

*“Golden Forests” of the Sea<sup>1</sup>:*  
ASSESSING VALUES AND PERCEPTIONS OF KELP IN  
THE WESTERN CAPE REGION OF SOUTH AFRICA

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<sup>1</sup> The inspiration for this title was taken from one of the interviews conducted for this research.

## ABSTRACT

Kelp are large seaweeds that provide a variety of contributions to humans and the environment. In South Africa, kelp forests are expanding as a consequence of climate change. In light of this expansion, assessing perceptions and values around kelp may contribute to the implementation of successful marine resource management initiatives. The lack of consideration of non-market values is a gap in kelp valuation studies with kelp ecosystems and their use rarely valued outside of classical economic valuation frameworks. This study aims to fill this research gap, with the intention to elicit perceptions about other value dimensions related to kelp. The study investigates the attitudes and perceptions of value of three groups of actors' (Recreational Users and/or Coastal Community Members, Environmental Managers and Conservationists, and Kelp and/or Abalone Industry Actors) towards kelp in the Western Cape region of South Africa. This is done using the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services' (IPBES) conceptual framework, that considers: (i) kelp as a facet of nature, and (ii) kelp's contributions to people as foci of value that contribute to quality of life.

The results of the study indicate that the perceived value of kelp extends far beyond its economic value as a harvested resource. Rather, actors highly value kelp's ecological and social contributions, and have strong relational values towards kelp, recognizing its role in enhancing their quality of life and well-being. Areas of dissonances in valuing kelp's contributions — such as differences in perceptions around kelp's ability to increase one's safety from extreme natural events, or its importance as a source of food and feed for domestic animals — are attributed to individuals' held values as well as their socio-demographic characteristics and situational contexts. While actors did not display significant negative perceptions around kelp, Kelp and/or Abalone Industry Actors indicated frustrations with kelp management strategies and kelp concession permit allocation processes. In turn, 27% of Kelp and/or Abalone Industry Actors perceived inequality in the kelp sector, contributing to a reduction in their appreciation of kelp.

The dissertation makes a case for integrated marine resource management solutions aimed towards just and sustainable futures through the recognition of the plurality and complexity of values around kelp. A critique of the IPBES conceptual framework as a methodology is also included, suggesting that its utility is dependent on the objectives of its application. It is recommended that NCP should be considered within the context of governance and access dimensions to elicit a holistic view on assigned values and perceptions towards nature.

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## LIST OF ABBREVIATIONS

DAFF	Department of Agriculture, Forestry and Fisheries
DEFF	Department of Environment Forestry and Fisheries
DFFE	Department of Forestry, Fisheries and the Environment
ES	Ecosystem Services
GDP	Gross Domestic Product
GSR	Great Southern Reef
IPBES	Intergovernmental Platform on Biodiversity and Ecosystem Services
IPCC	Intergovernmental Panel on Climate Change
MA	Millennium Assessment
MLRA	Marine Living Resources Act
MPA	Marine Protected Area
NCP	Nature's Contributions to People
SRCA	Seaweed Rights Concession Areas
SSFP	Small-Scale Fishing Policy
TAC	Total Allowable Catch
TEEB	The Economics of Ecosystems and Biodiversity
WTP	Willingness To Pay

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*How easy it is to lose oneself  
in a kelp forest. Between  
canopy leaves, sunlight filters thru  
the water surface; nutrients  
bring life where there'd other-  
wise be barren sea; a vast eco-  
system breathes. Each  
being being  
being's link.*

- Jeffrey Yang, poet

# CHAPTER ONE

## 1.0 INTRODUCTION

Marine resources and ecosystems provide various contributions to people, ranging from economic to social benefits that directly and indirectly impact society. Ecosystems have value because they maintain life on Earth, and marine ecosystems are no exception (Millennium Ecosystem Assessment, 2005). Even so, environmental degradation of marine ecosystems is a global challenge, especially in light of changing ocean conditions. Climate change is affecting our oceans, and alongside overfishing, off-shore mining, and plastic pollution, the ocean is increasingly under threat (IPCC, 2019). In turn, the magnitude of the contributions provided by marine ecosystems is changing. Kelp forests form one of many such marine ecosystems, which are transforming under climate change (Bolton and Blamey, 2017a).

Kelp are large seaweeds that belong to the Order Laminariales. Kelp exists along temperate to Arctic shores where they form forest ecosystems in the lower-intertidal to shallow sub-littoral reefs (Krumhansl et al., 2016). Kelp can be found from shorelines all the way down to depths of 30-40 meters, with vertical limits to their distribution depending on waves, grazers, and light (Bennett et al., 2016).

Kelp ecosystems are complex and provide a variety of contributions to humans and the environment. These range from providing habitats for various species of invertebrates, fish, and marine mammals to carbon sequestration and shoreline protection (Steneck et al., 2002). In the past 50 years, however, there has been a global decline of kelp abundance of ~2% per year, due to the increasing number of threats faced by kelp ecosystems worldwide (Krumhansl et al., 2016). That said, research has also shown that the changes in kelp abundance vary across regions (Wernberg et al., 2018). As stated in the IPCC's Special Report on the Ocean and Cryosphere in a Changing Climate, there is high confidence that distribution ranges of kelp forests have been expanding at high latitudes but contracting at low latitudes (IPCC, 2019).

A unique consequence of climate change for South Africa is that kelp forests in this region are expanding, both in terms of abundance and range, with kelp forests moving eastwards towards Koppie Allen (Bolton and Blamey, 2017). In Southern Africa, kelp forests now occur over ~1,000 km of coastline in the cool nutrient-rich waters of the Benguela Current Large Marine Ecosystem (BCLME). This increase in kelp productivity could be attributed to the increased intensity and duration of the south-easterly wind, which causes the upwelling of cool, nutrient-rich water (Bolton and Blamey, 2017a; Abrahams, Schlegel and Smit, 2021). These changing climatic conditions have triggered a need to understand how to better manage kelp ecosystems in light of their expansion in South Africa.

### 1.1 RATIONALE

To understand how to better manage kelp and kelp ecosystems, it is first essential to understand and assess perceptions of their value. Perception studies about marine ecosystems and biodiversity are valuable for many reasons, including their ability to inform policy and management decisions

(Tonin and Lucaroni, 2017). Perceptions can also be used to improve conservation initiatives (Bennett, 2016). These include exploring the magnitude of social impacts of conservation initiatives through determining whether local actors view an initiative as equitable or fair (e.g., Weeratunge et al., 2014). Additionally, perception studies can convey insights about local evaluations of the ecological impacts of a conservation initiative (e.g., increase in species, harvest productivity, ecosystem services). Local fishers, for instance, are often the first to realize the benefits (or lack thereof) of instituting MPAs (Cinner et al., 2014). Past studies that have dealt with various stakeholders' (including local fishers') perceptions towards marine resource and ecosystem governance, show that fishers' perceptions are a useful indicator to temporally and spatially track changes in marine resources (Leleu et al., 2012).

In this way, perception studies are also of use in determining the value of a marine resource in the context of other sectors. The importance of perceptions in marine resource management is starting to gain more recognition, with some experts even advocating for the use of locally-trained 'Perception Experts,' whose role is to recognize and communicate actor perceptions, in the decision-making process (Beyerl, Putz and Breckwoldt, 2016). As such, insights from perception studies can be utilized to continuously monitor, evaluate, and improve conservation decision-making and co-management processes.

To conduct a perception study, it is first essential to define the term. Bennett's (2016:584) definition of perceptions based on Munhall (2008) proves useful here, referring to perceptions as "the way an individual observes, understands, interprets, and evaluates a referent object, action, experience, individual, policy, or outcome". The process of 'perceiving' then, is that of observing, understanding, interpreting, and evaluating the referent object. Perceptions are influenced by contextual factors (e.g. socioeconomics, culture, livelihoods), individual attributes (e.g. gender, race), and past experiences (Munhall, 2008). In other words, perceptions are the "sensory processes to extract information from the environment" (Kiley et al., 2017, p. 4). They influence and are influenced by awareness, knowledge, attitudes, beliefs, and values themselves (Kiley et al., 2017; Gkargkavouzi, Halkos and Matsiori, 2019).

The concept of value is also subjective and can have different meanings for different people. One attempt at understanding the value dimensions of nature comes from The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), an independent intergovernmental body that was established to "strengthen the science-policy interface for biodiversity and ecosystem services for the conservation and sustainable use of biodiversity, long-term human well-being and sustainable development" (IPBES, 2021).

IPBES distinguishes between four different meanings of the word 'value' with regards to biodiversity and ecosystems. For one, a value can be a **principle** or core belief underpinning rules and moral judgments. Second, a value can be the **preference** someone has for something, or for a particular state of the world. Third, a value can be the **importance** of something for itself or for others, now or in the future, close by or at a distance. Fourth, a value can be a **measure**. Of course, these definitions can be interrelated, but are not always synonymous (IPBES, 2016).

Much like value, perceptions are not always objective. However, perceptions can and do represent an aspect of truth. Moreover, in the case of involved stakeholders, subjective perceptions can become truths that then inform realities and behaviours (Munhall, 2008). In this way, perceptions

are useful in determining the value that actors assign to a particular object — in this case, kelp forests.

While many studies have been conducted to understand the perceptions of marine resources and ecosystems, few have considered the value of kelp and kelp forests. Despite the many contributions of kelp to people's well-being, awareness of these ecosystems remains low (Vásquez et al., 2014a). Historically, kelp forests have suffered from a lack of public attention and limited research funding in comparison to seemingly more alluring ecosystems like coral reefs (Bennett et al., 2016). However, recent phenomena such as the ever-growing popularity of documentaries, including *Blue Planet II* and *My Octopus Teacher*, have promoted awareness and concern for kelp (Baker, 2020; Duong, 2020; Reid, 2020). Such events make it timely for the further study of kelp from a variety of academic approaches, beyond simply natural sciences and economic valuations of nature.

Value itself comprises many diverse dimensions, and a failure to acknowledge other dimensions of value in terms of kelp could be detrimental to management and policy-making. For instance, in South Africa, Blamey and Bolton (2018) undertook an economic valuation of kelp forests, estimating their value to be US\$434 million, US\$144 million of which was attributed to indirect ecosystem services such as nutrient cycling, carbon fixation, and coastal protection. However, Bolton and Blamey (2018) did not consider facets of non-use and non-market value (such as the intrinsic, bequest, and cultural value of kelp) in their study. Thus, a glaring gap in kelp valuation studies is the lack of consideration of non-market values. In other words, kelp ecosystems and their use have rarely been valued outside the economic valuation framework in available research. This study aims to fill this research gap, with the intention to elicit perceptions about other value dimensions related to kelp, as expounded in Section 2.3 below.

## 1.2 RESEARCH AIM AND OBJECTIVES

Building on this rationale, the aim of this research is to understand how the value of kelp is perceived in the Western Cape region of South Africa. This is explored through the main Objectives of the study which are to:

- i. Identify the diverse sets of actors who directly and/or indirectly depend on kelp in the Western Cape,
- ii. Construct a typology of values with regards to kelp in the Western Cape,
- iii. Explore sources of value dissonance and/or confluence among different sets of actors, and
- iv. Identify key issues around kelp utility and management in the Western Cape.

The research hopes to contribute to the body of literature on kelp ecosystem and resource valuation. Insights about perceptions of social and cultural value of kelp ecosystems support initiatives to change the narrative about kelp ecosystems in South Africa and globally. This shift away from viewing ecosystems solely as useful 'services' or commodities, towards a view that recognises the value of kelp and its vital ecological role, interacting both with and without humans is increasingly important. In fact, the commodification of nature's contributions is one of the main critiques against the concept of 'ecosystem services' popularized by the Millennium Ecosystem Assessment (MA) (Brockington, 2011). The framing of the 'ecosystem services' often involves

economic valuation, which some have argued can lead to “selling out” on nature and increasing commodification (McCauley, 2006; Turnhout et al., 2013).

In turn, many scholars have also raised concerns about the exploitative relationship with nature the ecosystem service metaphor could promote. Viewing nature through this lens could then turn people into consumers of nature who are increasingly alienated from natural resources and ecosystems (Robertson, 2012). Furthermore, transactive and consumptive nature of the ES has been critiqued for its inadequate conversation of social and cultural dimensions of nature. In this way, the implementation of the ES concept does not leave much room for alternative worldviews and understanding of nature, such as holistic perspectives of indigenous and long-resident peoples (Schröter et al., 2014).

A stronger recognition of cultural and social aspects of nature—and in this case, kelp—is thus necessary to present a more encompassing picture of kelp’s contributions to people and its resulting value, through the acknowledgement of the pluralism of value dimensions.

### 1.3 ORGANIZATION OF THE THESIS

The thesis is organized in the following way. The literature review in Chapter 2 gives a summary of the state of kelp use in the Western Cape and then presents kelp valuation studies from across the world. A review is provided of examples of constructs of value as they pertain to nature, as well as perceptions towards nature. Both these are imperative to understanding the perceived value of kelp as both a resource in nature and as an ecosystem. The literature review concludes with a short critique of the Millennium Ecosystem Assessment’s concept of ‘ecosystem services’ to frame human-nature relationships, consequently justifying the use of IPBES’ conceptual framework to frame human-kelp relationships in this study. The IPBES’ conceptual framework is then described. Chapter 3 details the methods and materials used to achieve the research objectives. The study area and sample population, data collection techniques and methods of data analysis are explored. Following that, the positionality of the researcher and limitations of the chosen methods are acknowledged. Chapter 4 moves on to the results of the study and presents the typology of values associated with kelp in the Western Cape. Then, Chapter 5 presents a discussion and reflection on the results. To conclude, Chapter 6 offers a study summary, and highlights the main conclusions from this study.

# CHAPTER TWO

## 2.0 LITERATURE REVIEW

The following section seeks to present and critically consider the relevant literature to provide a backdrop against which this study was conducted. It begins by describing the state of kelp use in the Western Cape, before covering valuation studies pertaining to kelp across the world. This is followed by a deeper look into constructs of value as they relate to nature and its facets, and related perceptions. Finally, this section delves into the framing of human-nature relationships, specifically through the IPBES conceptual framework, and its relevance and utility for this study.

### 2.1. KELP IN SOUTH AFRICA

#### i. TYPES OF KELP IN SOUTH AFRICA

The common kelp species found in the Western Cape, specifically in the Cape Peninsula, include *Ecklonia maxima* (commonly known as sea bamboo), *Laminaria pallida* (commonly known as split-fan kelp), and *Macrocystis pyrifera* (commonly known as bladder kelp) (Maneveldt, 2013). Of these, *Ecklonia maxima* is the largest of local kelp species, and is found in abundance across the inshore regions of the southern and west coast of South Africa. On the other hand, *Macrocystis pyrifera* is the least common of West Coast kelp species.

Internationally, there is a significant market for the harvesting of kelp to produce alginate — a substance used as a gelling and emulsifying agent. Alginate has a vast variety of applications, namely in the food industry, cosmetics industry, paint and welding industries, and the medical industry. Outside of alginate production, kelp is also used in fertilizers, as a nutritional supplement for farm animals, in plant-growth enhancers, and in abalone feed (Maneveldt, 2013). The utilization and management of kelp as a resource, particularly in the Western Cape, is detailed in the next section.

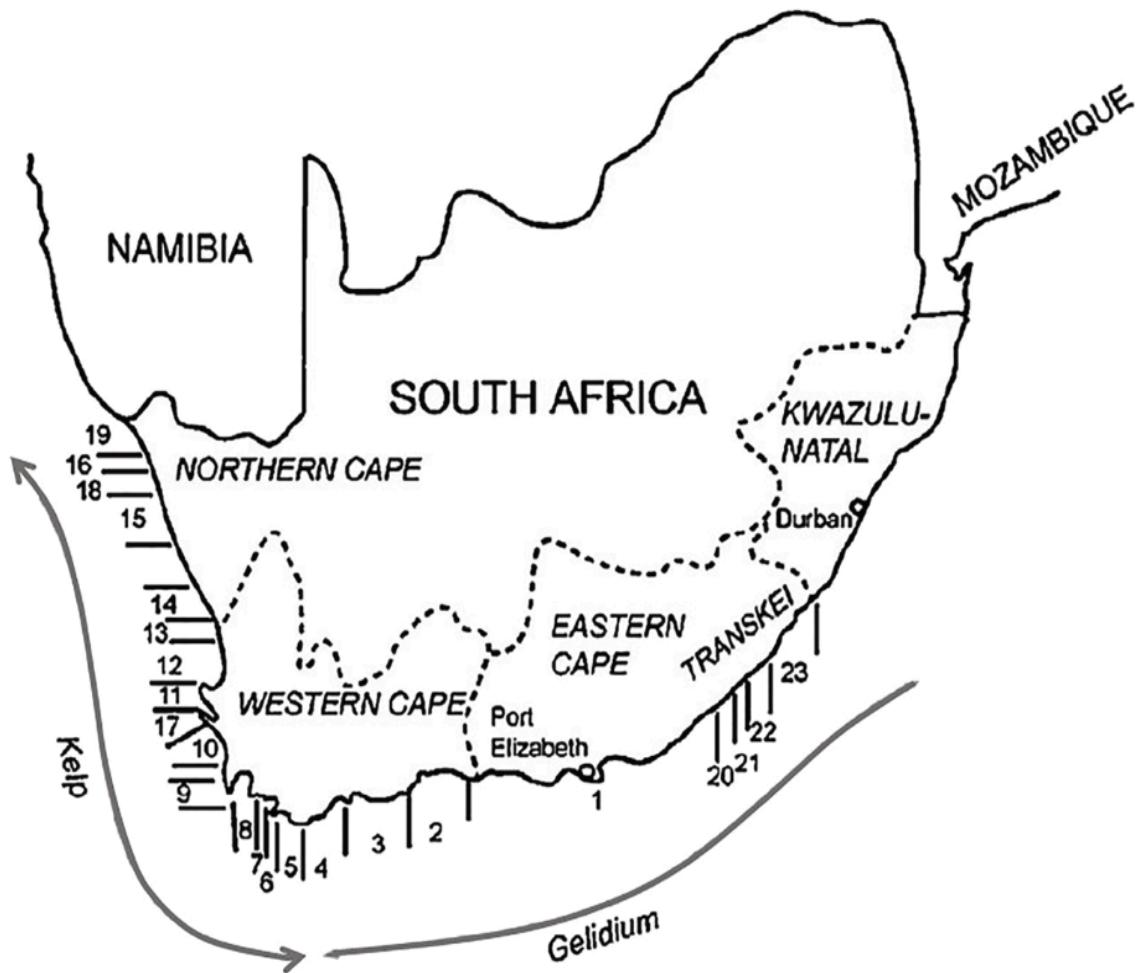
#### ii. TRENDS IN KELP RESOURCE USE IN SOUTH AFRICA

In South Africa, the harvesting and use of kelp as a resource can be viewed through three lenses: the commercial seaweed sector, subsistence fishery, and recreational fishery.

##### a. Commercial Kelp Sector

The commercial seaweed sector in the Western Cape is based on the beach-cast collection of kelp and the harvesting of kelps. These occur in the Western Cape region. The dominant kelp species used for commercial purposes are *Ecklonia maxima* and to a lesser extent, *Laminaria pallida* (DAFF, 2013). *Macrocystis pyrifera* is not used for commercial purposes in the Western Cape as its natural population is too small to warrant harvesting (Maneveldt, 2013). Currently, kelp in South Africa is managed under the Marine Living Resources Act (MLRA) of 1988, administered by the Department of Forestry, Fisheries, and the Environment (DFFE). The South African coastline area where seaweed occurs is divided into 23 Seaweed Rights Concession Areas (SRCAs), as seen in

Figure 1. Specifically, Areas 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, 16, 18, and 19 contain kelp rights with differing limits/total allowable catch (TAC) (Rothman et al., 2020).



*Figure 1: Map of the South African coast with the 23 Seaweed Rights Concession Areas. Areas 5–9, 11–16 and 18–19 contain kelp rights (DAFF, 2013).*

Seaweed concession rights are currently allocated to harvesting and collection entities for a period of 15-years. Historically, these concession permits were only issued to large-scale commercial entities. As of 2016, however, DFFE also introduced a ‘Small-Scale Fishing Policy’ (SSFP), aimed at including small-scale fishers in the SRCA application process. These fishers were previously unable to obtain seaweed concession rights due to their inability to compete with larger commercial entities. Seaweeds were included in the group of resources to which certain small-scale fishers would be given rights (Rothman et al., 2020). As a result, in 2017, many SRCAs were not assigned to commercial entities, but were provisionally allocated to small scale fishers under the SSFP. However, even after this policy introduction and provisional allocation, the small-scale fisheries sector has not yet been fully activated, for unknown reasons (Rothman et al., 2020). This delay has led to a pause in the harvesting of beach-cast kelp in areas provisionally allocated to small scale

fishers after 2016. Ultimately, the temporary solution put in place by DFFE was to give previous rights holders (i.e., large-scale commercial entities) exemptions to continue harvesting in these provisionally allocated areas. As a result, the small-scale commercial harvest of kelp remains virtually non-existent (Rothman et al., 2020).

For large-scale commercial entities, kelp is collected either on the beach (in the form of beach-cast kelp) or harvested directly from the ocean. Fresh beach-cast kelp is collected mostly for abalone feed, while dry beach-cast kelp (i.e. washed-up kelp that is then dried and milled) is used for export, mainly to Asia, after which alginate is then extracted from it to be used in various applications (e.g. medicines, gelling agents). Kelp that is harvested directly from the ocean through utilizing a boat (and sometimes SCUBA) is used as abalone feed, and as a plant-growth enhancer in cases where the whole kelp is harvested for the extraction of its cell sap (Rothman et al. 2020). In South Africa, the use of kelp in plant-growth enhancers was pioneered with Kelp Products Ltd., through their product *Kelpak®*, which acts as a fertilizer for arable crops. Subsequently, other South African companies<sup>2</sup> also started producing similar products, leading to a steady increase in the harvest of kelp for growth enhancers.

Figure 2 shows the commercial kelp yields in South Africa from 1986 to 2018, as differentiated by the end-use of harvested kelp.

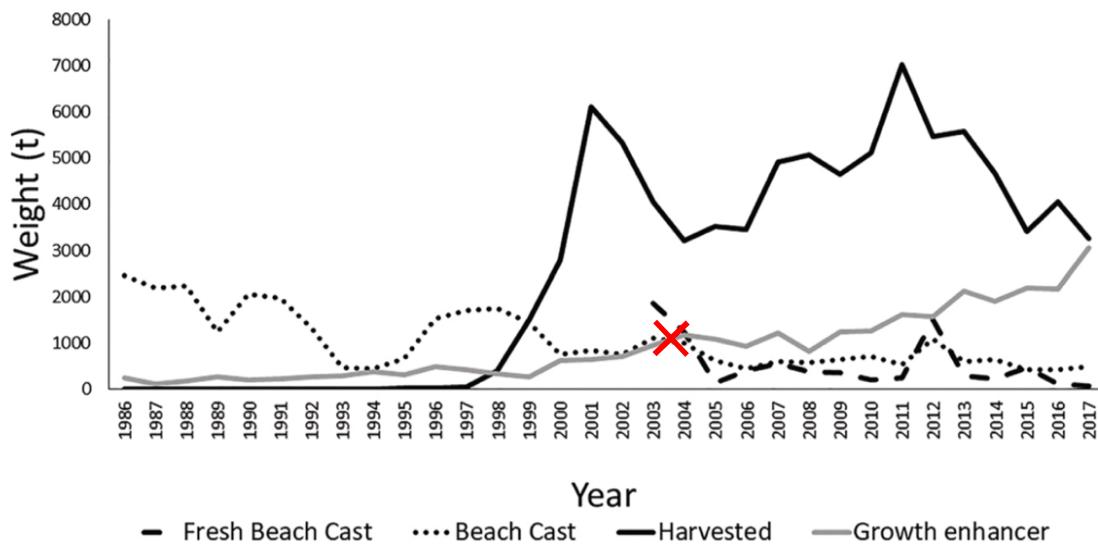


Figure 2: Kelp yields in South Africa, from 1986 to 2018 (adapted from Rothman et al., 2020). The red X marks when annual kelp use for plant-growth enhancers exceeded kelp use for export and alginate production, between 2003 and 2004.

<sup>2</sup> Currently, South African entities with concession permits (under the functional group allocation of kelp) include Bright Starr Fishing 24 (Pty) Ltd, Ecklowood Industries (Pty) Ltd, Fulline Trading (Pty) Ltd, Kelp Products (Pty) Ltd, Really Useful Investments No.72 (Pty) Ltd, Turnover Trading 284 (Pty) Ltd, Taurus Chemicals (Cape Kelp) (Pty) Ltd, Verdino 143 (Pty) Ltd, and Lydia van Rooyen.

One of the notable changes witnessed in South Africa is the shift in importance from the export of beach-cast kelp for alginate to a focus on fresh harvested kelp, mainly used for abalone feed and plant growth enhancers (Rothman et al., 2020). As seen in Figure 2, the years 2003-2004 mark the time when annual kelp use for plant-growth enhancers exceeded kelp use for export and alginate production. The amount of kelp harvested for plant-growth enhancers is almost the same as that harvested for abalone feed. At the current rate, kelp specifically harvested for plant-growth enhancers will also overtake kelp harvested for abalone feed (Rothman et al., 2020).

### **b. Subsistence Fishery**

Subsistence fishing refers to fishing, other than fishing for sport, that is carried out primarily to feed the family of the person doing the fishing. It often involves the use of low tech or artisanal fishing techniques. Generally, it also implies the use of low tech ‘artisanal’ fishing techniques (Durnford, 2008).

A handful of local entities (e.g., The Kelp Shack, Veld and Sea) who are involved with kelp claim that historically, kelp was commonly used for subsistence by Indigenous coastal dwellers in South Africa. However, there is limited academic literature to quantify and/or detail the specifics of this historical use. Going even further back in time, available literature suggests that early humans were able to adapt to the coasts of Southern Africa through their dietary choices, which comprised of nutrient-rich marine organisms supported by kelp forests (Bustamante et al., 1995).

Today, however, there is little to no subsistence fishery of kelp in South Africa. This is mostly due to economic reasons and the fact that local seaweed and kelp are rarely eaten in South Africa. Although in-depth studies are scant, DAFF (2013) suggests that local seaweed and kelp are seldom eaten in South Africa. As such, the kelp industry is sophisticated and requires large initial investments in the form of vehicles, boats, storage space and facilities for kelp processing. Additionally, as noted by DAFF, dried kelp sometimes has to be stored until international markets warrant its sale, resulting in an industry that may not be highly profitable. As a result, harvesting kelp in South Africa remains a commercial operation, with essentially no subsistence fishery (DAFF, 2013).

### **c. Recreational Fishery**

Recreational harvesting of kelp entails collecting kelp for private use (DAFF, 2013). Recreational fishery differs from subsistence fishery in that its primary purpose is not to feed or support the fishers and their families, but rather is focused on recreational experiences and enjoyment. For instance, recreational harvesting of kelp could be for use in one’s home aquarium, use in one’s urban garden, or even foraging and cooking experiences. In South Africa, individuals wishing to collect kelp must obtain an ‘Annual Recreational Fishing Permit.’ According to the permit, kelp and other seaweeds fall under the category of “Molluscs: which excludes abalone, but includes Octopus and Squid; worms and other invertebrates, and Aquatic Plants” (DAFF, 2013:6). While the permit allows an individual to collect up to 10 kilograms in fresh seaweed mass per day, recreational harvesting of kelp in South Africa remains low (DAFF, 2013). That said, foraging for kelp and consuming it as food has increased in popularity in recent years, as is evident from the establishments of entities such as Veld and Sea (a business that provides wild food foraging experiences) and The Kelp Shack (a restaurant that aims to promote kelp as a viable source of

food). This could indicate an increase in recreational harvesting of kelp. Even so, given that relatively few people in South Africa eat seaweed, it is unlikely the increases in recreational fishery will have an immediate and significant impact on the general state of kelp in the country (DAFF, 2013).

## 2.2 VALUING KELP AND KELP ECOSYSTEMS

While various value classification systems exist, valuation studies conducted with regards to kelp are sparse in literature. Perhaps the most pertinent to this project is the review by Blamey and Bolton (2018), which assessed the value of kelp in South Africa. They estimated South African kelp's annual value to be US \$434 million, of which US \$144 million was attributed to indirect ecosystem services such as coastal protection, carbon fixation, nutrient cycling, and scientific research and education. Interestingly, only US \$290 million of the total annual value is considered in South Africa's GDP (Blamey and Bolton, 2018). It must be noted that Blamey and Bolton's 2018 valuation only considered kelp ecosystems in terms of how they could be valued economically, thus focusing on kelp's use value (both direct and indirect) and market value. These values correspond with kelp's contributions in the form of provisioning services, regulating services, and habitat services as per The Economics of Ecosystems and Biodiversity's (TEEB) classification of ecosystem services. Additionally, Blamey and Bolton's (2018) valuation was not a full market analysis in that it did not calculate the derived economic gains from direct services (e.g., job creation, wages earned by workers, etc.) along the value chain. Cultural contributions from kelp were also not considered, and so the total economic value does not reflect other, non-quantifiable dimensions of value such as social value, or cultural value.

In Northern Chile, Vasquez et al. (2014) conducted an economic valuation of kelp forests across 700 km of the coastline. They estimated the total economic value to be close to US \$540 million, of which 75% was attributed to kelp harvesting and 15% to associated species fisheries. This was primarily a desktop study where use values for various contributions from kelp were estimated based on external sources. Interestingly, the assessment of indirect use values showed that there was no interest in kelp forests for their recreational and educational offerings. Using stakeholder surveys, non-use value in the form of bequest and existence value was calculated using contingent valuation, i.e., willingness to pay and willingness to work. As such, both use and non-use values of kelp were considered; however, some ecosystem services remain excluded from the study due to the lack of availability of data associated with kelp forests in the Southeast Pacific (Vásquez et al., 2014).

A study by Bennett et al. (2016) assessed the value of Australia's temperate reef ecosystem that is largely made up of kelp. The purpose of the study was to raise awareness and create an identity for Australia's kelp forests as the 'Great Southern Reef' or GSR, which was at the time overshadowed by other ecosystems in Australia such as the Great Barrier Reef. The GSR covers 71,000 km<sup>2</sup> and is estimated to generate at least AUS \$10 billion annually through GSR-related fishing and tourism. This makes the GSR an extremely valuable natural asset for Australia. Even so, Bennett et al. (2016) found that the public research funding by the Australian Research Council (ARC) on temperate reef research—AUS \$4 million between 2010-2015—was significantly less than the AUS \$55.3 million funding afforded to coral reef research during the same period. These figures highlight what the authors term a 'paradoxical mismatch' between the public awareness and investment in Australia's temperate reef ecosystem and its ecological and economic value for

Australian society (Bennett et al., 2016, p. 7). This mismatch is not unique to Australian temperate reef ecosystems. A lack of public awareness of kelp forests was also noted by Vasquez et al. (2014) in Chile.

This lack of public awareness around the myriad contributions of kelp forests is even more surprising when one considers the estimation by Filbee-Dexter and Wernberg (2018) of global benefits from kelp forests—US \$500,000 to 1,000,000 per kilometer of coastline—based on the results of the three studies cited above. It must be noted that these figures are based mostly on the direct-use services from kelp forests, the details of which are shown in Table 1 below. While this sort of economic valuation is useful, it does not reflect the true value of kelp forests and all the contributions these ecosystems provide.

Region	Total value (US dollars per kilometer per year)	Key services evaluated (percentage of total value)	Main species	Reference
Northern Chile, Pacific Ocean <sup>a</sup>	811,000	Kelp fishing (76%) Commercial fisheries (15%) Scientific, biological, and climate value (9%)	<i>Lessonia</i> spp., <i>Macrocystis pyrifera</i>	Vásquez et al. 2013
Great Southern Reef, Australia, Indian Ocean and Southern Ocean <sup>b</sup>	914,000	Tourism (90%) Recreational and commercial fishing (10%)	<i>E. radiata</i> , various endemic fucoids	Bennett et al. 2016
South Africa, South Atlantic Ocean <sup>c</sup>	520,000	Commercial (incl. kelp), recreational, and illegal fishing (45%) Ecotourism (30%) Nutrient cycling and carbon sequestration (25%)	<i>Ecklonia maxima</i>	Blamey and Bolton 2017

<sup>a</sup>US\$540 million, 666 km coastline  
<sup>b</sup>AU\$10 billion per year, 8100 km coastline, US\$0.74  
<sup>c</sup>5.2 billion South African rand per year, 700 km coastline, US\$0.07

Table 1: The estimated value of services from global kelp forests (adopted from Filbee-Dexter and Wernberg, 2018).

In light of this gap, a more recent study by Hynes et al. (2021) considers several non-market ecosystem services in their estimate of the marginal welfare impact from potential kelp forest restoration in Norway. Using a survey and choice experiment approach, Hynes et al. (2021) showed that there was a significant and positive willingness to pay (WTP) for benefits associated with kelp forest restoration amongst Norwegian society. The authors are careful to note that it is “difficult however to contextualize the magnitude of the results of this study as there are very few other studies that examine WTP for marine restoration efforts” (Hynes et al., 2021, p. 8). Additionally, factors like Norway’s high income per capita, a developed social welfare system, and the strong connection Norwegians have with the ocean all are likely to result in a higher WTP for marine restoration in Norway as opposed to other country studies. That said, their study highlights the **importance of social context and cultural differences in terms of valuation**. As argued by Hynes et al. (2021), the exclusion of non-market values in marine ecosystem and resource decision making may be more detrimental than beneficial to society. Ultimately, while assigning a monetary figure to ecosystem services has its utility, there are other ways to assess the value of nature and its contributions, some of which are argued to be more holistic and inclusive (Pascual et al., 2017).

### 2.3 CONSTRUCTS OF VALUE PERTAINING TO NATURE

As it stands, valuations of the world’s kelp forests remain inadequate and incomplete. So, in order to explore the perceptions of value of kelp ecosystems in the Western Cape, it is necessary to turn

to the wider literature on value constructs and perceptions as they pertain to marine ecosystems. Various valuation studies have been conducted with relation to the marine environment (Bennett and Dearden, 2014; Murray, D'Anna and MacDonald, 2016; Gkargkavouzi, Halkos and Matsiori, 2019). Although there are diverse approaches to understanding value, two general kinds of value are generally recognized, namely **held** or **core** human values, which refer to underlying situational influence, including ideals, ethics, and morals such as equality, freedom, bravery; and **assigned** values, which refer to the relative importance humans attribute to an entity, for example conservation, economy, or aesthetics (Brown 1984; Schwartz 2006; Chan et al. 2012; Kiley et al. 2017; Gkargkavouzi et al. 2019). Held values act alongside situational context to influence an individual's assigned values, in turn manifesting in individual preferences, perceptions, attitudes, and behaviour (Brown, 1984). Thus, it is implied that assigned value is nested within the context of held values and perceptions.

One way of further classifying assigned values is to divide them into market and non-market values. As stated by Chan, Satterfield, and Goldstein (2012), a fundamental distinction is made between values mediated through the market. **Market value** refers to the value of goods and services that are directly transacted in markets whereas **non-market values** relate to the benefits or costs for which there is no explicit market. As a result, there is no observable price (Rogers et al., 2019). In this way, the valuation of goods or services that are not directly transacted in markets is considered 'non-market' (Chan, Satterfield and Goldstein, 2012). While this distinction is important, it only encompasses **one dimension of value interpretation, as derived through the lens of economics**. Delineating market and non-market value from perceptions may prove to be too reductionist as values people assign to biodiversity rarely fit squarely into one classification—more often than not, assigned values span multiple dimensions, some of which can even contradict one another (Murray, D'Anna and MacDonald, 2016). In the case of kelp ecosystems, for instance, actors may value the economic contribution kelp provides for their livelihoods, while simultaneously valuing the cultural association they have with kelp. This cultural relationship cannot be represented in the relatively utilitarian constructs of market and non-market values. Thus, it is important to further identify different dimensions of value constructs.

Assigned values can also be classified according to **use** and **non-use** values. **Use value** refers to the utilitarian or material exploitation of nature and can be *direct* (e.g. food, pharmaceutical products), *indirect* (e.g. water filtration), and *optional values* (the ability to use ecosystem goods and services in the future) (Gkargkavouzi, Halkos and Matsiori, 2019). Non-use values include **bequest value**, which is the value for future generations; and **existence value** refers to the appreciation of the existence of natural assets (Laurila-Pant et al., 2015; Kiley et al., 2017; Gkargkavouzi, Halkos and Matsiori, 2019).

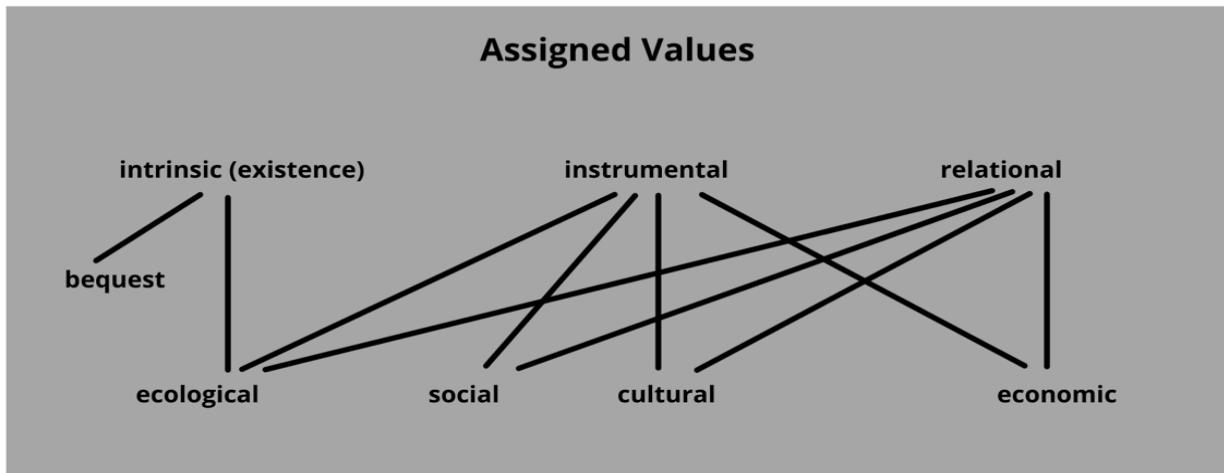
Another classification comes from de Groot, Wilson, and Boumans (2002), who identify three perspectives for valuing biodiversity. These are **economic value** (such as service provision); **ecological value** (the level of benefits that ecosystems provide to support all life), and **socio-cultural value** (based on the level of mental well-being, ethical, and spiritual benefits provided) (De Groot, Wilson and Boumans, 2002). Infield and Mugisha (2013) further divide cultural value into the five dimensions of **spiritual values, use values, ethical values, place values, and lifestyle values**. Note here that this classification nests use value under cultural value, further highlighting how value constructs are interdependent, overlapping, and open to a range of interpretations (Infield and Mugisha, 2013).

Finally, a pertinent classification of values comes in the form of differentiating between **intrinsic** and **instrumental** values (Farber, Costanza and Wilson, 2002). **Intrinsic** value refers to the inherent value of an ecosystem, independent of human utility (Chan et al., 2016; Pascual et al., 2017). The basis for nature having intrinsic value can be differentiated by two viewpoints — subjective intrinsic value and objective intrinsic value. Subjective intrinsic value is created by the valuer (humans) based on what a referent object is, rather than what it can bring about. Examples of things that humans value intrinsically include personal mementos or religious artefacts, ceremonies, and accomplishments. These are valued for a variety of reasons, such as what an object represents or embodies. In this way, subjective intrinsic value is reason-oriented and is open to evaluation and revision (R Sandler, 2012). Ecosystems and nature can be valued intrinsically too, for their complexity, wonder, wildness, beauty and more. In this way, nature has subjective intrinsic value that is based on assets of nature beyond human utility, even though this value is labelled by humans themselves. On the other hand, objective intrinsic value is not humanly conferred. If nature has subjective intrinsic value, it has properties by which it is valuable independent of anyone's evaluations and judgments. Often, objective intrinsic value is considered relevant to the value of persons, in that people have value in virtue of what they are, outside of whether others value them. This sort of objective intrinsic value is thus not conditional. In terms of nature, this viewpoint would posit that if nature indeed has objective intrinsic value, this value was only discovered by humans, not created by them (R Sandler, 2012). In this study, intrinsic value will be used as a broad term encompassing both subjective and objective viewpoints, to denote the value the object of study (kelp) has for what it is, as an entity in itself, and/or as an end in itself.

Contrasting intrinsic values, **instrumental** values are anthropocentric in essence, and refer to the value that stems from the manner in which resources help to produce other things (Chan, Satterfield and Goldstein, 2012). In this way, instrumental value is derivative, and can also be conditional. The instrumental value of a referent object can change depending on how desirable the object is as a means to an end, and whether another means to the same end is available (Robert Sandler, 2012). For example, a fishing line may be of high instrumental value to a fisher when he is catching fish, but its value could lessen if the fisher gained access to a more effective fishing net. Similarly, nature possesses a variety of instrumental values, that could themselves be further differentiated into social, economic, and cultural values.

More recent literature also recognizes the burgeoning prevalence of **relational values**, referring to the value that is not inherent in ecosystems but derivative of relationships and responsibilities to ecosystems (Chan et al., 2016). At an individual level, relational values can create feelings of fulfilment through stewardship for the environment. This could take the form of an environment being important to an individual's identity, such as a fisher's identity being tightly linked to the ocean, or spiritual connections to specific aspects of nature. At a community level, or in the sense of the 'human collective,' relational values help define cultural identities and create social and/or moral bonds between groups of people, as a result of their relationships with nature (Sandborn and Jung, 2021). For example, collective relational values could take the form of social cohesion, in that being in nature allows groups to connect to each other. Thus, relational values are also applicable to social, economic, and cultural values.

This is not an exhaustive list of the dimensions of values. There are many other overlapping definitions and types of values—these are not mutually exclusive but interact and reinforce each other (Murray, D’Anna and MacDonald, 2016). This is shown in Figure 3, where the value constructs used in this study and their internal relationships are mapped out.



*Figure 3: Dimensions of assigned value, mapped to show potentially overlapping constructs*

In this way, this study promotes a values ethic that embraces value pluralism, as opposed to a unidimensional value framing. To quote Pascual et al. (2017), “When possible, promoting different conceptualizations of value and valuation approaches is more appropriate than a deeper focus on a subset of unidimensional values (e.g. economic, biophysical, social-cultural)”. In essence, value pluralism recognizes the diversity of values as well as resolution approaches if value conflicts arise—a particularly useful approach for this study.

## 2.4 PERCEPTIONS TOWARDS NATURE

Assessing public and individual actor perceptions is one way of arriving at a quantitative and qualitative understanding of assigned values. Perceptions are the “sensory processes to extract information from the environment” (Kiley et al., 2017, p. 4). They are defined as the way an individual observes, understands, interprets, and evaluates a referent object, action, experience, individual, policy, or outcome” (Bennett, 2016). Perceptions are mediated by **awareness** and **knowledge**, and are influenced by attitudes and beliefs, all within the context of one’s **held values** (Kiley et al., 2017; Gkargkavouzi, Halkos and Matsiori, 2019).

Often used interchangeably, awareness and knowledge are in fact distinct from one another. Awareness is perceiving, feeling, or being conscious of events, objects, thoughts, emotions, or sensory patterns (Holender, 1986; Merikle and Reingold, 1991). Awareness can shape attitudes and behaviour and subsequently affect management and policy decisions in marine environments (Bennett and Dearden, 2014; Gkargkavouzi, Halkos and Matsiori, 2019). **Knowledge**, on the other hand, is information and skills acquired through experience and/or education. Unlike awareness, knowledge implies a deeper understanding and familiarity with the subject. In this

study, awareness and knowledge will be considered as distinct yet overlapping pre-conditions that influence perceptions (Figure 4).

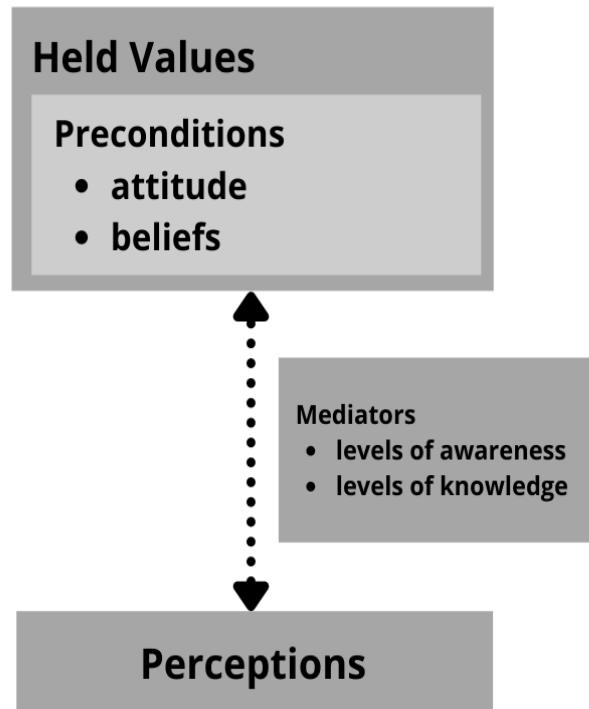


Figure 4: Perception process and its relationship with mediators

**Attitudes** can be defined as an individual's mental and emotional stance towards a particular object. Importantly, attitudes are often context-dependent. Attitudes towards nature can be complex as a result of the complex relationships humans have with nature. One way to think about attitudes towards nature is through the two broad lenses of eco-centrism and anthropocentrism. Eco-centric attitudes are associated with views that consider nature as a focus in its own right, beyond its use to humans. On the other hand, anthropocentric attitudes are associated with the viewing of nature through its relevance to human use (Kiley et al., 2017). An individual's attitude towards aspects of nature and its contributions can fall anywhere on this spectrum of attitudes, even right in the middle, thus resulting in equally anthropocentric and eco-centric attitudes towards nature. Additionally, it is also possible that an individual may have contradictory attitudes towards nature depending on the specific aspect of nature being considered. For example, a person might have an eco-centric attitude towards the ocean but view certain types of fish through an anthropocentric lens as a result of subsisting on fish.

Putting this all together, Figure 5 then shows the mutually dependent relationship between held values, mediators of awareness and knowledge, facets of perception, and assigned value.

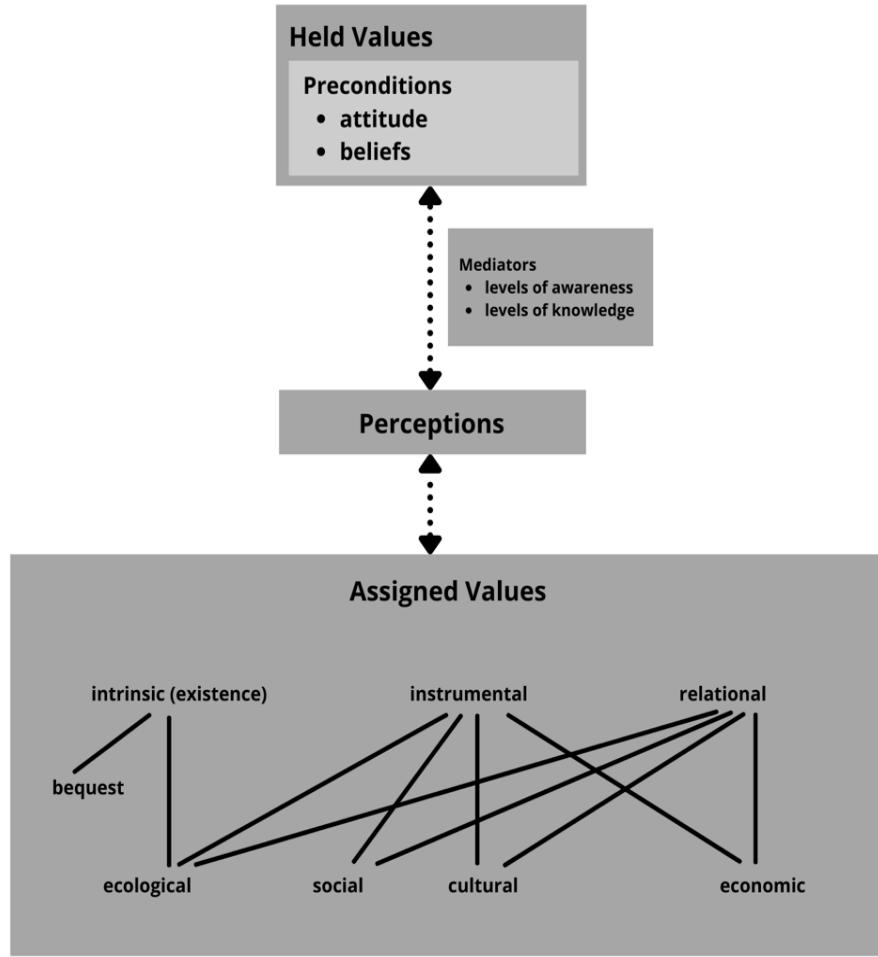


Figure 5: The mutually dependent relationship between mediators, perceptions, and assigned value. The dotted arrows show that each of these influence the other.

## 2.4. FRAMING HUMAN-NATURE RELATIONSHIPS

There are various systems in place to frame and classify the relationships and interactions human beings share with nature. One dominant system is the Millennium Ecosystem Assessment (MA) that promulgates an approach of ‘ecosystem services’ (ES) based on the four categories of provisioning, regulating, cultural and supporting services (SEEA, 2018). While this system of classification has utility, the ecosystem services approach has been criticized by a variety of scholars from different perspectives. For instance, from an ecological perspective, it has been criticized for oversimplifying ecological functions. Its political efficacy, as well as possible confusion with other concepts such as landscape multifunctionality, has also been the subject of critiques (Peterson et al., 2009; Lamarque et al., 2011; (Kull, Arnauld de Sartre and Castro-Larrañaga, 2015). Additionally, the ecosystem services classification has been deemed an inequitable neoliberal approach, criticized for its reinforcement of certain market-based models of society (Brockington, 2011). One of the most relevant critiques of ecosystem services for this study comes from the social perspective, in that it neglects consideration of crucial social, political, and contextual factors (Kull,

Arnauld de Sartre and Castro-Larrañaga, 2015). The strong economic and natural science-oriented framing of people-nature relationships that is articulated by the ecosystems approach is considered to neglect the insights and tools available from social science and humanities disciplines. For instance, the examination and valuation of ‘cultural ecosystem services’ has lagged behind due to their inability to be measured via the traditional ES concept (Díaz et al., 2018). In turn, diverse actors, worldviews, and disciplines tend to remain excluded from MA-inspired research.

This side-lining of cultural considerations has spurred the need for a more encompassing framing of environment-society relationships (Chan et al., 2012). So much so that Chan, Satterfield and Goldstein (2002: 9) state that “As long as non-use, intangible, and cultural values are relegated to an after-thought or poorly represented by ill-suited value metrics, an ES approach will continue to be critiqued by many.” According to these authors, the critique that important dimensions of value have been overlooked in the ES concept pertains mostly to the representation and the measurement of value (Chan, Satterfield and Goldstein, 2012). Dominant discourses and approaches (like the MA’s ecosystem services, for instance) tend to favour *either* instrumental or intrinsic value dimensions of nature. Over time, the dichotomy between these two approaches and the consequent framing of human-nature relationships has manifested in different philosophical ideologies, from a view focused on ‘Nature for itself’ (1960-1970) to one that considers ‘People and Nature’ (2010 onwards). This is shown in Figure 6 by Sanborn and Jung (2021), based on Mace, (2014).

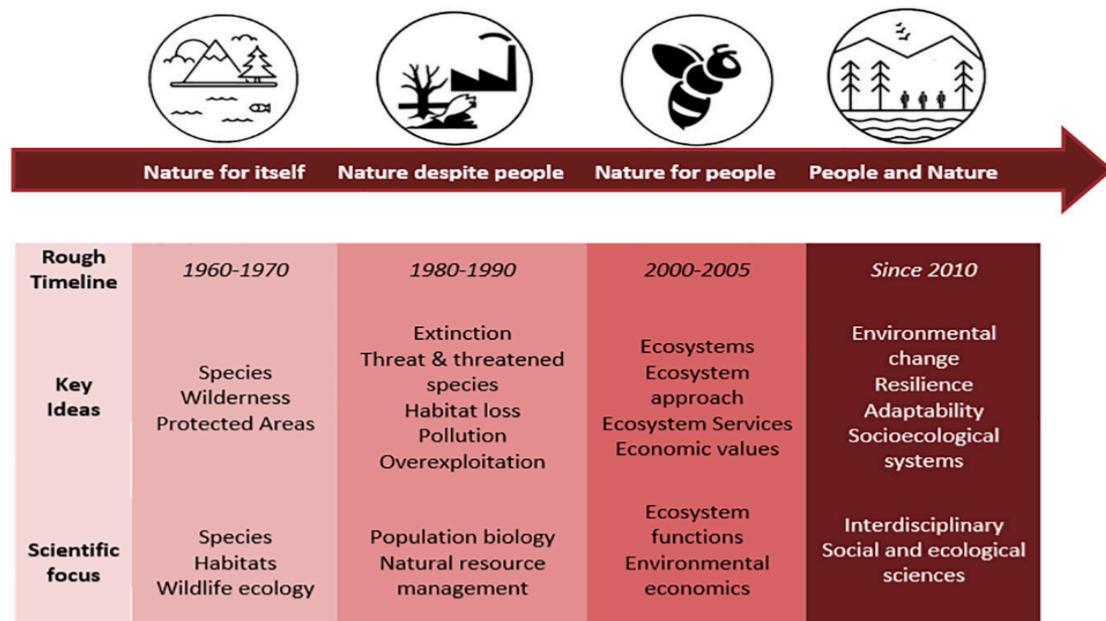


Figure 6: Changes in the philosophical framing of conservation over 50 years and the resulting shifts in practical focuses (adopted from Sanborn and Jung, 2021, based on Mace, 2014).

Today, it seems that the discourse is once again shifting—this time away from opposing approaches of intrinsic and instrumental values to a synthesis of the two. As a result, an approach that focuses on relational values, or values that are “dependent upon the realization that people rarely make choices solely on the inherent worth of an object or on how it satisfies their needs, but upon how

they relate with the object and others around them, and on how that choice itself can be conducive to a meaningful and happy life” has become more relevant (Sanborn and Jung, 2021).

Here is where the IPBES framework that focuses on Nature’s Contributions to People (NCP)—as one of the many ways to contextualize the interactions between humans and nature—is of much utility. Over the years, the IPBES has continually improved its conceptual framework, with the intent of integrating local and indigenous knowledge into the framework, as well as recognizing the pervasive role culture plays in defining links between people and nature (Díaz et al., 2018). In the context of the IPBES, the conceptual framework can be described as a “summary of the relationships between people and nature” (Díaz et al., 2015).

The IPBES framework builds on and improves the ES concept popularized by the MA but is not subject to the factors that limit the utility of the MA. Unlike its predecessor, the IPBES framework aims to explicitly embrace a range of scientific disciplines (natural, social, engineering sciences, etc.) as well as diverse actors beyond the immediate scientific community and their different knowledge systems. In this way, the IPBES framework aims to consider not only Western science, but also, “indigenous, local, and practitioners’ knowledge” (Díaz et al., 2015). Thus, the IPBES framework has the potential to incorporate a wider set of worldviews and actors, simultaneously not being confined solely to singular economic or natural science-based approaches for defining human-nature relationships, and moving beyond the rather arbitrary intrinsic versus instrumental value dichotomy. Rather, the IPBES conceptual framework relies on a plural value lens that can encompass a multitude of value dimensions as well as their interdependences (IPBES, 2021).

With this in mind, the IPBES conceptual framework is centred around three foci of value:

### **i. Nature**

This first focus of value refers to the natural world, living organisms within it, and their interactions. From a Western science perspective, this would include biodiversity, ecosystems, ecosystem structure and functioning, and living natural resources. Within the context of other knowledge systems, ‘Nature’ as a focus of value may include holistic concepts such as ‘Mother Earth’ and systems of life (such as those shared by the Indigenous peoples of the South American Andes), or beliefs such as ‘tien-ti’ (Heaven and Earth) that are pervasive through some populations in East Asia (Díaz et al., 2015). As such, Nature—as a focus of value—corresponds broadly with intrinsic values.

### **ii. Nature’s Contributions to People (NCP)**

Nature’s Contributions to People (NCP) comprises “all the contributions, both positive and negative, of living nature (diversity of organisms, ecosystems, and their associated ecological and evolutionary processes) to people’s quality of life” (Díaz et al., 2018). Beneficial contributions can include food provision and water purification, while detrimental contributions consist of the likes of predation that damages people or their assets. NCP can be perceived as both benefits and detriments, and these perceptions are dependent on the cultural, socioeconomic, temporal and/or spatial context (Díaz et al., 2018). This framing, which considers both positive and negative contributions of nature, is especially relevant in the case of kelp ecosystems. For instance, kelp ecosystems are recognized as beneficial by coastal property owners for their shoreline protection

offerings but are also perceived as a nuisance—even by the same property owners—for their unpleasant odours because of being cast on the beach.

NCP are organized into three partially overlapping groups: material, non-material, and regulating, NCP:

### ***Material NCP:***

These contributions are substances, objects, or other material elements from nature that directly sustain people's physical existence and material assets. Examples include energy from natural resources, food and feed, and medicinal and genetic resources.

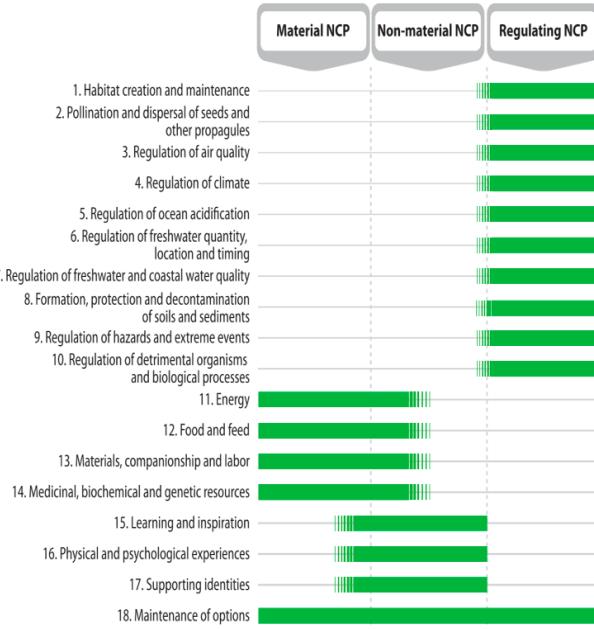
### ***Non-material NCP:***

These contributions are nature's effects on subjective or psychological aspects underpinning people's quality of life, both individually and collectively. Examples include learning and inspiration from nature, the ability of nature to provide physical and/or psychological satisfaction, and the ability of nature to support and maintain religious and/or cultural identities.

### ***Regulating NCP:***

These contributions are functional and structural aspects of organisms and ecosystems that modify environmental conditions experienced by people and/or regulate the generation of material and nonmaterial contributions. Regulating contributions frequently affect the quality of life in indirect ways. Examples include the creation of habitats and environments, climate regulation contributions, and protection from extreme events.

Further, within these three groupings, IPBES has listed 18 categories that aid in the reporting of specific contributions of nature (Figure 7). Further descriptions of each of these categories can be found in Appendix 1. Regulating NCP tend to be ecological contributions, whereas material and non-material NCP loosely correlate to socio-economic and socio-cultural contributions, with significant overlaps between these two. Importantly, culture permeates across all three NCP groups, as opposed to being confined to an isolated category (like ‘cultural ecosystem services’ in the MA framework). In this way, the three groups of material NCP, non-material NCP, and regulating NCP are nested in the cultural context (Díaz et al., 2015; Díaz et al., 2018; IPBES, 2021).



*Figure 7: Mapping of the 18 NCP reporting categories used in IPBES assessments onto three broad groups of Material NCP, Non-Material NCP, and Regulating NCP. Most NCP are straddled across groups to some degree. All NCP across all columns are nested within their cultural contexts (adopted from Díaz et al., 2018).*

Thus, the importance of the political and cultural context is acknowledged by NCP framing and categorization. Finally, the broad socio-economic benefits provided by NCP are categorized in diverse aspects of “quality of life”, which can serve as a compass to determine quantification and qualification indicators (SEEA, 2018).

### iii. Quality of Life

This focus of value is the “achievement of a fulfilled human life” (Díaz et al., 2015). Of course, what a fulfilled life entails varies drastically across cultures and societies. However, this focus point assumes that everybody wants a life free from poverty and disease, with access to human freedoms and rights. A ‘good quality of life’ is understood to be highly subjective and value-based, comprising of both material and non-material components.

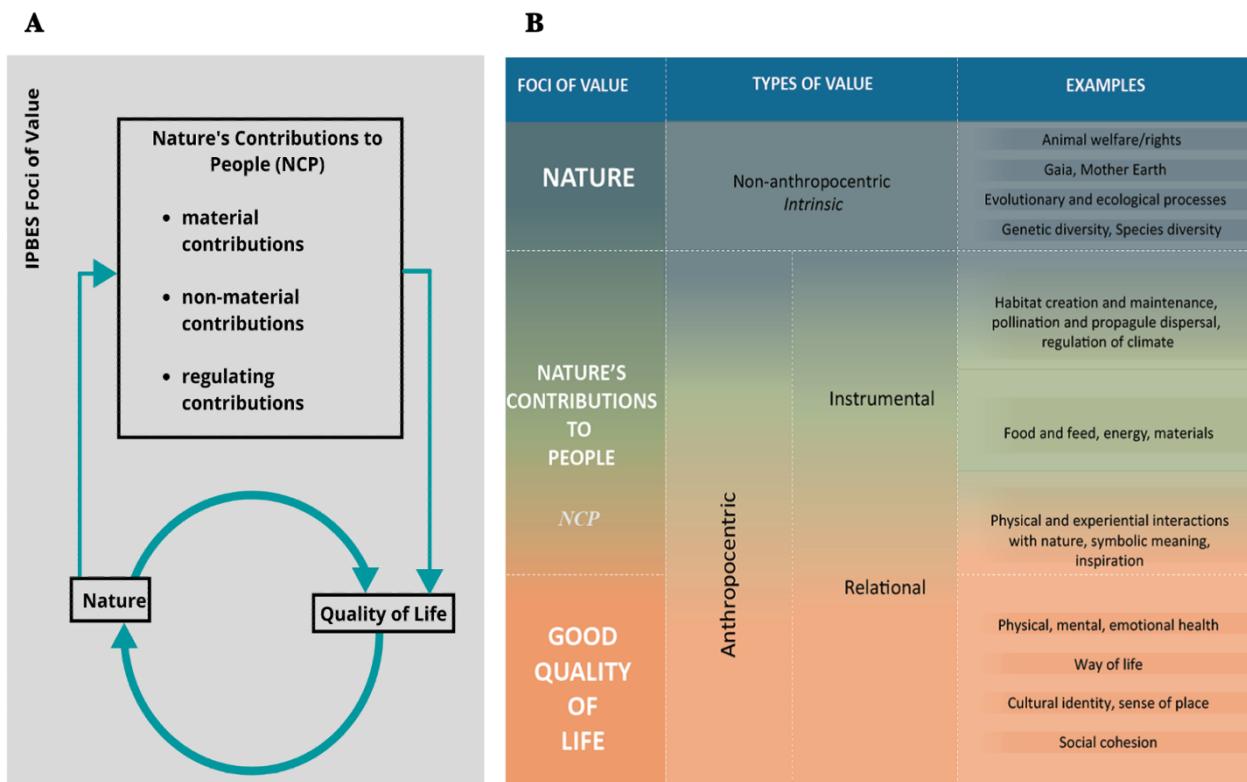
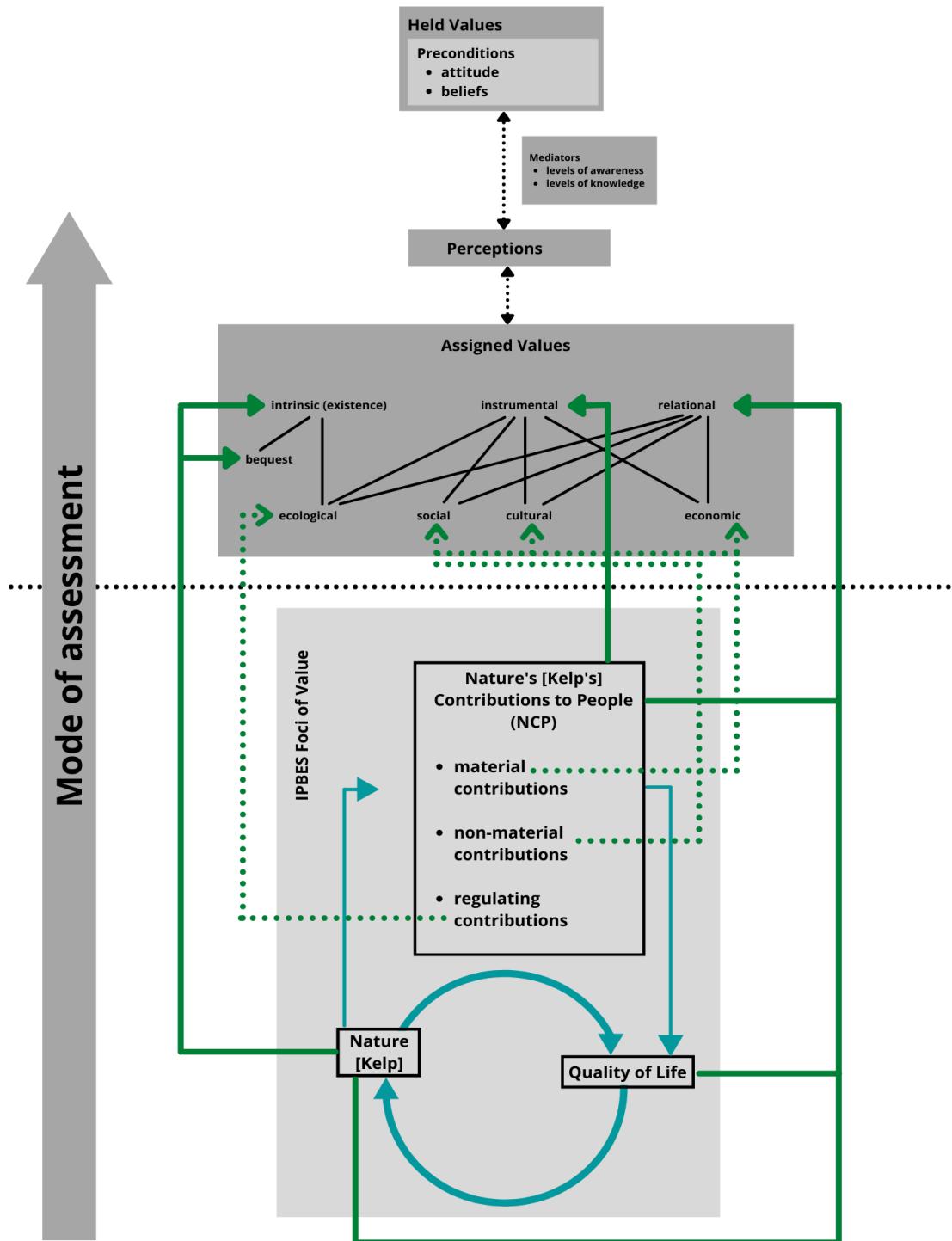


Figure 8: (A): IPBES Foci of Value. (B): Kaleidoscope view of relationships between IPBES' foci of value and types of value with examples (adapted from IPBES, 2021).

The linkages between Nature, NCP and Quality of Life illustrate the prevalence of both instrumental values and relational values in understanding our relationship with nature. Figure 8(A) shows the foci of value and how they influence one another, and Figure 8(B) shows a kaleidoscope view on these broad value dimensions—*intrinsic*, *instrumental*, and *relational*—and the corresponding foci of value with examples.

In this way, and building on Figure 5, Figure 9 shows how the IPBES' foci of value will be used to elicit insight into the perceived value of kelp, across the various value constructs discussed above.



*Figure 9: Framework to elicit the perceived value of kelp utilizing IPBES' foci of value for human-nature relationships and interactions. The solid green arrows show the associations between a focus of value and a type of assigned value. The dotted green arrows denote the relationship between specific NCP and certain constructs of value (ecological, social, cultural and economic). While these constructs are both separate from and overlapping with instrumental and relational types of values, they provide another lens from which to understand the perceived value of kelp.*

# CHAPTER THREE

## 3.0 RESEARCH METHODOLOGY

This chapter presents the methods used to achieve the objectives of the study. It identifies the study area and sample populations and details the data collection and analysis techniques. Then, it considers the limitations of the study, acknowledges the positionality of the researcher, and describes the research ethics followed.

### 3.1 STUDY AREA AND SAMPLE POPULATION

The regions of the South African coastline where kelp forests (comprising *Ecklonia maxima* and *Laminaria pallida*) occur extend from Koppie Alleen, De Hoop, in the south of South Africa to Kleinsee, in the north of the country. To understand how the value of kelp was perceived this study considered a sample population of actors from across these areas who are directly or indirectly dependent on or who are involved with kelp. These actors were identified through a literature review of the kelp ‘industry’ in the Western Cape, including consideration of government reports by DFFE, as well as through consultation with other researchers engaged in seaweed-related research in South Africa. Taking a cue from the ‘snowball sampling’ technique, potential respondents were also identified through recommendations of actors who were considered knowledgeable about kelp (Cox, 2015). Fulfilling Objective (i), these actors were grouped into three groups differentiated based on their relationship and use of kelp:

- i. **Recreational Users and/or Coastal Community Members:** This included actors comprised of individuals who were members of coastal communities and/or used kelp primarily in a recreational and/or personal capacity. This grouping included individuals who owned property by the coast, volunteers from coastal community ‘stakeholder meetings,’ members of dive clubs, members of recreational angling clubs, and kelp foraging groups. In total, there were 24 actors surveyed in this group.
- ii. **Environmental Managers and Conservationists:** This set of actors is comprised of individuals involved with the research and conservation of biodiversity (either through the government or through non-governmental organizations) and/or the government-appointed environmental management of kelp. Occupations of individuals in this category included actors working for CapeNature<sup>3</sup>, World Wide Fund for Nature (WWF)<sup>4</sup>, South African Shark Conservancy<sup>5</sup>, and more. In total, there were 20 actors surveyed in this group.

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<sup>3</sup> CapeNature is a public entity that promotes and ensures biodiversity conservation in the Western Cape. Cape Nature manages complexes made up of 113 nature reserves and wilderness areas, including six Marine Protected Areas (the latter on behalf of the national Department of Forestry, Fisheries and the Environment).

<sup>4</sup> WWF is a leading independent conservation organization.

<sup>5</sup> The South African Shark Conservancy (SASC) is an NGO based in Hermanus, Western Cape that works to promote the sustainable use and informed conservation of living marine resources.

**iii. Kelp and/or Abalone Industry Actors:** This set of actors comprised of individuals whose livelihoods directly depended on kelp, either as a resource or ecosystem. It consisted of workers from kelp companies, including kelp harvesters, kelp processors, kelp tumblers, beach-cast kelp collectors, skippers, and kelp company management executives. It also consisted of small-scale fishers, abalone divers, and abalone poachers, who rely on kelp for their daily catch. In total, there were 30 actors surveyed in this group.

In total, 74 surveys were completed by actors who directly or indirectly depend on kelp.

## 3.2 DATA COLLECTION AND ANALYSIS

A hybrid approach that employed both quantitative and qualitative techniques was used to gain insight into perceptions of value of South African kelp forests. For this study, data were collected in two stages: first, through the use of questionnaires distributed to the sample population, and second, through key informant semi-structured interviews.

### i. QUESTIONNAIRES

A survey questionnaire modelled on the IPBES' foci of value with regards to kelp as detailed in Figure 9 outlined above was administered to the sample population. Participants were asked about their knowledge, attitudes and perceptions towards kelp and its contributions to people, in order to understand the perceived sources of kelp's value. Participants were also asked to elaborate on perceived opportunities and threats from kelp. The questionnaire mostly consisted of multiple-choice questions, with blank spaces for additional inputs from respondents. There was also a smaller set of open-ended questions that respondents were able to answer freely in order to gain qualitative insights on perceived value. Prior to answering the questions, participants were briefed about the background and objectives of the study. The questionnaire can be found in Appendix 2.

Characteristics relating to the individuals' demographics, self-assigned ethnographic grouping, income bracket, residential area (related to proximity to coast), community grouping, self-described levels of awareness and knowledge, environmental beliefs, and modes of income generation were also recorded to provide additional insights about perceived values. Surveys were available for completion via two modes. For those with access to internet-enabled devices, surveys were distributed through the RedCap online survey platform. For parts of the sample population that were unable to access internet-enabled devices, a face-to-face questionnaire was conducted. Surveys were made available in three languages: English, Xhosa, and Afrikaans. Respondents were asked to choose a language of their choice for survey completion. Where respondents struggled with literacy, a trained facilitator aided with the process of survey completion.

The quantitative data resulting from the questionnaire was exported from RedCap to Microsoft Excel for a graphical representation of actors' perceptions of value. Basic statistical tests were carried out to better visualize the data, and these initial insights were used to guide the key informant interviews.

## ii. KEY INFORMANT SEMI-STRUCTURED INTERVIEWS

After the questionnaire was disseminated and data were analysed, semi-structured interviews were held with a selection of key informants to qualitatively contextualize the data insights from the questionnaire results. Semi-structured interviews were selected as appropriate for this study due to their exploratory and subjective nature. These sorts of interviews lie between the rigid focus of a closed survey and the flexibility of an open-ended interview. Although semi-structured interviews consist of a pre-decided general structure, the researcher and respondent have a fair degree of freedom in what to discuss (Drever, 1995). In this way, semi-structured interviews were the obvious choice to further explore the nuanced insights from the prior quantitative data collection.

The sampling of key informants was based on both their expertise and knowledge, as well as the willingness of respondents to partake in an interview. Initially, key informants were identified through discussions with my supervisors (who were able to point me in the direction of a handful of individuals knowledgeable about kelp), as well as my own research around actors involved with kelp in the Western Cape. Thereafter, key informants were also identified through recommendations of identified actors who were considered knowledgeable about kelp (Cox, 2015). Because this research was conducted during the COVID-19 pandemic, key informants were first approached using online and telephonic communications after which a request for an interview with each informant was made.

Furthermore, due to the ongoing COVID-19 pandemic and resultant restrictions, there was low willingness from respondents to be interviewed. This issue was further exacerbated for actors within the kelp and abalone industry, as many of these actors lacked access to internet-enabled devices, thereby precluding virtual interviews at a time where face-to-face interactions had to be restricted due to health and safety concerns. As a result, fewer than expected key informant interviews were undertaken, and the feasibility of interviewing became a determining factor in the choice of key informants.

With this in mind, the key informants spanned all three categories listed above and a total of nine semi-structured interviews were conducted. Specifically, key informants included an individual involved in policy aspects of kelp management and kelp concession permit allocation, two district-level kelp managers, a group of five kelp harvesters (interviewed together upon their request and so considered as one interview), an ex-ward councillor of a region where kelp is harvested, an ex-abalone poacher, a research and development executive at a commercial abalone farm, an academic expert steeped in South African kelp research, and an individual who curates kelp foraging and cooking experiences. Three of the interviews took place face-to-face and were audio-recorded after gaining consent. Five of the interviews took place over Zoom and were also recorded after gaining consent. The Zoom and face-to-face semi-structured interviews lasted about 30-45 minutes. One interview took place over email at the request of the key informant. Due to the varying backgrounds, roles, and expertise of the key informants, questions were tailored for each informant, but based on common themes. Each interview thus consisted of questions based on insights from the questionnaire relevant to each key informant's field of expertise, as well as some general questions about their relationship with and feelings toward kelp. The guiding questions for the key informant interviews can be found in Appendix 3.

Unlike in the case of disseminating the questionnaires to participants with different language preferences and skills; all but one set of selected key informants were able to communicate in English. As a result, few language barriers had to be overcome in terms of these semi-structured interviews with the key informants. The group of five kelp harvesters (who were interviewed together upon their special request) was the only ‘key informant’ group that warranted the use of a translator. For this interview, in particular, each question was posed in English, after which the translator would relay the question to the harvesters in Xhosa. These key informants would then respond in Xhosa, after which the translator would translate their responses into English. This exchange was also recorded after gaining the kelp harvesters’ consent to do so.

The key informant interviews were transcribed using Otter.ai software. These transcripts were uploaded into NVivo (qualitative data analysis software) for textual analysis. NVivo allowed for the sorting and arrangement into different themes based on the questions explored during the interviews, as well as the ‘reading and re-reading’ of interviews for in-depth analysis (Rice and Ezzy, 1999).

### 3.3 LIMITATIONS

There are both theoretical and practical limitations to this research that must be acknowledged. First and foremost, the concept of value is subjective and can have different meanings to different people. Similarly, perceptions have a strong element of subjectivity (Munhall, 2008). The subjectivity of these concepts raises the question of whether the conclusions can be extrapolated to a wider population with similar demographic features. Second, while the researcher strived to maintain objectivity, it is known that researchers’ perceptions often include many preconceptions, not all of which are known to the researcher (Glaser and Strauss, 1967). Third, potential biases could have arisen from the use of the key informant interview method. Key informants can sometimes embed their own agendas into information, thus affecting its validity (McKenna and Main, 2013). This study attempted to reduce this potential bias by selecting key informants across various groups and from different backgrounds in order to validate the information gathered.

The study was posed with some practical obstacles too. The most serious of these was that the research occurred during the Covid-19 pandemic, thus hampering the data collection process in many ways. As a result of the uncertainty of lockdowns, people’s varying levels of risk-averseness, and national-level restrictive measures, some potential respondents had to be omitted from the study. Thus, the sample population for this study was smaller than expected. Additionally, gaining contact with relevant people proved challenging. Representatives from the government were especially difficult to get in touch with, and getting people to complete the questionnaire in a timely manner required a lot more following up than initially anticipated. One cannot say whether this was due to a lack of interest in this knowledge creation, or rather a matter of re-aligned priorities in light of the global pandemic. It must be noted that many of the participants who were asked to complete the questionnaire were unable to communicate in English. While the questionnaire and responses were professionally translated into Xhosa and Afrikaans to overcome this language barrier, it must be acknowledged that the use of translators is a limitation in terms of the accuracy of information relayed especially when subjective concepts like values, attitudes, perceptions, and beliefs are in play. As described by Newing et al., this reduces the ability of the researcher to identify nuances in responses, thus affecting the quality of data (Newing et al., 2010).

Finally, my positionality and resulting impacts must be recognized. Among the factors that define a researcher's positionality, race, affiliation, and emotional response were relevant factors (Berger (2013). There is a need to acknowledge the differences in physicality in terms of the researcher being an 'outsider' in the communities and areas where the study was carried out. Being of a different nationality, race, and gender from the majority of the actors surveyed could have prevented the notion of shared commonalities that beget a sense of comfort in order to share deep personal experiences (Dwyer and Buckle, 2009). I sought to overcome this limitation by thoroughly familiarizing myself with the study area and all relevant actors as best as possible.

#### 3.4 RESEARCH ETHICS

Ethical clearance for this study was issued by the Faculty of Science at the University of Cape Town (FSREC 011–2021). In keeping with the ethical standards of the Faculty of Science, respondents' identities were kept strictly confidential. All respondents were briefed about the objectives of the study and informed about their right to anonymity as well as withdrawal from the study at any stage without penalty or prejudice.

# CHAPTER FOUR

## 4.0 RESULTS AND FINDINGS

This chapter aims to present the findings from the analysis of data gleaned through the data collection techniques. The chapter will use the framework for value assessment (Figure 8) as a way to coherently present the results.

### 4.1. DEMOGRAPHICS

In total, 74 surveys and 9 key informant interviews were conducted. Table 2 shows the number of respondents surveyed and key informants interviewed by actor groups.

*Table 2: Sample population by actor group*

	Recreational Users and/or Coastal Community Members	Environmental Managers and Conservationists	Kelp and/or Abalone Industry Actors	Total Sample Population
Respondents	24	20	30	74
Key Informants	3	4	3	9

The majority of respondents (72%) were male. The ages of respondents ranged from 18 to 60 years old, with the average age of the respondents being 43 years old. Almost three-fourths of all respondents (70%) lived by the coast in coastal towns or less-formal coastal settlements, within 10 km of the coast. Table 3 shows the main descriptive statistics for each actor group. As seen in the table, the education levels of actors differed significantly by group, with 73% of Kelp and/or Abalone Industry Actors having not completed Grade 12. In stark contrast, 0% of environmental managers and conservationists, and 4% of recreational users did not complete Grade 12. The summary of socio-demographic characteristics of the respondents can act as an indicator of situational context and held values, within which the subsequent results illustrating other value dimensions are nested.

*Table 3: Sociodemographic characteristics of the respondents, further differentiated by actor group. The median is shown for certain characteristics, namely, age, years in stated occupation, breadwinners, dependants and years in residence area. Education levels (less than Grade 12, Bachelor's degree or higher), gender (male, female) and whether one lives in a coastal residence area are reported as both, a proportion of the sample population (%) and the actual number of respondents fitting each of these characteristics (n).*

	Sample Population (n = 74, 100%)	Recreational Users and/or Coastal Community Members (n = 24, 32%)	Environmental Managers and/or Conservationists (n = 20, 27%)	Kelp and/or Abalone Industry Actors (n = 30, 41%)
Median age (years)	40.5	59.5	40.5	40.5
Median number of years in stated occupation	11	20	10	10
Median number of breadwinners in the family	1	1	1	1
Median number of dependants	3	1	1.5	4
Less than Grade 12 (n, %)	n = 22, 31%	n = 1, 4%	n = 0, 0%	n = 22, 73%
Bachelor's degree or higher (n, %)	n = 28, 38%	n = 15, 63%	n = 12, 60%	n = 1, 3%
Male (n, %)	n = 54, 72%	n = 14, 58%	n = 14, 70%	n = 25, 83%
Female (n, %)	n = 20, 27%	n = 10, 42%	n = 6, 30%	n = 4, 13%
Coastal Residence Area (within 10 km of coast) (n, %)	n = 52, 70%	n = 13, 54%	n = 13, 65%	n = 26, 87%
Median number of years in stated residence area	12.5	12.5	10.5	12.5

## 4.2 KNOWLEDGE, AWARENESS, ATTITUDES

All actors in the study exhibited high levels of awareness of kelp, as seen through responses to the question “Which marine/ocean plants/vegetation are you aware of?” This was an open-ended question, the answers of which were coded into groups. As Figure 10 shows below, ‘kelp’ was the most frequently mentioned response.

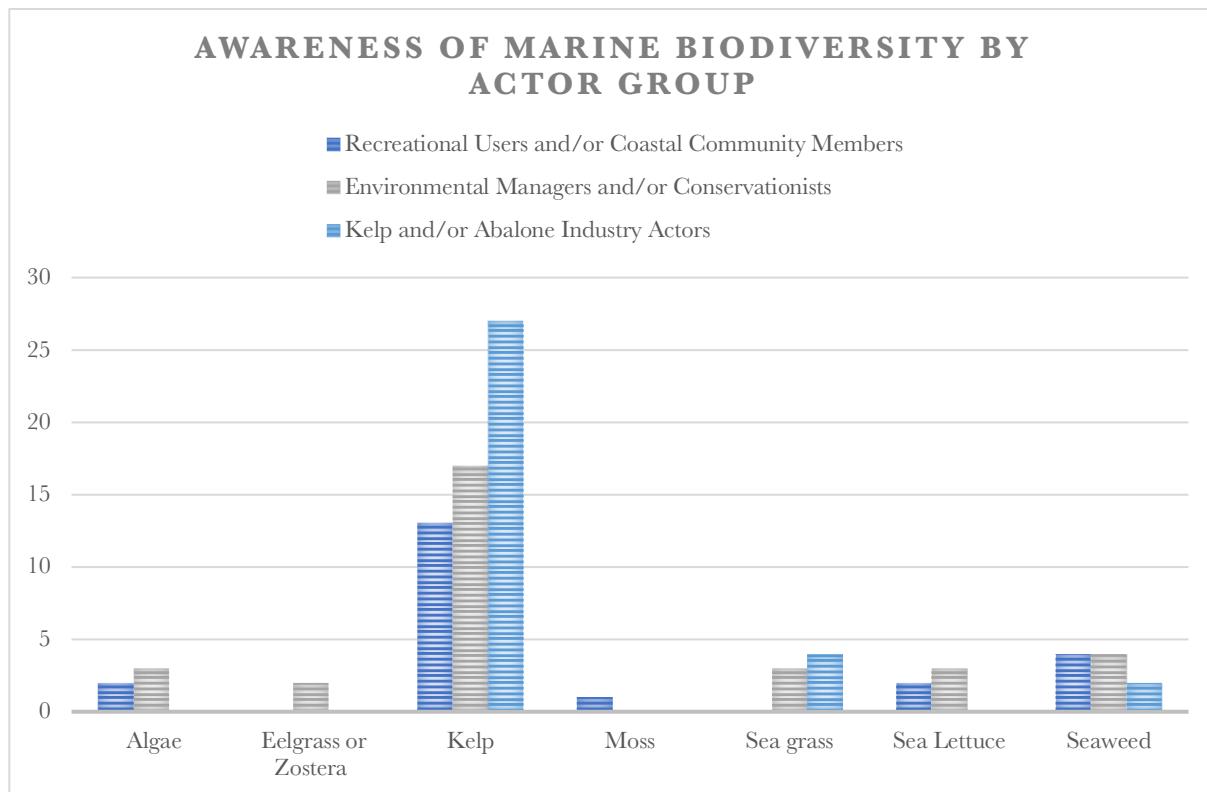


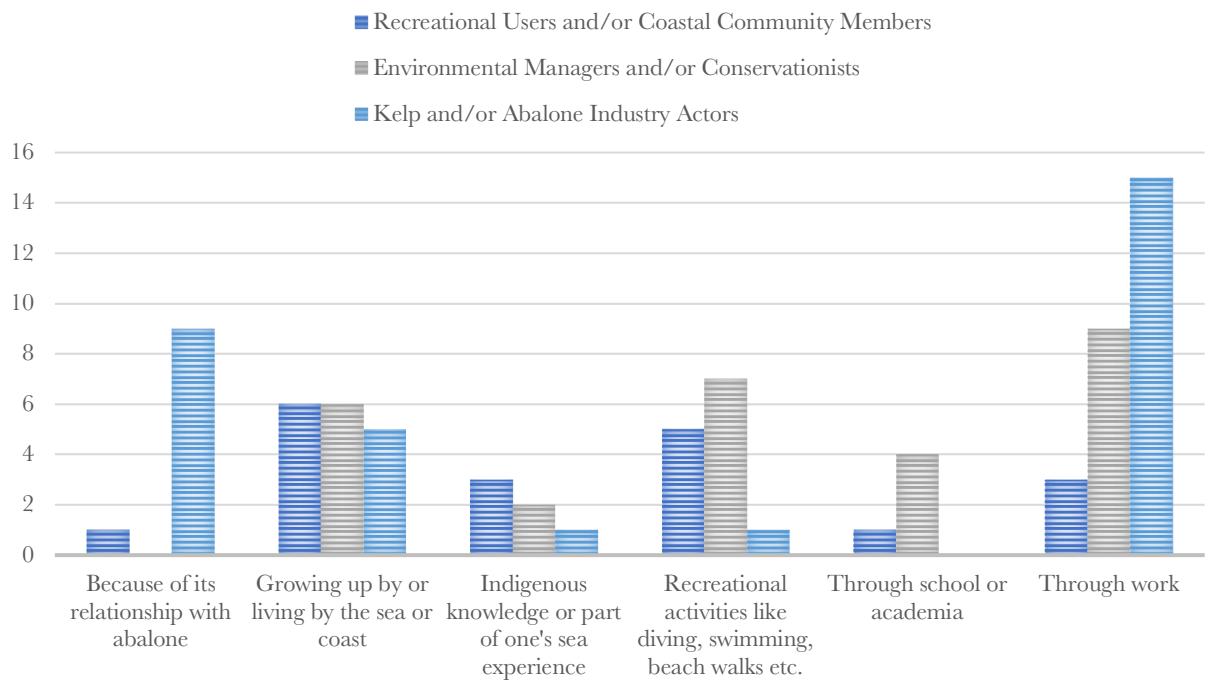
Figure 10: Graph demonstrating the distribution of responses to the question “Which marine/ocean plants/vegetation are you aware of?” by actor group as a measure of awareness of marine biodiversity.

Interestingly, while Kelp and/or Abalone Industry Actors obviously exhibited high levels of awareness of kelp, the same cannot be said about other ocean vegetation. This is not surprising, however, when one examines the sources of awareness for this group of actors. As seen in Figure 11, kelp industry actors most often mentioned becoming aware of kelp through work, or through kelp’s relationship with abalone.

The part of kelp awareness that these respondents attributed to abalone may be because of their previous experiences as abalone divers (and, perhaps ‘poachers’). To quote one respondent,

*“So I started diving. First a Skin Diver, it was warm because I was always on top, and then started scuba diving. So then I saw big kelp, small kelp and different colours of kelp. That's how I met kelp.”* (Actor, Kelp and/or Abalone Industry Actors, April 2021).

## SOURCES OF AWARENESS OF KELP BY ACTOR GROUP



*Figure 11: Graph demonstrating the distribution of responses to the question "How did you become aware of kelp?" by actor group to determine sources of awareness.*

Qualitative insights such as these statements further illustrate how interactions with abalone can lead to awareness of kelp, especially for abalone divers (and poachers), many of whom depend on kelp for their livelihoods in South Africa (Blamey and Bolton, 2018; de Greef, 2018). Notably, there were nine mentions of work being a primary source of awareness within the Environmental Managers and/or Conservationists group, making it the most common source of awareness of kelp. Unsurprisingly, the recreational users of kelp only barely attributed their awareness of kelp to work; rather, most respondents cited living by the sea and partaking in coastal recreational activities as a source of their awareness of kelp.

In terms of knowledge, the results showed that Kelp and/or Abalone Industry Actors tended to describe kelp based on how they experienced it—as “sea plants” and an “underwater forest.” One respondent noted that his experience of kelp was the same for him as growing up on the farm:

*“On the farm, we get water plants in the water. They grew the same way from the bottom to the top with big leaves or softer ones. It wasn’t different for me, it was like, touching a wet plant, just more slick than the ones in the dam. But the same.”* (Actor, Kelp and/or Abalone Industry Actors, April 2021).

On the other hand, environmental and conservation actors not only described kelp overwhelmingly as an “underwater forest,” but also as “macroalgae,” exhibiting a more scientific

type of knowledge regarding kelp (Figure 12). Recreational users also favoured the “underwater forest” and “sea plants” descriptions.

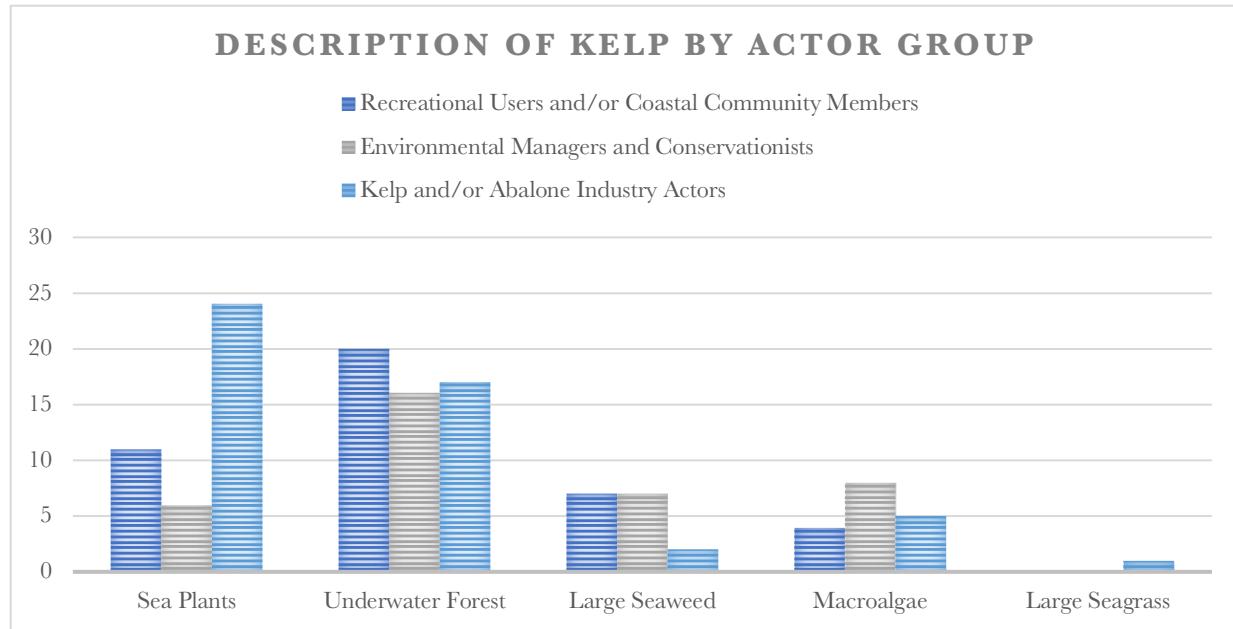


Figure 12: Graph showing the distribution descriptions of kelp by Actor Group.

These levels of knowledge could be a result of how knowledge about kelp was acquired in the first place. Across all groups of actors, personal interaction with kelp was the mode of knowledge acquisition with the highest frequency of 37% (Figure 13). In this study, results with regards to knowledge around kelp are better viewed as a whole rather than differentiated by actor groups because of the commonalities across all groups, thus yielding more insight when visualized as an aggregate.

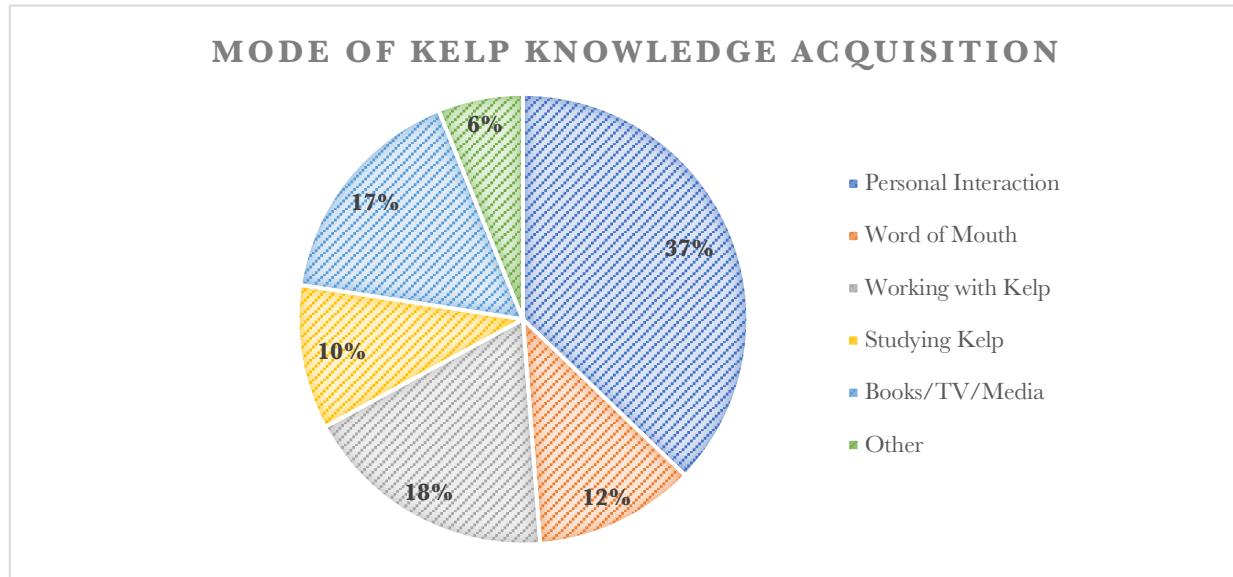
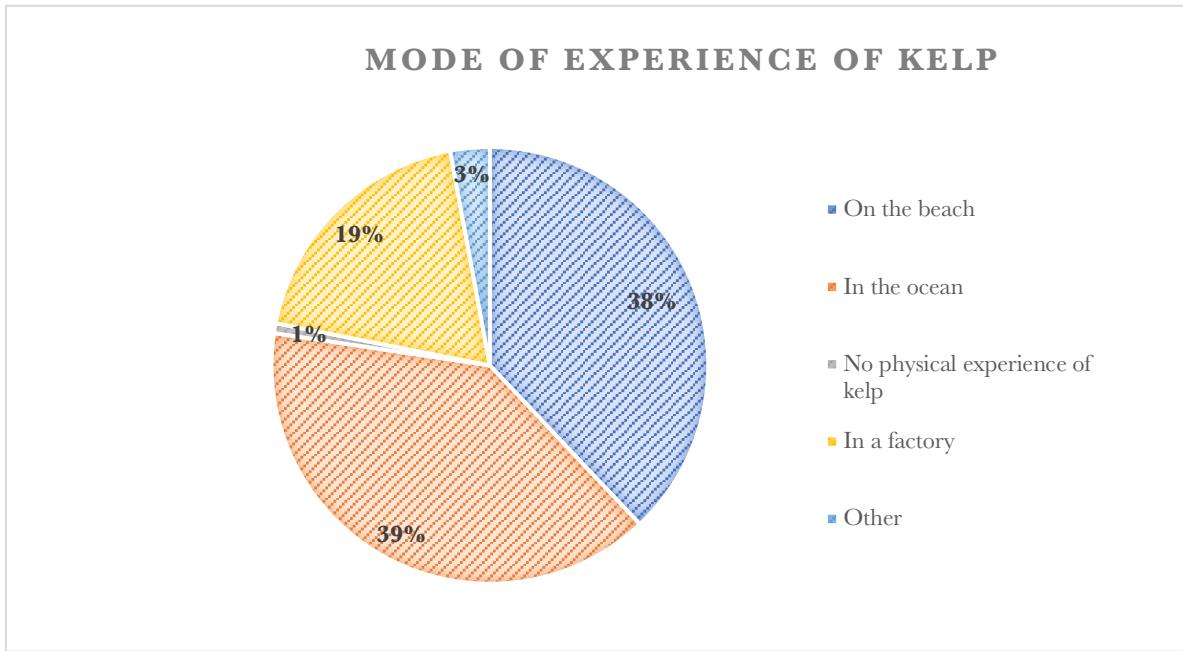


Figure 13: Graph representing the relative proportions of modes of knowledge of kelp acquisition across the entire sample population. Actors were asked to choose all the sources of knowledge that applied to them from the given options.

Given that 77% of responses indicated that actors experience kelp in the ocean and/or on the beach (Figure 14), the popularity of the choice to describe kelp as an underwater forest is warranted, since kelp is most often experienced in the ocean and/or on the beach in this manner (Figure 12). For instance, one respondent attributed their knowledge of kelp to their “experiences as a young child snorkelling in kelp forests” (Recreational User and/or Coastal Community Member, May 2021).



*Figure 14: Graph representing the relative proportions of modes of experience of kelp across the entire sample population. Actors were asked to choose all the modes of experience that applied to them from the given options.*

Additionally, 40% of all respondents indicated that they acquired knowledge of kelp over 20 years ago, with 22% indicating that they learned about kelp between 11 and 20 years ago (Figure 15). This means that 62% of the sample population had knowledge about kelp for 11 years or more. As such, this indicates a high level of knowledge (scientific or otherwise) and awareness of kelp, which supports the repeated mention of kelp being an innate part of these actors’ lives. To quote some respondents:

*“It's [kelp] just always been there. I was born at the sea.”* (Actor, Recreational User and/or Coastal Community Members, May 2021).

*“My knowledge of kelp is very helpful in many areas, in the field, at work, in life.”* (Actor, Environmental Managers and/or Conservationists, May 2021)

*“We [actor and kelp] work together as one.”* (Actor, Kelp and/or Abalone Industry Actors, April 2021)

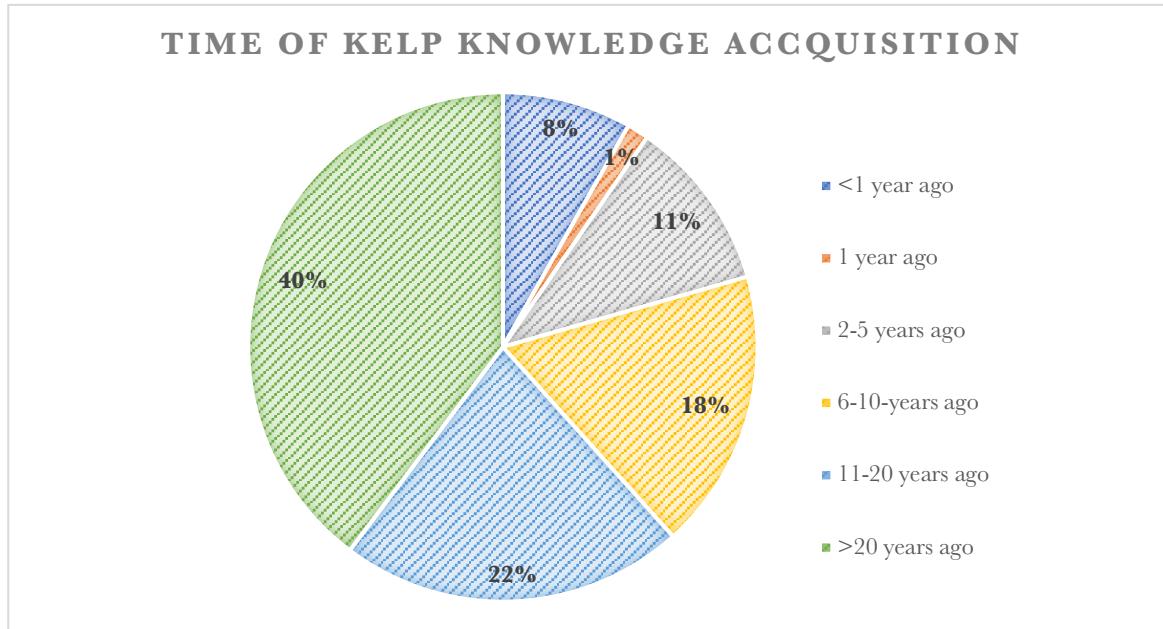


Figure 15: Graph representing the time of kelp knowledge acquisition across the entire sample population in response to the question “When did you acquire knowledge about kelp?”

Further, virtually all respondents (96%) were seen to believe biodiversity should be protected (Figure 16). To contextualize this general statistic, it is worth considering the qualitative reactions to the thought of the loss of kelp:

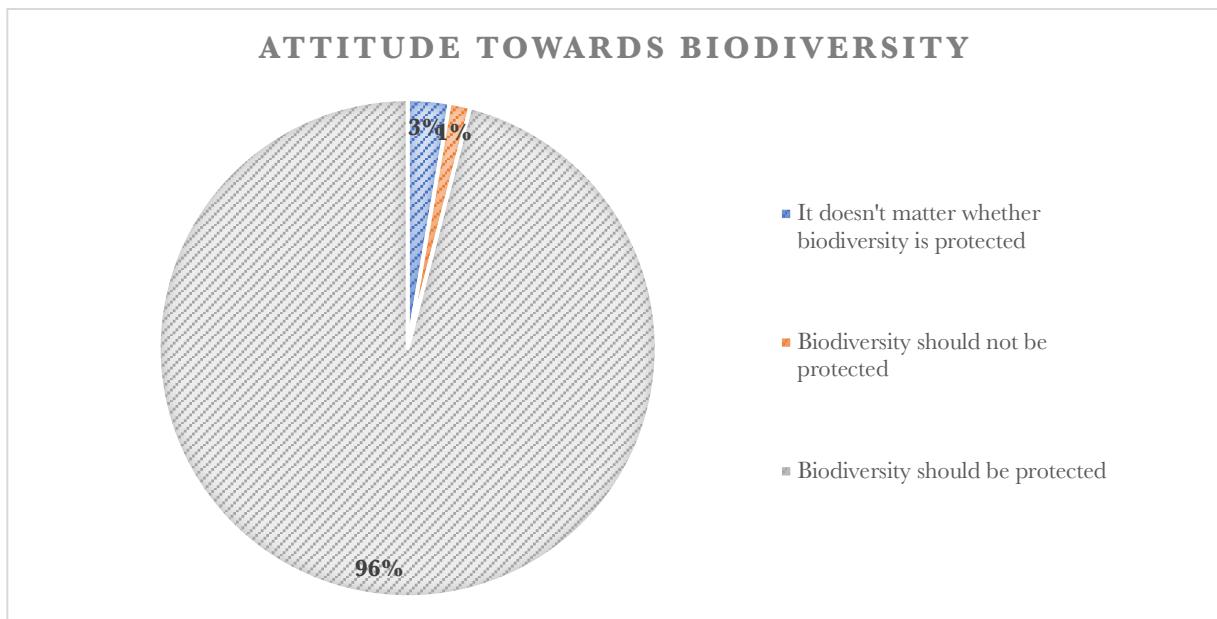
*“Devastated. We would lose so much of our sea life.”* (Actor, Recreational User and/or Coastal Community Members, May 2021).

*“A personal tragedy as the diversity that exists because of the kelp would be lost.”* (Actor, Environmental Managers and/or Conservationists, May 2021)

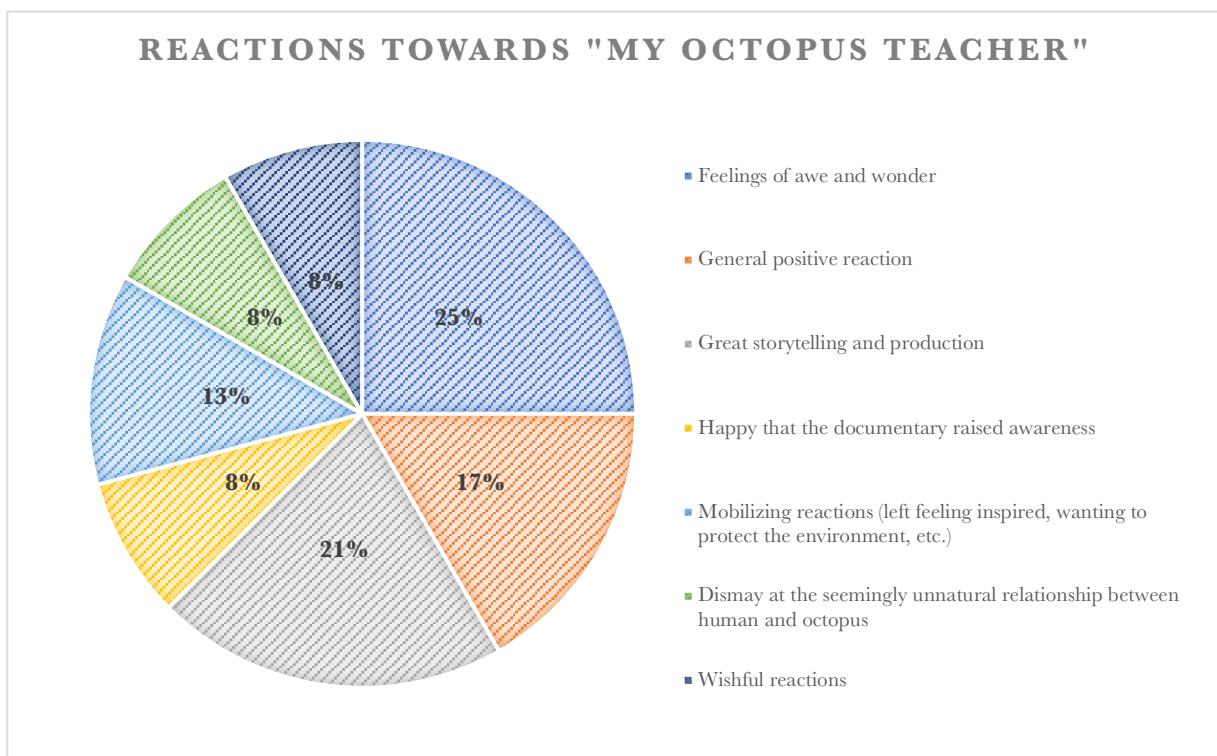
*“Grief—these forests are the natural ecosystem that I know best.”* (Actor, Recreational User and/or Coastal Community Members, May 2021).

*“I will repent.”* (Actor, Kelp and/or Abalone Industry Actors, April 2021).

Clearly, most actors had strong preferences for the continued flourishing of kelp forests. General attitudes towards nature amongst environmental managers and recreational users were also evidenced through these actors’ feelings of the South African documentary ‘My Octopus Teacher.’ Figure 17 shows the range of themes responses could be grouped into, when participants were asked about whether they had watched the documentary and how it made them feel. Note, these results only represent the 36% of the sample population (27 participants) that had watched My Octopus Teacher, all of whom were from within the Environmental Managers and/or Conservationists and Recreational User and/or Coastal Community Members groupings. None of the Kelp and/or Abalone Industry Actors stated that they had watched the



*Figure 16: Graph representing responses to the question “Do you believe biodiversity should be protected?” to gauge general attitudes towards biodiversity amongst the sample population.*



*Figure 17: Graph showing the broad themes of reactions towards the documentary “My Octopus Teacher” across the sample population.*

documentary. Nonetheless, the strong presence of feelings of awe, wonder, inspiration, and the desire to protect the marine environment portrayed in the documentary further illustrate the penchant for appreciative and positive attitudes towards biodiversity amongst these participants.

For instance, one recreational user stated that he “would wish for a similar experience. [I am] pleased that it is raising awareness of what we have, it needs protection” (May, 2021).

#### 4.3 INSTRUMENTAL VALUES OF NATURE’S CONTRIBUTION’S TO PEOPLE

As discussed above, the IPBES focus of value of ‘Nature’s Contributions to People,’ or NCP, is one way to bring attention to kelp’s contributions that are of importance. In turn, these contributions can shed light on the construct of instrumental values with regards to kelp forests. At their core, instrumental values are anthropocentric and deal with the value of nature’s contributions in their ability to provide for, support, and produce other things (Chan, Satterfield and Goldstein, 2012). Table 4 details the proportion of respondents that assigned importance to each kelp’s contributions. These perceptions of value based on regulating, material, and non-material contributions of kelp are displayed as aggregate totals and then further differentiated by the three actor groupings considered in this study.

*Table 4: Perceived value of kelp's contributions to people across the three types of NCP*

		Perceived Importance by actor grouping (% of respondents in each group)		
Kelp's Contributions To People	Aggregate Perceived Importance (% of respondents)	Recreational Users and/or Coastal Community Members	Environmental Managers and Conservationists	Kelp and/or Abalone Industry Actors
<b>Regulating contributions</b>				
It creates and maintains a healthy marine and coastal environment	89%	88%	100%	83%
It regulates air and water quality and improves the climate	38%	42%	65%	17%
It absorbs pollutants	39%	46%	60%	20%
It can increase my safety from extreme natural events	38%	33%	75%	17%
It provides a habitat for abalone, rock lobster, and other fish or invertebrates	81%	79%	85%	80%
It is not important to me for any of the above contributions	0%	0%	0%	0%
<b>Range</b>	<b>38%-89%</b>	<b>33%-88%</b>	<b>60%-100%</b>	<b>17%-83%</b>

		Perceived Importance by actor grouping (% of respondents in each group)		
	Aggregate Perceived Importance (% of respondents)	Recreational Users and/or Coastal Community Members	Environmental Managers and Conservationists	Kelp and/or Abalone Industry Actors
<b>Material contributions</b>				
It provides energy, such as fuel from dried kelp	27%	17%	30%	33%
I can consume it as an alternative source of food	47%	38%	35%	63%
It is a source of food and feed for domestic animals	39%	8%	40%	63%
It is used in materials like paint and cosmetic products	22%	21%	40%	10%
It contributes to my livelihood and/or job satisfaction	45%	8%	45%	80%
It allows me to procure abalone	5%	0%	10%	7%
It is not important to me for any of the above contributions	14%	33%	0%	0%
<b>Range</b>	<b>5%-47%</b>	<b>8%-38%</b>	<b>10%-50%</b>	<b>7%-80%</b>
<b>Non-material contributions</b>				
It is a source of inspiration for me in terms of art and design	23%	20%	30%	17%
It provides opportunities for recreation that give me physical/psychological satisfaction	45%	60%	37%	42%
It plays a role in my social life	26%	20%	37%	17%
I associate kelp with influential childhood experiences	42%	40%	53%	29%

		Perceived Importance by actor grouping (% of respondents in each group)		
	Aggregate Perceived Importance (% of respondents)	Recreational Users and/or Coastal Community Members	Environmental Managers and Conservationists	Kelp and/or Abalone Industry Actors
<b>Non-material contributions (continued)</b>				
It supports my religious and/or spiritual identity and plays a role in rituals, and celebrations.	4%	10%	3%	0%
It increases my enjoyment of the sea and/or coast	64%	75%	47%	75%
It is not important to me for any of the above contributions	8%	10%	3%	13%
<b>Range</b>	<b>4%-64%</b>	<b>10%-75%</b>	<b>3%-53%</b>	<b>17%-75%</b>

For each broad category of NCP (regulating, material, and non-material), the range, denoting the contributions with the lowest and highest percentage of respondents (and thereby those that are perceived to have the most and least value) is shown. This allows for a better understanding of general tendencies of the perceived value of kelp's contributions, both when comparing the ranges for each type of NCP, as well as through a comparison of actor groups. The denoted range discounts the response option "It [kelp] is not important to me for any of the above contributions." This response option is considered separately beyond the above typology of values, as the option does not measure kelp's contributions but rather the perceived lack of them.

Environmental Managers and Conservationists strongly valued kelp for its regulating contributions (range: 60-100%)—more so than the Kelp and/or Abalone Industry Actors (range: 17-83%) and Recreational Users and/or Coastal Community Members (range: 33-88%). Specifically, its ability to create and maintains a healthy marine and coastal environment (100%) and its provision of a habitat for abalone, rock lobster, and other fish or invertebrates (85%) are of importance to Environmental Managers and Conservationists. That said, both the Kelp and/or Abalone Industry Actors and Recreational Users and/or Coastal Community Members also primarily valued kelp for the same specific contributions as the Environmental Managers and Conservationists (Table 4). One respondent articulated this importance as follows:

*"We appreciate that kelp provides a range of ecosystem services benefits to the city (Cape Town). It is quite well researched, and that is, it provides a role in trapping sand and elevating beach profiles, which is useful to mitigate against coastal erosion. And in an urban context, that's important because we do have large sections of our coastline that are developed and there is coastal property and infrastructure public infrastructure that is fairly close to the high-water mark."* (Actor, Environmental Managers and Conservationists, May 2021).

Another respondent from within the Kelp and/or Abalone Industry further highlighted kelp's regulating contributions and resulting impacts on abalone farming:

*"Kelp has also got its importance as an—I'm not going to use the right words here—an ecosystem regulator. Maybe I'm using the wrong words, but because we [abalone farm] are a flow-through operation, we rely on the water that's coming out from the sea, and that the water is of good quality. So you know, the kelp and the kelp beds then form an important part of protecting the water in front of us, and ensuring that the water is as healthy as it can possibly be. So it's got huge direct and indirect benefits to us."* (Actor, Kelp and/or Abalone Industry Actors, June 2021).

In summary, all three actor groups generally perceived kelp to be of high value due to its regulating contributions.

On the contrary, with a range of 5-47%, the material contributions of kelp were not valued as highly as its regulating contributions, when the three groups of actors were considered as an aggregate. The Kelp and/or Abalone Industry Actors were the major contributing group to this statistic, with 80% of respondents in this group valuing kelp for its contributions to their livelihoods and/or job satisfaction. This theme of kelp as an enabler of livelihoods also manifested when actors in this group were asked to explain why kelp was important to them, as an open-ended question without any pre-decided choices. Responses included statements like "*kelp keeps my family living*," "*It [kelp] is important because it helps keep the doors open*," "*it [kelp] is how I put food on the table every day*," and "*for it [kelp] is my daily bread*" (Kelp and/or Abalone Industry Actors, June 2021). This group of actors was also the only one wherein a majority of respondents assigned importance to kelp as an alternative source of food (63%), a source of food and feed for domestic animals (63%), and its provision of medicinal resources (60%). A handful of actors in other groupings seemed either against or largely ambivalent to these specific material contributions of kelp:

*"I prefer to see kelp in nature and not on my plate."* (Actor, Recreational Users and/or Coastal Community Members, April 2021)

*"I have a mostly non-consumptive relationship with kelp."* (Actor, Environmental Managers and Conservationists, May 2021)

These qualitative insights are further supported by the statistic showing that one-third (33%) of all Recreational Users and/or Coastal Community Members surveyed indicated that they **did not** value kelp for any material contribution. In this way, while kelp's material contributions were recognized by the other groups in the ranges of 10-50% (Environmental Managers and Conservationists) and 8-38% (Recreational Users and/or Coastal Community Members); the Kelp and/or Abalone Industry Actors grouping valued these contributions more highly (range: 7-80%).

Another source of instrumental values towards kelp was seen through the perceived importance of non-material contributions of kelp. Non-material contributions often encompass socio-cultural

dimensions of value (Small, Munday and Durance, 2017). The findings from this study show that the range of respondents who indicated that they valued kelp for any of its non-material contributions was 4-64% across actor groups, thereby being the lowest range among the three types of NCP. Non-material contributions, specifically kelp's role in increasing one's enjoyment of the sea and/or coast, was valued the most by Recreational Users and/or Coastal Community Members and Kelp and/or Abalone Industry Actors (75% respectively):

*“It [kelp] forms part of what makes the West Coast, the ‘West Coast’ for me.”* (Actor, Recreational Users and/or Coastal Community Members, April 2021)

*“Diving/snorkelling in a kelp forest is perhaps the best diving I know.”* (Actor, Recreational Users and/or Coastal Community Members, April 2021)

In contrast, only 47% of the Environmental Managers and Conservationists indicated that kelp was important to them for this specific contribution. Sixty percent of respondents from the Recreational Users and/or Coastal Community Member groups also indicated that kelp enabled opportunities for recreation that resulted in physical/psychological satisfaction. On further probing, it was seen that many of these actors had what could be defined as a ‘nostalgic and sensorial relationships’ with kelp forests, as surmised by these responses:

*“Kelp and the smell of kelp is one of the first memories of my childhood, it is synonym with holiday and fun. When I watch the kelp moving in the waves it brings me so much calmness.”* (Actor, Recreational Users and/or Coastal Community Members, April 2021)

*“Nothing like the joy it brings floating through a golden forest.”* (Actor, Recreational Users and/or Coastal Community Members, April 2021)

*“To me, it [kelp] is important because it's an environment that brings me extreme happiness and fulfilment.”* (Actor, Recreational Users and/or Coastal Community Members, April 2021)

As such, the non-material contributions of kelp were seen to have less value than its regulation and material contributions, with 8% of actors across all groups indicating kelp held no importance to them for any non-material contributions.

In summary, while kelp's various contributions to people are valued at different degrees of importance it cannot be denied that kelp is perceived to possess high instrumental value.

#### 4.4 NATURE AS A FOCUS OF INTRINSIC AND RELATIONAL VALUE

Participants were also asked to rate statements regarding the presence of relational, intrinsic and bequest values of kelp on a 5-point Likert scale. The results of this are shown in Table 5. The perceptions of intrinsic, relational and bequest value are highly correlated, as shown by the high Cronbach  $\alpha$  value of 0.78. The mean response was that of agreement to the statements associated with each value dimension Table 6 further unpacks these findings, showing the proportion of

responses in agreement (i.e., ‘Agree’ or ‘Strongly Agree’ on the Likert scale) with the statements of relational, intrinsic and bequest value. Kelp and/or Abalone Industry Actors had the lowest range of responses in agreement with the statements (67-73%). Overall, however, 80-89% of respondents perceived kelp’s relational, intrinsic and bequest value.

*Table 5: Perceptions of non-use value for the sample population of 74 actors; SDi: strongly disagree; Di: disagree; N: neither; Ag: agree; SAg: strongly agree. All items were measured in a 5-point Likert scale; Mean of each factor is computed by averaging the items of the corresponding factor.*

<b>Cronbach's <math>\alpha^6 = 0.787</math>, Mean = 4.26</b>	<b>Responses (%)</b>						Mean	Standard Deviation
	Unanswered (0)	SDi (1)	Di (2)	N (3)	Ag (4)	SAg (5)		
Relational value: “I have a moral and ethical obligation to protect kelp forests.”	1%	5%	0%	5%	24%	64%	4.36	1.13
Intrinsic value: “My seaside experience depends on the knowledge that kelp is flourishing.”	3%	1%	1%	15%	39%	41%	4.08	1.08
Bequest value: “Kelp is important to me because of its value to future generations.”	3%	3%	3%	3%	28%	61%	4.34	1.15

*Table 6: Positive perceptions of kelp’s relational, intrinsic, and bequest value by actor group*

<b>Perceptions of ‘Kelp’ As a Foci of Value</b>	Aggregate % of respondents in agreement (Ag, SAg)	% Of respondents in agreement (Ag, SAg) by actor group			
		Recreational Users and/or Coastal Community Members	Environmental Managers and Conservationists	Kelp and/or Abalone Industry Actors	
Relational value: “I have a moral and ethical obligation to protect kelp forests.”	88%	79%	85%	70%	
Intrinsic value: “My seaside experience depends on the knowledge that kelp is flourishing.”	80%	75%	70%	67%	
Bequest value: “Kelp is important to me because of its value to future generations.”	89%	83%	90%	73%	
<b>Range</b>	<b>80-89%</b>	<b>75-83%</b>	<b>70-90%</b>	<b>67-73%</b>	

<sup>6</sup> Cronbach’s  $\alpha$  is a measure of internal consistency showing how closely related a set of items are as a group. In this study, the high alpha value shows that the dimensions measured are closely related.

Relational values towards kelp were especially high across actor groups (88%). This is not surprising, given that the prevalence of relational values continues to be seen through actors' responses to other questions in the questionnaire too. Not only were relational values brought to light through some of the qualitative responses like "*Kelp is important and should be valued and protected as a critical and beautiful environment*" or "*Kelp is important to me because conserving and caring for nature is important to me*," but also through the frequent indications by actors that kelp "*plays a role in community life*" and/or "*contributes to lifestyle.*" Similarly, both quantitative and qualitative findings show that most actors (80%) perceive kelp to have high intrinsic value. One actor's response succinctly captures the general feeling around the intrinsic value of kelp:

*"Quite simply it is one of the most important ecosystems in the world."* (Actor, Recreational Users and/or Coastal Community Members, May 2021).

#### 4.5 NEGATIVE PERCEPTIONS AROUND KELP

Actors were also asked about whether there was anything that reduced their assignment of value to kelp (and if so, what the source of these negative perceptions entailed), as well as whether kelp created any threats or frustrations for them. Interestingly, 54% of responses across actor groups indicated that nothing reduced their appreciation of kelp, with 76% of responses stating that kelp created no threats. Table 7 shows these results in greater detail, and further differentiates sources of negative perceptions and threats by actor group. Once again, the range, denoting the responses chosen by the lowest and highest percentage of respondents (and thereby those that are perceived to contribute most and least to negative perceptions) is shown. The range discounts the options "*None of the above reduce my appreciation of kelp*" and "*It [kelp] does not create any threats for me*" since these statements do not measure negative perceptions towards kelp, but rather the perceived lack of them.

*Table 7: Negative perceptions around kelp, further detailed by reasons for the reduction of appreciation of kelp and threats from kelp and differentiated by actor group*

	Aggregate Negative Perceptions (% of respondents)	Negative Perceptions by Actor Grouping (% of respondents in each group)		
		Recreational Users and/or Coastal Community Members	Environmental Managers and Conservationists	Kelp and/or Abalone Industry Actors
<b>Reduction of Appreciation</b>				
Mechanisms of control and rules of access around kelp (e.g., harvest control and regulations).	9%	4%	5%	17%

		Negative Perceptions by Actor Grouping (% of respondents in each group)		
Aggregate Negative Perceptions (% of respondents)		Recreational Users and/or Coastal Community Members	Environmental Managers and Conservationists	Kelp and/or Abalone Industry Actors
<b>Reduction of Appreciation (continued)</b>				
Issues of power and inequality in the kelp sector	15%	8%	5%	27%
Its odour and unsightly looks	14%	13%	10%	17%
Its ability to take away from my recreational enjoyment of the sea/coast	14%	4%	15%	20%
None of the above reduce my appreciation of kelp	54%	63%	75%	33%
Other	3%	4%	0%	3%
<b>Range</b>	<b>3%-15%</b>	<b>4%-13%</b>	<b>5-15%</b>	<b>3%-27%</b>
<b>Threats</b>				
Kelp limits my recreational opportunities	5%	4%	0%	10%
Kelp limits my livelihood/business	1%	0%	0%	3%
Kelp negatively affects my experience of the coast and/or ocean (e.g. unsightly, smelly, etc.)	8%	8%	5%	10%
Kelp scares me when I come across it while swimming	1%	0%	0%	3%
Kelp does not create any threats for me	76%	71%	95%	67%
Other	5%	4%	0%	10%
<b>Range</b>	<b>1%-8%</b>	<b>4%-8%</b>	<b>5%</b>	<b>3%-10%</b>

Based on these results, one can infer that most actors hold kelp in high regard and were not threatened by it. The ranges amongst actor groups also did not differ significantly in terms of perceived threats from kelp, showing that most actors felt similarly. Importantly, the main reasons for a diminished appreciation of kelp were issues of power and inequality in the kelp sector (15%). As can be seen in Table 7, this statistic is largely made up of Kelp and/or Abalone Industry Actors (27%), while only 5% of the Environmental Managers and Conservationists and 8% or the Recreational Users and/or Coastal Community members recognized these issues as a source of diminishing value in terms of kelp forests. However, on further probing specific power issues, Kelp and/or Abalone Industry Actors were reluctant to provide detail, often reverting to statements like “*it’s just like that,*” or “*it’s the honest truth*” (April 2021). One cannot say whether this was due to a sense of trepidation as a result of being recorded, whether this was a result of translation problems, because the actors wanted to be done with the questionnaire and conversation, or due to a sense of uneasiness about talking about these issues. Nonetheless, insights about possible power imbalances and inequality were provided by key informants, implying that these feelings around inequality were a result of the kelp concession rights allocation process for commercial kelp harvest, (that tends to favour larger commercial entities that have the capacity to compete in global markets). In this regard, an actor from within the Environmental Managers and Conservationists group stated:

*“Inequality in South Africa can be regarded as a “wicked problem.” Therefore, there will always be South African persons perceiving that they are treated unfairly regardless of the measures put in place to ensure that everyone is given the opportunity to participate in the seaweed rights allocation process to some degree, and the opportunity to apply for seaweed rights of which the applications are subjected to the assessment process. Hence, some would be granted the rights, and some would not. Those that are not granted the rights or did not apply for them would always regard themselves as being treated unfairly.”* (Actor, Environmental Managers and Conservationists, May 2021).

Another key informant from within the Environmental Managers and Conservationists group provided details about a separate set of manifestations of the power inequalities between local government officials tasked with clearing kelp off the beach and kelp concession holders. For instance, a key informant from the Environmental Managers and Conservationists group who is involved with kelp management at the national level mentioned that there have been reports of rights holders collecting kelp past their permitted harvesting boundaries, disregarding both the authority of compliance officials and the conditions of their permits. To this end, the key informant stated:

*“Some of the conflict which we have been dealing with includes but is not limited to right holders that would unknowingly process kelp in coastal areas affecting or annoying coastal dwellers or other resource users... Seaweed rights holders would not be happy to arrive at their harvesting area and find out that the local municipality has already collected the kelp for dumping. In terms of the law, they [rights holders] are not allowed to collect kelp from the dumping site, but only from their allocated harvesting areas.”* (Actor, Environmental Managers and Conservationists, June 2021).

Another key informant involved in the provincial sphere of government also highlighted the prevalence of friction between kelp concession holders and officials involved with the resource’s management:

*“So, there’s still a point of friction between the way that we manage kelp and, specifically rights holders removing kelp from our ‘no kelp clearing’ areas. And I do believe there’s still some friction there that’s almost unresolved. The discussion surrounding that exact point is always really difficult… But business carries on and we carry on doing our own thing. And every now and again, the problem does crop up when we do find rights holders removing kelp from beaches where they’re not meant to. And that’s problematic for us because those beaches are erosion hotspots.”*

(Actor, Environmental Managers and Conservationists, May 2021).

Interestingly, another issue this brought to light was the struggle for inclusivity in terms of kelp management, even across different spheres of government. The problem seems to stem from the fact that while provincial and local spheres of government have no mandate in the management of the kelp, these two spheres are involved in the management of coastal areas which entails beach cleaning (and the clearing of kelp from beaches). To quote one key informant, “*As far as I am concerned, the provincial and local spheres of government of South Africa has no mandate in management of the kelp. However, these two spheres are involved in the management of coastal areas which entails beach cleaning*” (Environmental Managers and Conservationists group, June 2021). As a result, provincial and local government bodies often run into problems with kelp concession holders when clearing kelp off beaches of kelp, because these government bodies are sometimes not made aware of newly issued concession permits. This is because concession permits are only issued at the national level through DFFE and are not always communicated to the local and provincial spheres of government. One key informant from within the provincial government elaborated on this lack of communication, the resulting frustrations, and the provincial government’s attempts at fostering transparency amongst various spheres of government:

*“We spoke to colleagues, they tried to set up a meeting. And after we struggled for some time and then at long last, we were able to meet with two or three of the DEFF (now, DFFE) officials. We put forward the case to say that ‘you are issuing [permits] from the National Department, a lot of rights to these kelp collectors, all along the coast… Normally an individual or company receives the right to collect from point A to point B along the coast. And it’s valid for quite a lengthy period. And within that, that period is there is no communication to the local authorities, to the Cape Natures,’ to the Birdlife etc., if it [the permit conditions] is actually being monitored. And if the collection is being done in a way that you see is not negatively impacting the rest of the user groups in the coastal area.” And that was our biggest frustration—it’s been done in isolation and there was no proper communication to say, “Mr. X just received a permit,” or “there is an application, are you against it? Are you agreeing to the issuing of a permit for this specific area?” And then no further communication to anybody. And we say that if we can contribute—not to dictate to the department—but we would like to have an opportunity to provide some comments on the effectiveness of the permit allocation and monitoring process, since we are the to clear up the kelp on the beach and usually encounter the right’s holders… The long and short of it is that if the department [DFFE] is not willing to monitor the people on the ground, and if there’s not a willingness to work with the local authorities, then it’s very challenging. And very frustrating.”*

(Actor, Environmental Managers and Conservationists, May 2021).

These responses highlight the power issues at play when it comes to kelp collection and management, resulting in major disconnects across the various spheres of government. Some of these disconnects with regards to the permit allocation, kelp clearing, compliance, and monitoring are rooted in age-old systems of marine resource management, and unsuccessful attempts at expanding the permit allocation system to become more inclusive and equitably managed, as

detailed in Section 2.1. One actor in the Environmental Managers and Conservationists group at the national level of government attributed these challenges to the general complexity of governing common-pool resources, and the inevitability of resulting ‘winners’ and ‘losers,’ as evidenced by the following words:

*“Generally fisheries (including seaweed) management is complex. What makes fisheries management complex is that the legal framework prescribes that there shall be orderly access to the fisheries resources and that the resources shall be managed sustainably. In other words, there is limited fisheries resources, hence the right or quota holders shall be limited. Therefore, the process of limiting the numbers will always have challenges given the rights as prescribed in the Constitution of RSA and government priorities, as well as the objectives and principles as set out in the relevant legal framework.”* (Actor, Environmental Managers and Conservationists, June 2021).

Perhaps as a result of this complexity, attempting to resolve management issues and determine ‘best practices’ for the act of kelp collection has evolved into an informal process of negotiations between authorities at the local and provincial level of government and the rights holders themselves:

*“Generally, we [local/provincial authorities] then try and form a gentleman’s or gentlewoman’s agreement between the rights holder to try and resolve that [issues of right holders’ breaking the permit conditions as a result of power]. And that’s done between us and the rights holder. It’s no longer done between us and the national level [DFFE], because, it’s quite a difficult engagement and we found it to be more productive to engage directly with the rights holder, and to try and work around that. And let them know what our challenges are and what our concerns are. And we understand that they have a right to remove kelp, so we do try and find a delicate balance, but that’s done between us and the rights holder directly.”* (Actor, Environmental Managers and Conservationists, May 2021).

Ultimately, these insights are not directly associated with the perceived value of kelp *per se*. However, they do point to larger issues around the processes of management and governance of kelp in South Africa, which in turn could affect attitudes towards policies aimed at sustainable kelp use and kelp conservation in the country. As seen through the survey responses, issues of power and inequality pertaining to kelp were the main reasons for a reduction of appreciation of kelp, although these issues were not a function of kelp itself. While there is no denying that these dynamics need to be explored in future research, when considered in the context of the assignment of values of kelp and its contributions, the majority of the respondents felt these factors did not reduce their perceived value of kelp.

Finally, it is worth noting that the main reasons for a reduction of appreciation of kelp that is a direct function of kelp, and its contributions, included its unsightly looks when washed up on the beach, and/or its odour. When this was further probed, participants explain that “*When washed out [kelp] it makes the beach untidy*” and “*It [Kelp] smells foul when washing onto the beach*” (Kelp and/or Abalone Industry Actors, Recreational Users and/or Coastal Community Members, May 2021). Still, the value assigned to the benefits from kelp and its contributions were seen to far outweigh its perceived detriments. One actor from the Recreational Users and/or Coastal Community Members group expressed this in his explanation of what he disliked about kelp:

*“The only minor frustration is in surfing—leashes get snagged, it [kelp] can make it hard to surf waves, and dings my board. But honestly, I wouldn’t change it for the world.”* (Actor, Recreational Users and/or Coastal Community Members, April 2021).

#### 4.6 SUMMARY

This chapter detailed the qualitative and quantitative findings around how the value of kelp is perceived in the Western Cape region of South Africa, as elicited through the IPBES’ conceptual framework. Respondents were seen to have high levels of awareness and knowledge about kelp. The instrumental value of kelp—through its ecological, economic, social, and cultural contributions—was also perceived to be high. That said, kelp’s most valued contribution was seen to be its ability to create and maintain a healthy marine and coastal environment, with 89% of all respondents choosing this contribution as important. Kelp was also seen to have high intrinsic, bequest and relational value, with over 80% of all actors recognizing its value for future generations, as well as signifying that they felt an ethical obligation to protect kelp forests. Finally, the majority of respondents did not express significant frustrations around kelp and were not threatened by it. It must be noted, however, that 27% of Kelp and/or Abalone Industry Actors indicated that issues around power and inequality in the kelp sector contributed to a reduction in their appreciation of kelp. The root of these power issues could not be substantially evidenced, however, key informants indicated that feelings around inequality could arise from the kelp rights allocation process and the management of this resource. A few Recreational Users and/or Coastal Community Members also indicated that kelp’s odour and unsightly looks when washed up on the beach were a minor source of frustration.

# CHAPTER FIVE

## 5.0 DISCUSSION AND REFLECTIONS

While perception studies about the marine environment have been conducted in various capacities (e.g., Tonin and Lucaroni, 2017; Gkargkavouzi, Halkos and Matsiori, 2019), the perceived value around kelp has not featured prominently in literature. This study contributes to this gap by assessing how actors in South Africa perceive kelp. This chapter discusses and reflects upon the results of the study. First, value confluences—agreements in terms of how actors assign value to kelp—are identified by drawing upon the results and relevant literature. Instances of value dissonances—differences in how value is assigned—and their possible causes are also explored. Second, key issues around institutional processes and their role in influencing perceptions beyond the usual foci of value is discussed. Third, a case for value pluralism in kelp management is made, given the key issues previously discussed. Reflecting upon the results of the study, this chapter ends by critiquing the utility of IPBES' conceptual framework as a mode of assessment for valuation, highlighting gaps in the framework as seen through its application in this study.

### 5.1 VALUES TOWARDS KELP: IDENTIFYING CONFLUENCES AND UNPACKING DISSONANCES

The study reveals that, in general, individuals perceived kelp to have high instrumental value particularly due to its regulating contributions, such as maintaining a healthy marine and coastal environment. These regulating contributions of kelp were the only instrumental contributions of kelp that were equally and strongly recognized by actors across all the groups surveyed. Most respondents across all actor groups exhibited relational values towards kelp, alongside recognizing its intrinsic and bequest value (Table 6) thereby exhibiting another area of value confluence. Other studies exploring the conservation and sustainable use of marine biodiversity in South Africa have also highlighted the overlapping prevalence of perceived instrumental, intrinsic, and relational values of aspects of nature. For instance, a study attempting to investigate perceptions regarding marine biodiversity conservation in the Kogelberg Biosphere Reserve showed that two main themes emerged, a ‘scientific management-based ecological approach,’ and a ‘livelihoods discourse’, illustrating the impact of variation in how values were assigned to biodiversity in the reserve (Hagan and Williams, 2016). In a similar vein, literature shows that people across the globe tend to value nature for both its material (e.g., food, energy supply) and non-material (e.g., aesthetic value, cultural value) contributions (van Riper et al., 2017). In particular, and much like in this study, individuals who reside in coastal areas were seen to be both dependent on and appreciative of the marine environment, thereby valuing its economic, cultural, and ecological contributions (Abecasis et al., 2013; Hynes et al., 2014; Tonin and Lucaroni, 2017).

This research indicates that most interviewed actors overwhelmingly held appreciative attitudes towards kelp, with 80% of all actors indicating that their seaside experience depended on the knowledge that kelp was flourishing. In various types of research within the marine and coastal sphere, individuals around the world seem to understand the importance of marine environments, resulting in a show of positive attitudes towards it (Hynes et al., 2014; Pearson et al., 2014; Hawkins et al., 2016; Suziana, 2017; Tonin and Lucaroni, 2017). In South Africa, a study that aimed at assessing recreational divers’ interest in kelp monitoring showed that all participants believed that

kelp deserved to be protected as a species (Lucrezi, 2021). While the study only considered a sample population of recreational kelp divers, its findings were echoed by the present study that showed that most actors favoured the protection of biodiversity. However, the meaning different actors ascribed to kelp's utilization and protection was relational and was often informed by deep-seated histories or lived experiences with kelp. In this way, while all the actors in this study exhibited protection-positive attitudes towards kelp, it is unlikely that the different groups of actors would agree upon the mode, measures, and purpose of 'protection.' For instance, where Recreational Actors might favour protection through the institution of Marine Protected Areas, Kelp and/or Abalone Industry Actors may equate "protection" with more equitable right allocation processes to commercially exploit kelp as a resource, thereby protecting their own livelihoods.

In turn, this brings to light the importance of understanding sources of value dissonance across actor groups, characterized by cases where contributions from kelp are valued at significantly different degrees by the various actor groups. Through the critical consideration of mediating factors, held values and the influence of sociodemographic characteristics in the assignment of value towards a particular contribution from kelp, the possible reasons for certain value dissonances amongst actor groups as seen through the findings of the study are discussed below.

One of the most evident sources of value dissonance, i.e., the differences in how kelp was valued by separate actor groups, was with regards to kelp's ability to increase their safety from extreme natural events. While 75% of actors from the Environmental Managers and Conservationists group valued kelp's ability to increase their safety from extreme natural events, only scant proportion to Kelp and/or Abalone Industry Actors (17%) were seen to value this contribution (Table 4). One explanation for this difference in perception could be attributed to the varying levels of education, and thus factual knowledge with regards to kelp, between the two sets of actors. As seen in Table 3, 60% of Environmental Managers and Conservationists had bachelor's degrees or higher, while 73% Kelp and/or Abalone Industry Actors were seen to have less than a Grade 12 education. As a result, it can be assumed that Kelp and/or Abalone Industry Actors knowledge of kelp comes primarily from experience and interactions with it, rather than through formal scientific education around kelp's various contributions. In this way, it is likely that Kelp and/or Abalone Industry Actors have not directly experienced kelp's ability to increase their safety from extreme natural events, and therefore do not consider this contribution to be of much value. On the other hand, while Environmental Managers and Conservationists may also have not directly experienced kelp's ability to increase their safety from extreme natural events, their scientific knowledge of kelp because of their education levels means that they are able to value this particular contribution of kelp, as they *know* it theoretically exists. This is just one of the ways the differing sociodemographic characteristics of these two sets of actors in terms of education levels is seen to affect how each group assigns value to kelp.

Another source of value dissonance between Recreational Users and/or Coastal Community Members and Kelp and/or Abalone Industry Actors was evident through differing responses kelp's importance as a source of food and feed for domestic animals. While 63% of Kelp and/or Abalone Industry Actors valued kelp for this particular contribution, only 8% of Recreational Users and/or Coastal Community Members valued kelp as a source of food and feed for domestic animals (Table 4). The knowledge to use kelp as a source of feed for domestic animals could be attributed to the Kelp and/or Abalone Industry Actors' main source of awareness of kelp, i.e., through their work (Figure 11). It is likely that their work as kelp harvesters or employees for commercial kelp entities

has exposed them to the many ways kelp can be utilized—including as feed for domestic animals amongst other things. On the other hand, Recreational Users and/or Coastal Community Members main sources of kelp awareness comprised of growing up by the sea, and/or through recreational activities. Thus, kelp's use as an alternative way of feeding domestic animals would probably not have featured in their experiences with kelp. As a result, the mode of awareness of kelp serves as a mediator in how instrumental value is assigned by actor group.

Finally, an interesting variation in perceived importance was seen with regards to kelp's provision for opportunities for recreation that lead to physical/psychological satisfaction. 60% of Recreational Users and/or Coastal Community Members were seen to value this particular contribution of kelp, while less than half of the respondents in both other actor groups valued kelp's provision for opportunities for recreation that give physical/psychological satisfaction (Environmental Managers and Conservationists: 37%, Kelp and/or Abalone Industry Actors: 42%) (Table 4). This could be attributed to these actors' inherent held values of respect for the marine ecosystems, as a result of their immersive recreational experiences within marine environments. Not surprisingly then, the highest proportion of respondents in agreement with the statement "My seaside experience depends on the knowledge that kelp is flourishing" (75%) came from Recreational Users and/or Coastal Community Members (Table 6). Alongside some of the qualitative responses by Recreational Users and/or Coastal Community Members as detailed in Section 4.4., it can be assumed that many of these actors have a strong sense of connectedness to kelp forests, highlighting the presence of abstract held values that then mediate how value is assigned to kelp's contributions. While actors from the Environmental Managers and Conservationists may also possess similar held values, with 70% of these actors stating that their seaside experience depended on the knowledge that kelp is flourishing, it must be noted that 90% of Environmental Managers and Conservationists valued kelp because of its importance to future generations. This could be a result of this group's stronger penchant for the held belief that protection of a natural resource is important and desirable behaviour. After all, held values represent ideals of what is desirable and how one should interact with the world (Murray et al., 2016).

Thus, it is important to thoroughly consider mediating factors and situational contexts when assessing the assignment of values, especially in terms of value dissonance to the actor groups in this study. In this way, this study contributes to the limited research worldwide and in South Africa on the importance of assessing and integrating values into improving kelp management. Knowing how actors perceive and relate to a resource and/or ecosystem has already been proven to be of use through various case studies. For instance, Gkargkavouzi et al., investigated citizens' assigned values for ecosystem services, perceived threats, and attitudes toward marine biodiversity in Thessaloniki, a Greek coastal port city in order to incorporate these findings into policy implementations (2019). Similarly, a study by Roberts et al. explores public perceptions of the deep-sea environment among the Scottish and Norwegian public, showing that the public recognize the value of ecosystem services, the current ecological crisis and the need for sustainable management (2020). Insights like these are useful to inform consequent conservation and resource management strategies so much so that there have been increasing calls for perceptions to be a cornerstone of natural resource management strategies (Beyerl et al., 2016).

## 5.2 BEYOND FOCI OF VALUE: KEY ISSUES AROUND INSTITUTIONAL PROCESSES

This study showed that the second-largest contributors to people's frustrations around kelp were issues of power and inequality in the kelp sector — clearly, this is not one of kelp's contributions, nor is it a product of kelp as a focus of value in itself, but rather concerns key issues around the institutional processes of managing kelp as a resource in South Africa. Specifically, frustrations were noticed around the kelp rights allocation process that occurs at the national level of government without adequate consultation of both provincial and local spheres of government, as well as the lack of inclusion of small-scale fishers in the permit allocation process. As the system currently stands, even if small-scale fishers were able to obtain kelp concession permits, a systemic failure has occurred in that these fishers would not have the capacity or means to harvest kelp and compete with larger commercial entities. As a result, these fishers are dependent on employment by larger commercial entities that can retain permits to harvest kelp — as commercial entities have access to infrastructure that enables large-scale harvesting — whereas small-scale fishers simply do not due to their positional disadvantages. These facets were seen to reduce the value of kelp and influence perceptions towards it. These insights show that it is not enough to simply assess values on human-nature relationships; rather, recognising and addressing the historically disadvantaged and disempowered positions of the small-scale fishers is essential in the development of transformative and integrated resource management practices aimed at sustainable and just futures (Pascual et al., 2017). This argument is not new—political ecologists have long claimed that environmental change is not merely technical or scientific, but fundamentally social (Kull, Arnauld de Sartre and Castro-Larrañaga, 2015). To quote Forsyth (2005:165) who uses political ecology to investigate the 'ecosystem approach' idea, political ecology "does not suggest that environmental problems do not exist, or that ecological science cannot help, but acknowledges the greater political controversies about the nature of ecological risk, and the influence of different political actors upon what is seen to be authoritative knowledge".

In this study, the role of institutions with regards to kelp management is highlighted through the responses of discontent detailed in Section 4.5, mainly in terms of negative perceptions of institutional and decision-making structures (with 17% and 27% of Kelp and/or Abalone Industry Actors indicating issues around rules of access and issues around power and inequality respectively). Reports at the provincial and local level corroborate these findings, stating that:

*"It is evident that the planning around the advertisement and allocation of the fishing rights and concessions, does not take the full life cycle of this activity into account or the cumulative impact of harvesting activity on the environment. There are numerous examples, reports and complaints from several sources, government departments, Municipal departments and members of the public to support this view." (Green and de Villiers, 2018).*

As a result, there is constant friction between the actors involved with kelp. This friction could be attributed to the top-down manner in which kelp concession permits are assigned, without using best practice guidelines or consulting stakeholders (Green and de Villiers, 2018). While previous seaweed rights allocation processes included an opportunity for the public to comment on the provisional list of the outcomes of the rights allocation process, this is no longer the case. Additionally, the long tenure of validity of each permit (15 years) with little monitoring and follow-

up is incongruous with the changing presence of kelp in South Africa due to climate change. When participation is implemented through a top-down approach, it can exacerbate already existing power imbalances. Additionally, power inequities can be propagated when decision-makers fail to make an effort to fully understand the social-ecological systems they are working within (Brown, 2002). All of these factors contribute to the continued ‘friction’ amongst actor groups, as described by Green and De Villiers (2018).

Governance failures to adequately bring all actors together for an inclusive solution, combined with a lack of empowerment of historically disadvantaged actors, and negative perceptions surrounding the current management of kelp, could lead to a reduction in relational value towards it, and consequently, cascade into a widespread ambivalence towards the sustainable use of and management of kelp (IPBES, 2016). In this regard, the nuanced dynamics — ranging from the lack of competitive capacity, harvest rights allocation processes, disempowered small-scale fishers, and a lack of cooperation and communication within decision-making bodies — not only amongst different actors but also within each group must be addressed if improved management of kelp is to occur as it increases in abundance. While this study only scratches the surface in terms of management and governance issues around kelp, initial insights make a strong case for the potential of future research to further unpack the power dynamics and governance of kelp in South Africa.

### 5.3 THE CASE FOR VALUE PLURALISM IN KELP MANAGEMENT

The results of this study bring attention to dynamics around kelp in South Africa that may have never surfaced without the incorporation of holistic and inclusive approaches in understanding nature. If anything, the complexities around values and kelp management in South Africa serve as proof that ecological and sociological systems are not separate entities, but rather, are innately entwined (Sanborn and Jung, 2021). Recognizing the deep embeddedness and interconnection of social and ecological systems has thus altered what a ‘successful’ natural resource management strategy looks like, with increased recognition of the need to include social justice, equity, and alternative sources of knowledge of biodiversity conservation and sustainable use (Berkes, 2004; Kareiva and Marvier, 2012; Chan et al., 2016; Bennett, 2018).

In this way, assessing the diversity and complexity of values ascribed to nature is needed to design and implement management interventions that are consistent with actor values, in order to avoid undermining the very functions those interventions seek to accomplish. Further, inclusive marine resource and ecosystem management that incorporates value pluralism has the potential to avoid undesirable outcomes, and promote sustainable, just and transformative futures. This is especially important given the diverse set of actors from different backgrounds, knowledge systems and social-cultural systems in South Africa, to prevent the management and governance of changing kelp forests from taking the form of ‘ocean-grabbing’ (Bennett and Roth, 2019). Today, many marine resource management strategies still separate scientific decisions from those that are social in nature. For instance, total allowable catch limits are often based on species biology and stock assessments, with little consideration of the socio-political elements of allocation (Loring, 2017). While there is no doubt that ecological assessments are necessary in informing total allowable catch limits in order to prevent the over-exploitation of natural resources, the consequent permit allocation process must be socially inclusive in order to ensure the fair and equitable use of these resources. In the absence of explicitly including plural values into policy-design, resultant outcomes

can be undesirable, and even hostile. This is seen in South Africa, where a lack of genuine consultation during policy implementation—specifically, amendments to the MLRA to enable a new small-scale fisheries sector policy—has meant that local values, principles and practices have not been systematically integrated into planning and decision-making (Sowman and Sunde, 2021).

As a result, implementation of policy provisions has not been suited to local socio-ecological contexts. Rather, a ‘one size fits all’ approach has been adopted. One example of this is seen in the lack of uptake of kelp harvesting rights by small-scale fishers, despite the fact that allocations have been made to favour this set of actors in terms of permits (Rothman et al., 2020; Sowman and Sunde, 2021). Inappropriate legal mechanisms to operationalize small-scale fishing policy paired with the lack of consideration for the inability of small-scale fishers to compete with larger entities has resulted in policy implementations that are not suited to the unique small-scale fisher context (Sowman and Sunde, 2021). As a result, these fishers often remain excluded from the kelp collection rights allocation process, further evidenced by the 17% of Kelp and/or Abalone Industry Actors who expressed discontent around the mechanisms of control and access rights in terms of kelp.

Another example of this blanket approach towards kelp management, is seen in the way this resource is recreationally governed under the category of “Molluscs: which excludes abalone, but includes Octopus and Squid; worms and other invertebrates, and Aquatic Plants” (DAFF, 2013:6). Strangely, the same permits issued for the recreational fishery of octopus and squid are applicable to kelp, even though kelp is in no way a ‘mollusc’. This just goes to show that there is a lack of tailoring of policy provisions with regards to contextually relevant knowledge of kelp. Furthermore, the lack of inclusivity and participation as a result of weak governance have hindered the implementation of intended transformative policies highlighting major mismatches between the original principles underlying the policy and the actions of management entities (Sowman and Sunde, 2021).

Outcomes such as these can be avoided through the recognition of complex values towards nature as uncovered from this study. The current management regime around kelp does not take into account the diversity of values and diverse interests around kelp as uncovered from this study. For instance, the commercial rights allocation process does not consider relational, intrinsic and bequest values towards kelp, which 80-89% of all actors considered important (Table 6). In this way, recognizing the diversity of values towards kelp is necessary to permit the “recognition of, and respect for, the values of all individuals, communities and social entities, including those who are at risk of being disenfranchised by the outcomes of decision making” (IPBES, 2016).

Second, the integration of value pluralism in marine resource management can unearth seemingly lost forms of knowledge as well as alternative opportunities from nature. With regards to kelp, this study has shown that these opportunities could take the form of kelp’s use in the bio-economy as bioenergy, cooking and for new foods, its use in livestock feed, and even personal everyday use of washed-up kelp for fertilizer, energy, or food, prior to it being removed and dumped into landfills.

Crucially, integrating social and cultural dimensions around kelp could bring into focus some of the lost historical knowledge about kelp and its opportunities. History suggests that although *Homo sapiens* has exploited the resources from kelp forests for at least 10,000–70,000 years, the intimate connection humans have with kelp forests could be as old as humankind itself (Filbee-Dexter and

Wernberg, 2018). Yet, today, the historical, traditional, and indigenous knowledge surrounding kelp seems to have been lost. In fact, as seen through this study, only a handful of responses indicated the knowledge of traditional uses of kelp. Although most responses indicated awareness that this historical and indigenous knowledge exists, most respondents were not privy to it and were unable to articulate the knowledge itself. A few respondents talked about kelp's use in 'potjies' (a South African stew slow-cooked over an open flame in a cast iron three-legged pot), as a direct and natural fertilizer for marijuana and other indigenous plants, and its medicinal properties of high iodine levels, that were harnessed through salves and creams. A couple of respondents also pointed out stories of their use of kelp in the ocean itself, as an anchor to hold on to during strong currents, and as an oasis from predatory sharks to hide within while diving for fish. However, all of these are seemingly modern applications of kelp by communities that derive livelihoods from marine environments. While these applications of kelp do not necessarily ascertain knowledge around the traditional uses of kelp, they do illustrate coastal communities' livelihood dependendance on marine environments and their ability to adapt and rely on marine resources like kelp. This is undoubetdly a "historical" skill, and on further probing, it was found that this knowledge, of how to effectively and sustainably use kelp, was passed down to them from their forefathers who also lived by the coast.

These insights make the case for paying particular attention to opportunities offered by kelp to maintain customary coastal livelihoods—whether historical, modern, or a combination of the two—in turn, making visible the wide spectrum of values that can be ascribed to kelp and its contributions.

#### 5.4 REFLECTIONS ON IPBES' NCP: NOTEWORTHY OR NOT WORTHY?

While there is undoubtedly importance in considering the perceived value of kelp in terms of management and decision-making around the resource, this study prompted reflections around the utility of the IPBES' NCP framework in meaningfully assessing those values. Consider Figure 17 below, which attempts to place certain findings from this study based on IPBES' reporting categories into the conceptual framework of the IPBES. The figure shows the two most popular sources of value across all actor groups within their respective foci of value.

At first glance, Figure 17 does not highlight the uniqueness of the IPBES' conceptual framework in eliciting perceptions of kelp's value. Indeed, after reflecting on the findings of the study, it can be plausibly argued that many of kelp's contributions to people could easily have been assessed through the ecosystem systems approach itself. For example, this study showed that many of kelp's contributions to people within these reporting categories could neatly fall into the ecosystem services categories of supporting, regulating, provisioning and cultural services. From Figure 17 we see that the material contributions of kelp as both an alternative source of food and contributor to livelihoods could easily be classified as provisioning services under the ES approach. Similarly, the non-material contributions of kelp in its ability to increase one's enjoyment of the sea and/or coast and its provision of recreational opportunities could be classified as cultural ecosystem services. This warrants the examination of whether the reporting categories of NCP are in fact novel and different from those of the previous ecosystem services in aspects other than the revised use of language.

A critique by Maier and Feest (Maier and Feest, 2016) further exacerbates this concern, claiming that the “novelty of the IPBES valuation approach is not necessarily all that novel, but a mere revision of the Millennium Assessment’s ‘ecosystem service’ approach and its many iterations. While possibly disappointing, this critique cannot be labelled as surprising given that IPBES does state that their conceptual framework aims to build on and improve the ecosystem services concept (Díaz et al., 2018). Furthermore, it must be noted that IPBES itself includes the usage of ‘ecosystem services’ in its titular name (Intergovernmental Science-Policy Platform on Biodiversity and **Ecosystem Services**), which seems contradictory to its subsequent promotion of nature as providing contributions as opposed to services. This can be confusing when trying to disentangle the utility and novelty of IPBES from the MA’s ecosystem services approach.

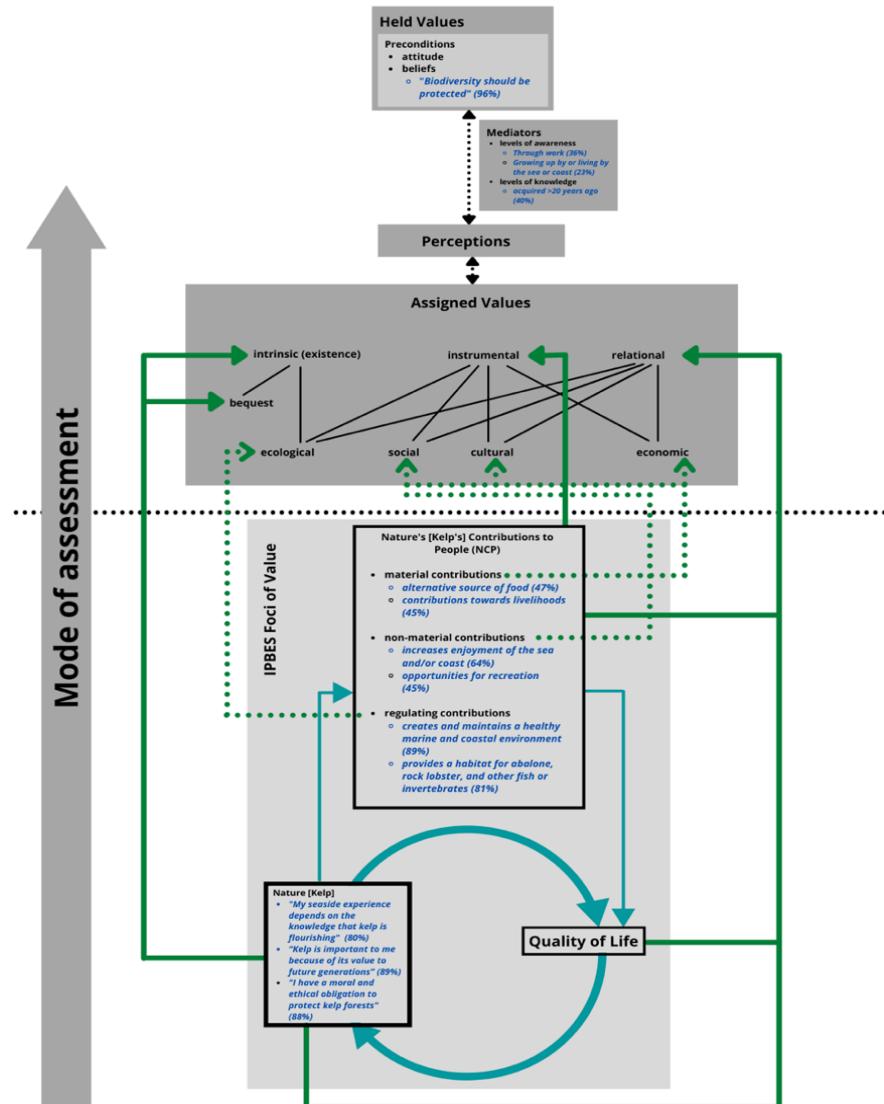


Figure 18: Certain findings from the study (dark blue) within the assessment framework to elicit the perceived value of kelp utilizing IPBES' foci of value for human-nature relationships and interactions. In terms of NCP, the two most popular contributions towards the value of kelp in each category (material contributions non-material contributions, regulating contributions) are displayed.

Having said this, it is my opinion that the intentional language and fluid boundaries across nature's contributions used by IPBES does in fact matter and influence valuation outcomes. For one, the language and framing of NCP, in that nature provides 'contributions' rather than 'services' is shown to be inclusive and assists in novel visualizations between people and nature. This was seen through the findings of this study in various ways—for instance, probing kelp's non-material contributions to people yielded insights on unique ways actors across groups perceived kelp, shown through statements such as "*the joy it brings floating through a golden forest*" and "*its skin leaf is beautiful*" (Recreational User and/or Coastal Community Members, May 2021; Kelp and/or Abalone Industry Actor, April 2021). Looking at Figure 18, while kelp's contribution to livelihoods could easily be classified as provisioning services under the ES approach; the ES approach does not consider the more nuanced social and cultural value that stems from kelp's provisioning of livelihoods. This could take the form of job satisfaction, happiness and contentment in one's home, and even opportunities for forming friendships with other co-workers. Alongside its intentional use of language around 'nature's contributions' as opposed to 'provisioning services,' IPBES' NCP is also nested within the social and cultural context, and this allows for these layered value dimensions with regards to kelp to come to the surface. To echo sentiments by Kadykalo et al., these new conceptualizations may be well-suited to understand varied knowledge systems while embracing the plural dimensions of human relationships with nature and appealing to diverse stakeholders (2019).

Furthermore, given that IPBES' foci of value span across various overlapping value dimensions, quantifying a particular value dimension is virtually impossible. In this way, while some may critique the IPBES conceptual framework for its inability to concretely quantify a particular value dimension with regards to nature, it is my opinion that this discrete quantification is not only unnecessary but can be inaccurate and misleading. Rather the inability of NCP to discretely value kelp could be advantageous, in that the intentionally overlapping groups of NCP manage to embrace the plurality of value dimensions of nature (Kadykalo et al., 2019). Due to this acknowledgement and integration of plurality in values, IPBES' NCP is more likely to reflect the lived experiences and realities of the actors involved. Viewing the fluidity of NCP in this manner could indicate that NCP has the potential to be a powerful mode of communication to facilitate understanding amongst a broad range of actors and inclusively co-produce knowledge. For this study, in particular, the IPBES' NCP framing proved useful to fulfil Objective (iii) in determining areas of value confluence and dissonance amongst and between actor groups.

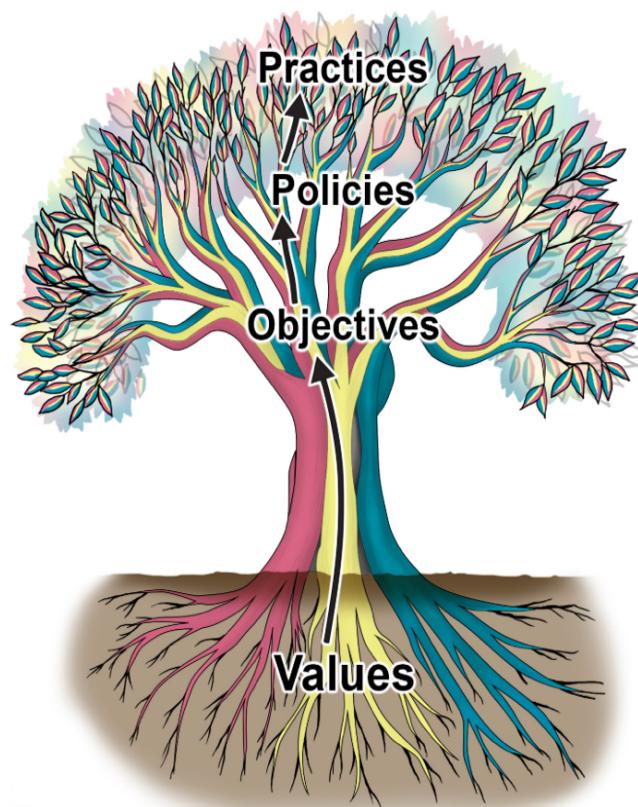
On a deeper level, this reflection encourages further thinking about whether it is even necessary to delineate value dimensions with regards to nature into sub-categories such as the economic, social, cultural, and ecological value as categorized by de Groot, Wilson, and Boumans (2002), especially since the lived experiences of actors rarely fit neatly into these boxes. Rather, a more fluid approach that embraces the relationality and connectedness of humans and nature would better assist in establishing a values-led management system.

According to Artelle et al., a values-led management system is built on a foundation of values concerning the relationship between a given community and nature (2018). These values, then, guide the ways of conduct with nature, with place, and even with other individuals. In this way, values inform the management approach, and support objectives, which in turn translate into specific policies and finally implemented practices. This management approach is conceptualized through a tree, as seen in Figure 19 (Artelle et al., 2018). In this regard, the fluid nature of the IPBES' NCP can assist in unearthing the prevalence of these foundational values amongst relevant actors, as well as place already known values within an existing management system to better understand and improve it.

For instance, through utilizing the IPBES' framework in this study, foundational values of relationality and reciprocity—or the right to use kelp as a resource existing along with the responsibility to maintain and protect it—were seen to exist across actor groups, as detailed in Section 4.4. This sense of stewardship for kelp was especially pronounced amongst actors in the Kelp and/or Abalone Industry group, 70% of whom agreed that they had a moral and ethical obligation to protect kelp forests, and 80% of whom simultaneously valued kelp for its contributions to their livelihoods (Table 4). In turn, through the implementation of a values-led management approach, these unearthed held values of respect towards marine spaces, and a sense of stewardship towards marine resources can translate into actionable objectives, and further, policies, that uphold the aforementioned values.

In this way, unlike the rigid categories of the four ‘ecosystem services,’ the fluid boundaries within the IPBES conceptual framework are able to elicit more nuanced dimensions of value that could assist in more holistic management approaches. However, for research that requires the discrete quantification of values, this framework might not have been the ideal choice. In other words, the utility of the IPBES' NCP as a focus of value is dependent on the objectives of its application.

Finally, while the utility of the IPBES' NCP in meeting specific objectives of this study is recognized, there is one glaring gap in its effective application—it does not consider the political dimensions of governance and access to the resource. Integrating cultural and social relationships



*Figure 19: Representation of a values-led management approach, with each aspect building from those below. In this sort of approach, the values (roots of the tree) that connect people to place at a given scale form the foundation of the approach as well as inform the rest of the approach, supporting environmental objectives, which in turn support specific policies, which in turn guide individual practices (Artelle et al., 2018).*

with ecosystems that specifically target dimensions of governance and access is essential for many reasons. For one, these highlight the need to acknowledge the role of institutions and power, including social and cultural norms that underpin human-nature relations (Pascual et al., 2017). As seen through the findings of this study, the role of institutions and resultant resource management issues strongly influences actors' perceptions around kelp, resulting in real and experienced frustrations.

As expounded in Section 5.3, one of the largest contributors (27%) to Kelp and/or Abalone Industry Actors reduced appreciation of kelp were the issues of power and inequality in the kelp sector. However, management and political issues such as these do not fit well within the confines of the NCP reporting categories. The integration of such questions in Figure 18, for example, is challenging and it is not clear if and where key issues around kelp that lead to the reduction in its perceived value could fit within the assessment framework. In turn, this shows that the framework is not able to fully integrate perceptions around institutional processes and natural resource management. The real-life repercussions of these processes of management are important in how value is perceived as they affect many actors' everyday lives with 80% of Kelp and/or Abalone Industry Actors stating that kelp contributes to their livelihood (Table 4).

Neglecting dimensions of governance and access can result in an incomplete understanding of actors' perceptions towards the value of kelp, and at a broader level, any natural resource or ecosystem. After all, governance and access are key dimensions in understanding social-ecological systems (Poe, Norman and Levin, 2014). Ultimately, perceptions of governance and the value of institutions and processes may also affect the perceived cultural and social values of the marine resource/ecosystem itself. More importantly, perceptions of governance of a natural resource affect behaviour towards that resource and, ultimately, its sustainable use (Song, Chuenpagdee and Jentoft, 2013; Sanborn and Jung, 2021).

Based on this argument, and in order to improve the utility of the NCP, consideration should be given to viewing the original 18 NCP reporting categories (Figure 7) within the context of an additional dimension of 'governance and access' around the resource in question (in this case, kelp). This dimension of 'governance and access' could include mechanisms of control, rules of access, decision-making processes with regards to the resource/ecosystem (e.g., harvest control, catch allocations), political issues of power and inequality that arise from relationships with nature, and varied dynamics across spatial and organizational scales of social-ecological systems. The facets of this dimension are adapted from a review by Poe et al. that considers key cultural, social, and political dimensions to formulate guiding principles for conservation in coastal environments (2014). As seen through the results of this study and analysed in Section 5.3, management and governance aspects as well as issues around access rights are present in the discourse around kelp in South Africa and can contribute to a change in perceptions around the resource (Table 7). In turn, these should be considered in future management and decision-making processes. Finally, while viewing NCP within the context of governance and access may not affect the (lack of) quantification of value dimensions, doing so can clearly give a more holistic and realistic overview of perceptions around all aspects of kelp.

# CHAPTER SIX

## 6.0 CONCLUSION

In conclusion, this chapter summarizes the findings of this study through the discussion of the study's initial objectives. Then suggestions for how to replicate this study elsewhere are provided. The intended next steps after the finalization of this dissertation are then detailed.

### 6.1 ASSESSING VALUES AND PERCEPTIONS OF KELP IN THE WESTERN CAPE: A SUMMARY

This study investigated the perceived value of kelp as a resource and ecosystem, through the consideration of actors organized around kelp in the Western Cape region of South Africa. In this regard, this study intended to:

- i. Identify the diverse sets of actors who directly and/or indirectly depend on kelp in South Africa,
- ii. Construct a typology of values with regards to kelp in South Africa,
- iii. Explore sources of value dissonance and/or confluence among different sets of actors, and
- iv. Identify key issues around kelp utility and management in the Western Cape.

Fulfilling Objective (i), actors who depended on kelp were identified through literature reviews and word of mouth, and consequently groups into three broad groups: Recreational Users and/or Coastal Community Members, Environmental Managers and Conservationists and Kelp and/or Abalone Industry Actors. Consequently, The IPBES conceptual framework with three foci of value (Nature, Nature's Contributions to People, and Quality of Life) was used to frame human-kelp relationships to meet the Objectives (ii) and (iii).

In this way, the significance of kelp—whether in terms of its intrinsic value, instrumental value or relational value—is evident through the findings of this study. Individuals were seen to have high levels of knowledge and awareness of kelp, mostly as a result of their work with kelp and/or by living by the sea or coast. For most actors, knowledge around kelp was acquired over 11 years ago, and overwhelmingly through personal interaction with kelp. Consequently, kelp was valued for its:

- regulating contributions; namely for creating and maintaining a healthy coastal environment and providing a habitat for forms of marine life,
- material contributions; namely for its contributing to livelihoods and its provision of important medicinal and/or genetic resources,
- and non-material contributions; namely for its ability to increase one's enjoyment of the sea and/or coast, and its provision of opportunities for recreation that allow for physical/psychological satisfaction.

Actors were also seen to assign importance to the intrinsic and bequest value of kelp. Finally, the insights from the study showed that there was a strong presence of relational values towards kelp, with many actors exhibiting a sense of stewardship and intense connectedness towards kelp. In this

way, confluences of value amongst actor groups were seen strongly in terms of relational values. Areas of dissonances in the assignment of value to kelp's contributions were also noted and discussed. Results showed that particular contributions of kelp were assigned varying degrees of importance by different groups of actors. For instance, kelp's provision of livelihoods and/or job satisfaction was considered extremely valuable by Kelp and/or Abalone Industry Actors, but the same sentiments were not echoed by Recreational Users and/or Coastal Community Members. Sources of value dissonance across actor groups can be attributed to individual's held values of what desirable behaviour consists of, as well as their socio-demographic characteristics and situational context, as seen through this study. In this way, recognizing the plurality of complexity of values of and towards nature is necessary in order to design management and policy interventions that take into account different worldviews and knowledges.

Finally, Objective (iv) was met by identifying and probing key issues around the utility and management of kelp. While considering all actors as an aggregate did not indicate a significant presence of issues and frustrations around kelp management, delineating results by actor group revealed that 27% of Kelp and/or Abalone Industry Actors; had concerns about issues of power and inequality in the kelp sector. Crucially, these frustrations around the governance and management of kelp were mostly signified the group that is arguably most closely involved with kelp—Kelp and/or Abalone Industry Actors.

The frustrations around the kelp concession permit allocation processes key issue was further discussed and potentially attributed to governance failures. Particularly, the lack of inclusive participatory processes in decision-making, has meant that local values have not been holistically integrated into planning. In this way, a systematic integration of local values, principles and practices into policy interventions is necessary to equitably manage kelp and serves as a useful starting point to resolve certain frustrations around kelp as indicated by some of the actors in the kelp industry.

With this in mind, I recommend that further investigations should be undertaken to determine and resolve the underlying issues experienced by actors in the Kelp and/or Abalone Industry. Secondly, based on the insights obtained about kelp management and processes, I suggest that efforts towards improved cooperation and increased transparency between different spheres of government be undertaken. Using participatory approaches that take the interests of all stakeholders into account is one way of promoting inclusivity bringing together actors from varied backgrounds and with different perspectives. Finally, further research at the local level is required to discover missed opportunities from kelp, some of which were only tangentially unpacked through this study. As a resource, kelp has enormous potential within the bio-economy. In different parts of the world, kelp has been used as a source of biofuel (Shapiro and Evstatieva, 2017), a superfood (Millin, 2019), a biodegradable replacement for single-use plastics (Price, 2020), livestock feed that reduces methane emissions (Roque et al., 2021), and more. These uses have not yet been mainstreamed in South Africa. As kelp continues to increase in abundance across the coastline of South Africa, it is worth looking into these opportunities and considering how they can be leveraged sustainably and equitably, to improve the livelihoods of small-scale fishers without exploiting the resource.

## 6.2 SUGGESTIONS FOR THE FUTURE REPLICATION OF THIS STUDY

This study was tailored to suit the kelp in the Western Cape region of South Africa. While every socio-ecological system and environment has unique characteristics, here are some general suggestions for the effective design should a similar study to assess the perceived value of a marine resource or environment be rolled out in other regions or countries.

For one, it is crucial to identify actors around the marine resource or environment being that is being assessed. This step is heavily dependent on the marine resource being assessed as well as the area of study—for instance, my research considered actors who depended on kelp, within the geographical boundaries of the Western Cape. To start thinking about actors organized around a particular marine resource or environment, it is useful to ask questions like: *How is this resource/ecosystem used? Who uses this resource/ecosystem? What is the current opinion around this resource/ecosystem in the designated study area, and whose opinion is it? Who might be indirectly affected by this resource/ecosystem simply due to its existence?*

Secondly, I suggest choosing a conceptual framework that suits the objectives of the study. This study was biased towards the IPBES' conceptual framework to frame human-nature relationships, with the intent of understanding the plurality and complexity of values associated with kelp. However, depending on a study's objectives, other framings of human-nature relationships might be more appropriate. No matter the conceptual framework, key issues around governance, access and institutional processes should be probed, to make a stronger case for the potential restructuring of policy around the management of marine resources. Appendix 2 details the questionnaire used in this study, which could act as a guide for context-specific research elsewhere.

Third, a hybrid methods approach that includes both quantitative and qualitative components is suggested no matter the conceptual framework chosen. It is my opinion that qualitative insights are necessary to contextualize quantitative information, especially in research that intends to assess the many diverse dimensions of values towards nature. Thus, in addition to questionnaires and surveys; semi-structured interviews, storytelling and narrative approaches, participant observation, transect walks and more with the identified sample population should all be considered as methods to gain a full understanding of values towards nature. This study was limited in its use of in-person qualitative methods due to the COVID-19 pandemic. However, these methods are highly recommended for consideration in the replication of this study elsewhere, if the contemporary social climate allows for them.

## 6.3 MOVING FORWARD: NEXT STEPS

Any research with a strong human dimension prompts the question, “who will benefit from this research?” Findings from this research will be presented to all actors that participated in the study, as well as those that could not participate but which fall within the kelp industry in South Africa. I hope that this study will contribute to furthering the ‘people and nature’ approach towards the environment in South Africa (Sanborn and Jung, 2021). A research infographic, using the results of this research, is planned for the communication of results in an accessible manner. Additionally, I will have this research published in a journal.

Finally, this research will contribute to the BlueConnect project titled ***Blue Growth Opportunities in Changing Kelp Forests*** (Project Number: 287191). The overarching purpose of the BlueConnect project is to establish a collaborative knowledge platform and build research capacity for knowledge-based management of kelp forest resources under changing ocean conditions (BlueConnect, 2019).

Since there are only a few studies in South Africa that assess attitudes, perceptions and values towards kelp, further research is necessary to collect information on the South African public's perceptions of kelp so that this knowledge can be incorporated into kelp governance and management strategies. This is especially important given the increased abundance of kelp across the South African coastline as the climate changes. As previously noted, a unique consequence of climate change for South Africa is that kelp forests in this region are increasing in abundance, possibly due to the increased intensity and duration of the south-easterly wind, which causes the upwelling of cool, nutrient-rich water (Bolton and Blamey, 2017). With these changes, the value of interdisciplinary and integrated resource management solutions is becoming increasingly apparent. Through consideration of diverse and plural perceptions towards and values of kelp, the research can be used in the future management and governance of kelp in order to promote equitable, sustainable, and inclusive marine resource management in South Africa.

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# APPENDICES

## APPENDIX 1: NCP REPORTING CATEGORIES

Details of the reporting categories of nature's contributions to people (NCP) from (Díaz et al., 2018). The grey categories were not considered for this study as they do not directly pertain to kelp's contributions.

	<b>Reporting categories of nature's contributions to people</b>	<b>Brief explanation and some examples</b>
1	Habitat creation and maintenance	The formation and continued production, by ecosystems or organisms within them, of ecological conditions necessary or favorable for living beings of direct or indirect importance to humans. E.g. growing sites for plants, nesting, feeding, and mating sites for animals, resting and overwintering areas for migratory mammals, birds and butterflies, roosting places for agricultural pests and disease vectors, nurseries for juvenile stages of fish habitat creation at different soil depths by invertebrates
2	Pollination and dispersal of seeds and other propagules	Facilitation by animals of movement of pollen among flowers, and dispersal of seeds, larvae or spores of organisms beneficial or harmful to humans
3	Regulation of air quality	Regulation (by impediment or facilitation) by ecosystems, of CO <sub>2</sub> /O <sub>2</sub> balance, O <sub>3</sub> , sulphur oxide, nitrogen oxides (NOx), volatile organic compounds particulates, aerosols, allergens Filtration, fixation, degradation or storage of pollutants that directly affect human health or infrastructure
4	Regulation of climate	Climate regulation by ecosystems (including regulation of global warming) through: <ul style="list-style-type: none"> <li>• Positive or negative effects on emissions of greenhouse gases (e.g. biological carbon storage and sequestration; methane emissions from wetlands)</li> <li>• Direct and indirect processes involving biogenic volatile organic compounds (BVOC), and regulation of aerosols and aerosol precursors by terrestrial plants and phytoplankton</li> </ul>
5	Regulation of ocean acidification	Regulation, by photosynthetic organisms (on land or in water), of atmospheric CO <sub>2</sub> concentrations and so seawater pH, which affects associated calcification processes by many marine organisms important to humans (such as corals)

		Regulation, by ecosystems, of the quantity, location and timing of the flow of surface and groundwater used for drinking, irrigation, transport, hydropower, and as the support of non-material contributions (NCP 15, 16, 17).
6	Regulation of freshwater quantity, location and timing	<p>Regulation of flow to water-dependent natural habitats that in turn positively or negatively affect people downstream, including via flooding (wetlands including ponds, rivers, lakes, swamps)</p> <p>Modification of groundwater levels, which can ameliorate dryland salinization in unirrigated landscapes</p>
7	Regulation of freshwater and coastal water quality	Regulation – through filtration of particles, pathogens, excess nutrients, and other chemicals – by ecosystems or particular organisms, of the quality of water used directly (e.g., drinking, swimming) or indirectly (e.g. aquatic foods, irrigated food and fiber crops, freshwater and coastal habitats of heritage value)
8	Formation, protection and decontamination of soils and sediments	Formation and long-term maintenance of soil structure and processes by plants and soil organisms. Includes: physical protection of soil and sediments from erosion, and supply of organic matter and nutrients by vegetation; processes that underlie the continued fertility of soils important to humans (e.g., decomposition and nutrient cycling); filtration, fixation, attenuation or storage of chemical and biological pollutants (pathogens, toxics, excess nutrients) in soils and sediments
9	Regulation of hazards and extreme events	<p>Amelioration, by ecosystems, of the impacts on humans or their infrastructure caused by e.g., floods, wind, storms, hurricanes, heat waves, tsunamis, high noise levels, fires, seawater intrusion, tidal waves</p> <p>Reduction or increase, by ecosystems or particular organisms, of hazards like landslides, avalanches</p>
10	Regulation of detrimental organisms and biological processes	<p>Regulation, by organisms, of pests, pathogens, predators, or competitors that affect humans (materially and nonmaterially), or plants or animals of importance for humans. Also, the direct detrimental effect of organisms on humans or their plants, animals, or infrastructure. These include e.g.:</p> <ul style="list-style-type: none"> <li>• Control by predators or parasites of the population size of animals important to humans, such as attacks by large carnivores, or infestation by liver fluke, on game or livestock)</li> <li>• Regulation (by impediment or facilitation) of the abundance or distribution of potentially harmful organisms (e.g. venomous, toxic, allergenic, predators, parasites, competitors, pathogens, agricultural weeds and pests, disease vectors and reservoirs) over the landscape or seascapes</li> </ul>

		<ul style="list-style-type: none"> <li>• Removal, by scavengers, of animal carcasses and human corpses (e.g. vultures in Zoroastrian and some Tibetan Buddhist traditions)</li> <li>• Biological impairment and degradation of infrastructure (e.g., damage by pigeons, bats, termites, strangling figs to buildings)</li> <li>• Direct physical damage to crops, forest plantations, livestock, poultry and fisheries by mammals, birds and reptiles</li> <li>• Damage caused by invertebrates as pests of agriculture, horticulture, forest, and stored products, and by affecting health of domestic animals</li> <li>• Direct damage caused by organisms to humans by e.g. frightening, hurting, killing, or transmitting diseases</li> <li>• Regulation of the human immune system by a diverse environmental microbiota</li> </ul>
11	Energy	Production of biomass-based fuels, such as biofuel crops, animal waste, fuelwood, agricultural residue pellets, peat
12	Food and feed	<p>Production of food from wild, managed, or domesticated organisms, such as fish, bushmeat and edible invertebrates, beef, poultry, game, dairy products, edible crops, wild plants, mushrooms, honey</p> <p>Production of feed (forage and fodder) for domesticated animals (e.g., livestock, work and support animals, pets) or for aquaculture, from the same sources</p>
13	Materials, companionship and labour	<p>Production of materials derived from organisms in cultivated or wild ecosystems, for construction, clothing, printing, ornamental purposes (e.g., wood, peat, fibers, waxes, paper, resins, dyes, pearls, shells, coral branches)</p> <p>Live organisms being directly used for decoration (i.e., ornamental plants, birds, fish in households and public spaces), company (e.g., pets), transport, and labour (including herding, searching, guidance, guarding)</p>
14	Medicinal, biochemical and genetic resources	Production of materials derived from organisms (plants, animals, fungi, microbes) used for medicinal, veterinary and pharmacological (e.g., poisonous, psychoactive) purposes. Production of genes and genetic information used for plant and animal breeding and biotechnology

15	Learning and inspiration	Provision, by landscapes, seascapes, habitats or organisms, of opportunities for the development of the capabilities that allow humans to prosper through education, acquisition of knowledge and development of skills for well-being, information, and inspiration for art and technological design (e.g. biomimicry)
16	Physical and psychological experiences	Provision, by landscapes, seascapes, habitats or organisms, of opportunities for physically and psychologically beneficial activities, healing, relaxation, recreation, leisure, tourism and aesthetic enjoyment based on the close contact with nature (e.g. hiking, recreational hunting and fishing, birdwatching, snorkelling, diving, gardening)
17	Supporting identities	<p>Landscapes, seascapes, habitats or organisms being the basis for religious, spiritual, and social-cohesion experiences:</p> <ul style="list-style-type: none"> <li>• Provisioning of opportunities by nature for people to develop a sense of place, belonging, rootedness or connectedness, associated with different entities of the living world (e. g. cultural, sacred and heritage landscapes, sounds, scents and sights associated with childhood experiences, iconic animals, trees or flowers)</li> <li>• Basis for narratives, rituals and celebrations provided by landscapes, seascapes, habitats, species or organisms</li> <li>• Source of satisfaction derived from knowing that a particular landscape, seashore, habitat or species exists</li> </ul>
18	Maintenance of options	<p>Capacity of ecosystems, habitats, species or genotypes to keep options open in order to support a good quality of life. Examples include:</p> <ul style="list-style-type: none"> <li>• Benefits (including those of future generations) associated with the continued existence of a wide variety of species, populations and genotypes. This includes their contributions to the resilience and resistance of ecosystem properties in the face of environmental change and variability</li> <li>• Future benefits (or threats) derived from keeping options open for yet unknown discoveries and unanticipated uses of particular organisms or ecosystems that already exist (e.g. new medicines or materials)</li> <li>• Future benefits (or threats) that may be anticipated from ongoing biological evolution (e.g. adaptation to a warmer climate, to emergent diseases, development of resistance to antibiotics and other control agents by pathogens and weeds)</li> </ul>

## APPENDIX 2: QUESTIONNAIRE

<b>Construct</b>	<b>Question</b>	<b>Answer Type/Response Options</b>	<b>Intent</b>
<b>Levels of Awareness</b>			
	Which marine/ocean plants/vegetation are you aware of?	Open-ended	Testing general awareness
	How did you become aware of kelp?	Open-ended	Testing information sources
<b>Levels of Knowledge/Experience</b>			
	How would you best describe kelp? South African kelps are: (Select two of the following)	i. Sea plants seen floating on the water surface ii. An underwater forest iii. Large seaweed iv. A group of large macroalgae v. Large seagrasses	Testing factual understanding of kelp
	How did you acquire knowledge on kelp? Choose all that apply to you:	i. Personal interaction with kelp ii. Word of mouth iii. Working with kelp (collecting, harvesting, processing, etc.) iv. Studying and researching kelp v. Books, television, movies, or other media vi. Other:	Testing sources of knowledge
	When did you begin to acquire knowledge about kelp?	i. Less than a year ago ii. 1 year ago iii. 2-5 years ago iv. 6-10 years ago v. 11-20 years ago vi. More than 20 years ago	Testing source and stage of knowledge
	How do you usually experience (see/touch/smell) kelp?	i. On the beach ii. In the ocean iii. I do not iv. In a factory v. Other:	Testing physical experiences with kelp
	How did you get involved in the kelp sector?	Open-ended	Testing history of involvement with kelp

	Do you directly interact with kelp in your daily activities/job/lifestyle? If yes, how? If no, what is your relationship to the kelp sector?	Open-ended	Testing level of interaction kelp (direct vs. indirect)
	On average, how frequently do you interact with kelp?	<ul style="list-style-type: none"> <li>i. Every day</li> <li>ii. 2-3 times a week</li> <li>iii. Once a week</li> <li>iv. 2-3 times a month</li> <li>v. Once a month</li> <li>vi. Rarely (once or less than once in a 3-month period)</li> </ul>	Testing frequency of interaction with kelp
<b>Attitudes</b>			
	How would you feel if we no longer had kelp forests? Why?	Open-ended	Testing emotional response
	Do you believe biodiversity should be protected?	<ul style="list-style-type: none"> <li>i. Yes</li> <li>ii. No</li> <li>iii. It doesn't matter to me</li> </ul>	Testing presence of eco-centric attitudes regarding the conservation of biodiversity
	When I come across kelp, I: (Choose all that apply)	<ul style="list-style-type: none"> <li>i. Look at/appreciate it</li> <li>ii. Touch it</li> <li>iii. Ignore it</li> <li>iv. Remove it</li> <li>v. Collect it</li> <li>vi. Harvest it</li> <li>vii. Avoid it</li> </ul>	Testing response towards kelp regardless of the benefits derived from it
	How does the existence of kelp create opportunities for you? Choose all that apply.	<ul style="list-style-type: none"> <li>i. Kelp creates work for me</li> <li>ii. Kelp increases my job/employment opportunities</li> <li>iii. Kelp provides additional food sources</li> <li>iv. Kelp enhances my job satisfaction</li> <li>v. Kelp improves my recreational experiences</li> <li>vi. Kelp's existence enhances my happiness, contentedness, and/or sense of place” (including improving my mental health)</li> <li>vii. Kelp does not create any opportunities for me</li> <li>viii. Other:</li> </ul>	Testing attitude towards opportunities from kelp

	<p>How does the existence of kelp threaten you? (Choose all that apply)</p>	<ul style="list-style-type: none"> <li>i. Kelp limits my recreational opportunities</li> <li>ii. Kelp limits my livelihood/business</li> <li>iii. Kelp negatively affects my experience of the coast and/or ocean (e.g. unsightly, smelly, etc.)</li> <li>iv. Kelp scares me when I come across it while swimming</li> <li>v. Kelp does not create any threats for me</li> <li>vi. Other:</li> </ul>	<p>Testing attitudes towards threats from kelp</p>
	<p>Have you watched “My Octopus Teacher”? If yes, how did it make you feel?</p>	<p>Open-ended</p>	<p>Testing awareness and attitude towards changing narratives around kelp, and emotional response to the same</p>

#### **Dimensions of value**

	<p>Why is kelp important to you?</p>	<p>Open-ended</p>	<p>Testing perceptions of value without any leading/pre-determined answers</p>
	<p>What are some of the things that reduce your appreciation of kelp?</p>	<p>Open-ended</p>	<p>Testing sources of frustration without any leading/pre-determined answers</p>
	<p>Kelp is important to me because: (Choose all that apply)</p>	<ul style="list-style-type: none"> <li>i. It creates and maintains a healthy marine and coastal environment</li> <li>ii. It regulates air and water quality and improves the climate</li> <li>iii. It absorbs pollutants</li> <li>iv. It can increase my safety from extreme natural events.</li> <li>v. It is not important to me for any of the above reasons</li> <li>vi. It provides a habitat for abalone, rock lobster, and other fish or invertebrates</li> <li>vii. Other:</li> </ul>	<p>Testing perceptions around ecological value</p>
	<p>Please explain your answer:</p>	<p>Open-ended</p>	

	Kelp is important to me because: (Choose all that apply)	<ul style="list-style-type: none"> <li>i. It provides energy, such as fuel from dried kelp</li> <li>ii. I can consume it as an alternative source of food</li> <li>iii. It is a source of food and feed for domestic animals</li> <li>iv. It is used in materials like paint and cosmetic products</li> <li>v. It provides important medicinal and/or genetic resources</li> <li>vi. It contributes to my livelihood and/or job satisfaction.</li> <li>vii. It allows me to procure abalone</li> <li>viii. It is not important to me for any of the above reasons</li> <li>ix. Other:</li> </ul>	Testing perceptions around economic value
	Please explain your answer:	Open-ended	
	Kelp is important to me because: (Choose all that apply)	<ul style="list-style-type: none"> <li>i. It is a source of inspiration for me in terms of art and design</li> <li>ii. It provides opportunities for recreation that give me physical/psychological satisfaction</li> <li>iii. It plays a role in my social life</li> <li>iv. I associate kelp with influential childhood experiences</li> <li>v. It supports my religious and/or spiritual identity and plays a role in rituals, and celebrations.</li> <li>vi. It increases my enjoyment of the sea and/or coast</li> <li>vii. It is not important to me for any of the above reasons</li> <li>viii. Other:</li> </ul>	Testing perceptions around social and cultural value
	Please explain your answer:	Open-ended	
	<p>Rate the following statement according to your level of agreement with it:</p> <p>“I have a moral and ethical obligation to protect kelp forests.”</p>	<ul style="list-style-type: none"> <li>i. Strongly disagree</li> <li>ii. Disagree</li> <li>iii. Neutral</li> <li>iv. Agree</li> <li>v. Strongly agree</li> </ul>	Testing perceptions around the intrinsic value of and relational value towards kelp

	<p>Rate the following statement according to your level of agreement with it:</p> <p>“My seaside experience depends on the knowledge that kelp is flourishing.”</p>	<ul style="list-style-type: none"> <li>i. Strongly disagree</li> <li>ii. Disagree</li> <li>iii. Neutral</li> <li>iv. Agree</li> <li>v. Strongly agree</li> </ul>	Testing perceptions around the intrinsic value of and relational value towards kelp
	<p>Rate the following statement according to your level of agreement with it:</p> <p>“Kelp is important to me because of its value to future generations.”</p>	<ul style="list-style-type: none"> <li>i. Strongly disagree</li> <li>ii. Disagree</li> <li>iii. Neutral</li> <li>iv. Agree</li> <li>v. Strongly agree</li> </ul>	Testing perceptions around bequest value
	<p>My appreciation of kelp is reduced due to: (Choose all that apply)</p>	<ul style="list-style-type: none"> <li>i. Mechanisms of control and rules of access around kelp (e.g. harvest control and regulations).</li> <li>ii. Issues of power and inequality in the kelp sector</li> <li>iii. Its odour and unsightly looks</li> <li>iv. Its ability to take away from my recreational enjoyment of the sea/coast</li> <li>v. Other:</li> <li>vi. None of the above reduce my appreciation of kelp</li> </ul>	Testing which aspects of kelp affect how it is perceived and valued, brings to light any governance issues for further exploration
	Please explain your answer:	Open-ended	

### Demographics

**Note:** The demographics section is included at the end so that it doesn't influence answers to the questions asked

	Age	<ul style="list-style-type: none"> <li>i. 18-35</li> <li>ii. 36-45</li> <li>iii. 46-55</li> <li>iv. &gt;55</li> <li>v. I prefer not to disclose this information</li> </ul>	.
	Gender	<ul style="list-style-type: none"> <li>i. Male</li> <li>ii. Female</li> <li>iii. Other:</li> <li>iv. I would prefer not to disclose this information</li> </ul>	

	Highest level of education	<ul style="list-style-type: none"> <li>i. Less than Grade 12</li> <li>ii. Grade 12</li> <li>iii. Higher certificates and Advanced National (vocational) certificate</li> <li>iv. National Diploma and Advanced certificates</li> <li>v. Bachelor's Degree, Advanced Diplomas, Postgraduate Certificate, B-tech Tertiary Education</li> <li>vi. Honour's Degree, Postgraduate Diploma, and Professional Qualifications</li> <li>vii. Master's Degree</li> <li>viii. Doctor's degree</li> <li>ix. I would prefer not to disclose this information</li> </ul>	.
	Occupation	Fill in: _____	
	Number of years in this occupation	Fill in: _____	
	Number of breadwinners in your household	<ul style="list-style-type: none"> <li>i. 1</li> <li>ii. 2</li> <li>iii. More than 2</li> <li>iv. I prefer not to disclose this information</li> </ul>	
	Number of dependants in your household	<ul style="list-style-type: none"> <li>i. 0</li> <li>ii. 1</li> <li>iii. 2</li> <li>iv. 3</li> <li>v. 4</li> <li>vi. 5 or more</li> <li>vii. I prefer not to disclose this information</li> </ul>	
	Residential Area	Fill in: _____	
	Number of years living in above residential area	Fill in: _____	

## APPENDIX 3: GUIDING QUESTIONS FOR KEY INFORMANT INTERVIEWS

### GENERAL GUIDING QUESTIONS (FOR ALL ACTORS)

- How did you get involved with kelp?
- How do you feel when you directly interact with kelp, either on the beach, or in the ocean?
- Do you have any cultural connections to kelp? If so, would you be willing to share them? [Example: cultural connections could include kelp playing a role in rituals/celebrations, kelp being symbolic of something in your community and/or culture, kelp being used in home remedies, kelp featuring in any of your routine practices, kelp being a part of any inherited generational behaviours, etc.]
- Does kelp feature in any of your family/community/religious/spiritual customs and traditions? Do you have any childhood memories with kelp?
- Does kelp feature in any of your traditional folklore/legends/stories? If so, would you be willing to share some of these?
- From your perspective, what are some of kelp's most important contributions/uses?
- Have you noticed any changes in the abundance and distribution of kelp in recent years?
- Have you noticed a change in attitudes towards kelp ecosystems in recent years? If so, what factors do you think are responsible for these changing attitudes?
- Have you watched "My Octopus Teacher"? If so, did the documentary influence your views about kelp?
- Is there anything that may enhance your involvement with kelp? Is there anything that diminished your involvement with kelp, or an area of concern in this field that you'd like to share?

### ADDITIONAL QUESTIONS FOR KEY INFORMANTS TAILORED BY ACTOR GROUP

#### i. KELP AND/OR ABALONE INDUSTRY ACTORS

- What does your typical day as a [choose appropriate title: kelp harvester; kelp processor; kelp sector management staff] consist of? Would you be able to run me through your day?
- Where is most of the kelp used as abalone feed sourced from?
- As an expert in the abalone industry, what are your views on kelp and its importance with regards to abalone?
- Do you view kelp only as a resource or have your interactions with it contributed to any sort of cultural or social value from your perspective?
- Do you enjoy working with kelp, whether directly or indirectly? What are the most rewarding aspects of working with kelp? Do you consider these activities beneficial? What do you dislike about it?
- Aside from your work, do you use kelp in any other way? (For instance, do you collect kelp for personal consumption as food, or perhaps use it in traditional medicine or home remedies?)

- Is the harvest and trade of kelp your primary source of income? Do you receive any others benefits from the harvest and trade of kelp? If so, would you be willing to share these?
- How did you learn your [kelp collecting; kelp processing] skills? Who taught you? When? What was the learning process like? What is the most challenging or difficult aspect to learn? Why?
- Are there any conflicts of interest between different kelp companies or with spheres of governance? If so, please elaborate on them.
- Have you noticed any conflicts of interest between various kelp user groups?
- What are your thoughts on how seaweed, and specifically kelp, is managed in South Africa?

ii. ENVIRONMENTAL MANAGERS AND/OR CONSERVATIONISTS

- Can you briefly run me through the governance and management of kelp at various levels of government, and your specific role in this?
- Could you tell me a little bit about how seaweed collection rights are granted and how collection thresholds/limits are decided? Are these decided solely by DFFE or do provincials structures and/or district municipalities also contribute to the process?
- Respondents have indicated that they felt as though there could be issues of inequality when working with kelp and found the mechanisms of control and regulations around kelp could be problematic. What are your thoughts on why this might be the case?
- Are there any conflicts of interest between different kelp management bodies? Have you noticed any conflicts of interest between various kelp user groups?
- Would you say the management of seaweed in South Africa is complex, or is the process is fairly straightforward? What are some of the main issues in terms of seaweed and kelp management?
- Do you have a particularly special or meaningful interaction with kelp that you might share?

iii. RECREATIONAL USERS AND/OR COASTAL COMMUNITY MEMBERS

- How does your role/lifestyle relate to your use of kelp?
- How do you experience kelp? How often do you interact with it?
- As a recreational user of kelp, have you noticed any tensions or issues with regards to kelp management between the population you represent, and conservation authorities in the area?
- Do you have a particularly special or meaningful interaction with kelp that you might share?