I interviewed over thirty factory workers at four different companies and the majority of these individuals expressed concern over the security of their job, wages, and housing allowances. To enter the factory as an observer, one must wear a hairnet, rubber boots, and gloves. In the doorway between the offices and the factory is a small entryway where in the floor is a small reservoir of solution you step into and then out onto the other side (factory side). The solution cleans your boots of any bacteria that could potentially be tracked into the factory. Once inside the factory the general layout is the same: rows of assembly lines where workers are lined on both sides, facing each other on opposite sides of the long table-like structures with a conveyor belt running down the middle. As the fish come along the conveyor belt, individuals take them off and proceed to hand fillet the fish with small serrated knives. The workers wear smocks over their jumpsuits and latex gloves, and layers of jerseys and sweaters to combat the frigid temperatures on the factory floor.

The fish factories are large buildings that are usually right on the jetty docks where the fish are unloaded after each trip. The fish that are caught on the vessels go through preliminary processing on-board where the heads are chopped off and the fish sorted by size and put on ice in bins. Once they arrive back at Walvis Bay, the bins are unloaded and taken directly into the cold storage facilities of the factory for further processing. The factories are cold. Temperatures are kept low because of the cold storage facilities that are kept at around -20C. The spaces are usually open plan to allow for movement of machinery and the unloading and loading of bins of fish, meaning the cold effects of the freezers spill into the work areas. Once the fish are filleted on the assembly lines, they are packed again into bins on ice to then be transported to a different area of the factory where they are boxed and packaged for export. It is loud in the factory from the machines, the sounds of voices, and the conveyor belt running constantly. There is a smell of fresh fish mixed with the sea, as well as a distinct sterile, cleaning solution smell. Precarious work in the racialised economy manifests most significantly on the floor of fish factory. Ultimately, the power of logistics, the hold of capitalist science, expresses the ambitions to render thousands of bodies as superfluous.

The history of trade unions in the fishing industry includes a triumvirate of the labour movement with the Namibian Food and Allied Workers Union (NAFAU), the Namibian Seamen and Allied Workers Union (NASAWU), and the Namibian Fishing Industries and Fishermen's Workers Union (NFI). These unions emerge out of the workers strikes of the 1970s which saw country wide protests in all sectors, most notably in the general strike of contract workers in Walvis Bay whose central demand was "*Odalate Naiteke!*" or "*Let's break the wire (contract)!*" (Wallace 2011:275). Their aims were to both end the migrant labour system as an institution, and to achieve higher wages for workers.

By the time that negotiations had begun for the transition to independence in May 1988, civil society organisations including the trade unions were already being formulated with assistance from a certain liberalisation of the political climate, underpinned by the advocacy for inclusion of black Namibians in the business sector, as a form of reparative policies. For example, Namibianisation within the fishing sector meant that legislation was built directly into the fisheries management plans as they were developed post-independence. Namibianisation as a policy was put into place in 1992, and is based on the fact that during South Africa's colonial rule, apartheid policies excluded black Namibians from entering the business, owning fishing boats and gear, and participating in the fishing sector in any material and economic way. The Namibianisation policy thus prioritised the inclusion of black Namibians in the sector through economic incentives for Namibian participation through either ownership or employment (Armstrong, Sumaila, Erastus, and Msiska 2004). The Namibianisation policy is comprised of two parts; control-ownership and economic (Kirchner 2010). The former refers to the goal of achieving Namibian majority shareholding in fishing companies, and the latter involves job creation for Namibians and the generation of earnings and revenue for government (Erastus 2002). In addition, under the Namibianisation policy, all fishing rights expired in 1993 and new fishing rights allocations were to be provided using alternative criteria, as noted in the rights-holders section of the White Paper of Namibia's marine resources policy framework (Kirchner 2010). A couple of factors are at play in the extent to which Namibianisation of the applicant (for fishing rights) is determined. Fishing rights are granted over a period of time, and the longevity of the fishing rights provide a sense of security amongst rights holders and assumes that if granted longer fishing rights, there will be parallel incentive for infrastructure investment (ibid).

Under the Namibianisation process all fishing rights expired in 1993 and new allocations of rights, provided using alternative criteria, as mentioned under the right-holders section, were made. The extent of Namibianisation of the applicant determined the time period of the fishing right. For right-holders to have a sense of security, and an incentive for infrastructure investment, a fishing right granted over a long time period is essential. However, the permitted duration of the fishing rights depended on the percentage of Namibian ownership of vessels or onshore processing plants and investments. Right-holders with less than 50% ownership received seven years, whereas those ventures that were at least 90% beneficially Namibian owned and which had a 50% Namibian investment in vessels and onshore processing facilities received 15-year rights. Namibian right holders with smaller shares in larger ventures, and foreign-owned ventures that had invested significantly or had the potential to do so, would also qualify for 15-year fishing right. A venture that employed at least 5 000 permanent employees in onshore processing facilities and fulfilled the 15-year criteria, would be entitled to a 20-year fishing right (Armstrong et al., 2004). As yet, no right-holder has qualified for the 20-year right.

How did the momentum of the liberation struggle become silenced and obsolete in the current moment? One analysis points to the political climate that was established immediately after independence where a policy of national reconciliation was implemented by the new government that attempted to set aside the conflicts and horrors of the past by taking no action against individuals who had committed human rights violations under the old regime. The new government also took control of civil service, adding posts for its own people rather than dismissing those already employed (contributing to Namibia's disproportionately large bureaucracy) (Wallace 2011).

From September 1986 the first industrial union was launched in the form of the Namibia Food and Allied Workers Union (NAFAWU) led by former Robben Island prisoner John Pandeni. Coupled with SWAPO's victory in 1989, it was expected that SWAPO would be a worker's government and continue to pursue the revolutionary working class politics that had been at the forefront of both the labour movement and liberation struggle. However, once in power, SWAPO maintained capitalist structures as the government adopted neoliberalism as part of the requirements to receive development money and sought 'social partnerships' within labour relations. These partnerships form the backbone of SWAPO's vision for labour relations reform governed by the Labour Act of 1992 (Jauch 2007).

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Daniel Imibili is the vice president of the Trade Union Congress of Namibia (TUCNA), and based in Walvis Bay, a long time unionist and outspoken in the community with regards to workers' rights. He has been involved with various industry and government activities for decades. He was born in Walvis Bay and once able, he worked in the canning factories for pilchards, travelling to South Africa to learn metalworking. I met him early on in my fieldwork, and over the course of a year, developed a vibrant collegiality with him. Mr. Imibili and I met on several occasions during the busy lunch rush from 13h00 – 14h00. Throughout my fieldwork he kept an open door policy and invited me to visit him as I wanted and needed to during the lunch hour. Such an invitation allowed me to have regular conversations and visits, and I saw him at least once a week on average.

An air raid siren blares out every day at 13h00 and signals the lunch hour. During this time people flood from their work establishments and into the city centre on both foot, bicycle, and vehicle. NFI is housed on Sam Nujoma Avenue, named in respect of the founding father of independent Namibia himself. The symbolism is not lost of NFI being located on Sam Nujoma Avenue and is a pointed reminder of the current state of affairs in Namibia's labour movement. The labour movement today struggles to gain traction at any grassroots level. In addition, more and more pressure is placed onto union leaders to act as mediators and as 'the voice' of the working class. Such a role is problematic because the grievances of the workers are funnelled through a small group of individuals who then discuss, mediate, and negotiate with business and government behind closed doors.

In our conversations it became clear that the union operates in a space of tight constraints. The bureaucracy of the industry and the highly politicised nature of how the fishery operates tend to limit progression, and does not allow for much worker participation. There were two main agendas that Mr. Imibili was focused on during my time in Walvis Bay. They were the yearly wage negotiations with companies which raised issues with housing allowances and overtime pay. Secondly, he advocated for a revision of the severely outdated Merchant Shipping Act from 1954. The Act does not protect current workers with regards to occupational safety on-board vessels or for a standard of wages while at sea. For example, fishermen have gone on strike because they often work overtime when out at sea but are not compensated for the extra hours worked. Because of this antiquated Act, Mr. Imibili voiced his growing concern over the fracturing of workers' rights spurring gross human rights violations while at sea.

The Labour Act of 2007²⁹ attempts to streamline and condense workers' rights in line with the Constitution. The Act makes the information accessible and synchronised across the

²⁹ The Labour Act of 2007 can be found here: http://www.ilo.org/dyn/travail/docs/1018/2007_Labour_Act.pdf

sectors for the first time. However, it must be noted that while the information remains in the public sphere, my sense is that it is not being disseminated in a constructive way that is beneficial to workers. Shop stewards serve as the liaison within the workplace for workers raise issues with. Shop stewards serve to educate workers on their rights with regard to the Labour Act and to strategise solutions. Because the structure of the fishing industry is top-down with much at stake, the ways in which workers have been able to organise around specific issues (i.e. wages, housing allowances, contracts) is severely limited.

In mid-2013 I attended the tripartite labour meeting with the Minister of Labour and Social Welfare and various representatives of industry and the public. The meeting began with the Minister speaking on the “promotion of dialogue, economic independence, proactive social partners, and the overcoming of historical oppression into an age of harmony.” The sentiments he expresses are reminiscent of other meetings I have attended that generally serve as posturing tactics of government bodies. Central to much of the rhetoric are concerns for the Namibian people, but the speeches are general in scope and with few concrete solutions. In addition, there is a very faint line of engagement with the everyday concerns of Namibians.

The labour meeting and others like it, begin to unravel in the form of political theatre, formalities, and predictable rhetoric. Participants come to the meetings with very little expectation for change. In a conversation with Mr. Imbili, he lamented that Namibia’s short-sightedness has resulted in “the country being spoon-fed from its own resources.” We were talking about the relationship between government (Ministry of Labour), industry, and the unions and he was describing to me that he sees it as a relationship between a parent and child in terms of the amount of pressure one can put on the parent and still expect to receive help. In a situation where the economy rules the country because of the natural resources, those that run the industry (economy), run the country. The bureaucracy as it stands includes the Ministry of Labour and the Ministry of Trade both of which are complicit in creating problems for each other to be mediated by the unions. The business arm to the unions tends to prioritise the wealth generating mechanisms such as rights allocations and quotas, while there is a lack of focus on the labour issues.

Mr. Imbili’s comments point to a politics that has indeed been killed, a politics that has succeeded in obfuscating the very real and very dangerous consequences of myopic capitalist tendencies. His comments also point to a trend in the racialised extractive economy to obscure the exploitation of workers. This obfuscation is made possible due to the remoteness of the fishing activities at sea, often in the areas most vulnerable to the violent expulsions (Sassen) and which form the undercommons (Harney and Moten). Namibia, where it is truly a remote

country due to both sheer size in relation to population, it becomes an enclave of self-regulated exploitation of the workers and the communities that sustain these industries against the backdrop of an extractive economy.

The labour question underpins the notion of human wellbeing in the fishing industry because of the invisibility of exploitation. The wellness and wellbeing of individuals who work in the industry is carefully hidden under the banner of employment. Mr. Imbili articulates further that in a country that is as wealthy in natural resources as Namibia, first and foremost its citizens should have access to and benefits from those resources. To state that the country is now being spoon-fed from their own resources reflects the problematic rise of multi-national companies and their subtle alliances with government bodies. Such alliances displace the resources into the hands of the wealthy (state and foreign companies). The resources are then re-circulated back into the country via avenues of exploitation and continued oppressive exclusivities, namely through cheap (black) labour under the guise of employment opportunities.

The contract labour system was a historical achievement for the colonial powers. The devastation of the contract labour system was seen throughout the majority of black African families in the north who, by 1973 saw at least 75% of men on contract lease (Wallace 2011). The potential for strike action was largely a result of the mines and the factories where workers were housed on compounds which facilitated communication and organisation. By 4 January 1972, over 12 000 migrant workers had stopped work. At its peak, the strikers numbered at least 13 500 and eleven mines and twenty-three other workplaces had closed (ibid). This was a significant victory for the workers and contributed to the move towards political transition. There has not been a strike with such an effect in scale since.

Namibia's labour movement is considered the largest arm of civil society in the country. Its developments are inextricably linked to those of the liberation struggle leading up to independence on 21 March 1990. Historically, the labour movement has been led by two main federations, the National Union of Namibian Workers (NUNW), and the TUCNA. During the liberation struggle, NUNW was undoubtedly a key player in the organization of workers and ideas. They were, and remain, closely affiliated with the ruling (then opposition) party, the South West People's Organisation (SWAPO). NUNW played a critical role both during the liberation struggle and in the public policy debates after independence. Their role was crucial in linking the struggle in the workplace with the broader struggle for political independence by forming alliances with the Namibia National Students Organisation (NANSO) and SWAPO. NUNW self-identified as a social movement and emphasised the entanglement of exploitation in the work place and the broader struggle against racial and political oppression.

The transition from occupied apartheid state to independent nation reveals a politics on similar grounds to the South African anti-apartheid movement and subsequent transition of power to the African National Congress (ANC). As such, it is difficult to engage the politics of SWAPO without a reflection of the ANC's political trajectory in post-independence Namibia. In addition, with the rise of the ANC to power in South Africa, their civil society and labour movement emerged under the auspices of the Congress of South African Trade Unions (COSATU), much like NUNW would emerge alongside SWAPO. It should come as no surprise that similarities exist across the neighbouring countries. Given their shared history of apartheid and colonisation, inclusion and exclusion, their linked currency, linguistic lineage, and development of extractive industries, the labour movements in both countries developed along a parallel trajectory with quite different outcomes (Jauch 2007, Cleaver and Wallace 1990).

The labour movement's greatest strides were in the 1980s when efforts proceeded under the cover of the Council of Churches in Namibia (CCN). Because any attempts by trade unions to mobilise were dismantled and defeated by the apartheid state the Unions found a welcome alliance with and protection under the churches that were operating freely across the country. A key moment in the movement also began to take shape in the 1980s when South Africa's National Union of Mineworkers (NUM) attempted to organise at Diamond Mine in Oranjemund and Rossing Mine in Arandis. There, they joined with the Worker's Action Committee and by April 1986 they formed the Rossing Mineworkers Union that would later become the Mineworkers Union of Namibia (MUN), providing the organisational vehicle through which workers could take up workplace grievances (Jauch 2007). Throughout the movement, the workplace remained an extension of, and site of dissent against the broader political issues of entrenched racial and economic oppression.

The history of the labour movement is crucial to understand the ideological contradictions of fisheries management, which relies wholly on the ideology of capitalism, and the idea of the human dimension as a necessary and nuanced domain in which to address and streamline the increased injustices faced by workers in the sector. Such contradictions arise in the form of radical nationalisation and liberation sentiments on issues such as land, mixed with an acceptance of neoliberalism as an ideology of the free market. Against this discrepant political backdrop, there is little class analysis, as nationalist and populist sentimentality remains dominant, despite Namibia having one of the highest income distribution disparities in the world. Namibia today is in a position of indecision and uncertainty, and lacks leadership within the movement. Despite the initial political merging of SWAPO and NUNW, some trade unions

argue for the separation between the unions themselves and government structures. As such, TUCNA formed in 2002 from unions that rejected NUNW's party-political link.

My friend Lolo said to me once, as we drove past a SWAPO rally in Kuisebmond, "I just don't get it. Those guys out there, those guys at that rally, they're cheering and shouting, but they don't have a house! They just go back to their shacks, you know? And they're out there cheering for those guys!"³⁰ His comment points to the legacy of SWAPO and how many citizens still outwardly express support and favouritism for the party despite the clear lack of fundamental and basic government service deliveries. The populist antics of the SWAPO party echo empty promises and disengaged rhetoric. For example, housing is considered a basic human right and included in the Constitution. However, there are years-long waiting lists to even be considered for a plot of land. If the situation wasn't so dire, it might be comical considering how much land makes up the country and how few people there are. SWAPO and its politics enact a political severance from the everyday life of many Namibians who remain entrenched in a system of oppression, with very few options for mobility. It is the realisation of the living that underpins the humanity, the praxis of humanness at the heart of this dissertation. At the end of 2014 Namibia held its 6th democratic elections, and SWAPO has never looked stronger. The incumbent ruling party won 87% of the votes and SWAPO's presence in the National Assembly also rose to 80%, the highest percentage of support in the history of Namibia's elections.

Today, NAFAU and NASAWU remain closely affiliated with the ruling party SWAPO, while NFI is aligned under TUCNA and independent from political affiliations. The hake industry employs approximately 9 508 (figures from 2013) individuals in its onshore and offshore activities (Paterson, Draper, Jarre 2014). Until just a few years ago, labour brokerage was the main channel through which individuals found work, even though such practices had been under legal review for many years. Since the 1970s labour brokerage had been deemed a predatory and unconstitutional practice, but no real strides were taken to abolish the practice until very recently. Finally, in 2007 with the amendment to the Labour Act, labour hire was deemed a practice that infringes upon basic human rights and freedoms within the constitution, namely the rights to freedom from slavery and forced labour, and equality and freedom from discrimination (van Eck 2010).

The fishery is a dynamic space, a panoply of relationships underpinned by power and wealth. The idea that the sciences can be used to support an ideological trajectory, requires an interrogation of the dominant ideologies, namely that of capitalism. Stengers calls to activate the possible, to think situations through their unknowns, must push beyond the practice of merely

³⁰ From field notes

describing the probable. It is a time for action. Namibia's stance toward globalisation, which the acting government adopted during the transition to independence, reflects the lack of engagement with the ideological monopoly that underpins civil society without the practical effects. These structures are the very structures upholding 'democracy' in the independent Namibian nation state today; capitalism active in its continued reorganisation to prevent anyone from getting a hold. These structures are also complicit in promising a false reality underpinned by the authoritative notion of modernity.

Industrialism and fisheries management

The relationship between labour, nature, and capital presents a host of questions in the narrative of work in the postcolony. Labour built the empire of fish and labour sustains it in its current iteration today. Most importantly, it begins to question the effectiveness of the fisheries management framework with regards to the human dimension. Such a relationship casts light through the shadows of the liberation struggle vis-à-vis current neoliberal policies. The marriage between corporate wealth and political nepotism becomes increasingly disconcerting. For Marx and Engels, the mode of production must not be considered simply as being the production of the physical existence of the individuals. They state, "as individuals express their life, so they are. What they are, therefore, coincides with their production, both with what they produce and with how they produce. The nature of individuals thus depends on the material conditions determining their production" (1845:42). In extractive industries in particular, workers are increasingly alienated from their work through the continued colonial project of exploitative cheap (black) labour and the dangerous rise of multi-national corporations. Political elitism and control, coupled with increased social inequities point to covert corrupt activities and technocratic majority. In effect, the result is a de-politicisation of the majority of Namibia's citizens and lack of political participation. It is an environment of work that fuels this feeling of being watched and monitored all while in a position of extreme uncertainty.

Today, the workers of the (post)industrial fishing sector face a legacy and collective history of the violence of the colonial project. What questions can be asked about the liberation of labour, nature, and capital from the historically complex matrix of power that has defined 'work' in the fishing industry since the arrival of the colonisers? Can there be a re-configuration of the relationship between labour, nature, and capital that fosters sets of relations rather than succumb to the quick gains, quick fix mentality of late capitalism? Such questions are crucial to reconceptualise the human dimension for fisheries management. So far, management has been

unsuccessful in their efforts to develop the notion of the human dimension that goes beyond the accessible statistical outputs of employment and census data.

The process of existential catalysis concerns the production of an autonomous *power to become a cause for thought*, meaning the cultivation of a sensibility and disposition to think and act. The relationship between labour, nature, and capital then, must confront the erasure of subjectivity that occurs within the structures of capitalism and resist the new forms of indexing the worker and the biophysical world. Such indices are in hot pursuit of new forms of abstraction, the next form of conquering techniques that render bodies, work, and historical oppression as disposable. The pragmatist lens of Pignarre and Stengers assumes pragmatics in this context to associate a politics of the expedient alongside capitalism, which also reconfigures the scientific practice. In other words, it is the thoroughly modernist position that Marx takes up vis-à-vis knowledge, the relationship between science and ideology, and the narrative pull of progress in his writings that calls for reformulation. In this way, to take the efficacy of a technique seriously imposes the need to understand it as being addressed to something more powerful than the technician. Overcoming the ideological limitations of capitalism and labour within the fisheries management framework can magnify the areas of the human dimension.

Anna Tsing offers a discussion on salvage accumulation which refers to the frontier spaces in which wealth is amassed within capitalism that converts histories of social relations (human and raw materials) into capitalist wealth (Tsing 2014). In other words, salvage accumulation occurs at the periphery of capitalism, which is built upon the translation of value created on its periphery that can be transported and transposed into a variety of economic contexts. Tsing draws from Gibson-Graham's work on the heterogeneity of capitalism in which she argues that these peripheries, rather than posing alternatives to capitalism are in part constitutive of capitalism itself. As such, capitalism continues to require these peripheries, and thrives on drawing resources from them (Tsing 2014). Take for instance, the idea of bycatch. On the fishing vessels, bycatch is all of the other raw material that comes out of the sea in the fishing nets that is not the targeted species. On the hake vessels, this could be other species of fish such as monk, angelfish, or shark. Anything that is caught must be kept on-board. Bycatch then, becomes a site of salvage accumulation because those raw materials can be sold for profit, at little to no cost for the company or fisherman. Nature is thus capitalised on in the spirit of salvage accumulation, forced into the markets in non-traditional ways. Here is a site where resistance takes shape. Another example is when fishing boats return from trips, the crewmembers often get to take home five to ten kilograms of fish for personal consumption. Some crewmembers might go and sell their fresh fish to others in Kuisebmond rather than eat

the fish. Such are the intricate flows of commodities in the messy world of industrial fishing. The relationship between labour, nature, and capital is thus the node from which all wealth emanates in the fisheries sector, with the workers' experiences forming on the periphery of natural resource extraction. In this way, the Namibian workers become sites of salvage accumulation through the networks of capital, the webs of expropriation and exploitation, which underpin the fishing sector. Without them, the fishing industry would be non-functional, but the value of their work is deeply entrenched in the valuation practices of the colonial era which categorised the labour of the black body as the cheapest way to expropriate nature for the benefits of the colonisers.

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The changing social environment of fisheries management attempts to address the challenges of including the human dimension into the modelling framework. The strategy so far has been to separate the domains of ecology, human, and governance and to develop indicator frameworks that can inform the management of these separate domains. However, as has been discussed at length in the first two chapters, the stock assessment model remains the foundation for management as it produces the TAC which determines the operations of the fishery for the year. In the realm of ecosystem services, a monetary value is given to the various actors involved in natural resource extraction, and thus calls for a renewed politics of labour. Based on the historical implications of labour in the liberation struggle, the management paradigm cannot seriously address the notion of employment let alone its contribution to the human wellbeing categorisation laid out in the framework.

Labourers in Walvis Bay are most certainly not benefitting at fraction of the rate of industry executives, managers, scientists, or government officials. The income disparity in Namibia is so vast precisely because of the national politic that was adopted at independence that allowed for the liberation struggle heroes of the then oppositional SWAPO party to transition into the ruling SWAPO party as it exists today. The transition itself was smooth, but the ways in which Namibia's resources and the suite of neoliberal interventions to monitor, assess, and predict the value of those resources has been entirely unequal and undemocratic. The hold that capitalism has on Namibia affects the very sets of relations that can and should sustain the industries. However, the social and political dynamics play directly into the hands of capitalism in ways that leave the majority of Namibians disenfranchised and excluded. One of the stranger elements of Walvis Bay is the way in which activities are often out of sight. In a

place that is marked by unique physical beauty, fisheries work itself either happens offshore or within the confines of the factories. Each of the fishing companies is surrounded by walls, fences, and security gates. Guards are posted at the entrances. There exists a distinct feeling of surveillance.

The hold of capitalism advances a kind of vulnerability that is key to Pignarre and Stengers' depiction of the current economic predicament as being bewitched and entrapped by the sorcery of a cunning system of exploitation. An assumption that protection against such sorcery already exists is part of the hubris of capitalism against the backdrop of the colonial matrix of power, or coloniality. In this way the sorcery of capitalism is not about job creation but about turning thousands of people into superfluous human beings. It speaks to the perpetual restructuring of work that can always be explained by reference to critical shifts in the mode of production or strategies of accumulation. The fishing industry often remarks that it employs a significant amount of the jobs for Namibians. Their statement is true, the hake fishery alone employs over 8 000 people, but the relationship between labour, capital, and nature is a troubled one, most clearly illustrated in the massive structural inequalities, precarious living and working conditions, and depleted fish populations. Labourers do not generally receive any sort of benefit package, companies are not required to contribute to workers' housing funds, and if the fishing vessels are not out fishing, there is simply no work.

The narrative of labour in Namibia demonstrates how extremely narrow alternatives dictated by multi-nationals and the state are presented as the voice of economic rationality, or reason itself. Such a troubling marriage between the capitalist business model and the service delivery of the state, namely via employment opportunities, presents a system in which workers and citizens become ensnared within an apparatus of control, in constant negotiation with the sets of technocratic solutions for fisheries managers.

EAF models have the potential to take on the role of logistics when applied to the human dimension. They could also become the mechanisms of control over the work and worker, such as on the assembly lines of the fish factories. Therefore, different sets of practices are needed to address the inclusion of the human dimension, by way of human wellbeing, into the modelling framework that resists the holds of capitalism.

The limits of liberation under capitalism

The human dimension in the hake sector has thus not been conceptualised in a well thought through manner. In the realm of expert authority such as fisheries management, there is an

urgent need to understand the kind of destruction that occurs under the auspices of progress and modernity, and the expulsions that occur within the realm of data. In this way, the management landscape quickly becomes one marked by sets of technocratic processes, such as the rights holders and quota allocations process, that tends to proceed through “that set of situations that seem to leave no other choice than resignation or a slightly hollow sounding denunciation” (Pignarre and Stengers 2011:24). Essentially this means that workers succumb to certain conditions because they cannot escape, and even more, are expected to accept their position within such a fragmented industry without dissent. It is a discourse of acceptance where labour is moved to work under increased levels of uncertainty. This is both the ‘hold’ and spell the capitalist mode of production has over individuals, as well as the hold or grip one has on grappling with and transforming a situation.

The constitution of contemporary capitalism is composed of a multitude of local actors who fabricate it, and hold, support, and maintain these connections. Because ‘network’ capitalism is made of these connections and fabrications, “every hold is local, it is impossible to sketch out a general picture,” (Pignarre and Stengers 2011:77). The argument, invoking Deleuze and especially Guattari’s work on machinic enslavement and apparatuses of capture, claims that capitalism does not reproduce itself via the powers of ideology/illusion or alienation. Ideology/illusion separates a theatre of appearances from an objective and truthful reality, while alienation implies the existence of non-alienated intellectuals who are going to allow the masses to “become conscious” of the forces oppressing them (Pignarre and Stengers 2011:106). In contrast, capitalist sorcery operates by “capture,” through a culture of “spells” that immobilise thinking and paralyse collective action. The ideology of capitalism prohibits the fisheries management model from incorporating the human dimension into its framework in a way that does not divert from the practices of neoliberalism that generate market based solutions entrenched in a legacy of exploitation.

In the article “The Coloniality of Being” (2007) Maldonado-Torres argues for the distinction between coloniality and colonialism. This difference is crucial in engaging current modes of ‘post’ or ‘de’ colonialities, as the two speak to each across temporal and existential modes. Colonialism is marked by the political and economic relations embedded in the sovereignty of a nation or a people but rests on the power of another nation, which makes such nation an empire. As such, coloniality refers to long-standing patterns of power that emerged as a result of colonialism, but that define culture, labour, intersubjective relations, and knowledge production well beyond the strict limits of colonial administrations. Therefore, “coloniality survives colonialism, through books, criteria for academic performance, in cultural patterns, in

common sense, in the self-image of peoples, in aspirations of self, and so many other aspects of our modern experience. In a way, as modern subjects we breathe coloniality all the time and everyday,” (Maldonado-Torres 2007:243).

Coloniality is not simply a residue of colonialism nor is it a reactionary force. Colonialism emerges out of specific social and historical moments, and most importantly refers to the two axes of power that became definitive in the matrix of control in the conquered lands. As Quijano states, these two axes of power were,

the codification of the differences between conquerors and conquered in the idea of ‘race’, a supposedly different biological structure that placed some in a natural situation of inferiority to the others. The conquistadors assumed this idea as the constitutive, founding element of the relations of domination that the conquest imposed...The other process was the constitution of a new structure of control of labor and its resources and slavery, serfdom, small independent commodity production and reciprocity, together around and upon the basis of capital and the world market (Maldonado-Torres 2007: 243-44).

Race and labour are very much entrenched in the colonialist project in Namibia, and remain significant markers in the country’s reliance on extractive economies today.

Walvis Bay is a marine industrial ecology that exemplifies the relationship between labour, nature, and capital within the matrix of power. The coloniality of being in such a context of power is most clearly seen in the company structures along racial divisions. The black workers are working in the factories, on the vessels as crew members, and as machinery operators. The majority of factory workers are female, adding a gendered element to the narrative of work in Walvis Bay. The majority of workers are kept in the holds of capitalism out of the desperation for work coupled with the Namibian government’s promises to distribute the economic benefits of the industry for the people. Such promises have been very slow to materialise, as seen in the severely insufficient education and health sectors, despite the government’s claim to distribute the income generated from resource rents (tax and levies on fishing practices) for the betterment of Namibian society.

Labour thus remains severed from the historical narrative in which a liberated and independent Namibia was imagined by the Freedom Fighters. The spirit of the liberation struggle, which gained significant momentum in the 1980s with the expansion of the trade union movement and student movements, was amplified when South African Defence Minister P.W.

Botha became President in 1978. Botha claimed to be in favour of reformist strategy but nonetheless clung to the ideal of white power. He unleashed his total strategy, which involved increased militarisation in South Africa, Namibia and other southern African states to destabilise and weaken both politically and economically (Wallace 2011). The key points here were to establish economic policies alongside trade union engagement with the private sector and government's role as 'referee' between business and labour. Such processes divert from the model whereby capital, labour, and the state jointly form socio-economic policies, allowing the Namibian government to uphold their right to make any final decisions. Thus began the dismantling of the labour movement's ideological solidarity with struggles of race and class oppression and a move toward a platform of business orientated favouritism and reduction of worker militancy, resulting in shifts of power from the workers' struggles to negotiations between union leaders and management.

The resulting fallacy of 'social partnership' is embodied in the post-independence labour legislation that in effect, against the backdrop of gross economic imbalances between capital and labour, promoted the state's role as 'neutral referee' that clearly benefits big business (Melber 2007). The SWAPO government's adoption of a capitalist economic ideology was very much in line with the contemporary shift away from the antagonisms of the Cold War. In the face of the industrial economic pressures today, the trade unions play an important role in attempting to hold the government to account, although there are significant weaknesses here due to the government undermining unions deliberately through funding of rival organisations and continued political alliances between SWAPO and certain unions.

The relationship between the unions and the fishing industry is notably hostile and secretive, particularly for the unions unaffiliated with the ruling SWAPO party. In terms of what this means for incorporating the human dimension into the fisheries management model, the industry/union/labour relationship points to ideological conflicts in how labour in the extractive economy is expelled in the process of turning the narrative of labour into the mathematical output of employment statistics. In fisheries management, business plans that advocate for increased employment opportunities are encouraged, despite the fact that the factories are already developed beyond their capacity. The capitalist ideology of the management plan is in direct conflict with the ideology of an EAF framework in which the fluidity of the fishery is attended to through setting up the linkages between the ecological, social, and political spheres.

Fred Moten and Stefano Harvey address how the wealth of social life is confronted by the mutations in the mechanisms of control in their collection of essays in *The Undercommons: Fugitive Planning and Black Study*, which touches on a wide range of discussions that speak to these

mechanisms of control, from credit schemes to the management of pedagogy, but most importantly for this study, the mass proliferation of capitalist logics, in which “logistics are the master of all it surveys,” (Harney and Moten 2013:91). In an essay titled *Fantasy in the Hold*, the authors trace the emergence of human capital, which stems from the fantasy of Marx’s automatic subjects, a fantasy in which capital could exist without labour. In this regard, they argue that human capital is in effect a strategic category, one that is underpinned by a strategy in investment in and speculation on the self (ibid). Therefore, the automatic subject of capital that human capital is designed to replicate, is a hollow subject, and a subject dedicated to hollowing itself by the expunging of the negativity of labour, “by exiling the one who, in being less and more than one, are his figure, his other, his double, the bearers of a generativity without reserve,” (Harney and Moten 2013:90).

The human dimension then, in the context of the labour practices in extractive economies, “departs from the strategic subject of neoliberalism, generalising through self-infliction the departure that subject ritually imposes upon its exiled interiors and making of itself a porous object that still talks like a subject, as if in some burlesque enactment of philosophy’s dream of the ultimate reconciliation,” (Harney and Moten 2013:90). It is for this reason then, that human capital cannot be strategised, or managed, in any traditional sense (ibid). The ambition of logistics to connect bodies, objects, affects, and information most clearly and devastatingly manifests in the Atlantic slave trade. This is what modern logistics is founded upon, “breaking from the plundering accumulation of armies to the primitive accumulation of capital, modern logistics was marked, branded, seared with the transportation of commodity labour that was not, and ever after would not be, no matter who was in that hold or containerized that ship,” (Harney and Moten 2013:92). The automatic subject of capital that human capital seeks to emulate is a hollow subject.

Capitalism and its relation to labour frame the fishing industry in Namibia under such fantasies in the hold in which the mechanisms of control of the worker, to extract labour power, are entangled in the processes that erase subjectivity through the sorcery of capitalism. In other words, the labourer, (dis)embodied in the black body, is destined to become superfluous, without subjectivity, in the creation of logistical populations that “do without thinking, feel without emotion, move without friction, adapt without question, translate without pause, connect without interruption, or they will be dismantled and disabled as bodies in the same way they are assembled,” (Harney and Moten 2013:90). This is what work today means for the generation of labourers in Walvis Bay, who are captive in the neoliberal fantasy of generating such subjects, hollow subjects or even non-subjects, that is the drive of the field of logistics. Logistics as such,

is founded on the dream of dominant capitalist science which wants to dispense of the subject altogether (ibid).

Pignarre and Stengers argue in *Capitalist Sorcery* (2011) that capitalism and any anti-capitalist politics are not necessarily rational, and as such presents both a problem and a promise. The core argument of the text redefines capital in an atypical manner stating that at the most basic level, capitalism is a social system which de-politicises decision-making practices or, as they state eloquently, “a politics that kills politics.” In this regard, the elusive capitalism is able to constantly reorganise itself to prevent people from getting a hold. In Namibia, this has meant the increased economic growth of the fishing sector, despite the ecological predictions that show slow stock recovery. As Dr. Kirchner rightly argues, the fishing industry operates on a very short memory in terms of how far they go back to determine good catch years. At this point in the game for hake, any increase in stock abundance is assumed to mean that the TAC can be set higher, increasing economic gains for companies and providing jobs, but clearly disregarding how this could turn sharply downhill in the coming years and potentially result in another stock collapse. This would be devastating for both the ecology and for the lives of workers who depend on the ocean.

In this way, capitalism supports governance systems that are able to place a monetary value on the various aspects of the industry. This is most starkly seen in how such systems render labour, and particularly the labour of black Africans as superfluous in that “to exercise sovereignty is to exercise control over mortality and to define life as the deployment and manifestation of power,” (Mbembe 2003:11). Mbembe writes on the notion of *necropolitics*, in which he argues that what is occurring in the social and political turmoil of the postcolonial, post-slavery era is a world in which human life and social existence are increasingly subjected to conditions of life that ultimately are a negation of life, or what he calls the “status of living dead,” (ibid). One of the more unsettling aspects of contemporary Namibian society is how such severe inequalities in the lives of Walvis Bay residents tend to mean apathy with regards to political participation such as worker organising, labour law education, and election campaigning that challenges the forces that be. Considering that the country’s wealthiest sectors are in extractive industries, it is no surprise that these sectors are the most contentious and the opaqueness. The lives of citizen subjects are at the hands of the state, particularly those whose existence is most marginalised.

The management model, by extension, is not and cannot be considered an account of nature or ecology minus human extraction. The account that will be possible in the model will always already be constrained by its purpose which is to keep the factories viable through the

continued extraction of labour that comprises much of the human dimension. When sociologist Saskia Sassen talks about invisibility in relation to slums and refugees coupled with economic inequalities in her book *Expulsions* (2014), what she refers to is how these are made “invisible” due to their non-visibility in data. This idea, along with the discussion on logistics, underpins the account of fisheries models for management in a way that shows how capitalism has framed the fisheries sector to make invisible what Harney and Moten call the undercommons, and what Sassen calls expulsions, which are violent and dramatic erasures of subjectivity at the hands of the captive markets.

The potential for data on the human dimension to be produced is limited by the very structures of the management model which attempts to capture human wellbeing through the transformation of experience into statistical outputs. Labour’s role in the history of resource extraction in Namibia is certainly lost in the modelling framework, which operates with a short-sightedness similar to the industry’s tracking of catch rates. However, approaching the incorporation of the human dimension into the model through practices of inclusion may start to fulfil some of these demands. In this way, it is useful to approach the contemporary factory as the hold of the slave ship in which the masters are the algorithms, logistics and models that quantify the self into the fantasy of the automatic worker, without attending to the ripple effect this has into every aspect of social life in Walvis Bay.

To identify capitalism as a system of sorcery operating by capture, rather than as an enormous hyper-rational machine operating by the production of false ideas points to how capitalism is not just about the “economy” or “society,” but also about the control of immense affective and energetic flows—hence the stress on practices and techniques of empowerment capable of “breaking the spell” of capitalism’s infernal alternatives and those who subscribe to such actions (Pignarre and Stengers 2011). If the struggle for liberation sparked from a radical organising around defeat of the contract labour system, then the current moment faces an eerily similar environment in which workers continue to form the base of the industry but with little bargaining power and space for demands. The lack of politics in the workplace brings to light how the capitalist vein of international management procedures employs a new form of logistics, through control of labour and employment statistics. Notions of wellbeing are reduced to employment statistics which creates a false understanding of the relationship between labour and capital. The management framework is expected to specifically act in the social world when fisheries managers have been trained to separate their work into categories to be managed. The result is that an EAF model for management is itself part of a neoliberal suite of interventions specifically designed by markets for markets.

Chapter 6

Reassembling the social and ethical responsibilities of industrial extractive fisheries

In this final chapter, I make an intervention in the conceptual framing for an EAF. This chapter argues that part of the reason why an EAF has been slow to materialise in Namibia is that human wellbeing is assumed to be a monolithic category that can be broken down into quantifiable data, as discussed in chapters 3 and 4. The assumption that the human dimension is already in the form of data through demographic and census statistics supports the idea that an EAF is working in Namibia. Building from the previous chapter that went in search of wellbeing in Walvis Bay, this chapter reconfigures the sets of practices and ultimately the sets of questions around human wellbeing in a way that illuminates what an EAF could potentially look like given the new considerations. Stengers remarks that we can never get a relevant answer if our practices have not enabled us to produce a relevant question. This chapter intervenes in the current moment of EAF liberalism in order to question the suite of practices that contribute to the idea of human wellbeing in the fisheries context. So far, the modelling practices of EAF have not enabled the production of relevant questions within Namibia's industrial extractive fisheries. Now, it should be clear that the research presented in this dissertation elucidates the questions that are relevant and requiring attention. Such questions therefore do not concern the vague entity posited by economics, "an industrial extractive industry, a fantasy or unicorn entity," (Verran 2015:376). Rather, the questions concern the responsibilities of knowledge workers and their roles in effecting what Stengers calls "active comparison" which considers how entities like the EAF might be conceptually (re)designed so as to gather the power to impose due attention.

Shifting the sets of questions

Frameworks such as EAF attempt to dissolve the boundaries of nature and society by advancing the idea that resource management is not solely about what is contained within the territorialised space of the ocean (the fish stocks), but takes on the language of systems approaches that sees linkages across the biophysical and social worlds. As presented in the previous chapters, there are a number of reasons as to why managerial frameworks are limited in their scope and slow to be implemented despite the urgency to manage fisheries in a way that both benefits the public

and ensures longevity of the fishery for future generations. The emergence of nature, people, and governance as separate entities that must be incorporated into a capitalist framework of extraction is a major conceptual limitation.

The relationship between labour, nature, and capital in extractive industries is one of the most relevant ways in which to frame the current crisis of the environment. The conceptualisation within managerial frameworks however, tends to be myopic in scope and reverts to employment statistics and poverty indicators. If I present an intervention that re-assembles the sets of practices in order to arrive at a different set of answers that are indeed, much more relevant in scope, then human wellbeing and the assumptions about how to measure and turn the information into data may not be the place to start. In order to address the difficult questions about wellness, health, collective trauma, participatory politics, and a sense of being and belonging in Walvis Bay, conceptual models in a broad sense also attempt to make meaning by stringing together symbols, data, and value. The many different sets of relations in Walvis Bay can contribute to a more nuanced approach to the human dimension that invokes life affirming strategies rather than reductive strategies. To place the relationship between labour, nature, and capital in the fishing industry as generative sets of practices that reveal how meaning and value stem from the sets of relations that underpin the fishing sector allows questions to surface around the complexities of humanism and technology within the scope of environmental politics and natural resource management.

The future of natural resource extraction and of communities reliant on such practices is caught in ecologies of wellbeing, the network of relations that are particular and also have global implications. In fisheries management, the shift towards a more holistic management paradigm of an ecosystems approach to fisheries only begins to include issues of labour, work, wellbeing, and justice into the conversation. The three-pronged approach of an EAF that looks to the ecological and social/human wellbeing of the fishery coupled with good governance, or the potential to manage the fishery in good faith (i.e. in line with international maritime laws, human rights discourse, and sustainability), is a step to dissolve the parameters of nature and society, culture and environment. Given the current global economic and environmental crises, there is much work to be done.

Neoliberal frameworks tend to offer reactionary tactics where in situations that become more uncertain and unpredictable the more myopic management strategies become. Studies from Canada, where the fishing crises have been well documented and studied provide useful examples of how these alliances have led to unexpected and unintended collapses and scientific muzzling. As Bavington notes in his critique of Department of Oceans Canada (DFO) in

Managed Annihilation: An Unnatural History of the Newfoundland Cod Collapse the “DFO’s precautionary approach provides the very ethical framework and burden-of-proof requirement that the precautionary principle was designed to avoid and eliminate” (2010:55). The troubled marriage of authoritative state science and economic based management intensifies governance initiatives, surveillance, and opaque decision-making strategies.

At the end of 2015, there were protests in British Columbia over a contentious herring fishery where the consequences of massive DFO funding cuts in 2012 were clearly seen. In this case, the Heiltsuk First Nations community stated that by their estimations (based on centuries long fishing heritage in the area), the herring stock would be unable to recover from the proposed commercial herring-roe fishery and a commercial gill net fishery. DFO scientists stated that by their calculations the herring fishery was robust and the stock could be sustainably managed with the opening of these commercial fisheries. The important point here is to recognise the embedded politics in the technoscientific apparatus of DFO. Funding cuts meant there was less capacity to actively and consistently monitor the fish stocks alongside a refusal to recognise the local knowledge of the fishing communities. Because the Heiltsuk First Nations interests did not necessarily align with the interests of the state, the results were a deepened schism between state science, fish harvesters, and fisheries management. Such schisms should be heeded as grave warnings in the circuitous political game of risk.³¹

The muzzling of government scientists in Canada under nearly a decade of conservative policies of the Harper government, paints a dystopic situation of the consequences of a government that utilises science for its own political agendas. These types of situations speak to the democratisation of science (Latour) as well as to a Faustian pact between governments, science, and wealth.

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³¹ The case is well documented in Canadian media outlets such as: <http://www.cbc.ca/news/canada/british-columbia/heiltsuk-first-nation-occupies-federal-office-over-herring-fishery-1.3014855>

<http://www.cbc.ca/news/canada/british-columbia/heiltsuk-dfo-herring-agreement-1.3409704>

<http://www.theglobeandmail.com/news/british-columbia/heiltsuk-first-nation-claims-victory-over-disputed-herring-fishery/article23757390/>

http://www.vancouversun.com/First+Nation+Heiltsuk+calls+extension+herring+fishery+closure/11117007/story.html?_lsa=3615-8ed5

The Namibian Fish Consumption Promotion Trust (NFCPT) was established in 2001 as part of a cabinet decision to include “infrastructure development and human capital investment in order to take fish to the nation.”³² It was designed and developed to promote the consumption of fish in Namibia through a rollout of available fish products in ten out of the fourteen regions in the country. A subsidiary of the Ministry of Fisheries, the NFCPT owns and operates fourteen fish shops across the country with the aim to make fish more accessible and affordable for Namibians.

In the thirteen years since the inception of the NFCPT, the gross weight of distributed fish per year rose from 500 tonnes in 2001 to 6700 tonnes in 2013 (ibid). In September 2012, I attended the national fish day in Swakopmund, an event sponsored by the NFCPT. Held in the centre of town, the event had various stalls that promoted fish in a variety of ways. Food demonstrations, the sale of fresh fish and frozen fish products, and informational stalls about the NFCPT were all part of the activities on offer. In addition, music and entertainment by local artists was also featured. What I could gather from talking with some of the attendees was a sense of surprise about the NFCPT and what they offer. Most of the visitors that I spoke to said they were “just checking things out,” walking through town and were drawn to the music and gathering of people. I had only been in the field for about a month or so, and it was also the first time I had heard of the NFCPT.

Back in Walvis Bay, over the course of my fieldwork, I learnt more about the NFCPT and visited their brand new offices and facilities that opened in the industrial area of Walvis Bay in 2013. The NFCPT, as part of the Ministry of Fisheries, operates on quota that they receive from the government for horse mackerel and hake. As of 2013, horse mackerel quota is guaranteed to the NFCPT. The NFCPT receives a greater quota allowance for horse mackerel than for hake. Because the NFCPT does not have fishing vessels, they have to sell their quota to industry in order to acquire the fish to sell in their shops. Once the fish is caught, the frozen fillets are then distributed by the NFCPT to the various outlets in the country, with a large portion of the products sent to the fish shops in the northern part of the country. Namibians are allowed to purchase five kilograms of packed fish at a time, as supplies are limited.

A peculiar relationship arises out of the institutional commitment to fish consumption and the governance that contributes to how the fish is caught. The relationship between the NFCPT and the government fosters a direct linkage between industry, government, and the public in such a way that all can benefit from the social responsibilities that result from the promotion of fish consumption to all Namibians. Fish is historically not seen as a food source in

³² <http://www.nfcpt.com.na/>

Namibia. Namibia is an agrarian and cattle country and also relies on game and chicken production for protein sources. Fish emerges within the marine industrial ecology as a mediator between companies and markets as well as a food source for nutritional reasons. To follow the fish from extraction to processing to distribution as commodity in the global supply chain reveals dependencies that exist between the flow of labour, consumption, and governance entities. The development of the NFCPT marries the market-based solution of fish production that benefits Namibians with the assumption that Namibians will choose to consume fish if it is made available at an affordable price. However, such an assumption disregards the ways in which human behaviours cannot be predicted or promoted as universal. In this way, the governance structures in practice are limited in their ontological capacities for building management procedures that achieve the objectives that are set out in the framework.

The NFCPT is an example of a government intervention into the crises of capitalism and environment that face Namibians. Drought has plagued the country for many years now, and the lack of rainfall has severely damaged crops and animal stocks. The NFCPT promotes the consumption of fish in times of crisis (food and agriculture), and amplifies the greater struggle to dissolve the boundaries of nature and culture. Much of the distribution of the fish products is in the northern part of the country, where there is a larger rural population and where people are more dependent on what they grow and harvest for supplying their food. The NFCPT is a dynamic and far reaching project because as a key actor, the NFCPT assumes the roles of a government body, a fishing rights holder (they are given their own quota), an employer, and a distributor. The NFCPT actually captures much of what the private fishing industry claims to do, but in a much more public space.

An emergent postcolonial science

To advocate for the democratisation of science in postcolonial Namibia is to challenge the ways that capitalism thwarts the effort to overcome the public misgivings about technological solutions and often fosters doubts about the veracity of scientific knowledge. The precision with which capitalism requires that bodies continue to be exploited on the factory floor and the ecology exploited out at sea is part of the legacy of colonialism and resource extraction that today exists as neoliberal management frameworks. The democratic project must address is how science done in the postcolony must also be part of the transition to democracy. To shift the ways in which democratic societies accommodate scientific understandings and regulate the increasingly complex scientific and political apparatus of technological development has to

address the ways in which the logic of late capitalism supports and requires the complicity of science to maintain the status quo. In this context, the old certainties of the implied 'social contract for science,' in which scientific authority is marshalled to 'speak truth to power,' is unlikely to provide reliable guidance in negotiating the complex interweavings of scientific expertise and modern democratic governance within the scope of capitalism.

A crisis of representation exists in the space where stock assessment science confronts the severe inequalities in the management paradigm for fisheries. Neoliberalism and a capitalist rendering of nature have formed a specific kind of fisheries management trajectory.

Measurement, logistics, and statistics are the foundations for how information becomes part of the sets of practices that contribute to decision-making processes.

In the marine industrial ecology of Walvis Bay, there is an urgency to re-assemble the social and ethical responsibilities for extraction. Such a re-assembling softens the rigid categorisations of ecological and social wellbeing and governance, focusing on the sets of relations that establish meaning, value, and responsibility for the task at hand: to develop a decolonial framework for fisheries management that attends to environmental and economic justice. Such a framework is holistic in scope and situates scientific modelling practices as part of the process, rather than the authority, and advocates for transformative practices rather than reductive calculations.

The failure in the post-modern and post-colonial analytical approaches is the sustained separation of society and nature, both singular. To think with nature is to think within it; a coalescing of ethnology and ethology in thinking together with nature. An ethology of capitalism points to the need to investigate how capitalism exists in specific circumstances and speculates on how it might learn a particular kind of behaviour. To think of capitalism in ethological terms, is to consider processes of domestication and the logic of mastery, a logic that demands a submission to nature to better master it. The perpetual restructuring of work can always be explained by reference to critical shifts in the mode of production or strategies of accumulation. This chapter concludes the study by situating it within the current debates on capitalist nature, fisheries management, and the role of science in political decision-making processes. In doing so, it illustrates the need for sets of practices that allow for relevant answers to the pressing questions of how to manage fisheries in the current moment of global capitalism and environmental devastation.

The processes of a decolonial approach to science in the postcolony develops a line of thinking that first recognises how history shapes the current paradigm of fisheries science. With regards to knowledge, Stengers offers a useful intervention through what calls the curse of

tolerance. Stengers' (2011) arguments around the fallacy of objective knowledge and the (re)crisis of representation point to the apoliticisation of universal, rational claims to situated knowledge. It is not to say that history and the geography of reason are not crucial elements in the discussion on the knowledge economy, but rather bind knowledge, and science to an epistemological tether in which the isolation of knowledge does not allow for the politics of representation to emerge.

As Stengers states, "to turn the curse of tolerance into an operator guiding the construction of what would pass its test is to gamble with what scientific practices may, or might, be capable of" (Stengers 2011:312). Her argument is not to sever the relations that emerge from structures of power and knowledge as an object/subject division as this is to suppress the problem through an *othering* of knowledge in which there is an obligation to reveal meaning whilst others are constructing meaning. In this way, scientific research in Namibia has not been in a position to speculate on the linkages between producers of knowledge, labour, and ecology, while also suppressing these facets. Economic orthodoxy requires an uneven relationship. Science as complicit in the project of democratisation, must be located within the historical space of colonialism, where the most lucid account is in the categorisations of black bodies for different labour sectors by their physical measurements. The hegemony of science remains largely unprovoked in the sphere of fisheries science and management, due mostly to the economic value attributed to the fishery that is most visible in the TAC. Here it becomes clear that not only is the scientific and economic orthodoxy embedded within structures of financial responsibility and control, but that power structures reflect centuries of imperialism that results in the structural violence seen today.

The political apparatus of fisheries science in Namibia are deeply entrenched within the historical, material, and political trajectory of colonialism. To frame it differently, the questions needed might ask how the historical entrenchment of knowledge within structures of power can be dealt with on a political level. For Latour, to invoke the phantoms of the political requires a politics that practices a quite distinct extraction of alterity in which "there is no crisis of representation" and "must not overestimate the unreason of politics but rather follow the experience of political speech," (Latour 2013:327). I tend to disagree with Latour on the issue of representation, and take a more material stance in my understanding of the role of politics. The urgency to act will not manifest from those who are already in a position of power, but will emerge from the spaces where politics requires action, such as in the factories.

As such, imperial science and the colonial project, although now vested in the *post-colonial* moment, remain committed to a discourse of sustainability and holistic management practice that continues down the path of ecological destruction and social and political unrest. Fisheries

management is tangled in the legacy of colonialism particularly in its reductive tendencies and the quantification of the very life forces that are in need of protection, autonomy, and collective care. What kinds of questions can promote practices that can reveal relevant information for *action*?

When working with institutional knowledge production in the form of scientific practices in the fishing industry, it is imperative to recognise the category mistakes that become conflated in the discourse of management practices. The distinctions between the political institutions, political public, and institutional knowledge are becoming increasingly more opaque. In this way, working with the fisheries science students (in Chapter 2) was an insightful exercise in dissolving some of the disciplinary limitations that underpin how the study of fisheries is conducted in Namibia. It became quite clear the ways in which institutions, as knowledge bearers, transmit and transmute historically uneven practices through a politics of inclusion, but one that is almost always selective. In other words, the students are trained with the goal that they will go on to work for the Ministry, a political institution with certain prestige of expertise. But, with such opaque relations between institutional knowledge, political publics (which include economic and material publics), and a new generation of scientists emerging both as products of and agents in such spaces, the historical entrenchment of certain types of knowledge practices are reconstructed as part of the liberal discourse of independence, democracy, and free markets. In this way, students are part of the political entity of higher educational institutions, and being trained within the very structures that are part of a historical legacy of undemocratic transitions.

Knowledge frameworks such as an EAF remain caught in the orthodoxy of state science and economic practices of resource extraction that benefit a certain political class. Of all the structures and categorisations present in such a messy assemblage of numbers, data, statistics, scientific research, organisms, and markets, the object of study in this dissertation is the model. Globally, amidst the climate crises and climate change debates, the statistical model has emerged as the technological intervention that is increasingly relied upon in the political sphere for political gains under the auspices of scientific objectivity. I offer that perhaps statistical models are not the most applicable intervention for fisheries management in its current state, particularly in the initiatives to model the human dimension and human wellbeing. If they are to be used (which is the goal for an EAF) the practices that inform the role of the models must define the assumptions for implementation in order to carefully negotiate for transformative practices and economic equity.

Recent scholarly debates around notions of the Anthropocene have focused on the argument on whether humanity has entered into a new epoch marked by the geological forces of humankind (Steffen et al 2007). In this new epoch, the Anthropocene concept suggests that humankind is the new geological force transforming the planet beyond recognition by burning prodigious amounts of coal, oil, and natural gas (Malm 2016). The current debates around the Anthropocene reflect a discursive shift in the way to think about the human in framing of the continuous ecological destruction that has become the norm.

It is within this precarious epoch in which controversies emerge on the very reality of nature(s), and perhaps more importantly, a dangerous authority over who and what speaks in defence of these natures. On a spectrum that ranges from climate change scepticism to the moralism of conservationism, there is a very real polemical surge of authoritarian politics of nature in regards to the environmental crises that define this moment in history. The current trend in the sciences is to rely on a range of practices that are designed to harness information, in the form of data, to extrapolate and predict changes from the earth's system, to weather patterns, to education, and the welfare state. Outcomes are weighted within frameworks of measurable indicators, and are deterministic tools to implement rollouts of many public services. The interface of science, technology, nature, and reality are constantly re-configuring information and authority in ways that amplify the trope of environmental destruction vis-à-vis human exceptionalism.

While various approaches to understanding humanity's role in the simultaneous conservation and destruction of the earth, its resources, and in communities are emerging in intellectual spaces, to work within the realm of the Anthropocene debates currently underway presumes a specific type of human/nature relationship. The agency of humans is grouped together under the banner of humankind which is troubling as the world's inequalities become even more severe. Supporters of the Anthropocene concept argue that such degradation is the result of humans acting out their innate predispositions, the inescapable fate for a planet subjected to humanity's "business-as-usual," (Malm 2016). Walvis Bay relies on the main industries that extract and export raw materials: fish and minerals. The country sees its most valuable resources leaving the country permanently and the city of Walvis Bay occupies a distinct position within the wider global supply chains. Walvis Bay itself feels extremely isolated, but the undercurrents that move the raw materials, people, and commodities reflect the truly globalised position of the city.

The growth of Walvis Bay is staggering. From my initial field work in 2010 to the completion of field work in 2013, the growth is significant. In particular, the sprawl of Kuisebmond has grown from edges of town centre out towards the B2 highway that runs from Walvis Bay to Swakopmund. When I first travelled to Walvis Bay in 2010 Kuisebmond's outer reaches were at least one thousand metres in from the highway and when I left in 2013 there were homes being built right up next to the highway. Despite the sprawling development of the city, Walvis Bay still felt socially isolated, with relationships hard to establish and maintain on a deeper level. The survival of the city is in its relation to global markets and supply chains, yet in the everyday experience in Walvis Bay, one's own mobility is disrupted, halted, or diverted.

Life in Walvis Bay is a precarious experience to navigate the urbanism of a global port city that sees the country's most valuable raw materials being exported. The strangeness of the town against the backdrop of urban development and globalism is indeed contradictory. The social relations that contributed to much of my experience there seemed shallow and forced much of the time. It is very common for people to keep to themselves, to disengage in conversation or leisure with one another, which paints a starkly different picture of the global African city. Walvis Bay continues its transformation in the direction of capitalist nature making built on processes of extraction. The Namibian Fish Consumption Trust is one effort to transform the relationship between national resource and the country's citizens.

Everyday life under capitalism in the postcolony assumes labour, nature, and resources as part of an assemblage of uneven relations that emerge from specific historical conditions. These conditions stem from the magnitude of the material conditions under colonialism, which saw the simultaneous plunder of resources and human labour. The experience of colonialism across the Global South manifests in different ways in the present moment. In the Latin American context, where colonialism has also triumphed in its fracturing of people's experiences and collective trauma and exploitation are markers for centuries long occupations, there is a resistance to these practices through a shift of the life negating narrative into one of life affirming. Out of the negation of being, which is the trick of imperialism, there must be a shift in which the oppressed internalise the negation of experience into one of affirming. It is a moment of rupture in the continuity of colonialism in which the oppressed groups are agential because of the emphasis on life affirming tactics. These tactics also apply to the natural world, as the expropriation of nature occurs simultaneous to the colonisation of people. Therefore, value, as Dussel asks, "how is human life transformed into an objective reality?" (Dussel 2012:231). I would extend this to beyond human life to all life. Life making ecologies are transformative in their role as creating a reality in which a praxis of liberation transforms norms, actions, institutions, and ethical systems

(ibid). The historical moment when living labour becomes formally subsumed in capital, is in the material sense of producing surplus value and to the extent that it is the machinery rather than the worker that commands the production process. This results in the worker being completely dominated by capital, subsumed in capital in its totality, and marks an ethical moment par excellence of the negation of the worker, their experience, and produces the conditions in which capitalism is able to flourish (ibid).

In a world composed of multiple worlds and inhabited by various actors, political pragmatics avoids the pitfalls of not only simplistic binaries, but also of the *capitalocentrism* (Gibson-Graham 2006, Haraway 2015) that emerges from the global environmental crises. If the globalisation of the division of labour is a process that has its origins in capitalist centres and is moulded in particular ways by imperialism, it forms part of a logical framework and set of practices that purposely under-develop certain geographical portions of the global labour market in order to force people into decisions like becoming migrant workers. Marxist and anti-imperialist politics typically conclude that broad organisation of people in those marginal regions into communities of nation and classes (in solidarity with the working classes of the capitalist centres) are the best method to resist the global processes and develop local alternatives to them.

Nature is deeply entrenched in the historical conditions of colonialism and capitalism, and in the context of Namibia, in the history of extractions. Moore presents a useful shift in thought that states “nature can neither be saved nor destroyed, only transformed,” (Moore 2015:45). Such a placement of nature as within the contradictory conditions of capitalism rather than outside as an external force to be tamed, allows the historical and relationally produced features such as labour, fish, and minerals to form part of these contradictions particularly in light of colonialism and the exploitation of labour and the expropriation of energy (ibid). Nature and resources then, are not a timeless background to capitalism, but are part of certain modes of production that reveal how historical natures and their reproduction are not incidental to accumulation, and that natures are the condition of its possibility.

Capitalism is in crisis. The effects of the crisis reach into spaces as vast and dissonant as the cabin of a fishing vessel to the homes of young children who are raising each other. Particular attention to the historical materialisms and realisms that have contributed to the transformation of fisheries science in Namibia reveals a legacy of science, labour, and extraction that is both exclusive and hierarchical. In this way, there is a (re)production of colonial thought in the scientific authority that the Ministry of Fisheries deploys through the alliance of state science and economic orthodoxy, coupled with a science that has yet to be brought into democracy. In the hake sector, such alliances between the state, science, and capitalism reveals

the potency of power (political, economic, and scientific) in guiding how management models in turn govern and control people. Thus, the exercise that was presented in the previous chapter was one such strategy to reassemble the social and ethical responsibilities of industrial extractive economies to design a conceptual model that is both relevant to the Namibian context and that attend to the tasks at hand.

The questions around human wellbeing need to be further reworked to reflect the management objectives in a way that accounts for the experiences of Walvis Bay residents and their personal and collective efforts for economic mobility, social and emotional stability, and opportunities for growth in a rapidly changing landscape in southern Africa and beyond. Human wellbeing is a critical component to fisheries management within the neoliberal modes of production. To frame experiences and to capture what life under capitalism means in postcolonial Namibia is still nascent. Instead of working from pre-supposed assumptions, the practices that lead one to carefully and considerately frame the question of human wellbeing in a complicated space such as Walvis Bay may render more fruitful observations of meaning and value. The fishing industry in Walvis Bay has thus not been assembled very well within the management paradigm. In order to change these limitations, it is useful to step back and examine the sets of practices that have so far, grounded fisheries management in Namibia. The next step, I would argue, would be to ask whether an EAF is the appropriate formulation of a management model in Namibia, as this study has demonstrated the severe limitations to the conceptual model in practice.

Alternatives to the status quo require more than moral posturing about sustainability practices and corporate responsibility. In this way, to (re)assemble the social and ethical responsibilities of extractions is to start from an assumption that ethics can be a mode of locatedness, and in the Namibian case it is a location in the history of colonialism, in which to tease out the relationalities that continue to build from this experience. It is in this way, that the affirmation of life and life ecologies must emerge from the ashes of the liberation struggle, to fully grasp the crisis at hand. Namibia's fish stocks remain depleted with little sign of recovery. In *Negative Dialectics*, Adorno prepares us for a philosophy that no longer has the infinite at its disposal, and must do without the consolation that the truth cannot be lost (Adorno 1973). As such, discussions of ethics and morality will always be in a continuous loop over and within themselves. Ethical and moral considerations attempt to give order to space, or reconfigure space in ways that are tentative, fragile, and in some ways apologetic. The space to re-configure is that which is suspended between the ideal and the real, the spaces in which the particular emerges beyond the norm. These contingencies of reality, of life expressions, demand an ethics

of responsibility, an ethics that is situated within an industrial landscape, marked by significant contradictions.

Conclusion

Namibia as a country is understudied, and while there are a wide range of studies on fisheries globally, there has previously been no qualitative study on Namibia's hake fishery. Situated within wider global processes of natural resource extraction, the challenges of modelling wellbeing in Namibia are filtered through a distinctly local lens.

The scale of this project is therefore extensive and multi-faceted even at the local level. The empirical data is presented here as one way in which to address the limitations of the current fisheries management paradigm. An ethnography of Namibia's hake fishery is useful because it requires long-term exposure to the site of study. The longevity of the project allowed me to experience the full fishing season coupled with the decision-making processes that occur for each fishing season. It also allowed ample time to get to know the context of Walvis Bay and the residents of the town because I too, was a resident, with my own sets of assumptions and questions that took time and effort to dismantle and overcome.

Lessons learnt

The challenge to first understand the scientific landscape in Namibia hangs on the idea that science and scientific practices operate outside of the social and political worlds. In Chapter 1, I presented an overview of the conceptual model of an EAF in the Benguela Current in order to set the stage for the following interventions. Because an EAF in Namibia needs to be implemented before its success can be measured through the statistical devices of the decision support tool, it is important to understand the difference between statistical models and conceptual models.

In Chapter 2 I engaged with the relationship between fisheries science, stock assessment and EAF. The stock assessment is embedded in specific historical and material practices that are entrenched in the social and political worlds, but it operates with the assumption of being in the objectively scientific world. The old paradigm of stock assessment science remains so dominant because the stock assessment model produces a numerical estimation of how many hakes are in the ocean which is then attributed an economic value. Within the historical legacy of stock assessment science is an assumption about the value embedded in the expropriation of the physical world. The stock assessment model remains the voice of authority within fisheries management because it so entrenched in the bureaucratic practices of the Ministry of Fisheries.

In Chapter 3, I present empirical data to demonstrate, through an exercise in hardest case modelling, the separateness in method of fisheries science and qualitative ethnography. The task that Barbara Paterson and I undertook to re-structure the indicator framework for human wellbeing is presented in the figures, and reveals the important indicators as clusters and through their relation to the others. Barbara has already been able to run this new framework through a computer simulation, with the outputs of her computer model included in the figures. While this is only a bare electronic model, it begins to illustrate how modelling wellbeing can be done in a way that attends to the myriad ways of capturing wellbeing in Walvis Bay. This chapter provides a conclusion to the first half of the dissertation that is concerned with the workings of contemporary fisheries science.

Chapter 4 begins the second half of the dissertation whose focus is on the anthropological conception of human wellbeing in Walvis Bay. Through ethnographic methods, as distinct from fisheries science, this chapter searches for human wellbeing in the strangeness of Walvis Bay. The industrial ecology of the town itself presents a host of signals that would lead one to believe that wellbeing cannot exist. The stories of Meme Tresia and other close friends in Walvis Bay illuminate the ways that wellbeing must come to mean something else than the prescribed indicators within the development agenda. Before wellbeing can be attributed to a category within the management framework and modelled by electronic devices such as statistical models and software, a clear definition of wellbeing must be conceived that is particular to Walvis Bay (and more broadly Namibia).

It became quite clear the ways in which institutions, as knowledge bearers, transmit and transmute historically uneven practices through a politics of inclusion, but one that is almost always selective. In other words, the students are trained with the goal that they will go on to work for the Ministry, a political institution with certain prestige of expertise. But, with such opaque relations between institutional knowledge, political publics (which include economic and material publics), and a new generation of scientists emerging both as products of and agents in such spaces, the historical entrenchment of certain types of knowledge practices are reconstructed as part of the liberal discourse of independence, democracy, and free markets. The foundations of the Ministry of Fisheries is embedded within Namibia's history of colonialism, and is part of the governance structures today that postulate the idea of wellbeing as part of the industry growth, profits, and benefits.

My search for wellbeing in Walvis Bay meant I had to first question the basis for this claim in the fisheries context. The ecosystems approach to fisheries management model is a product of the UN FAO, and distinctly part of the global development agendas as set out by the

key figures of international development, namely the UN, the IMF, and the World Bank. The assumptions of these institutions relies significantly on ideas of individualism, community resilience and adaptation, and technological solutions to address the growing inequalities, unemployment, and disease that mark societies in transition such as Walvis Bay. As I built relationships with residents in Walvis Bay, it became clear to me the impossibility of understanding wellbeing within a framework that puts wellbeing at one end of the spectrum (as something to be achieved) and poverty at the other. Such a linear approach implicitly assumes that wellbeing cannot exist in places where poverty is the norm. I had to thus search for alternative imaginaries of wellness as they appear in the specific material and social conditions in Walvis Bay.

In Chapter 5 I argue that wellbeing in Namibia's hake fishery has thus not been conceptualised fully or sufficiently. The relationship between capital and labour attests to this. One of the key issues in the fisheries sector centres on labour, as it becomes the dominant thread in which to justify growth (in the form of factories and in the granting of fishing rights). The unjust labour practices point to an industry that is over-capacitated in facilities with a slowly recovering hake population in which to fish and process. The crucial error in the management framework has been its reliance on employment statistics as the explanation to maintain large scale, industrial fishing corporate strategies. In working with employees of the fishing companies (i.e. factory workers, crew members, skippers, managers) and the fisheries labour unions, I am able to argue that fisheries management fails to see how corporate growth with the agreement of the Ministry of Fisheries contributes to the growing inequalities, poor living conditions, and increasingly desperate working conditions in Walvis Bay. All of this troubles the idea of wellbeing in the fisheries context.

Finally, Chapter 6 offers an intervention in the thought experiment of scientific and statistical modelling in Namibia's hake fishery. Capitalism thwarts the democratisation of science in the postcolony and contributes to uneven relationships between labour, nature, ecology, and the state. A crisis of representation of scientific knowledge allows for little political action to materialise in Namibia despite the urgency to address the social and ecological devastation that exists. To challenge the scientific orthodoxy in fisheries management also requires a challenge to the economic logics of neoliberal management practices.

Looking ahead

The study has offered a distinctly qualitative perspective on the challenges of incorporating the human dimension into a national fisheries management programme. It was conducted in the urban town of Walvis Bay over the course of eighteen months. Because of the scope of the topic, there are a couple of limitations that need to be considered. First, fisheries management in Namibia is massively difficult to understand, not least because it is so disaggregated. There is limited research to draw from with regards to the human dimension as it is a concept that is constantly evolving. Therefore, the study is limited by my own understanding of how the fishery works, based on what I have learnt up to this point. Secondly, working within institutional and bureaucratic systems comes with its own sets of limitations, namely that of access. Much of the information on the hake fishery should be public information, but since there is no database, web portal, or archive to host such information, one has to rely on others to provide requested information. There were times when people would not respond to these requests. Because of the corporate character of the fishing industry, gaining access to speak with the companies was sometimes very difficult or denied. I tried to speak to as many companies as I could, but I was unable to reach them all. One final and perhaps the most important limitation is that an EAF in Namibia has not been implemented. Therefore, measuring the effectiveness of an EAF as the management approach assumes that an EAF has already been implemented. Such a paradigm shift is thus a process, and therefore truly incorporating the human dimension into an EAF management model that can be electronically modelled can only manifest once an EAF has been implemented.

My conclusions here remain elusive, and I am reluctant to set out any policy prescriptions. It is my hope and intention that my work can be used as part of the foundation for research to come with regards to the incorporation of the human dimension into models for management, and that the empirical data can be used to formulate new questions, frameworks, and ideas for managing Namibia's fisheries that attends to the environmental and economic injustices that mark contemporary society in Namibia today.

All life makes environments, and all environments make life, writes Moore (2015). As an ethnographer, I am ethically bound to my research participants in my writing and how I present them and their experiences. It is not an easy task to know whether I have afforded my research participants and my friends enough, and it can unwillingly be easier to write out others' agency rather than acknowledging the limitations of my own. Namibia is a place of extremes. The gravitas of the social extremes that I witnessed in my time there necessarily demands a non-effacing of the human agency within this text. The tension between the established rules and

roles and the desire to reconfigure life outside of these constraints shows a tension between hierarchy and humanity.

The future of natural resource extraction and the future of communities that are embedded in such practices are caught in the web of life, the assemblage of relations that are not universal, yet have global implications. In fisheries management, the shift towards a more holistic management paradigm of an ecosystems approach to fisheries is only beginning to attempt to include issues of labour, work, wellbeing, and justice into the conversation. The three-pronged approach of an EAF that looks to the ecological and social/human wellbeing of the fishery coupled with good governance, or the potential to manage the fishery in good faith (i.e. in line with international maritime laws, human rights discourse, and sustainability), is a step in dissolving the parameters of nature and society, culture and environment. Such moments are important in dismantling the conditions in which the fishing sector has been able to maintain the hold, the sorcery of capitalism that haunts the landscape of industrial supply towns across the African continent.

Throughout the dissertation I have done my absolute best to stay true to my friends, colleagues, and participants with the hope that this research will reach those who are open to different ways of organising knowledge and doing science in the postcolony. It is my hope that the work presented here may provide a starting point for which to further engage in studies of wellbeing as being distinctly situated within the realm of nature and mutually co-producing of environments that are life affirming.

Bibliography

- Bavington, D. 2009. "Managing to Endanger: Creating manageable cod fisheries in Newfoundland and Labrador, Canada." *Mast* 7:99-121.
- Browman, H. et al. 2004. "Perspectives on ecosystem-based approaches to the management of marine resources." *Marine Ecology Progress Series*. 274:269-303.
- Callaghan, M. 2014. *Antiretroviral Therapy in Walvis Bay, Namibia*. Doctoral dissertation. University of Toronto Graduate School.
- Césaire, A. 1955. *Discourse on Colonialism*. New York: Monthly Review Press.
- Césaire, A. 1983. *The Collected Poetry*. Berkeley: University of California Press.
- Cochrane, K.L., et al. 2007. "Results and conclusions of the project 'Ecosystem approaches for fisheries management in the Benguela Current Large Marine Ecosystem.'" *FAO Fisheries Circular*. No. 1026. Rome: UN FAO.
- Cowling, R. 2014. "Let's Get Serious About Human Behavior and Conservation." *Conservation Letters*. 7(3):147-148.
- de Landa, M. 2011. *Philosophy and Simulation: The Emergence of Synthetic Reason*. London: Continuum.
- Deleuze, G., and Guattari, F. 1987. *A Thousand Plateaus: Capitalism and Schizophrenia*. Minneapolis: University of Minnesota Press.
- Deleuze, G., and Guattari, F. 1983. *Anti-Oedipus: Capitalism and Schizophrenia*. Minneapolis: University of Minnesota Press.
- Dengbol, P., and Jarre, A. 2004. "Review of indicators in fisheries management: A development perspective." *African Journal of Marine Science*. 26(1):303-326.
- Draper, K. 2014. "Networks of capital: Reframing knowledge in the Namibian hake fishery." *Marine Policy*. 60:293-299.

- Draper, K. 2011. *Technologies, knowledge and capital: toward a political ecology of the hake trawl fishery Walvis Bay, Namibia*. Unpublished MA dissertation. University of Cape Town.
- Dussel, E. 2012. *Ethics of Liberation: In the Age of Globalization and Exclusion*. Durham: Duke University Press.
- Dussel, E. 1985. *Philosophy of Liberation*. Maryknoll, NY: Orbis Books.
- Fanon, F. 1965. *The Wretched of the Earth*. New York: Grove Press.
- Fanon, F. 1986. *Black Skin, White Masks*. London: Pluto Press.
- FAO. 2003. "Fisheries Management, the ecosystem approach to fisheries, the human dimensions of the ecosystem approach to fisheries." *FAO Technical Guidelines for Responsible Fisheries*. No. 4. Rome: UN FAO.
- Fournier, M. 2014. "Lines of Flight." *Transgender Studies Quarterly*. 1(1-2):121-122.
- Garcia, S., et al. 2003. "The ecosystem approach to fisheries. Issues, terminology, principles, institutional foundations, implementation and outlook." *FAO Fisheries Technical Paper*. No. 443. Rome: FAO.
- Garcia, S., and Cochrane, K. 2005. "Ecosystem approach to fisheries: a review of implementation guidelines." *ICES Journal of Marine Science*. 62:311–318.
- Gibson-Graham, J. K. 1996. *The End of Capitalism (as We Knew It): A Feminist Critique of Political Economy*. Cambridge, MA: Blackwell Publishers.
- Gibson-Graham, J. K. 2006. *A Postcapitalist Politics*. Minneapolis: University of Minnesota Press.
- Goodrich, A. 2013. *Rifling through 'Nature': An ethnographic account of biltong hunting, late capitalist 'nature' and a politics of belonging in the South African wildlife ranching industry*. Unpublished PhD dissertation. University of Cape Town.

- Green, L. 2014. "Archaeologies of Intellectual Heritage?" *Ethics and Archaeological Praxis*. 229-43.
- Green, L. 2015. "Fisheries Science, Parliament and Fishers' Knowledge in South Africa: An Attempt at Scholarly Diplomacy." *Marine Policy*. 60:345-52.
- Guattari, F. 2015. *Lines of Flight: For another world of possibilities*. New York: Bloomsbury Academic.
- Hage, G. 2015. *Alter-Politics: Critical Anthropology and the Radical Imagination*. Melbourne: Melbourne University Press.
- Hage, G. 2005. "A not so multi-sited ethnography of a not so imagined community." *Anthropological Theory*. 5(4):463-475.
- Haraway, D. 2008. *When Species Meet*. Minneapolis: University of Minnesota Press.
- Haraway, D. 2015. "Anthropocene, Capitalocene, Plantationocene, Chthulucene: Making Kin." *Environmental Humanities*. 6:159-165.
- Harney, S., and Moten, F. 2013. *The Undercommons Fugitive Planning & Black Study*. Wivenhoe: Minor Compositions.
- Helmreich, S. 2009. *Alien Ocean: Anthropological Voyages in Microbial Seas*. Berkeley: University of California Press.
- Hutchings, L. et al. 2009. "The Benguela Current: An ecosystem of four components." *Progress in Oceanography*. 83(1-4):15-32.
- Jayiia T., et al. 2008. "Strategy for fisheries socio-economic research." *PLAAS Working Paper*. No. 5. Cape Town: Institute for Poverty, Land and Agrarian Studies.
- Kaapama, P. 2007. "Commercial land reforms in postcolonial Namibia: What happened to liberation struggle rhetoric?" In H. Melber (ed) *Transitions in Namibia: Which changes for whom?* Uppsala: Nordiska Afrikainstitutet. pp 29-49.

Kirchner, C. 2014. "Estimating present and future profits within the Namibian hake industry: a bioeconomic analysis." *African Journal of Marine Science*. 36(3):1-10.

Kirchner, C., and Leiman, A. 2014. "Resource rents and resource management policies in Namibia's post-Independence hake fishery." *Maritime Studies*. 13(7).

Kirchner, C., et al. 2012. "Evaluation of the status of the Namibian hake resource (*Merluccius spp.*) using statistical catch-at-age analysis." *Environment for Development Discussion Paper Series*.

Gothenburg: Environment for Development, Environment for Economics Unit, University of Gothenburg.

Kirchner, C. 2010. *Determinants of resource rents in the Namibian hake industry*. MBA thesis. University of Cape Town Graduate School of Business.

Latour, B. 2013. *An Inquiry into Modes of Existence: An Anthropology of the Moderns*. Cambridge: Harvard University Press.

Latour, B. 2007. "The Recall of Modernity: Anthropological Approaches." *Cultural Studies Review*. 13(1):11-30.

Latour, B. 2005. *Reassembling the Social: An Introduction to Actor-network-theory*. Oxford: Oxford University Press.

Latour, B. 2004. *Politics of Nature: How to Bring the Sciences into Democracy*. Cambridge: Harvard University Press.

Latour, B. 2004. "Whose Cosmos, Which Cosmopolitics?: Comments on the Peace Terms of Ulrich Beck." *Common Knowledge*. 10(3):450-62.

Latour, B. 1993. *We Have Never Been Modern*. Cambridge: Harvard University Press.

Law, J., and Lin, W.Y. 2010. "Cultivating Disconcertment." *The Sociological Review*. 58:135-53.

- Lett, C., et al. 2008. "A Lagrangian Tool for Modelling Ichthyoplankton Dynamics." *Environmental Modelling & Software*. 23(9):210-214.
- Leys, C., et al. 1995. *Namibia's Liberation Struggle: The Two-edged Sword*. London: J. Curry.
- Mace, P. 2001. "A new role for MSY in single-species and ecosystem approaches to fisheries stock assessment and management." *Fish and Fisheries*. 2(1):2-32
- McKittrick, K. 2015. *Sylvia Wynter: On Being Human as Praxis*. Durham: Duke University Press.
- Maldonado-Torres, N. 2008. *Against War: Views from the Underside of Modernity*. Durham: Duke University Press.
- Malm, A. 2016. *Fossil Capital: The Rise of Steam-power and the Roots of Global Warming*. London: Verso Books.
- Marx, K. 1964. *Economic and Philosophic Manuscripts of 1844*. New York: International Publishers.
- Marx, K. 1976. *Capital Volume 1*. London: Pelican Books.
- Mbembe, A. 2003. "Necropolitics." *Public Culture*. 15(1): 11-40.
- Melber, H. 2007. *Transitions in Namibia: Which Changes for Whom?* Uppsala: Nordiska Afrikainstitutet.
- Ministry of Fisheries and Marine Resources. 1991. *Towards responsible development of the fisheries sector*. White Paper. Government of the Republic of Namibia: Windhoek.
- Ministry of Fisheries and Marine Resources. 2004. *Namibia's marine resources policy: towards sustainable development of the marine sector*. Government of the Republic of Namibia: Windhoek.
- Moore, Jason. 2015. *Capitalism in the Web of Life: Ecology and the Accumulation of Capital*. London: Verso Books.
- Moorsom, R. 1984. *Walvis Bay: Namibia's Port*. IDAF: London.

Oelofson, B.W. 1999. "Fisheries management: the Namibian approach." *ICES Journal of Marine Science*. 56:999-1004.

Paterson, B. 2015. "Namibia's award-winning fish regime needs to move up a gear." *The Conversation*. <http://theconversation.com/namibias-award-winning-fish-regime-needs-to-move-up-a-gear-42423> [web]

Paterson, B., et al. 2015. "Incorporation of stakeholders' knowledge in data collection and analysis: Evidence based management recommendations for the Namibian hake fishery with special emphasis on use value and employment." Technical report prepared for the Benguela Current Commission.

Paterson, B., et al. 2013. "A Short History of the Namibian Hake Fishery: A Social-Ecological Analysis." *Ecology and Society*. 18(4):66.

Paterson, B., et al. 2007. "A fuzzy-logic tool for multi-criteria decision making in fisheries: the case of the South African pelagic fishery." *Marine and Freshwater Research*. 58:1056-1068.

Paterson, B., and Kainge, P. 2014. "Rebuilding the Namibian Hake Fishery: A Case for Collaboration between Scientists and Fishermen." *Ecology and Society*. 19(2):49.

Paths to Freedom. Dir. Richard Pakleppa, 2014. Film.

Prigent, M., et al. 2008. "Using cognitive maps to investigate fishers' ecosystem objectives and knowledge." *Ocean and Coastal Management*. 51:450-462.

Sassen, S. 2001. *The Global City*. Princeton: Princeton University Press.

Sassen, S. 2014. *Expulsions: Brutality and Complexity in the Global Economy*. Cambridge: Harvard University Press.

Seaver, N. 2014. "Knowing algorithms." Unpublished paper presented at *Media in Transition 8*. Cambridge, MA.

- Seaver, N. 2013. "What should an anthropology of algorithms do?" Unpublished paper presented at *American Anthropological Association* annual meeting. Chicago, IL.
- Shannon, L.V., and Nelson, G. 1996. "The Benguela: Large Scale Features and Processes and System Variability." *The South Atlantic*. 163-210.
- Smith, Neil. 1984. *Uneven Development: Nature, Capital, and the Production of Space*. Athens: University of Georgia Press.
- Soggot, David. 1986. *Namibia: The Violent Heritage*. New York: St. Martin's Press.
- Steffen, W. et al. 2007. "The Anthropocene: Are Humans Now Overwhelming the Great Forces of Nature?" *Ambio*. 36(8):614-621.
- Stengers, I. 1997. *Power and Invention. Situating Science*. Minneapolis: University of Minnesota Press.
- Stengers, I. 2000. *The Invention of Modern Science*. Minneapolis: University of Minnesota Press.
- Stengers, I. 2010. *Cosmopolitics*. Minneapolis: University of Minnesota Press.
- Stengers, I. 2011. *Cosmopolitics II*. Minneapolis: University of Minnesota Press.
- Strathern, M. 2005. *Partial Connections*. Lanham: Altamira Press.
- Strathern, M. 1980. "No nature, no culture: the Hagen case." In M. Strathern & C. McCormack (eds) *Nature, Culture and Gender*. Cambridge: Cambridge University Press. pp 174-222.
- Trotter, H. 2011. *Sugar Girls and Seamen: A Journey into the World of Dockside Prostitution in South Africa*. Athens: Ohio University Press.
- Tsing, Anna. 2015. "Salvage Accumulation, or the Structural Effects of Capitalist Generativity." *Theorizing the Contemporary, Cultural Anthropology*.
<http://www.culanth.org/fieldsights/658-salvage-accumulation-or-the-structureal-effects-of-capitalist-generativity> [web]

- van Sittert, L. 2002. "Leviathan Bound: Fisheries Reform in South Africa, 1994-2001." In A. Lemon & C.M. Rogerson (eds) *Geography and Economy of South Africa and Its Neighbours*. Farnham: Ashgate Publishing. pp 45-62.
- Verran, H. 2013. "Valuing natures. Knowing numbers. Between environment and economy." Paper presented to the Department of Anthropology Seminar Series. July 2013. Cape Town.
- Verran, H. 2015. "Enumerated entities in public policy and governance." In E. Davis and P. Davis (eds) *Mathematics, Substance and Surmise*. Springer, Cham. pp. 365-379.
- Wallace, M., and Kinahan, J. 2011. *A History of Namibia: From the Beginning to 1990*. New York: Columbia University Press.
- Wilhelm, M. 2012. *Growth and otolith zone formation of Namibian hake Merluccius capensis*. Unpublished PhD thesis. University of Cape Town.
- Winterfeldt, V. 2007. "Liberated economy? The case of Ramatex Textiles in Namibia." In H. Melber (ed) *Transitions in Namibia: Which changes for whom?* Uppsala: Nordiska Afrikainstitutet. pp 65-93.
- Wark, M. 2014. *Molecular Red: Theory for the Anthropocene*. London: Verso Books.