Using a spatial resilience lens to understand alignments and misalignments in South Africa's marine governance system

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Abstract

In marine protected areas (MPAs), the radically open nature of marine ecosystems, the seemingly contradictory short-term goals of fisheries management (resource use) and conservation efforts (biodiversity protection), the variety of stakeholders, and the inherently political nature of space have contributed to a disconnect between policy and practice. Many groups operate in an MPA at various spatial and socio-political scales, from national government bodies to local community groups, as such an MPA can be viewed as a complex, multi-scale and multi-level social-ecological system (SES). A greater understanding of the multi-scale processes driving the spatial resilience of SES can help address scale mismatches between continuous ecological change and the long-term governance of a seascape.

South Africa has a long history of spaces and natural resources being politicised and faces high levels of unemployment and political frustration. Marine governance has been characterised as being siloed, lacking transparency regarding government processes and even between departments, and not properly addressing the needs of local communities; resulting in scale and level mismatches throughout the multi-scale processes (from national policies to local regulations) therefore, it is pertinent to understand the interactions between various national policies, their implementation, and their impacts. Using a spatial resilience lens, I set out to understand scale alignment in South Africa's marine governance systems as it relates to MPAs. A spatial resilience lens emphasises analysis of both spatial and temporal scales, thus highlighting the multi-scale variables and interactions that occur within a system. I first sought to understand the policy and management across national and regional scales by conducting a series of semi-structured interviews with experts which were analysed using thematic analysis. I then approached the question of alignment from a local to national scale by using the Table Mountain National Park Marine Protected Area as a case study, here I carried out a series of workshops and interviews with line fishers, women's groups, and eco-tourism operators from three different communities.

Experts identified six themes when describing the structure of governance in South African MPAs; they consisted of: government departments and marine legislation, management level factors, communication and information sharing, local level factors, biophysical factors, and scale. Communication and information sharing was the most mentioned referenced theme (40.26 %). The relationships between the communities and other actors (i.e. how communities are impacted, or impact on, the Department of Environmental Affairs, the Department of Agriculture Forestry and Fisheries, and Park Authorities) contributed 67.27 % to the total number of mentions, 91 % of which were from the following themes: communication and information sharing, local level factors, biophysical factors, and scale. My results indicate that weak, top-down relationships dominate the governance system in South Africa.

During the Cape Town workshops I applied the spatial resilience lens in three ways. Firstly, the participants collaborated on a mapping exercise discussing the existing zone types within the MPA, as well as developing their own. There was an 87.87 % overlap of community designed zones on the existing MPA zones, however the types of zones designed by the community were different. Secondly, I carried out a document analysis and used information from the workshops to analyse the status and rights designation of important species for different user groups. The results show that the various stakeholder groups, while all active in the marine environment, interact with the ecosystem at different scales and with differing species. The differing interactions between groups result in challenges such as representation and complicated power dynamics between user groups. Finally, I asked participants to discuss factors that affect their ability to gain a livelihood from the sea. The external elements and their effects differed between the user groups, identifying important socio-political interactions. Whilst the external elements were all geographically distinct and localised, the spatial resilience lens allowed for a cross-scale, and to a certain extent cross-sector, understanding of these elements thus producing a more holistic understanding.

My thesis shows that user groups operate on different spatial scales within the marine environment as a result of social, economic, and political influences leading to several scale-based challenges. The identified scale-based challenges have contributed to misalignments in marine governance in South Africa. My study shows that scale mismatches have important implications for understanding how marine policy influences user groups and identified pathways that affected policy implementation. , and identifies future research application of a spatial resilience lens within social-ecological systems, for example it's potential use in understanding the gendered nature of MPAs.

Glossary

Term of reference	Definition	Reference(s)
Theory		
Conceptual Framework	A conceptual framework relates concepts, empirical research, and relevant theories to advance and systematise knowledge about related concepts.	Rocco, T.S. and Plakhotnik, M.S., 2009. Literature reviews, conceptual frameworks, and theoretical frameworks: Terms, functions, and distinctions. Human Resource Development Review, 8(1), p. 128
Resilience	The ability of a system to maintain identity in the face of internal change and external perturbations	Cumming, G.S., 2011. Spatial resilience in social-ecological systems. Springer Science & Business Media. p. 14
Spatial resilience	"The ways in which spatial variation and variables, both inside and outside the system of interest, influences (and is influenced by) system resilience across multiple spatial and temporal scales. It has elements that are both internal and external to the system"	Cumming, G.S., 2011. Spatial resilience in social-ecological systems. Springer Science & Business Media. p. 21
Theoretical Framework	A theoretical framework is a single theory (in the case of this thesis the Spatial Resilience Theory). The theory is the primary means through which the research problem is understood and investigated – sometimes referred to as a "lens"	Walden University Library https://academicguides.waldenu.edu/library/theory#s-lg-box-21974720
Fishing		
Small-scale fishing	Small-scale fishing means the use of marine living resources on a full-time, part-time or	Policy for the small-scale fisheries sector in South Africa. Department of Agriculture, Forestry and Fisheries, Pretoria. Government Gazette 20 June 2012

	seasonal basis using predominantly low-technology fishing gear to ensure food and livelihood security through direct consumption and/or sale or barter of catch	
Subsistence fishing	Fishing for personal consumption or traditional/ceremonial reasons only.	OECD, 1998. Review of Fisheries in OECD Countries: Glossary.
Commercial (large-scale) fishing	The harvesting of fish for sale or trade (no personal consumption)	OECD, 1998. Review of Fisheries in OECD Countries: Glossary.
Sports fishing		
Marine protected areas		
Marine Protected Area	Areas designated and effectively managed to protect marine ecosystems, processes, habitats and species, which can contribute to the restoration and replenishment of resources for social, economic, and cultural enrichment	Reuchlin-Hugenholtz, E., 2015. Marine protected areas: Smart investments in ocean health. World Wildlife Fund (WWF).
Controlled zone	Activities and living resource extraction are allowed with relevant permits.	Findlay, K., 2020. Challenges facing marine protected areas in Southern African countries in light of expanding ocean economies across the sub-region. In Marine Protected Areas (pp. 37-65). Elsevier. RSA (Republic of South Africa), 2004. Notice declaring the Table Mountain National Park Marine Protected Area under section 43 of the Marine Living Resources Act, 18 of 1998. Government Notice, South Africa 695 (26431).
No-take zone	Also known as restricted zone. The extraction of all marine flora and fauna is prohibited.	Findlay, K., 2020. Challenges facing marine protected areas in Southern African countries in light of expanding ocean economies across the sub-region. In Marine Protected Areas (pp. 37-65). Elsevier. RSA (Republic of South Africa), 2004. Notice declaring the Table Mountain National Park

		Marine Protected Area under section 43 of the Marine Living Resources Act, 18 of 1998. Government Notice, South Africa 695 (26431).
South African Marine legislation and government offices		
Marine Living Resources Act 18 of 1998	The Marine Living Resources Act 18 is focused on the conservation of the marine ecosystem, ensuring the long-term, sustainable use of marine living resources. It allows for controlled access to exploitation, use, and protection of certain resources. The act aims to control marine living resources to provide equitable and fair benefits to all South African citizens.	RSA (Republic of South Africa), 1998. Marine Living Resources Act (Act No. 18 of 1998). Government Gazette, South Africa 395 (18930).
National Environmental Management: Protected Areas Act 57 of 2003	This act aims to provide for the conservation and protection of ecologically viable areas representative of the country's biodiversity found in its natural landscapes and seascape. A national register of all national, provincial, and local protected areas has been established. The act also provides a framework for the management of these areas in accordance with national standards and norms, allowing intergovernmental co-operation and public consultation.	RSA (Republic of South Africa), 2004. National Environmental Management: Protected Areas Act (Act No. 57 of 2003). Government Gazette, South Africa 464 (26025).

National Environmental Management: Integrated Coastal Management Act 24 of 2008	The Integrated Coastal Management Act is concerned with the establishment of a system of integrated coastal and estuarine management, addressing norms, policies and standards aiming to promote the conservation of the coastal environment. It provides for the socially and economically justifiable development and use of natural resources within the coastal zone, defining the rights and duties of the organs of state related to coastal areas. Issues such as dumping at sea, pollution, and international obligations are also encompassed within the act.	RSA (Republic of South Africa), 2009. National Environmental Management: Integrated Coastal Management Act (Act No. 24 of 2008). Government Gazette, South Africa 524 (31884).
Marine Spatial Planning Bill	The Marine Spatial Planning Bill was initially drafted in 2016, however it lapsed in terms of National Assembly Rule 333(1) in December 2017. The National Assembly resolved to revive the Bill in February 2018 and it has now been sent to the National Council of Provinces. The current version of the Bill (Version D) aims to provide a framework for marine spatial planning in South Africa (MSPB	Centre for Environmental Rights, 2018. Legislation: Marine and Coastal. https://cer.org.za/virtual-library/legislation/national/marine-and-coastal.

	2018). It focuses on developing institutional arrangements which allow for the implementation of marine spatial plans and governance of the ocean by multiple sectors.	
Marine Living Resources Act Amendment 2014	The Marine Living Resources Amendment Act was passed in May 2014 to allow for the enactment of the Small-Scale Fisheries Policy. This amendment included changes to definitions, expansion of the Marine Living Resources Act's objectives and principles, and the outlining of measures, powers, and duties related to small-scale fishing.	Cochrane, K.L., Joyner, J., Sauer, W.H.H, and Swan, J., 2015. An evaluation of the Marine Living Resources Act and supporting legal instruments as a framework for implementation of an ecosystem approach to fisheries in South Africa, African Journal of Marine Science, 37(4), pp.437-456, DOI: 10.2989/1814232X.2015.1100682 RSA (Republic of South Africa). 2014a. Marine Living Resources Amendment Act (Act No. 5 of 2014). Government Gazette, South Africa 587 (37659).
Policy for the Small-Scale Fisheries Sector (SSFP) 2012	The purpose of the SSFP is to provide a framework through which all coastal small-scale fishers are granted collective, community-based fishing rights through access to a "basket" of marine resources.	Department of Agriculture, Forestry and Fisheries, 2012. Policy for the Small-Scale Fisheries Sector in South Africa. Cape Town, South Africa, 2012.

List of Abbreviations

DAFF	Department of Agriculture, Forestry, and Fisheries
DEA	Department of Environmental Affairs
MLRA	Marine Living Resources Act
MPA	Marine Protected Area
NEM:PAA	National environment Management: Protected Areas Act
NGO	Non-governmental Organisation
SANBI	South African National Biodiversity Institute
SANParks	South Africa National Parks
SASSI	The South African Sustainable Seafood Initiative
SES	Social-ecological system
TMNP (MPA)	Table Mountain National Park (Marine Protected Area)
TOPS	Threatened of Protected Species

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Finally, Dad this one is for you. I'll see you where the sky meets the ocean.

Contents

Chapter 1: General Introduction and Theoretical framework

1. Introduction

Spatial misalignments between environmental and governance systems are a significant challenge to sustainability (Sayles and Baggio 2017). High numbers of stakeholders, permeable man-made jurisdictional and political demarcations in contrast with the spatial and temporal extent of ecosystem processes, and a limited understanding of social and ecosystem dynamics all contribute to the challenge of managing an ecosystem (Bodin 2017). The relationship between people and the sea is one example where alignment between management of the environment and society is crucial, yet it remains elusive in parts of the world.

The ocean and coasts provide many ecosystem services, which directly and indirectly impact on livelihoods, agriculture and food security, and trade and industry (GRID-Arendal 2016). However, these ecosystems and the services they provide are threatened, in part due to poor management. Overfishing, along with other threats, undermines the biodiversity required to sustain marine ecosystems, and can consequently endanger some of the most vulnerable human populations and marine habitats around the world (GRID-Arendal 2016, Liquete et al. 2016, Hopkins et al. 2018, Lotze et al. 2018).

1.1. Marine Protected Areas

Marine protected areas (MPAs) are a popular tool for marine conservation (McCrea-Strub et al. 2011, Smith and Metaxas 2018). The criteria for MPAs is constantly evolving in order to address continuing concerns, with particular regard for the extent to which MPAs are effectively managed (Humphreys and Clark 2020). The variability of the definitions of MPAs, often depending on the priorities and circumstances of those proposing them, reveals the difficulty experienced in international policy and management of MPAs (Humphreys and Clark 2020). Work carried out by Humphreys and Herbert (2018) identified the following four reoccurring attributes in MPA definitions:

- "A geographical area of marine character or influence with defined boundaries, normally including both water column and underlying benthic components;
- Which is protected through legal or explicit means;
- For the purpose of conservation of specified features or systems, and;
- Managed with the intention of achieving a higher level of protection than that of the surrounding area" (Humphreys and Herbert 2018, p. 1).

However, the definition that was described by the World Wildlife Fund is used in this thesis, and is as follows "Areas designated and effectively managed to protect marine ecosystems, processes, habitats and species, which can contribute to the restoration and replenishment of resources for social, economic, and cultural enrichment" (Reuchlin-Hugenholtz and McKenzie 2015). The reason for using this definition is based on the fact that this definition was developed by a range of NGOs whose missions aim at stopping the degradation of the natural environment (Humphreys and Clark 2020), yet also encompasses the role that MPAs play in the social, ecological, and economic realm. Furthermore, this definition is reflective of the right to an environment that is beneficial to people's health and wellbeing which is enshrined in the South African Constitution (RSA 1996).

However, the establishment of MPAs is often controversial due to the negative association between sea closures and human activities affected by those closures, such as tourism and fishing (Ruiz-Frau et al. 2015). Cases where the MPA design is based on stakeholder decisions and needs have often been criticised for being driven by political interests and lacking conservation effectiveness (Stewart et al. 2009, Ruiz-Frau et al. 2015). However, MPAs designed purely on ecological criteria risk failing to gain the support of the people affected by its establishment, thus limiting the effectiveness and continuation of the MPA (Stewart et al. 2009, Ruiz-Frau et al. 2015).

As many MPA management plans show, MPAs generally aim to both conserve biodiversity and support livelihoods. In reality, national policy is often poorly translated into decision-making and management, particularly at the local level, resulting in a policy-implementation gap (Agardy et al. 2011, Sowman et al. 2014, Christie et al. 2017, Bednarek et al. 2018, Bennett 2018). Some of the key challenges in aligning policy and practice include differing values and goals, institutional barriers, sectoral agendas, the challenge of aligning global goals with local realities, unfair distribution of costs and benefits, weak governance, and the challenge of balancing environmental principles with human rights (See Chapter 3) (Sowman et al. 2014, Humphreys and Clark 2020). Ecosystems and communities interact within and between multiple spatial, temporal, and societal scales, resulting in dynamic feedback loops between the two (Holling and Gunderson 2002, Cumming et al. 2006). People and the sea can be considered a social-ecological system (SES), intertwined not only at the local level, but across scales and levels in an interconnected world (See chapter 3 for further discussion on scales and levels) (Folke 2016). In the case of MPAs, managers often try to integrate multiple objectives via zonation of MPAs through marine spatial planning (Foley et al. 2010, Sowman et al. 2014,

Pfaff et al. 2019). However, there are two key challenges: the first is that overlapping human uses in a three-dimensional environment requires inter-sectoral and jurisdictional management (Kenchington et al. 2014). Secondly, management of the ecosystem and resources must align with societal expectations (Kenchington et al. 2014). As such, MPAs must be viewed as complex social-ecological systems.

Social-ecological systems are complex adaptive systems whose properties include being hierarchical in nature, often with fuzzy boundaries, radically open, dynamic, and context-dependent (Berkes and Folke 1998, Holling and Gunderson 2002, Berkes 2003, Norberg and Cumming 2008, Cumming 2011, Preiser et al. 2018). Furthermore, definitions of what components of the system are important are subjective and depend greatly on the values and beliefs of the researcher or manager (Cumming 2011). The dynamic nature of SES as complex adaptive systems lends itself to resilience theory as resilience research emphasises the interplay between abrupt and gradual change (Berkes and Folke 1998, Folke 2017). Marine protected areas and their governance have a spatially-based nature, as management is often guided by the spatial variation of habitat patches and the use activities in the MPA (See Chapter 4). The lack of traditional "fencing" in an MPA, compared to a terrestrial reserve or national park, means that the implementation of regulations needs to pay close attention to the variables outside the system and how they may affect activities taking place within the park – again the focus needs to consider the spatial nature of MPAs as SES. Spatial resilience theory is one lens through which we can understand SES in terms of resilience research.

1.2. Resilience and Spatial Resilience

In considering potential trade-offs in ecosystem services, and between ecosystem services and biodiversity, it is helpful to remember that SES, including marine systems, are complex adaptive systems that have complex properties. There properties include being hierarchical in nature (Cumming 2011), definitions of what matters are subjective and depend greatly on the beliefs and values of the researcher or manager (Cumming 2011), and often with fuzzy boundaries and changes in core aspects of a system tending to be a question of degree rather than the absolute (Cumming 2011). Resilience research emphasises the interplay between abrupt and gradual change, while an underlying assumption of resilience thinking is that SES are complex adaptive systems (Folke 2017).

Carpenter et al. (2001) define resilience as the amount of change a system can undergo while maintaining the same structure and functions, the ability of a system to self-organise, and the extent to which a system is able to learn and adapt. Cumming et al. (2006) describe SES as

systems consisting of essential components, actors and interactions, thus system identity consists of maintaining these elements through space and time. Therefore, resilience may be understood as "The ability of the system to maintain its identity in the face of internal change and external perturbations" (Cumming 2011, p. 14). Folke et al. (2016) and Preiser et al. (2017) discuss the role of resilience thinking in the Anthropocene highlighting (i) the current scale and unpredictability of change means "bouncing back" or withstanding change is becoming more and more difficult, (ii) resilience also means it is important to be able to stay on the same development pathway while adapting to change, and (iii) in this new context, resilience is also about transformation, which refers to the need for reconfiguring how things are done. This understanding of resilience and the role of resilience thinking provides a useful lens through which to study marine ecosystems, and in fact MPAs (Osterblom et al. 2017).

In using a resilience lens to understand a system, it is increasingly pressing to explicitly consider spatial dimensions of within and surrounding a system; spatial resilience thinking has been presented as a helpful lens in incorporating spatial elements. Spatial resilience is defined as "the ways in which spatial variation in relevant variables, both inside and outside the system of interest, influences (and is influenced by) system resilience across multiple spatial and temporal scales. It has elements that are both internal and external to the system" (Cumming 2011, p. 21). Despite the growing recognition of the importance of spatial resilience, ecosystem management and governance remain focused on small scales and tends to be spatially fragmented (Cumming et al. 2017). Generally speaking, practitioners still finds it challenging to incorporate a multi-scale perspective in implementation strategies, and there is limited research into the cross-scale interactions and implications of management policies in practice (Nash et al. 2014). A greater understanding of the multi-scale processes driving the resilience of SES, as emphasised in spatial resilience theory, can address the scale mismatches between continuous ecological change and long-term governance of seascapes (Cumming et al. 2017).

A spatial resilience lens which considers the functioning, structure, and interactions within a system may be helpful in understanding how alignment between governance, ecological change, and stakeholders might be achieved and what trade-offs might arise at different scales (Cumming 2011). The open, dynamic nature of the ocean's energy flows and their migratory animals, which aren't disrupted by barriers and fences, is fundamentally at odds with the bounded nature of jurisdictional and institutional governance (Jouffray et al. 2020). The interactions between ecosystems, resource users, and governance structures of marine ecosystems have been researched extensively (Marsden 2018). However, resource

management boundaries continue to be poorly aligned with the ecological system, leading to ecological and social problems (Sayles and Baggio 2017). Interdisciplinary research has shown that in systems in which actors are involved, who they collaborate with, and the ways in which they are connected to the structures in the ecosystem, have serious implications on an actor's ability to address various environmental problems (Bodin 2017). Connections between actors and structures vary across scales, levels, and space, therefore in order to understand how to address environmental problems (such as policy implementation) we need to understand these connections. I hypothesise that one of the causes of the marine policy-implementation gap is misalignment in scales between different governance levels, resulting in difficulty in implementing progressive policies and ensuring just and effective MPA governance.

Policy implementation in MPAs has been well studied in South Africa (for example, Butterworth et al. 1997, Hauk and Sowman 2005, Fassen and Watts 2007, Cochrane et al. 2009, Hara 2014, Sowman 2015, Sowman and Sunde 2018). South Africa now has well respected environmental legislation, however the organisational structure of the national government departments, local management departments, and external stakeholders, results in difficulties in communication and consequently effectiveness – essentially this is evidence of a policy-implementation gap (Chadwick et al. 2014). Furthermore, despite South Africa's national coastal policy highlighting co-governance, inclusivity and fairness, the principles are elusive in day-to-day coastal management (Colenbrander 2019).

The face of MPAs and marine policy in South Africa is currently undergoing many institutional and spatial changes. On 24 October 2018, the Department of Environmental Affairs (DEA) announced that Cabinet had approved a network of 20 new MPAs (SANBI 2018)[1]. These MPAs advance offshore ecosystem protection, as well as extend the area covered by some inshore MPAs already in existence. Finally, fisheries rights allocations are due for re-allocation in 2020 (Parliamentary Monitoring Group 2018). These changes will have impacts across different scales and levels and could affect both the marine ecosystem and those who are reliant on it. Additionally, this may present future opportunities for cross-scale and level policy implementation research. Thus, the aim of this thesis is to understand how applying a spatial resilience lens can help us better understand the policy-implementation gap in MPAs, focusing on South Africa as a case study.

[1] In June of 2019, the DEA was renamed the Department of Environment, Forestry, and Fisheries (DEFF), a merger between itself and the fisheries and forestry functions from the previous Department of Agriculture, Forestry, and Fisheries (DAFF) (DEFF 2019).

1.3. The theoretical framework

1.3.1. A note on conceptual frameworks, theoretical frameworks, and lenses

The terms "conceptual framework" and "theoretical framework" are often used interchangeably (Rocco and Plakhotnik 2009). However, the distinction is extremely important for the understanding of this thesis as I am investigating the usefulness of a lens/perspective, rather than trying to fully understand the working of a system. Rocco and Plakhotnik (2009) explain that a "conceptual framework relates concepts, empirical research, and relevant theories to advance and systematise knowledge about related concepts" (pg. 128). They are often used in cases where one theory cannot encompass the phenomena being studied, or in areas that are understudied (Rocco and Plakhotnik 2009, Walden University 2020).

A theoretical framework has been described as "the structure, the scaffolding, the frame of your study" (Merriam 2001, p. 45). A theoretical framework provides a particular lens or perspective through which a research problem is understood and investigated (Rocco and Plakhotnik 2009, Walden University 2020). Spatial resilience theory is the theoretical framework, or the lens, in this thesis. The system considered in the thesis, that of South African marine governance of MPAs, is considered through the spatial resilience lens and so I focus of the spatial and temporal cross-scale nature of the governance structure, as well as considering the interactions that influence (and are influenced by) the system – as laid out in the definition of spatial resilience by Cumming (2011) (see section 1.2).

1.3.2. Argument for a spatial resilience lens

During the conceptualisation of this thesis I considered the use of three theoretical frameworks: The Sustainable Livelihoods Approach, the Robustness of Coupled Infrastructure Systems Framework, and Spatial Resilience Theory.

The Sustainable Livelihoods Approach provides a way to conceptualise the scope, objectives, and priorities for development activities (Serrat 2017). The Sustainable Livelihoods Approach considers the following five main factors: capital assets, vulnerability context, policies and institutions, livelihood outcomes, and livelihood strategies (Serrat 2017). Some of the strengths of this the Sustainable Livelihoods Approach as a theoretical framework include the fact that it emphasises the importance of micro- and macro linkages, considers linkages across sectors, draws attention to social relationships, and it interrogates the changing modes of livelihoods in a temporally dynamic context (Small 2007, Serrat 2017). However, a key weakness is that the

Sustainable Livelihoods Approach is that it does not pay great attention to power inequalities and underplays the fact that the enhancement of one type of livelihood may undermine the other (Small 2007). The spatial resilience lens allows me to interrogate the micro- and macro-linkages across sectors and stakeholders, as the Sustainable Livelihoods Approach does, however one of its strengths lies in the fact that it acknowledges that space is inherently political, the nature of which is a product of the relations of social interactions within it (Williams 1975, Massey 1999) – by acknowledging the temporal and spatial elements of a space (in this case an MPA), Spatial Resilience Theory allows for the interrogation of power dynamics. Furthermore, the fact that spatial resilience considers how the internal elements, as well as external elements, interact one is able to question how one type of livelihood may undermine another , this is extremely important in spaces such as MPAs where there are multiple stakeholders whose livelihoods depend on the same space but often have (seemingly) conflicting needs (Kenchington et al. 2014).

The Coupled Infrastructure Systems Framework encompasses five main types of infrastructure: hard human-made (physical structures), soft human-made (regulations and policies), social, natural, and human (Anderies et. al 2016). It further includes the external, or contextual variables, such as biophysical conditions, attributes of the community, and rules-in-use (Anderies et al. 2016). The Robustness of Coupled Infrastructure Systems Framework often used to investigate SES governance (for example Homayourfar et al. 2018, who utilised the mathematical version of the Coupled Infrastructure Systems Framework, Tellman et al 2018, Bonte et al. 2019, and Janssen et al. 2019). The framework provides a systematic way to analyse how infrastructures interact with regards to their functions, provides a minimal set of infrastructural groupings while allowing for higher level patterns to emerge (Anderies et al. 2016). However, this framework does not allow for the simultaneous analysis of horizontal and vertical interactions of different livelihoods, for example while one could analyse how park managers interact with national scale legislation and the natural environment, the interactions between park managers and other stakeholders are relegated to “attributes of the community” thus risking underplaying the importance or impact of that relationship. Spatial Resilience Theory can simultaneously encompass the vertical interactions (local, to regional, to national), and the horizontal interactions (between stakeholders at the local level, of between government departments).

Finally, Spatial Resilience Theory echoes the nature of marine ecosystems. Reed et al. (2020) begin their paper by saying “Marine ecosystems function dynamically in space and time and

an understanding of both the spatial and temporal scales over which social-ecological systems operate is therefore necessary to manage natural resources sustainably" (p.1). Spatial Resilience Theory explicitly addresses the multiple, heterogenous spatial and temporal scales that exists within a system. Further, the prevailing form of fisheries management in South Africa is spatial. Areas are first designated as fisheries management areas, priority fishing areas, or MPAs (Reed et al. 2020). The regulations for MPAs and fishing permits are also spatially determined and consider aspects such as by-catch, protection of nursery and key spawning areas, and the total catch allowable (which depends on the presence of different species with the area) (Reed et al. 2020). It is thus essential to explicitly address the spatial nature of a governance system that is essentially grounded in spatial concepts.

1.4. General approach and key questions

Mismatches between the scales of environmental variation, stakeholder variation, and scales of management can lead to a decrease on social-ecological resilience – including mismanagement of natural resources (Cumming et al. 2006, Folke et al. 2007, Reed et al. 2020). Furthermore, the temporal mismatches between legal processes and biological processes are have reportedly led to degradation of marine ecosystems (Crowder et al. 2006, Young et al. 2007, Reed et al. 2020). The integrity and biodiversity of marine ecosystems is essential for thousands of livelihoods and several commercial sectors in South Africa (Turpie et al. 2003, Moolla and Kleinschmidt 2008, WWF-SA 2011, DAFF 2013, DEA 2015, Blamey and Bolton 2018, van der Bank et al. 2019). It has been argued that the governance of South African fisheries, both past and present, has failed to recognise the complex social dimensions and social-economic needs and characteristics of low-income coastal communities (Branch and Clark 2006, Hauck and Kroese 2006, Raemaekers 2009, Sowman 2011, Sowman et al. 2011, Brill 2012)[2]. While these dimensions are well documented, in this thesis I suggest that a Spatial Resilience Lens can ask why these characteristics are not recognised and what mismatches occur for this to arise.

The overarching question for this project is as follows: Can applying a spatial resilience lens help identify alignments and misalignments in the implementation of marine policy? To answer this question, I applied a spatial resilience lens in two scenarios: National to local management, and national management to local resource users. The levels between national management and local management look directly at the structure of the governance system itself, whilst the levels between national management and local resource users looks at the implementation as well. Each results chapter focuses on separate key questions, essentially forming a standalone paper with different methodologies but with the same theoretical lens. Lessons from the use of the theoretical lens and spatial elements at each scale will then be used to answer the overarching question in the synthesis chapter.

Chapter Two provides a broad overview of the South African marine context and outlines the theoretical differences between scales and levels, as well as which scales are pertinent to this study. The first results chapter (Chapter Three) applies a spatial resilience lens to analyse the national management level through to the local management level. As the national government,

[2] The separation of South African fisheries into fisheries management areas, priority fishing areas, and marine protected areas results in a silo-like organisation of its marine ecosystems (Reed et al. 2020). To understand the governance of South Africa's entire marine territory is too ambitious for one project, as such I focus in on MPAs (however I do consider the role of legislation beyond MPAs with regard to their impacts on MPAs).

government departments, and park authorities are responsible in different ways for developing and implementing marine policy, it is important to understand *how* they interact, and to identify misalignments that may compromise the ability of each body to pursue their responsibilities. The key question for this chapter is: What does a spatial resilience lens reveal about misalignments across governance levels?

In the second results chapter (Chapter 4), I take a case study approach and apply the lens at a more localised scale, whereby I consider cross-scale interactions between park management, government offices, and resource users in the Table Mountain National Park (TMNP) MPA. The Table Mountain National Park was chosen as a case study due to its rich fishing history, high biodiversity and endemism, and its popularity as a tourist destination. Each of these characteristics involve different spatial distributions and different types of legislation, yet all occupy the same space and rely on the same resources. Here the park management, as well as national marine legislation, needs to balance the needs of low-income households, the persisting legacy of apartheid, and a well-established tourism sector – all of which are greatly reliant on the marine ecosystem around the peninsula for their continuing existence. In order to understand some of the different ways in which the MPA is used, how this may be related to scales and levels, and if marine policy is aligned or not with the various actors, I asked:

1. To what extent are important conservation species and important species for local user groups represented in national policy? What are the spatial implications of any alignment and misalignment between the protection and access statuses of important species identified by international and national legislation, park regulations, and user groups?

On one hand it is essential to understand how people are affected by marine policy, on the other hand it is also imperative that researchers remain cognisant of the fact that SES are complex and so other factors will influence how they interact with the resource system and potentially the extent to which they comply with regulations. The role of external elements is explicitly addressed in spatial resilience thinking. Consequently, I asked the following question:

2. How do non-marine national level policies impact on local scale management and resource use?

Finally, the process of zoning MPAs according to use and access is a commonly used tool in marine governance, yet users do not always comply with these zones. Zonation is an explicitly spatial tool that will directly affect people's access to resources and thus may influence their

willingness to comply with regulations; furthermore, it will affect user groups differently. It is important to know how the zones impact on resource users in order to pursue an equitable and just governance strategy. As a result, the last key question is:

3. How do the zonation criteria differ for official MPAs and an MPA designed by user-groups?

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Chapter 2: Study Site

2.1. Marine resources in South Africa

Coastal and ocean resources in South Africa play an essential role for local coastal communities that are dependent on them, many of whom live in poverty, by providing tangible benefits such as direct harvesting of food and medicinal resources, and tourism, educational, and recreational benefits, as well as less tangible spiritual, cultural, and ecological infrastructural benefits. (DEA 2015, SANBI 2019, van der Bank et al. 2019). These resources are also of extreme value to commercial sectors such as mining, forestry, fisheries, and tourism (Turpie et al. 2003, DEA 2015, Blamey and Bolton 2018, van der Bank et al. 2019). An estimated 43,000 individuals are engaged in commercial fishing and approximately 29,000 individuals from approximately 147 coastal communities across South Africa are engaged in small-scale fishing (Moolla and Kleinschmidt 2008, WWF-SA 2011, DAFF 2013, van der Bank et al. 2019). Small-scale fishing includes a range of fishing techniques and spatial variation throughout the coast, for example, handlining and recreational surf and rock angling are entrenched in cultures across the country, whilst treknetting is found mainly in Strandfontein (Western Cape) and traditional woven fish traps have been used in the Kosi Estuary (Kwa-Zulu Natal) for over 700 years (van der Bank et al. 2019). (Figure 1) Subsistence fishers harvest resources for food security and sale, which include fish, mussels, oysters, lobsters, and abalone (DAFF 2013, Sink et al. 2012). Approximately 85 % of subsistence fishers target fish caught on rod and line (linefish) (Hara et al. 2008, DAFF 2012). Despite small-scale fishing contributing less than 1 % to South Africa's GDP, this sector is essential for poor coastal communities as it provides employment and food security in these areas (Isaacs and Hara 2015).

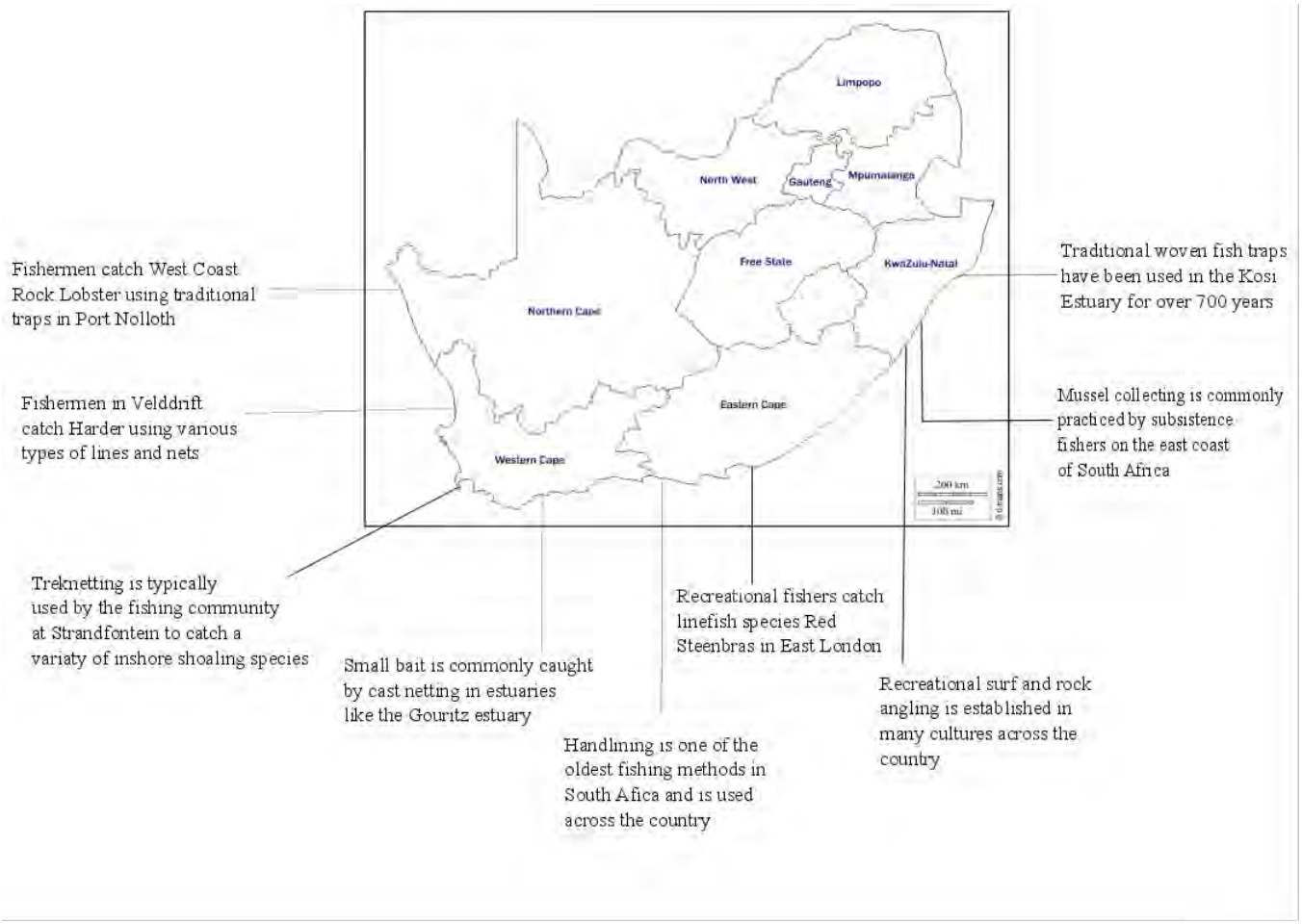


Figure 1. Examples of various small-scale, subsistence, and recreational fishing techniques across South Africa (adapted from van der Bank et al. 2019).

Over 770 marine species are harvested in South Africa, however there are only current stock assessments for 54 stocks (van der Bank et al. 2019b, van der Bank et al. 2019c). Approximately 22 % of the stocks are considered optimally exploited (species include Yellowtail, Kelp, and Kingklip), and 19 % are underexploited (including Hake, Hottentot, Snoek and Bigeye Tuna). However 19 % of stocks are considered overexploited (species include Santer, Yellowfin Tuna, and shallow-water prawns), and 20 % are collapsed (including Geelbek, Red Steenbras, Silver Kob, Abalone, and West Coast Rock Lobster) (van der Bank et al. 2019b). Many of the important linefish stocks have outdated assessments, some last being assessed over 20 years ago, however, the 27 linefish stocks with current assessments are considered as follows: 15 % underexploited, 22 % optimally exploited, 19 % overexploited, 33 % collapsed, and 11 % uncertain (van der Bank et al. 2019b).

South Africans and tourists also engage in non-consumptive uses of the marine environment. Coastal tourism contributes approximately R26 billion to the national economy annually, with

marine ecotourism having developed significantly over the last few decades and contributing R200 million, and a further R2 billion indirectly (DEA 2015, Blamey and Bolton 2018, van der Bank et al. 2019). The true value of access to the coastline is much higher, however, and there are more than 500,000 active sports fishers, with diving, sun-bathing, swimming, and picnicking also being popular activities (DEA 2015). Furthermore, the ocean has an important cultural value and is deeply embedded in the beliefs, songs, and poetry of coastal communities, with some religious groups using the coastal environment for activities and ceremonies and many collecting sea water for medicinal purposes (DEA 2015, van der Bank et al. 2019).

The man-made environment within coastal areas, tourism, fisheries, infrastructure, and marine biodiversity have all been identified as sectors requiring a variety of interventions to ensure continuing provision of goods and services to the environment (DEA 2015). These sectors form the foundation of the complex management of oceans and coastal regions (DEA 2015). Decades of a combination of over-fishing and other factors (such as mining, invasive species, and waste water discharge) have resulted in numerous changes in the South African marine environment, including marine resources categorised as "collapsed" and others as "over-exploited" (DAFF 2012, Sink et al. 2012, Majiedt et al. 2019). The overexploitation of these marine resources has resulted in the loss of potential nutrition, livelihood provisions, and threatening the traditional fishing culture present in the country's coastal communities as well as potentially changes in ecosystem structure and functioning (Sunde and Isaacs 2008, Blamey et al. 2014, Chadwick et al. 2014, WWF-SA 2016, Sowman and Sunde 2018). Fishing, fresh-water flow reduction, pollution, climate change, and coastal development are the main pressures impacting South Africa's marine ecosystems (Mead et al. 2013, Moloney et al. 2013, Pfaff et al. 2019, Skowno et al. 2019). Marine protected areas are a key tool in managing and governing South Africa's important coastal and marine environments, and restoring overexploited stocks, if designed, managed, and enforced correctly (Hillborn et al. 2004, Sowman et al. 2011). South Africa currently has 42 declared MPAs with protection levels ranging from controlled to restricted/no-take (Sink et al. 2019).

2.2. South African Marine Protected Areas

Many of the existing South African MPAs were promulgated between 1964 and 1994 during the height of the Apartheid regime (Sowman and Sunde 2018), and their establishment was associated with racially motivated removals of black communities from their traditional lands and fishing grounds (Sowman and Sunde 2018). Over the last 30 years, the management of marine resources has conceptually moved from a top-down, isolationist approach to marine

resources and sectors, to a systems-oriented multi-stakeholder approach (Pfaff et al. 2019). A suite of environmental laws passed during the transition to democracy require redress and equitable access to resources (Sowman and Sunde 2018). Yet, in practice the continuing top-down, state-driven decision-making processes for the identification and designation of MPAs have resulted in negative impacts on local fisher groups (Sunde and Isaacs 2008, Sowman et al. 2011, Gammage et al. 2017, Sowman and Sunde 2018, Colenbrander 2019). Sowman et al. (2011) believe that the issue of removing people's rights to using and accessing marine resources and areas, is as of equal concern now, as it was when marine reserves and sanctuaries were first established the mid-1900s. This is especially distressing given the progressive nature of the South African constitution and the national environmental legislation (Sowman et al. 2011).

There are several progressive legal provisions and statutes that emphasise the need for benefits of protected areas, equitable access to resources, and participation in the management and decision-making processes relevant to coastal and marine resources (Sowman et al. 2011). The legislative framework in place promotes co-operative governance and forms a basis for participatory decision-making and benefit sharing (Sowman et al. 2011). However, despite the understanding that the socio-economic needs of neighbouring communities should be recognised and incorporated into MPA planning and governance, there is limited evidence of this taking place on the ground (Sunde and Isaacs 2008, Sowman et al. 2011).

Despite the negative social outcomes of the narrow perspective of MPAs, the natural science discourse continues to dominate MPA identification, planning, and decision making (Sowman et al. 2011). Ecological and fisheries management goals have been used to justify the proclamation and expansion of South African MPAs since the 1970s (Sowman et al. 2011). However, it can be naïve to make the assumption that an MPA will be respected by the small-scale fishers who have been dispossessed by arguing that MPAs will benefit them in the long term (Sowman et al. 2011). In fact, the assumption that MPAs will enhance compliance is false when the MPA is not considered legitimate in the eyes of the resource users (Sowman et al. 2011). Instead, it is important to understand how the socio-economic and political context may also impact on resource user's relationships with MPAs.

Research on South Africa's small-scale fisheries highlights the importance of social justice in enhancing compliance, with an understanding of the socio-economic, political and institutional issues that influence a fisher's decision-making, being vital as well (Hauck 2009, Sowman et

al. 2013). South African marine ecologists have acknowledged the role of resource users in identifying and designing MPAs, in addition to the need to address conflicts regarding access. Yet, in reality, traditional fishing communities have rarely been able to influence decisions regarding their activities in MPAs, due to the power of the scientific community in governance agreements (Sowman et al. 2011). The loss of tenure rights amongst already marginalised communities neighbouring MPAs, has led to increased food insecurity and lower household income (Sowman and Sunde 2018). The threats faced by South Africa's marine ecosystems have the potential to deepen inequalities and reduce the wellbeing of coastal communities, making the understanding of cross-scale trade-offs an important research opportunity.

2.2.1. The legislative seascape of South Africa

The Bill of Rights in the South African Constitution guarantees everyone to the right to an environment that is neither harmful to their health nor their wellbeing (RSA 1996), this is especially relevant to fisheries law (Witbooi 2006). The government is required to protect the environment for present and future generations – this includes the prevention of environmental degradation and pollution, promotion of conservation and the ecologically sustainable use and development of natural resources, while simultaneously promoting justifiable social and economic development (RSA 1996, Cochrane et al. 2015). The Marine Living Resources Act was passed in 1998 and outlined the objectives and principles for fisheries management (RSA 1998, Cochrane et al. 2015). Whilst it was positively regarded by some (for example Witbooi 2006), others were less enthused (Cochrane et al. 2015). Sowman (2011) stated that many traditional and small-scale fishers had been marginalised by the MLRA due to it's narrow interpretation of subsistence fishing, and that this and implications for other aspects of the constitution including human rights, equity, and food security. This argument had previously been raised in the case of George and Others vs the Minister (2005), with the main focus on three core rights enshrined in the constitution: the right to equality, the right to a livelihood, and the right of access to food (Isaacs and Witbooi 2019). In May 2007, it was agreed that the Minister was required to develop a policy which addressed the needs of small-scale fishers (Isaacs and Witbooi 2019). In June 2012, the Policy for the Small-Scale Fisheries Sector (SSFP) was adopted; it is intended to allow for fishers and their communities to be allocated rights to ensure equitable access to marine living resources (DAFF 2012, Cochrane et al. 2015). The Marine Living Resources Amendment Act was passed in May 2014 to allow for the enactment of the SSFP (RSA 2014a, Cochrane et al. 2015). This amendment included changes

to definitions, expansion of the MLRA's objectives and principles, and the outlining of measures, powers, and duties related to small-scale fishing (Cochrane et al. 2015).

In February 2009, the Integrated Coastal Management (ICM) Act (RSA 2009) was enacted, specifically aimed at managing complex coastal and marine environments, as well as addressing past injustices by awarding the ownership of the coastal land to citizens and promoting sustainable access to the coast and the free ecosystem services it provides (Celliers et al. 2009, DEA 2015).

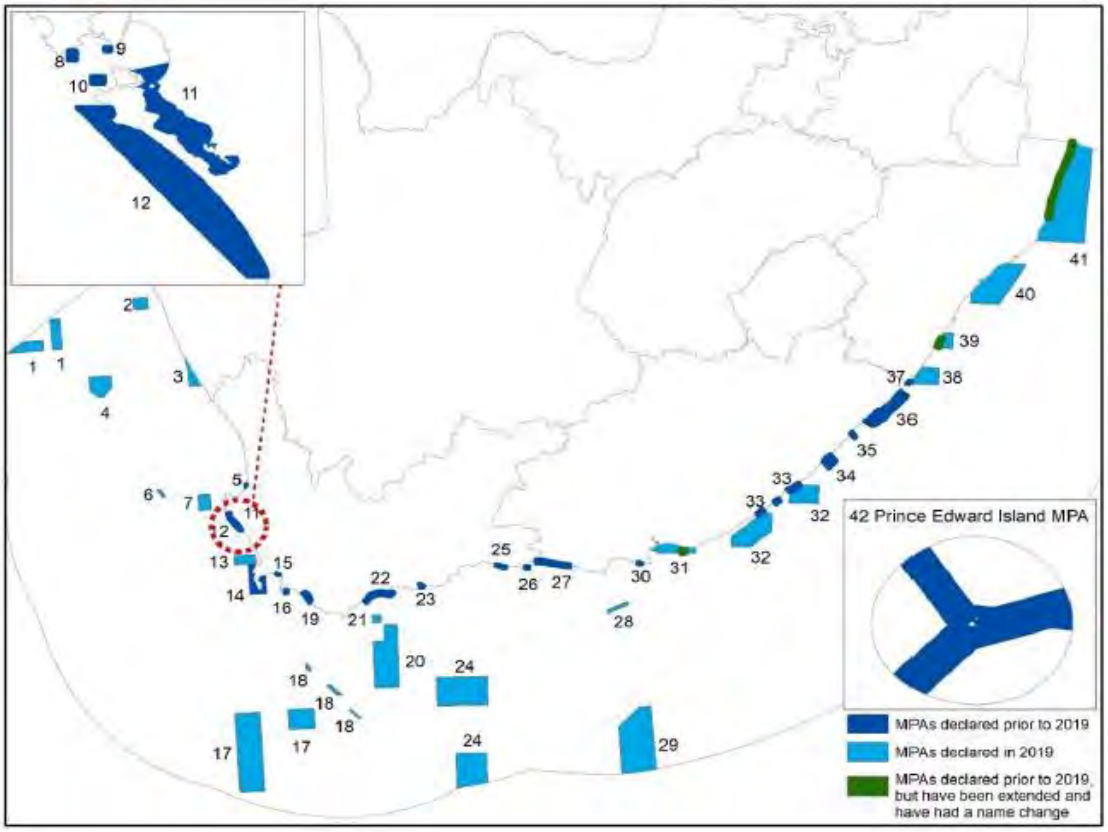
The mandate for fisheries and the implementation of the MLRA was held by Marine and Coastal Management and the Department of Environmental Affairs and Tourism, subsequently the Department for Environmental Affairs (DEA), until 2010 (Cochrane et al. 2015). In February 2010, Marine and Coastal Management's functions and powers for fisheries were assigned to the Department of Agriculture, Forestry, and Fisheries (DAFF), whilst those regarding MPAs and the implementation of the Integrated Coastal Management Act were transferred to the DEA (Cochrane et al. 2015). It was only in 2013 that further clarity on the allocation of functions and powers was provided to the ministers of DEA and DAFF – the DEA was responsible for all aspects of the MLRA pertaining to MPAs, however the DAFF was still given responsibility for registering and issuing all permits and rights for fishing within MPAs (Cochrane et al 2015. The legacy of confusion after the dissolution of the Marine Coastal Management remains to this day and has gone on to impact on the governance of South African MPAs (see Chapter Three). In 2014, the National Environmental Management: Protected Areas Amendment Act gave the Minister of Environmental Affairs the authority to declare an MPA – however the Cabinet member responsible for fisheries must be consulted before any declaration and zoning within the MPA (RSA 2014b, Cochrane et al. 2015)[3].

Other key legislation includes the Marine Spatial Planning Bill (Centre for Environmental Rights 2018). In June 2019, the DEA was merged with Forestry and Fisheries, and was renamed Department of Environment, Forestry, and Fisheries (DEFF) As this institutional change was made after the data for this project was collected, and the focus of this study is the use of a spatial resilience lens rather than an in-depth, holistic study of South African marine governance, it does not affect the integrity of the study.

[3] For a full explanation of South African marine legislation see: Taljaard, S., van Niekerk, L. and Weerts, S.P., 2019. The legal landscape governing South Africa's coastal marine environment–Helping with the 'horrendogram'. Ocean & Coastal Management, 178, p.104801.

2.2.2. The Marine Protected Areas

South Africa's MPAs are currently distributed between seven main provincial conservation agencies: CapeNature, Eastern Cape Parks and Tourism Agency, Ezemvelo KZN Wildlife, iSimangaliso Wetland Park Authority, South Africa National Parks (SANParks), the City of Cape Town and Nelson Mandela Bay Metropolitan Municipality. In 2018, 16 additional MPAs were approved for declaration and were proclaimed under the Protected Areas Act in 2019, the number of South African MPAs went from 26 to 42, furthermore, some existing MPAs were expanded or merged and then expanded (Figure 2) (Sink et al. 2019). The protection of South Africa's marine environment around the mainland rose form <0.5 % (~ 4 900 km2) in 2018 to 5.4 % (57 900km2) in 2019 after the proclamation of the new MPAs (Sink et al. 2019). Prior to 2019, there were 25 mostly coastal MPAs along the coastline, with only 20 % of marine ecosystem types being Well Protected and 47 % Not Protected; currently 87 % of the 150 marine ecosystem types are represented in the MPA network – there are now 30 coastal MPAs (Sink et al. 2019).



1. Orange Shelf Edge	15. Helderberg	29. Port Elizabeth Corals
2. Namaqua Fossil Forest	16. Betty's Bay	30. Sardinia Bay
3. Namaqua NP	17. Walker Bay	31. Addo Elephant NP
4. Childs Bank	18. SE Atlantic Seamounts	32. Amathole
5. Benguela Mud	19. Browns Bank Corals	33. Amathole Offshore
6. Cape Canyon	20. Agulhas Mud	34. Dwesa-Cwebe
7. Rocherpan	21. De Hoop	35. Hluleka
8. Malgas Island	22. Stilbaai	36. Pondoland
9. Marcus Island	23. Agulhas Bank Complex	37. Trafalgar
10. Jutten Island	24. SW Indian Seamounts	38. Protea Banks
11. Langebaan Lagoon	25. Goukamma	39. Aliwal Shoal
12. Sixteen-mile Beach	26. Robberg	40. Uthukela Banks
13. Robben Island	27. Tsitsikamma	41. iSimangaliso
14.Table Mountain NP	28. Agulhas Front	42. Prince Edward Islands

Figure 2. Map and list of South Africa's Marine Protected Area network (adopted from Sink et al. 2019)

2.3 Study Site: Table Mountain National Park Marine Protected Area

Table Mountain National Park Marine Protected Area was selected as the local scale case study for this thesis. The Table Mountain National Park Marine Protected Area (TMNP MPA) is located in Cape Town, South Africa, with an area of 1000km^2. The MPA encompasses part of the Cape Peninsula and is influenced by two major oceanic systems with the colder waters from the Atlantic Ocean on the west and the warmer waters of the Indian Ocean on the east (Figure 1). The eastern side of the peninsula forms part of an area known as False Bay. There is highly diverse flora and fauna, with numerous endemic species found in the marine environment. As a result, over 100 species, ranging from shellfish to seaweed, are harvested for commercial and recreational use (including West Coast rock lobster, abalone, and line fish). The management of TMNP MPA is administered through an agreement between SANParks, the DEA, and the DAFF, which gives SANParks enforcement powers regarding fisheries-related crimes (Pfaff et al. 2019). The harbours and landing sites are overseen by representatives of the Department of Public Works, DAFF, the City of Cape Town, and the National Treasury (Pfaff et al. 2019). Issues concerning the management of waste, beach access and amenities, and management boundaries are the mandate of local authorities (Pfaff et al. 2019). Limited resources and capacity in fulfilling their respective responsibilities has resulted in a highly sectoral based approach to marine governance in the area (Pfaff et al. 2019). However, there are various local government initiatives that are working towards a more co-ordinated and integrated approach to governance (Pfaff et al. 2019).

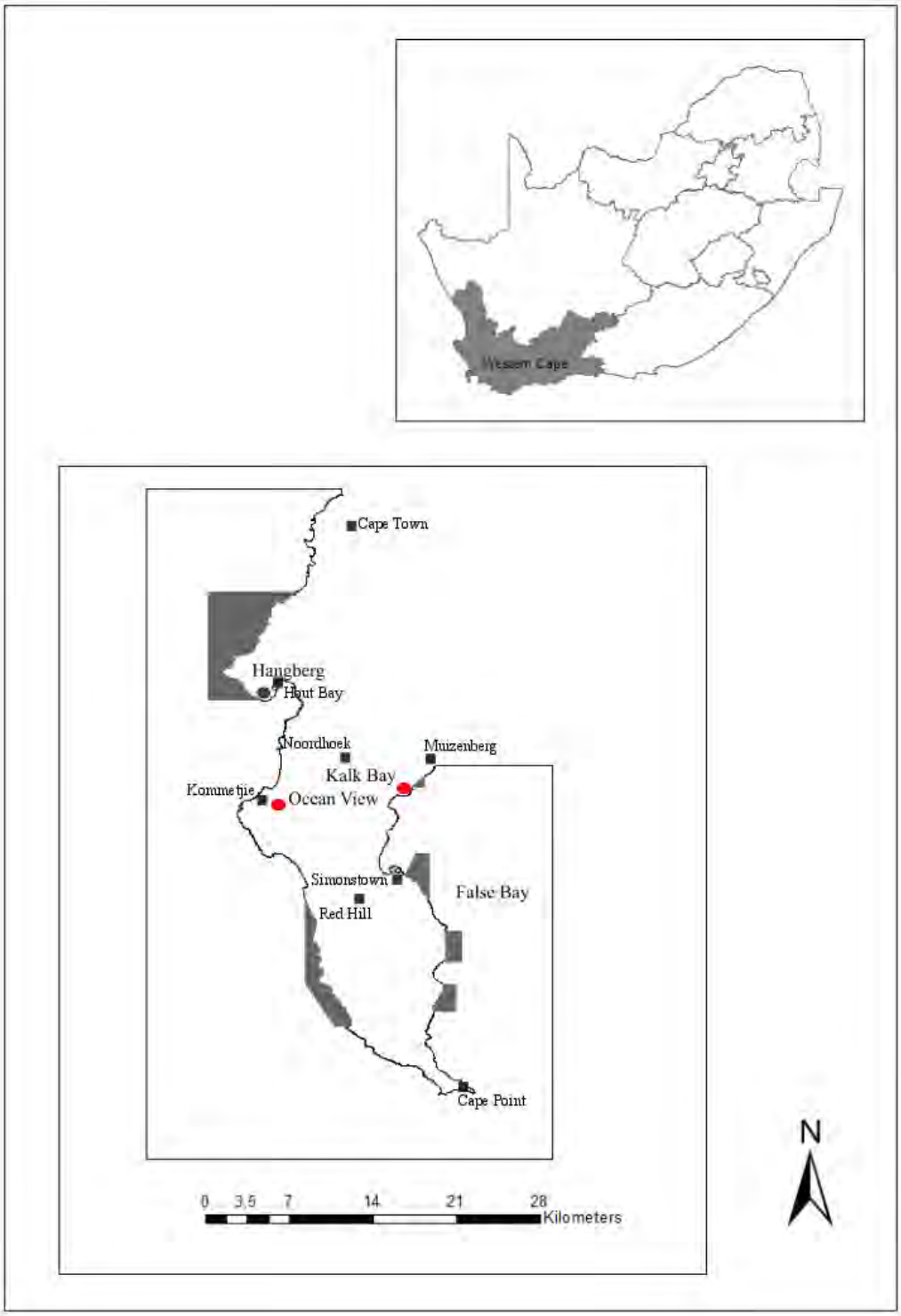


Figure 1. Map of Table Mountain National Park Marine Protected Area, target communities Hangberg, Kalk Bay, and Ocean View (red circles), and surrounding areas (black squares). Grey areas represent "no-take" zones and the enclosed white area allows controlled fishing in the Table Mountain National Park Marine Protected Area.

The MPA was established in 2004 under the authority of SANParks and consists of both controlled and no-take zones. The park's mission is "…to play an active role in facilitating access and contributing towards sustainable economic development and poverty alleviation within the disadvantaged communities of Cape Town" (SANParks 2015, pg. 20). The four aims of the park - for both marine and terrestrial systems – are as follows:

1. Protect areas of national and international important biodiversity, scenic areas, and cultural heritage sites;
2. Prevent exploitation or occupation inconsistent with the protection of the ecological integrity of the area;
3. Allow spiritual, scientific, educational, recreational, and tourism opportunities which are environmentally compatible; and
4. Contribute to economic development (SANParks 2015).

Three fishing communities were identified through consultation with the TMNP MPA management team: Hangberg (Hout Bay), Ocean View, and Kalk Bay (Figure 1)[4]. Hout Bay is in the north-western area of the peninsula and is often described as an area with high levels of poaching and increased unemployment and poverty levels – here you find contrasting levels of economic groups living side by side (Sowman and Sunde 2018). Ocean View is a community on the western side of the peninsula with high levels of poverty and is a relatively younger fishing community, with many fishing families from Simonstown, Noordhoek, and Redhill being forcibly relocated during Apartheid (Isaacs 2013). Kalk Bay is in the east of the peninsula, along False Bay, and has a rich fishing history, providing a source of food since the time of the indigenous inhabitants of the Cape, the KhoiKhoi (Walker 2002). Whilst these are three distinct communities, it should be noted that the fishing crews tend to operate along the whole peninsula and sometimes beyond depending on the best fishing grounds at the time (i.e. during the time of data collection many crews were in Lambert's Bay, over 250 km north of Cape Town city).

Commercial line-fishing in the MPA, and along False Bay, has had little change in approaches for over 300 years and consists mainly of baited hand-line fishing (Pfaff et al. 2019). In contrast, landing composition has changed dramatically over the last three decades; in the 1990s, approximately 30 % was Snoek (*Thyrsites atun*), 10 – 15 % was Hottentot

[4] For more detail on the history of MPAs in South Africa and the fishing community of Hangberg see Sowman et al. (2011) "Marine Protected Area Management in South Africa: New Policies, Old Paradigms".

(*Pachymetopon blochii*), Kob (Argyrosomus spp.), and White Stumpnose (*Rhabdosargus globiceps*), while Roman (*Chrysoblephus laticeps*), Yellowtail (*Seriola lalandi*), and Geelbek (*Atractocion aequidens*) contributed < 5 % each; in 2010 – 2013, Snoek constituted more than 90 % of the reported catch, with Hottentot, Yellowtail, Geelbek, and White Stumpnose making up the rest (Pfaff et al. 2019).

Recreational fishing is now the most valuable and largest fishing activity in False Bay, mostly taking the form of boat and shore-based angling, spearfishing, and cast netting (Pfaff et al. 2019). The eastern side of the Cape Peninsula (i.e. from Muizenberg to Cape Point) is a popular item on international tourist itineraries (Pfaff et al. 2019). The penguin colony at Boulders Beach in Simonstown brought in an estimated R19 million between the mid-1990s and 2010 (Lewis et al. 2012), while activities such as shark cage diving and whale watching contributed approximately R29.5 million and R1.6 million respectively (DEA unpublished data, Pfaff et al. 2019).

2.4. The system of interest

The system of interest in this project can be understood as a partially nested system with porous boundaries, whereby each component has both horizontal/internal interactions, as well as vertical/cross-scale interactions which may permeate several levels. Scale is the dimension used to study or measure any system; it can consist of spatial, temporal, analytical, or quantitative dimensions (Gibson et al. 2000, Cash et al. 2006). Units of analysis at different positions on a scale are known as levels (Gibson et al. 2000, Cash et al. 2006). The relevant scales for this study are spatial, jurisdictional, institutional, and knowledge (Figure 3).

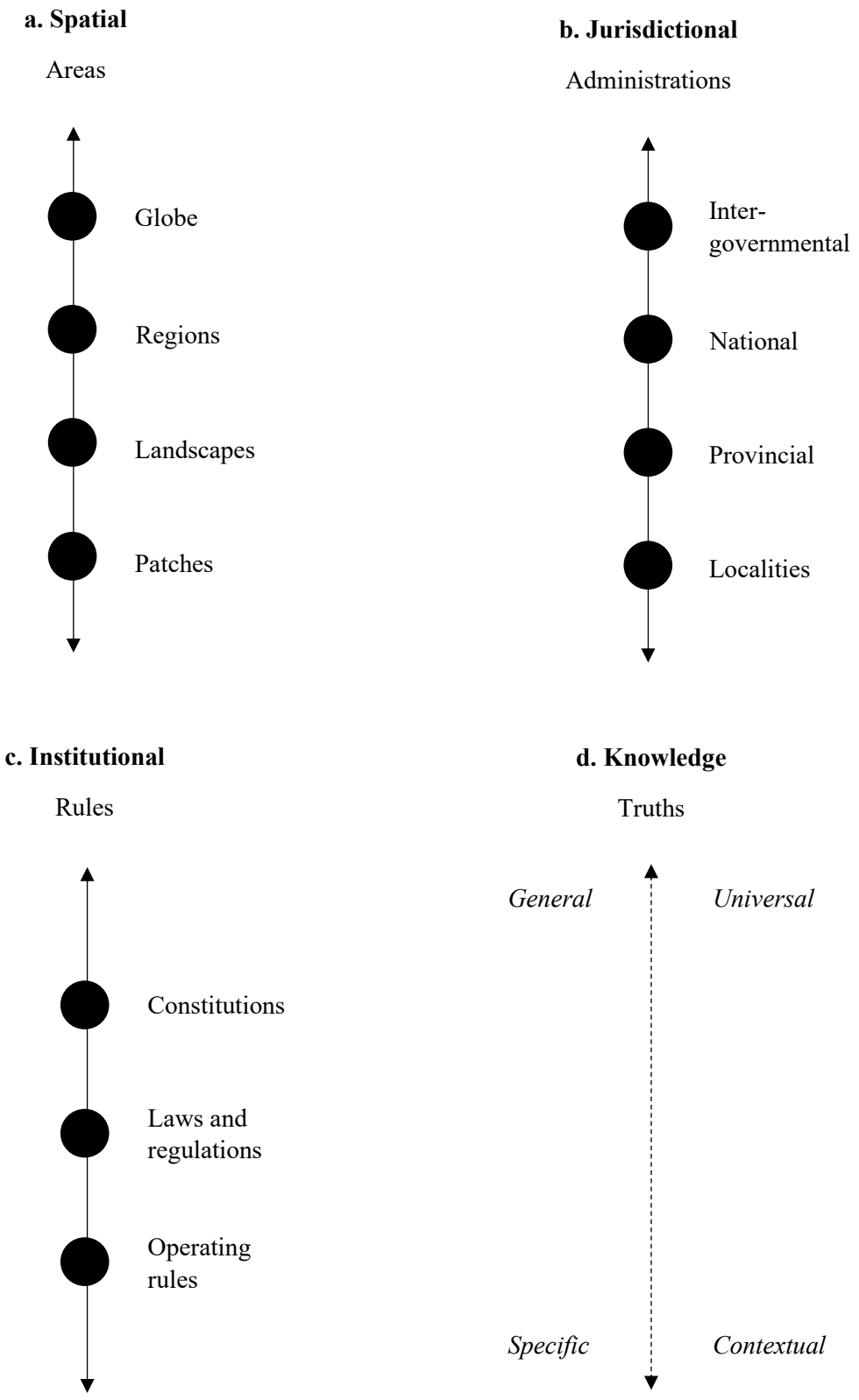


Figure 3. Schematic of the scales (bold and arrows) and levels (circles) that are relevant to this study. Adapted from Cash et al. (2006)

The spatial scale consists of the environmental, ecological, and geophysical phenomena that occur over a range of levels (Figure 2a) (Cash et al. 2006); in this study, I focus on the distribution of various species across habitats. A jurisdictional scale is closely related to a spatial scale, as they are clearly defined by boundaries and organised by political units (Cash et al. 2006); for this project, I focused on the national (i.e. DEA and DAFF), provincial (i.e. municipal DEA and DAFF branches, and park authorities), and local (park authorities and communities) levels (Figure 2b). The linkages between these levels are created by institutional arrangements, ranging from constitutions, to decision-making processes, to basic operating rules and norms (Figure 2c) (Cash et al. 2006). Finally, I consider knowledge as a scale. There are two key gaps: the first is the difference between highly generalised (and generalisable) knowledge that is produced by formal science and the practice-based knowledge embedded in local ecological knowledge and traditional ecological knowledge (Cash et al. 2006). The second gap lies in knowledge of processes at a large-scale, which can often only be applied by accepting a lower resolution and the fact that general processes are being applied to context-specific local situations (Figure 2d) (Cash et al. 2006).

In the following chapters I investigate the cross-scale and cross-level interactions in marine governance in South Africa (Chapter 3), focusing on the jurisdictional and knowledge scales while remaining cognisant of the other scales. Chapter 4 questions the effect of scales and levels in the Table Mountain National Park MPA; I actively engage with all four scales.

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Chapter 3

Abstract

The number and coverage of MPAs is increasing around the world. In 2011, 193 countries agreed to "effectively and equitably" manage coastal and marine areas as part of the 2011 Aichi Targets. However, there has been a long history of disappointments in various areas of governance due to a failure to take cross-scale and cross-level interactions into account in management, policies, and assessments. In this chapter, I analysed the social network of the South African marine governance system by first identifying the links between the different actors (namely the DEA, DAFF, Park authorities, and communities); next I carried out a thematic analysis of important factors that affect relationships between the actors across levels and scales. This information was extracted from semi-structured key expert interviews. The themes included government departments and marine legislation, management level factors, communication and information sharing, local level factors, biophysical factors, and scale. Communication and information sharing was the most referenced theme (40.26 %), however it also contained the most categories within the theme. The relationships between the communities and other actors contributed 67.27 % to the total number of references, 91 % of which were from the following themes: communication and information sharing, local level factors, biophysical factors, and scale. The thematic analysis results and a visualisation of the structure of the governance system indicate that weak, top-down relationships dominate the governance system in South Africa.

Keywords: Cross-scale, Cross-level, Marine governance, Social network analysis, South Africa

3.1. Introduction

Increasing awareness of the impact humans have on marine biodiversity around the world has prompted history's largest expansion in the coverage and number of MPAs (Lubchenco and Grorud-Colvert 2015, UNEP-WCMC and IUCN 2016, Gill et al. 2017). In 2011, 193 countries agreed to "effectively and equitably" manage coastal and marine areas through the use of MPAs as part of the 2011 Aichi Targets (Secretariat of the CBD 2011). However, failure to take cross-scale and cross-level dynamics in social-ecological systems (SES), including MPAs, into account, has resulted in a long history of disappointments in various areas of governance including management, policies, and assessments (Cash et al. 2006, Millennium Ecosystem Assessment 2005).

Governance can be understood as the structures and processes through which human communities shape behaviours, identity, incentives, and decision making; distribute power; interact with one another; and influence outcomes (Tai 2015). Governance involves stakeholders and actors, formal and informal institutions, and various decision-making processes and actions (Lemos and Agrawal 2006, Lebel et al. 2006, Tai 2015). Cross-scale and cross-level dynamics are a core issue for governance of SES in complex, multi-scale, and multi-level contexts (Berkes 2006, Armitage 2008, Tai 2015). An example of a cross-scale interaction is when the spatial scale is influenced by the jurisdictional motivations behind an intervention, i.e. large-scale MPAs are increasingly being established to meet global targets (Leenhardt et al. 2013, Ban et al. 2017). Cross-level dynamics concern the units of analysis on a single scale, for example one could look at knowledge transfer from local fishing communities has been used to inform regional management interventions (for example Azzurro et al. 2019 and da Silva et al. 2020), whilst the transfer of regional fishing patterns can be contextualised to be more relevant to fishers who operate within a smaller geographical area. Cash (2006) provides a useful illustration of the types of interactions between various cross- and multi- levels and scales (Figure 1). The terms multi -level and -scale indicate more than one scale or level without implying that there are important cross -scale or -level interactions (Cash et al. 2006).

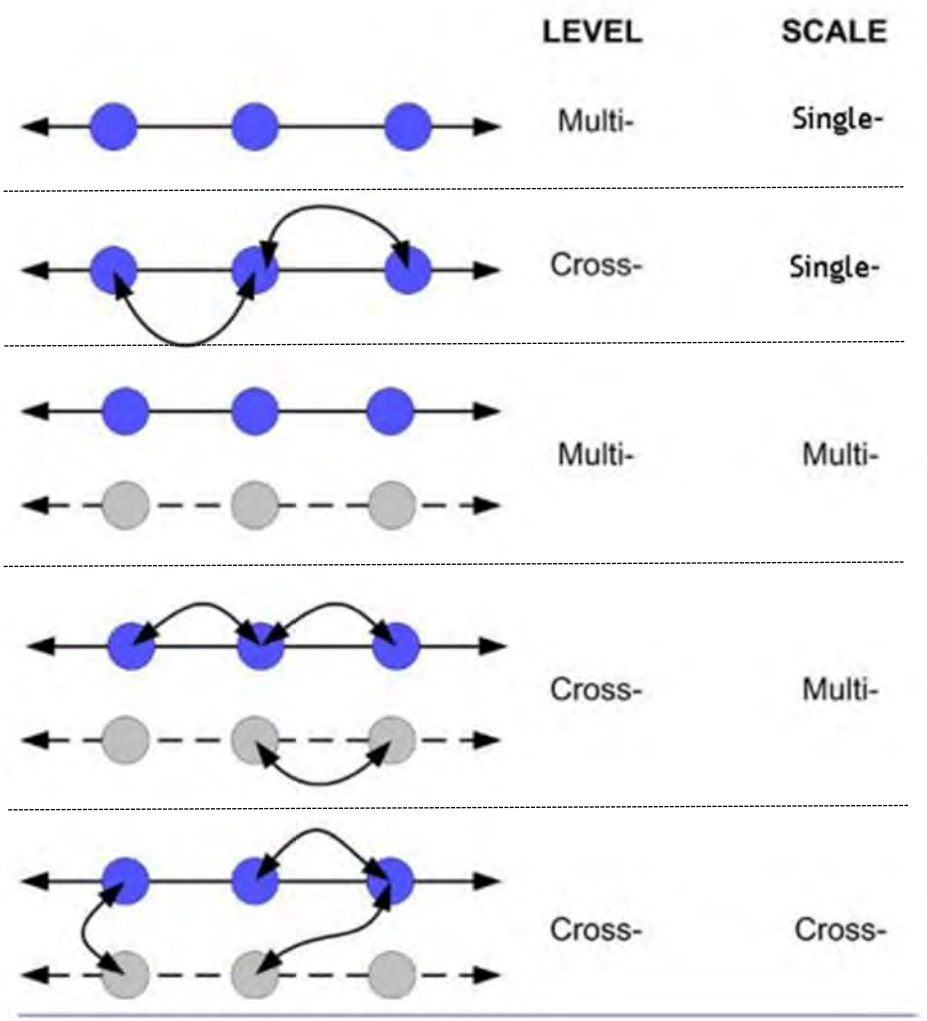


Figure 1. Schematic illustration of cross-level, cross-scale, multi-level, and multi-scale interactions. Interactions (short arrows) can occur across or within scales (horizontal arrows) and can result in considerable complexity in system dynamics. Interactions among levels (circles) within a scale are "cross-level" interactions, whilst interactions across different scales are "cross-scale".

Many scholars have highlighted the need for scale- and level- sensitive approaches to governance, calling for a more in-depth understanding of the complex feedbacks and processes associated with scale-based issues (Cash et al. 2006, Berkes 2006, Wilson 2006, Young 2006, Armitage 2008, Termeer et al. 2010, Tai 2015). One way to understand these processes is to conceptualise the system as a social network with nodes and links (Bodin et al. 2019). In many cases, the interactions and behaviours of nodes in a social network are influenced by their spatial location (Bodin et al. 2019). Nodes that are in close geographical proximity are more likely to interact than those that are far apart (Cumming et al. 2010), as face-to-face contact eases the sharing of knowledge (Storper and Venables 2004, Berge 2017) and increases the likelihood of meaningful collaborations (Catalini 2018). Furthermore, people in locations that

are close to each other are more likely to share values, language, and culture; however, it is important to note this is not always the case (Cumming et al. 2010). Therefore, geographic distance and location influence social networks and can potentially have important impacts on SES (Storper and Venables 2004, Cumming et al. 2010, Groce et al. 2018). In a spatial network, the broader network provides a set of constraints and opportunities that may have a large influence on local events (Bodin et al. 2006, Cumming et al. 2010). Simultaneously, local activities may have knock-on effects that can alter the network from within (Bodin et al. 2006, Cumming et al. 2010). The analysis of scale mismatch with social (and social-ecological) network analysis is relatively new and tends to focus on single governance levels (for example local municipalities) (Sayles and Baggio 2017). However, single-level network analysis often fails to represent the reality of resource management which occurs across levels, therefore, it is important to take a multi-level network approach (Sayles and Baggio 2017). This framing suggests that cross-scale and cross-level interactions can have an influence on the abilities of different bodies in implementing policy.

In this chapter, I analyse the relationships between stakeholders in South Africa's marine governance structure, whereby the DEA, DAFF, Park authorities, and communities are "nodes" and the "links" are the cross-scale and cross-level interactions between the nodes (Groce et al. 2018). As the links are not the same, I qualify the difference as either cross-scale or cross-level. Nodes often operate at different spatial scales, i.e. national government makes decisions at a national level, whilst a body like SANParks operates at both national and local scales (Anderies et al. 2018) This means their priorities and the relationships will be different. However, decisions made at a national level need to be applicable at the local level – this will be affected by the local context such as community beliefs and the state of the ecosystem (Anderies et al. 2018). External players, such as NGOs and consultants, may impact on the functioning of the governing system – and often operate across scales.

Management of South Africa's marine resources has conceptually evolved from an isolationist, top-down approach to resources and sectors, to a multi-stakeholder, systems-oriented approach over the last 30 years (Pfaff et al. 2019). However, changes in the reorganisation of legislative responsibilities of national level government departments has resulted in challenges for both the provincial and local levels (Chadwick et al. 2014). The complicated structure of the various governing bodies (i.e. DAFF, DEA, and the Park authorities) has resulted in difficulty enforcing policies (Chadwick et al. 2014). The change to a systems-based approach, whilst simultaneously employing a spatial approach to management, makes South Africa a good

context to use a spatial resilience lens to help identify cross-scale and cross-level misalignments. Conversely, the adaptive, spatial framing that results from a spatial resilience lens means that it can potentially help identify and investigate the cross-scale and cross-level alignments and misalignments of South Africa's marine governance structure.

By understanding the cross-scale and cross-level interactions between management levels and players in governing South Africa's MPAs, I ask whether a spatial lens can contribute to the understanding of challenges in implementing marine policies. This chapter interrogates the connections between the DEA, DAFF, Park authorities, and communities for two main reasons: firstly, to understand the cross-scale links between the nodes, and secondly, potentially identify what influences these links. The first section of results consists of a thematic analysis of key expert interviews. I identify the key actors, interactions, and the nature of the key interactions. The thematic analysis contributes to the thesis' overarching question by identifying potential sources of disconnect or misalignment in the governance structure, as well as any spatial themes. In the second part of the results, I combine results from the thematic analysis and descriptions from the interviews to develop a diagram of the governance structure and the general relationships between the various stakeholders. This diagram condenses the information from the analysis, while also considering the spatial levels and external actors that may influence the governance structure. As marine policy often includes explicit references for multi-stakeholder involvement – which requires cross-scale and cross-level interactions – interrogating the links between the nodes may highlight some of the processes that drive the implementation gap, rather than focussing on the structure, thus further contributing to our understanding of why there is an implementation gap and ways in which to address it.

3.2. Study site

Please refer to Chapter 2 – Study Site

3.3. Methods

I conducted eight semi-structured interviews with experts over the phone on South African marine policy in February 2019. Ethical clearance was obtained from Rhodes University, and research permits were obtained from Cape Nature, Eastern Cape Parks and Tourism Agency, Ezemvelo KZN Wildlife, and SANParks (Appendix A). Experts were identified as individuals who have worked with or researched MPAs and/or marine legislation for at least ten years during which the DEA and DAFF existed; this was done through the analysis of published articles, research directories, and a snowball technique whereby individuals were asked to

recommend further contacts in the initial invite, in further correspondence (even if they could not be interviewed themselves), and at the end of the interview (MacKeracher et al. 2018). All experts were either associated with a government department (2), park authority (2), or a research institute (4). Over 24 individuals were contacted (and followed up with) for interviews, however only eight were available – this is possibly due to the fact that the timing of the interviews coincided with the final writing period for the 2018 National Biodiversity Assessment. Furthermore, due to time limitations, I was not able to expand the pool of experts – the consequences of this is discussed in more detail in section 3.5 in this chapter. All participants were asked to provide informed consent before the interview began having been assured anonymity and were able to either skip questions they were not comfortable with or end the interview at any time; all participants completed the whole interview. The interviews were recorded and transcribed at a later date.

The purpose of the interviews was to consult a varied collective concerning the legislative and administrative structure of marine governance in South Africa, thus understanding the relationships between departments operating at different scales and levels. Each interview focused on three key areas: i) the effectiveness of the National Environmental Management: Protected Areas Act and how it is represented in policy, ii) the organisation of departments and stakeholders such as NGOs, and iii) how park management and regulation enforcement are aligned with the national level legislation. The National Environmental Management: Protected Areas Act is the overall guiding piece of legislation for MPAs, therefore it served as a useful platform to begin discussing marine governance in terms of MPAs in a general way. It also looked at the role of the national level departments DEA and DAFF within the context of other national government departments. The organisation of departments and stakeholders served to identify the links between them and led to a discussion concerning the nature of the relationships - in some cases this was also where experts identified areas where there should have been a relationship, but there seemingly wasn't. By asking how national legislation and management aligned, experts were encouraged to consider the system as a whole and were able to identify links that ranged across multiple levels and scales. Information from the interviews focused on the cross-scale and cross-level links between the different bodies.

Experts were identified based on their knowledge of, and the levels and scales they interact with marine policy, in order to gain a representative understanding of the connections and relationships between different bodies that contribute to marine governance at a national to local scale. The following were interviewed: a marine law professor, a marine policy

consultant, a DEA representative, researchers, a SANParks' MPA manager and marine scientist, and a government appointed fishing community "caretaker"[5]. In cases such as the marine law professor and the community caretaker, their focus is mainly at one scale – i.e. the professor is involved with national and international legislation, whilst the community caretaker is involved directly with the local community and permitting issues. Other experts operated across several levels and scales either directly (e.g. DEA representatives or SANParks representatives), or indirectly (e.g. researchers or marine policy consultants).

In order to further understand the relationships between the various stakeholders, I conducted a thematic analysis (Bazeley 2009, Guest et al. 2012). I took an exploratory approach to identify analytic categories, which were not predetermined and instead were derived from the data (Guest et al. 2012). Reoccurring key words and phrases were highlighted through a word-count analysis; words and phrases needed to occur at least 30 times in total (Guest et al. 2012). It is important to note that in identifying the themes, the entire interview was considered. However, in the later thematic analysis (as represented in the results section) the references were only recorded/counted if they were connected to an interaction between two or more nodes, for example the following statement would not have been included in the analysis at this stage as it does not relate to the relationship between stakeholders: "There needs to be an inclusion of estuaries in the MPA plans".

The analysis then moved beyond counting key words and phrases and focused on the explicit and implicit ideas within the interviews in relation to the key words and phrases – these became the themes (Guest et al. 2012). Themes were further divided into categories (i.e. good or poor communication, strong or weak relationships, etc.), by looking at the context in which the theme was mentioned. Themes can be understood as higher level, abstract concepts, whilst categories are the descriptive level of coding (Bazeley 2009). Appendix B contains the results of the word-count analysis.

I used the "describe-compare-relate" approach outlined by Bazeley (2009) to further analyse the importance of the themes. "Describe-compare-relate" is a three-step formula. "Describing" entails understanding how the theme relates to the context of the study and what the characteristics and boundaries of the theme are. "Comparing" themes considers who discussed the themes, in what context they mentioned it, and how it was discussed (i.e. positively or

[5] Caretakers are members of an area of a fishing community. They are normally the contact point for the DEA, DAFF, and NGOs. They are generally in charge of ensuring permits are applied for and distributed. They work with fishers as well as marketers.

negatively). It is also important to note who in the group did not mention the theme, as the absence may also provide insight into a theme's relevance at difference levels. The last step involves "relating" the findings of the theme to other themes identified in the study - this contributes to the interactions and feedbacks between the different themes and categories.

The following questions were used to help guide this analysis:

- How frequently did the theme occur?
- How was the theme communicated?
    - What was the nature in which the theme/category was referred to, i.e. positive, neutral, or negative?
    - What theme was the category referred to?
- How did the theme relate, or not, to other themes or categories?

The number of times the theme was mentioned and the nature in which it was portrayed (either positive, negative or neutral) was counted. As the questions can consider the links across organisational scales and levels, statements regarding two or more of the nodes (DEA, DAFF, Park authorities, and communities), were further analysed to understand the theme, category and nature of the interaction. A positive connection referred to interactions that were explicitly "positive", i.e. "there is generally good communication between park management and communities in smaller MPAs", or if a relationship was predicted to be constructive, i.e. "educational programmes could help with communication and this could improve the relationships". A statement was classified as neutral when the connection was neither deemed constructive nor destructive, for example, "In some ways the objectives of the protected areas act are entangled in the way park management operates on a daily basis." A negative statement spoke of interactions that undermined either one of the actors, or was an inherently weak link, for example, "The lack of trust between park management teams and communities is often due to a lack of openness…". The direction of this interaction/relationship was also recorded. Figure 2 provides two examples of how statements were analysed

1.

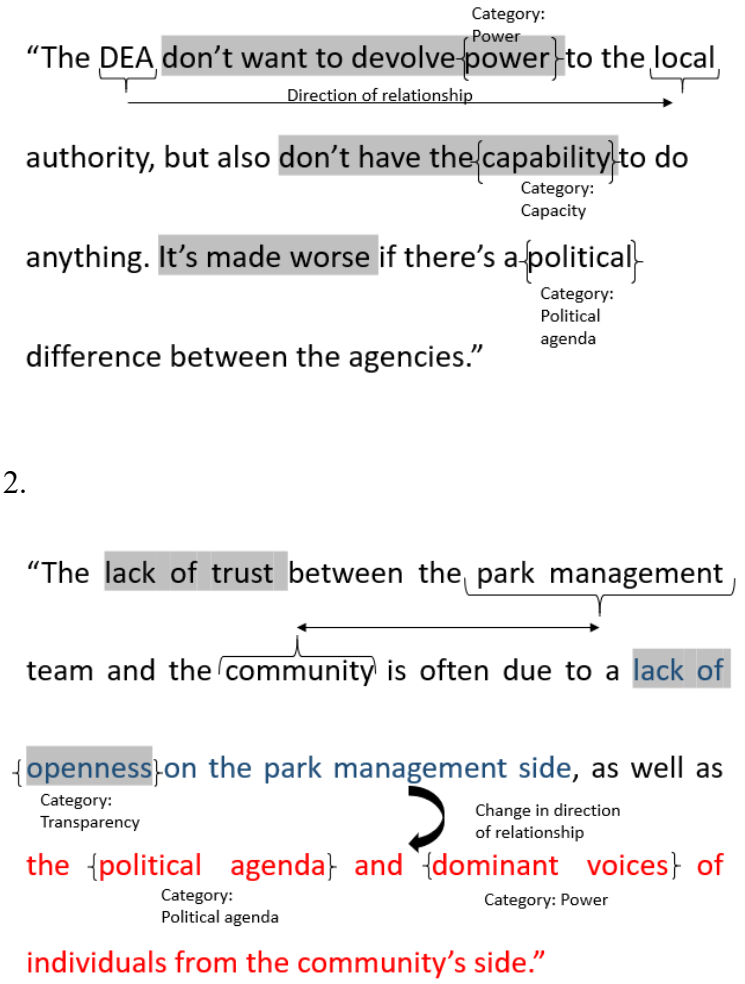


Figure 2. Two examples of how the statements were analysed according to category, nature (i.e. positive or negative), and relationship direction. Blue and red text highlight that the direction of the relationship being discussed has changed, i.e. goes from talking about park management to local communities. Highlighted text illustrates phrases that determine the nature of the relationship.

3.4. Results

3.4.1. Thematic analysis

Six themes were identified across various levels and a total of 34 categories were recognised (Table 1). The themes of "Management bodies and marine legislation" and "Communication and information sharing" had the greatest number of associated categories, eight and nine respectively. Community/neighbours, Park authorities, the DEA, and the DAFF were designated as nodes.

Table 1. Themes and corresponding categories identified during expert interviews. The nodes are identified with an asterisk (*).

Theme	**Categories**

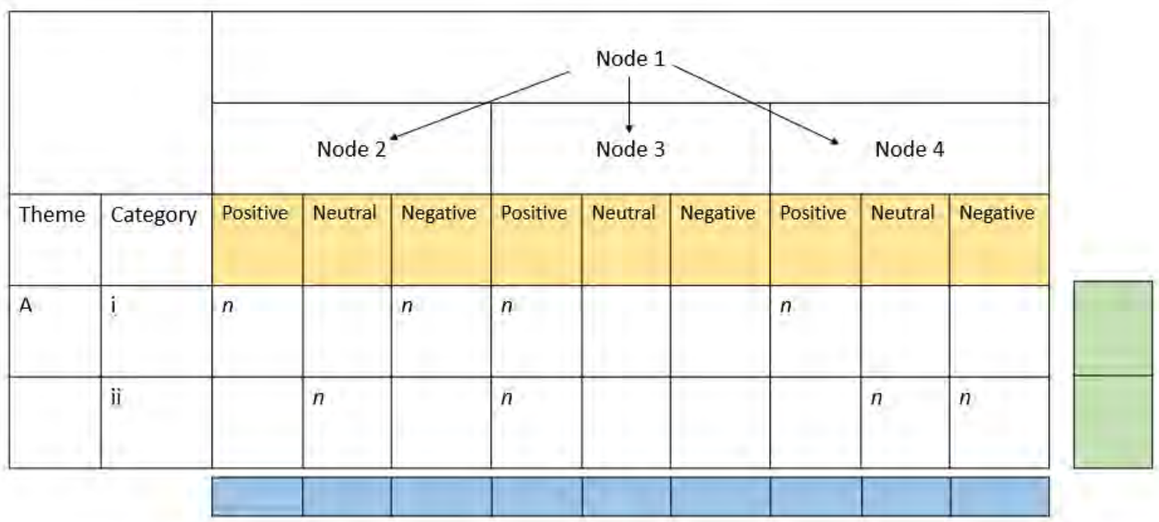
Management bodies and marine legislation	• Community/neighbours* • Park authorities* • DEA* • DAFF* • Other government departments • Marine Living Resources Act • National Environmental Management: Protected Areas Act • National Environmental Management Act
Management level factors	• Clear responsibilities • Budgets • Personnel capacity • Power • Political agenda
Communication and information sharing	• Co-operative governance • Transparency and accountability • Top-down interactions • Bottom-up interactions • One-way communication • Forums • Community engagement • Education and awareness • NGOs
Local level factors	• Local ecological knowledge (LEK) • Monetary/livelihood benefits • Community buy-in • Resource access • Historical context • User conflicts
Biophysical factors	• Biodiversity protection • Ecosystem function and life strategies • Spill-over effects • MPA size • MPA location
Other	• Scale

"Communication and information sharing" was the most common theme mentioned by the experts, making up 40.26 % of the references, and was highlighted when discussing all three governing bodies and the communities. The themes "Government departments and marine legislation" and "Management level factors" were mainly commented on when discussing the DEA, DAFF, and Park authorities (contributing to 9.87 % and 14.81 % of the references respectively), whilst "Local level factors" and "Biophysical factors" were more often associated with the Park authorities and communities (contributing to 18.70 % and 11.95 % of the references respectively) (Table 2).

The DEA was mentioned in 42.34 % of all thematic references. The DEA was related to the DAFF, Park authorities, and communities 23.93 %. 34.36 %, and 41.72 % respectively. DAFF was mentioned in 34.55 % of all thematic references, 23.31 % of which were in relation to Park authorities, while 47.37 % were in relation to communities. Park authorities were mentioned in 55.84 % of all thematic references, of which 59.53 % were in relation to the communities. The communities contributed to 67.27 % of all thematic references, and 91 % of these references were found at the lower level themes i.e. communication and information sharing, local level factors, biophysical factors, and scale (Table 2).

Table 2. Thematic analysis of categories that were used to describe the relationships between nodes across scales and levels. *Numbers represent the percentage contribution of the category to the description of the relationship and its nature (i.e. positive, neutral, or negative). Across the bottom is a scale of the percentage contribution of the nature of the links between two nodes to the overall description of the links. Along the right-hand side is a similar scale, this time representing the percentage contribution of each category to the overall description of the system's links. Please note that this is not a rank/measure of importance/influence of each relationship or category. The colours are linked to the authorities (DAFF is blue, Park authorities are yellow, Communities are orange, and the DEA is green).*

	Direction of relationship	DEA									DAFF									Park authority									Community									% contrib
		DAFF			Park Authority			Community			DEA			Park Authority			Community			DEA			DAFF			Community			DEA			DAFF			Park Authority			
Theme	Categories	Positive	Neutral	Negative	Positive	Neutral	Negative	Positive	Neutral	Negative	Positive	Neutral	Negative	Positive	Neutral	Negative	Positive	Neutral	Negative	Positive	Neutral	Negative	Positive	Neutral	Negative	Positive	Neutral	Negative	Positive	Neutral	Negative	Positive	Neutral	Negat	Positive	Neutral	Negative	
Government departments and	Other government departments		5.26				3.03																						2.70			3.23			1.79			9.87
	MLRA	5.26			3.03						5.00			9.09						4.35	8.70		5.56	11.11														
	NEM:PAA		5.26		3.03							5.00		9.09							8.70	4.35		11.11	5.56		2.78			2.70			3.23			1.79		
	NEMA				3.03									9.09							8.70			11.11			2.78											
Management level factors	Clear responsibilities		5.26	26.32			12.12			3.23	5.00	5.00	25.00			18.18			3.13		17.39			11.11		1.39												14.81
	Budgets						3.03																															
	Personnel capacity						3.03			3.23											4.35			5.56														
	Power				3.03		9.09							9.09													1.39									1.79		
	Political agenda			15.79			3.03			3.23			15.00						3.13		8.70			5.56		1.39			2.70			3.23			3.57		
Communication and information sharing	Co-operative governance	5.26		5.26	3.03		12.12	3.23		3.23	5.00		5.00	9.09		9.09	3.13		3.13	4.35	4.35		5.56		1.39			1.39	2.70			3.23			1.79			40.26
	Transparency and accountability			5.26			3.03			22.58			5.00			9.09			25.00		8.70			11.11		1.39		9.72		5.41			6.45		1.79		3.57	
	Top-down interactions						3.03												6.25							1.39		6.94										
	Bottom-up interactions																									1.39									1.79			
	One-way communication									16.13									15.63									5.56		2.70			3.23			3.57		
	Two-way communication						3.03	3.23		3.23						9.09	3.13			4.35			5.56		5.56	2.78		5.41	2.70		6.45		3.57					
	Forums			5.26			3.03			3.23			5.00			9.09			3.13		4.35			5.56	2.78	1.39	1.39		2.70			3.23			3.57		
	Community engagement						3.03																			2.78	1.39								1.79	1.79		
	Education and awareness									3.23			5.00						6.25							2.78		2.78	2.70	2.70		3.23	3.23	3.23	3.57	1.79		
	NGOs																									1.39			2.70	2.70		3.23	3.23		1.79	1.79		
Local level factors	LEK																													5.41			6.45			3.57		18.70
	Monetary/livelihood benefits							3.23				5.00														1.39	2.78	1.39	2.70	2.70	5.41		3.23	3.23	1.79	3.57	5.36	
	Community buy-in							6.45									3.13									4.17	1.39	2.78	5.41		2.70	3.23		3.23	5.36		3.57	
	Resource access																										1.39									3.57		
	Historical context									9.68									9.38									8.33		5.41			6.45			7.14	
	User conflicts																													5.41			6.45			3.57		
Biophysical factors	Biodiversity protection		10.53							3.23		5.00														1.39	1.39									1.79		11.95
	Ecosystem function and life strategies		5.26									5.00					3.13													5.41						3.57		
	Spill-over effects									3.23							3.13		3.13							1.39		1.39	5.41		2.70		3.23	3.57		1.79		
	MPA size																										1.39	1.39								1.79	1.79	
	MPA location						6.06		3.23									3.13									1.39	1.39		2.70	5.41		3.23	6.45		1.79	3.57	
Other	Scale						18.18			3.23						18.18			3.13					5.56			1.39			2.70			6.45			1.79		4.42
% contribution		0.52	0.52	3.90	0.52	0.78	7.27	1.30	0.26	6.49	0.78	0.26	4.16	0.52	0.78	2.08	1.04	0.52	6.75	0.52	1.82	3.64	0.52	1.82	2.34	5.45	3.90	9.35	2.60	1.30	5.71	1.56	1.30	5.19	3.90	2.60	8.05	



Interpreting the table

The node in the top row represents the dominant node (i.e. the direction of the relationship, shown by the arrows) in the relationship being described by the categories, i.e. Node 1's influence over Nodes 2,3, or 4.

The cells labelled "positive", "neutral", and "negative" (i.e. the cells shaded in yellow) denote the nature of the relationship between the nodes in the stated direction.

The number in the cells (i.e. *n*) represents the percentage contribution of the category, and nature of the relationship in a certain category to the description of the whole relationship. For example, *n* of the descriptions/references of the relationship between Node 1 and Node 2 were described as category i in a positive light.

Across the bottom is a scale (i.e. the blue cells) of the percentage contribution of the nature of the links between two nodes to the overall description of the links. For example, the positive relationship between Node 1 and Node 3 constituted *x* % of all of the interactions described.

The scale along the right side (i.e. the green cells) represent the percentage contribution of each category to the overall description of the system's links. For example, *y* % of the relationships were described under category ii.

The theme of "Government departments and marine legislation" shows a top-down relationship, i.e. the community is not identified as affecting or influencing the DEA or DAFF while the 66 % of the community interactions are affected by the actions of the DEA and DAFF (Figure 3): "National legislation does influence the park-user relationship… without the legislation, communities would be engaged even less" (Respondent 6). Of references to the issue of responsibility distribution, 50.02 % highlighted the relationship between the DEA and DAFF, often linking it back to the dissolving of the Marine and Coastal Management branch of the DEA and the allocation of fisheries (Marine Living Resources Act) and biodiversity protection (National Environmental Management: Protected Areas Act), to DAFF and the DEA respectively. "About 10 years ago, fisheries was moved from the DEA to DAFF, so then the DEA tried to manage the ocean with the exception of fish… this was totally out of alignment with the ecosystem itself" (Respondent 1). Another expert continued the sentiment of a misalignment between the government and ecosystem structures, stating "There were internal battles about what are DEA's and DAFF's responsibilities. Some marine issues don't fall neatly into their categories" (Respondent 4) (Table 2 and Figure 3 & 4).

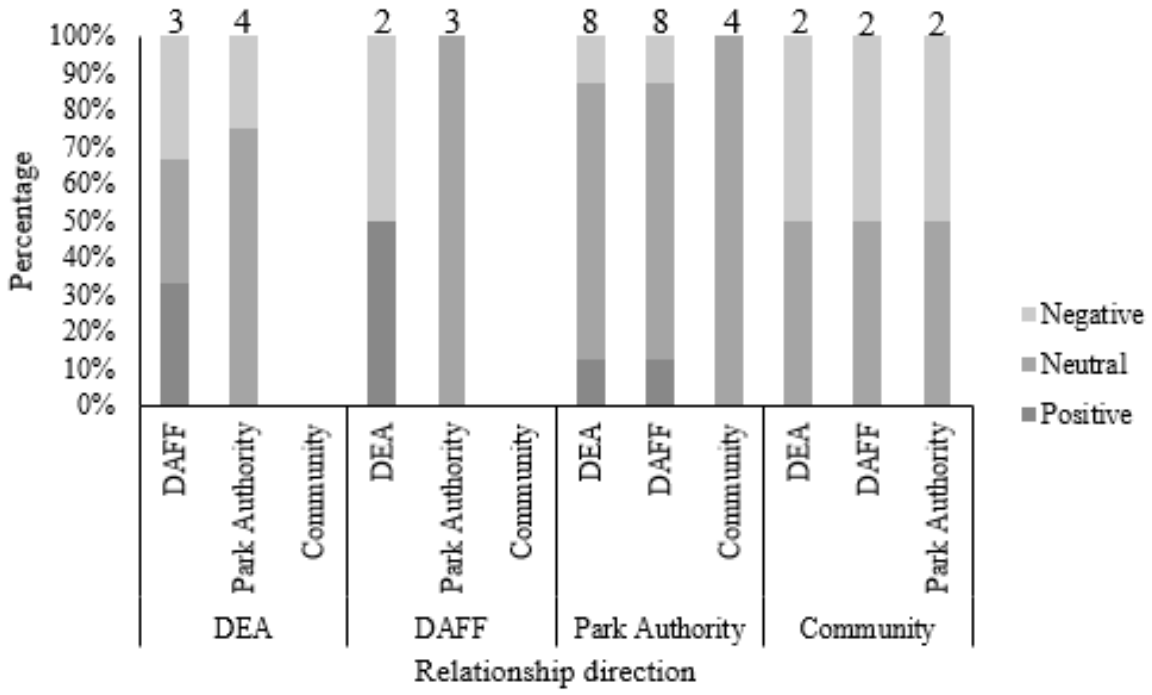


Figure 3. Percentage of the nature (positive, neutral, or negative) of the links between the DEA, DAFF, Park authorities, and communities according to the theme of "Government departments and marine legislation". Numbers above the bars state the number of times the theme was mentioned with regards to the interaction.

The vast majority (91 %) of references in the theme "Management level factors" centred around the links between the DEA, DAFF, and Park authorities (Figure 4). Whilst "local level factors" are centred around one-way interactions between the community and the DEA, DAFF, and Park authorities individually (18.06 %, 13.89 %, and 29.17 % of the total local level factors respectively), one expert stated that, "the DEA doesn't have enough people to solicit opinions from the communities" (Respondent 3); another stated, "there are low numbers of staff [working for the park authorities] available to enforce regulations, partly due to poor political decisions at the top" (Respondent 2). The Park authorities were, however, also affected by the communities with 23.16 % of the total local level factors referencing this interaction. Yet there is almost no association between the DEA, DAFF, or the Park authorities (Figure 5).

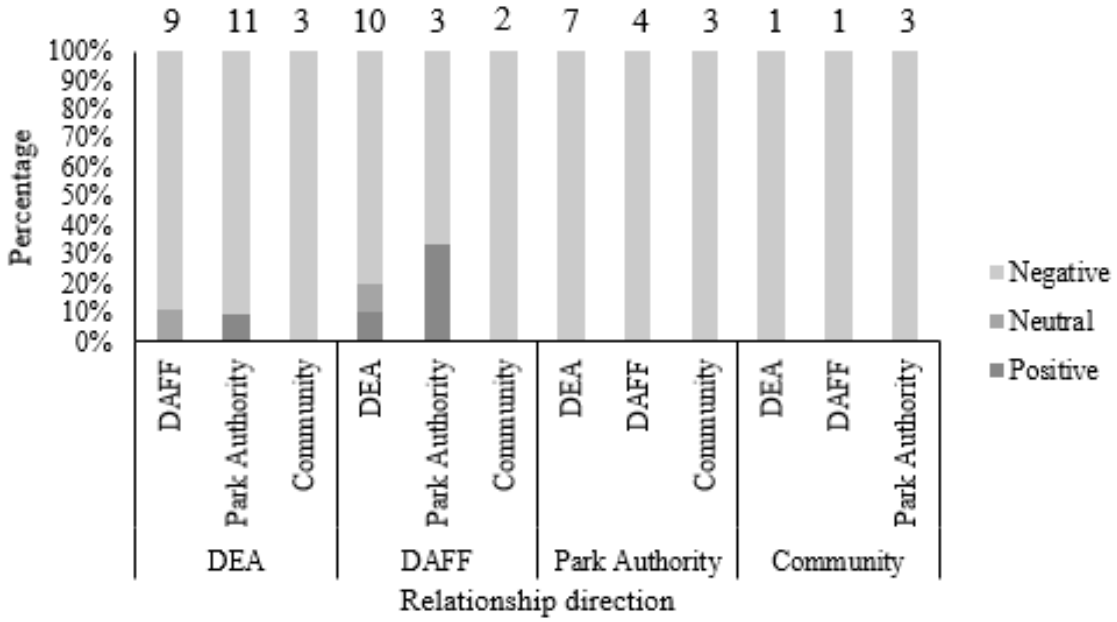


Figure 4. Percentage of the nature (positive, neutral, or negative) of the links between the DEA, DAFF, Park authorities, and communities according to the theme of "Management level factors". Numbers above the bars state the number of times the theme was mentioned with regards to the interaction.

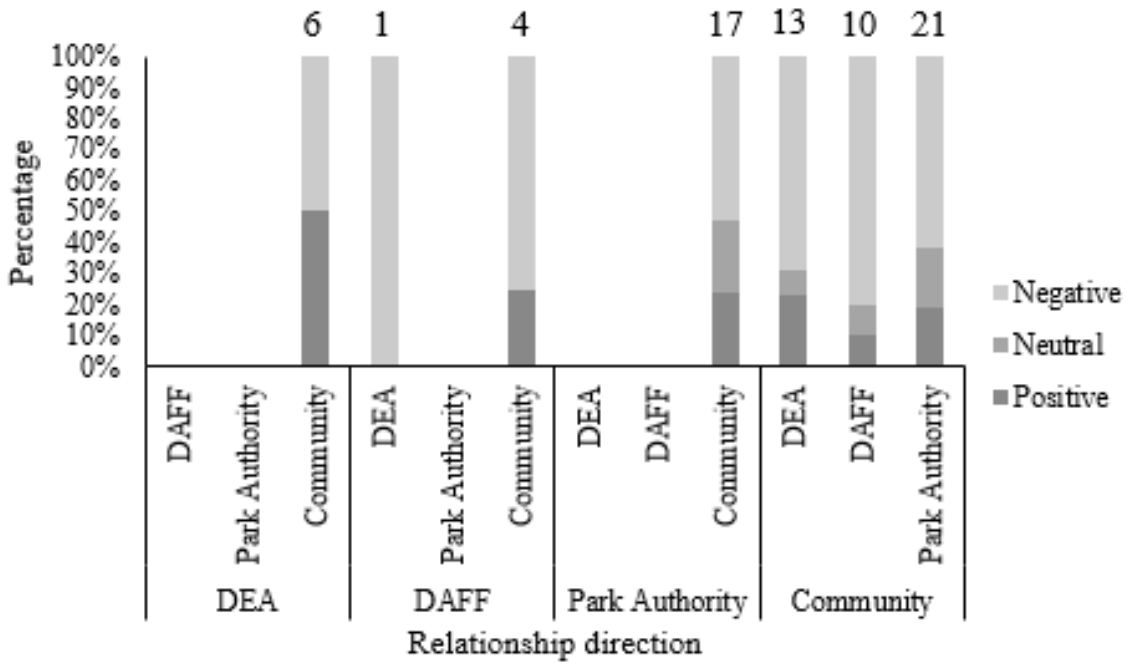


Figure 5. Percentage of the nature (positive, neutral, or negative) of the links between the DEA, DAFF, Park authorities, and communities according to the theme of "Local level factors". Numbers above the bars state the number of times the theme was mentioned with regards to the interaction.

The theme of "Communication and information sharing" was the most often referred to theme and affects all relationships (Table 2). It was stated that information sharing can be linked to the capacity of personnel (a management-level factor) and can negatively impact community buy-in (a local-level factor): "The terrestrial part of the park connected to the MPA is the focus. Rangers have no exposure to the marine context during their training", which often results in "…a big mismatch in the communication on what people want to hear and what they want to engage in, and what the agencies are capable of delivering" (Respondent 3); this was echoed by respondents 2, 5, and 4. When discussing the relationships between the different bodies for the theme of communication and information sharing, 64.93 % of the associations were negative in nature (Figure 6). Comments that were positive were often stated hypothetically, for example one expert stated, "The most important thing is that the channel of communication needs a structure so there can be effective, meaningful contribution from the communities, but also so that the Parks can address misinformation. So two-way communication is the biggest thing we need to work on" (Respondent 8).

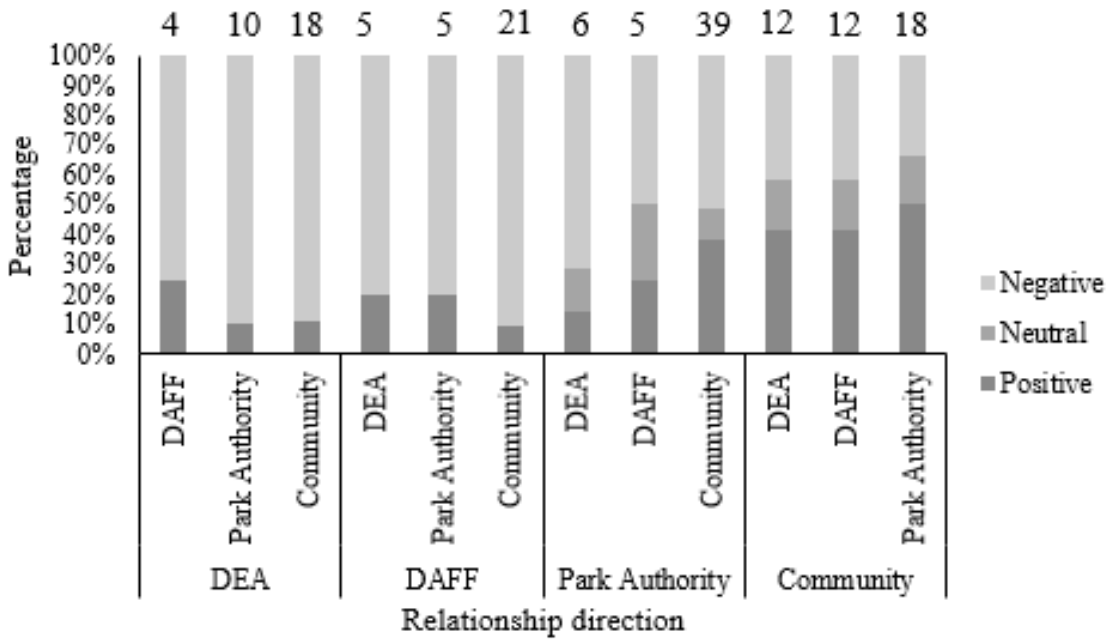


Figure 6. Percentage of the nature (positive, neutral, or negative) of the links between the DEA, DAFF, Park authorities, and communities according to the theme of "Communication and information sharing". Numbers above the bars state the number of times the theme was mentioned with regards to the interaction.

"Biophysical factors" were primarily associated with the communities and how they affect the relationships between communities and other bodies (67.39 % of all biophysical references); however, this was generally more an implicit reference to the interactions, than an explicit one (Figure 7). Life history and reproductive strategies were highlighted in several interviews as part of the ecosystem function category and were often associated with spill-over effects. Experts stated that, "With MPAs it's a case of replenishing stock, so you might not be able to fish over here, but there will be more stock over there – but explaining this can be difficult, especially when fishers need the fish now" (Respondent 5). If the no-take zone is in the "right area, the fish will increase in size and hopefully breed, leading to positive spill-over effects and the fishers will benefit, and then the community might support the MPA more, but this takes time" (Respondent 4). The biophysical factors were also linked to the spatial and temporal design of MPAs, which is closely linked to national level organisation. One researcher stated that, "The challenge of temporal and seasonal closures is the long life-cycle of many reef species. The closures might not be long enough to help, and these are only really useful for spawning grounds for fish who aggregate in the same place annually as it's temporal and spatial" (Respondent 2).

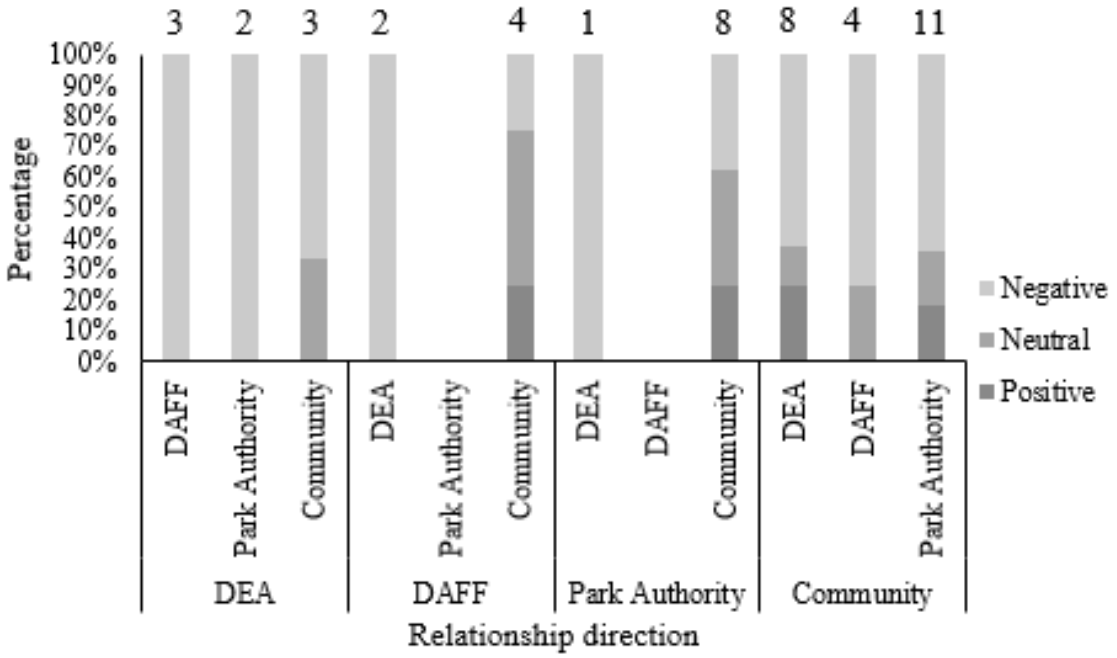


Figure 7. Percentage of the nature (positive, neutral, or negative) of the links between the DEA, DAFF, Park authorities, and communities according to the theme of "Biophysical factors". Numbers above the bars state the number of times the theme was mentioned with regards to the interaction.

"Scale" was associated with cross-scale links by respondents 1, 2, 3, 5,7, and 8; however, it was not associated with the cross-level interaction between the DEA and DAFF (Figure 8). Scale was used to emphasise the impact of MPA location on small-scale fishers (41.18 % of all scale-based interactions referenced communities), with one expert stating, "The main issue with small-scale is literally in the word 'scale' in that [small-scale fishers] are not mobile, for example the big trawling companies won't complain too much about MPAs because they can travel anywhere" (Respondent 1). Scale can also refer to the ways in which people think, and interact, with the system – this can result in difficulty in communicating needs and concerns in a meaningful way. Experts discussed this, "The people living on the ground know a huge amount about a small problem, whereas the people working in high government levels have a macro-view of policy but can't engage on any specific issue. The one group thinks the other is useless because they're thinking at different scales and they can't communicate in a way that the other understands" (Respondent 1).

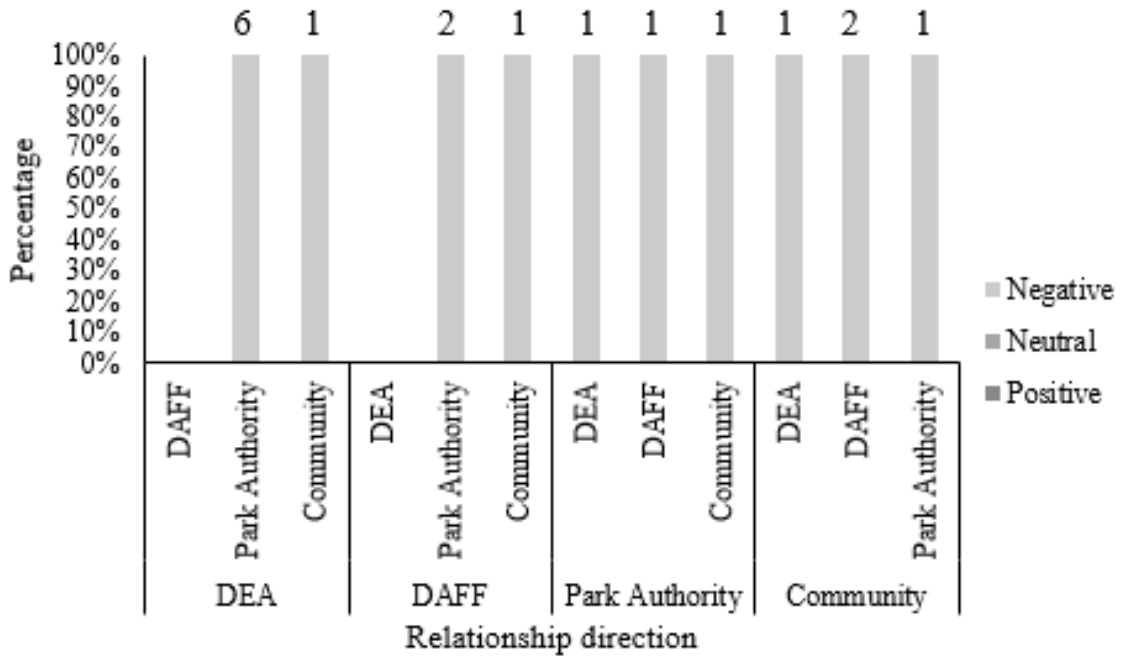


Figure 8. Percentage of the nature (positive, neutral, or negative) of the links between the DEA, DAFF, Park authorities, and communities according to the theme of "Scale". Numbers above the bars state the number of times the theme was mentioned with regards to the interaction.

3.4.2. Governance structure

Figure 9 shows the structure of the governance system, including the main governance bodies and key external contributors (a, b, and c). The relationship between DAFF and DEA (1) was characterised by poor communication and an unclear division of responsibilities (Respondents 1, 2, 3, 4, 5, 7, and 8); "The DEA and DAFF were initially in the same building at the time when fisheries was moved to DAFF, but they weren't sure about who was responsible for what and this compromised their ability to effectively manage the ocean" (Respondent 5). The relationships between the national DEA and DAFF and their municipal counterparts (2) was described as weak with the national bodies showing poor leadership (Respondents 1, 2, 4, 5, and 7). At a lower level, there is poor two-way communication and a lack of clarity of responsibilities between the municipal DEA and DAFF agencies (3) (Respondents 2, 5, 7, and 8). Arrows 2 and 4 show the main source of connection between the national DEA and DAFF agencies with Park authorities. The relationship between municipal DEA and DAFF agencies with Park authorities is characterised by poor, top-down communication and a reluctance to share power with the Park authorities by the DEA and DAFF (4) (Respondents 1, 3, 4, 5, and 8). One expert highlighted that, "Park management is held accountable for the management

plan, but this can get messy about who is responsible for different areas like development and waste, and this can lead to misalignments" (Respondent 4). The relationship between Park authorities and user groups (5) is generally considered to be top-down; however, this can be dependent on the size and location of the MPA, as well as local opportunities for economic development (Respondents 3, 4, 5, 7, and 8). One expert stated, "Communication tends to be top-down in larger MPAs – it's more a form of conveying information; while smaller ones can, and do, have more grassroots connections and conversations" (Respondent 5). Another stated that, "The bigger the MPA, the more people are affected, and so collaboration becomes more complex and difficult" (Respondent 3). The relationship between the municipal DEA and user groups (6) was described as top-down, with little transparency or accountability from the DEA regarding community feedback (Respondents 1, 3,7, and 8). The relationship between DAFF and user groups (7) was characterised by a lack of transparency and accountability, and mostly top-down in nature – this relationship is also influenced by education (Respondents 2, 4, 5, 7, and 8).

Experts also gave information about interactions with industries and departments not directly tied to marine legislation. The status of the DEA in the context of the national government is highly affected by power imbalances; one expert stated that, "The DEA is often treated as the lowest priority when it comes to government funding, it's often swept aside by more powerful departments" (Respondent 4). This sentiment was echoed by all experts.

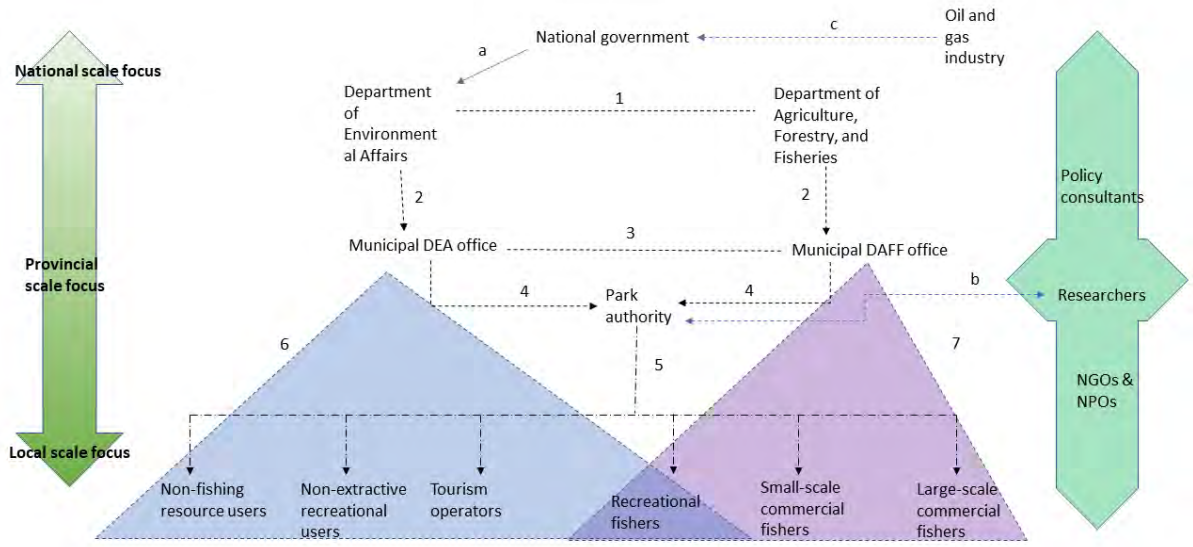


Figure 9. The structure of South Africa's marine governance system from national level to local level. Lines show the channels of interaction, with arrows showing the dominant direction of communication as indicated from the interviews. In cases where the dominant direction was unclear, the lines were left without arrows. Shaded areas represent the spheres of activity/responsibility according to the National Environmental Management: Protected Areas Act (light blue) and Marine Living Resources Act (purple). Researchers, NGOs, NPOs, and policy consultants are not part of the formal governance structure, however they operate horizontally and vertically across all levels. The letters "a", "b", and "c" represent links to external contributors, whilst the numbers 1 – 7 are used to identify different links.

3.5. Discussion

The aim of this chapter was to identify sources of alignment and misalignment, as well as spatial themes, in South Africa's marine governance system. I addressed this by carrying out interviews and a thematic analysis. Communication and information sharing between stakeholders was identified as the biggest weakness for marine governance, followed by local level factors, management level factors, biophysical factors, and finally, other government departments and marine legislation. Difficulties in communication and information sharing was a common theme between all stakeholders. Meanwhile, management level factors and other government departments, and marine legislation, were difficulties faced by actors that operate and conceptualise the system at a national and provincial scale. Local level factors and biophysical factors were found to explicitly affect those who operate and conceptualise the system at a provincial to local scale. There were very few references to the relationships

between local communities and national level departments; the few references that were made, generally spoke of a top-down interaction.

Thematic analysis of marine policy

Results indicated that communication and information sharing was the most commonly occurring theme throughout the interviews (42.26 % of the references). A study by Cochrane et al. (2015) found similar results. The researchers sought to evaluate how the MLRA supported the implementation of an Ecosystem Approach to Fisheries (EAF) and progress made in this area. The study found three key shortcomings that needed to be addressed, firstly that there is a need for more transparent government, this was part of a prominent theme in this study with 40.26 % of the relationships being described under the theme of communication and information sharing. The second finding was that co-management principles need to be entrenched in all fisheries, whilst co-management was identified as a category it was not as common as others, however, categories such as personnel capacity, power relations, transparent resource and responsibility allocation, and knowledge sharing were all highlighted as challenges, all of these categories are highlighted as conditions for successful adaptive co-management by Armitage et al. (2009). Therefore, co-management principles remain elusive in the implementation of policies despite co-management being explicitly referred to throughout marine policy. Finally, Cochrane et al. (2015) stated that there needs to be a legal requirement for detailed management plans for all fisheries – this was not an explicitly identified theme, however it could be connected to the category regarding a lack of clarity of responsibilities of the different nodes (Cochrane et al. 2015). It is important to note that whilst the report by Cochrane et al. (2015) focusses on fisheries, the results from this project consider multiple resource users and the difficulties for implementation apply to the entire MPA.

An assessment of South Africa's MPAs in 2014, using the Management Effectiveness Tracking Tool (METT) approach and site visits, utilised criteria which were similar to some of the themes and categories identified in this study (for example, human resource capacity, education and awareness programmes, and community partners) - however, the analysis was centred on the individual criterion rather than how they interacted (Chadwick et al. 2014). Whilst their report had similar results to this study, for example the lack of understanding of the responsibilities and roles of different nodes, and the limited amount of stakeholder engagement affecting the relationship between park authorities and communities; the use of a spatial resilience lens (and thematic analysis) in this study, focuses on the links between the nodes and

can begin to identify how the state of each node affects the others. It was found that, when considering the cross-level and cross-scale interactions, the similar categories identified by Chadwick et al. (2014) often resulted in negative, top-down relationships between the various nodes and thus may limit opportunities for positive alignment, implementation, and collaboration between the nodes.

Political history and identity

The conceptualisation of the system and the important interactions can be linked to resource access (both historical and current), identity, and local ecological knowledge (OECD 2007, Daw et al. 2012, Cundill et al. 2017). Space was a much-used tool by the Apartheid government to physically separate communities, providing better access or resources to certain groups – these effects were particularly felt by fishing communities that were highly dependent on marine resources and whose exclusion from the marine commons was exacerbated by industrialisation, privatisation of resources, and institutionalised racism (Van Sittert et al. 2006, Daniels 2014, Sowman et al. 2014). Protected areas became a symbol of exclusion and elitism throughout history, with more recent associations to gentrification (Adams and McShane 1996, West et al. 2006). The recent historical era of Apartheid and the colonialism that pre-dates it, has become a part of the national identity of South Africa and was highlighted as a major influence on the links between nodes. In South Africa, as in many places, identity, sense of place, customary practices, and culture are often closely linked to a location and thus have been negatively affected by displacement and forced removals from traditional lands, the effects of which are still evident in present day (Sowman and Sunde 2018). In a study carried out in five different South African MPAs, respondents in all five sites reported MPAs as having a negative impact on their cultural heritage, sense of place, and identity (Sowman and Sunde 2018). By understanding the temporal/historical context of an area, it is possible to be more sensitive to the needs and identity of the communities and thus potentially improve the implementation of policies (Blount and Pitchon 2007, Mascia et al. 2010, Sowman and Sunde 2010). As such, one expert interviewed in this study stated that, “We need to move away from protected areas being an elitist thing and show that they are there for looking after our future.” Zoning of MPAs needs to consider a range of factors, one of which includes the impact of historical access and it’s connection to identity, as one expert interviewed states: “If fishers live near or historically fished in the MPA, there is frustration and anger and so it’s difficult to get buy-in”.

The issue of scale

Scale has both physical and theoretical applications. A physical/biophysical application of scale can have strong connections to the biophysical factors outlined in this study. In addition to the complex 3D nature of the marine ecosystem, the pervading limited amount of species and habitat distribution (mostly because biological processes are extremely difficult to record over large areas) can compromise sustainable management of marine ecosystems and species as a whole (Camino et al. 2018). However, as in the case of South Africa, even when there is good fisheries data available (for example Isaacs 2016, Wentink et al. 2017, Menon et al. 2018, Isaacs and Witbooi 2019, Gammage et al. 2020, Reed et al. 2020) there is still an implementation gap – scale can help us begin to understand this issue. The scale and complexity of an MPA has implications for budget and personnel, as the rangers need to have access to appropriate monitoring techniques and technologies that can help supervise a vast area that is not always easily accessible. Budget and personnel capacity were highlighted as factors that negatively impacted on the relationship between Park authorities and the DEA and DAFF. In fact, one of the archetypical scale challenges is the mismatch between ecological systems and human action; institutional boundaries do not fit ecological or resource boundaries for a range of reasons, one of which is the complexity of the ecosystem (Cash et al. 2006, Berkes 2006, Bordin 2017).

The challenge of fit is even greater in a marine system due to its fluidity and lack of boundaries as compared to a terrestrial system. Spatial resilience theory can be useful in identifying alignments and misalignments in certain aspects of marine policy – such as right allocation – however, this is limited to one area of the policy. Results indicate, albeit indirectly, the mismatch of biophysical and institutional boundaries and scale. Several key experts that were interviewed highlighted the fact that life strategies, MPA size and location, and spill-over effects affected the relationships between the community and other nodes. There are difficulties in explaining spill-over effects to gain community buy-in, as well as difficulties in cross-scale communication, which can be tied to the fact that the nodes operate in, and think about, the ecosystem at different scales (McConney and Charles 2010, Eikeset et al. 2018). This communication challenge can limit effective policy implementation and hinder future relationships. A spatial resilience lens allows researchers to compare, and potentially marry, the similarities and differences between both ecological scales and institutional scales in the marine realm.

Theoretically, the scale and ways in which the different nodes conceptualise and interact with the ecosystem has consequences for the interactions between nodes and therefore potentially

for the implementation of policy, as outlined by the key expert in the description of Figure 8 (This concept is elaborated on in Chapter 4). A study carried out in Taiwan showed that government bodies were mainly concerned with global and national scales, national jurisdictional scales, and institutional scale laws and regulations (Tai 2015). Conversely, local communities were more concerned with patch spatial scales, local institutional scales, and community network scales (Tai 2015). This mismatch can also be seen in this study in the difference of focus between the DEA and DAFF interactions and the community interactions, whereby most interactions were management level factors and local level factors respectively, whilst the issue of communication and information sharing was a major area of concern between the government departments and the communities - this means there are few effective cross-scale linkages (Tai 2015). The mismatch between the scales of knowledge and focus generally results in the production of information that lacks legitimacy or credibility in the eyes of actors at different scales, thus resulting in implementation challenges (Cash et al. 2003, Cash et al. 2006).

Local ecological knowledge

Local ecological knowledge also has a highly spatial aspect, as it is often tied to a certain location or part of the ecosystem. As one expert stated, "[Local fishers] might have an immense amount of knowledge of an area, but that knowledge is not portable and their gear is domicile where it can't move very far. So that's a really big drawback of a protected area approach as it will heavily penalise people who can't move either their knowledge, or their gear, or their markets". A diverse range of knowledge systems and worldviews are essential to understand the range of interactions between people and the natural environment (Garcia Rodrigues et al. 2017). A spatial resilience lens provides a way of incorporating such a diverse range of information into a single analysis, and thus can provide a way of understanding the alignments and misalignments between worldviews and knowledge systems by grounding them in one location: "Knowledge is essentially linked to resource access both in terms of gears and important species, and fishers may be at a disadvantage if they are made to fish in new areas, or prevented from fishing in known areas" – Respondent 5.

Resource access is rooted in spatial analysis as distribution of the resources, geographical distance from the resources, and access routes such as paths, roads, and terrain will have an impact on access – therefore the allocation of resource rights must be appropriate for the rights holder's needs and mobility. Resource access was shown to be an important link in the bottom-

up link between communities and other stakeholders. Furthermore, an analysis of the space around the community/neighbours and the MPA can help determine sustainable livelihood strategies. Applying a spatial resilience lens in this instance would help align transport and resource needs, and patterns with the location of MPAs. In this way decision-makers could design policies and allocate rights that are aligned with the needs of the community. This highlights an area for future research: an investigation of if, and how, terrestrial infrastructure influences regulation compliance. Terrestrial infrastructure could also affect a park authority's ability to monitor activities and compliance, as well as address illegal issues such as poaching more effectively.

Governance Structure

A study carried out by Tai (2015) on the Danungdafu Forestation Area in Taiwan developed a similar governance structure visualisation as the one produced in this study. In asking if this structure could cope with scale-dependent challenges and cross-scale interactions, the researcher stated that it would not (Tai 2015). Interestingly, the reasons given for this answer could be applied in this study as well, as they were often explicitly mentioned by key experts: i) the national government, policies, and agents consider land use options from a predominantly national or global perspective; ii) the way policy is carried out overlooks the socio-ecological context, iii) when state government does try to fix the imbalance between biodiversity conservation and human rights, policies tend to overemphasise community-level management issues (Tai 2015). Both the thematic analysis and the subsequent diagram carried out in this project indicate a lack of effective cross-level linkages - with the state dominating decision-making and appearing to be reluctant to devolve power or accept feedback from other governing levels. The lack of effective cross-scale linkages suggests that it may be difficult to pursue effective multi-layered governance, despite the organisational structure indicating that this could be the original intention (Tai 2015).

However, a case study from Guinea-Bissau (Weigel et al. 2014) suggests that the governance structure may only contribute to a part of the cause for misalignments in marine policy and its implementation. As in South Africa, poverty, a growing population density, and increased mobility of multiple demographic groups including migrant fishers had been causing stress to marine environments (Weigel et al. 2014). The intensive exploitation of marine resources by small-scale fishers was a result of few economic opportunities and financial constraints (Weigel et al. 2014). Fisheries management was caught between the requirements of

conservation and development which, in the short-term, are sometimes contradictory however, a synergy evolved (Weigel et al. 2014). Collaboration first developed at the local level through consultative forums which brought community stakeholders and decentralised authorities together, thus allowing key interest groups to reach a collective agreement relating to access rights and permitted fishing techniques (Weigel et al. 2014). Collaboration was also established at an institutional level whereby various entities and government departments shared complementary responsibilities (Weigel et al. 2014)– this structure is almost identical to that of the South African governance system. In the case of Guinea-Bissau's MPA, the multi-stakeholder approach at both the institutional and community levels allowed the MPA to reconcile conservation and fisheries management objectives (Weigel et al. 2014). Whilst this MPA differs from the South African context in that it was established by the community rather than as a government-born protected area in a country with a complex, political relationship with conservation, the collaboration within and across scales is perhaps one of the factors that contributed to the success of Guinea-Bissau's MPA.

Cross-scale collaboration

The results from this study show that many weaknesses occur across scales, thus constraining the implementation efforts within MPAs. A study carried out by Guerrero et al. (2014) investigated ways of achieving cross-scale collaboration for large-scale conservation projects and initiatives using the Fitz-Stirling region of Australia as a case study. A network analysis showed that the local social network can predispose cross-scale collaboration and that, in cases where there is little evidence of cross-scale collaboration often due to underrepresentation of cross-scale interactions, sub-regional stakeholders are well positioned to facilitate cross-scale collaborations (Guerrero et al. 2014). Here we can see that, despite being a developed country with arguably more access to resources, the attitudes of local communities and the power transfer from central government departments to those operating at smaller spatial scales can determine the effectiveness of conservation efforts – these are two challenges that were greatly highlighted through the interviews carried out in this study.

Interestingly, a case study in Belize has shown that cross-scale management can be successful in a developing country (Weigel et al. 2014). As in South Africa, the waters are home to an abundance of species and habitats which benefit people through tourism and commercial fishing, including approximately 15 000 people who directly depend on fishing for their livelihoods (Weigel et al. 2014). Despite the implementation of an ecosystem-based approach

to fisheries management and conservation, the impacts of open access fishing were seen through the declining fish stocks and increasing conflict between local fishers and fishers from neighbouring countries (Foley 2012, Weigel et al. 2014) – once again this is similar to South Africa. Several Belize government offices collaborated on developing a Managed Access (MA) approach (Weigel et al. 2014). A Managed Access approach can be understood as "a form of catch-share that 'limits access to General Use Zones within (already existing) reserves, restricted by a licensing system defined via community consultation with guidelines produced by the Fisheries Department, and establishes catch limits for commercial species that fishers depend on for their livelihoods' (Foley 2012)." (Weigel et al. 2014, pp. 205). Hundreds of fishers were engaged with the discussions and several MA committees were established, and through extensive discussion with the MA committees, the Fisheries Department was able to consult fishers when defining the parameters of the catch share management system and the licensing programme. Illegal fishing has since decreased, whilst stock sizes and compliance has increased (Spruill 2013, Epstien 2014). The case study from Belize differs from the South African case in terms of having a clear and collaborative approach between the various government departments, and meaningful engagement between the government and the local communities. Knowledge was clearly being transferred from the community to upper government departments and vice versa and committees were seen as legitimate in the eyes of both the communities and government departments (Weigel et al. 2014). However, it is important to note that whilst Belize is a developing country, it has a drastically smaller population size that South Africa (383 071 and 58.78 million respectively) and may have a different historical relationship with conservation to South Africa.

The issue of sample size

A key limitation for this part of the study was the small sample size, by having more participants I may have had a more representative and holistic depiction of the interactions between the various actors. The literature on cross-scale and cross-level interactions from South Africa and various MPA governance around the world identifies many of the same themes and categories as this thesis, for example power, top-down interactions, historical context, poor communication pathways, lack of clarity on responsibilities are often predominant themes throughout literature (see: McConney and Charles 2008, Sunde and Isaacs 2008, Isaacs 2013, Daniels 2014, Guerroro et al. 2014, Kolandai-Matchett and Armoudian 2018, MacKeracher et al. 2018, Isaacs and Witbooi 2019). However, there is a possibility that other relationships may have been highlighted, especially given that there are several different

park authorities that all operate slightly differently. Another main weakness is that the weighting of the interactions may have been altered; if there were a bigger sample size the influence of a theme may be relatively greater or less than others. It would also have been preferable if I could have interviewed at least three expert from each stakeholder group (including one from each park authority) as I would have been able to conduct a deeper investigation into the links within each level. If this had been the case, an alternative approach would have been to conduct a social network analysis, whereby I could investigate the capacities, attitudes, and communication between the actors (Groce et al. 2018) - however it is important to note that many of the resources required for this kind of analysis would have been beyond the scope of this thesis.

3.6. Conclusion

The results in this chapter highlight the complex cross-scale and cross-level links between the various nodes. Many of the weaknesses and resulting misalignments between the organisational bodies were linked to poor communication, lack of transparency, and a lack of clarity of responsibilities and power sharing. Few interactions fit into individual themes, instead often linking across themes and across scales. Despite the fact that many of the themes and aspects of this study were not explicitly spatial, each does have an implicit, strong spatial element. For example, the marine legislation deals closely with the management of the environment and the division of responsibilities, whilst communication and information sharing can be affected by the location of the different bodies as this may affect accessibility to various stakeholders. My results suggest that the spatial scale at which the system is conceptualised has implications for the themes and categories of challenges or misalignments that affect the relationships between stakeholders. Further research needs to be carried out to test whether the themes and categories reoccur between the different levels before this can be applied generally.

While the biophysical and scale themes were not the most commonly referred to themes, I suggest they may be underlying drivers that contribute to the misalignments between stakeholders. Firstly, the misalignment between ecosystem and jurisdiction/institutional boundaries was highlighted by the experts as a fundamental challenge that resulted in lack of clarity of responsibilities – this has serious implications for the effective functioning of the offices as well as for communication and engagement between stakeholders. Secondly, the scale and location of the MPA essentially determines the extent of stakeholders (i.e. is the surrounding area densely populated or not), as well as their ability to engage with management,

(i.e. if the closest resource users are far away from the MPA, as is the case with some MPAs that are connected to fenced terrestrial protected areas), the way they engage and if they can attend forums. Access to resources, as well as the ecosystem type, will affect the needs of the users and thus their relationship with the park authorities. The spatial themes (namely the scale and biophysical themes), speak well to the relationship between the ecosystem and people. This relationship has implications for communication and implementation, as how the different users conceptualise the system will affect understanding between stakeholders and thus can affect all interactions.

Communication and trust appear to be at the centre of many of the challenges experience in conservation management around the world. The ongoing impacts of Apartheid, poor communication resulting in confusion of management measures, and top-down implementation of marine policy in South Africa has resulted in misalignments and has contributed to the implementation gap. I argue that it is not the actual structure of the governance system that is constricting implementation, but rather the interactions between the various stakeholders. A key next step may be to carry out a social network analysis for MPAs within South Africa; the next chapter begins to identify what this network's nodes and the links may consist of.

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Chapter 4

Abstract

Spatial approaches to marine governance are popular throughout the world, however, there is a well-established disconnect between policy design and implementation. I applied a spatial resilience lens to a South African case study to interrogate whether a lens that combines the spatial and socio-economic components of a marine socio-ecological system (SES) can help identify alignments and misalignments between policy and user groups.

The case study was in the Table Mountain National Park: Marine Protected Area (MPA). There is a long history of small-scale fishing in the area. Many people are dependent on this type of fishing for their livelihoods and are involved in all stages of the process, from catching the fish to processing and selling them. The area is also a popular tourist destination, with activities ranging from whale watching and scuba diving, to sports fishing.

I carried out a series of workshops in three fishing communities with different user groups. During these workshops I applied the spatial resilience lens in three ways. Firstly, the participants collaborated on a mapping exercise discussing the existing zone types within the MPA, as well as developing their own. There was an 87.87 % overlap of community designed zones on the existing MPA zones, however the types of zones were different. Secondly, I carried out a document analysis and used information from the workshops to analyse the status and rights designation of important species for different user groups. The results show that the user groups, while all active in the marine environment, interact with the ecosystem at different scales and with differing species. The differing interactions between groups result in challenges such as representation and complicated power dynamics between user groups. Finally, I isolated a key component of spatial resilience theory – the role of external elements – by asking participants to discuss factors that affect their ability to gain a livelihood from the sea. The external elements and their effects differed between the user groups, identifying important socio-political interactions. Whilst the external elements were all geographically distinct and localised, the spatial resilience lens allowed for a cross-scale, and to a certain extent cross-sector, understanding of these elements thus producing a more holistic understanding.

The spatial resilience lens allowed me to identify alignments and misalignments between bodies, from national government to local communities. Furthermore, a spatial resilience lens lends itself well to a variety of field methodologies. This concept allows us to continue to use spatial approaches to management and design of MPAs, whilst incorporating key ecological, social, political, and economic components into our understanding of the system. Additionally, it enables cross-scale and cross-level analysis that identifies the complex interactions within the system.

Keywords: MPA, Zones, Important Species, External Elements, Spatial Resilience, Cross-scale, Cross-level

4.1. Introduction

Spatial approaches to marine governance, such as zoning and marine spatial planning, have increasingly addressed overlapping human uses in a dynamic and changing marine environment (Crowder and Norse 2008, Agardy 2010, Kenchington et al. 2014). The combination of multiple uses and users of common property or unallocated resources, presents many significant inter-sectoral and jurisdictional challenges (Branch and Clark 2006, Hauck and Kroese 2006, Crowder and Norse 2008, Raemaekers 2009, Agardy 2010, Sowman 2011, Sowman et al. 2011, Brill 2012, Kenchington et al. 2014). Therefore, the key governance challenge is in developing an integrated governance system that addresses the opportunities, constraints, responsibilities, and goals of various user groups and sectors that use or impact on marine spaces (Berkes 2006, Lowry et al. 2009, Pajaro et al. 2010, Kenchington et al. 2014, Lombard et al. 2020). Governing policies and bodies, managers, and planners must address, and continually review, a sustainable balance of objectives and outcomes, as well as ensuring equitable distribution of costs and benefits (Kenchington et al. 2014). Furthermore, these actors must also consider the complex social, cultural, environmental, economic, and legal context of the system (Kenchington et al. 2014, Savage et al. 2020). This is no small task as many interventions still struggle to cope with politics, history, long-term cumulative pressures, surprises, and feedbacks (Muhl 2016, Cumming et al. 2017, Lombard et al. 2020).

There has been significant recent progress in understanding the relevance of temporal and spatial scale, networks, heterogeneity, and multi-scale governance (Ardoron et al. 2008, Ehler and Douvere 2009, Agardy 2010, Halpern et al. 2015, Cumming et al. 2017). Scale is a central issue in understanding and quantifying all aspects of spatial resilience and has important implications for the interpretation of research findings (Cumming 2011, Vaughan and Agardy 2020). Furthermore, when considering interactions between two systems, the role of scale must be addressed in order to understand how it may influence the number and nature of those interactions (Cumming et al. 2006). This chapter applies a spatial resilience lens to the relationship between government authorities and user groups, using the Table Mountain National Park MPA as a case study, to investigate its application in identifying policy, management, and user group alignments and misalignments. The Table Mountain National Park MPA was selected as a case study as it has a long and diverse history of small-scale fishing, unique habitats, and is a popular tourist destination, therefore the MPA management is required to address a multitude of stakeholders that have different needs and uses of the marine ecosystem.

Currently in South Africa, changes in national legislation are being (or have recently been) made in order to move towards a more system-oriented approach and to create more cohesive and equitable marine governance (Parliamentary Monitoring Group 2018, SANBI 2018, DEFF 2019). Essentially, these changes should contribute to less fragmented management, therefore, South Africa is a good place to question the relationship between different user groups as this research can be used for future analysis of legislative transitions. In order to explore how cross-level information and thinking affects MPAs specifically, I asked the following key question:

1. How do priorities for demarcating MPA zones differ between national government bodies and local user groups?

The reason for looking at the priorities is that official MPAs need to consider international maritime agreements, national economic opportunities, and representation of South Africa's marine ecosystem types, as well as local resource uses (Sink et al. 2019). Conversely, the main considerations for local user groups are centred around activities and habitats on a local or regional scale. I focused on the difference between the official MPA zones and the opinions of local user groups on where and what they think the MPA zones should be, as the official MPA zones are informed by a variety of cross-scale information, whilst the local user groups will be influenced mainly by local scale factors (Lagabrielle et al. 2018, SANBI 2018). The different spatial and knowledge scales and levels of the actors may result in different priorities, thus potentially leading to misalignments between stakeholders (Anderies et al. 2019).

As the resource users and manager operate at different spatial scales, the spatial footprints and priorities will be different, not only between users and managers, but also between user groups (Levine et al. 2015). The spatial footprint of a user group can be influenced by the resources on which they depend (Crona and Bodin 2006, Levine et al. 2015, Fortnam et al. 2019), therefore by identifying the species on which the user groups identify as important we can begin to understand the spaces in which they operate. In order to contribute to the overarching question of this thesis, I further carried out a comparative analysis of species present on national permits and protection lists to understand whether the needs of user groups operating at various spatial scales are better or worse aligned with national level policies. Consequently, I asked:

2. To what extent are important conservation species and important species for user groups represented in national policy?

Spatial resilience theory states that, "Spatial resilience refers to the ways in which spatial variation in relevant variables, both inside and outside the system of interest, influences (and

is influenced by) system resilience across multiple spatial and temporal scales. It has elements that are both internal and external to the system" (Cumming 2011, pp. 21). Drivers can be understood as human-influenced or natural factors, such as global markets and government policies, that directly or indirectly cause change in a system (MA 2003, Berkes 2006). On one hand, drivers may be clearly linked to the system, on the other hand, drivers and their impacts can be difficult to identify due to the confounding effects of various factors acting simultaneously (Berkes 2006). As I am using spatial resilience as a theoretical framing, I ask about external components that may impact the system:

3. What non-marine/ coastal policies and interactions impact on local scale resource use?

Non-marine/ coastal policies refer to legislation and regulations that do not fall under the mandate of DEA, DAFF, or the Park authority.

4.2. Study site

Please refer to Chapter 2 section 2.3.

4.3. Methodology

4.3.1. Data collection

I conducted a series of 18 workshops with the fishing communities in Ocean View, Hangberg (Hout Bay), and Kalk Bay to understand some of the benefits and challenges they face in pursuing a marine-based livelihood. The following groups were identified: women's groups, small vessel crews including skippers and boat owners, eco-tourism operators, and sports fishers (Table 1) (Appendix D for a full description). The women's, smalls vessel crew, and sports fishing groups are actively involved in the extraction of marine living resources within and around the MPA; women were interviewed separately from men when possible to encourage a sense of ease and to investigate if there is a gendered aspect to marine resource use. Tourism operators were included in the study as one of the main objectives of the MPA's management plan is to encourage sustainable tourism. To be conscious of social relations and power differences, the workshops were carried out separately for each user group, to encourage ease and openness (Abunge et al. 2013). A total of 76 participants were identified through snowball sampling (Sharma 2017). Contact was initially made with individuals who had been identified by SANParks' People and Parks officers, NGOs who had previously done work in Kalk Bay and Ocean View, and a committee member from the Peace and Reconciliation Organisation in Hangberg, as well as a small-scale fishing community representative. Despite attempts to ensure an even distribution of participants with regards to user groups and locations,

this was not attainable. A variety of factors may have influenced this, and the sample size, such as initial contacts inadvertently acting as gatekeepers, gender bias, mistrust of "outsiders", and the mobile nature of fishing as many participants were not in the areas due to the season (I tried to minimise this by spending time in Lambert's Bay, where many of the fishers were working at the time) (Gammage et al. 2017). Ethical clearance was obtained from the Rhodes University Ethical Board and a research permit was obtained from SANParks (Appendix A).

Discussions were conducted and recorded in English and/or Afrikaans depending on which language participants were most comfortable in. Each focus group began with a discussion of what they understood an MPA to be, what the purpose of them is, and the difference between no-take and controlled zones. The discussion was structured around three themes:

- How does the marine environment contribute to your life and livelihood? This included discussions around important species, identity, and in some cases why they pursue this livelihood strategy, thus relating to key question two about important species. They were provided with a blank outline of the peninsula and were encouraged to mark important areas; this information was used to frame discussion around key question one on how they would design their own MPA as well as aiding in understanding the user group's spatial footprint - not all participants were able or willing to do so as they worried it would be possible to identify their group through this information. If this was the case, the group was encouraged to simply talk about this among the group and locations were not noted down.

- What are some of the factors that affect your livelihood? Participants identified, or elaborated on, important species as well as discussing how other interactions impact on local resource use. Therefore, information from this theme helped answer key question two on important species, and question three on external elements.

- How does the MPA enable or hinder your livelihood? Discussions regarding important species and other interactions contributed to exploring ways in which participants could design their own MPA zones and zone priorities, thus contributing to the discussion for key question one and three.

In most instances each theme yielded discussion that contributed to two or more of the key questions.

In each case, the participants were asked to explain their rationale for their answers, which were also recorded, and contributed to the understanding of relationships. The number of participants in each group varied as their presence was dependent on the weather and ability to go fishing on given days; however, I ensured there were at least three participants in each session.

These discussions were aided by encouraging participants to physically mark areas and locations on a map of the peninsula. The technique is also known as participatory mapping whereby all participant are encouraged to contribute to the information on the map (Robinson et al. 2016, Weyer et al. 2019). Participatory mapping has become an important medium for incorporating indigenous knowledge about the environment and rights into science-based planning and solutions (Robinson et al. 2016). Ideally, participatory mapping exercises can help enable individuals to provide expertise which is free from the constraints of traditional data collection and encourage a co-production of research (Howitt 2014, Robinson et al. 2016, Weyer et al. 2019). Maps are inseparable from the cultural and political contexts in which they are developed (Chambers 2006, Rambaldi et al. 2006, Kathirvel et al. 2012, Weyer et al. 2019). In the parameters of this study, the connectedness between maps and the socio-political context is a key source of information for the analysis, however it must be noted that whilst participatory mapping can empower the voiceless it can favour some voices and does not necessarily represent the diversity of knowledge and does not underpin all indigenous planning goals (Rambaldi et al. 2006, Ramirez-Gomez et al. 2013, Wynne-Jones et al. 2015, Robinson et al. 2016, Weyer et al. 2019).

Once the main themes had been discussed, participants were asked to reflect on the discussion and design an MPA of their own on a blank outline of the peninsula. They were encouraged to create their own zones and regulations, as well as providing a definition of each zone type and providing reasons for the zones. I skipped this process if any of the participants stated they were not comfortable doing this, only one women's group was comfortable contributing to the process while all fishers, and most eco-tourism and sports fishers were willing to contribute. The participants had only been shown an image of the official MPA when the zones of the MPA were initially discussed. This map was then removed to reduce any influence it may have had over their zoning; however, given some users are likely familiar with the official zoning, the risk of participant bias could not be avoided completely. I transferred each hand-drawn map onto Google Earth and over-laid them to identify common areas and requirements. If two or more groups highlighted the same, or similar, areas for the same, or similar, reasons, the zone

was added to a "merged community MPA". I presented it back to the participants during a second round of workshops to gain consensus and to ensure that the merged map was representative of their responses; if there were any strong objections to the map from two or more groups, the zone was removed from the community MPA.

Table 1. Number of participants per community area per group

	Location			
Group	Hout Bay (n = 21)	Kalk Bay (n = 17)	Ocean View (n = 17)	Other (n = 21)
Women's Group (n = 23)	4	4	5	10
Fishers (n = 32)	12	8	12	-
Sports Fishing (n = 10)	3	-	-	7
Eco-tourism operators (n = 11)	5	5	-	4

4.3.2. Analysis

4.3.2.1. Map analysis

The kml. files from Google Earth Pro v7.1.8.3036 were exported to ArcMap v.10.5.1 to allow for easier measurements of the zones. The community map, use maps, and the existing MPA map were compared by overlaying the zones on ArcMap, in order to identify areas of alignment, zone distribution, and a comparison of priorities. The co-ordinates and information for the existing MPA map were sourced from the official TMNP dataset provided by SANParks. To calculate the percentage overlap between the community MPA and official no-take zone, I created an intersect layer on ArcMap with the layers of the two zone groups. The total area for the intersect polygons was calculated and then divided by the total area of the official no-take zones and multiplied by 100.

4.3.2.2. Important Species

In many cases the participants discussed the important species without prompting, in these cases I would ask them to confirm the important species and they could add or remove species from the list. If participants did not discuss important species of their own accord, I would explicitly ask them to list the species. The important species identified by the various user groups were compiled to allow for comparison between user groups as well as with important national and international conservation species. I carried out a cross-scale analysis of important species identified by the participants by comparing their status with local park fishing permits

and national and international reports, thus addressing key question two. The National Biodiversity Assessments from 2011 (Sink et al. 2012) and 2018 (Sink et al. 2019) – which include verified information from national stock status reports, IUCN red lists, the Threatened or Protected Species (TOPS) list compiled by the DEA - the Southern African sustainable seafood initiative (SASSI) list, recreational and small-scale permit regulations and the MPA regulations, were all used to inform the cross-scale analysis. Species-based policies/statuses were considered to be aligned based on the following conditions:

1. If a species, identified as important for extractive use, is permitted by the park, has a status of "optimally harvested", and is on the SASSI green list;
2. If a species, identified as important for extractive use, is permitted by the park, does not have a status of vulnerable/over-exploited/endangered/threatened, and does not appear on the SASSI orange or red list.
3. If a species, identified as important for non-extractive use (i.e. eco-tourism), is not permitted for extraction by the park, and had a protective status in at least one of the lists.

If the species-based policies/statuses did not fit at least one of these criteria, they were deemed misaligned.

4.3.3. External components

External elements are defined as: "The primary external elements of system resilience include context… connectivity… and resulting spatial dynamics, such as spatially driven feedbacks and spatial subsidies" (Cumming 2011, pg. 25). *Context* refers to what surrounds the system, for example the political and economic climate as well as social context beyond the fishing community, such as social taboos. *Connectivity* refers to links to other actively or potentially interacting units, for example alternative livelihoods or activities in related, but separate, sectors. *Spatial feedbacks* occur between system processes and spatial variation, for example migration and species distribution. *Spatial subsidies* are external inputs that typically come at some cost to the system providing the subsidy and are important components of the system being studied. The issue of scale is extremely important in identifying external elements as they, and their impacts, will likely differ depending on the system description and the scale it is being approached from.

For this project, I focused on the external elements that affect local resource users. I carried out a thematic analysis to identify external elements that were highlighted by the participants

throughout the discussions. I took a confirmatory approach to the qualitative data analysis, using the external element themes outlined by Cumming (2011) and Guest (2012).The external elements are any factors or interactions that impact on the user's ability to access the resource that are not based on equipment, permits, or the state of the immediate marine ecosystem. Identifiers included, but were not limited to, fuel, gender norms, basic needs and household level relationships, criminal activities, and weather or climate. It is essential to note that these are "perceived" external elements according to the experience of the participants and cannot be generally applied for all users groups in the peninsula. A description of the coding can be found in Appendix E.

4.3.4. Limitations

There are two main limitations in this chapter that prevent the information from being generalised (rather it can contribute to an existing pool of knowledge). The first limitation is the possibility of respondent bias; it is possible that respondents gave answers that they felt they were expected to give. I tried to reduce this bias by ensuring all participants that I was in no way connected to any government authority and that they had total anonymity, I also contacted them through a snowballing method as participants might feel more comfortable talking to me once I was recommended by a trusted member of the community. However, there was a trade-off for using the snowball method: the sample cannot be assumed to be representative (Sharma 2017). One way to overcome this would be to carry out further research in order to interact with a greater range of participants. It is also important to note that respondent biases are often overcome only after many years of working with the community and building relationships.

An important limitation of participatory mapping is that the mapping of resources is not always accessible/inclusive. In this study, the women's groups and any marketers that were interviewed, were unable or unwilling to contribute to the process. Whilst the actual resource directly impacts on women's and marketer's livelihoods, and the zones indirectly impact on them, their spatial knowledge of the location of the resources (fish) is extremely limited (to the extent that almost no marketers were not confident in identifying areas of importance), alternatively they may not have been willing to share this information. Users that operated on a smaller scale (mostly the women's group in this study), were uncomfortable with identifying areas of importance, as they felt they could then be easily identified as participants.

4.4. Results

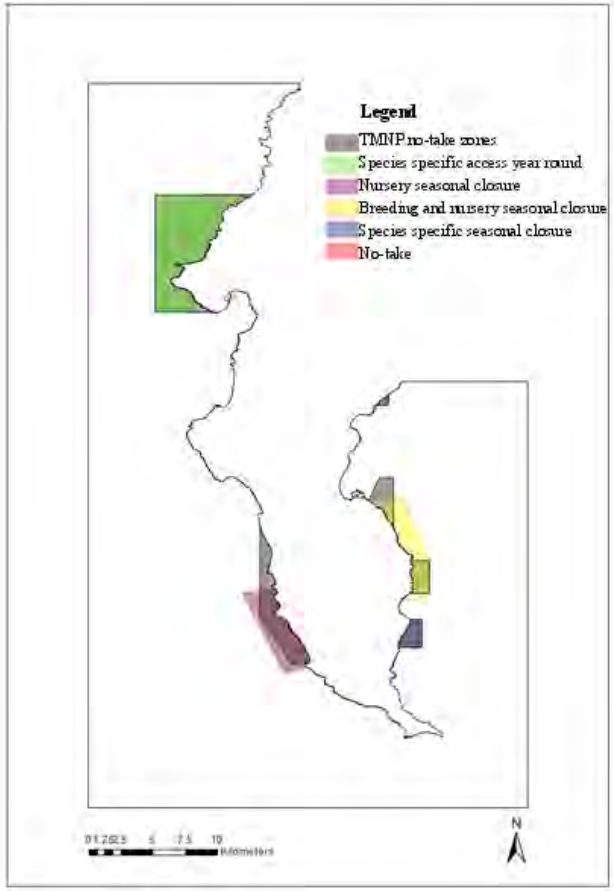
4.4.1. Zonation and mapping exercise

The existing MPA has two zone types: no-take and controlled (Table 2). The no-take area is 49.75 km^2 (4.975 % of the entire TMNP MPA). The community-designed MPA has four zone types: no-take, controlled, species specific, and seasonal closures (Figure 2a). The total area encompassed by the zones is approximately 56.56 Km^2, however the total no-take area is 0.32 km^2 with the majority of the protection occurring in a species-specific zone (30.60 km^2). The fish species identified for the species-specific zone is Hottentot (*Pachymetopon blochii)*. The zones identified by the communities overlapped with 87.87 % of the official no-take zones. Both the sports fishers and eco-tourism operators identified areas beyond the official MPA boundaries for protection.

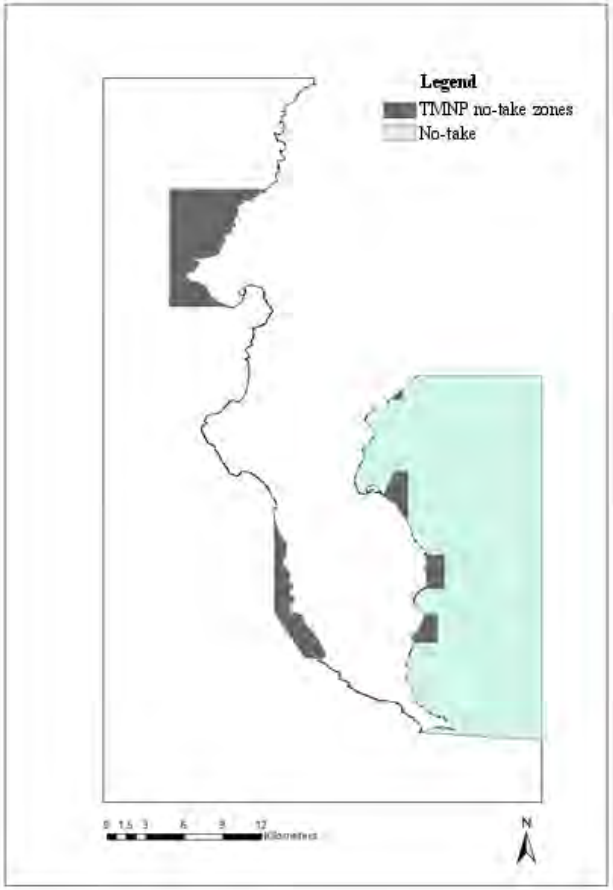
Table 2. Type and allocation percentage (%) of zones in the existing Table Mountain National Park MPA and the hypothetical community MPA

Zone Types	Percentage (%) of protected area in the existing MPA	Percentage (%) of protected area in the community MPA	Existing MPA zone definition	Community zone definition
No-take	100.00 (4.975 % of the entire MPA)	0.61	No fishing or extractive activities are allowed within the no-take/restricted zones.	Same definition as the official definition
Species-specific zones	-	56.74	-	Fishers should be allowed to access Hottentot (*Pachymetopon blochii)* in the Karbonkelberg zone throughout the year, rather than it being a no-take zone. It is important to note that in the official regulations, fishers are allowed to capture Snoek (*Thyrsites atun)* deeper than the 35 m contour.
Seasonal closures	-	42.65	-	These areas are to be closed to extractive activities (including fishing for two of the zones) during breeding seasons.
Total no-take area	49.75 km^2	0.32 km^2		
Total protected area (not including controlled zone)	49.75 km^2	56.56 km^2	-	-

a.


Legend
TMNP no-take zones
Species specific access year round
Nursery seasonal closure
Breeding and nursery seasonal closure
Species specific seasonal closure
No-take
N

b.


Legend
TMNP no-take zones
No-take
N

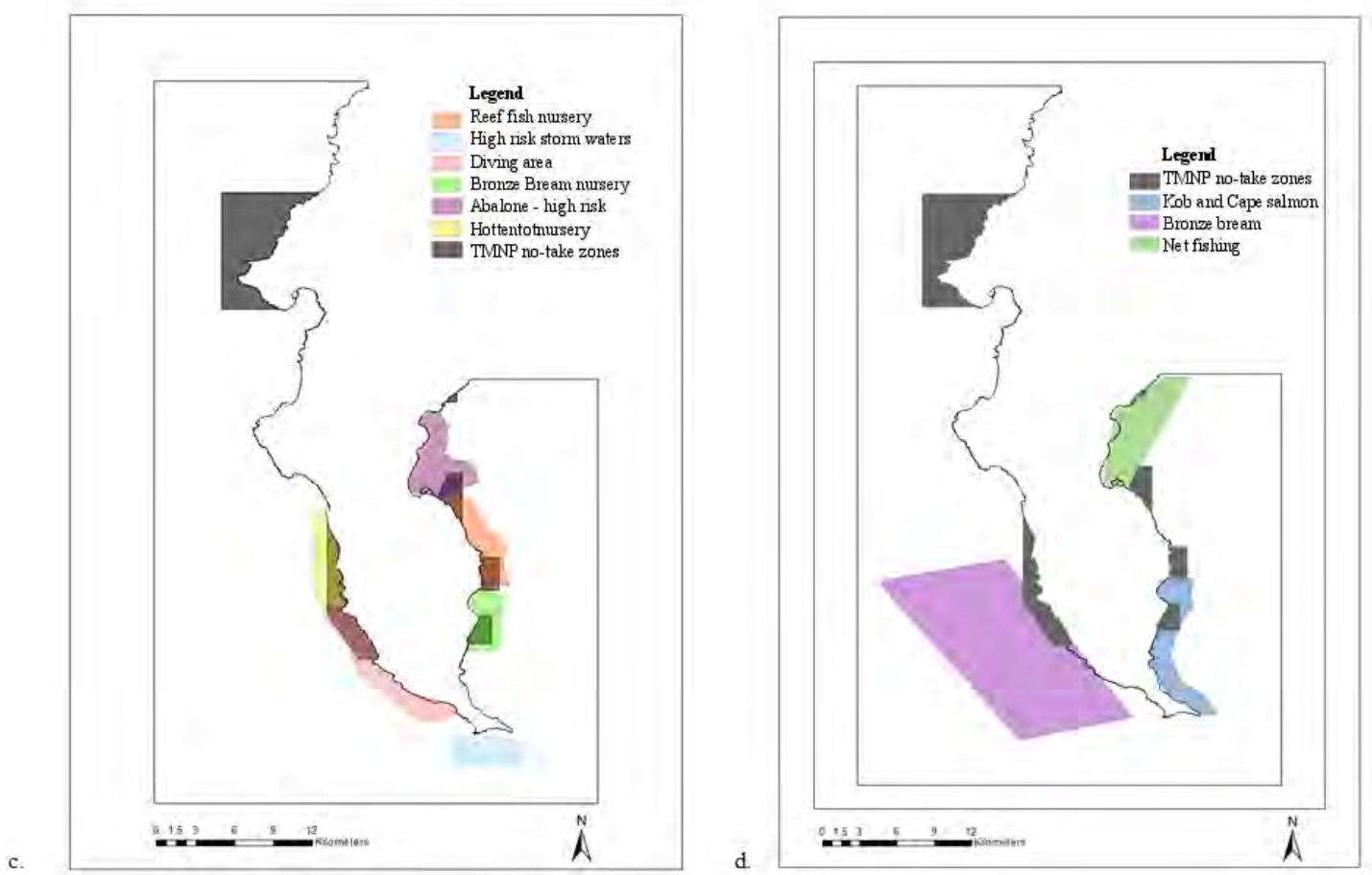


Figure 2. Participant maps: a. Community designed MPA; b. Eco-tourism designed MPA; c. Non-fishing activity use map; d. Fishing activity map. The maps are within the boundaries of the Table Mountain National Park MPA, grey polygons represent the existing no-take zones.

The physical spatial allocation of the zones overlaps greatly between the government allocated zones and the user group zones. However, some of the motivation behind decisions for zones differed. Whilst the official zoning is guided by the principles of sustainable ocean economy development, enhancing societal benefits, and promoting sustainable marine resource use and a healthy marine environment (RSA 2019), the motivation for the user group zoning was based more on the areas of use, as well as important breeding and nursery sites (Table 3) (Figure 2c & d). Justification for the species-specific zones was based on the identification of important breeding and nursery grounds for some species during certain times of the year, this is similar to the official principles of sustainable ocean economy development and enhancing social benefits as it promotes the sustainable use of resources. The motivation behind the no-take zone was that it was an area in which line-fishers do not operate and so they would not be affected by its closure. The justification for the species-specific area was that Hottentot, an economically important species, from that area were not currently available to them.

Table 3. Community zone motivations and the percentage of participants that supported this zone type. Note: this percentage is derived from the total number of participants that contributed to this stage of the workshop (n = 60) and not all of the participants.

Zone type	Motivation	Percentage (%) of participants that supported this zone type
Species-specific	"We need to get Hottentot when there is no Snoek so that we can keep working when they [Snoek] move away" - Marketer "Many non-protected fish move through the no-take zones and then we can't access them." - Fisher "Open routes for us to get to Hottentot, akrikels, mussels, limpets to help with food security everyday." – Women's Group	81.66
Seasonal closures	"We don't want the MPAs open completely, we know it's for species to lay their eggs there." - Fisher "It they close off the ocean and issue the fishers grants they mustn't close the oceans forever – only to allow the fish to repopulate." – Fisher	78.33
No-take	"These zones (no-take) will help a lot with our current circumstances and it also helps with the species." - Fisher "No-take areas are important to protect the ocean." – Women's Group	80.00

Whilst there was consensus on the community map from all user groups, it should be noted that the MPA map suggested by the tourism operators (Figure 2b) was vastly different and consisted of one large no-take area on the inside of False Bay. A possible driver behind the different spatial allocations may be due to the important species for the different groups – a specific component of the ecosystem.

4.4.2. Important species

There was a clear distance-from-shore habitat distribution pattern of the important species for the different user groups (Table 4). Women's groups were mainly dependent on near-shore species (many of which were invertebrates), fishers were dependent on a mix of invertebrate

and fish species that normally occur within 10-12 NM, sports fishers were dependent on larger fish species also found ~10 NM from shore and only one invertebrate, namely West Coast Rock Lobster, eco-tourism operators identified species that tend to be charismatic and have long-distance migratory routes. Species for women's groups, fishers, and sports fishers are largely informed by government permits. Disparity between ranges for women's groups and fishers was also affected by social norms. In many cases, women were not permitted onto boats by many male-dominated crews and thus were restricted to species that were easily accessible from the shore: "What about our kids? And your husband wants a good plate of food when he comes from the sea. So, if she goes out to sea, who will care for the other duties?" – Male skipper.

Table 4. Important species identified by resource user groups and the percentage of workshop sub-groups that identified the species (WCRL = West Coast Rock Lobster). Sources for habitat information: Mann (2013), Simm-Castley and Hosking (2003), Cockcroft et al. (2011), Van der Merwe (2009), Van Bonn (2015), Nowak (1999), Seiphetlho (2014).

Women's Group (n= 23)			**Fishers(n= 32)**			**Sports fishing (n= 10)**			**Eco-tourism (n= 11)**		
Species	%	Habitat	Species	%	Habitat	Species	%	Habitat	Species	%	Habitat
Periwinkles (*Littorina littorea*)	30	Intertidal zone	Snoek (*Thyrsites atun*)	100	Mesopelagic (Adult) and epipelagic (juvenile)	Snoek (*Thyrsites atun*)	100	Mesopelagic (Adult) and epipelagic (juvenile)	Cetaceans (Infraorder Cetacea)	87	Coastal areas and open ocean
Bronze bream (*Pachymetopon grande*)	30	Shallow intertidal rocky shores and reefs down to 25 m	Yellowtail (*Seriola lalandi*)	100	Deep reefs, down to 150 m	Yellowtail (*Seriola lalandi*)	100	Deep reefs, down to 150 m	Sharks (Subclass Elasmobranchii)	75	Mostly across the continental shelf
Hottentot (*Pachymetopon blochi* i)	70	Rocky reefs from the surf-zone, down to 60 m (Adults), shallow subtidal reefs (Juvenille)	Hottentot (*Pachymetopon blochii*)	100	Rocky reefs from the surf-zone, down to 60 m (Adults), shallow subtidal reefs (Juvenille)	Hottentot (*Pachymeto pon blochii*)	80	Rocky reefs from the surf-zone, down to 60 m (Adults), shallow subtidal reefs (Juvenille)	African penguin (*Spheniscus demersus*)	25	Coastal areas and offshore islands
Abalone (Haliotis spp.)	30	Shallow coastal waters, preferably rocky	Abalone (Haliotis spp.)	90	Shallow coastal waters, preferably rocky	Tuna (Thunnus spp.)	100	Generally in the first 350 m of the ocean, dependent on the thermocline	Seals (Suborder pinnipedia)	12	Foraging and resting in shallow waters near littoral zone, otherwise are pelagic
Mussels (*Donax serra*)	70	Sandy intertidal	Red Roman (*Chrysoblephus laticeps*)	81	Deeper low- and high-profile inshore and offshore reefs down to 100 m	Marlin (Family Istiophoridae)	100	Epipelagic, not usually found near land masses			
WCRL (*Jasus lalandii*)	100	Rocky bottoms depth range 5 - 20 m	WCRL (*Jasus lalandii*)	59	Rocky bottoms depth range 5 - 20 m	WCRL (*Jasus lalandii*)	80	Rocky bottoms depth range 5 - 20 m			
Limpets (Family Patellidae)	70	Rocky intertidal, often sublittoral	Geelbek (*Atractocion aequidens*)	59	Throughout distributional range, over sandy and rocky substrata down to 150 m (Adult)						
			Mussels (*Donax serra*)	59	Sandy intertidal						
			Limpets ((Family Patellidae)	59	Rocky intertidal, often sublittoral						

The comparison of important species generally shows good alignment across scales (Table 5). The main source of misalignment occurs between the species permitted by park management and DAFF and the species national stock status or international status. Species such as White Steenbras (*Lithognathus lithognathus*) and Geelbek (*Atractocion aequidens*) are permitted for capture and sale according to the latest regulations (2017-2018), however they are categorised as collapsed by the 2018 NBA (Sink et al. 2019). There was seemingly good alignment between user group and national and international status as species described as no longer present in the area by users are either classed as overexploited at the national scale, or endangered or vulnerable at the international scale. The only misalignment at a local scale – species that are important for user groups, but not permitted by park management and DAFF – are the use of abalone (Haliotis spp.) and Panga seabreem (*Pterogymnus laniarius*).

Table 5. Important species identified by different user groups compared with local permitting regulations, and national and international status. Stock status = present stock status as reported in NBA 2018 (Sink et al. 2019). Stock status that aren't current have the most recent year next to them in brackets. Stocks with an asterisk indicate their status has been raised in previous years. TOPS - South African list of Threatened or Protected Species. Rows that are highlighted in yellow show possible mismatches across scales. Rows highlighted in blue show possible local level mismatches i.e. between user groups and the MPA/DAFF guidelines. Species with a plus were identified by fishers as no longer present in the fishing area. Rows that are not highlighted show possible alignment. Important species for each group, and percentage of groups that referred to them are taken from Table 3.

Scientific name	Common name	MPA Permitted	MPA Protected	Women's group	Fishers	Eco-tourism	Sports fishing	SASSI Green	SASSI Orange	SASSI Red	SASSI No sale	Stock Status 2011	Stock status 2018	TOPS National	Global assessment 2011 (IUCN Red list)	Global assessment 2018 (IUCN Red list)
Thyrsites atun	Snoek	X		X	X		X	X				Optimally exploited	Underexploited*	Not listed		Not assessed
Pachymetopon blochii	Hottentot	X		X	X		X	X					Underexploited*			LC
Atractocion aequidens	Geelbek	X			X					X		Overexploited, collapsed or threatened	Collapsed	Not listed		VU
Argyrosomus spp.	Kob	X			X							Information not available				
Seriola lalandi	Yellowtail	X			X		X	X				Optimally exploited	Optimally exploited	Not listed		LC
Donax serra	White mussels	X		X	X							Uncertain status				
Haliotis spp. *Pterogymnus laniarius*	Abalone Panga seabreem			X	X X					X		Overexploited, collapsed of threatened	Collapsed* Underexploited (1994-1995)			
Chrysoblephus laticeps	Red roman	X			X				X			Overexploited, collapsed of threatened	Optimally exploited (2004)			NT
Pachymetopon grande *Lithognathus lithognathus*	Bronze bream White steenbras	X X		X	X						X	Overexploited, collapsed or threatened	Collapsed (1993)		In review	NT EN
Family Patellidae	Limpets	X		X	X											
Turbo sarmaticus	Alikreukel	X		X												
Ecklonia maxima, Laminaria pallida	Kelp	X				X						Optimally exploited	Optimally exploited*			
Subclass Elasmobranchii	Sharks		X			X						Uncertain			VU	
Suborder Pinnipedia	Seals		X			X								Protected		LC
Spheniscus demersus	African penguin		X			X								Endangered	EN	EN
Infraorder Cetacea	Cetaceans		X			X								Not listed	EN	LC
Thunnus spp.	Tuna	X					X	X				Optimally exploited				
Family Istiophoridae	Marlin	X					X							Not listed		VU
Littorina littorea	Periwinkels	X		X												

Jasus lalandii	West Coast Rock Lobster	Seasonal availability, special license required		X	X		X			X		Overexploited, collapsed or threatened	Collapsed*			
Chrysoblephus gibbiceps	Red stumpnose[+]	X								X					In review	EN
Rhabdosargus globiceps	White stumpnose[+]	X								X		Uncertain				VU
Pomatomus saltatrix	Elf[+]	X										Overexploited, collapsed or threatened		Not listed		VU
Cheimerius nufar	Santer[+]	X							X				Overexploited			DD
Trachurus trachurus capensis	Horse mackarel[+]	X							X				Uncertain			

4.4.3. External elements

Participants identified 23 different external elements when asked what factors affect their livelihoods, with contextual elements having the greatest impact, and range, across the three groupings (Table 6). The fishers were affected by the most external elements (18), whilst the eco-tourism and sport fishing sectors identified the least number of elements (11). Some elements were highlighted by more than one group; however, this does not mean that the impacts they have are the same. Please see Appendix D for more detail.

The issue of scale is an important component of spatial resilience theory; this is also demonstrated by the results. Contextual elements tend to occur on the local to national scale (such as elections and fuel prices), even going so far as the household scale (for example, divorce or death of a family member). It appears that women are the group most concerned with household scale elements, 100 % of women identified gender-based exclusion and family dynamics as external elements that affect their ability to pursue a livelihood in fisheries. Conversely eco-tourism and sport fishing groups are almost exclusively concerned with municipal to national scale elements, such as travel patterns (52.38 % of respondents from this user group highlighted this element) and national education (76.19 % of respondents in this user group highlighted this element). Connectivity elements show a range from community scale to international scale. Similar scale patterns are evident between the groups whereby women are mostly concerned with community elements, while eco-tourism and sports fishers are concerned with national and international elements, and fishers are affected across the scales. Poaching (women: 86.96 %, fishers: 98.88 %, and eco-tourism/sports fishers 90.48 %), corruption (women: 100.00 %, fishers: 87.50 %, and eco-tourism/sports fishers 100.00 %), and communication (women: 91.30 %, fishers: 62.50 %, and eco-tourism/sports fishers 71.43 %) were some elements that were emphasised by all stakeholders. The same spatial feedback categories were identified by each group (although pollution was not mentioned by the women's groups), however each element and its impacts can themselves be scaled up or down.

Table 6. External elements identified as factors that affect the ability of user groups to pursue their livelihoods

		Percentage (%) of participants that referred to the external element		
Category	External element	Women's groups (n=23)	Fishers (n= 32)	Eco-tourism/ sport fishing (n= 21)
Context	Fuel prices		84.38	30.48
	Poor education			76.19
	Changes in national legislation and policy	60.86	62.50	66.67
	Government budget	43.48	75.00	95.24
	Elections		46.88	
	Corruption	100.00	87.50	100.00
	Lack of training		59.38	
	Communication barriers	91.30	62.50	71.43
	Food insecurity		93.75	
	Family dynamics (i.e. divorce and death)	100.00		
	Gender-based exclusion/superstitions	100.00	31.25	
Connectivity	International and local travel patterns			52.38
	Underground mafia	69.57	84.38	
	Poaching	86.96	96.88	90.48
	International fishing industry		100.00	
	Drug use	73.91	43.75	
	Prostitution	43.48		
	Child exploitation	21.74		
	Lack of alternative livelihood opportunities	86.96		
	Selective and assumptive research practices		34.38	
Spatial feedbacks	Climate change	65.22	96.88	100.00
	Pollution		78.13	95.24
	Weather patterns	82.61	62.50	85.71

4.5. Discussion

In this chapter, I sought to understand the alignments and misalignments between national policy and management goals, and different local stakeholder groups. Community designed MPAs as well as important species and access to species highlighted several alignments and

misalignments between local park authorities and stakeholder groups. The results show spatial elements, such as species distribution, help inform the foundation of how people interact within the system and that these spatial factors influence, and are influenced by, multiple other elements such as gender norms, corruption, and fishing regulations. A participatory zoning exercise showed not only tangible resource use and activity distribution, but also helped in identifying the interactions, as well as the representation of different user groups. In using a spatial resilience lens to identify important species, an essential data layer in marine spatial planning, I was able to combine the geographically distant characteristics of these species with the interactions of differing user groups, policy, and regulations at various scales and levels. The external elements showed the complex, multi-scale and multi-level nature of some of the interactions between policies and user groups. The effects of these elements are often experienced in localised areas and can be spatial in nature; however, a spatial resilience lens allows us to consider the numerous ways in which these elements operate across scale, space, and time. I shall, to a certain extent, address each key question in turn, however, important links between the applications will be highlighted as well.

TMNP MPA and Community Designed MPAs

My results showed an 87.87 % similarity in the placement of the official MPA no-take zones and all the different community MPA zones; there is, however, a relatively large disparity between the official no-take zones for the MPA and the community's no-take zone. One of the interesting outcomes of the mapping exercise was the juxtaposition of motivations behind the zones developed by the community, versus the official MPA – this is to be expected due to the different interests at play. The predominant motivation of the official MPA's designation is to protect the ecological integrity of the area encompassed by the park (SANParks 2015), whilst the community motivations can mostly be classed as socio-economic motivations such as food security and access to economically viable species throughout the year. Management regimes are less likely to experience challenges due to lack of resources when they are designed to meet community goals, as they may have greater compliance and consequentially have greater conservation success than regimes primarily designed for biodiversity conservation (McClanahan et al. 2006). Whilst the TMNP MPA is predominantly designed for biodiversity conservation, it does so in part so as to be able to address socio-economic issues as well, such as encouraging responsible tourism, job creation, and protection of cultural and spiritual heritage (SANParks 2015). Uncovering the disparities, and similarities, in motivations behind the zones could be helpful in moving forward in MPA zoning, as it can aid in explicitly

combining the lateral and vertical perspectives of social-ecological systems (Cumming et al. 2017). The need to balance socio-economic needs and environmental sustainability is increasingly pressing due to the rise in consumer demands, population growth, and technology (Ansong et al. 2017). Marine governance processes need to ensure that consumption of marine resources does not lead to a lower prioritisation of conservation goals, whilst simultaneously ensuring that community involvement and values are not constrained in decision-making processes (Ansong et al. 2017). However, balancing human rights and environmental principles requires overcoming a variety of challenges including differing values, goals and agendas, institutional barriers and having to reconcile global aspirations with local realities (Sowman et al. 2014). Achieving sustainable management of marine resources is centred around two arguments: firstly, unsustainable consumption and demand of natural goods and services are the underlying pressures on biodiversity; secondly, global poverty is exacerbated, and economic development is undermined, by the loss of biodiversity and ecosystem functioning (Secretariat of the Convention on Biological Diversity 2014, Dominguez-Tejo et al. 2016).

By comparing the community MPA, the official MPA, and the suggestions from eco-tourism operators, the results show that some groups are being more represented in the design of the official MPA than others (mostly the fishing crews) as there was the greatest overlap between their priority species and the species protection levels, and the MPA designs. The main difference in representation can be seen by the fact that eco-tourism operators and sports fishers designed an MPA that is located beyond the actual boundary of the existing MPA and is positioned entirely on the east of the peninsula. Another source of space-based user differences is seen in the placement of the community's "no-take zone" – the fishers interviewed for this project were mainly long-line fishers and so are not active in that area, however after consulting with SANParks officials I was made aware that this area is often used by net fishers, thus emphasising the heterogeneity within small-scale groups[6]. This is not unique to South Africa, a study in Florida Keys focusing on the degree of public participation in marine zoning plans, found significant differences among three user groups, with one group feeling highly alienated and disempowered (Suman et al. 1999), this is important to note as fair representation is an important aspect for social justice and wellbeing. Despite growing concerns about social injustices and exclusionary processes, attention to social issues – such as representation –

[6] Whilst this is not ideal for this thesis as it would have added another area of analysis, it does not take away from the value of this study as I am focussing on the application of a lens, however it will be essential to include this heterogeneity and identify all sub-groupings in any studies trying to present a holistic analysis of the area.

remains inadequate (Bennett 2018). Issues of inclusion and representation are important for fisheries management and marine conservation; however, a review of coastal and ocean planning processes found that less than 50 % included social data and only 10.8 % of that data was spatially characterised (Cornu et al. 2014, Bennett 2018). The use of a spatial resilience lens has aided in identifying the possibility that exclusion may, in part, occur due to spatial mismatches in management scale and use scale. A spatial resilience lens can help to dissect the complexities, such as resource access and multi-user relationships, that occur at user level as it shows the physical space which each user group occupies and thus gives us insight into how the space is used, resource priorities, and accessibility - the obvious example from this study being the maps designed by fishers versus the one designed by eco-tourism operators; these issues will have impacts on the implementation of the MPA regulations and their appropriateness for the area. This is a difficult challenge to overcome as, even when social factors are included, marine spatial planning often uses large-scale data with a low spatial resolution, whereas local plans are generally based on fine-scale, high-resolution data (Lagabrielle et al. 2018). By using spatial elements and applying a spatial resilience lens, it may be possible to find appropriate negotiation entry points through similarities and differences.

Evidence from the important species and the external elements for the user groups provides a finer level of detail that can inform the interpretation of the spatial data used in marine spatial planning. For example, by combining the fact that food insecurity is an external challenge that affects users; Hottentot and molluscs were identified by women as important species (whose distribution tends to be inshore); and that many fishers identified women as the main care-givers - thus it is not surprising that the most important species for women are generally located inshore as given they are identified as the primary care-givers and this restricted to fishing close to home, therefore we can create a more appropriate spatial zoning that can address direct and indirect factors that impact on resource user behaviour. In line with my results, a study by Fortnam et al. (2019), showed that fishing activities carried out by men in Kenya and Mozambique were farther away from the coast in deeper water, while women in these communities generally exploited areas accessible by land or exposed at low tide. Furthermore, by understanding the distribution of, and relationships between, important species and user activities, it may be possible to better predict user behaviour and ensure that the spatial management of the MPA is efficient, and when user groups feel their needs and opinions have been included in planning there is greater potential for buy-in and compliance (Read et al. 2011,

Di Franco et al. 2016, Sene-Harper et al. 2019). A spatial resilience lens allows us to understand the spatial heterogeneity of resource use. An area for future investigation would be a deeper incorporation of the terrestrial infrastructures - such as roads, schools, slipways, elevation, and vegetation - into the analysis to help understand how the implementation of regulations may be enhanced or hindered. Investigating the land-sea interface could give important insights into access to resources for both resource users and management teams (the importance of resource access was also highlighted in Chapter Three) (Cochrane et al. 2020). Furthermore, it would be essential to incorporate the political and historical interactions that influence the distribution of land-based structures into marine spatial planning and MPA management activities.

One of the strengths of the spatial resilience lens is that the system of focus can include those that operate across multiple scales and locations (Cumming et al. 2017). In this study, the way the resource space is being used depended not only on the physical presence of the resource, but on the social and political context as well. External elements such as gangs, fuel prices, and family dynamics were all identified as external drivers that affect the user's access to resources and how they operate spatially. Each of these drivers operates at a different scale and will have dynamic interactions with each user group – a factor that is taken into consideration in the spatial resilience lens. It is appropriate here to discuss the concept of fragmentation, especially in social systems, as the physical (terrestrial) and social fragmentation is contrary in nature to the open, dynamic character of the marine environment, thus complicating the processes of aligning the management of human expectations and behaviour with regard to marine environments, resources, and biodiversity within the context of societal expectations (Kenchington et al. 2014). Social fragmentation can consist of the loss of connectedness or the separation of a component of a system that "should" be incorporated within the broader system, perhaps for functional, ethical, or historical reasons (Cumming 2011). External elements may have resulted in deepening this social fragmentation as they can limit access to resources and social networks within the fishing community. Despite South African marine policy being designed to directly address past and current social injustices, such as the Small-Scale Fisheries Policy (see glossary), the lack of recognition of the spatial/access barriers resulting from these external elements can result in a misalignment between the needs of the user groups and policy. The issue of access is spatially rooted (i.e. location of the resource and physical access routes); however, if the way the issue is addressed is purely spatial, then the "solution" may not be meaningful.

Participatory mapping is a useful technique for providing social data and predicting conflict potential, as it can facilitate knowledge sharing between resource users, management staff, and other collaborators (Robinson et al. 2016). While it is increasingly used in terrestrial applications to inform planning, it has not had as wide an application in the marine realm (Moore et al. 2017). In the context of this study, it aided in identifying misalignments and alignments in the zonation of the MPA, as well as beginning to understand local ecological knowledge; however, the more meaningful information lies within the connections, relationships, and motivations behind the information given. There is evidence of this starting in South Africa with studies such as the NBA 2018 (see Mavumengwana et al. 2018, Harris et al. 2019, van der Bank et al. 2019), whereby elements including cultural and spiritual sites are being incorporated into benefit analyses. Analysing maps consisting of socio-cultural and bio-geographical information, as well as those of the terrestrial infrastructure, through a spatial resilience lens, encourages a systematic, and more holistic understanding of a system; however, it is evident that the information gained from mapping can be strengthened when used in conjunction with other methods in the analysis. By using a spatial resilience lens, we can ensure that the combination of methods and elements is appropriate to the system being studied.

Important Species

Information about important species identified by natural resource users is often used to determine ecosystem services (for example Potts et al. 2013, Carcamo et al. 2014, and Outreiro et al. 2015). However, we can also utilise this information to help us understand the needs and ways of thinking of the participants/user groups – as the interaction between people and spaces influence people's knowledge rooted in the system - which can help build on our understanding of the community and management dynamics as the management of marine resources is political and culturally driven (Crona and Bodin 2006, Levine et al. 2015, Fortnam et al. 2019). The results from this study show that there are different scales of thinking and interaction between the various community groups. The success or failure of implementing policies and decision-making processes are influenced by human livelihoods and perceptions, and these notions are fundamentally shaped by both space and place (Levine et al. 2015). This suggests that the way in which users will interact and be affected by management policies may be different, due to the ways in which the groups think about, and operate in, the marine space (Manzo and Perkins 2006). Secondly, the species identified by the different user groups point to inherent power dynamics between the user groups – for example, the fact that tourism operators are dependent on highly migratory and mostly charismatic species that are

considered, not only in local marine management, but at an international scale for their protection, means that this group of users may be more likely to have influence over the design and implementation of the MPA. This was further illustrated by the overlap of the fishing community map and the official MPA.

The cross-scale comparison of important species yielded an interesting result: while there is good alignment between the local user group species and those permitted by the park, and national and international stocks there seems to be some misalignment between the species permitted for capture in the park and national and international stocks. Examples of alignment include Snoek and Yellowtail which are deemed important by fishers, on the SASSI green list, and are listed as optimally exploited, additionally, Elf and Santer were identified as being no longer available by fishers, overexploited by national government documents, and are listed on the IUCN Red list. Examples of misalignment include Geelbek and Red roman, both classed as important for fishers and are permitted for capture within the MPA, however are listed as red and orange of the SASSI list respectively, overexploited/collapsed or threatened in national stock status reviews, and Geelbek is classed as vulnerable on the IUCN Red list. One reason for the alignment may be due to the coarse data that is used for national and international stocks resulting in "coincidental" alignment, that is to say there may be alignment with one local area and no alignment for a neighbouring area due to the spatial heterogeneity of SES and biodiversity at finer scales. However, the same can also be said of the misalignments i.e. the populations of Geelbek and Red roman within the park may be large enough to sustain fishing within the area – this highlights the importance of scale, migratory behaviours, and nursery areas when appointing fishing permits within a single MPA.

Protection of Key Species

There are two key species that warrant further discussion as they clearly demonstrate the cross-scale and cross-level nature of species protection and use: Abalone and West Coast Rock Lobster. Both species are identified as being important by the fishers and women's groups, only West Coast Rock Lobster is permitted for seasonal capture in the MPA whilst Abalone is not permitted at all, and both are listed on the SASSI Red list and as collapsed by the 2018 national stock status review. Furthermore, both species are considered high-value, in-shore species at a national level and are poached/illegally caught at high levels with the levels of illegal fishing increasing dramatically between 2000 and 2009 (Brill and Raemaekers 2013). One of the key reasons that these species are so highly poached is since they are readily

available resources in relatively shallow water and are of high value (Warchol and Harrington 2016, Cochrane et al. 2020).

There are, however, important differences between the use and protection of the two species. A study by Brill and Raemakers (2013) found that in TMNP MPA Abalone were predominantly confiscated on the east coast of the peninsula, whilst West Coast Rock Lobster were predominantly confiscated on the western side. Illegal Abalone fishers tend to be associated with highly sophisticated, hierarchical, international gangs that operate on a large scale harvesting the maximum possible amount (Brill and Raemaekers 2013, Warchol and Harrington 2016). They are also not averse to violence (Brill and Raemaekers 2013, Warchol and Harrington 2016). The impacts of these operations (and the act of poaching itself) such as drug use, gangs were all highlighted as external elements that affected participant's ability to pursue their livelihoods in this study. However, there are also less organised and more opportunistic Abalone harvesters that operate within the TMNP, in fact some of the participants within this study admitted to harvesting Abalone illegally (Brill and Raemaekers 2013, Warchol and Harrington 2016). Small-scale harvester's motivation, however, tends to be different as they tend to come from greatly impoverished communities that have been greatly affected by Apartheid whilst the sale of Abalone allows access to quick, easy money, and/or have a lengthy history of using the resource (Warchol and Harrington 2016, Isaacs and Witbooi 2019). A study carried out by Isaacs and Witbooi (2019) in Arniston (an area about 200 km east of TMNP) reports participants stating that their motivations for Abalone poaching include lack of livelihood opportunities, poor rights allocation processes, and the appeal of quick and easy money. Once again, many of these factors were identified by participants within this study.

An analysis on the management of the West Coast Rock Lobster fishery in South Africa found that the management performance in this fishery was classed as below necessary standards overall, and across many criteria (Cochrane et al. 2020). The motivations for poaching/illegally harvesting West Coast Rock Lobster in TMNP MPA tend to be associated mainly with food insecurity, poverty, and basic income (Brill and Raemaekers 2013, Isaacs and Witbooi 2019, Cochrane et al. 2020), once again these are all external elements identified by fishers and women's groups within this study. The challenge of protecting this species include a decreasing capacity within DAFF, rejection of the legitimacy of policy and regulations, and confusion over rights allocations – these challenges could, in essence, be applied to many MPA management scenarios and are in fact echoed in Chapter Three of this thesis (Cochrane et al. 2020).

The messages from this section focussed discussion about Abalone and West Coast Rock Lobster emphasise the importance of understanding the socio-economic context of the people who live near and use the marine resources within the MPA as many of the challenges faced by park authorities in protecting key species are rooted in socio-economic issues. Furthermore, it highlights the scale-based differences between the use and protection of individual species thus it is challenging for policies to address multiple species and increasing the possibility of cross-scale mismatches. This message is echoed throughout literature which argues that current and past governance of South African fisheries arrangements have failed to understand and integrate the complex social dimensions of impoverished coastal communities (Branch and Clarke 2006, Hauck and Kroese 2006, Raemaekers 2009, Sowman 2011, Sowman et al. 2011, Brill 2012, Brill and Raemaekers 2013).

External Elements

As stated in the first chapter of this thesis, SES are complex adaptive systems; this means that they are contextually determined (Prieser et al. 2018). The external elements are as much a part of the system as the internal structure (Juarrero and Lissack 2000, Cilliers 2001). Consequently, the function of a system and its components can be enhanced or restricted by its environment (Poli 2013). Therefore, it is imperative to include the external elements in the study of any SES, this can be seen – in differing forms - throughout SES frameworks such as the Sustainable Livelihoods framework and the Robustness of Coupled Infrastructure Systems framework (Anderies et al. 2016).

Whilst this project provides a snapshot of the external elements rather than an in-depth analysis, it starts to highlight the exposure to change and outside influences of the user groups, for example the issue of local crime impacts on all of the user groups, yet it may affect them in different ways. However, the factors identified in this project greatly overlap with those of a study carried out by Gammage et al. (2017) in a neighbouring area. Both studies found that despite the factors (termed stressors by Gammage et al. 2017) and their impacts affecting the fishers at a local scale and in a geographically distinct location, the factors are a part of, and result in, multiple feedback loops across various scales and form a variety of complex systems at several geographical and political scales. The patterns and processes of these external elements at different scales may undermine or reinforce one another, reducing or enhancing the potential for change at other scales and elements (Cumming 2011). By introducing the concept of scale, we can see that negative changes/events at the local scale can potentially be

more detrimental to women than fishers or eco-tourism operators as most external elements exist at a community level, for example gender-based discrimination/ exclusion, drug use, and lack of alternative livelihoods, whilst certainly not unique to any one area, will be felt at a smaller social scale rather than impacts such as international fishing industry trends (as identified by fishers) which occur on a greater spatial scale. One of the key benefits to the spatial resilience lens is that it strengthens our understanding of the multi-level and multi-scales at which these external elements impact the users and thus can inform appropriate levels of intervention. The impact of gender has emerged from these results and warrants further investigation. Women operated in different marine spaces to fishermen, identified different important species, and, perhaps more importantly, experienced different external pressures – some of which are linked closely to social norms.

4.6. Conclusion

The purpose of this chapter was to apply a spatial resilience lens to the Table Mountain National Park MPA in order to investigate policy, management, and user groups alignments and misalignments. I carried out workshops with various user groups from three communities that are situated and mainly operate in the MPA. There were three main outcomes to this investigation: the development of a community designed MPA. an understanding of important species, and identification of perceived external elements. It is important to note that the purpose of this chapter was not to form a holistic representation of the Table Mountain National Park MPA, but rather to understand how spatial resilience framing can aid in understanding interactions.

There was an 87.87 % overlap in the placement of zones between the community map and the official MPA zones, however the size of the community's "no-take" zone was less than $1/100^{th}$ of the area zoned by the official MPA. Fishing activities tended to take place outside most of the official no-take zones, the exception being the most south-easterly no-take zone where fishers stated that it was a good area for Kob and Geelbek. Areas that were identified as important for some sort of closure by the community greatly overlapped with official no-take zones. A take-home message from this exercise is that there is a large amount of overlap in the justification for zones – this suggests that there is room for potential improvement of the relationship between park management and the community. However, it also suggests that the reasons for the mistrust between park management and communities is not so much to do with enforcement, but rather factors that may be out of control for both stakeholders – results and existing literature highlight the issues of historical and continuing social fragmentation,

communication, and poor interactions with other government departments having a negative influence on this relationship (for example see Sunde and Isaacs 2008, Sowman and Wynberg 2014, Colenbrander 2018, Sowman and Malan 2018, Isaacs and Witbooi 2019).

A key result from the important species and external elements analysis was the emphasis on the heterogeneity of the different user groups. The heterogeneity between user groups can be seen to have differences in scale and level. Women's groups both operates in a smaller marine space, nearer to the shore, additionally the external elements they identified were mostly linked to social norms and community characteristics. Meanwhile fishers and ecotourism operators operate in a larger area and identified more external elements that can be connect to regional to international levels. As a result, it may be important for interventions to take this heterogeneity and the scale different into account.

In conclusion, by incorporating scale and external elements as some of the key elements of spatial resilience lens, we are able to better understand alignments and misalignments in the marine policy and implementation. A spatial resilience lens also lends itself well to a variety of methodologies thus is useful for the transdisciplinary approaches that are currently being encouraged in marine conservation and management. Results from this chapter shows that there are overlapping priorities and opportunities for collaboration as many of the participants arrived at similar conclusions or priorities, the main difference was in how the groups arrived at these decisions.

4.7. References

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Chapter 5

Synthesis

This research aimed to understand if a spatial resilience lens can help identify alignments and misalignments in the implementation of marine policy. Based on my analysis of marine policy in South Africa and its effects on different stakeholders, I conclude that a spatial resilience lens provides an approach which encompasses the dynamic nature of social-ecological interactions as well as the incorporation of multiple scales in analysis. The results indicate that misalignments between all scales and levels identified for this project (jurisdictional, knowledge, institutional, and spatial), have negatively impacted the governance of MPAs and the implementation of marine policy in South Africa. This supports my hypothesis that one of the causes of the marine policy-implementation gap is misalignment in scales between different governance levels, causing difficulties in the execution of progressive policies to ensure just and effective MPA governance.

Isaacs and Witbooi (2019) deliver a damning statement in their discussion of fisheries crime, human rights and small-scale fisheries in South Africa: "All the linefish permits are allocated to individual rights holders and, whilst there is a promise that all abalone will be allocated to small-scale fishers, with the 'basket' of rights continually being diminished by the fisheries department, it is becoming increasingly clear that the department is paying lip service to promoting fishers rights to livelihood and food security. The lack of political will to implement real change in the fisheries rights allocation system seems set to risk the sustainability of the resources and fuel continued illegal fishing in the small-scale sector. Why is this so despite the provisions of the SSFP that seek to move towards the fulfilment of constitutional rights including the right to food? The answer is arguably related to the current failure of the State to play the necessary proactive role in both protecting and fulfilling these rights." (pp. 163). Whilst based on a relatively small sample size, the results from this study certainly exemplify the lack of capacity and cohesiveness between national government departments, park authorities, and communities. As many other studies have shown, there is no one solution, or even leverage point that may help address the implementation gap, but rather a series of changes and links that require attention within the system. Rather than blame specific groups or stakeholders for the implementation gap, my results suggest that cross-scale and cross-level interactions shape policy design, behaviour, and knowledge and need to be incorporated into interventions appropriately. Below, I bring together information from the two results chapters

to reflect on the various factors that affect scale and level misalignments within south Africa's marine policy realm.

5.1. Scale misalignments

I identified two key scale misalignments (i) spatial and jurisdictional (Chapter Four), and (ii) jurisdictional and institutional (Chapter Three). Results highlighted the misalignment between spatial and jurisdictional scales with several experts stating that marine systems and issues do not fall neatly into jurisdictional categories, and the separation of fishing and other marine-based activities between departments was out of alignment with the nature of the ecosystem. The spatial-jurisdictional misalignment is not new to policy or network research; in fact, it is well established that the fragmentation of jurisdictions and institutions are often mismatched with the scale and extent of many types of ecosystems, thus undermining the governance of a system (Lubell 2013, Bodin 2017, Sayles and Baggio 2017, Lombard et al. 2019, Reed et al. 2020).

The fragmentation between jurisdictions and institutions can also be conceptualised as a scale misalignment. The results indicated that responsibilities, as outlined by the institutions, were often distributed across jurisdictional levels; subsequently, communication between jurisdictional levels was limited and the effective implementation of marine policy suffered (Chapter 3: Table 2). A clear example of this was highlighted by one expert whereby the checking of permits in an MPA was not carried out as "The DEA and Park thought it was DAFF's responsibility, as permits are concerned with fishing. Conversely, DAFF felt it was the Park's responsibility, as the fishing was taking place in a protected area. Ultimately, no-one was checking permits" (Respondent 2) - essentially, silo nature of the government departments contributed to the misalignment between levels. The merging of the DEA and forests and fisheries from DAFF, to form DEFF in June 2019 could have important, positive impacts in overcoming the misalignment between these two scales as the responsibilities will fall under on higher level government department and hopefully reduce the misalignment that exists between the DEA and DAFF.

Another aspect of the misalignment between jurisdictional and institutional scales was best exemplified by Respondent 1: "The main issue with small-scale is literally in the work 'scale' in that [small-scale fishers] are not mobile; for example, the big trawling companies won't complain too much about MPAs, because they can travel anywhere." There is a need for institutions to acknowledge the different capabilities and geographical location of various user

groups. The Small-scale Fisheries Policy and Fishing Rights Allocation was developed in order to ensure a more inclusive policy that recognises the different roles small-scale fishers play in fisheries and has been implemented throughout most of South Africa, however its implementation in the Western Cape is ongoing (Masifundise Development Trust and Too Big to Ignore, 2014). Since its finalisation in 2016, DAFF have spent the following years addressing contentious issues across the country, including who is a "bona fide" fisher, thus the slow process has pushed fishing communities towards partnerships which as independent from the state (Nthane et al. 2020) and thus contributing to more, and important, links within the network – however this can also potentially lead to more misalignments if lessons aren't learned from previous experiences.

5.2. Level misalignments

"The people living on the ground know a huge amount about a small problem, whereas the people working in high government have a macro view of policy but can't engage on any specific issue. The one group thinks the other is useless because they are thinking at different scales and they can't communicate in a way that the other understands" (Respondent 1). This is a fascinating quote to dissect. The respondent indicated that there is a disconnect between different jurisdictional levels, in part due to different knowledge levels. This is a relatively common issue as national and provincial administrations often need to work with generalised/universal information, whilst local communities and user groups often have practice-based knowledge which is specific and contextual in nature (Cheng and Daniels 2003,Tai 2015, Thiault et al. 2017, McElwee et al. 2020). This knowledge is tied to spatial levels – the generalised/universal information used by national and provincial administrations often concerns regions or landscapes, yet local community's practice-based knowledge is often more concerned with patches (Tai 2015) (Figure 1). The importance of including multiple scales in analyses is evident as the three scales highlighted here all influence each other. Yet, this is not an example of a scale misalignment nor scale alignment – rather it is the influence of having multiple interacting scales on different levels – and in this case leading to a misalignment between jurisdictional levels due to fragmentation between spatial and knowledge scales.

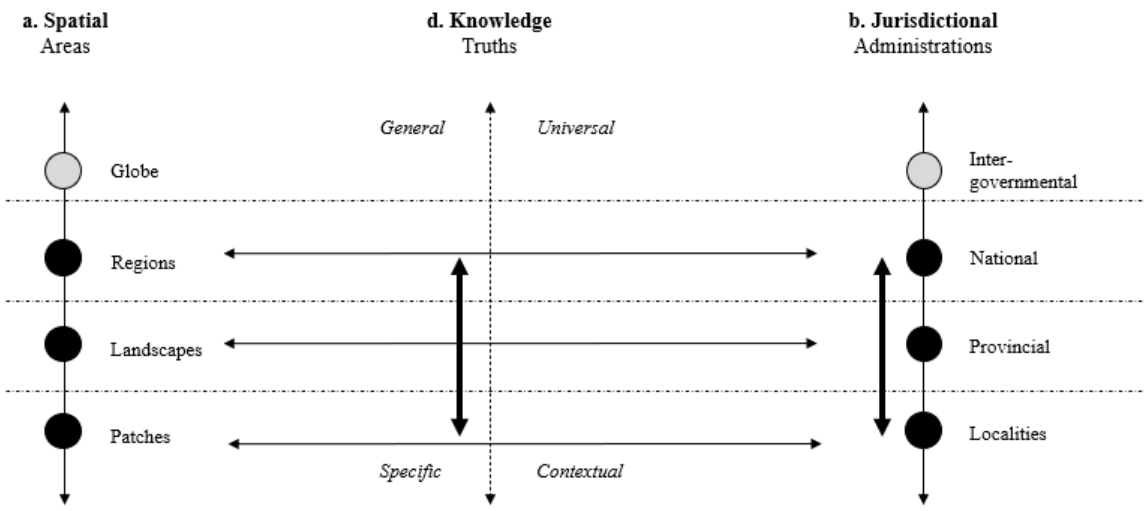

Figure 1. Cross-scale interactions between knowledge and jurisdictional scales are influenced by the spatial level at which they conceptualise the system. The horizontal arrows show the interaction across the scales, the horizontal dashed lines show that these cross-scale interactions are generally confined to one level in each scale. The vertical arrows indicate the misalignment (fragmentation) between the levels on the knowledge and jurisdictional scales that occur partly due to this fragmented cross-scale interaction. Black circles represent the spatial scales that were included in this study, whilst the grey circles represent that spatial scales which were not included.

The results also indicated that there are important level misalignments within the jurisdictional scale; these misalignments can be enhanced by external elements and have dynamic feedback loops (Chapter Three : Figure 9, Chapter 4:Table 5) Furthermore, the results show that there are even misalignments within levels – often affected by the spatial and knowledge scales. As highlighted by Vignola et al. (2013), people who are directly dependent on resources (ecosystem services), are often both administratively and spatially separate from those who influence the quantity and quality of ecosystem services provision and those who generate, generalise, and disseminate information that influences the resource management. Results from Chapter Four show that local resource users operate in different ecological patches of various sizes; this is linked (among others) to rights allocations, financial and social capital, needs, and knowledge. The subsequent relationships, similarities, and differences between the user groups go on to affect the effectiveness and equity of policies, which may result in power and representation imbalances; the same can be said for the national and provincial administrations.

The differences within a level highlight the impact of how a scale and its levels are defined, as it will influence which interactions and consequences are analysed.

5.3. Reflection on the methodologies and analyses

Analysis of the themes and cross-scale and cross-level interactions in order to understand the structure of the governance bodies may have benefitted from a more detailed network analysis with attention paid to the weight of the different links to better understand the possible implications of changes in links or nodes in the implementation of policy. As many of the cross-scale and cross-level challenges identified in the thematic analysis were centred around the "social" interactions, such as communication, capacity, trust, and interactions a social network analysis would be an appropriate form of analysis (Groce et al. 2019). Crona et al. (2011) stated that a social network analysis can be used as an analytical tool to understand ongoing resource management and why a collaborative effort may have stalled, this would be useful in identifying misalignments and alignments. Unfortunately, I was unable to carry out a social network analysis due to the small sample size, and the fact that I did not have at least one representative from each stakeholder group. However, the analysis in this study did identify key themes and addressed the key question in identifying alignments and misalignments across organisational levels.

Participatory mapping has been extensively used to successfully integrate local and traditional knowledge with practitioner and scientific knowledge (Robinson et al. 2016, Weyer et al. 2019). As in the case of the TMNP, we were able to identify similarities (and possible future negotiating points) between groups that have a history of mistrust. Maps can be emotionally removed entry points for emotive discussions. Maps are also a useful way of understanding knowledge of a system without using direct questioning which may make participants uncomfortable. For example, we were able to establish participant's understanding of the different zones without asking them directly, fishers also conveyed an understanding of the importance of protecting spawning grounds and having seasonal closures. Maps also allowed us to identify alignments and misalignments without losing sight of the system as a whole – they served as a "grounding" point. Ethical implications that come with using mapping exercises were highlighted during this research: the study groups need to be large and varied enough to ensure there is no way of identifying the participants; this is especially important for groups such as poachers or minority groups, as they may be targeted by authorities or other groupings within the area of interest (Chambers 2006).

The identification of important fish species revealed itself as a key spatial and temporal indicator. Important fish species can be used to understand user patterns and distributions throughout the seasons, thus providing insight into how the zoning of an MPA impacts users. This was also a more inclusive way to engage participants, as users who have limited or no knowledge of the important fishing areas (such as marketers), are still able to contribute to discussions around MPA zoning and policy implications. Furthermore, identification of important species, and their distributions, can give us an idea of power dynamics in a community in a slightly removed manner, therefore hopefully reducing the amount of bias. This is important for understanding how representative policies are, as well as why there may be some tensions between the various actors.

One of the limitations of this study was the fact that the workshops were not as diverse as hoped in the TMNP MPA, for example it would have been preferable to involve fishers who utilised different fishing gears (i.e. fishing nets), have a wider racial and age diversity of stakeholders, and social empowerment campaigners or groups. This was due, in part, to time limitations and the availability of participants, given the unpredictable and mobile nature of fishing as a livelihood (Gammage et al. 2017). Had the diversity and size of the workshops been greater, it would have been beneficial to carry out a network analysis to understand important leverage points. The sample size for the interviews was also low and so prevented meaningful statistical analysis. As a result, the data from this research cannot be generalised as it is not from a large enough pool in order to be representative, however it can contribute to existing information.

5.4. Future Research

1. A need for gendered spatial analysis

Results from this project indicated that there are differences between how genders operate in the marine ecosystem, regarding not only the spatial patterns but also access to resources. Whilst there is a lot of research regarding MPAs as social-ecological systems and their impacts, this tends to focus on ecological impacts and is often guided by the assumption that fisheries are a male domain (Manez and Pauwelussen 2016), thus the consideration of gender is often overlooked (Siegelman et al. 2019). Women, however, play an active role in the fisheries value chain and have always had a major influence on fishing practices and fish trade (Manez and Pauwelussen 2016).

Gender can be considered as something people *do* and is a dynamic identity category from which gender relations and hierarchies are developed and maintained over time (Agarwal 1992,

Nightingale 2006, Munoz Boudet et al. 2013, Bene et al. 2016, Siegelman et al. 2019). In some cases, gender networks can be considered the relevant social network when it comes to natural resource management (Siegelman et al. 2019), therefore it is essential to incorporate this network in any kind of SES analysis. Feminist political ecologists note that in cases where gendered environmental management is the primary focus of research, the focus is overwhelmingly placed on women (Siegelman et al. 2019). This research bias risks placing disproportionate responsibility for environmental and gender equality outcomes on women's shoulders, despite resource management being a predominantly male role (Mayoux 2001, Molyneux 2002, Bannon and Correia 2006, Siegelman et al. 2019); therefore, a gendered analysis – rather than research that focuses solely on women, but rather looks at the interactions across genders – can contribute to our understanding of the alignments, misalignments, justice, and equity of marine policy.

2. Combining terrestrial features and marine data

The community maps developed in this project were informed by both social and ecological factors. Whilst the analysis in this study considered the distribution of important species, this analysis could be elaborated on by carrying out a map analysis which includes data layers that are pertinent to the justification of zones outlined by the communities i.e. nursery areas and mapped species distributions. Unfortunately, this level of analysis was not possible at the time of writing the thesis as not all data layers were available and was not within the scope of the project – however, this may now be possible with the publication of the 2018 National Biodiversity Assessment.

An alternative analysis would be to utilise predictions of species distributions and impacts of climate change on marine habitats in order to identify how marine policy may affect different users and marine governance in the future (Free et al. 2020). Some of these changes are already being experienced by fishers; in Chapter Three fishers identified fish that they are no longer able to catch as they are simply not present in the waters, this could influence the gear that is used and may cause them to adopt more harmful fishing gears, it could increase poaching as it may increase food insecurity, and may result in greater social unrest (Silva 2006, Fiorella et al. 2017, Isaacs and Witbooi 2019). Ecologically, nursery and spawning areas may move and no longer be protected thus no-take zones will need to be moved in order to meaningfully protect them and ensure the presence and availability of economically important species (Potts et al. 2015, Free et al. 2020). The potential implications of distribution changes are vast and varied

and need to be thoroughly investigated through a SES lens. Data collected in this study can help inform some of these predictions.

5.5. Conclusion

The ocean has been described as the new frontier for conservation and development, as a result there are increasing concerns about sustainability and international awareness of ocean governance (Bennett 2018, Jouffray et al. 2020). Despite growing concerns about social injustices and exclusionary decision-making processes the inclusion of these issues in science, management, and governance are still inadequate (Bennett 2018). This study asked: Can a spatial resilience lens help identify alignments and misalignments in policy implementation, using South Africa as a case study? The hope was that this approach may present a way of addressing the concerns about unjust and unequal decision-making processes (Bennett 2018).

Evidence from chapters three and four shows that a lack of acknowledgement of scales and levels may limit a researcher's ability to gain an understanding of the interactions between departments, user groups, legislation, and ecosystem. One key barrier for implementation was highlighted throughout this study and can be directly linked to alignments and misalignments in policy and policy implementation: communication - which can be closely tied to space. As stated in Chapter Three, the interactions and behaviours of stakeholders in a social network are influenced by their spatial location (Bodin et al. 2019), this was further evidenced by results from Chapter Four regarding important species and external elements. Stakeholders that are in close geographical proximity are more likely to interact than those that are far apart (Cumming et al. 2010), as face-to-face contact eases the sharing of knowledge (Storper and Venables 2004, Berge 2017). The influence of geographical proximity can be seen in the thematic analysis in Chapter Three, whereby interactions were focussed between Park authorities and communities, or Park authorities and national government offices, whilst there was very limited interaction between national government offices and communities.

So, why a spatial resilience lens and why scale? One of the greatest contributors of the spatial resilience lens is in its name, it embraces the spatial elements of a system. As shown in this thesis, spatial analysis can be applied in a variety of ways and can aid in investigating questions that may not be explicitly "spatial", for example it has given insight into issues of knowledge, power, gender, and policy implementation. The use of a spatial resilience lens and spatial elements can be a very useful platform to initiate discussions and in identifying future questions or research areas. It may also be used as a "grounding" concept for large projects. Whilst it

would perhaps be best used in conjunction with other approaches to delve further into alignments and misalignments once they have been identified, a spatial resilience lens and elements can definitely contribute to the identification and understanding of alignments and misalignments. Understanding the misalignments and alignments in marine governance is a strong step towards identifying leverage points for change that can contribute to meaningful, fair, and effective implementation of policies.

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Appendices

Appendix A. Letter of ethical approval and research permit numbers

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Where leaders learn

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Department of Environmental Science
Tel: +27-(0)46-603-7002
Fax: +27-(0)46-622-9319
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15 January 2019

Dear Shannon

OUTCOME OF APPLICATION FOR RESEARCH ETHICS APPROVAL

With regards to your application for ethics clearance of the following project:

Application no: : ES18_33
Research Title : Understanding how spatial resilience thinking can help address scale mismatches in marine protected areas: Case study of South African marine policies
Research Type : Masters
Name of researcher: Shannon Enid Hardisty

The Department of Environmental Science Ethics Review Committee reached the following decision:

Approve the application	x
Approve the application, with minor revisions (see appendix)	
Modifications and then resubmission required (see appendix)	
Not approve (see appendix)	

This letter serves as final approval of your ethics application, pending gatekeepers permission (i.e. permits).

Yours sincerely

Dr Kaera Coetzee-Hanscik

(Lecturer & DES Ethics Chair - 2018)

Research permit numbers:

SANParks: DEVA/AGR025-2018/2018-2021/V

Eastern Cape Parks and Tourism Agency: RA_0294

Ezemvelo Kwa-Zulu Natal Parks: MSP189

Cape Nature: CN-32-31-7036

Appendix B. Count-analysis of themes

All the categories were associated with negative comments, these made up 56 % of the total comments made. Positive and neutral comments made up 14 % and 30 % of the total comments respectively. Division of responsibilities, personnel capacity, and power were the most often cited categories (n= 14, 12, and 12 respectively) – these were all negative associations. The lack of two-way communication, transparency and accountability, and funding were explicitly referred to as some of the biggest limitations in policy and regulation implementation.

The theme of park management and marine legislation was referred to 83 times in total, 47 of which were neutral comments such as those that spoke to the roles and structure of the management bodies, for example "The people who enact and enforce the regulations are the provincial park authorities and in some cases SANParks" (Figure 1).

Results show 32.5 % of the referrals were negative in nature. The two categories with the most negative referrals were the DEA (n=8) and the National Environmental Management: Protected Areas Act (n=7). Comments regarding the DEA include "The DEA seems to be treated as the lowest priority when it comes to government funding. They are often swept aside by more powerful departments" and "…DEA don't devolve any responsibility or authority down to local level". The second quote shows that there is a challenge across management levels. The dominant negative theme about the National Environmental Management: Protected Areas Act was its suitability in the marine ecosystem and the challenges of incorporating terrestrial and marine environments under one act, "The PAA [Protected Areas Act] works for the terrestrial perspective, but doesn't work well for the marine perspective and this hinders its application…" and "The objectives of the PAA are very terrestrial-oriented and consider neighbours; this isn't always the case with MPAs, as communities can be very far away, so they're more like user groups". The latter quote highlights a mismatch between the PAA and its implementation that it is closely linked to a spatial issue – the geographical distance between MPA and 'neighbours'.

Only 11 % of the comments in this theme were positive and they all centred around marine legislation (n=9), however it was often followed by caveats around implementation, e.g. "We have excellent policies, we've got excellent legislation; it's an implementation problem, and often it's about finances and it's about finding the resources, and you need someone [to have the initiative]".

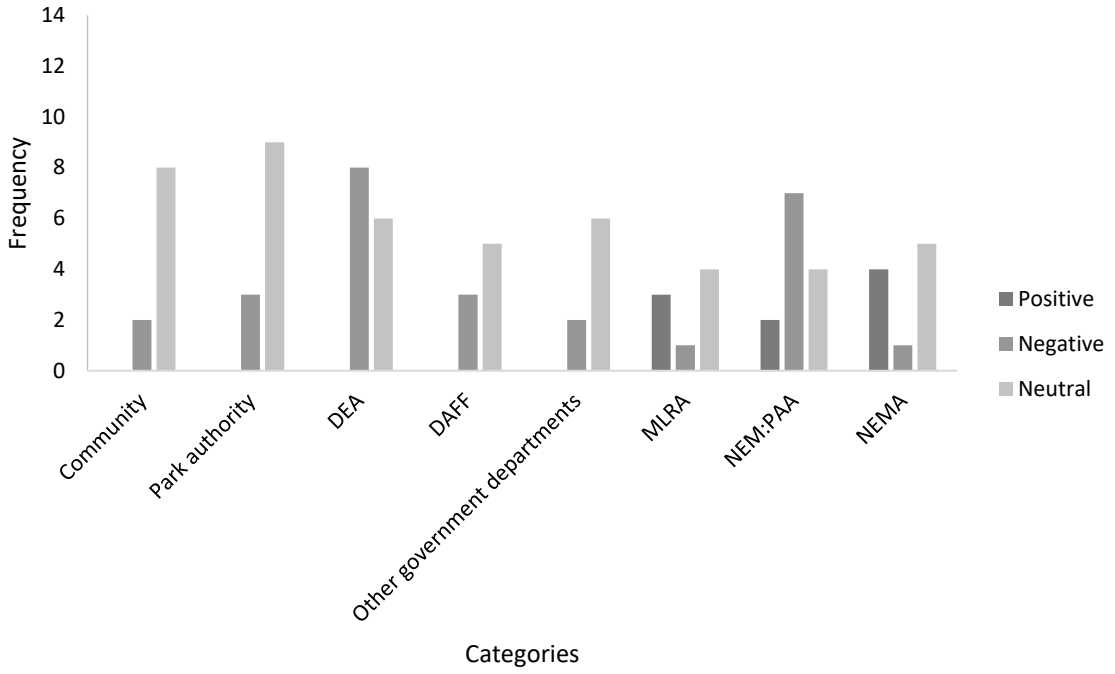

Figure 1. Number of times experts referred to management bodies and marine legislation categories in a positive, negative, or neutral manner.

Management level factors were referred to 67 times with only two neutral comments and the rest being negative (Figure 2). Clarity of responsibilities, personnel capacity, and power were the most often negatively cited categories in this theme (21 %, 18 %, and 18 % of the total comments respectively).

The category of power was discussed in a variety of ways, albeit always negatively, and mostly referred to cross-level links. Much of the discussion centred around a lack of power sharing, for example "[The Park authorities] have a better understanding of the local issues, but they're not given the responsibilities or powers to talk to people and to make good on these discussions, like changing regulations".

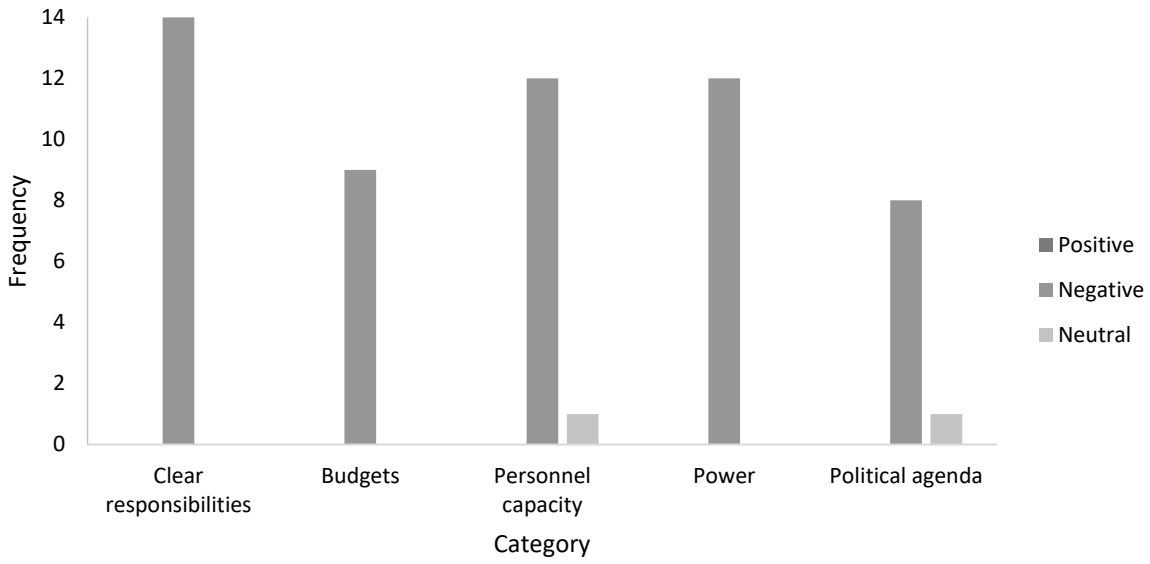

Figure 2. Number of times experts referred to management level factors categories in a positive, negative, or neutral manner.

Communication and information sharing categories were referred to 75 times, 25 % of which were positive, 9 % were neutral, and 66 % were negative (Figure 3). A lack of transparency and accountability, and two-way communication were the most cited categories in this theme (both 13 %). Forums were highlighted as a possible solution to increase effective communication, however difficulty in getting participants "in one place" was highlighted as a major barrier for this. This becomes especially difficult when the MPA is in an isolated area or even offshore; means of communication need to be appropriate for the individual MPAs, and this can be greatly influenced by geographical distance. Education and awareness, as well as NGOs, were recognised for generally making positive impacts: "NGOs have played a very valuable role, but not always. There is a range of them with a range of motivations… Larger ones tend to be more balanced in their approaches and are more representative", while "Education campaigns can be effective but have to be thorough and target the most affected stakeholders."

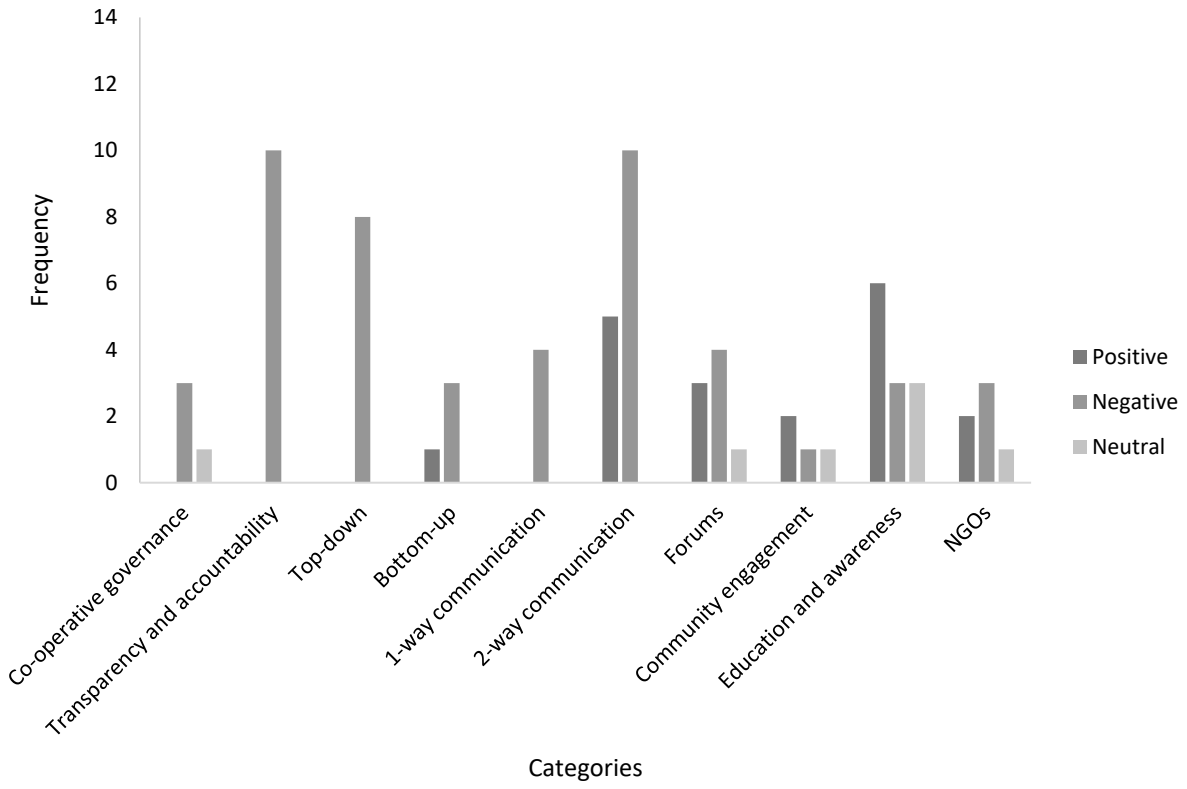

Figure 3. Number of times experts referred to communication and information sharing categories in a positive, negative, or neutral manner.

Local level categories were mentioned 45 times, 58 % percent of the comments were negative whilst 33 % were neutral, and 9 % were positive (Figure 4). Resource access was referred to in a predominantly neutral way and was often associated with the fact that resource access is a part of the marine environment. It was stated that "People have different uses of the MPA which affects how they view the MPA", and so "when you're closing off an area you need a full inventory of who is doing what and what options there are in order to avoid backlash". Historical context was the most often negatively cited category, making up 27 % of the negative comments in this theme.

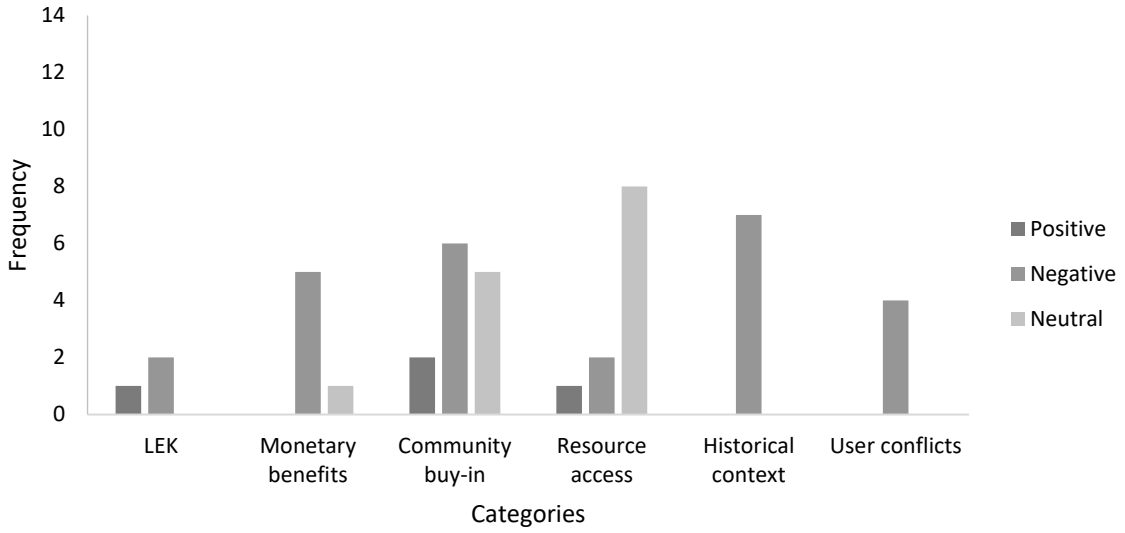

Figure 4. Number of times experts referred to local level factors in a positive, negative, or neutral manner.

Biophysical factors were referred to 51 times and had the greatest proportion of positive comments (22 %), relative to the other themes (Figure 5). Size made up 17 % of the negative comments of this theme and was linked to complexity and community engagement. MPA location was referred to positively (n= 4) and neutrally (n= 6). Scale, while implicit in many of the categories and statements, was explicitly referred to 9 times.

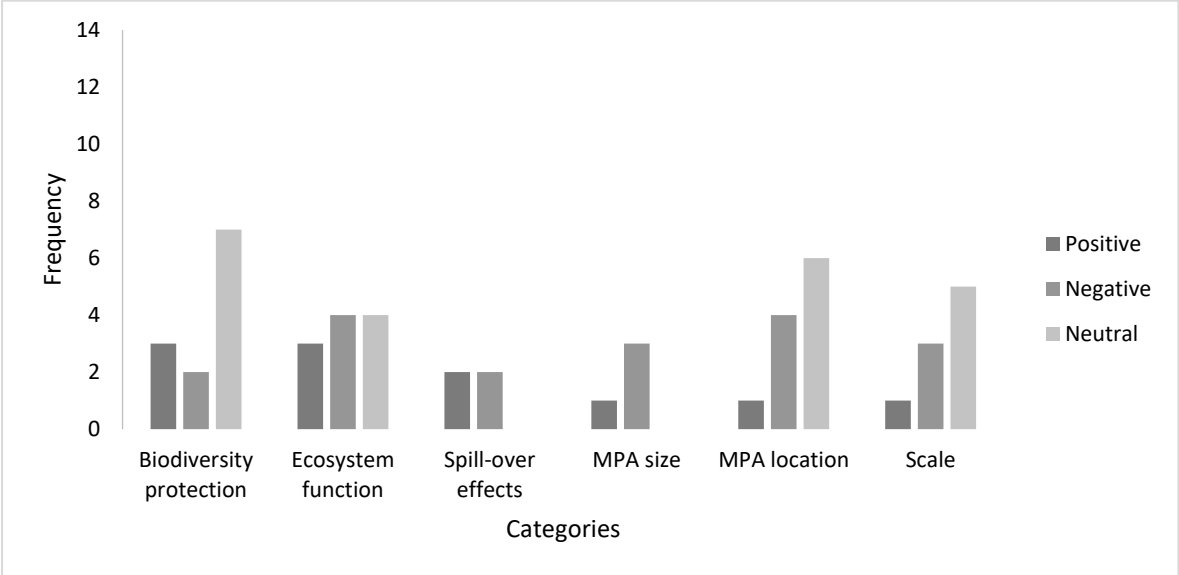

Figure 5. Number of times experts referred to biophysical factors in a positive, negative, or neutral manner.

Appendix C. Additional quotes from key expert interviews

"Knowledge is essentially linked to resource access both in terms of gears and important species, and fishers may be at a disadvantage if they are made to fish in new areas – or prevented from fishing in known areas" – Respondent 8.

"We need to move away from protected areas being an elitist thing and show that they are there for looking after our future" – Respondent 4.

"If fishers live near or historically fished in the MPA there is frustration and anger and so it's difficult to get buy-in" – Respondent 1.

"[Local fishers] might have an immense amount of knowledge of an area, but that knowledge is not portable and their gear is domicile where it can't move very far. So that's a really big drawback of a protected area approach as it will heavily penalise people who can't move either their knowledge or their gear or their markets" - Respondent 2.

"The DEA and Park thought it was DAFF's responsibility as permits are concerned with fishing, DAFF felt it was the Park's responsibility as the fishing was taking place in a protected area, so in the end no-one was checking permits" – Respondent 2

"The people living on the ground know a huge amount about a small problem, whereas the people working in high government have a macro view of policy but can't engage on any specific issue. The one group thinks the other is useless because they are thinking at different scales and they can't communicate in a way that the other understands." – Respondent 1

"The DEA and Park thought it was DAFF's responsibility, as permits are concerned with fishing. Conversely, DAFF felt it was the Park's responsibility, as the fishing was taking place in a protected area. Ultimately, no-one was checking permits" -Respondent 7.

Appendix C. Workshop demographics including location, gender, age, race, language, and if feedback was provided.

Area	Location	Workshop	Number of participants	Gender	Age range	Language	Race	Feedback
Hout Bay	Community centre	Women's group	4	Female	53 - 65	English and Afrikaans	Coloured	Yes – Same as initial workshop
Hout Bay*	Fisher's accommodation	Fishers	12	Male	31 - 60	English and Afrikaans	Coloured and Black	Yes – Same as initial workshop
Hout Bay	Hout Bay Harbour	Eco-tourism operators	2	Male	35 & 50	English	White	Yes – Contact over phone with one and in person with other
Hout Bay	Hout Bay Harbour	Sports Fishing (Feedback provided via phone call)	3	Male	45 - 57	English and Afrikaans	Coloured and White	Yes – Same as initial
Kalk Bay	Kalk Bay harbour	Women's group	4	Female	40 - 60	English and Afrikaans	Coloured	Yes - Feedback provided to nominated representative over the phone after attempted visit where only one lady was available.
Kalk Bay*	Fisher's accommodation	Fishers	8	Male	34 - 50	English and Afrikaans	Coloured and White	Yes – Same as initial
Kalk Bay	Kalk bay harbour	Eco-tourism operators	5	4 male, 1 female	30 - 48	English	Black and White	Yes – Feedback via e-mail as requested
Ocean View	Community centre	Women's group	5	Female	40 - 67	English and Afrikaans	Coloured	Yes – Same as initial workshop. Reduced number of participants.
Ocean View	Community centre	Fishers	12	10 males, 2 females	35 - 70	English and Afrikaans	Coloured and Black	Yes - Same as initial workshop. Reduced number of participants.

Lambert's Bay	Residence	Women's group (requested by community)	10	Female	32 - 66	Afrikaans	Coloured and Black	Yes – Phone call to nominated representative
Other	Various	Sports Fishers	7	Male	35 - 60	English	White and coloured	Yes – Phone call, email, and in person depending on request
Other	Various	Eco-tourism	4	2 males, 2 females	28 - 54	English	White and Coloured	Yes – Phone call, email, and in person depending on request

Groups with an asterisk (*) were interviewed in Lambert's Bay due to the fishing season, however they lived in the relevant area (i.e. Hout Bay or Kalk Bay).

Appendix D. Thematic coding for external elements. Cells have been left empty for themes that were not identified by that user group.

		User group sample quote(s)		
Category	External element	Women's groups	Fishers	Eco-tourism/ sport fishing
Context	Fuel prices		"Petrol, diesel, maintenance, and licenses are so expensive, and what happens when we don't catch fish? Then we can't afford fuel tomorrow."	"With the fuel prices constantly going up we have to raise our prices, and that means that we don't get as many clients."
	Poor education			"The people making the laws at a national level don't understand the vastness of the ocean, so the amount of resources allocated is completely ineffective."
	Changes in national legislation and policy	"Before with the nearshore rights is the inspector didn't see the woman (rights holder) on the boat they had to dump the fish. But with Interim Relief women don't need to [be on the boat] so men don't let us on."	"DAFF and SANParks are the main culprits who change rules that [then] negatively affect us."	"The permitting laws are changed without consultations, and challenging these changes requires lawyers. We can't afford it." "They don't consider the ripple effect of legislation on the wider industry." "New restrictions turn people who used to be law-abiding fishers into "criminals". But why should we follow laws if poachers will get away with poaching anyway?"

	Government budget	"Compliance is a big problem. If you call [SANParks] they don't have petrol or there is a problem with the motors or equipment."	"[SANParks] need more boats to protect the MPAs regularly."	"What MPA? There's no enforcement because there's no resources. I support the concept, but there's no point if there's no enforcement."
	Elections		"As soon as there is an election [DAFF and the police] start targeting us to show they are working."	
	Corruption	"Policing is only for small-scale fishers not for the other parties. Small-scale fishers are discriminated against, but they only get a small portion of the pie."	"A man in Joburg will get a permit because he is friends with the politician, but he has never seen the sea. My family always fished, but I don't get the permit!"	"Blame is passed from department to department with no repercussions." "The permit conditions are being used to benefit cronies."
	Lack of training		"Most of us only know how to do fishing, we don't have any other trade to do."	
	Communication barriers	"Most of our women were left out of the [small-scale permitting] process, we are unsuccessful because the government doesn't communicate."	"There are too many different departments: police, SANParks, metro police, DAFF… too much law enforcement authorities and everyone has their own law. It is confusing."	"SANParks runs some areas and DAFF runs other areas – again we have too many authoritative bodies and they all have different policies. So when something goes wrong 'it's not their problem'."
	Food insecurity		"The government is forcing us to poach because there is no food… we need better rights or grants so that we can survive."	

			"Open rights for us to get akrikels, mussels, limpets to help with food security every day."	
	Family dynamics (i.e. divorce and death)	"I have lost two of my sons to the sea. My husband fell off the boat and now I must look after him – he cannot move. But now I also have to provide for them." "When my husband and I divorced, people didn't give me my [allotted] catch that I gave my permit for."		
	Gender-based exclusion/superstitions	"It's not been easy for women in this fishing industry, the men don't want us to be part of what they're doing. They physically fight with us."	"You can't equal women to men catching fish, we were taught it's a man's world." "There's not a lot of boats that will allow women to work on [them] because its cold, toilet facilities, and women need a lot of strength to bring the fish up; they don't have the physical power."	
Connectivity	International and local travel patterns			"Our work does tend to be very seasonal and depends on when people are travelling. We're quite lucky because Cape Town is such a popular destination."
	Underground mafia	"The gangsters from China come and pay our people to poach for them. This means there are gangs and lots of violence."	"Those who want to protect the MPAs because they know the resource is there to sustain them, but you get the underground mafia	

			and poachers who use it for their gain."	
	Poaching	"Poachers go into these MPAs and go steal all our resources for their gain," "Youngsters go the poacher route because it's easier than going through all these channels."	"We need more policing because people steal too much fish." "There are three types of poachers: some of us poach for the pot, other poach if they don't catch enough that day, and others poach to get rich – they are the problem ones."	"Poaching is much more appealing for some people because it's much less time commitment for much more gain."
	International fishing industry		"With all the trawling going on they drive away a lot of species. At night they will trawl the species away."	
	Drug use	"Young people don't want to go into fishing because it's too much work, so they work for the underground mafia and use drugs instead."	"These crime syndicates bring drugs into our communities and pay their poachers to sell drugs too."	
	Prostitution	"They say they will call me when they are going to sea, but they never do, so I have to sleep with the skipper and stay all night on the boat to make sure I am there."		
	Child exploitation	"These boys have to go out on the boats with their fathers at night because that is their duty, but then they are too tired for school the next day and then they fail or they have to take drugs to stay awake."		

	Lack of alternative livelihood opportunities	"We weren't taught how to do anything else. We only know how to fish because that's what our parents did."		
	Selective and assumptive research practices		"We have never seen them involving fishermen in their research. Scientists only look where we are fishing, not areas where we don't fish. Scientists make decisions on our behalf. Research must be done correctly."	
Spatial feedbacks	Climate change	"The boats that we currently use in the future will have no meaning because the fish is moving from the miles where these boats can go."	"The fish don't run like they used to, it's this climate change."	"Species are moving further and further away. We haven't seen a Great White [Shark] for ages and that really affects the draw for tourists."
	Pollution		"The mussels and crayfish that keep the ocean clean are destroyed… public works needs to help with plastic and dirt."	"Municipal authorities are polluting the ocean with contaminated material but the blame [for pollution] is being put on the fishers and eco-tourism businesses."
	Weather patterns	"When the weather is bad, we can't go out to collect mussels, it is not safe." "Some days the boats can't go out because of the weather and then we can't sell the fish so none of us get money for the day."	"Sometimes, even when the weather is bad, we have to go out. But then it's very dangerous and we could fall into the sea and drown. So mostly we just can't eat when the weather is bad."	"Of course, we're highly dependent on the weather, so if it's not good we might as well not open that day."