

**Social vulnerability of fishing communities in the  
southern Cape to change, including additional  
pressures of COVID-19**

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### **Dedication**

I dedicate this dissertation to my late grandmother, whose motivations were a beacon of hope throughout my entire research journey. To my parents and siblings, who also supported and offered words of wisdom and inspiration.

## **Abstract**

Marine systems are critical for providing support to the lives and livelihoods of millions of people, including small-scale fishers (SSFs). However, these communities are faced with many challenges such as resource scarcity, climate change and variability, policy and regulation and the more recent COVID-19 pandemic. This dissertation examines the social vulnerabilities of SSFs in the southern Cape, particularly in the two fishing towns of Bitouville and Melkhoutfontein, to better understand how challenges impact the ability of SSFs to support their livelihoods and how this has changed over the last 10 years. This research made use of a mixed-method technique that included both qualitative and quantitative aspects, drawing on the Global Understanding and Learning for Local Solutions (GULLS) survey that was first implemented in 2013/14 and amended to suit the local context of the southern Cape, which was administered through face-to-face interviews in 2023. Social vulnerability scores were calculated in line with the GULLS framework to gain a deeper insight into the vulnerabilities faced by SSFs and how these have evolved over the last decade.

In both Bitouville and Melkhoutfontein communities, vulnerabilities of SSFs were exacerbated by the more recent COVID-19 pandemic, which led to the loss of income sources and available sea days, which in turn contributed to food insecurity. Regarding the evolution of the drivers of changes in 2013/14 and 2023, the results of this study revealed an increase in the social vulnerability scores in both Bitouville and Melkhoutfontein over time as a result of increased exposure to challenges linked to resource scarcity, climate change and variability, and policy and regulation. For example, the continued delay in the implementation of South Africa's small-scale fishing policy (SSFP) has contributed to increased vulnerability, as this impacts SSFs' access to fishing rights. The results also revealed that SSFs in Bitouville faced more vulnerabilities compared to their counterparts in Melkhoutfontein, which was attributed to their higher social dependency on fishing, limited livelihood opportunities, higher exposure to environmental changes, and lower adaptive capacity.

The vulnerability of these two fishing communities is thus increasing due to compounding stressors such as resource scarcity, climate variability, the COVID-19 pandemic and policy and regulation. This research highlighted the importance of

improving the adaptive strategies of SSFs, as limited improvement in these strategies places the livelihoods of these fishing communities at greater risk and exacerbates vulnerabilities in the important, livelihood-intensive southern Cape fisheries.

**Key Words:** social vulnerability, small-scale fishers, climate change, resource scarcity, COVID-19 pandemic, policy and regulation, southern Cape fisheries, sensitivity, exposure, and adaptive capacity.

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## Acronyms

**DMP:** Data Management Plan

**DAFF:** Department of Agriculture, Forestry and Fisheries (South Africa)

**DEAT:** Department of Environmental Affairs and Tourism (South Africa)

**DEFF:** Department of Environmental Forestry and Fisheries (South Africa)

**DFFE:** Department of Forestry, Fisheries and the Environment (South Africa)

**Eco-ACE:** Ecosystem-based adaptive capacity through community engagement

**FS:** Food Security

**FSREC:** Faculty of Science Research Ethics Committee

**GULLS:** Global Understanding and Learning for Local Solutions

**GDPR:** Gross Domestic Product Per Region

**IPCC:** Intergovernmental Panel on Climate Change

**MLRA:** Marine Living Resources Act 18 of 1998 (South Africa)

**MPA:** Marine Protected Area

**NGO:** Non-Governmental Organisation

**RSA:** Republic of South Africa

**SCIFR:** Southern Cape Interdisciplinary Fisheries Research Project

**SES:** Social-ecological systems

**SSF:** Small-Scale Fisher

**SSFP:** Small-Scale Fishing Policy No. 35455 of 2012 (South Africa)

**SLA:** Sustainable Livelihood Approach

**SAMSA:** South African Maritime Safety Authority

**TAC:** Total Allowable Catch

**TAE:** Total Applied Effort

**UNFCCC:** United Nations Framework Convention on Climate Change

**WHO:** World Health Organisation

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## Chapter One: Introduction

Marine systems are home to a rich abundance of diverse systems and marine biodiversity (e.g. FAO, 2020, 2022, 2024). These ecosystems are also critical for climate change mitigation through the climate regulatory services they provide (e.g. Gattuso, 2015; Al-Sodany and Diab, 2023; Cronan, 2023). The importance of marine ecosystems extends beyond environmental functions, as they are also critical for food security and economic contributions, supporting different ecosystem services<sup>1</sup> for millions of people living adjacent to the coasts, where these services make a critical contribution to human well-being (e.g. Lau, 2019; Mills et al., 2023; Lazarow, 2024; Koehn, 2022; FAO, 2020, 2022). For instance, fisheries play an important role as a food and livelihood source all over the world.

### 1.1. Overview of small-scale fisheries

It is estimated that about 27,5 million small-scale fishers (SSFs) rely on marine ecosystem services to sustain livelihoods and are employed within the harvesting segment either part or full-time (WorldFish, 2023). In contrast to industrial fisheries, SSFs are often associated with traditional fishing practices, characterised by simpler technology, labour-intensive methods (e.g. handlines and gill nets) (Pita and Gaspar, 2020; Herdiana *et al.*, 2023) low capital investment, and the use of small fishing vessels (Berkes, 2001; FAO, 2005; Chuenpagdee *et al.*, 2006; Pauly, 2006; Sowman, 2006; Sowman, 2011; FAO, 2015; Pretorius, 2017; Smith and Basurto, 2019; Saksono, Nissa and Suadi, 2023).

Small-scale fishing activities are not only linked to fishing for food or economic gain. Several factors linked to important social and cultural aspects also drive fishing activity for SSFs (Mancha-Cisneros *et al.*, 2019; FAO, 2022; FAO, Duke University and WorldFish, 2023; Mills *et al.*, 2023). Whilst economic drivers include dependency on fishing as a primary source of income and limited employment opportunities (Fasina, 2011;

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<sup>1</sup> Ecosystem services refer to the benefits to human beings derived from the ecosystems (Millennium Ecosystem Assessment, 2001; Barbier *et al.*, 2009; Seppelt *et al.*, 2011; Costanza *et al.*, 2017). These services include provisioning (e.g., food derived from animals and plants, freshwater and ornamental resources), cultural (e.g., recreational services, aesthetic services, and spiritual connections), and regulating (e.g., coastal protection, water purification, nutrient cycling, and carbon sequestration) (Elwell *et al.*, 2020; Lakshmi, 2021; Nowak-Olejnik, Schirpke and Tappeiner, 2022; B-Béres *et al.*, 2023; Nevzati *et al.*, 2023; Solomon, 2023; Zhao *et al.*, 2024).

Schuhbauer, 2017; Saksono, Nissa and Suadi, 2023; Zamzami, Azwar and Moenir, 2023), social factors include strong networks or connections that exist in the communities, such as the sharing of information and their reliance on other fishers (Jentoft, 2020; Obregón *et al.*, 2020; Arlidge *et al.*, 2021). Cultural considerations include the local knowledge and traditions held about fishing that have been passed from generation to generation (Jabali, Wamukota and Fulanda, 2020; Pei Ze, 2023).

### **1.1.1. Vulnerabilities faced by SSFs**

SSFs in developing countries are faced with many challenges that impact their lives, livelihoods and their ability to adapt to changing conditions. These include (but are not limited to) climate change and variability, environmental degradation (e.g. pollution, habitat loss, and overexploitation of fish stocks), policy and governance challenges, competition between SSFs and other fishing sectors, and socio-economic issues (e.g. poverty and market fluctuations, and education and health) (Dias *et al.*, 2023; Nyiawung, Bennett and Loring, 2023; Saksono, Nissa and Suadi, 2023; Barboza *et al.*, 2024; Enema and Quezon, 2024).

Global change, and especially climate change, remains one of the most pressing stressors that exacerbate the vulnerability of SSFs in several ways, including contributing to the decline of fish stocks that heavily impact the income sources of SSFs (Dias *et al.*, 2023; Mozumder *et al.*, 2023a; Sultana *et al.*, 2023). The occurrence of extreme weather events (e.g. wind, drought, flooding) also has the potential to disrupt the activities of SSFs (Limuwa *et al.*, 2018; Muringai, 2019; Macusi, 2021) which results in reduced fish catches and available sea days (Macusi, 2021; Macusi, Sabino and Macusi, 2023; N'Souvi *et al.*, 2024). These stressors push fishers to consider responses that include, amongst others, travelling longer distances to fish that have knock-on impacts, such as increasing the associated costs of operation like fuel and maintenance (Noman *et al.*, 2019; Juan *et al.*, 2024).

Environmental degradation such as marine habitat loss, pollution and overfishing further compound challenges experienced by SSFs in developing countries (Pauly, 2006; Nayak, Oliveira and Berkes, 2014; Islam and Chuenpagdee, 2022). For example, marine habitat destruction and pollution from agricultural runoff negatively affect fish populations and health resulting in stock declines, reduction in catches and eventually loss of income

(Islam and Tanaka, 2004; Sabilla, 2017; Häder, 2021; Satkar *et al.*, 2024). Overfishing also results in reduced fish stocks, further reducing potential income from fishing and food security (Elleby *et al.*, 2023). These stressors are also exacerbated by globalisation and enforced rules and laws that do not cater for the needs of the local communities but rather focus on the exportation of fish resources (Cronan, 2023).

Policy and governance challenges in many developing countries can further exacerbate the vulnerability of SSFs (Islam and Chuenpagdee, 2022; Frawley *et al.*, 2024). Inadequate regulatory frameworks and access to rights and tenure often limit the ability of SSFs to sustain their lives and livelihoods (Sowman, Raemaekers and Sunde, 2014; Cánovas-Molina and García-Frapolli, 2022), further exacerbating the vulnerability of SSFs, which can result in food insecurity and poverty (Chuenpagdee and Jentoft, 2018; Auld and Feris, 2022). In addition, SSFs typically have limited involvement and representation in decision-making processes, especially concerning marine planning, which in turn results in conflicts over resources (De Mattos and Wojciechowski, 2019; Auld and Feris, 2022a; Thoya, 2022; Jentoft and Chuenpagdee, 2024; Kuboja *et al.*, 2024).

Competition with other fishing sectors is also a key challenge faced by SSFs, which can impact these fishers economically, ecologically, and socially. As an example of economic stressors, competition between SSFs and inshore trawl fisheries can reduce fish catches for SSFs if the same fish species are targeted (Mahesh *et al.*, 2019; Cánovas-Molina and García-Frapolli, 2022). By-catches landed by industrial fishers also impact fish populations, especially juvenile fish (Erguden, Kabasakal and Ayas, 2022). Bottom trawling activities impact sensitive seafloor habitats important for supporting marine species (Mendo *et al.*, 2022; Bradshaw *et al.*, 2024; Van Denderen *et al.*, 2024). This competition between fisheries often leads to conflict (Visser, 2015; Pomeroy, 2016; Dahlet, Himes-Cornell and Metzner, 2021; Seto *et al.*, 2023).

Socio-economic issues such as poverty and market volatility continue to exacerbate the vulnerability of SSFs (Noman *et al.*, 2019; Cánovas-Molina and García-Frapolli, 2022; Islam and Chuenpagdee, 2022; Saksono, Nissa and Suadi, 2023). SSFs in developing countries often have limited access to markets, resulting in economic marginalisation and exclusion, leaving these fishers particularly vulnerable in the face of market volatility

(Jentoft and Eide, 2011; Nayak, Oliveira and Berkes, 2014). Additionally, changes in the price of goods and services, particularly an increase in fish prices, may increase poverty among fishers if they are unaware of the current market value of their catch and how much they can make through selling their catches (Hardy *et al.*, 2016; Brock, 2024).

Other factors that place SSFs under threat include limited access to education and healthcare services (Béné and Friend, 2011; Saksono, Nissa and Suadi, 2023). Lower levels of education are characteristic among SSFs, and this can exacerbate their vulnerability by hindering their ability to take part in formal decision-making processes (Thoya, 2022). Additionally, the limited access to healthcare services also exacerbates the health problems of SSFs, such as untreated injuries from accidents (Shrestha *et al.*, 2022; Zakaria *et al.*, 2022).

Given the importance of understanding social vulnerabilities for SSFs in developing contexts, my research focuses on SSFs in South Africa. Below, I broadly introduce the marine and associated fishery context of South Africa, with a focus on SSFs in the southern Cape.

## **1.2. Introducing the South African context**

The Benguela Current Large Marine Ecosystem (BCLME), is an eastern boundary current upwelling system that is productive and supports important fisheries for Angola, Namibia and South Africa<sup>2</sup> (Jarre, Ragaller and Hutchings, 2013; Jarre *et al.*, 2015; Jarre *et al.*, 2015; Blamey *et al.*, 2015; Ortega-Cisneros *et al.*, 2018; Shannon *et al.*, 2020). The BCLME also exhibits extensive variability and is made up of the following subsystems: the northern Benguela, southern Benguela and includes the Agulhas Bank off the coast of southern Cape (Hutchings *et al.*, 2006; Veitch, Penven and Shillington, 2010; Blamey, Shannon, Bolton, Crawford, *et al.*, 2015; Tim *et al.*, 2018).

My research took place in the southern Benguela (e.g. Figure 1.1), which spans from the western to the southeast of South Africa and includes the Agulhas bank, which was identified as a hotspot by Hobday and Pecl (2014) and is characterised by accelerated warming (Puccinelli *et al.*, 2023; Jury, 2024). The southern Benguela is productive, where its productivity is attributed to the coastal upwelling influenced by the south-easterly

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<sup>2</sup> <https://www.benguelacc.org/>

winds and characterised by a wide range of biological diversity (Van der Lingen *et al.*, 2016; Watermeyer, 2016).

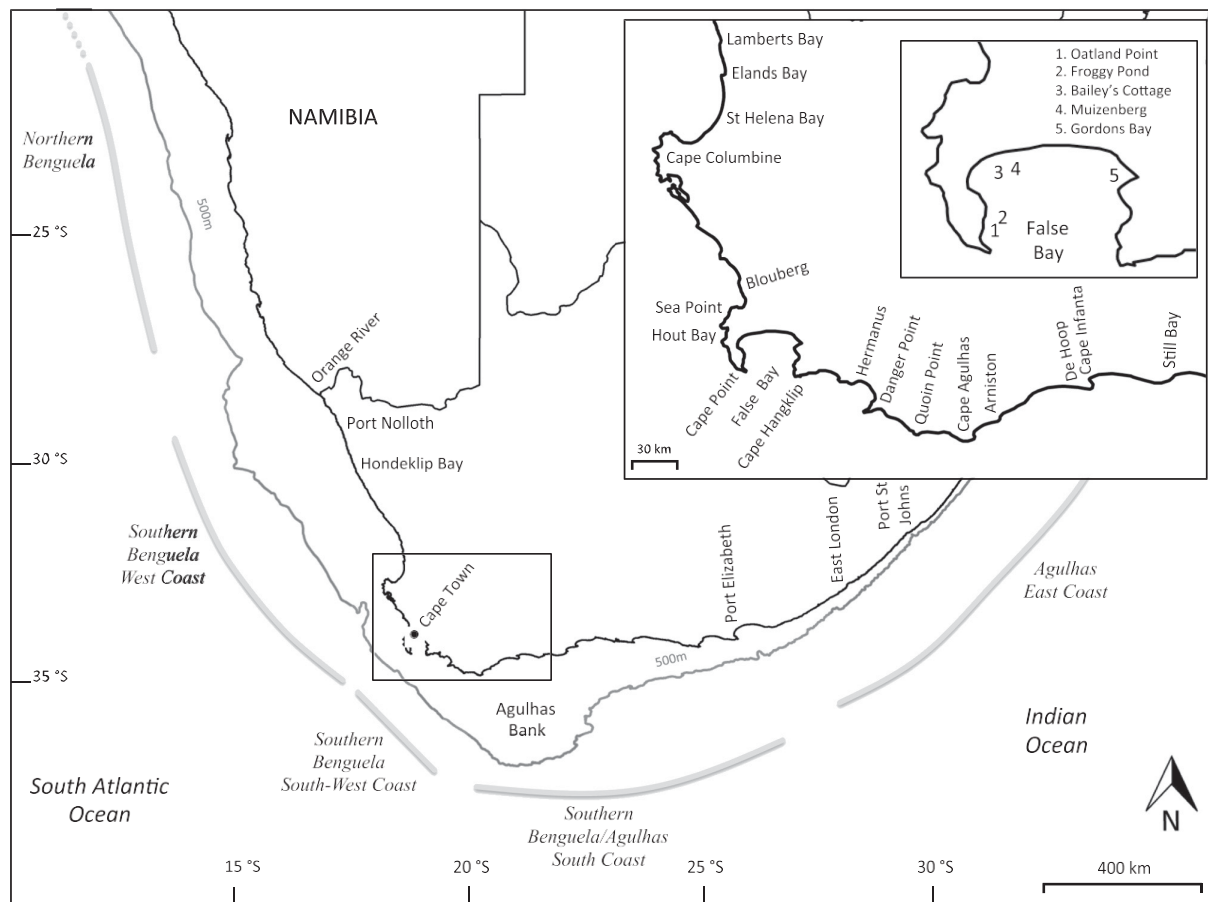


Figure 1.1: Shows a southern Benguela map including the place names (Adopted from Blamey *et al.*, 2015)

The southern Benguela ecosystem supports South African fisheries operating along the length of South African coastlines of ~3,000 km (i.e., spanning along the provinces of the Northern Cape, Western Cape, Eastern Cape, and KwaZulu-Natal), which is important for supporting the lives and livelihoods of about 147 fishing communities (DAFF, 2014; Isaacs, 2022). Despite the important contribution of SSFs in supporting the lives and livelihoods of coastal communities, they are faced with multiple pressures which increase vulnerabilities. The multiple pressures include governance issues, where delays in policy implementation are one of the issues that are heavily impacting SSFs in South Africa, leaving them without access to fishing rights (Isaacs, 2011, 2022; Gammage, Jarre and Mather, 2017a; Gammage, Jarre and Mather, 2019; Martins *et al.*, 2019; Gammage and Jarre, 2020; Sowman and Sunde, 2021; Sowman, 2021; Auld and Feris, 2022; Lück-

Vogel *et al.*, 2023; Williams, 2023). These issues are further highlighted in Sections 2.3 and 2.4.

To address the vulnerabilities faced by SSFs in South Africa, it is critical to better understand the stressors as they heavily influence the lives and livelihoods of coastal communities. If these vulnerabilities are not fully addressed, the challenges will continue to worsen, especially poverty and food insecurity, which in turn lead to the occurrence of other issues (e.g. Gammage, Jarre and Mather, 2017a; Gammage, Jarre and Mather, 2017b; Martins *et al.*, 2019; Mbatha, 2021; Isaacs, 2022; Auld and Feris, 2022; Sowman and Rebelo, 2022).

### **1.2.1. Southern Cape Fisheries**

Southern Cape fisheries are found along the southern coast of South Africa and encompass fishing activities taking place in fishing towns such as Bitouville, Mossel Bay, Melkhoutfontein, Witsand, Vermaakliheid, and Slangrivier, ranging from rural to peri-urban areas (Gammage, Jarre and Mather, 2017a, 2019; Andra, 2022).

The southern Cape fishery is a multi-species fishery which includes small-scale commercial, recreational and community-based rights line fishing. It is also boat-based and targets key species such as silver kob (*Argrosomus inodorus*), silvers/carpenters (*Argyrozona argyrozona*), red roman (*Chrysoblephus laticeps*), and shark (*Chondrichthyes*) (Griffiths, 2000; Blamey *et al.*, 2015; Gammage, Jarre and Mather, 2017a; Duggan, Jarre and Murray, 2020; Andra, 2022).

Southern Cape fisheries are exposed to a wide range of stressors that influence their vulnerability including resource scarcity (e.g. declined fish stocks, and competition between fishing sectors) (Gammage, Jarre and Mather, 2017a, 2019), climate variability (e.g. marine species distributional changes, and fluctuations in weather conditions) (Gammage, Jarre and Mather, 2017a; Lyttle, 2021; Ward *et al.*, 2021), policy and regulation (e.g. challenges with rights allocation, and delays in policy implementation) (Gammage, Jarre and Mather, 2017a; Martins *et al.*, 2019; Andra, 2022). These stressors or drivers of changes are further discussed in detail in Section 2.4 of this dissertation.

It is important to build an understanding of how vulnerabilities faced by southern Cape fishing communities change over time as this has environmental and social

consequences for local livelihoods and the marine system, where the failure to address vulnerabilities can exacerbate poverty among SSFs and lead to the degradation of marine resources (e.g. Visser, 2015; Duggan, Jarre and Murray, 2020).

### **1.3. Situating the Dissertation**

To examine the social vulnerabilities faced by SSFs in selected towns in the southern Cape (Bitouville and Melkhoutfontein), this study uses the Global Understanding and Learning for Local Solutions (GULLS) framework and associated survey.<sup>3</sup> The original survey, implemented in 2013/14 was adapted for this study. The adapted GULLS survey was critical for examining drivers of changes in the selected towns, the associated impacts, and changes that took place since the earlier GULLS research was conducted. Prior research by (Gammage, 2015; Gammage, 2019) has similar findings. Key aspects relevant to this study are as follows:

- The main driver of social vulnerability in previous research was policy and regulation, highlighting deficiencies created by the lack of formalisation of the sector due to the absence of a legal definition and associated regulations (Gammage, 2015; Gammage, Jarre and Mather, 2017a; Gammage, Jarre and Mather, 2019).
- Prior GULLS research has found that resource scarcity and climate variability further exacerbate the social vulnerability of fishers in the southern Cape, with policy and regulation as the main drivers of change despite the fact that the SSFP was promulgated in 2012 (Gammage, Jarre and Mather, 2017a; Gammage, Jarre and Mather, 2019; Martins *et al.*, 2019; Andra, 2022) .
- The GULLS survey did not find a big impact of extreme or unexpected events; highlighting the nuances linked to climate change impacts in the research area. Although subsequent research has highlighted the increasing impact of future extreme events. Research has shown that SSF will be disproportionately impacted by such events (Duggan, 2012, 2018; Gammage, Jarre and Mather, 2017a).

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<sup>3</sup> The GULLS framework and survey was developed by a multilateral scientific team to measure the vulnerability of marine-dependent hotspot coastal communities like South Africa, India, Brazil, Australia and Mozambique (Aswani, *et al.*, 2019).

Prior research has highlighted that the drivers of changes exacerbating the social vulnerability of fishers within the southern Cape were consistent, indicating little to no variations among the fishing towns (Gammage, 2015; Gammage, Jarre and Mather, 2017a; Gammage, Jarre and Mather, 2019). The importance of my research lies in providing a lens to evaluate change over time to better understand how social vulnerability is evolving in these towns, ultimately providing important understanding to inform improved adaptive capacity.

### **1.3.1. Aim**

The overall aim of my research is to update and re-implement an updated version of the GULLS survey to better assess the social vulnerability of fishing communities to changes in the southern Cape regions, particularly Bitouville and Melkhoutfontein. This includes examining the impact of recent extreme events (including the impact of COVID-19).

### **1.3.2. Objectives**

The objectives of this research are to examine the vulnerabilities that are faced by SSFs in Bitouville and Melkhoutfontein and to compare the changes that took place over time since the earlier GULLS research was undertaken in 2013/14.

### **1.3.3. Research Questions**

Key questions include:

1. What are the drivers of vulnerability among SSFs in the southern Cape?
2. What are the associated impacts of COVID-19 on the vulnerability of SSFs in the southern Cape?
3. How did social vulnerability and the drivers of change evolve in the southern Cape fishing communities compared to earlier GULLS research?

## **1.4. Structure of the Dissertation**

This section provides an overview of the dissertation structure (e.g. Figure 1.2), which highlights the chapters that make up the dissertation, including the literature review, research methodology, results, discussion, and conclusion. A summary of the detailed dissertation structure is provided below:

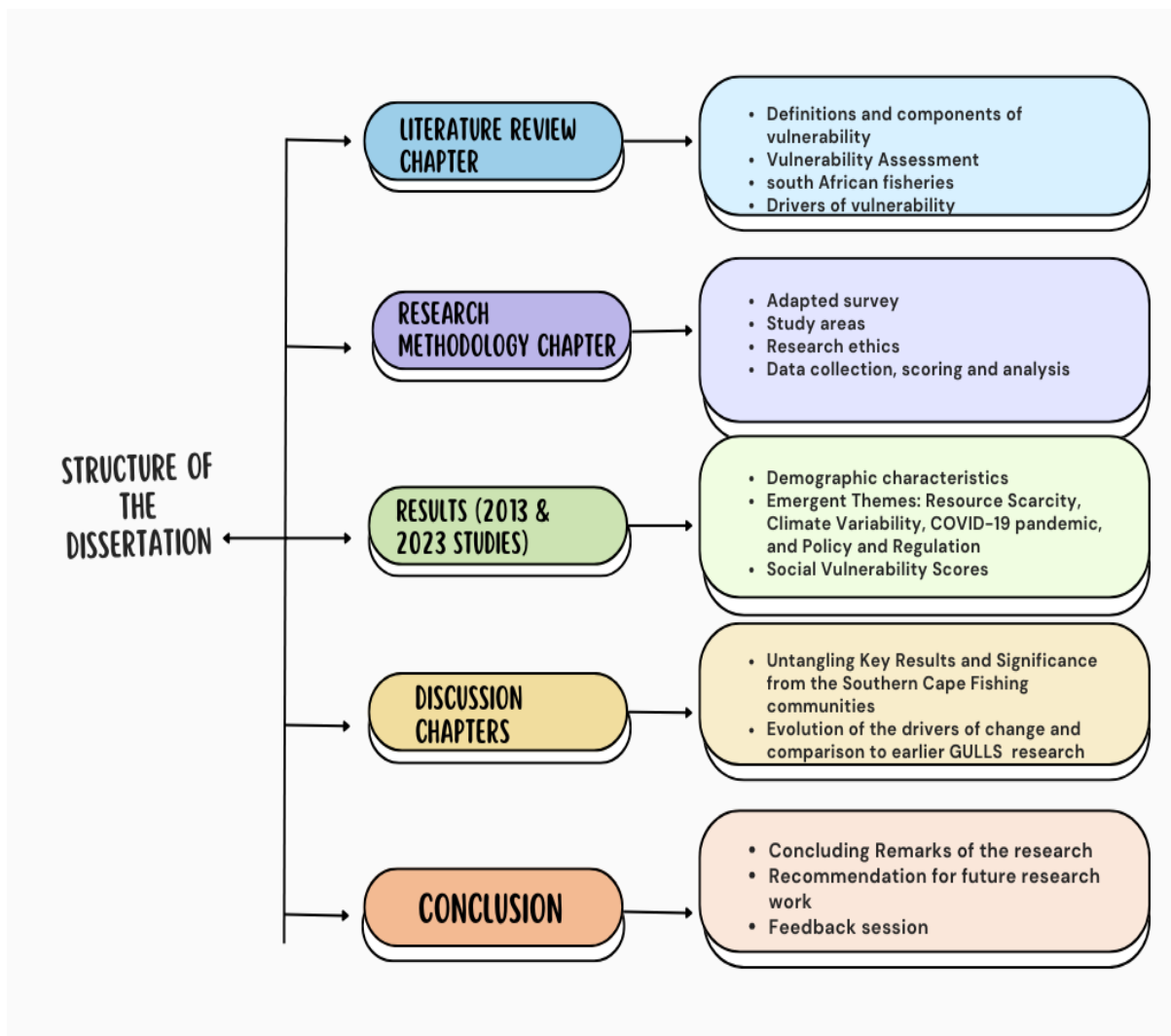


Figure 1.2: An outline of this thesis highlighting the chapter themes (on the left) along with their content (on the right).

**Chapter One** provides an overview of the research ideas and gaps that exist. It highlights an overview of the drivers of social vulnerabilities among SSFs from various contexts, including international, South African, and the southern Cape. It also provides the research objectives and key questions.

**Chapter Two** provides background and context on the drivers of vulnerability among SSFs. It highlights the social vulnerability concept, including the definitions, components, and theoretical frameworks (e.g. the GULLS framework, the International Panel on Climate Change (IPCC) 2001 framework, food security (FS), and the sustainable livelihood approach (SLA) framework). It provides an overview of the stressors contributing to exacerbating the vulnerability of SSFs, including resource scarcity, climate change and variability, COVID-19, and policy and regulation.

**Chapter Three** highlights the methodological approaches utilised in this research, including administering the GULLS survey in the selected towns of Bitouville and Melkhoutfontein. It provides a detailed description of these two selected towns in terms of population and infrastructure. The chapter also highlights the ethical considerations and procedures undertaken, and the data collection, scoring and analysis process.

**Chapter Four** provides the key results of this research about the drivers of social vulnerability among SSFs in the selected towns including the associated impacts of COVID-19. It presents how these drivers of vulnerabilities have evolved since the earlier GULLS research was conducted in 2013/14. The presentation of the results is through themes such as resource scarcity, climate variability, the COVID-19 pandemic, and policy and regulation. The social vulnerability scores which are important for the comparison of the 2023 and 2013/14 results to examine the drivers of changes are also presented.

**Chapter Five** highlights a detailed discussion of my research findings, which addresses questions one and two about the drivers of vulnerabilities and associated impacts of COVID-19 in the selected towns. The chapter also compares the results with what we already know in the literature, to understand the research gaps that exist. The discussion adopted a thematic approach; resource scarcity, climate variability, the COVID-19 pandemic, and policy and regulation to discuss these drivers of change.

**Chapter Six** highlights the discussion of the research findings which addresses key question three about the evolution of drivers of changes in Bitouville and Melkhoutfontein in 2013/14 and 2023. The findings are discussed in terms of the emergent themes: resource scarcity, climate variability, and policy and regulation.

**Chapter Seven** provides concluding remarks and recommendations for future work based on the findings of this research following their analysis and discussion in chapters five and six.

## **Chapter Two: Literature Review**

### **2.1. Introduction**

This literature review chapter provides an overview of the conceptual definitions and concepts related to the social vulnerability of SSFs, which is at the core of this research. It also places its focus on understanding the social vulnerabilities faced by SSFs to ensure sustainable livelihoods and human well-being as well as preserving the fishing culture among communities.

The chapter begins by examining the definitions and elements of vulnerability, including exposure, sensitivity, adaptive capacity, and risk. It also provides an overview of the theoretical frameworks and vulnerability assessment. Next, it provides an overview of the stressors that drive the vulnerability of SSFs such as resource scarcity, climate variability, extreme or unexpected events and policy and regulation.

### **2.2. Vulnerability**

Understanding the concepts of social vulnerability is important, particularly in the context of SSFs, as it plays a critical role in the sustainability of livelihoods and the assessment of risks and key challenges. Understanding vulnerability also improves communities' adaptive capacity and resilience by highlighting the challenges faced within communities. This section unpacks the definitions of vulnerability across multiple disciplines.

#### **2.2.1. Definitions**

Vulnerability, central to this research, is a multifaceted concept with numerous definitions across various disciplines, often derived from conceptual frameworks and models (Cutter et al., 2009; Paul, 2014; Tallman et al., 2019). In engineering, vulnerability pertains to hazard preparedness, emphasizing the importance of designing resilient systems and infrastructure (Wu *et al.*, 2023; Santi, Tyas and Ramadhan, 2024). The social sciences introduce concepts of vulnerability focusing on poverty assessment, livelihoods, disaster management, and food security (Cutter, 2003; Borre, Ertle, and Graff, 2010; Biswas and Nautiyal, 2023). Geography and hazard literature have significantly contributed to the foundational understanding of vulnerability, particularly concerning climate change, natural hazards, livelihoods, and global environmental change (Füssel and Klein, 2006; Paul, 2014; Liverman, 2024). Furthermore, vulnerability

is intricately related to resilience, risk, exposure, and adaptive capacity, concepts that are essential for comprehensive risk assessments (Johnson and Welch, 2009; Iwama *et al.*, 2016).

Adger (2006, p. 268) defines vulnerability as "the state of susceptibility to harm from exposure to stresses associated with environmental and social change and from the absence of the capacity to adapt." He interprets vulnerability from two perspectives: internally, as the ability to withstand changes, and externally, as the impact of changes emanating from climate change on households (Adger, 1999). This study adopts a definition of social vulnerability as the susceptibility to harm, considering three critical elements: exposure, sensitivity, and adaptive capacity (Füssel, 2007; IPCC, 2007; Paavola, 2008; Singh and Nair, 2014). These elements are further elaborated in Figure 2.1 and Section 2.2.2. This definition aligns with the study's objectives by providing a framework to assess how these components influence the vulnerability of the target population.

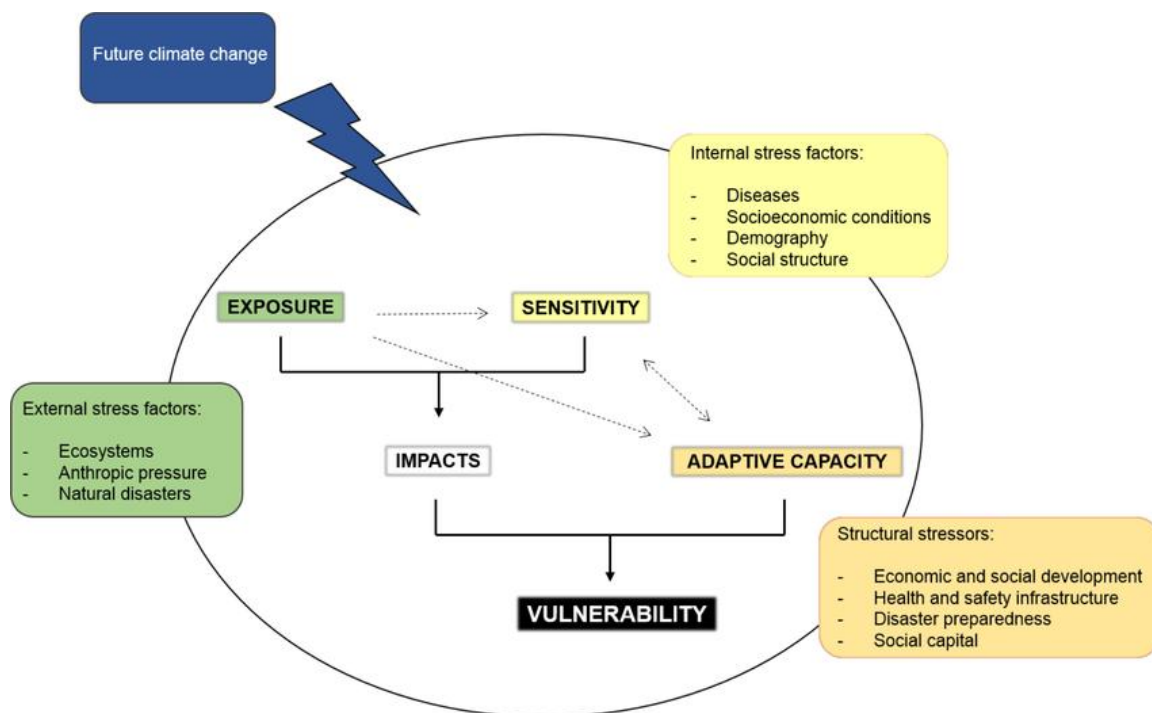


Figure 2.1: The conceptual framework that visually represents the relationships between the vulnerability components (As Cited by Menezes *et al.*, 2018 and adapted from Allen Consulting Group, 2005).

### 2.2.2. Components/Elements of Vulnerability

This section examines the key components of vulnerability: exposure, sensitivity, adaptive capacity, and risk, as they pertain to the socio-economic and environmental

contexts of the southern Cape handline fishers. Different disciplines interpret and measure these components uniquely, influenced by context and data availability (Turner et al., 2003; Sullivan and Meigh, 2007). For instance, while climatologists may focus on atmospheric variables, social scientists emphasize socio-economic factors. However, the use of these three components in this research was based on the GULLS social vulnerability framework (e.g. Aswani et al., 2019).

#### **2.2.2.1. Exposure**

According to the IPCC (2001, p. 995), exposure refers to the “*nature and degree to which a system is exposed to significant climatic variations*”. It includes the frequency and magnitude of climatic events that affect a system and addresses rising perceptions of climate change and increased climate change concerns (Ogunbode, Doran and Böhm, 2020). It is also considered in terms of being exposed to information and influencing knowledge of environmental problems (Damerell, Howe and Milner-Gulland, 2013). Various social, economic, and cultural factors, such as the distribution of wealth, demographics, and access to technology and information influence exposure (IPCC, 2014). Other factors include climatic variables such as ocean temperatures, precipitation, salinity, nutrient levels, and flooding, which tend to influence fisheries (Barange., 2003; Stenseth et al., 2003; Lehodey et al., 2006; Brander., 2007).

It is also important to understand the concept of exposure, especially in the context of socio-economic and natural hazards, as it is critical for informed decision-making in terms of the allocation of resources, the overall planning and the adaptive strategies that address the needs of the communities (Modica, Reggiani and Nijkamp, 2019; Balica, Dinh and Popescu, 2023).

Globally, climate change impacts the abundance and distribution of marine species (Perry et al., 2005; Lehodey et al., 2006; Dulvy et al., 2008). Climate change also gives rise to more frequent and severe weather events, destroying infrastructure whilst disrupting fishery operations (Adger, 2006). The indirect impacts of climate change include changes to the habitat quality of ecosystems and effects on livelihoods due to changes in ecosystem productivity rates (O’Reilly et al., 2003; Edwards et al., 2004; Hall-Spencer et al., 2008). Communities are exposed to several climatic variations that tend to make the

ecosystems and people vulnerable (IPCC., 2022). Approximately 3.3 to 3.6 billion people are susceptible to climate change (IPCC., 2022).

The southern Cape regions are not exempted from exposure, as these regions are exposed to the impacts associated with climate change and variability. They are exposed to environmental stressors such as increased sea surface temperatures, and shifts in wind conditions (e.g. winds arriving from southeasterly and south-westerly directions), which in turn impacts the availability of sea days and their overall livelihood in terms of generating profits, thus also impacting their fish catches and food security (Gammage, Jarre and Mather, 2017a; Gammage, Jarre and Mather, 2019; Martins *et al.*, 2019).

#### **2.2.2.2. Sensitivity**

Sensitivity, which is an important element of social vulnerability, is interpreted differently across each discipline. For instance, in the field of Climatology, sensitivity refers to the rise in global mean temperature that occurs due to changes in carbon dioxide, while ecologists and other environmental scientists define sensitivity as “the degree to which a system is affected, either adversely or beneficially, by climate-related stimuli” (IPCC, 2001, p.995).

In the context of this research, sensitivity refers to the “equilibrium change in global mean surface temperature following a doubling of the atmospheric (equivalent) CO<sub>2</sub> concentration (IPCC, 2001, p.789). It is influenced by multiple factors, including social and human systems (e.g. gender, age, education, ethnicity, and poverty) (Tuler *et al.*, 2008; Tucker *et al.*, 2015). Sensitivity is also influenced by community characteristics and existing social relations, including access to resources, community location, and lack of institutional support (Tuler *et al.*, 2008; Thomas *et al.*, 2019). In South Africa, characteristics such as education, location, poverty, gender, and ethnicity also influence sensitivity (e.g. Carleton and Hsiang, 2016; Flatø, Muttarak and Pelsler, 2017; Gammage, Jarre and Mather, 2019). Poverty, education, and social networks influence sensitivity in numerous ways, for example, SSFs who are already facing economic strain and limitations in accessing financial resources to purchase fishing equipment, makes them further economically disadvantaged (Cánovas-Molina and García-Frapolli, 2022; Islam and Chuenpagdee, 2022).

Apart from the socio-economic factors, climate variables such as changes in temperature, rainfall patterns, sea state conditions, and others influence communities. For example, temperature changes impact the metabolic rate of fish species. When the metabolic rate of fish species increases, the respiration rate increases, thus affecting their distribution (Mohanty et al., 2010). Changes in fish species' distribution impact people who rely on fisheries for a living because it alters the rate at which they fish (Mohanty et al., 2010).

Many studies in South Africa have highlighted that skills outside fishing is one of the issues exacerbating the vulnerability of fishers, and this is attributed to low levels of education and apartheid (Sowman, 2006; Sowman and Raemaekers, 2018). The lack of skills also makes SSFs heavily reliant on fishing as their source of income, thus also making it difficult for them to adapt to changing conditions. Additionally, the attachment to fishing makes SSFs reluctant to leave fishing, and this is corroborated by Gammage (2015), who noticed the “ubuntu” spirit in Vermaakliheid.

#### **2.2.2.3. Adaptive Capacity**

The concept of adaptive capacity emanated from different disciplines and is related to resilience and vulnerability, where resilience deals with examining the degree or extent to which a human action makes it possible for social-ecological systems (SES) to thrive under certain conditions (Adger, 2006; Smit et al., 2006). Social-Ecological Systems (SES) refers to the “integrated complex systems that include social (human) and ecological (biophysical) subsystems in a two-way feedback relationship” (Berkes, 2011). Importantly, the concept of SES places a strong focus on the interconnectedness of social and ecological subsystems and their influence on improving adaptive capacity and sustainability (Berkes, Folke and Colding, 2000; Ostrom, 2009; Stephenson *et al.*, 2021; Biggs *et al.*, 2022). It is worth noting that the SES concept is grounded on several research studies, for instance, Ostrom (2007, 2009) highlighted that the management of these two subsystems is dependent on several components, such as governance and management of SES through collaborative efforts, while Berkes and Folke (1998) also placed a strong emphasis on the importance of using approaches that are multi-disciplinary in understanding the social and ecological subsystems. Crucially, Ostrom (2009) defines

fisheries as SES to recognise the importance and interconnectedness of social and ecological subsystems and their management.

On the other hand, the concept of adaptive capacity is also applied in various disciplines, including water management (Gain, Rouillard and Benson, 2013), the study of indigenous people, and desertification (Seely et al., 2008), to mention a few. Researchers usually use the concepts of adaptive capacity at scales ranging from household to community (Fernández-Giménez et al., 2015; Goldman et al., 2013; Moreno-Sánchez et al., 2013). However, for this study, adaptive capacity “is the ability of a system to adjust to climate change (including climatic variability and extremes) to moderate potential damages and take advantage of opportunities or cope with consequences” (IPCC, 2001, p.995).

Adaptive capacity studies seek to identify the characteristics and conditions that determine the adaptive capacity of different groups (Cannon et al., 2010). To assess the conditions, researchers look at the overall adaptive capacity of a system. Therefore, adaptive capacity is then considered a regulatory practice found in the socio-ecological systems (Cannon et al., 2010). To fully understand the regulatory practice, it is crucial to explain it in the societal context. Describing the regulatory practice in the societal context allows the researcher to look at challenges and mitigation measures (Cannon et al., 2010). In climate change, adaptive capacity is only partially considered as the direct reaction to climatic variables. Instead, it deals with how communities react to specific changes, and the discussions centre on economic and political issues (Cannon et al., 2010; Fernández-Giménez et al., 2015). Adaptive capacity is also important for those communities that are facing challenges. For instance, communities with better adaptive mechanisms tend to adapt to changing conditions when faced with problems and they can manage their resources sustainably and get access to help including financial capital (Akther and Evans, 2024). For example, in southern Cape Andra (2022) found out that the adaptive capacity of fishers was driven by their attitude and perception, physical capital and occupational flexibility. The research also revealed that communities with strong ties tend to be resilient when faced with challenges (Andra, 2022).

To deal with the impacts of climate change on human well-being, governments and other social organisations have made significant improvements in ensuring that the capacity

of people to adapt to change is improved (Cheung et al., 2010; Cinner et al., 2018). Adapting to change is important through different aspects, such as assets and flexibility to change strategies (Cinner et al., 2018). For example, in South Africa, even though much adaptive attention is focused on the energy sectors, several international and institutional organisations are involved in climate change mitigation measures for fisheries, including the South African National Biodiversity Institute (SANBI), Council for Scientific and Industrial Research (CSIR) and the Benguela Current Commission (BCC), to mention a few (Hampton et al., 2017; Ortega-Cisneros et al., 2021). In the southern cape, the adaptive strategies employed by fishers include that in the absence of silver kob fishers were targeting other species such as carpenters/silvers to mention a few. Additionally, fishers have also through collaborative efforts managed to establish a seafood branding scheme (Duggan, Jarre and Murray, 2020). Understanding these components is important as it serves an important role for policymakers, and communities, particularly in the examination of drivers of vulnerabilities faced by communities, to improve their adaptive capacity. Additionally, it also helps other stakeholders working along with communities to better understand the challenges facing the communities and to prepare them for any uncertainty that may arise.

#### **2.2.2.4. Risk**

Risk is defined as the uncertainty surrounding an activity, its severity, and its consequences (Aven and Renn, 2009). The uncertainty of events and consequences occur due to climate change's physical and human components, such as political, economic, and risk. In the context of climate change, risk has not been given the much-needed attention by scholars because the attention is focused on assessing and understanding risk based on aspects such as modelling, probabilities, and uncertainties (Dessai and Hulme, 2004; Smith and Stern, 2011; Spiegelhalter and Riesch, 2011; Frigg, Smith and Stainforth, 2013, 2015; Tangney, 2017). Even though risk arising from climate change has not been given much attention, the IPCC has been assessing climate change from different perspectives, including its impacts, human exposure, and adaptive capacity (IPCC, 2007).

Recently, risk has been framed differently. For instance, within the context of climate change, risk now incorporates vulnerability, adaptive capacity, exposure, and the level of

socio-economic development (IPCC, 2023). The IPCC (2023) has highlighted that the concept of risk should not be treated in isolation within regions or sectors as it is connected. The report highlighted that risks due to drought and heatwaves result in challenges to food productivity, which in turn results in increased food prices and a decline in household income. The report also highlighted that climatic factors, coupled with non-climatic factors, such as competition for land, food production, and pandemics, cause risks to become more severe. Risks also arise due to the adaptive strategies that are intended to reduce climate change impacts, such as measures to remove carbon dioxide and reduce emissions (IPCC, 2023).

In South Africa, climate change and variability pose risks to fishers, particularly SSFs in terms of changes in the distribution patterns of marine resources, reduction of available fish resources, and exacerbation of the cost of going to sea to fish (Gammage, Jarre and Mather, 2017a; van der Lingen and Hampton, 2019; Cochrane, Eggers and Sauer, 2020).

### **2.2.3. Measuring Vulnerability**

It is important to measure social vulnerability to understand better the challenges faced by communities including the drivers of changes in the communities and to improve the adaptive capacity. Vulnerability is often measured using vulnerability assessments that examine the extent or degree to which a system or subsystem is susceptible to changes as a result of exposure to hazards (Dewan, 2013; Moret, 2014). It provides a good understanding of system interactions and risks for implementing adaptive strategies as this aids in governance, planning, monitoring, and evaluation of resources (Brooks and Adger, 2005; Naudé, Santos-Paulino and McGillivray, 2009; Mamauag, 2013; Parsons et al., 2016). A vulnerability assessment seeks to address the following key questions: 1) “What is the extent of the vulnerability?” 2) “Who is vulnerable?” 3) “What are the sources of vulnerability?” and 4) “How do households respond to shocks?” (Hoddinott and Quisumbing, 2003, p.46).

Participatory rapid appraisal is a type of assessment that is more inclusive as it includes community perspectives on aspects related to vulnerability (Moret, 2014; Licuanan et al., 2015). For example, a study conducted with coastal communities in the Benguela Current Large Marine Ecosystem (BCLME), which includes South Africa, Angola, and Namibia, conducted the rapid vulnerability assessment using workshops to gather

information about the attitudes and perceptions of coastal communities towards environmental conditions (Sowman and Raemaekers, 2018). As already indicated rapid assessments were undertaken in other parts of the world, one example is that of a case study undertaken in the two fishing communities of Ambola and Ambotsibotsike in the south-west of Madagascar, which applied a participatory approach and utilised a conceptual model to assess the impacts of climate change on fisheries (Cochrane et al., 2019).

One of the tools important for measuring vulnerability is calculating social vulnerability scores using the formula:  $\text{social vulnerability} = \text{exposure} \times \text{sensitivity} \div \text{adaptive capacity}$ . Additionally, the scores are calculated based on categories (e.g. exposure, sensitivity and adaptive capacity), components, subcomponents and indicators (e.g. Adger, 2006; Aswani *et al.*, 2019; Andra, 2022). Section 2.2.4 delves deeper into the theoretical frameworks that are important for this research in terms of examining the social vulnerability of SSFs.

#### 2.2.4. Theoretical Frameworks for Assessment

In the context of vulnerability, theoretical frameworks play an important role in ensuring that vulnerability is well understood from various levels, including community, household, and individual levels (Moret, 2014). My study uses the GULLS framework, developed for understanding better the social vulnerability faced by marine-dependent coastal communities. This section presents an overview of the frameworks that the GULLS framework draws on, namely the Intergovernmental Panel on Climate Change (IPCC) 2001 framework, the Sustainable Livelihoods Approach (SLA) framework, and the Food Security (FS) framework. An overview of these frameworks is summarised in Table 2.1 and is expanded below.

Table 2.1: An overview of the vulnerability frameworks, including their advantages and disadvantages (Adopted from Aswani et al., 2019)

Framework	Advantage	Disadvantage	Area of focus	References
<b>Intergovernmental Panel on Climate Change (IPCC) 2001 framework</b>	Both the ecological and social dimensions characterise the framework	The framework is broad, and it is not appropriate for local-scale assessments. It also places more focus on economic aspects than on	Mexico, Northern Gulf of California, National fisheries and Indian Ocean coral reefs	IPCC, 2001; Allison and Horemans, 2006; Cinner, 2012

		social and ecological aspects	and communities	
<b>Sustainable Livelihoods Approach (SLA) framework</b>	The framework offers a very multi-dimensional view of poverty	The framework lacks the means to measure exposure to climate change or adaptation practices.	West African countries and Australia	Allison and Horemans, 2006; Mensah, 2011; Metcalf, 2015; Krantz, 2001; Natarajan et al., 2022; Karki, 2021
<b>Food Security (FS) framework</b>	The framework offers a multi-dimensional view of food-based welfare (i.e. access, availability and utilisation)	The framework is unsuitable for local-scale assessment; its main focus is on global-scale assessments. The emphasis is on food access and availability, and it often fails to focus on other dimensions.	Global food security and Household food security	Schmidhuber and Tubiello, 2007; Godfray, 2010; Clapp et al., 2022

#### 2.2.4.1. The Intergovernmental Panel on Climate Change 2001 Framework

The IPCC 2001 framework is used to assess the vulnerability of communities (including coastal communities) to climate change (IPCC, 2001a). It incorporates social and ecological aspects, thus making it applicable from local to global scales. This framework highlights how human processes play an important role in influencing climate change by contributing to global change through their impacts and their adaptive capacity (IPCC, 2001a).

Although the IPCC 2001 framework is applicable at various scales, it has some disadvantages for example, the framework is broad and it places more focus on economic aspects than on social and ecological aspects (Allison *et al.*, 2009; Cinner, 2012; Morzaria-Luna, Turk-Boyer and Moreno-Baez, 2014). Additionally, it offers a simplified view of the adaptive capacity. The framework emphasises climate policies that should have a strong focus on the cultural, social, and economic aspects, but understanding these aspects for adaptive capacity is often challenging. To address some of these limitations, the framework does draw from other frameworks, such as the SLA, to further assess communities' vulnerabilities to climate change (IPCC, 2001; Aswani *et al.*, 2019). Refer to Table 2.1 for more details.

#### **2.2.4.2. Sustainable Livelihood Approach Framework**

The SLA framework provides a multifaceted (e.g. economic and social) understanding of poverty (Allison and Horemans, 2006; Metcalf, 2015). The SLA framework integrates a conceptual framework with a collection of practical principles to offer a direction for developing policies and strategies for addressing poverty (Allison and Horemans, 2006, p.757). It also considers rural livelihood from the perspective of the underprivileged and poor (Ahmed, 2011). For example, in SSF communities, the approach is used to inform policy and contribute to poverty reduction, improved livelihoods, and food security (Allison and Horemans, 2006).

The approach offers three perspectives on poverty. The first perspective emphasises the link between economic growth and poverty reduction. The second and third perspectives emphasise that poverty is not just a lack of income; it also encompasses vulnerability, a sense of powerlessness, and a lack of social services (Krantz, 2001; Allison and Horemans, 2006). Even though the SLA does not attempt to address every area of livelihood, it seeks to use a holistic viewpoint in the analysis of livelihoods to deal with issues of great concern and to provide mitigating measures (Krantz, 2001). The SLA framework has some advantages. These include its capacity to place people's social and economic activities at the centre of analysis, its examination of various management options from multiple perspectives, such as those in fisheries and agriculture, its encouragement of collaboration between SSFs and the private sector or any other stakeholders, and its consideration of the sustainability perspective (Allison and Horemans, 2006). The disadvantage of the framework is that it lacks details on how to measure exposure to climate change or adaptation practices (Allison and Horemans, 2006; Metcalf, 2015). For more details, see Table 2.1.

#### **2.2.4.3. Food Security Framework**

The FS framework provides a multifaceted view of welfare related to food. It has essential components such as food supply, availability, stability, and use (FAO, 2002; Schmidhuber and Tubiello, 2007). In the context of the FS framework, availability refers to the capacity of food supplies to meet demand, stability considers the people at risk of losing access to sufficient food sources critical to their livelihoods, utilisation includes food safety and nutritional quality, and access is the capacity to obtain the right foods for a healthy diet (Schmidhuber and Tubiello, 2007). The advantage of the FS framework is that it provides

a multi-dimensional view of food-based welfare (e.g. access, availability, and utilisation). Its disadvantages include being unsuitable for local-scale assessment as its main focus is on global-scale assessments, and its emphasis on food access and availability means that it often fails to focus on other dimensions (e.g. Table 2.1).

#### **2.2.5. The GULLS Vulnerability Framework**

The GULLS vulnerability framework was part of the Belmont-funded GULLS project, initiated in 2013 by a team of researchers to build an understanding of issues around coastal vulnerability in five countries identified as marine hotspots by Hobday and Pecl (2014): Brazil, South Africa, India, Australia, and Mozambique (Hobday, 2016). Ultimately, the aim was to explore adaptation strategies for policymakers and local communities (Hobday, 2016; Aswani et al., 2019). One of the components of the project was to understand social vulnerability at the community-level case study sites (marine-dependent coastal communities) using a method that enabled comparison across communities within and between case studies (Aswani et al., 2019).

The social vulnerability team developed an integrated framework (known as the GULLS framework) that draws on elements from the IPCC 2001, SLA, and FS frameworks. The GULLS framework (Figure 2.2) comprises two primary components: ecological and socio-ecological (Aswani et al., 2019). These components establish a comprehensive structure that enables the individual measurement of sensitivity and exposure, which in turn determines the adaptive capacity of a given community or household (Aswani et al., 2019). Of importance is the interdependence of the two dimensions, wherein exposure in the human system depends on the biological system and the adaptive capacity that stems from potential impacts (Aswani et al., 2019). Additionally, within the human dimension, the dependence on marine resources, exposure level, and adaptive capacity tend to influence socio-ecological vulnerability (Metcalf, 2015).

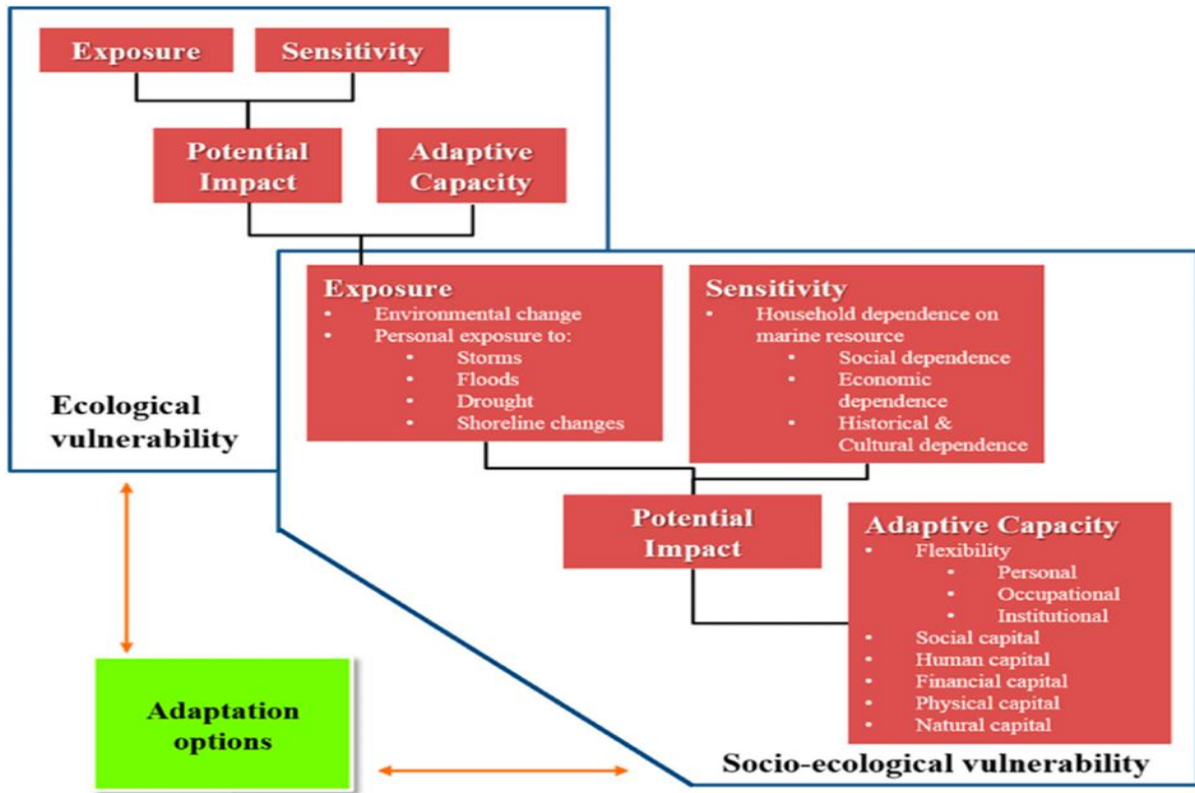


Figure 2.2: Illustration of the GULLS framework for evaluating the vulnerability of coastal communities. This framework draws on various approaches, including the IPCC 2001, SLA, and FS frameworks (Section 2.2.2). The framework's components include dependencies, encompassing social, economic, historical, and cultural factors, and capital, providing for human, social, physical, and financial aspects. Furthermore, the framework incorporates institutional, occupational, and personal flexibility. These components denote high levels of complexity within a socio-economic subsystem (Aswani et al., 2019).

The framework emphasises the varying complexity in measuring social vulnerability to climate change (Figure 2.3) (Aswani et al. 2019). The main components of vulnerability, as defined here, i.e. sensitivity, exposure, and adaptive capacity (e.g. section 2.2.3), form the main categories of the framework. These categories, in turn, are informed by a series of 18 components and are split into 90 subcomponents and 255 indicators (Aswani et al., 2019). For example, competition for fish (subcomponent) falls under economic dependence on fishing (component), which is nested within the sensitivity category.

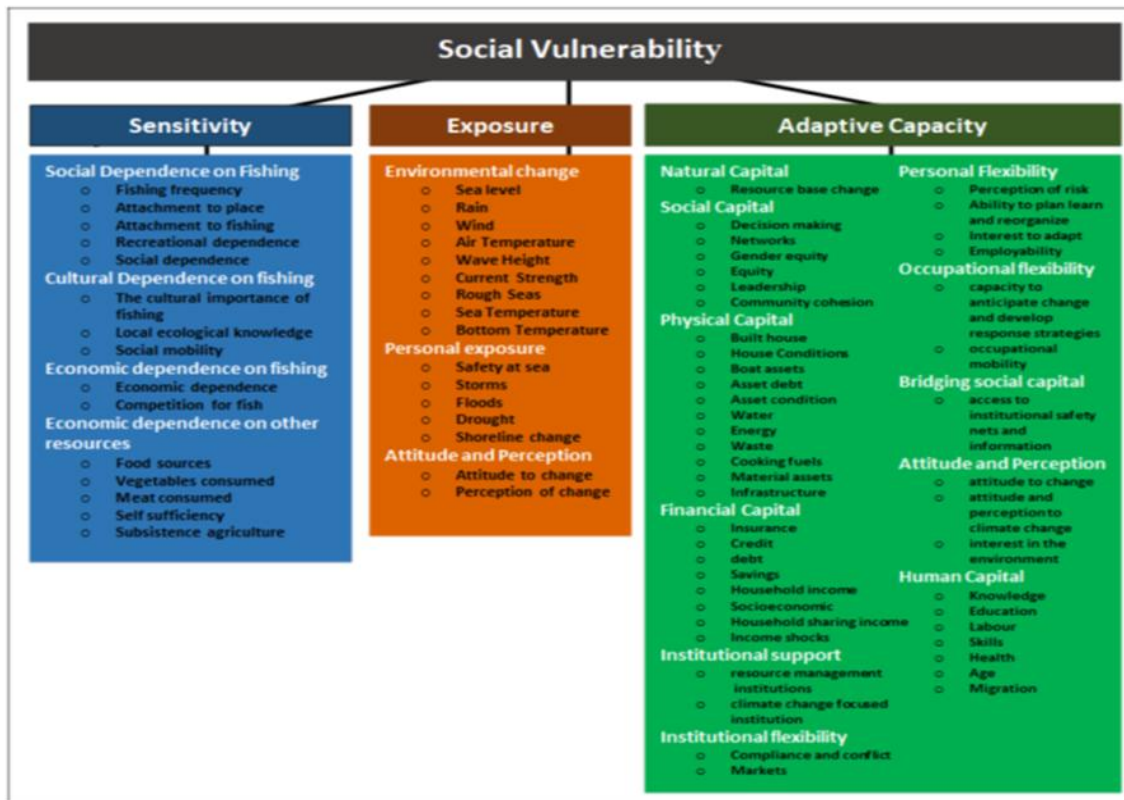


Figure 2.3: Framework for social vulnerability in the context of GULLS. The framework has been organised into categories and components, which are presented in a left-aligned format in white. Subcomponents are delineated and shown as bullet points beneath their corresponding components. This framework was adapted from Andra (2022).

The sensitivity category comprises four components: social dependence on fishing, cultural dependence on fishing, economic dependence on fishing, and economic dependence on other resources (e.g. Figure 2.3). The social dependence on fishing category is divided into the following subcomponents: fishing frequency, attachment to place, attachment to fishing, recreational dependence, and social dependence. The cultural dependence on the fishing component includes the following subcomponents: cultural importance of fishing, local ecological knowledge, and social mobility. The economic dependence on the fishing component consists of the following subcomponents: economic dependence and competition for fish. Economic dependence on other resources has the following subcomponents: food sources, vegetable consumption, meat consumption, self-sufficiency, and subsistence agriculture (Aswani *et al.*, 2019; Martins *et al.*, 2019).

The exposure category comprises three components: environmental change, personal exposure' and attitude and perception. The environmental change component is

subdivided into subcomponents: sea level, rain, wind, air temperature, wave height, air temperature, current strength, rough seas, and sea temperature. The personal exposure component comprises the following subcomponents: safety at sea, storms, floods, drought, and shoreline changes. Lastly, the attitude and perception component includes the attitude to change and perception of change subcomponents (Aswani et al., 2019).

Adaptive capacity refers to the “ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with consequences” (IPCC, 2001, p.995). A more detailed explanation of adaptive capacity has been included in section 2.2.2. The adaptive capacity category comprises natural capital, social capital, physical capital, financial capital, human capital, bridging social capital, institutional flexibility, occupational flexibility, institutional support, personal flexibility and attitude and perception (Aswani et al., 2019). All these components are further subdivided into subcomponents (e.g. Figure 2.3 for more details on the arrangement of the category).

The natural capital component is divided into resource base change; the social capital component is divided into decision-making, networks, gender equity, equity, leadership, and community cohesion. The physical capital component is divided into the following subcomponents: built house, house conditions, boat assets, asset debt, asset condition, water, energy, waste, cooking fuels, material assets, and infrastructure. The financial capital component includes insurance, credit, debt, savings, household income, socio-economic, household sharing income, and income shocks. The institutional support component is subdivided into resource management institutions and climate change-focused institutions. The institutional flexibility component is divided into compliance and conflict, and markets. Personal flexibility is subdivided into perception of risk, ability to plan, learn, and reorganise, interest to adapt, and employability. Occupational flexibility includes the following subcomponents: capacity to anticipate change and develop response strategies and occupational mobility. Bridging social capital has the following subcomponents: access to institutional safety nets and information. The attitude and perception component consists of the following subcomponents: attitude to change, attitude and perception to climate change, and interest in the environment.

The human capital component is subdivided into the following subcomponents: knowledge, education, labour, skills, health, age, and migration (see Figure 2.4).

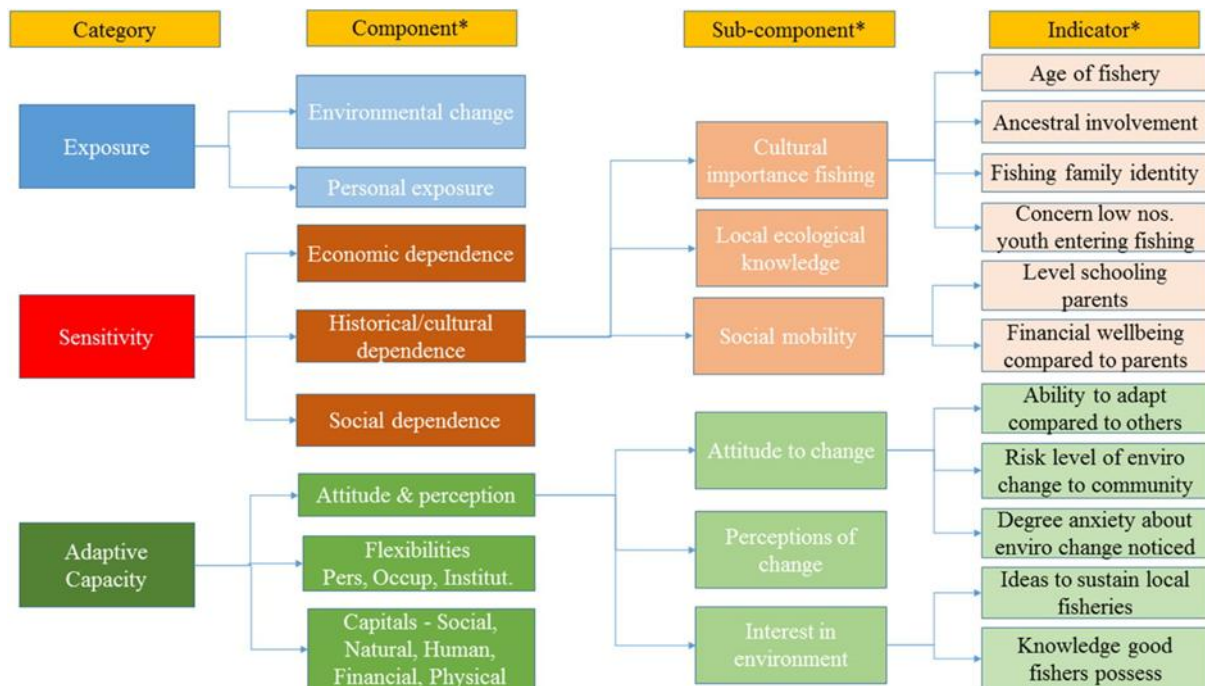


Figure 2.4: The structure of the integrated framework reveals the various complexity levels within each broad-scale category. Because the categories have more subcomponents and indicators, only high-level indicators are shown in the figure. Exposure is depicted up to the component level (Aswani et al., 2019).

A survey instrument was designed based on the framework (Figure 2.4) and administered in various marine-dependent coastal communities, particularly Australia, Brazil, India, and South Africa, to effectively address issues, considering the local-scale processes and comparison among the hotspot countries (Aswani et al., 2019).

The GULLS survey has been used in various research to examine the social vulnerability of fishing communities to climate change and contributed to the understanding of social vulnerability and improvement of adaptive capacity. Some of the studies that have previously utilised the GULLS survey are detailed in Table 2.2 below.

Table 2.2: Studies that have utilised the GULLS survey arranged according to the author, the aim of the study, the methodological approaches and research findings

Author(s)	Aim/purpose	Methodological approach(es)	Research findings
Martins and Gasalla (2020)	Examining the social vulnerability and the adaptive capacity of fishing communities	GULLS Survey and interviews (151) and quantitative indicators	<ul style="list-style-type: none"> <li>• The multiple drivers of social vulnerability include the remoteness of communities and limited climate-related support from institutional bodies.</li> <li>• Vulnerability reduction among fishing communities was attributed to the community organisations that exist within the community, leadership, and the availability of alternative livelihoods.</li> </ul>
Martins and Gasalla (2018)	Examining the perception of SSFs towards climate and ocean changes and their impacts on fisheries and livelihoods	Ethno-oceanographic framework, and GULLS survey (120)	<ul style="list-style-type: none"> <li>• Observed changes such as wind patterns, ocean temperatures and drought increase, calm sea conditions and reduction in rainfall.</li> <li>• These climate-related changes impacted SSFs' lives and livelihoods e.g., increased ocean temperature and drought conditions impacted the populations of fish resources including distribution and availability.</li> <li>• Arising of new hypotheses as a result of the observed changes e.g., coastal currents</li> </ul>
Malherbe (2017)	Identification of vulnerability components	GULLS survey (110)	<ul style="list-style-type: none"> <li>• The factors contributing to driving vulnerability in the five fishing communities in the Solomon Islands included environmental exposure and little to no adaptive strategies.</li> <li>• The results revealed a need to understand the alternative livelihood strategies employed at either household or community levels.</li> </ul>
Malherbe, Sauer and Aswani (2020)	Examination of the social capital role in the reduction of vulnerability		<ul style="list-style-type: none"> <li>• Overall social capital vulnerability of 0,379 with contributing factors such as community networks, leadership and gender equity to mention a few. Additionally, through the ANOVA analysis differences in these factors were noted.</li> <li>• A high degree of social capital has been revealed.</li> </ul>

Andra (2022)	Investigating the social vulnerability of fishing communities in the context of climate change	GULLS survey, mixed methods framework	<ul style="list-style-type: none"> <li>• Similarity in terms of the sensitivity and exposure scores</li> <li>• Sensitivity was the main driver of changes as a result of various factors such as attachments to fishing and limited livelihood alternatives.</li> <li>• Adaptive capacity which differed among fishing towns influenced fishers' vulnerabilities including increasing their resilience.</li> </ul>
Gammage (2019)	To examine the experiences and challenges faced by crew members from the southern Cape Handline Fishery	GULLS survey (59)	<ul style="list-style-type: none"> <li>• Various stressors affecting the fishery include policy and regulation, environmental stressors</li> <li>• The limited willingness to explore livelihood alternatives outside of fishing</li> </ul>

The use of the GULLS framework was because it was utilised by previous GULLS research to examine the drivers of social vulnerability in fisheries. For this research, the GULLS framework was necessary to compare the changes that took place over time this research needed to make use of the GULLS framework. Consequently, Section 3.3 highlights in detail how the GULLS survey was utilised.

### 2.3. Stressors Driving Social Vulnerability in Fisheries

Here, I delve deeper into highlighting the drivers of social vulnerability in fisheries, including resource scarcity, climate variability, extreme or unexpected events, and policy and regulation.

#### 2.3.1. Resource Scarcity

According to Anayo (2024, p.6), resource scarcity refers to “the limited availability of critical resources necessary to support human well-being and economic development”, such as water and raw materials. However, the definition of resource scarcity varies across different disciplines. For example, in the field of economics, resource scarcity is defined based on two concepts: absolute and relative scarcity. Absolute scarcity refers to the physical limitations of resources, whereas relative scarcity refers to the limitations of resources relative to other inputs such as cost (Barbier, 2021). In the context of this study, resource scarcity refers to the lack of or inadequate resources to sustain or support individuals (Isler, 2021), including insufficient fish stocks due to spatial competition and inadequate physical assets, such as fishing boats and transportation.

Resource scarcity drives social vulnerability in fisheries in various ways, for instance, the decline of fish stocks due to competition between fishing sectors results in conflicts, especially among SSFs and industrial vessels (Bavinck, 2005; Bavinck, Sowman and Menon, 2014; Pomeroy, 2016; Dahlet, Himes-Cornell and Metzner, 2021; Seto *et al.*, 2023). Various studies have highlighted that the occurrence of conflicts (including physical altercations) is growing in numerous areas (Bavinck, 2005; Bavinck, Sowman and Menon, 2014; Seto *et al.*, 2023).

Pollution is also a stressor that continues to contribute to fish scarcity. A case study conducted in various South African estuaries revealed that the estuaries were impacted by pollutants stemming from agricultural and industrial runoff, which in turn led to increased persistent organic pollutants (Olisah, Adams and Rubidge, 2021). Various studies have also highlighted that nutrient pollution threatens water quality, affecting the availability of fish and the ecological resilience of marine ecosystems (Adams *et al.*, 2020; Van Schoor, 2021; Whitfield and Mann, 2023).

A study undertaken in the Colombian Caribbean revealed that SSFs there also face financial constraints. For example, 93% of the SSFs highlighted having informal savings. Informal savings, in turn, meant that SSFs encountered difficulties accessing financial reserves (Maldonado, 2022). Additionally, a case study conducted in the coastal communities of Indonesia revealed that fisher's livelihoods and adaptive capacity are impacted by limited access to financial capital (Saksono, Nissa and Suadi, 2023).

The limited access to financial resources exacerbated the vulnerability of SSFs. For example, a case study conducted by Mbatha (2021) highlighted the COVID-19 pandemic as one of the stressors that contributed to SSFs' increased reliance on social grants due to the government-enforced lockdown restrictions which reduced income sources. The reliance on social grants also played an important role in increasing the dependency cycle.

In addition to the fish scarcity and financial pressures, limited access to physical assets (e.g. fishing boats, market, and transportation) worsens the vulnerability of SSFs. In Struisbaai, one of the challenges fishers' faces is the lack of access to fishing vessels. Ski-boat fishers often do not have access to boats as they are owned by other people

(entrepreneurs and former fishers) (Parker, 2013). This means that a portion of fishers' income is forfeited to boat owners, thus exacerbating the fisher's financial constraints (Parker, 2013). This dependence on boat owners exposes SSFs to exploitative situations such as receiving low income and working long hours (Mengge, 2019; Simanjuntak, Sumarti and Kinseng, 2019). This situation is not limited to South Africa; SSFs reliant on outboard motorboats in the Takalar District, Indonesia, have also been reported to be experiencing poverty (Muslim et al., 2023).

### **2.3.2. Climate Variability**

The concept of climate change varies across disciplines and contexts; the United Nations Framework Convention on Climate Change (UNFCCC) defines climate change as “a change which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods” (UNFCCC, 1994; p.3 as cited by Rahman, 2013). However, the IPCC's definition of climate change includes change as a result of natural variability and anthropogenic activities (IPCC, 2014). Furthermore, the IPCC has also highlighted that anthropogenic activities between 1850 and 1900 were some of the major contributors to global warming, leading to an increase in global temperatures by 1.1 °C (IPCC, 2021). In the next decades, the temperatures are projected to increase globally by 1.5 °C (IPCC, 2021). This projected increase in temperature could have negative impacts on multiple sectors, including fisheries, as the responses to climate change impacts are still complex, as revealed by various scholars (Hall, 2011; Allison and Bassett, 2015).

Climate change and variability have played an important role in driving the vulnerability of SSFs. For example, a case study conducted within Latin American SSFs revealed that shellfish, particularly sedentary and sessile species, were susceptible to increasing temperatures (Defeo et al., 2009, 2013; Heath, 2012). In addition, other environmental factors, such as changes in sea surface temperature and wind intensity, led to the decline of fish stocks, which in turn resulted in a reduction of income sources and an increase in market prices (Defeo et al., 2013).

Within Sub-Saharan African fisheries, climate change and variability affected fish catches. For instance, a decline in fish catches was noted in the Sub-Saharan African

fisheries, and it was said to be associated with changes in rainfall patterns, temperature, and rising sea levels. Moreover, the decline in fish catches threatened overall food security (Muringai et al., 2019; Muringai, Mafongoya and Lottering, 2021). The decline in fish catches had severe economic implications in the form of lost employment opportunities, which limited access to food sources (Barange et al., 2018). However, to deal with the associated impacts of climate change and variability, fishers employed short-term coping mechanisms, such as purchasing new fishing gear and targeting new species (Belhabib, Lam and Cheung, 2016).

Other impacts of climate variability such as flooding, changing sea states, and cyclones resulted in the loss of lives, for instance, in Bangladesh cyclones and flooding have led to the loss of lives of fishers (IPCC, 2007). Additionally, these changes also had implications on fishers including damaging their fishing gear, and boats and making it difficult for them to launch their boats (Islam *et al.*, 2014).

A case study conducted in Togo found that changes in wind speed and direction were impacting fishing activities. For instance, approximately 85% of the fishers reported that strong winds resulted in rougher sea conditions, thus making it difficult for them to proceed to the sea. The changes also impacted the distributional patterns of marine resources, particularly fish, leading to a reduction in the catch rate (N'Souvi et al., 2024).

The international literature reports that accidents at sea result from poor visibility during foggy conditions, big swell conditions, and on days of low wind speed (Kim and Kang, 2011; Kim et al., 2019; Reverté, Buxeda and de Osés, 2022). Safety is also threatened when navigation tools such as geographical positioning systems (GPS) are limited (Sowman and Rebelo, 2022). The occurrence of incidents at sea also leads to an increase in maintenance costs of fishing vessels, which in turn put fishers under financial strain (Defeo et al., 2013; Gammage, Jarre and Mather, 2017a; Wanlem, Aujirapongpan and Songkajon, 2023).

Other stressors that continue to impact the livelihoods of fishers include unsafe working conditions in windstorms. For example, Pfeiffer (2020) found that storms were threatening the livelihoods of fishers, including their fishing vessels, gear, and available sea days, which, in turn, also impacted their adaptive capacity. In response to the

implications of the storms, fishers delayed or changed their fishing areas (Pfeiffer, 2020). The delays or changes in fishing trips were dependent on the size of the fishing vessels. Bigger fishing vessels were able to withstand storms (Pfeiffer, 2020). Much research has also highlighted an increase in economic burdens due to the loss of household assets amid storms (Vincent-Akpu and Annor-Frempong, 2017; Islam and Chuenpagdee, 2022; Saksono, Nissa and Suadi, 2023).

Drought can also impact the vulnerability of fishers. Odoulami, Wolski, and New (2023) found that the southwestern Cape region in South Africa experienced severe drought between 2015 and 2017, resulting in water shortages and affecting marine resources through changing flows. Flow changes in marine ecosystems affect the distributional patterns of marine species, particularly fish (e.g. James et al., 2013; Moloney et al., 2013; Scharler, Bownes and Jerling, 2023).

### **2.3.3. Extreme or Unexpected Events**

Extreme or unexpected events refer to any phenomena that have cascading effects, particularly on nature and human well-being (Alvre *et al.*, 2024) including climatic factors such as floods and droughts and other non-climatic factors such as the COVID-19 pandemic.

Extreme events such as droughts and flooding impact fishing communities in several ways including that the occurrence of such events leads to the relocation of fishing communities to areas that are safer, for instance, a study undertaken in the Indian Sundarbans highlighted that about 7000 fishers including their households had to be relocated from their homes as a result of the rise in sea level and cyclones (Defeo and Elliott, 2021; Dias *et al.*, 2023). These extreme events also impacted the ability of the fishing communities to adapt to changing conditions and to diversify their livelihood (Defeo and Elliott, 2021; Dias *et al.*, 2023).

The COVID-19 pandemic is one of the unexpected events that exacerbated the social vulnerability of fishers. According to the World Health Organisation (2020), COVID-19 is an infectious disease resulting from the SARS-Cov-2 virus, which causes severe acute respiratory syndrome. It was first identified in Wuhan, China, among patients who were exposed to the seafood market (Zhu et al., 2020). The first South African COVID-19 case

was identified in March 2020, and it rapidly spread across parts of the country. In an effort to curb the spread of COVID-19, the South African government enforced lockdown restrictions (e.g. Table 2.3) for approximately six weeks (Olivier, Botha and Craig, 2020; Stiegler and Bouchard, 2020).

Table 2.3: Enforced lockdown restrictions during the COVID-19 pandemic

Lockdown Level	Interpretation	Activities
Alert Level 5	High spread of COVID-19	Under this level, drastic measures are enforced to contain the spread of COVID-19 infections.
Alert Level 4	Moderate to high spread of COVID-19	Under this lockdown level, only essential services were allowed to operate. A curfew was enforced, i.e. people were not permitted to leave their homes between 8 pm and 5 am. Permits for travelling between provinces were required, and public transport operations were limited.
Alert Level 3	Moderate spread of COVID-19	The move to lockdown level 3 was based on the spread of COVID-19 infections. Most of the activities were limited including the travel between provinces unless under certain circumstances.
Alert Level 2		
Alert Level 1	Lower COVID-19 spread	Under this restriction level, most of the activities were allowed to operate following precautions and health guidelines.

The enforcement of the lockdown restrictions impacted SSF sectors heavily. For example, alert level 5 meant that SSFs were not allowed to operate their fishing activities, thus disrupting the fishing markets, which in turn resulted in a reduction of household income (America, Ginindza and Isaacs, 2020; Bennett, Finkbeiner, et al., 2020; Sowman et al., 2021).

Under alert level 4, only those fishers with commercial fishing rights were allowed to operate as essential workers, while those operating under recreational permits were deprived of fishing (Mbatha, 2021). In addition, fishers who held commercial rights were subjected to harassment from government officials and resorted to changing their fishing times to avoid being harassed (Mbatha, 2021).

Fishers also reported that during the lockdown restrictions, fish prices dropped because there were limited places to sell their catches. For example, before the lockdown

restrictions, the price of a kingklip was ZAR 115 per kilogram. However, during the lockdown restrictions, the price dropped to ZAR 50–60 per kilogram (Mbatha, 2021). Fishers also reported that they were receiving 30% less value for their fish catches, revealing that retailers and wholesalers were taking advantage of them (Mbatha, 2021).

Another challenge faced by SSFs in South Africa was the limited access to relief schemes amid the COVID-19 pandemic. Additionally, fishers who hold no fishing rights were excluded from many of the government relief programs and this further exacerbated their vulnerability (Sowman *et al.*, 2021; Lück-Vogel *et al.*, 2023). In the Western Cape, the Department of Forestry, Fisheries and the Environment (DFFE) provided a once-off food parcel to local communities (Mbatha, 2021). The limited access to relief schemes during the COVID-19 pandemic was not limited to South Africa. Studies conducted in Canada, the Philippines, Peru, and the USA also reported limited access to social protection for SSFs amid the COVID-19 pandemic (Bassett *et al.*, 2022).

Apart from limited relief schemes and changes in fish prices, the COVID-19 pandemic also had implications for the health of fishers. In South Africa, the COVID-19 pandemic exacerbated the vulnerability of communities in which fishers were already grappling with high rates of HIV/AIDS, malnutrition, and tuberculosis (Sowman *et al.*, 2021). The lockdown restrictions also influenced access to healthcare services, particularly for those who were residing in rurally disadvantaged areas (Sowman *et al.*, 2021). A case study from KwaZulu-Natal revealed that the majority (89,05%) of people residing in rural areas were not tested for COVID-19 because of limited access to COVID-19 testing tools (Brumwell, 2023).

In response to the COVID-19 impacts on fishers, the South African government implemented mitigation measures, including the distribution of food parcels, making loans and subsidies available, and cash transfers. However, some of these measures employed, particularly loans and subsidies, favoured commercial fishers, who contribute to economic development, over recreational fishers (Isaacs *et al.*, 2022; Isaacs, Ginindza and Mhlanga, 2022). Non-governmental organisations (NGOs) such as ABALOBI supplied equipment like face masks and sanitisers (Mbatha, 2021).

#### **2.3.4. Policy and regulation**

The origin of the line fishery in South Africa can be traced back to the indigenous Khoi people and the arrival of European seafarers in the 1500s (Thompson, 1913 as cited in Griffiths, 2000). It is also regarded as one of the oldest commercial fisheries (Griffiths, 2000). However, despite the abundance of line fish species, the fishing sector was slow to develop owing to the regulatory measures that were in place. In 1795, the regulatory measures were lifted by the British government in power within the Cape Colony (Branch and Clark, 2006). The line fishery was then formally recognised in 1985 and regulatory measures were implemented, including banning the harvesting of certain species, closed seasons, and the minimum fish catch size limit (Department of Environmental Affairs and Tourism, 2005; DEFF, 2020). These regulatory measures were implemented because line fish species were overexploited. Stock assessments undertaken in the 1980s supported this intervention. They revealed the overexploitation of line fish species to the extent that an emergency requiring attention was declared (i.e. limitation of fish catches) (Department of Environmental Affairs and Tourism, 2004, 2005).

Presently, the DFFE manages the line fishery. However, note that some fishers may still refer to the DFFE as the Department of Agriculture, Forestry and Fisheries (DAFF), its former name. The line fishery is managed through numerous processes, such as individual-based fishing rights allocation and enforced restrictions on fishing boats (known as Total Applied Effort (TAE)) (Joubert et al., 2006; Da Silva et al., 2015).

The Marine Living Resources Act (MLRA; No 18 of 1998) was gazetted as a way of dealing with the inequalities that took place before the democratic elections of 1994 and to create a system for regulating marine resources (RSA (Republic of South Africa), 1998). The MLRA (No 18 of 1998) introduced a system of rights allocation whereby the delegates or minister grants permission for the harvesting of marine resources for a specific period, and when the period is over, the rights automatically return to the state and then re-allocate the rights (Cochrane, 2015). The allocation of fishing rights and management was guided by core principles which take into consideration the ecological and biological aspects of marine resources, the socio-economic conditions, and transformative efforts (Kleinschmidt, Sauer and Britz, 2003; Department of Environmental Affairs and Tourism, 2004, 2005; Joubert et al., 2006).

However, in the context of SSFs, the MLRA (No. 18 of 1998) did not fulfil its purpose of recognising the SSF sectors (Sowman and Sunde, 2021), resulting in their further marginalisation. This prompted NGOs and civic society groups to advocate for SSFs by taking legal action. This included bringing the matter before the high court, which ruled in favour of SSFs (Isaacs, 2006; Sowman et al., 2014; Sunde, 2016). The court ordered the government to amend the MLRA and establish a policy for SSFs and an interim relief programme (Sowman et al., 2014). The MLRA Amendment Act 5 was enacted in 2014.<sup>4</sup>

In 2012, the SSFP was promulgated. This was a great milestone as it meant a shift of focus from resources to people. The SSFP aligned with the core principles of the Ecosystem Approach to Fisheries Management (EAFM). However, the promulgated SSFP faced many challenges including that despite the adoption of the collaborative approach within the policy development phase the government had all the power the moment the SSFP was gazetted, during the implementation phase there was limited involvement of fishers into the decision-making processes, outlining who would be responsible for the SSFP implementation, and limited resources to implement SSFP (Sowman *et al.*, 2014; Isaacs, 2016; Pretorius, 2017; Sowman and Sunde, 2021).

As of present, the DFFE has announced that SSFs, particularly in the Western Cape have been granted fishing rights for 15 years. The granting of 15-year fishing rights makes this a great milestone as it reveals an end to the interim relief permits.<sup>5</sup>

Despite the multitude of challenges SSFs face, a great number of initiatives in the southern Cape, such as the SCIFR Project<sup>6</sup> and Ecosystem-based adaptive capacity through community engagement (ECO-ACE) project<sup>7</sup> have played an important role in strengthening community resilience by prioritising taking into account SSFs' voices in decision-making and strengthening social networks, understanding the changes that took place over time, and improving the adaptive capacity of coastal communities.

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<sup>4</sup>[https://www.gov.za/sites/default/files/gcis\\_document/201409/37659act5of2014marinelivingres19may2014.pdf](https://www.gov.za/sites/default/files/gcis_document/201409/37659act5of2014marinelivingres19may2014.pdf)

<sup>5</sup> [https://www.dffe.gov.za/mediareleases/creecy\\_ssf.15yearfishingrights](https://www.dffe.gov.za/mediareleases/creecy_ssf.15yearfishingrights)

<sup>6</sup> <https://maris.uct.ac.za/eafsa>

<sup>7</sup> <https://ecoaceproject.co.za/>

## **2.4. Stressors driving social vulnerability in the southern Cape**

This section examines some of the stressors that exacerbate the vulnerability of SSFs, which forms an important part of the study. Here I focus on stressors that are relevant to the southern Cape.

### **2.4.1. Resource Scarcity**

Resource scarcity as defined in section 2.3.1 is one of the many drivers that exacerbate the social vulnerability in the southern Cape fisheries including fish scarcity, limited skills training and education, and limited physical and financial capital.

Fish scarcity is one of the stressors that impacts fishers, for example, in the southern Cape, silver kob is a key target species and is one of the most commercially viable. However, in the absence of silver kob, fishers also target silvers/carpenters, red roman, and Cape hake (Gammage, Jarre and Mather, 2017a; Gammage, Jarre and Mather, 2017b; Duggan, 2018). Additionally, Gammage, Jarre and Mather (2017a) have highlighted that the absence of silver Kob has resulted in fishers travelling further from the coast to target carpenters/silvers. This impacted fishers heavily by increasing their operational costs as well as decreasing their profits and increasing the cost of fuel (Gammage, Jarre and Mather, 2017a, 2017b; Gammage, Jarre and Mather, 2019).

Various studies conducted in the southern Cape have shown that the overfishing of marine resources forced fishers, particularly those in Mossel Bay, to expand their fishing ranges, which in turn had economic implications (increased fishing distance from the coast) for them (Gammage, Jarre and Mather, 2017a; Gammage, Jarre and Mather, 2019). Overfishing also threatens fish resources which are not exploited (Gammage, Jarre and Mather, 2017a). Additionally, the overexploitation of fish stocks leads to food insecurity and also threatens the overall fishing practices and cultural identity of coastal communities (Gammage, Jarre and Mather, 2019).

Apart from fish scarcity, fishers have limited alternative skills training and even those who underwent skills training, most of the skills were related to fisheries (Gammage, Jarre and Mather, 2019; Martins *et al.*, 2019). Additionally, the limited skills, coupled with limited education, impacted fishers in several ways, including limiting their ability to access alternative livelihood opportunities as they require skills and formal education and

limiting fishers' ability to participate in decision-making processes at the household or community level (Gammage, Jarre and Mather, 2019).

Physical assets (e.g. fishing boats, market and transportation) exacerbate the social vulnerability of SSFs, for instance, in the southern Cape, Gammage et al. (2019) found that approximately 91% of the fishers did not own a fishing boat. Consequently, they were crewing on the line fish boats of other fishers, which in turn reduced their available sea days and income.

Other factors that worsen the vulnerability of fishers include limited access to transportation and markets. In the case of the southern Cape, Gammage et al. (2019) highlighted that the remoteness of these areas, particularly Vermaakliheid, makes accessing transport challenging. This, in turn, also affects access to economic opportunities and markets. Moreover, the southern Cape, particularly Bitouville and Melkhoutfontein, are characterised by low levels of education (Statistics South Africa, 2011a) which can be attributed to the limited access to educational institutions (Gammage, Jarre and Mather, 2017a).

The financial constraints hinder fishers' ability to adapt to other stressors, such as climate change and variability, in several ways, including limiting fishers to purchase equipment and seeking other alternative livelihoods and exposing them to more economic shocks (Gammage, Jarre and Mather, 2019). For instance, a study conducted by Gammage *et al.* (2019) with skippers, fish buyers, and crew members in the southern Cape reported that the household income of the fishers was less than 5,000 South African Rands (ZAR) per month with more than 60% undertaking no financial planning. Additionally, fish scarcity increased the economic constraints in these regions.

#### **2.4.2. Climate Variability**

One of the issues that continues to exacerbate the social vulnerability of SSFs is climate variability which has been defined in detail in section 2.3.2 and is further explained here in the context of the southern Cape fisheries.

Various studies on sea surface temperature undertaken in South Africa have reported conflicting findings. For example, the studies noted sea surface temperature warming offshore and inshore of the Agulhas Bank, while other studies reported the exact opposite

(Blamey et al., 2012; Hutchings et al., 2012; Blamey et al., 2015). In the southern Cape, Gammage (2019) highlighted that changing sea state conditions, such as strong winds and rough seas, made it challenging for fishers to navigate their fishing areas and increased risk at sea. Gammage *et al.* (2017a) also found that the sea state changes (due to unpredictable and strong winds) reduced available sea days, thus reducing fishers' income sources.

Many studies have noted an increase in nearshore wave heights along the south coast of South Africa during the Austral summer due to changes in wind patterns (Lamont, 2018; Lyttle et al., 2021). Increasing swells may also be attributed to the increase in wind patterns due largely to the strong winds along the southern ocean (Blamey et al., 2012; Lamont, 2018; Lyttle et al., 2021). The increased wind patterns and wave heights impacted SSFs heavily by affecting their ability to go to sea and threatening their lives (Lyttle et al., 2021). Ward (2018) reported that some of the fishers who took part in interview sessions during the Southern Cape Interdisciplinary Fisheries Research (SCIFR) project observed an increased wind variability in terms of speed and direction. Duggan (2012) also highlighted that skippers observed an increase in the intra-seasonal conditions within their fishing areas, including prolonged periods of onshore winds, which hindered their ability to navigate fishing areas.

The changes in weather conditions, such as rougher seas, heavy waves, foggy conditions, and high wind speed, to mention a few, exacerbate the vulnerability of fishers by increasing the risk of accidents at sea. In South Africa, the National Sea Rescue Institute (2023) revealed that rough seas and heavy waves resulted in a fishing vessel having an accident at Gouritsmond, killing four fishers.

#### **2.4.3. Extreme or Unexpected Events**

Extreme or unexpected events (including extreme winds, deterioration of sea state, and drought) are some of the challenges exacerbating the social vulnerability of fishers in the southern Cape.

Prior research undertaken in the southern Cape as part of the SCIFR project has revealed extreme wind days (e.g. changes in wind speed and direction), including that winds were arriving late while the southeasterly and the south-westerly winds had shifted

(Gammage, Jarre and Mather, 2017a). These changes, particularly in winds have led to the deterioration of the sea state, which in turn resulted in the reduction of available sea days which put a strain on fishers including reducing their profits and increasing the operational costs (Gammage, Jarre and Mather, 2017a).

Prior research (Duggan, 2012, 2018; Gammage, 2015) have found that the sea state was deteriorating as a result of increased climate variability, especially wind regimes. Additionally, the sea state deterioration impacted the ability of fishers to leave nearshore using the river mouth due to the occurrence of higher waves (Gammage, 2015) and stronger winds (Duggan, 2018). This also may have resulted in fishers proceeding to the sea less because their safety has been compromised (Lyttle *et al.* 2021).

Extreme rainfall is another stressor that heavily impacts the livelihood of fishers. Ward *et al.* (2021) highlighted that some fishers in the southern Cape stated that rainfall affected the abundance of fish species, while others stated that less rainfall meant more fish catches. Ward (2018) reported high rainfall variability. However, no trends have been observed over time due to the lack of climatic data. The high rainfall variability heavily affected SSFs and farmers through its effects on water bodies (including estuaries), which in turn affected the availability of fish stocks. Some fishers stated that high rainfall variability resulted in low fish catches (Ward *et al.*, 2021). Importantly, the lack of climatic data within the southern Cape makes it difficult to understand the effects associated with rainfall patterns, as highlighted by Ward *et al.* (2021).

A case study conducted by Andra (2022) revealed that SSFs in the southern Cape were heavily affected by climate variability, and about 90% of the SSFs highlighted that the changes in weather conditions impacted their available sea days, while sensitivity and exposure in communities were driven by rainfall and sea state conditions.

To cope with extreme weather events fishers employ various adaptive strategies such as adjusting their fishing time (Duggan, Green and Jarre, 2014; Gammage, Jarre and Mather, 2017b) and making use of the larger fishing boats that can withstand extreme weather events (Gammage, Jarre and Mather, 2017b).

#### **2.4.4. Policy and Regulation**

Policy and regulation, particularly implementation remain a major concern within the southern Cape fisheries and prior research (Gammage, Jarre and Mather, 2017a; Gammage, Jarre and Mather, 2019; Martins *et al.*, 2019; Gammage and Jarre, 2021) has revealed that fishers have negative experiences especially when dealing with policy and regulation.

The initial post-Apartheid policy framework under the MLRA largely overlooked SSF, failing to address the needs of traditional small-scale fishers. This omission contributed to the marginalisation of communities that rely on fisheries for food security, poverty alleviation, and rural development. The subsequent protests and legal challenges launched by civil society groups (Sunde, 2004; Isaacs, 2006) eventually led to the gazetting of the small-scale fisheries policy (Act No 474 of 2012) (SSFP) and amendments to the MLRA (RSA, 2014).

The Marine Resources Amendment (Act No 587) of 2014 provided the definition of small-scale fishers, describing them as individuals in small-scale fishing communities who meet food and basic livelihood needs or participate in the processing or marketing of fish. These fishers traditionally operate in near-shore fishing grounds, use low-technology or passive gear, undertake single-day trips, and engage in fish consumption, barter, sale, or other commercial activities (RSA, 2014: p.2). Rights allocation within the linefish sector, a key focus of this research, is managed by DFFE based on a total applied effort, thereby limiting the number of fishing boats (DEAT, 2005; Sowman *et al.*, 2014).

While the SSFP represents a progressive framework, taking a people-centred approach aimed at promoting sustainable development, empowerment, and reducing inequality, it has also become a source of social vulnerability for many small-scale fishers. The policy environment, as it stands, often exacerbates rather than alleviates the challenges these communities face through perpetual delays in implementation (e.g. Gammage, Jarre and Mather, 2017a; Gammage *et al.*, 2019), inadequate marine resource allocation under the community-right (the so-called basket) (e.g. Gammage, Jarre and Mather, 2017a) and the lack of resources to properly exploit the rights (e.g. Gammage, Jarre and Mather, 2017a; Gammage, Jarre and Mather, 2019; Martins *et al.*, 2019). While the SSFP was originally introduced to provide legal recognition to the SSF sector whilst promoting equitable and

sustainable fisheries management, the slow pace of implementation has, in practice, contributed to the social vulnerability of small-scale fishers (e.g. Sowman and Sunde, 2021). The disconnect between policy intent and local realities continues to undermine the livelihoods of those most dependent on the fisheries sector.

## **2.5. Summary**

In this literature review, I have explored the concepts of vulnerability and the GULLS theoretical framework, which guided the examination of social vulnerability in my study. I further detailed some of the key stressors that have been found to drive social vulnerability for SSFs.

In the next chapter, I present the detailed methodology of this study.

## **Chapter Three: Methodology**

### **3.1. Introduction**

The overall purpose of this chapter is to describe the methods that were utilised in this research to examine the answers to the following research questions: 1) what are the drivers of social vulnerability among SSFs in the southern Cape? 2) What are the associated impacts of COVID-19 on the vulnerability of SSFs in the southern Cape? and 3) How did social vulnerability and the drivers of changes evolve in the southern Cape fishing communities compared to the earlier GULLS research?

To examine the answers to the research questions, this study used a mixed-method approach, which included qualitative and quantitative research to measure the social vulnerability of fishing communities in the southern Cape. Additionally, for the comparison of the drivers of changes that evolved, the 2013/14 data was rescored in alignment with the 2023 scoring (e.g. Table 3.2).

The chapter begins by providing a description of the research area, followed by a description of the GULLS survey and how this was adapted for this research; research ethics important for the integrity and confidentiality of participants; a detailed account of the data collection, scoring and organisation, and data analysis process; and concludes with limitations of this study.

### **3.2. Study Area**

The research areas- Bitouville and Melkhoutfontein in the southern Cape fall under the jurisdiction of the Hessequa local municipality (Statistics South Africa, 2011b). These areas were selected because they represent coastal communities facing vulnerabilities to climate change impacts and other drivers of change. They are also marked by a strong dependency on marine resources to sustain their lives and livelihoods, and as such, their dependency, especially on fish resources as their main source of livelihood, exposes them to multiple vulnerabilities, including impacting their ability to adapt to changing conditions. Multiple vulnerabilities (e.g. climate change and variability, resource scarcity, policy implementation delays) have also been reported to be affecting the selected areas previously (e.g. Gammage, Jarre and Mather, 2017 a, b; Gammage, Jarre and Mather, 2019; Ward *et al.*, 2021); therefore, a more recent study was necessary in these areas to identify the drivers of change that took place since prior studies, especially after the

emergence of the COVID-19 pandemic, and for enhancing adaptive capacity. More details on the southern Cape fisheries description can be found in section 1.2.1.

Figure 3.1 below shows the location of the study sites: Gouritsmond (Bitouville), a coastal town found at the mouth of the Gourits River, and Melkhoutfontein, a coastal town adjacent to the mouth of the Goukou River.

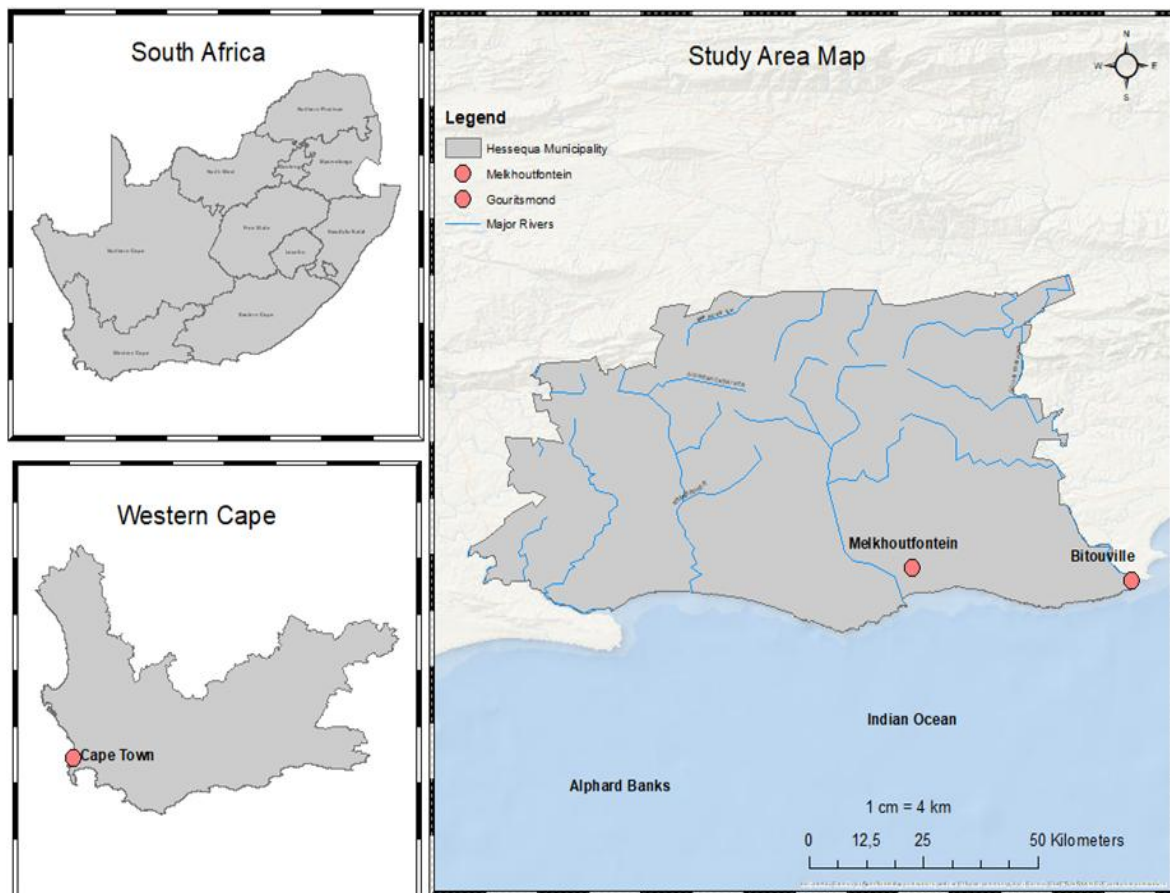


Figure 3.1: Map of the study sites: Gouritsmond (Bitouville), a coastal town located at the mouth of the Gourits River, and Melkhoutfontein, a coastal town adjacent to the mouth of the Goukou River.

The agriculture, forestry, and fishing sectors of the Hessequa local municipality contribute 12% of the Gross Domestic Product per Region (GDPR) of the Western Cape (Western Cape Government, 2019). Furthermore, these three sectors are characterised by low-skilled workers, who make up 61.3% and semi-skilled workers and subsequently make up 34.8% of the total workforce of the Western Cape (Western Cape Government, 2019). In the context of the fishing sector, commercial fishing activities, although less well-known take place in the southern Cape including small-scale commercial handline fishery- which has been taking place for years and operates in the inshore area of the

Agulhas bank and inshore trawl fishery (e.g. Visser, 2015; Gammage, Jarre and Mather, 2017a, 2017b; Andra, 2022). More details can be obtained from Section 1.2.1.

### **3.2.1. Bitouville**

Bitouville is a small coastal community which forms part of a larger community known as Gouritsmond. The spatial planning of the town can be traced back to the apartheid era,<sup>8</sup> wherein the wealthier and white people were situated along the coast while people of colour were situated on the land (a few kilometres away from the coast) (Ward, Gammage and Jarre, 2022). Gouritsmond is a coastal town that has approximately 515 people and 206 households (Statistics South Africa, 2011b). Gouritsmond is located near the mouth of Gourits River at 34°20'59"S, 21°52'43" E (Statistics South Africa, 2011b).

In terms of the infrastructure, Gouritsmond has basic infrastructures that are still in good condition including healthcare services, a municipal office, a public library, and a post office while Bitouville is characterised by little infrastructure apart from one shop known as the “cheap shop” (Ward, Gammage and Jarre, 2022). As of March 2023, three SSFs in Gouritsmond (including Bitouville) were granted access to the interim relief permits.<sup>9</sup>

### **3.2.2. Melkhoutfontein**

Melkhoutfontein is located adjacent to the mouth of the Goukou River. Melkhoutfontein has a population of approximately 2533 and 614 households (Statistics South Africa, 2011). The infrastructure services of the community are currently in a poor state, indicating that their availability and quality are not meeting the basic standard (e.g. Statistics South Africa, 2011b; Ward, Gammage and Jarre, 2022). Despite the limited availability of services, the community has access to certain key amenities, such as the municipal office, primary education services up until the ninth grade, a library, a bottle store, and a clinic (Ward, Gammage and Jarre, 2022). However, the community still faces significant limitations regarding access to shopping malls, secondary education, and retail services (Ward, Gammage and Jarre, 2022).

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<sup>8</sup> Apartheid is a legalised system that discriminates or separates people based on race, particularly black and white people, across different sectors such as government and spatial planning (Mhlauli, Salani and Mokotedi, 2015).

<sup>9</sup> Refer to <https://www.dffe.gov.za/The-DFFE-announces-final-list-of-declared-small-scale-fishers-in-the-Western-Cape-Province>.

The town is important because most crew members working for the fishery based outside Still Baai engage in small-scale commercial line fishing (Gammage, Jarre and Mather, 2017a). There are 29 registered small-scale fishers in Melkhoutfontein: two traditional handlines, one hake handline fisher, and an oyster harvester (fisher registration lists, as cited by Ward, Gammage and Jarre (2022)). As of March 2023, nine SSFs in Melkhoutfontein were granted access to interim relief permits.

### **3.3. The GULLS Survey**

As shown in the theoretical framework (e.g. section 2.2.5), the GULLS vulnerability framework guided the methodological approach drawing on the associated survey that was designed to understand social vulnerability at the community level. One of the objectives of the survey was to ensure sensitivity to local cultures and social contexts in its process of gathering information and comparing information among different countries (Aswani et al., 2019). The GULLS survey was designed to target coastal communities at the household level, including recreational fishers, commercial fishers, and people interacting with the ocean (Aswani et al., 2019). Before the survey was administered among different countries, it was field tested to allow for the omission and improvement of survey questions, e.g. Likert-scale questions, which yielded poor results, needed to be changed (Aswani et al., 2019).

The data collection processes differed in each country; for example, in South Africa and Brazil, the survey was administered through face-to-face interviews, while in Australia, an online survey was utilised (Aswani et al., 2019). In South Africa, the first GULLS survey was conducted in 2014 and 2015 in six southern Cape coastal communities: Slangrivier, Vermaakliheid, Melkhoutfontein, Witsand, Bitouville, and Mossel Bay. It comprised 253 closed and open-ended questions designed to examine the different aspects of climatic changes and their impacts. More details of the household survey can be found at <http://gullsweb.noc.ac.uk/communitysurvey.php> (Aswani et al., 2019), while discussions of the other survey results can be found in other publications (Gammage, Jarre and Mather, 2019; Martins et al., 2019; Andra, 2022). For more detailed information on how the GULLS survey was administered across various countries, see Section 2.2.5, Table 2.2.

### **3.4. The Adapted GULLS Survey**

Through my research questions (e.g. sections 1.3.2 and 3.1), I sought to understand how vulnerability continues to affect the small-scale fishers in the southern Cape and adapted the original GULLS survey to suit the local scale (southern Cape) based on recommendations made by Andra (2022) (e.g. Appendix A, which contains the English version of the adapted GULLS survey). The associated rationale table is in Appendix B. Furthermore, questions on the impacts of the COVID-19 lockdown regulation were included, given that SSFs, along with other vulnerable groups, were disproportionately affected, which would have added to their overall vulnerability in recent years (Mbatha, 2021; Sowman *et al.*, 2021; Lück-Vogel *et al.*, 2023).

Table 3.1 presents an overview of the questions included and omitted in the revised survey. These questions were systematically organised based on their categories, components, subcomponents, and indicators. Sound justification and comprehensive references were utilised as the underlying basis for selecting and eliminating questions. The survey questions were included or excluded across all three categories, with equal rigour and scrutiny. More indicators were added to the “economic dependence” component within the sensitivity category to better capture the economic and social nuances specific to the southern Cape small-scale fisheries (Andra, 2022). These indicators, which focus on the availability of government support or incentive programmes to assist SSFs, were added to the new “social assistance” subcomponent (e.g. Table 3.1).

The exposure category was also amended (e.g. Table 3.1). Within this category, some questions were omitted (e.g. questions on floods and shoreline changes) as they were irrelevant to the southern Cape context. Instead, questions were focused on known physical phenomena in the southern Cape found in the literature, including sea state, wind speed, and wind direction (Lyttle, 2018; Ward, 2018; Gammage and Jarre, 2021). Within the adaptive capacity category, all the questions were evenly distributed and evenly weighted in the framework. To make this possible, “institutional support,” institutional flexibility,” and “social bridging capital” components were regrouped into two components, namely “general conflicts” and “comprehensive policy and regulation” (Andra, 2022). The “comprehensive policy and regulation” component was characterised

by questions on government and institutional involvement. In contrast, the “general conflicts” component was characterised by questions on the conflicts of SSFs with other sectors and markets (Andra, 2022).

Table 3.1: Questions in the survey were categorised by category, components, subcomponents, and indicators based on their category, components, subcomponents, and indicators

Category	Component	Subcomponent	Indicator	Question	Omitted/Added	Rationale	References
Sensitivity	Economic dependence on other resources	Social Assistance	Support from the government	7.5 Does anyone in your household receive a government grant (SASSA)?	Added	Support from the government is equal to lower sensitivity	Mbatha, 2021
	Economic dependence on other resources		COVID-19 Grant	7.6 Did you receive the COVID-19 Distress grant?	Added	Receiving the COVID-19 distress grant means that the households can support their livelihoods, indicating low sensitivity to impacts.	Isaacs et al., 2022
	Economic dependence on other resources		Support from the government	7.7 Do you currently receive the Social Relief of Distress R350 grant?	Added	Support from the government indicates low sensitivity, i.e. if households are getting more support from the government, they are most likely to support their livelihoods, indicating low sensitivity.	Sowman, 2021
	Economic dependence on other resources		Time of being assisted with support	7.8 What type of social incentives do you receive?	Added	The type of social grant received indicates the level of	Béné, 2006; Mbatha, 2021; Isaacs et al., 2022; Kathleen Auld and Feris, 2022

Category	Component	Subcomponent	Indicator	Question	Omitted/Added	Rationale	References
						support, thus a low sensitivity level.	
	Economic dependence on other resources		Number of people receiving financial support	7.9 How many people in your household receive grants?	Added	The number of people within the household receiving financial is equal to sensitivity	Schuhbauer, 2017
	Economic dependence on other resources		Financial better off	7.10 Would you say that you are financially better off from the incentives?	Added	Financially better off from the incentives indicates the level of sensitivity, e.g. not financially better off indicates a high sensitivity level.	
Adaptive Capacity	Institutional Flexibility	Resource management institutions	Fishery conflicts	13.11 Would you say there have been management conflicts in the last five years in your area?	Added	Fishery conflicts indicate the level of exposure	
			Fishery management changes	13.9 If yes, what kind of management changes have you observed?	Added	Changing fishing rules is equal to better adaptability	
	Institutional Flexibility	Fishing compliance and conflict	Effectiveness of implemented fishing rules	30.5 How happy are you with the fishing rules implemented in the last five years?	Added	The high number of people that are happy with the fishing rules indicates that the fishing rules implemented are effective.	
		Social Bridging Capital			31.4 Would you say that the information	Added	Valuable information= greater

Category	Component	Subcomponent	Indicator	Question	Omitted/Added	Rationale	References
		Access to institutional safety nets and information	Strength of links between fishers and institutions or government	received from government departments and/or academic institutions regarding fishery is valuable?		adaptive capacity to respond to change	
Adaptive Capacity	Social Bridging Capital			31.6 How happy are you with the communication of information by DFFE?	Added	Fishers being happy with the communication of information indicates that there is a greater possibility for adaptive capacity.	
Exposure	Environmental Change	Wind Speed	Fishing effort in an area prone to changes in wind speed	66.1 Have you noticed any changes in wind speed in the last five years in your area?	Added	Changes in wind speed increase the likelihood of destruction to personal assets and overall exposure.	Martins and Gasalla, 2018
Exposure	Environmental Change		Extent of wind speed	66.2 How were you impacted by the changes in wind speed?	Added	Changes in wind speed determine the level of exposure to livelihood	Thoya, 2022
Exposure	Environmental Change		Degree of damage to fisheries	66.3 How severe were the changes in wind speed?	Added	Increased degree of damage to fishing effort from wind speed = high personal exposure	Martins and Gasalla, 2018
Exposure	Environmental Change		Number of fishing days when changes occurred	66.4 How many days did you go fishing when changes in	Added	The higher number of fishing days= lower exposure	Lyttle, 2018

Category	Component	Subcomponent	Indicator	Question	Omitted/Added	Rationale	References
				wind speed occurred?			
Exposure	Environmental Change	Rainfall	Households in areas prone to changes in rainfall patterns	68.1 Have you noticed any changes in rainfall patterns in your area in the last five years?	Added	Changes in rainfall patterns increase the likelihood of destruction to personal assets and overall exposure.	Martins and Gasalla, 2018; Ward, 2018
Exposure	Environmental Change		The extent of rainfall patterns	68.2 How were you impacted by the changes in rainfall patterns	Added	Changes in rainfall patterns determine the level of exposure to livelihood.	Gammage, Jarre and Mather, 2017a; Ward, 2018; Andra, 2022
Exposure	Environmental Change		Degree of damage to household	68.3 How severe were the changes in rainfall patterns?	Added	Exposure levels increase as the severity of damage increases	Gammage, Jarre and Mather, 2017a, 2017b
Exposure	Environmental Change		Number of fishing days when rainfall changes occurred	68.4 How many days did you go fishing when changes in rainfall patterns occurred?	Added	Loss of fishing days = high exposure.	Ward, 2018
Exposure	Environmental Change	Sea State	Changes in sea state	69.1 Have you noticed any changes in sea state in the last five years in your area?	Added	Changes in sea state are equal to high exposure	Gammage, Jarre and Mather, 2017a; Martins and Gasalla, 2018
Exposure	Environmental Change		The extent of sea state	69.2 How were you impacted by the changes in sea state?	Added	Changes in sea state determine the level of exposure to livelihood	Brander, 2010; Lyttle, 2021
Exposure	Environmental Change		Degree of damage to household	69.3 How severe were the changes in the sea state?	Added	Exposure levels increase as the	Lyttle, 2018

Category	Component	Subcomponent	Indicator	Question	Omitted/Added	Rationale	References
						severity of damage increases	
Exposure			Number of fishing days when changes occurred	69.4 How many days did you go fishing when changes in sea state occurred?	Added	Loss of fishing days is equal to high exposure.	
Exposure	Environmental Change	Drought	Occurrence of drought in the past five years	70.1 Have you noticed any changes in drought conditions in the last five years in your area?	Added	Droughts limit access to natural capital and overall livelihood activities and, therefore, increase exposure.	
Exposure	Environmental Change	Drought	Personally, I was directly impacted by drought	70.2 Did the changes in drought conditions have an impact on you?	Added	Personal impact = higher exposure	
Exposure	Environmental Change	Drought	Degree of damage to the fishing ability	70.3 How severe were the changes in drought conditions?	Added	Exposure levels increase as the severity of damage increases	
Exposure	Pandemic	COVID-19	Impacts of COVID-19	71.1 Were you affected by COVID-19 lockdown restrictions?	Added	The impact of COVID-19 on fishing and livelihoods indicates increasing exposure.	Mbatha, 2021; Sowman et al., 2021
Exposure	Pandemic		Impacts of different COVID-19 restrictions	71.2 How were you affected by the different COVID-19 restrictions?	Added	Different levels of lockdown restrictions indicate the extent of exposure	Mbatha, 2021
Exposure	Pandemic		Changes caused by the different COVID-19 restrictions	71.3 Did you notice any changes caused by the COVID-19 restrictions on	Added	The changes that occurred because of COVID-19 restrictions indicate	Mbatha, 2021

Category	Component	Subcomponent	Indicator	Question	Omitted/Added	Rationale	References
		COVID-19		fishing and livelihoods?		the extent of exposure (i.e. high/low exposure)	
Exposure	Pandemic		Fishing Frequency	71.4 Would you say that your ability to travel or rely on local marketers was affected during the different levels of lockdown restrictions?	Added	The ability to travel or rely on local marketers during the lockdown period indicates the level of vulnerability (i.e. whether low/high exposure)	Mbatha, 2021
Exposure	Pandemic		Measures employed to deal with COVID-19	71.5 Are you satisfied with the measures that were employed to deal with the impacts of COVID-19?	Added	The level of satisfaction with the measures implemented to deal with the impacts of COVID-19 indicates a better capacity to adapt.	Mbatha, 2021; Sowman et al., 2021
Exposure	Environmental Change			69.1-69.4 All questions on shoreline changes	Omitted	Questions did not apply to the local context (southern Cape)	Andra, 2022
Adaptive Capacity	Infra Index			Infra Index information can be obtained from community profiles at Ward et al., 2022	Omitted		Ward, Gammage and Jarre, 2022
Exposure	Environmental Change			64.1-64.5 Environmental change	Omitted (based on recommendations from Andra. 2022)		Andra, 2022
Sensitivity	Economic dependence	Plantation		7.5-7.12 All questions on the plantation	Omitted		Andra, 2022

### **3.5. Research Ethics**

Ethical clearance was obtained from the Faculty of Science Research Ethics Committee (FSREC) at UCT (e.g. Appendix C). Before administering the GULLS survey, all the participants provided written informed consent (Appendix D). Simultaneously, the translators/transcribers signed a form outlining confidentiality requirements (Appendix E). The data collected were only available to supervisors, translators, and transcribers to maintain the confidentiality of participants. For translators and transcribers, the confidentiality form required that all audio recordings and other data related to all participants be deleted.

A Data Management Plan (DMP) was developed. It can be accessed on the UCT data-management platform: <https://dmp.lib.uct.ac.za>. The DMP outlined the essential details of the research project, including a concise summary, data description, data quality, control measures, and data management and storage procedures. For example, the primary data collected were stored on a computer connected to a Microsoft One Drive cloud account at UCT. Additionally, to ensure data security, data backups were created on a password-encrypted external hard drive and flash disk that only the researcher can access.

### **3.6. Data collection**

The adapted GULLS survey was administered in Bitouville and Melkhoutfontein through face-to-face interviews. These types of interviews have the advantage of allowing for controlled interaction, confirming the interviewee's identity, and yielding a high response rate (Jennings, 2005; Straits and Singleton, 2011; De Leeuw, Hox and Dillman, 2012). A snowball sampling strategy was used for this study as it is one of the most often used techniques for locating hidden stakeholders and referrals of potential research participants by the already located participants (Johnson, 2014; Parker, Scott and Geddes, 2019).

26 surveys were completed, of which 11 were in Melkhoutfontein and 15 in Bitouville. The sample size for this was acceptable as it represented 54% of the population (Gammage, 2019; Andra, 2022). Face-to-face interviews were conducted with the assistance of a native Afrikaans speaker acting as a translator for *in situ* translations of the survey responses, which typically ranged in duration from one to two hours.

Although we originally targeted 35 fishery-dependent households, we had a smaller sample size as some potential participants declined to participate in the interview process. Of the 26 participants who participated in the interview process, 13 declined to be audio recorded. Reasons given by these participants included concerns of possible mishandling or misuse of recorded interviews, privacy concerns where respondents would not feel comfortable sharing all information if recorded, and possible risks that audio may be used out of context.

Responses of the participants who took part in the interview process without audio recording were captured by taking written field notes during the interview.

### **3.7. Data Scoring and Analysis**

This section delves deeper into discussing the data scoring and analysis processes including scoring criteria, transcription and qualitative and quantitative data analysis, analysis of the 2013/14 data and a comparative analysis.

#### **3.7.1. Scoring Criteria**

Initially, the study utilised scoring criteria based on the original GULLS survey and those used by Andra (2022), with a detailed rationale provided in Appendix B. New scoring categories were developed for ranking purposes, and open-ended questions were clearly defined (e.g. Table 3.2). For example, in question 1.8 (e.g. Table 3.3, Appendix B), fishers were asked to list the top three species of fish they had caught in the past five years. Each species mentioned was assigned a category number, and response frequencies were counted to determine the top three species for each town. Similarly, age categories corresponding to those used in the National Census were established (e.g. Appendix B). The establishment of new categories was due to several reasons, such as the addition of newer questions that did not exist in the original GULLS survey, and the categories were also based on participants' responses. Moreover, the data scoring methodology varied depending on the type of question: multiple-choice, Likert scale, binary, or open-ended (e.g. Table 3.2).

Table 3.2: Data scoring criteria including question type, format, and examples

Question Type	Format	Examples of Questions
Multiple choice	The scale was based on the participant's responses (i.e. sometimes a 1-4 scale or a 1-5 scale).	1.4 would you say you feel like you belong or do not belong to this community/town?
Likert scale	The scale ranged from 1-4	1.2 How many days per week do you go fishing?
Binary	Yes=4 No=1	2.1 Is there much variation in your household income between summer and winter?
Open-ended	Scoring based on participants' responses	1.8 List the three most important fish species you target for commercial purposes.  72.5 if you were in charge of the fishing activity in this area, what would you do?

### 3.7.2. Transcription and Qualitative Data Analysis

The first step in the data analysis process was the transcription of the audio recordings. All audio recordings of the participants were transcribed with the assistance of transcribers who were selected based on their ability to speak and understand Afrikaans. To strengthen the accuracy, the transcribers were trained on how to deal with unclear audio recordings and the formatting of the transcribed work. Quality checks were done on the transcribed work, which was compared with the audio recordings to ensure consistency. In addition, the transcribed work was stored in a safe space (see section 3.5) to ensure confidentiality. For participants who refused to be audio recorded for various reasons, their responses were documented in the fieldwork notes (e.g. Figure 3.2).

The second step of analysis involved applying qualitative content analysis, which is recognised as an effective tool for the organisation of the textual data (Schreier, 2014; Lindgren, Lundman and Graneheim, 2020). This method utilises various approaches, such as models, thematic frameworks, and conceptual maps, to describe research phenomena (Schreier, 2014). In this study, I adopted the thematic framework approach by using the GULLS framework (e.g. section 2.2.5) to identify trends and patterns within the content of the results. To facilitate theme identification, an initial structure linking the

survey categories was developed (e.g. Table 3.3). Apart from the development of the structure linking the survey categories, the responses from the face-to-face interview sessions were assigned codes (e.g. Appendix B), and these codes were assigned based on the things that were highlighted most by the participants, including resource scarcity, climate variability, COVID-19 and policy and regulation. The codes were also grouped in line with the GULLS categories such as sensitivity, exposure and adaptive capacity (see Table 3.3). Additionally, to ensure reliability, a rationale table (e.g. Appendix B) was developed to guide the application of the codes.

From the results, cross-cutting emergent themes such as resource scarcity, climate variability, COVID-19, and policy and regulation were identified. Table 3.3 highlights the linkages between the cross-cutting emergent themes and the GULLS vulnerability framework according to the three categories (exposure, sensitivity, and adaptive capacity), components, and subcomponents that feed into the overall social vulnerability of communities.

Table 3.3: Emerging themes identified and arranged according to categories, components, and subcomponents

Categories	Components	Subcomponents	Themes
Sensitivity	Social dependence on fishing	<ul style="list-style-type: none"> <li>Attachment to place</li> <li>Fishing frequency</li> <li>Attachment to fishing</li> <li>Recreational dependence</li> <li>Social dependence</li> </ul>	Resource Scarcity
	Historical and cultural dependence on fishing	<ul style="list-style-type: none"> <li>Cultural importance of fishing</li> <li>Local ecological knowledge</li> <li>Social mobility</li> </ul>	
	Economic dependence on fishing	<ul style="list-style-type: none"> <li>Economic dependence</li> <li>Competition for fish</li> </ul>	
	Economic dependence on other resources	<ul style="list-style-type: none"> <li>Food sources</li> <li>Vegetables consumed</li> <li>Meat consumed</li> <li>Self-sufficiency</li> <li>Social incentives</li> </ul>	
Exposure	Environmental change	<ul style="list-style-type: none"> <li>Storms</li> <li>Wind speed</li> <li>Wind direction</li> <li>Rainfall</li> <li>Sea state</li> <li>Drought</li> </ul>	Climate Change
	Attitude and perception	<ul style="list-style-type: none"> <li>Attitude to change</li> <li>Perception of change</li> </ul>	
	Pandemic	<ul style="list-style-type: none"> <li>COVID-19</li> </ul>	Pandemic
	Personal flexibility	<ul style="list-style-type: none"> <li>Perception of risk</li> </ul>	

Categories	Components	Subcomponents	Themes
Adaptive Capacity		<ul style="list-style-type: none"> <li>• Ability to plan, learn, and reorganise</li> <li>• Interest to adapt</li> <li>• Employability</li> </ul>	Resource scarcity
	Occupational flexibility	<ul style="list-style-type: none"> <li>• Capacity to anticipate change and develop response strategies</li> <li>• Occupational mobility</li> </ul>	
	Social capital	<ul style="list-style-type: none"> <li>• Decision-making</li> <li>• Networks</li> <li>• Gender equity</li> <li>• Equity</li> <li>• Leadership</li> <li>• Community cohesion</li> <li>• Access to institutional safety nets and information</li> </ul>	
	Human Capital	<ul style="list-style-type: none"> <li>• Knowledge</li> <li>• Education</li> <li>• Labour</li> <li>• Skills</li> <li>• Health</li> <li>• Age</li> <li>• Migration</li> </ul>	
	Financial Capital	<ul style="list-style-type: none"> <li>• Insurance</li> <li>• Credit</li> <li>• Debt</li> <li>• Savings</li> <li>• Household income</li> <li>• Socio-economic</li> <li>• Household sharing income</li> <li>• Income shocks</li> </ul>	
	Natural Capital	<ul style="list-style-type: none"> <li>• Resource base change</li> </ul>	
	Physical Capital	<ul style="list-style-type: none"> <li>• Built house and house conditions</li> <li>• Boat assets</li> <li>• Asset debt and condition</li> <li>• Water, energy, waste, and cooking fuels</li> <li>• Material assets</li> <li>• Infrastructure</li> </ul>	
	Economic dependence	<ul style="list-style-type: none"> <li>• Economic dependence</li> </ul>	
	Historical and cultural dependence	<ul style="list-style-type: none"> <li>• Cultural importance</li> <li>• Local ecological knowledge</li> </ul>	
	Social dependence	<ul style="list-style-type: none"> <li>• Attachment to place</li> <li>• Recreational dependence</li> <li>• Attachment to fishing</li> </ul>	
	Attitude and perception	<ul style="list-style-type: none"> <li>• Attitude to change</li> <li>• Perceptions to change</li> <li>• Interest in the environment</li> </ul>	Climate change
	Adaptation options	<ul style="list-style-type: none"> <li>• Climate change adaptation options</li> </ul>	
	Comprehensive policy and regulation	<ul style="list-style-type: none"> <li>• Markets</li> <li>• Resource management institutions</li> </ul>	Policy and Regulation
General Conflicts	<ul style="list-style-type: none"> <li>• Fishing compliance and conflict</li> </ul>		

Categories	Components	Subcomponents	Themes
		<ul style="list-style-type: none"> <li>Access to institutional safety nets and information</li> </ul>	

### 3.7.3. Quantitative Data Analysis

Quantitative data analysis was the last step of the analysis. However, in the quantitative data analysis, the exclusion of the questions that yielded poor results in terms of not being answered well, unexpected responses, or not applying to all participants (e.g. Table 3.4), followed a data quality assessment in line with the scoring criteria (Table 3.2, Appendix B). The overall process ensured the elimination of any inconsistency in survey responses and strengthened accuracy and trustworthiness.

Table 3.4: List of excluded questions from the analysis with reasons for exclusion

Question No	Question	Reason(s)
49.2	Number of boats	Most of the participants indicated that they do not have boats
49.3	Size of boat	
54.2	If yes, what do you believe is the leading cause of these changes?	This question was poorly understood by participants and yielded poor responses.
2.2	What is your average monthly household income before tax and from all sources?	Participants were uncomfortable answering the question, leading to only a few participants answering the question.
3.2	How many people (outside of family) did you employ over the last 12 months?	Almost all the participants reported that they have not employed anyone, nor do they have a fishing business.
3.3	Approximately how much income does your fishing business turn over each month?	

The retained questions were entered into Microsoft Excel software and categorised in alignment with the scoring criteria highlighted in Table 3.2. Thereafter, the percentage count was calculated, and tables and graphs were created to represent pertinent results in each town. Scores for each town were calculated for social vulnerability using the formula (from Adger, 2006):

**Social Vulnerability = E x S/AC**, Where: E- Exposure, S- Sensitivity, and AC- Adaptive Capacity

The calculation of the social vulnerability scores was based on the components, subcomponents, and indicators that comprised all three categories: sensitivity, exposure and adaptive capacity of the GULLS framework (e.g. Figures 2.2 and 2.3). Additionally, the interpretation of the social vulnerability scores was based on different vulnerability studies (e.g., Adger, 2006; Schmidtlein et al., 2008; Spielman et al., 2020; Aswani *et al.*, 2019). For example, high social vulnerability scores represent lower vulnerability levels (least vulnerable), while lower social vulnerability scores represent higher vulnerability levels (most vulnerable) (e.g. Table 3.5).

Table 3.5: The interpretation of vulnerability scores based on categories and themes

Category	Theme	Vulnerability scores	Vulnerability scores meaning
Sensitivity	<ul style="list-style-type: none"> <li>Resource scarcity</li> </ul>	The vulnerability scores were either low or high, depending on the components (e.g. socio-economic changes, environmental changes, COVID-19, etc.).	High vulnerability scores represent lower vulnerable levels (least vulnerable). Low vulnerability scores represent higher vulnerability levels (more vulnerable).
Exposure	<ul style="list-style-type: none"> <li>Climate change</li> <li>Pandemic</li> </ul>		
Adaptive capacity	<ul style="list-style-type: none"> <li>Resource scarcity</li> <li>Climate change</li> <li>Policy and regulation</li> </ul>		

#### 3.7.4. Analysis of the 2013/14 Data

The first step of analysis involved rescoring the participants' responses in line with the scoring criteria utilised in the 2023 data (e.g. Table 3.3 and Appendix B). The scoring process was not conducted on all questions, but on those questions that were similar across the 2013/14 and 2023 data. The questions were arranged in line with the GULLS framework categories, components, subcomponents and indicators.

For the qualitative analysis, the trends and patterns were identified through a thematic framework approach. Additionally, through the thematic approach, themes were developed, including resource scarcity, climate variability, and policy and regulation, and they were also linked back to the research aims and objectives. About the quantitative analysis, the percentage count was calculated using Microsoft Excel software, while the social vulnerability scores were calculated using the formula highlighted in section 3.7.3 based on various vulnerability studies (e.g. Adger, 2006; Aswani *et al.*, 2019).

### **3.7.5. Comparative analysis**

The comparison of the 2013/14 and 2023 data in this research was to identify the changes that took place over time. The comparison was conducted through a systematic approach. The systematic approach included qualitative and quantitative data analysis. Across the time frames, the participant's responses were coded to identify trends and patterns, including themes such as resource scarcity, climate variability, policy, and regulation. The social vulnerability scores were also calculated across time frames and highlighted through comparative tables and figures (e.g. Table 4.31).

### **3.8. Limitations of the study**

During the entire process of the dissertation, several limitations were encountered, including sampling limitations and researcher reflexivity.

#### **3.8.1. Sampling limitations**

Initially, the research intended to conduct about 35 face-to-face interview sessions in Bitouville and Melkhoutfontein; however, due to several reasons such as retirement and loss of lives (as revealed by participants), the conducted face-to-face interview sessions were about 26 in both towns. As highlighted in section 3.6, the snowball sampling strategy was used to locate participants in each town and for referrals- in this case, SSFs who held knowledge on fishing activities and those who were hard to reach. Despite the effectiveness of the snowball sampling strategy, it may have faced several limitations, including selection bias as a result of the relationship, experiences and networks that the referrer may have had with the participants. The position and relations of the referrer within the towns may have led to the rejection of potential participants to take part in the interview process, thus a smaller sample size. The smaller sample size may have also been due to research fatigue within the towns, especially in Melkhoutfontein, where some of the participants highlighted that several researchers have been visiting their towns in the last few years. Additionally, the scheduling of the face-to-face interview sessions was dependent on the availability of participants; sometimes the interviews had to be rescheduled to cater for participants. Due to the interviews taking about one to two hours, some of the older participants experienced fatigue; therefore, taking breaks in between the interviews was necessary.

### **3.8.2. Researcher Reflexivity**

As a scholar and a researcher who has experience in Environmental Sciences, Marine Ecology and Fisheries and being affiliated with the University of Cape Town, these experiences, along with my affiliation, may have influenced participants' perceptions towards me, including limiting participants from sharing insightful information that may have been relevant to the research. I acknowledge that the language (Afrikaans) barrier may have also limited participants from sharing insightful information; however, through the assistance of a translator, I managed to create a space where participants could express themselves in their languages. The difference in socio-economic and cultural experiences held by myself and the participants is one of the many things that may have made it challenging to understand their experiences, however I made an effort to spend some time with the community members, including visiting Still Baai harbour- to understand fishing activities, community garden- to understand other means of livelihood, rugby game (in Melkhoutfontein) and one of the community meeting- to embed myself into the community and understand the socio-economic situation.

### **3.9. Feedback Sessions**

*“The key to learning is feedback. It is nearly impossible to learn anything without it”.*

*Steven Levitt*

Initially, my research findings were to be disseminated to SSFs in Bitouville and Melkhoutfontein through an in-person feedback session. However, due to time constraints, in-person feedback sessions are beyond the scope of the study. To account for the communication of my research findings with the broader community of Bitouville and Melkhoutfontein, an English version of the research pamphlet containing my personal details (E-mail and contact number) has been developed (e.g. Appendix F) which will also be translated into Afrikaans and shared online with some of the fishers who will then share the online pamphlet with the rest of the fishing communities.

### **3.10. Summary**

This chapter has highlighted the methodology that was utilised to examine the social vulnerability of fishing communities in Bitouville and Melkhoutfontein. It also utilised a mixed-method approach which included qualitative and quantitative analysis. The chapter was guided by the GULLS theoretical framework and took into consideration the

research ethics, particularly the protection of sensitive information. The methodology approach used was in alignment with the aims and objectives of this research. It also played an important role in the examination of the drivers of change in the selected towns including resource scarcity, climate variability, COVID-19 and policy and regulation. Additionally, the GULLS survey was adapted through the inclusion and exclusion of questions relevant to the southern Cape context, to examine the changes that took place since the earlier GULLS research was conducted in 2013/14.

The next chapter presents my results.

## **Chapter Four: Results on Social Vulnerability of Fishing Communities in the Southern Cape**

### **4.1. Introduction**

For the purpose of this research, I updated an earlier survey developed by the GULLS project (e.g. Appendix A) to address and ascertain what drives the social vulnerability of SSFs within the two communities of Bitouville and Melkhoutfontein. The study addressed the following research questions: (1) What are the drivers of vulnerability among SSFs in the southern Cape? (2) What are the associated impacts of COVID-19 on the vulnerability of SSFs in the southern Cape? (3) How did social vulnerability and the drivers of change evolve in the southern Cape fishing communities compared to the earlier GULLS research?

In this chapter, I present the findings related to these research questions including findings from 2013/14 and 2023 arranged thematically. By re-administering and updating the GULLS survey, I aimed to capture the current state of social vulnerability in these communities and to understand how it has changed over time, particularly in the context of the COVID-19 pandemic. The results provide insights into the factors that currently drive vulnerability among SSFs and how these have evolved since the previous research. The chapter is structured as follows: first, I explore the drivers of vulnerability among SSFs in the southern Cape. Second, I examine the associated impacts of COVID-19 on these vulnerabilities. Finally, I analyse how social vulnerability and the drivers of change have evolved in the southern Cape fishing communities compared to the earlier GULLS research.

### **4.2. Thematic Summary Results for 2023**

In this section, I first present the demographic characteristics of the participants in 2023, including gender, age, race, and language as well as their fishing activities. I then present the results along with the emergent themes, including resource scarcity, climate variability, the COVID-19 pandemic, and policy and regulation.

#### **4.2.1. Demographic Characteristics**

In 2023, participants ranged in age from 21 years and older, with Bitouville having a median age of 45 years and Melkhoutfontein 57 years, suggesting fewer new entrants to the fishing sector. In Bitouville, 73% of participants were male and 27% female, while in Melkhoutfontein, 91% were male and 9% female. The majority of participants in both

communities were of coloured descent and predominantly spoke Afrikaans, with one exception in Bitouville who spoke Sesotho (e.g. Table 4.1).

Table 4.1: The demographic characteristics of participants, including gender, race, first language, and age in 2023

Demography	Bitouville (n= 15)	Melkhoutfontein (n=11)
Gender	11 (73%) Male 4 (27%) Female	10 (91%) Male 1 (9%) Female
Race	(14) 93% Coloured 1 (7%) Black	11 (100%) Coloured
First language	14 (93%) Afrikaans 1 (7%) Sotho	11 (100%) Afrikaans
Age	20-29 years= 1 (7%) 30-39 years= 3 (20%) 40-49 years= 5 (33%) 50-59 years= 3 (27%) >60 years= 2 (13%)	20-29 years= 0% 30-39 years= 0% 40-49 years= 2 (18%) 50-59 years= 5 (45%) >60 years= 4 (36%)
Median Age	45 years	57 years

73% of Bitouville participants reported fishing as their main occupation, with the remainder engaged in domestic work, while in Melkhoutfontein 91% considered fishing their primary livelihood. Fishing trip durations varied, with Bitouville participants mainly engaging in trips lasting 1–3 hours, whereas most Melkhoutfontein participants reported one-day trips. Distances from the coast where fishing occurred also varied between the communities, with Bitouville participants mostly fishing 1–5 km away and Melkhoutfontein participants showing a split between shorter and longer distances. Participants' observations on whether the fishing distance had changed over time were mixed between the communities (Table 4.2).

The frequency of fishing between the towns differed; Bitouville participants typically fished 2–3 days per week, while Melkhoutfontein participants fished less frequently overall, with some fishing daily. The targeted fish species also varied slightly between the communities, reflecting localised preferences and market demands (Table 4.2).

Table 4.2: Survey responses about the fishing activities in 2023

Fishing Activities	Bitouville (n=15)	Melkhoutfontein (n=11)
Ownership of fishing rights	Yes= 4 (27%) No= 11 (73%)	Yes= 1(9%) No= 10 (91%)
Fishing as a primary occupation	Main occupation=11 (73%) Not main occupation= 4 (27%)	Main occupation= 10 (91%) Not main occupation= 1 (9%)
The average length of the fishing trip	1-3 hours= 10 (67%) 3-6 hours= 4 (27%) One day= 1 (6%)	In less than one hour= 2 (18%) 3-6 hours= 3 (27%) One day= 6 (55%)

Days per week spent fishing.	Less than once a week= 2(13%) 1-2 days a week= 2(13%) 2-3 days a week= 10 (67%) 3-5 days a week= 1 (4%)	Less than once a week= 1 (9%) 1-2 days a week= 6 (55%) 2-3 days a week= 2 (18%) 3-5 days a week = 1 (9%) Every day of the week= 1 (9%)
Distance fishing from the coast	1-5km= 8 (53%) 6-10km= 6 (40%) >10km= 1 (7%)	NA/Not sure= 1 (9%) 1-5km= 6 (55%) >10km= 4 (36%)
Changes in distance from the coast where fishing takes place.	NA/Not sure= 1 (7%) Stayed the same= 13 (87%) Increased= 1 (7%)	Decreased= 3 (27%) Stayed the same= 4 (36%) Increased= 4 (36%)
The three most targeted species for commercial purposes	silver kob ( <i>Argyrosomus inodorus</i> ) = 11 (73%) red roman ( <i>Chrysoblephus laticeps</i> ) = 5 (33%) shallow-water Cape hake ( <i>Merluccius capensis</i> ) = 5 (33%)	silver kob ( <i>Argyrosomus inodorus</i> ) = 8 (73%) carpenter ( <i>Argyrosomus argyrosomus</i> ) = 6 (55%) red roman ( <i>Chrysoblephus laticeps</i> ) = 3 (27%)

#### 4.2.2. Emergent Themes for 2023 Study

This section presents the study results presented according to four cross-cutting themes (e.g. Table 3.3).

##### 4.2.2.1. Resource Scarcity

This section presents resource scarcity across natural, social, physical, and financial capitals (e.g. sections 2.3.1 and 2.4.1). For natural capital, participants were asked about the overharvesting of marine resources (e.g. Table 4.3). In Bitouville, 80% observed changes in marine harvesting and reported that these changes had affected their livelihoods. In Melkhoutfontein, only 45% noticed overharvesting, with a corresponding 45% observing changes in their livelihoods; 55% in both cases reported no change.

Regarding the diversity of marine resources, Bitouville's responses varied: one participant indicated very low diversity, 20% reported low diversity, 53% high diversity, and 20% very high diversity. Overall, 33% noticed a considerable decline in fish availability, 53% a general decline, and 13% perceived no change. When assessing the marine environment over the past five years, 53% felt it had worsened, while 47% observed improvements.

Similarly, in Melkhoutfontein, perceptions of marine diversity were mixed: 18% indicated very low diversity, 18% low, 36% high, and 27% very high. A majority noted a decline in fish availability, with 55% reporting a decrease and 45% a significant decline. Almost all

participants (91%) believed the marine environment had worsened over time, except for one who felt it had improved considerably.

Table 4.3: Survey responses in relation to the natural capital (including changes in the marine environment) in 2023

Changes in the marine environment	Bitouville (n=15)	Melkhoutfontein (n=11)
Perception of overharvesting of marine resources locally	Yes=12 (80%) No= 3 (20%)	Yes= 5 (45%) No= 6 (55%)
Observed changes to livelihood due to changes in the marine environment locally	Yes= 12 (80%) No= 3 (20%)	Yes= 5 (45%) No= 6 (55%)
Diversity of marine habitat	NA/Not sure= 0% Very low= 1 (7%) Low= 3 (20%) High= 8 (53%) Very high= 3 (20%)	NA/Not sure= 0% Very low= 2 (18%) Low= 2 (18%) High= 4 (36%) Very high= 3 (27%)
Changes in the number of fish	NA/Not sure= 0% Big decrease= 5 (33%) Decrease= 8 (53%) Same= 2 (13%) Increased= 0% Big increase= 0%	NA/Not sure= 0% Big decrease= 5 (45%) Decrease= 6 (55%) Same= 0% Increased= 0% Big increase= 0%
Factors cause fish numbers to decline locally.	NA/Not sure= 3 (20%) Pollution= 3 (20%) Climate variability (in general) = 4 (27%) Trawlers= 1 (7%) Changes in rainfall patterns= 1 (7%) Changes in wind direction= 3 (20%) Changes in weather patterns= 0%	NA/Not sure= 1 (9%) Pollution= 1 (9%) Climate variability (in general) = 3 (27%) Trawlers= 6 (55%) Changes in rainfall patterns= 0% Changes in wind direction= 0% Changes in weather patterns= 0%
The marine environment has worsened or improved in the last five years.	NA/Not sure= 0% Worsened a lot= 0% Worsened= 8 (53%) Improved= 7 (47%) Improved a lot= 0% Stayed the same= 0%	NA/Not sure= 0% Worsened a lot= 0% Worsened= 10 (91%) Improved= 0% Improved a lot= 1 (9%) Stayed the same= 0%

In the 2023 survey (e.g. Table 4.4), respondents described their primary social capital, the main sources of assistance during financial, food, or basic needs crises. In Bitouville, 53% relied on family, 33% on neighbours, 40% on friends, and 20% took out loans. In contrast, all respondents in Melkhoutfontein turned to family, with 27% also relying on neighbours and 36% on friends.

Regarding institutional safety nets and information, responses varied. In Bitouville, 67% reported no government safety nets, 27% said only a few were available, and one

respondent noted that many existed. In Melkhoutfontein, only one respondent said there were no safety nets; 45% felt few were available, one noted some, and 36% reported that many were present.

When asked about their satisfaction with government safety nets, 67% in Bitouville were not happy at all, one was slightly unhappy, 20% were happy, and one was very happy. Similarly, in Melkhoutfontein, 64% were not happy at all, 18% were slightly unhappy, one was happy, and one was very happy.

Finally, regarding the links between fishers and government institutions, 47% of Bitouville respondents reported no links, 47% described them as slight, and one noted a strong connection. In Melkhoutfontein, one respondent reported no links, 45% described them as slight, and 18% indicated a very strong connection.

Table 4.4: Survey responses in relation to social capital, networks, and community cohesion in 2023

<b>Social capital, networks, and community cohesion</b>	<b>Bitouville (n=15)</b>	<b>Melkhoutfontein (n=11)</b>
The main source of assistance when you have financial, food, or basic needs	Family= 8 (53%) Neighbours= 5 (33%) Friends= 6 (40%) Local organisation= 0% Take loans= 3 (20%)	Family= 11 (100%) Neighbours= 3 (27%) Friends= 4 (36%) Local organisation= 0% Take loans= 0%
<b>Gender equity</b>	<b>Bitouville (n=15)</b>	<b>Melkhoutfontein (n=11)</b>
Number of women in leadership roles in the community and positions	Yes= 12 (80%) No= 3 (20%)	Yes= 8 (73%) No= 3 (27%)
<b>Access to institutional safety nets and Information</b>	<b>Bitouville (n=15)</b>	<b>Melkhoutfontein (n=11)</b>
Number of government safety nets for fishers	None= 10 (67%) Few= 4 (27%) Some= 0% Many= 1 (7%)	None= 1 (9%) Few= 5 (45%) Some= 1 (9%) Many= 4 (36%)
Happy with government safety nets used in the fishing community during disasters	Not happy at all= 10 (67%) Slightly unhappy= 1 (7%) Happy= 3 (20%) Very happy= 1 (7%)	Not happy at all= 7 (64%) Slightly unhappy= 2 (18%) Happy= 1 (9%) Very happy= 1 (9%)
Strength of links between fishers and institutions or government	Not at all linked= 7 (47%) Slightly linked= 7(47%) Well linked= 0% Very well linked= 1 (7%)	Not at all linked= 1 (9%) Slightly linked= 5 (45%) Well linked= 2 (18%) Very well linked= 3 (27%)
Strength of links between fishers and institutions or government	NA/Not sure= 6 (40%) Not involved at all= 3 (20%) Slightly involved= 5 (33%) Involved= 1 (7%) Very involved= 0%	NA/Not sure= 0% Not involved at all= 3 (27%) Slightly involved= 3 (27%) Involved= 1 (9%) Very involved= 4 (36%)

Strength of links between fishers and institutions or government	NA/Not sure= 0% Not happy at all= 11 (73%) Slightly happy= 3 (20%) Happy= 1 (7%) Very happy= 0%	NA/Not sure= 0% Not happy at all= 6 (55%) Slightly happy= 0% Happy= 3 (27%) Very happy= 2 (18%)
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In the 2023 survey (e.g. Table 4.5), participants were asked about aspects of financial capital including savings, credit and insurance. In Bitouville, 80% reported that every household member contributed to expenses, compared with nearly all respondents in Melkhoutfontein.

Only 13% in Bitouville had access to cash in an emergency, versus 27% in Melkhoutfontein. Regarding loans, 73% in Bitouville relied on friends and family while 27% took out loans independently; 73% reported that they did not loan money to anyone. In Melkhoutfontein, 82% depended on family and friends, 18% on small money lenders, with only one participant loaning money and 91% not loaning money to others.

In terms of insurance, 93% of Bitouville participants had life insurance (with one lacking coverage), and all respondents in Melkhoutfontein were insured. When asked about enduring income shocks, 20% in Bitouville said it was impossible, 47% found it only slightly impossible and one felt it was very possible. In Melkhoutfontein, 36% said it was impossible, 27% slightly impossible, 27% possible, and one participant very possible.

Finally, regarding access to financial reserves during unemployment, 87% in Bitouville found it impossible, with one respondent saying it was only slightly impossible and another very possible. In Melkhoutfontein, 36% reported that accessing reserves was very impossible, 27% slightly impossible, 27% possible, and one very possible.

Table 4.5: Survey responses in relation to financial capital (including savings, credit, and insurance) in 2023

<b>Household sharing income</b>	<b>Bitouville (n=15)</b>	<b>Melkhoutfontein (n=11)</b>
Contribution of each household member's income to household expenses	Yes= 12 (80%) No= 3 (20%)	Yes= 10 (91%) No= 1 (9%)
Possibility to obtain cash for an emergency today	Yes= 2 (13%) No= 13 (87%)	Yes= 3 (27%) No= 8 (73%)
<b>Savings</b>	<b>Bitouville (n=15)</b>	<b>Melkhoutfontein (n=11)</b>
Money set aside for emergencies	Yes= 0% No= 15 (100%)	Yes= 3 (27%) No= 8 (73%)
<b>Credit</b>	<b>Bitouville (n=15)</b>	<b>Melkhoutfontein (n=11)</b>
Loan provision	Friends and family= 11 (73%) Large companies= 0% Small money lenders= 0%	Friends and family= 9 (82%) Large companies= 0%

	Banks= 0%	Small money lenders= 2 (18%) Banks= 0%
Loan provision for others in the past year	Yes= 4 (27%) No= 11 (73%)	Yes= 1 (9%) No= 10 (91%)
<b>Insurance</b>	<b>Bitouville (n=15)</b>	<b>Melkhoutfontein (n=11)</b>
Insurance policies available	None= 1 (7%) Life= 14 (93%) House= 0% Vehicle= 0% Income= 0% Boat= 0%	None= 0% Life= 11 (100%) House= 0% Vehicle= 0% Income= 0% Boat= 0%
Ability to endure some income shocks	Impossible= 3 (20%) Slightly impossible= 7 (47%) Possible= 4 (27%) Very possible= 1 (7%)	Impossible= 4 (36%) Slightly impossible= 3 (27%) Possible= 3 (27%) Very possible= 1 (9%)
Ability to access financial reserves if unemployed	Impossible= 13 (87%) Slightly impossible= 1 (7%) Possible= 0% Very possible= 1 (7%)	Impossible= 4 (36%) Slightly impossible= 3 (27%) Possible= 3 (27%) Very possible= 1 (9%)
Level of financial planning	No plan at all= 4 (27%) Planned a little= 7 (47%) Well-planned= 2 (13%) Very well-planned= 2 (13%)	No plan at all= 4 (36%) Planned a little= 1 (9%) Well-planned= 6 (55%) Very well-planned= 0%

Regarding physical capital, participants were asked in 2023 if they owned or rented a house. Responses varied among the communities in Bitouville. For instance, one participant indicated that they do not own a house, 11 (73%) participants owned a house, and 3 (20%) were renting (e.g. Table 4.6). In Melkhoutfontein, nine (82%) participants indicated that they owned a house, and 2 (18%) were renting (e.g. Table 4.6).

Regarding boat possession, in Bitouville, all the participants were not in possession of fishing boats, while in Melkhoutfontein, only 2 (18%) of the participants had fishing boats, and the sizes of the boats ranged from one to five metres in length (e.g. Table 4.6).

Table 4.6: Responses from the survey about the physical capital (including possession of house and boat) in 2023

<b>Built house</b>	<b>Bitouville (n=15)</b>	<b>Melkhoutfontein (n=11)</b>
Own/rent a house.	Do not own= 1 (7%) Own= 11 (73%) Rent= 3 (20%)	Do not own= 0% Own= 9 (82%) Rent= 2 (18%)
Possession of a boat	No boat= 15 (100%) Ski-boat= 0%	No boat= 9 (82%) Ski-boat= 2 (18%)
Number of boats	NA/Not sure= 0% None= 100% One to two boats= 0% Three to four boats= 0% >Five boats= 0%	NA/Not sure= 0% None= 9 (82%) One to two boats= 2 (18%) Three to four boats= 0% >Five boats= 0%

Size of boat	None= 15 (100%) One to five metres= 0% Six to ten metres= 0% >Ten metres= 0%	None= 9 (82%) One to five metres= 2 (18%) Six to ten metres= 0% >Ten metres= 0%
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Figure 4.1 shows household asset ownership among participants in 2023. Out of 26 participants, 2 owned vehicles; all had fishing gear and gas/electric stoves; 25 had televisions, refrigerators, and electricity; 24 owned cell phones and radios/cassette players; and 18 had piped water. Additionally, 21 had washing machines, 9 had video/DVD players, 5 had kerosene lamps, 6 had electric lamps, and 23 had garden/power tools. No one owned a solar panel, and 1 had a generator.

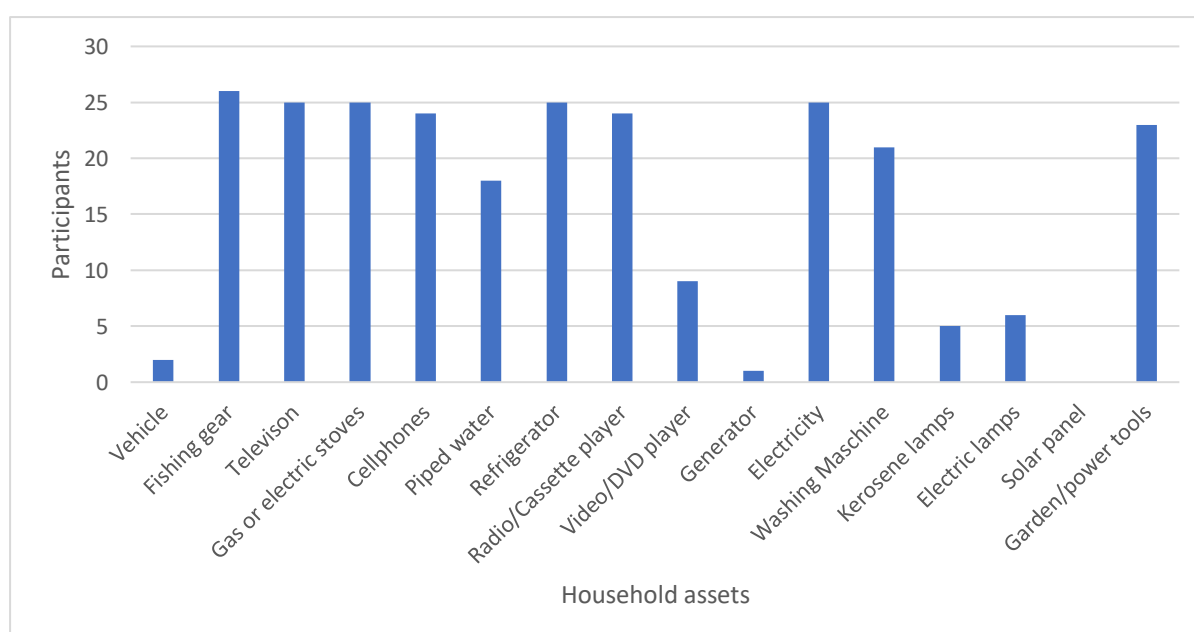


Figure 4.1: Household assets possessed by participants in 2023.

Table 4.7 shows the quotations from the survey responses which are related to the resource scarcity theme, highlighting the level of interaction and dependence on other people and institutions.

Table 4.7: Survey data in relation to the resource scarcity theme arranged according to participants and indicators in 2023

Theme	Indicator	Survey Data
	Level of interaction and dependence on other people and institutions	“Whenever I want to go fishing, I first ask other fishers, and sometimes I just look at the weather and decide whether or not it is a good idea to go”
		“At the moment, I only receive SASSA grant for my child, but it is not enough to support my family”

Resource scarcity	Availability of government incentives	“There is no government support except the COVID-19 food relief scheme, which only lasted for a month or two”
	Consumption of fish as a resource	“I consume Kob more because of their availability”
	Business approach	“I do not have a fishing business; I only sell fish if an opportunity arises”
		“I only have the fishing licence, not a business”
		“I cannot say for certain; it depends on the success of my business. If the business does not perform well, I will not be able to hire many people. However, if it does well, I can provide good employment opportunities”
	“I prefer not to talk about my household income”	

#### 4.2.2.2. Climate Variability

In 2023, data on community perceptions and responses to climate change were gathered (e.g. Table 4.8). In Bitouville, 73% of respondents felt unsafe about their livelihoods amid environmental challenges, while 27% felt safe. In Melkhoutfontein, however, perceptions varied: 36% felt not safe at all, 36% felt safe, and 27% felt very safe.

Regarding large storms over the past 10 years, most Bitouville participants (n = 14) reported their occurrence, with 87% of these individuals being personally or directly impacted. One participant noted that large storms did not occur, and 13% reported no direct impact. In Bitouville, 13% perceived household damage as minimal, 27% as somewhat bad, one participant said it was not bad, and 53% reported that the damage was very bad. For future storm damage, 60% took preventive actions, mostly by staying indoors or fixing their roofs, while 40% did not.

In Melkhoutfontein, one respondent was unsure about the occurrence of large storms; 55% reported that they had occurred, and 36% said they had not. Among those affected, 64% were directly impacted and 36% were not. Regarding household damage in Melkhoutfontein, one participant described it as very bad, 18% as bad, 36% as somewhat bad, and 36% reported no damage. Finally, 64% of respondents in Melkhoutfontein took measures to prevent storm damage, such as fixing roofs (55%) and tuning in to local radio and news for updates (45%), while 36% did not take any preventive actions.

Table 4.8: Survey responses pertaining to fisher’s safety in the context of windstorms in 2023

<b>Personal exposure</b>	<b>Bitouville (n=15)</b>	<b>Melkhoutfontein (n=11)</b>
Perception of safety in current livelihood despite environmental/climatic exposure	Very safe= 0% Safe= 4 (27%) Slightly unsafe= 11 (73%) Not safe at all= 0%	Very safe= 3 (27%) Safe= 4 (36%) Slightly unsafe= 0% Not safe at all= 4 (36%)
<b>Windstorms</b>	<b>Bitouville (n=15)</b>	<b>Melkhoutfontein (n=11)</b>
Occurrence of large storms in the past five years	Yes= 14 (93%) No= 1 (7%)	NA/Not sure= 1 (9%) Yes= 6 (55%) No= 4 (36%)
Personally, directly impacted by the storm	Yes= 13 (87%) No= 2 (13%)	Yes= 7 (64%) No= 4 (36%)
Degree of damage to household	Very bad= 8(53%) Bad= 1 (7%) Somewhat bad= 4 (27%) Not bad at all= 2 (13%)	Very bad= 1 (9%) Bad= 2 (18%) Somewhat bad= 4 (36%) Not bad at all= 4 (36%)
Actions that were taken to prevent future considerable storm damage	Yes= 9 (60%) No= 6 (40%)	Yes= 7 (64%) No= 4 (36%)
Actions that were taken to prevent future considerable storm damage	Fixed roof= 5 (33%) Stayed indoor= 10 (67%)	Fixed roof= 6 (55%) Tuned in to local radio and news for updates= 5 (45%)

Table 4.9 provides a detailed breakdown of participants’ observations on wind speed and wind direction changes in 2023. In Bitouville, 80% of respondents observed changes in wind speed compared to 73% in Melkhoutfontein, while the remainder, 20% and 27% respectively, reported no changes. When considering the extent of wind speed damage in Bitouville, responses were varied: 20% reported no damage, 27% moderate damage, 20% little damage, and 33% major damage. Participants’ assessments of the damage’s severity were similarly diverse, with 27% indicating that the damage was not bad at all, 20% describing it as slightly bad, 27% as bad, and 27% as very bad. In Melkhoutfontein, the reported damage due to wind speed was 36% for no damage, 18% for moderate, 27% for little, and 18% for major damage; 18% felt the damage was not bad at all, 30% slightly bad, 16% bad, and 36% very bad.

Observations on wind direction changes followed a similar pattern. In Bitouville, 80% of participants noticed changes in wind direction, while in Melkhoutfontein, 64% did so; the remaining respondents (20% in Bitouville and 36% in Melkhoutfontein) did not observe any change. In Bitouville, the impact of these wind direction changes was reported as having no impact by 20% of respondents, a slight impact by another 20%, a moderate impact by 40%, and a great impact by 20%. Moreover, when rating the severity of these changes, 20% described them as not severe at all, 33% as slightly severe, and 47% as

very severe. In Melkhoutfontein, the impacts were noted as no impact by 36% of respondents, a slight impact by 9%, a moderate impact by 27%, and a great impact by 27%; with 45% considering the changes not severe at all, 45% severe, and 9% very severe.

Table 4.9: Responses relating to wind speed and direction in 2023

<b>Wind speed</b>	<b>Bitouville (n=15)</b>	<b>Melkhoutfontein (n=11)</b>
Fishing effort in an area prone to changes in wind speed	Yes= 12 (80%) No= 3 (20%)	Yes= 8 (73%) No= 3 (27%)
Extent of wind speed	No damage= 3 (20%) Moderate damage= 4 (27%) Little damage= 3 (20%) Major damage= 5 (33%)	No damage= 4 (36%) Moderate damage= 2 (18%) Little damage= 3 (27%) Major damage= 2 (18%)
Degree of damage to fisheries	Very bad= 4 (27%) Bad= 4 (27%) Slightly bad= 3 (20%) Not bad at all= 4 (27%)	Very bad= 4 (36%) Bad= 1 (9%) Slightly bad= 4 (36%) Not bad at all= 2 (18%)
<b>Wind direction</b>	<b>Bitouville (n=15)</b>	<b>Melkhoutfontein (n=11)</b>
Changes in wind direction on fishing	Yes= 12 (80%) No= 3 (20%)	Yes= 7 (64%) No= 4 (36%)
Impacts of wind direction	No impact= 3 (20%) Slight impact= 3 (20%) Impacted= 6 (40%) Greatly impacted= 3 (20%)	No impact= 4 (36%) Slight impact= 1 (9%) Impacted= 3 (27%) Greatly impacted= 3 (27%)
The severity of wind direction	Not severe at all= 3 (20%) Slightly severe= 5 (33%) Severe= 7 (47%) Very severe= 0%	Not severe at all= 5 (45%) Slightly severe= 0% Severe= 5 (45%) Very severe= 1 (9%)

Table 4.10 presents the 2023 survey findings on drought conditions. In Bitouville, almost all participants (93%) observed drought, while only 7% saw no change. In contrast, in Melkhoutfontein, 64% noticed drought conditions, with 36% reporting no change.

In Bitouville, the majority rated the damage as severe (60%), with fewer participants describing it as slightly severe (13%), very severe (20%), or not severe at all (7%). In Melkhoutfontein, the impact on fishing ability was viewed as less severe by many, with 45% reporting no severe impact, 18% rating it as slightly severe, and 36% as very severe.

Table 4.10: Responses pertaining to drought conditions experienced by SSFs in 2023

<b>Drought</b>	<b>Bitouville (n=15)</b>	<b>Melkhoutfontein (n=11)</b>
Occurrence of drought in the past five years	Yes= 14 (93%) No= 1 (7%)	Yes= 7 (64%) No= 4 (36%)

Degree of damage to the fishing ability	Not severe= 1 (7%) Slightly severe= 2 (13%) Severe= 9 (60%) Very severe= 3 (20%)	Not severe= 5 (45%) Slightly severe= 2 (18%) Severe= 0% Very severe= 4 (36%)
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Table 4.11 summarises the 2023 survey responses on rainfall patterns, revealing notable differences between the two communities. In Bitouville, almost all respondents (93%) observed changes in rainfall, yet the majority (67%) reported only minor damage, with just 20% describing the damage as major. Most Bitouville respondents rated the severity of these changes as slightly bad (67%), while only a small fraction found them very bad (7%). In contrast, while fewer respondents in Melkhoutfontein (73%) noticed changes, the reported impact was more severe. Here, 45% observed little damage, but a higher proportion- 27% described the damage as very bad, and another 27% reported moderate damage. When assessing severity, Melkhoutfontein respondents were more divided: 36% rated the changes as slightly bad, while 27% each considered them bad or very bad, and 9% perceived no negative impact.

Table 4.11: Survey responses pertaining to rainfall patterns (including the extent and severity of the rainfall patterns) in 2023

Rainfall	Bitouville (n=15)	Melkhoutfontein (n=11)
Households in areas prone to changes in rainfall pattern	Yes= 14 (93%) No= 1 (7%)	Yes= 8 (73%) No= 3 (27%)
The extent of rainfall patterns	No damage= 1 (7%) Moderate damage= 1 (7%) Little damage= 10 (67%) Major damage= 3 (20%)	No damage= 3 (27%) Moderate damage= 3 (27%) Little damage= 5 (45%) Major damage= 0%
Severity of rainfall	Very bad= 1 (7%) Bad= 4 (27%) Slightly bad= 10 (67%) Not bad at all= 0%	Very bad= 3 (27%) Bad= 3 (27%) Slightly bad= 4 (36%) Not bad at all= 1 (9%)

In 2023, survey responses on sea state conditions revealed notable differences between Bitouville and Melkhoutfontein. In Bitouville, almost all respondents (93%) noticed changes, with most experiencing some impact- 60% reported being impacted and 20% greatly impacted, while only 7% experienced no impact. In contrast, in Melkhoutfontein only 55% observed changes, and a larger share (45%) reported no impact. When rating severity, 73% of Bitouville respondents deemed the changes severe, whereas Melkhoutfontein responses were more balanced, with 45% considering the changes not

severe and the remainder evenly split among slight, moderate, and very severe ratings (e.g. Table 4.12).

Table 4.12: Survey responses pertaining to sea state conditions in 2023

Sea state	Bitouville (n=15)	Melkhoutfontein (n=11)
Changes in sea state	Yes= 14 (93%) No= 1 (7%)	Yes= 6 (55%) No= 5 (45%)
Impacts of sea state changes	No impact= 1 (7%) Slight impacted= 2 (13%) Impacted= 9 (60%) Greatly impacted= 3 (20%)	No impact= 5 (45%) Slight impacted= 0% Impacted= 4 (36%) Greatly impacted= 2 (18%)
The severity of sea state changes	Not severe at all= 1 (7%) Slightly severe= 1 (7%) Severe= 11 (73%) Very severe= 2 (13%)	Not severe at all= 5 (45%) Slightly severe= 2 (18%) Severe= 2 (18%) Very severe= 2 (18%)

Table 4.13 shows that in 2023, climate change awareness was high in both communities: 93% of Bitouville respondents and 82% of Melkhoutfontein respondents were aware, leaving only 7% and 18% unaware, respectively. For information sources, both communities primarily relied on TV or radio, with newspapers, friends and family, and the internet also playing a role.

Table 4.13: Survey responses pertaining to attitude and perception of climate change (including access to information, institutions, and awareness) in 2023

Attitude and perception	Bitouville (n=15)	Melkhoutfontein (n=11)
Awareness of climate change	Yes= 14 (93%) No= 1 (7%)	Yes= 9 (82%) No= 2 (18%)
Experience of climate change	Yes= 14 (93%) No= 1 (7%)	Yes= 9 (82%) No= 2 (18%)
Access to climate change information	Newspapers= 5 (33%) TV/Radio= 14 (93%) Academic society= 0% My friends and family= 6 (40%) The internet= 8 (53%)	Newspapers= 4 (36%) TV/Radio= 9 (82%) Academic society= 0% My friends and family= 5 (45%) The internet= 7 (64%)

Quotes from research participants make in support of the climate change theme are shown in Table 4.14. They highlight the lack of institutions centred around climate change, awareness of climate change, experience with climate change including the difficulty of proceeding to the sea, access to climate change information and extent of environmental changes.

Table 4.14: Survey data in relation to climate change theme arranged according to participants and indicator in 2023

Theme	Indicator	Survey Data
Climate Change	Presence of climate change-centred institutions or government departments in the area or community.	“In this community, there are no institutions on climate change; we barely receive information from the government”
Climate Change	Awareness of climate change	“I have heard about climate change from radio and television, and other researchers have come to the community to talk about climate change”
Climate Change		“I know quite a lot about fishing, climate change and was included in a book titled Transformation and the South African Fishing Industry”
Climate Change	Experience of climate change	“Whenever I experience bad weather, it is difficult to go fishing because we cannot set up our fishing gear and do nothing”
Climate Change	Changes in the climate	“Even though I do not know much about climate change, I have observed changes in how we catch fish. Some of the fish are no longer available where they were normally available. There are changes in income in different seasons”
Climate Change	Access to climate change information	“If you are not well-informed, getting information about climate change is often difficult. I usually make my weather observations or talk with other fishers”
Climate Change	The extent of environmental changes	“In 2018, we experienced drought, and it was a difficult year for the community as we had a water shortage”
Climate Change		“Windstorms were very severe, and we could not go fishing as we were afraid; I remember we even had to fix the roof of the community hall”
Climate Change		“I still struggle to predict sea state changes, and going to the sea brings a painful memory because I lost my uncle at sea and never found him”

#### 4.2.2.3. COVID-19 Pandemic

Table 4.15 summarises the 2023 survey findings on the COVID-19 pandemic, its impacts, and the measures employed by SSFs (e.g. section 2.3.3 for details). In Bitouville, all respondents (100%) reported being impacted by COVID-19 between 2020 and 2023, compared to 82% in Melkhoutfontein (18% reported no impact).

Travel restrictions were significant: 93% of Bitouville respondents were limited in accessing fishing areas, while 64% of Melkhoutfontein respondents experienced the same, with 18% unsure. Many respondents also noted increased fish prices, difficulties selling fish, and reduced fishing frequency, with the ability to fish affected for 87% in Bitouville and 82% in Melkhoutfontein.

When asked about measures to address the pandemic, 53% of Bitouville and 45% of Melkhoutfontein respondents reported that measures were implemented, while 47% and 55%, respectively, indicated that no measures were taken.

Regarding government incentives, 73% of Bitouville respondents noted their availability, yet 93% felt they were not financially better off. Although most stated there was no overall government support, some received specific incentives such as the SASSA grant (33%) and a food relief scheme (7%). Furthermore, 27% reported that no household member received grants, whereas 73% indicated that one to three members did.

In Melkhoutfontein, 64% reported that government incentives were available, compared to 36% who said there were none. Only 18% received the COVID-19 Distress grant and another 18% received other government support; 82% did not receive any social incentives. Regarding household grants, 18% reported that no one received grants, while 82% indicated that one to three members did. Notably, 55% of Melkhoutfontein respondents stated that they were financially better off due to these incentives, compared to 45% who were not.

Table 4.15: Responses in 2023 relating to the COVID-19 pandemic

<b>Pandemic</b>	<b>Bitouville (n=15)</b>	<b>Melkhoutfontein (n=11)</b>
Impacts of COVID-19	Yes= 15 (100%) No= 0%	Yes= 9 (82%) No= 2 (18%)
Impacts of different COVID-19 restrictions	NA/Not sure= 0% Restricted to travel to fishing areas= 14 (93%) Contracted COVID-19= 1 (7%) Fish prices went up= 0% Unable to sell fish= 0%	NA/Not sure= 2 (18%) Restricted to travel to fishing areas= 7 (64%) Contracted COVID-19= 0% Fish prices went up= 1 (9%) Unable to sell fish= 1 (9%)
Ability to fish during COVID-19	Yes= 13 (87%) No= 2 (13%)	Yes= 9 (82%) No= 2 (18%)
Fishing frequency	Yes= 15 (100%) No= 0%	Yes= 11 (100%) No= 0%
Measures employed to deal with COVID-19	Yes= 5 (53%) No= 7 (47%)	Yes= 5 (45%) No= 6 (55%)
Government incentives available	Yes= 11 (73%)	Yes= 7 (64%)

	No= 4 (27%)	No= 4 (36%)
COVID-19 Distress grant	Yes= 3 (20%) No= 12 (80%)	Yes= 2 (18%) No= 9 (82%)
Support from the government	Yes= 1 (7%) No= 14 (93%)	Yes= 2 (18%) No= 9 (82%)
Type of social incentives received	None= 9 (60%) SASSA grant= 5 (33%) Food relief scheme= 1 (7%)	None= 7 (64%) SASSA grant= 4 (36%)
Number of people in the household that receive grants	NA/Not sure= 0% None= 4 (27%) One to three people= 11 (73%) Four to six people= 0% >seven people= 0%	NA/Not sure= 0% None= 2 (18%) One to three people= 9 (82%) Four to six people= 0% >seven people= 0%
Financially better off from the social incentives	Yes= 1 (7%) No= 14 (93%)	Yes= 6 (55%) No= 5 (45%)

Participants discussed numerous challenges that arose from the COVID-19 pandemic linked to restrictions. Key challenges highlighted by participants interviewed in 2023 are highlighted in Table 4.16.

Table 4.16: Survey data in relation to the COVID-19 pandemic theme arranged according to participants and indicators

Theme	Indicator	Survey Data
Pandemic	Impacts of COVID-19	“When lockdown restrictions were implemented, I was unable to go fishing. Even though the police were not constantly monitoring me, I was too scared to go fishing. It was a challenging year for my family, and I also suffered from COVID-19 and had a stroke simultaneously”
Pandemic		“During the different COVID-19 restrictions, I was unable to fish. I had to learn to adapt and accept any help available”
Pandemic		“I knew about the COVID-19 Distress grant but did not know how to apply. I am not good with technological things”

#### 4.2.2.4. Policy and Regulation

Table 4.17 presents the 2023 survey findings on policy and regulation. In both Bitouville and Melkhoutfontein, all respondents reported that no natural resource management institutions existed in their communities. Most participants observed that environmental changes had prompted rule adjustments, 87% in Bitouville and 91% in Melkhoutfontein, with the remaining respondents noting no change.

Regarding fishing regulations, Bitouville respondents reported that 20% observed no changes, 60% experienced stricter rules, and 20% noted changes in fish catch and

quantity. In Melkhoutfontein, 45% observed no changes, while 27% each reported stricter rules or changes in catch and quantity.

When asked about catch reporting (e.g. Table 4.14), only 13% of Bitouville respondents reported their catches. In Bitouville, 73% were unsure or felt the reporting system was not applicable; 7% noted that no reporting mechanism existed, another 7% used the harbour/DFFE system, and 13% used a logbook. In Melkhoutfontein, 73% reported using the harbour/DFFE system, with 27% either unsure or finding it not applicable.

Community organisations in Bitouville include rugby clubs, creches, churches, neighbourhood watches, and a youth wellness group. In Melkhoutfontein, similar organisations were mentioned, along with senior citizen clubs, the Melkhoutfontein association club, and a fire rescue/department.

Finally, regarding fishery management, 60% of Bitouville respondents reported that their fishery was managed, compared to 45% in Melkhoutfontein; the remainder reported no management. In Bitouville, 40% were unsure or felt that management changes were not applicable, while 60% noted the implementation of fishery resources. In Melkhoutfontein, 45% were unsure, 36% reported implementation, and 18% noted a move toward co-management of fishery resources.

Table 4.17: Responses relating to the resource management institutions that exist within the two communities in 2023

Resource management institutions	Bitouville (n=15)	Melkhoutfontein (n=11)
The presence of natural resource management institutions in the community	Yes= 0% No= 15 (100%)	Yes= 0% No= 11 (100%)
Level to which rules have changed due to environmental changes	Yes= 13 (87%) No= 2 (13%)	Yes= 10 (91%) No= 1 (9%)
Changes in fishing rules	No changes= 3 (20%) Strict fishing rules= 9 (60%) Changes in fish catch and quantity= 3 (20%)	No changes= 5 (45%) Strict fishing rules= 3 (27%) Changes in fish catch and quantity= 3 (27%)
Degree of recording/reporting of catches required	Yes= 2 (13%) No= 13 (87%)	Yes= 8 (73%) No= 3 (27%)
Reporting catch	NA/Not sure= 11 (73%) No one= 1 (7%) Harbour/DFFE= 1 (7%) Book available to fishers to record catch= 2 (13%)	NA/Not sure= 3 (27%) No one= 0% Harbour/DFFE= 8 (73%) Book available to fishers to record catch= 0%
Community organisations	NA/Not sure= 0% Rugby club= 14 (93%)	NA/Not sure= 0% Rugby club= 5 (45%)

	Creche= 12 (80%) Church= 9 (60%) Neighbourhood watch= 3 (20%) Senior citizens club= 0% Youth wellness= 1 (7%) Fire rescue/ department= 0%	Creche= 1 (9%) Church= 5 (45%) Neighbourhood watch= 6 (55%) Senior citizens club= 4 (36%) Youth wellness= 2 (18%) Melkhoutfontein association club= 4 (36%) Fire rescue/ department= 1 (9%)
Management of fishery	Yes= 9 (60%) No= 6 (40%)	Yes= 5 (45%) No= 6 (55%)
Fishery management changes	NA/Not sure= 6 (40%) No changes= 0% Implementation of fishery resources= 9 (60%) Co-management of fishery resources= 0%	NA/Not sure= 5 (45%) No changes= 0% Implementation of fishery resources= 4 (36%) Co-management of fishery resources= 2 (18%)

Table 4.18 summarises the 2023 survey findings on illegal fishing and related regulatory issues. In Bitouville, 53% reported no illegal fishing and 33% observed only minor instances, with few noting moderate or high levels. In Melkhoutfontein, 55% reported no illegal fishing, 27% observed minor occurrences, and 9% each reported moderate or high levels.

Awareness of rule-breakers was low in both communities, with 73% stating that no one knew who was breaking the rules. Among the remainder, Bitouville respondents noted that most people knew the offenders, while in Melkhoutfontein awareness ranged from a few to everyone.

Enforcement varied notably. In Bitouville, 67% felt that rules were not enforced at all, 13% reported minimal enforcement, and 20% said enforcement was strong. In Melkhoutfontein, only 18% noted minimal enforcement, while 36% each reported moderate or strong enforcement.

Conflict among fishers was more common in Melkhoutfontein, where 36% reported both common and very common conflicts. In Bitouville, 40% reported no conflicts, 7% said conflicts were rare, 33% reported common conflicts, and 20% noted very common conflicts.

Finally, perceptions of fishing rule effectiveness diverged sharply. In Bitouville, 73% were dissatisfied with the rules, while only 13% were happy and another 13% very happy. In

contrast, 73% of Melkhoutfontein respondents were satisfied and 18% were very satisfied with the rules.

Table 4.18: Responses relating to fishing compliance and general conflicts among SSFs in 2023

Fishing compliance and conflict	Bitouville (n=15)	Melkhoutfontein (n=11)
Relative occurrence of illegal fishing locally	Does not occur at all= 8 (53%) Occurs a little= 5 (33%) Occurs= 1 (7%) Occurs a lot= 1 (7%)	Does not occur at all= 6 (55%) Occurs a little= 3 (27%) Occurs= 1 (9%) Occurs a lot= 1 (9%)
Number of people who know those who break the rules	No one= 11 (73%) A few people= 0% Most people= 4 (27%) Everyone= 0%	No one= 8 (73%) A few people= 2 (18%) Most people= 0% Everyone= 1 (9%)
Enforcement of fishing rules in the area	Not enforced at all= 10 (67%) Enforced a little= 0% Just enforced= 2 (13%) Well-enforced= 3 (20%)	Not enforced at all= 1 (9%) Enforced a little= 2 (18%) Just enforced= 4 (36%) Well-enforced= 4 (36%)
Relative occurrence of conflict among fishers	Do not occur ever= 6 (40%) Not very common= 1 (7%) Common= 5 (33%) Very common= 3 (20%)	Do not occur ever= 3 (27%) Not very common= 0% Common= 4 (36%) Very common= 4 (36%)
Effectiveness of implemented fishing rules	Not happy at all= 11 (73%) Slightly happy= 0% Happy= 2 (13%) Very happy= 2 (13%)	Not happy at all= 8 (73%) Slightly happy= 0% Happy= 1 (9%) Very happy= 2 (18%)

Table 4.19 highlights responses from participants related to issue around policy and regulation.

Table 4.19: Survey data in relation to the policy and regulation theme arranged according to participants and indicators in 2023

Theme	Indicator	Survey data
Policy and Regulation	The presence of natural resource management institutions in the community	“There are no organisations available for marine resource management except for marine protected areas in Still Baai”
	Level to which rules have changed due to environmental changes	“I am more aware of the environmental changes”.
	Management of fishery	“In Bitouville, the only way to manage the fish catch is by reporting catch on an available book”
	Relative occurrence of illegal fishing locally	“Illegal fishing is not very common within our communities; I am only aware of one common incident at the harbour where one of the fishers was caught having more than the allowed fish catch and was expected to pay a fine after that”

	Effectiveness of implemented fishing rules	“Not all fishing rules are effective; some people report incorrect fish catch in an available book”
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The next section provides an overview of the thematic summary results for 2013, which is important in identifying the changes that took place over time.

#### 4.4. Thematic Summary Results for 2013

This section summarises the 2013 study's results. It begins by outlining demographic characteristics: gender, age, race, and language and then presents the emergent themes: resource scarcity, climate variability, and policy and regulation.

##### 4.4.1. Demographic Characteristics

In 2013, both Bitouville and Melkhoutfontein fishing communities were exclusively male. In Bitouville, all 10 participants were coloured, while in Melkhoutfontein, 24 of 25 were coloured and one was white. All participants spoke Afrikaans as their first language, with median ages of 38 in Bitouville and 48 in Melkhoutfontein (e.g. Table 4.20).

Table 4.20: Demographic characteristics including gender, race, first language, and age in 2013

Demography	Bitouville (n=10)	Melkhoutfontein (n=25)
Gender	Male= 10 (100%) Female= 0%	Male= 25 (100%) Female= 0%
Race	Coloured= 10 (100%) Black= 0%	Coloured= 24 (96%) White= 1 (4%)
First language	100% Afrikaans	100% Afrikaans
Age	20-29 years= 1 (10%) 30-39 years= 5 (50%) 40-49 years= 1 (10%) 50-59 years= 2 (20%) >60 years= 1 (10%)	20-29 years= 0% 30-39 years= 3 (12%) 40-49 years= 12 (48%) 50-59 years= 7 (28%) >60 years= 3 (12%)
Median Age	38 years	48 years

In 2013, survey responses revealed that most participants in both communities relied heavily on fishing for income, 70% in Bitouville and 84% in Melkhoutfontein, with almost all lacking fishing rights (100% and 88%, respectively; e.g. Table 4.21).

Fishing trip durations varied. In Bitouville, 60% of respondents reported one-day trips, 30% indicated trips lasting three to six hours, and 10% said trips lasted one to three hours. In Melkhoutfontein, 76% reported one-day trips, 8% indicated trips of three to six hours, and 12% were unsure.

The frequency of fishing also varied widely in Bitouville, ranging from less than once a week to daily or weather-dependent schedules. Responses on fishing distance differed between communities: in Bitouville, 40% were unsure, 40% reported distances of one to five kilometres, 10% reported six to ten kilometres, and 10% indicated distances greater than ten kilometres. In Melkhoutfontein, 28% were unsure, 8% reported one to five kilometres, and 64% reported distances over ten kilometres. Participants noted varied changes in their fishing distances from the coast, including increases, decreases, or no change.

The primary commercially targeted species in both communities were silver kob, red roman, and shark.

Table 4.21: Responses in relation to the fishing activities in Bitouville and Melkhoutfontein in 2013

Fishing Activities	Bitouville (n=10)	Melkhoutfontein (n=25)
Ownership of fishing rights	Yes= 0% No= 10 (100%)	Yes= 3 (12%) No= 22 (88%)
Fishing as a primary occupation	Main occupation= 7 (70%) Not main occupation= 3 (30%)	Main occupation= 21 (84%) Not main occupation= 4 (16%)
The average length of the fishing trip	1-3 hours= 1 (10%) 3-6 hours= 3 (30%) One day= 6 (60%)	Not sure= 3 (12%) 3-6 hours= 2 (8%) One day= (20)76%
Days per week spent fishing.	Less than once a week= 0% 1-2 days a week= 2 (20%) 2-3 days a week= 3 (30%) 3-5 days a week= 3 (30%) Weather-dependent= 2 (20%)	Not sure= 3 (12%) Less than once a week 0% 1-2 days a week= 3 (12%) 2-3 days a week= 6 (24%) 3-5 days a week = 12 (48%) Every day of the week= 1 (4%)
Distance fishing from the coast	NA/Not sure= 4 (40%) 1-5km= 4 (40%) 6-10km=1 (10%) >10km= 1 (10%)	NA/Not sure= 7 (28%) 1-5km= 2 (8%) 6-10km= 0% >10km= 16 (64%)
Changes in distance from the coast where fishing takes place.	NA/Not sure= 3 (30%) Stayed the same= 5 (50%) Increased= 1 (10%) Decreased= 1 (10%)	NA/Not sure= 3 (12%) Stayed the same = 10 (40%) Increased= 11 (44%) Decreased= 2 (8%)
The three most targeted species for commercial purposes	Silver Kob ( <i>Argyrosomus inodorus</i> ) = 9 (90%) Red Roman ( <i>Chrysoblephus laticeps</i> ) = 7 (70%) Shark ( <i>Chondrichthyes</i> ) = 5 (50%)	Silver Kob ( <i>Argyrosomus inodorus</i> ) = 92% Red Roman ( <i>Chrysoblephus laticeps</i> ) = 64% Shark ( <i>Chondrichthyes</i> ) = 16 (64%)

#### **4.4.2. Emergent Themes For 2013 Study**

This section presents the results of the 2013 study, which are arranged in accordance with the emergent themes, including resource scarcity, climate variability, policy and regulation.

##### **4.4.2.1. Resource Scarcity**

Table 4.22 and Table 4.23 summarise the 2013 survey findings on changes in the marine environment, fish declines, and habitat diversity.

In 2013, 70% of Bitouville respondents and 88% of Melkhoutfontein respondents observed changes in their marine environment. In Bitouville, perceptions were mixed: 30% reported slight damage, 30% reported severe damage, 20% noted improvements, and 20% observed no change. In Melkhoutfontein, one respondent noted an improvement, while 52% described severe degradation.

Respondents attributed fish declines to various factors. In Bitouville, 20% each cited climate variability and inshore trawl fisheries, while 10% pointed to overfishing and anchor damage. In Melkhoutfontein, 40% attributed declines to inshore trawl fisheries, 16% each to climate variability and changes in weather patterns, and 8% to overfishing. Additionally, 40% of Bitouville and 20% of Melkhoutfontein respondents were unsure about the causes.

Suggestions to boost fish numbers varied. In Bitouville, 50% favoured removing trawlers, while the other 50% were unsure. In Melkhoutfontein, 48% supported removing trawlers, with smaller proportions recommending fish recovery measures (8%), regulating anchor use (8%), or establishing fish farms (12%); uncertainty remained high.

Regarding overharvesting, 60% in both communities believed that marine resources were not being overharvested, although 40% disagreed. Changes in the marine environment were also seen as impacting local livelihoods, 50% in Bitouville and 84% in Melkhoutfontein reported adverse effects.

Habitat diversity was generally viewed as high. In Bitouville, 70% reported very high diversity and 20% low diversity, whereas in Melkhoutfontein, 44% noted very high diversity, 32% high diversity, and 24% low diversity.

Finally, most Bitouville respondents reported a significant decline in fish numbers (50%), with 40% noting a moderate decline and 10% an increase. In Melkhoutfontein, 64% observed a significant decline, 28% a moderate decline, and 8% reported no change. Overall environmental change perceptions were mixed: in Bitouville, 40% felt the marine environment had worsened considerably, 50% moderately worsened, and 10% improved, while in Melkhoutfontein, 32% reported a significant decline, 40% a moderate decline, 18% an improvement, 12% no change, and 8% a substantial improvement.

Table 4.22: Responses relating to the changes in the marine environment in 2013

Changes in the marine environment	Bitouville (n=10)	Melkhoutfontein (n=25)
Observed changes in communities' marine resources during the lifetime	NA/Not sure= 1 (10%) Yes= 6 (70%) No=2 (20%)	Yes=22(88%) No= 3(12%)
Perception of changes in the local sea habitat	NA/Not sure= 0% Irreversibly damaged= 0% Badly damaged= 3(30%) Slightly damaged= 3(30%) Improved since you were a child=2(20%) The same=2(20%)	NA/Not sure=2(8%) Irreversibly damaged= 0% Badly damaged=13(52%) Slightly damaged=6(24%) Improved since you were a child=1(4%) The same= 3(12%)
Factors cause fish numbers to decline locally.	NA/Not sure= 4(40%) Pollution=0% Climate variability (in general) = 2(20%) Trawlers=2(20%) Changes in rainfall patterns=0% Changes in wind direction= 0% Changes in weather patterns=0% Overfishing= 1(10%) Damage by anchors= 1(10%)	NA/Not sure= 5(20%) Pollution= 0(0%) Climate variability (in general) = 4(16%) Trawlers= 10(40%) Changes in rainfall patterns= 0% Changes in wind direction= 0% Changes in weather patterns=4(16%) Overfishing=2(8%)
Factors increasing the number of fish in the sea	NA/Not sure=5(50%) Removing trawlers=5(50%) Enforce strict rules=0% Monitoring fish catches= 0%	NA/Not sure=6(24%) Removing trawlers=12(48%) Enforce strict rules= 0% Monitoring fish catches= 0% Allowing recovery of fish= 2(8%) Make plans for anchors= 2(8%) Fish farms=3(12%)
Factors increasing the number of fish in the sea	NA/Not sure= 33% Removing trawlers= 7% Enforce strict rules= 47% Monitoring fish catches= 13%	NA/Not sure= 9% Removing trawlers= 73% Enforce strict rules= 18% Monitoring fish catches= 0%
Perception of overharvesting of marine resources locally	Yes= 4(40%) No=6(60%)	Yes= 10(40%) No= 15(60%)
Observed changes to livelihood due to changes in the marine environment locally	NA/Not sure= 3(30%) Yes= 5(50%) No= 2(20%)	NA/Not sure= 1(4%) Yes=21(84%) No= 3(12%)
Diversity of marine habitat	NA/Not sure=1(10%)	NA/Not sure= 0%

	Very low= 0% Low=2(20%) High= 0% Very high= 7(70%)	Very low= 0% Low= 6(24%) High= 8(32%) Very high=11(44%)
Changes in the number of fish	NA/Not sure= 0% Big decrease= 5(50%) Decrease=4(40%) Same= 0% Increased= 0% Big increase= 1(10%)	NA/Not sure=1(4%) Big decrease= 16(64%) Decrease= 7(28%) Same=2(8%) Increased= 0% Big increase= 0%
The marine environment worsened or improved in the last five years.	NA/Not sure= 0% Worsened a lot= 4(40%) Worsened= 5(50%) Improved= 1(10%) Improved a lot= 0% Stayed the same= 0%	NA/Not sure= 1(4%) Worsened a lot= 8(32%) Worsened=10(40%) Improved=2(8%) Improved a lot=1(4%) Stayed the same= 3(12%)

In 2013, survey responses showed that both Bitouville and Melkhoutfontein residents primarily relied on family, skippers, loans, friends, neighbours, and company members for financial or basic needs support (e.g. Table 4.23). 60% of respondents in both communities reported that women do not hold leadership roles.

In Bitouville, 60% were very confident in seeking financial help, while in Melkhoutfontein confidence varied, 28% were not confident, 40% were slightly confident, and 24% were confident.

Community decision-making participation also differed. Sixty percent of Bitouville respondents were involved, compared to Melkhoutfontein where 48% were not involved, 28% were slightly involved, 12% were involved, and 16% were very involved. Similarly, involvement in marine protected area (MPA) decision-making was low: 90% in Bitouville and 76% in Melkhoutfontein reported no involvement, with only one respondent in Bitouville and 24% in Melkhoutfontein participating.

Perceptions of community leadership strength varied. In Bitouville, 40% reported no strong leadership, 20% described it as slightly strong, 10% as strong, and 30% as very strong. In Melkhoutfontein, 24% rated leadership as not strong at all, 32% as slightly strong, 20% as strong, and 24% as very strong. Access to community leadership also differed: 50% of Bitouville respondents reported no access, whereas only 12% in Melkhoutfontein lacked access, with 88% having access.

Regarding equality in access and control over livelihoods and resources between men and women, all Bitouville respondents (100%) and most Melkhoutfontein respondents (68%) perceived equality. However, 28% of Melkhoutfontein respondents, and one individual, felt that access and control were significantly unequal.

Finally, perceptions of vulnerability to future harm varied. In Bitouville, 10% were unsure, 50% believed some people were vulnerable, 10% felt most were vulnerable, and 30% thought everyone was vulnerable. In Melkhoutfontein, 4% reported no one was vulnerable, 40% said some were vulnerable, 24% felt most were vulnerable, and 32% believed everyone was vulnerable (e.g. Table 4.23).

Table 4.23: Survey responses in relation to the social capital, networks, and community cohesion in 2013

<b>Social capital, networks, and community cohesion</b>	<b>Bitouville (n=10)</b>	<b>Melkhoutfontein (n=25)</b>
The main source of assistance when you have financial, food, or basic needs	Family= 1(10%) Neighbours= 0% Friends= 0% Local organisation= 0% Take loans= 3(30%) Skipper=4(40%) No one= 1(10%)	Family= 13(52%) Neighbours= 3(12%) Friends= 1(4%) Local organisation= 0% Take loans=2(8%) Skipper/Boss= 3(12%) Company members= 1(4%) No one=5(20%)
<b>Gender equity</b>	<b>Bitouville (n=10)</b>	<b>Melkhoutfontein (n=25)</b>
Number of women in leadership roles in the community and positions	NA/Not sure= 1(10%) Yes=3(30%) No= 6(60%)	NA/Not sure= 0% Yes= 10(40%) No=15(60%)
<b>Networks</b>	<b>Bitouville (n=10)</b>	<b>Melkhoutfontein (n=25)</b>
Relative confidence in calling on someone for help financially	Not all confident= 1(10%) Slightly confident= 1(10%) Confident=2(20%) Very confident=6(60%)	Not all confident= 7(28%) Slightly confident= 10(40%) Confident= 6(24%) Very confident= 2(8%)
<b>Decision-making</b>	<b>Bitouville (n=10)</b>	<b>Melkhoutfontein (n=25)</b>
Degree of involvement in community decision-making	NA/Not sure= 0% Not at all involved= 2(20%) Slightly involved=1(10%) Involved=1(10%) Very involved= 6(60%)	NA/Not sure= 0% Not at all involved=12(48%) Slightly involved=7(28%) Involved=3(12%) Very involved= 4(16%)
Degree of involvement in MPA management/decision-making	NA/Not sure= 0% Not at all involved= 9(90%) Slightly involved= 1(10%) Involved= 0% Very involved= 0%	NA/Not sure= 0% Not at all involved= 19(76%) Slightly involved= 4(16%) Involved= 1(4%) Very involved= 1(4%)
<b>Leadership</b>	<b>Bitouville (n=10)</b>	<b>Melkhoutfontein (n=25)</b>
Strength of community leadership	Not at all strong= 4(40%) Slightly strong=2(20%) Strong= 1(10%) Very strong= 3(30%)	Not at all strong= 6(24%) Slightly strong=8(32%) Strong=5(20%) Very strong=6(24%)

Accessibility of community leadership	Never= 5(50%) Sometimes= 2(20%) Often= 0% Always= 3(30%)	Never= 3(12%) Sometimes=6(24%) Often=5(20%) Always= 11(44%)
<b>Equity</b>	<b>Bitouville (n=10)</b>	<b>Melkhoutfontein (n=25)</b>
Equality of access and control over livelihoods and resources between men and women	Not at all equal= 0% Quite unequal= 0% Nearly equal= 1(10%) Equal= 9(90%)	Not at all equal=1(4%) Quite unequal= 7(28%) Nearly equal=2(8%) Equal=15(60%)
Degree of vulnerability to future harm among different community members	NA/Not sure= 1(10%) No one= 0% Some= 5(50%) Most= 1(10%) Everyone= 3 (30%)	NA/Not sure= 0% No one= 1(4%) Some= 10(40%) Most= 6(24%) Everyone= 8(32%)

In 2013, most participants in both Bitouville (90%) and Melkhoutfontein (88%) contributed their income to household expenses. However, there was a stark contrast in emergency cash access: 80% of Bitouville respondents said it was impossible to obtain cash in emergencies, while 80% of Melkhoutfontein respondents reported it was possible (e.g. Table 4.24).

Savings were scarce, 90% in Bitouville and 88% in Melkhoutfontein had no savings. In Bitouville, loans were obtained from family (20%), small money lenders or banks (20%), skippers (40%), bosses (10%), and priests (10%), whereas Melkhoutfontein participants relied mainly on friends and family (60%), with smaller percentages obtaining loans from large companies (4%), small money lenders (8%), and banks (16%). Additionally, most respondents did not provide loans to others (60% in Bitouville and 72% in Melkhoutfontein).

Insurance options were limited. In Bitouville, only life (10%) and funeral (70%) insurance were available. In Melkhoutfontein, respondents had access to life (32%), house (4%), vehicle (8%), and funeral (44%) insurance.

Regarding vulnerability to income shocks, Bitouville responses were mixed: 40% felt it was impossible to endure shocks, 10% said it was slightly impossible, and 40% believed shocks could be endured, with one participant stating it was very possible. In Melkhoutfontein, 28% found it impossible to endure income shocks, 36% also said it was impossible, and 8% considered it possible.

Access to financial reserves during unemployment was more challenging in Melkhoutfontein, where 68% reported it was impossible, compared to an even distribution in Bitouville (40% impossible, 20% slightly impossible, 20% possible, and 20% very possible) (e.g. Table 4.24).

Table 4.24: Responses relating to the household income in 2013

<b>Household sharing income</b>	<b>Bitouville (n=10)</b>	<b>Melkhoutfontein (n=25)</b>
Contribution of each household member's income to household expenses	Yes= 9(90%) No= 1(10%)	Yes= 22(88%) No= 3(12%)
Possibility to obtain cash for an emergency today	Yes= 2(20%) No= 8(80%)	NA/Not sure= 1(4%) Yes= 20(80%) No= 4(16%)
<b>Savings</b>	<b>Bitouville (n=10)</b>	<b>Melkhoutfontein (n=25)</b>
Money set aside for emergencies	Yes= 1(10%) No= 9(90%)	Yes= 4(16%) No= 22(88%)
<b>Credit</b>	<b>Bitouville (n=10)</b>	<b>Melkhoutfontein (n=25)</b>
Loan provision	Friends and family=2(20%) Large companies= 0% Small money lenders/banks=2(20%) Skipper= 4(40%) Boss= 1(10%) Priest= 1(10%)	Friends and family=15(60%) Large companies= 1(4%) Small money lenders= 2(8%) Banks= 4(16%)
Loan provision for others in the past year	Yes= 4(40%) No= 6(60%)	Yes= 7(28%) No= 18(72%)
<b>Insurance</b>	<b>Bitouville (n=10)</b>	<b>Melkhoutfontein (n=25)</b>
Insurance policies available	Life= 1(10%) House= 0% Vehicle= 0% Income= 0% Boat= 0% Funeral= 7(70%)	Life= 8(32%) House= 1(4%) Vehicle=2(8%) Income= 0% Boat= 0% Funeral= 11(44%)
Ability to endure some income shocks	Impossible= 4(40%) Slightly impossible= 1(10%) Possible=4(40%) Very possible= 1(10%)	Impossible= 7(28%) Slightly impossible=7(28%) Possible=9(36%) Very possible=2(8%)
Ability to access financial reserves if unemployed	Impossible=4(40%) Slightly impossible=2(20%) Possible= 2(20%) Very possible= 2(20%)	Impossible= 17(68%) Slightly impossible= 2(8%) Possible= 4(16%) Very possible= 2(8%)

In 2013, all Bitouville participants and 84% of Melkhoutfontein participants owned a house, with 16% of Melkhoutfontein residents renting. None of the Bitouville respondents owned fishing boats, while 80% of Melkhoutfontein respondents did not; however, 20% had access to ski-boats measuring one to five metres (e.g. Table 4.25).

Table 4.25: Responses relating to household assets in 2013

Built house	Bitouville (n=10)	Melkhoutfontein (n=25)
Own/rent a house.	Do not own= 0% Own= 10(100%) Rent= 0%	Do not own= 0% Own= 21(84%) Rent= 4(16%)
Possession of a boat	No boat= 10(100%) Ski-boat= 0%	No boat= 20(80%) Ski-boat= 5(20%)
Number of boats	NA/Not sure= 0% None=10(100%) One to two boats= 0% Three to four boats= 0% >Five boats= 0%	NA/Not sure=20(80%) None= 0% One to two boats=5(20%) Three to four boats= 0% >Five boats= 0%
Size of boat	None= 0% One to five metres= 0% Six to ten metres= 0% >Ten metres= 0%	None= 20(80%) One to five metres=5(20%) Six to ten metres= 0% >Ten metres= 0%

Figure 6.1 shows the household assets that were possessed by participants in both towns in 2013, which included: vehicles (8), fishing gear (32), Televisions (34), gas or electric stoves (34), cell phones (31), piped water (34), refrigerators (32), Radio or cassette players (24), video or DVD players (24), electricity (34), washing machines (24), kerosene lamps (5), electric lamps (13), and garden or power tools (29) (see Figure 4.2).

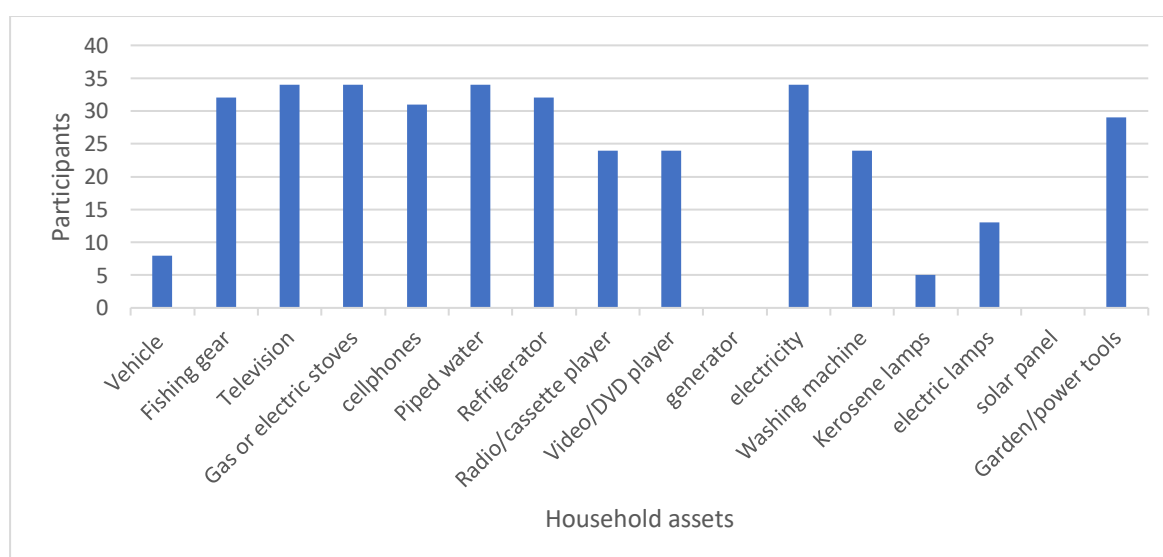


Figure 4.2: Household assets possessed by participants in 2013.

#### 4.4.2.2. Climate Variability

In 2013, perceptions of livelihood safety amid climatic exposure varied between the communities (e.g. Table 4.26). In Bitouville, 20% felt very secure, 30% felt safe, 40% considered their livelihood somewhat dangerous, and 10% felt it was very dangerous. In

Melkhoutfontein, 48% felt safe, 20% considered it somewhat dangerous, 12% deemed it dangerous, and 16% rated it very dangerous.

Regarding boat preferences for safety, 50% of Bitouville respondents preferred working with few boats, 30% preferred many boats, and 20% were unsure. In Melkhoutfontein, 48% preferred many boats, 32% preferred few boats, 8% preferred some boats, and 12% were unsure.

For windstorms, 70% of Bitouville respondents reported the occurrence of large storms, whereas 60% of Melkhoutfontein respondents said large storms did not occur, with 40% reporting their occurrence. Direct impacts from storms were experienced by 60% in Bitouville and 16% in Melkhoutfontein, while the remainder were not directly affected.

Household damage from storms was minimal: in Bitouville, 70% reported no damage (with 30% unsure), and in Melkhoutfontein, 30% reported no damage, 60% were unsure, and 10% reported major damage. No preventive actions were taken in either community.

Regarding fishing days lost due to storms, 60% of Bitouville respondents were unsure, 30% reported losing less than 10 days, and 10% reported a loss of one to three months. In Melkhoutfontein, 80% were unsure, 8% reported losing less than 10 days, 8% lost 10–30 days, and 4% lost one to three months.

Table 4.26: Responses relating to exposure and windstorms in 2013

<b>Personal exposure</b>	<b>Bitouville (n=10)</b>	<b>Melkhoutfontein (n=25)</b>
Perception of safety in current livelihood despite environmental/climatic exposure	Very safe=2(20%) Safe=3(30%) Somewhat dangerous= 4(40%) Slightly safe= 0% Dangerous= 0% Very dangerous=1(10%) Not safe at all= 0%	Very safe= 0% Safe= 12(48%) Somewhat dangerous= 5(20%) Slightly safe= 0% Dangerous= 3(12%) Very dangerous= 4(16%) Not safe at all= 0%
Preference of working with many boats for safety reasons	NA/Not sure= 2 (20%) None= 0 Few= 5 (50%) Some= 0% Many= 3 (30%)	NA/Not sure= 3 (12%) None= 0 Few= 8 (32%) Some= 2 (8%) Many= 12 (48%)
<b>Windstorms</b>	<b>Bitouville (n=10)</b>	<b>Melkhoutfontein (n=25)</b>
Occurrence of large storms in the past five years	Yes= 7 (70%) No= 3 (30%)	NA/Not sure=0% Yes= 10 (40%) No= 15 (60%)

Personally, directly impacted by the storm	NA/Not sure= 3 (30%) Yes= 6 (60%) No= 1 (10%)	NA/Not sure= 15 (60%) Yes= 4 (16%) No= 6 (24%)
Degree of damage to household	NA/Not sure= 3 (30%) No damage= 7 (70%) Moderate damage= 0% Major damage= 0% Catastrophic= 0%	NA/Not sure= 15 (60%) No damage= 9 (30%) Moderate damage= 0% Major damage= 1 (4%) Catastrophic= 0%
Actions that were taken to prevent future considerable storm damage	NA/Not sure= 10 (100%) Yes= 0% No= 0%	NA/Not sure= 24 (96%) Yes= 0% No= 1 (4%)
Actions that were taken to prevent future considerable storm damage	NA/Not sure= 10 (100%) Fixed roof= 0% Stayed indoor= 0%	NA/Not sure= 25 (100%) Fixed roof= 0% Tuned in to local radio and news for updates= 0%
Fishing days lost	NA/Not sure= 6 (60%) Less than 10 days= 3 (30%) 10-30 days= 0% More than 1-3 months= 1 (10%)	NA/Not sure= 20 (80%) Less than 10 days= 2 (8%) 10-30 days= 2 (8%) More than 1-3 months= 1 (4%)

Table 4.27 summarises the 2013 survey responses on drought conditions. In both Bitouville and Melkhoutfontein, 56% of respondents reported changes in drought conditions, while 50% in Bitouville and 44% in Melkhoutfontein reported no changes. Only 30% in Bitouville and 24% in Melkhoutfontein noted clear drought impacts, with 50% and 30% reporting no impacts, respectively; the remainder were unsure (50% in Bitouville, 40% in Melkhoutfontein).

Regarding severity, in Bitouville, 50% were unsure, 20% reported the drought was not severe, and 30% described it as slightly severe. In Melkhoutfontein, 56% were unsure, 20% reported no severity, and 24% considered it slightly severe.

Finally, most respondents were uncertain about the number of fishing days lost due to drought, 90% in Bitouville and 96% in Melkhoutfontein, with only one respondent in each community reporting a loss (less than 10 days in Bitouville; 10–30 days in Melkhoutfontein).

Table 4.27: Survey responses pertaining to drought in 2013

Changes related to Drought	Bitouville (n=10)	Melkhoutfontein (n=25)
Changes in drought conditions	NA/Not sure= 0% Yes= 5 (50%) No= 5 (50%)	NA/Not sure= 0% Yes= 14 (56%) No= 11 (44%)
Impacts of changes	NA/Not sure= 5 (50%) Yes= 3 (30%) No= 2 (20%)	NA/Not sure= 10 (40%) Yes= 6 (24%) No= 9 (30%)

Severity of changes	NA/Not sure= 5 (50%) Not severe= 2 (20%) Slightly severe= 3 (30%) Severe= 0% Very severe= 0%	NA/Not sure= 14 (56%) Not severe= 5 (20%) Slightly severe= 6 (24%) Severe= 0% Very severe= 0%
Days proceeded to the sea	NA/Not sure= 9 (90%) Less than 10 days= 1 (10%) 10-30 days= 0% More than 1-3 months= 0%	NA/Not sure= 24 (96%) Less than 10 days= 0% 10-30 days= 1 (4%) More than 1-3 months= 0%

In 2013, perceptions of environmental risk and responses varied between Bitouville and Melkhoutfontein (e.g. Table 4.26). In Bitouville, 20% perceived no risk, 10% low risk, 30% medium risk, and 40% high risk. In Melkhoutfontein, only 4% saw no risk, 8% low risk, 36% medium risk, and 52% high risk.

Regarding anxiety about environmental changes, 70% of Bitouville respondents reported no anxiety, with only a small minority expressing concern. In Melkhoutfontein, 28% were not anxious, 24% felt a little scared, 32% were scared, and 16% were very scared.

All respondents in both communities recognized that weather changes threatened fishing. In Bitouville, 20% reported that catching fish had become difficult compared to the past, while 80% experienced some difficulty. In Melkhoutfontein, only 8% found it not difficult, with the remaining 92% reporting some difficulty.

Observations on marine species also varied. In Bitouville, 20% observed no change, 60% noted few changes, and 20% reported many changes. In Melkhoutfontein, 32% saw no change, 20% observed few changes, 20% noticed some changes, and 36% reported many changes.

Climate change awareness was moderate: 60% of Bitouville respondents and 76% of Melkhoutfontein respondents were aware, leaving 40% and 24% unaware, respectively. Nevertheless, most reported experiencing climate change effects, 70% in Bitouville and all in Melkhoutfontein, with 20% in Bitouville not reporting any change and one respondent unsure.

All respondents had access to climate change information. In Bitouville, sources included newspapers (10%), TV or radio (10%), friends and family (20%), the internet (10%), personal observations (30%), other fishers (10%), and skippers (10%). In Melkhoutfontein, TV or radio was the primary source (84%), followed by newspapers

(20%), friends and family (12%), the internet (12%), observations (16%), academic societies (4%), and other fishers (8%).

Table 4.28: Survey responses pertaining to the attitude and perception of climate change in 2013

<b>Attitude and perception</b>	<b>Bitouville (n=10)</b>	<b>Melkhoutfontein (n=25)</b>
Perceived level of risk to the community from environmental change	None= 2(20%) Low= 1(10%) Medium= 3 (30%) High= 4(40%)	None=1(4%) Low= 2(8%) Medium= 9(36%) High= 13 (52%)
Degree of anxiety felt about environmental changes observed locally.	Not at all scared/anxious= 7(70%) Little scared/anxious= 2(20%) Scared/anxious= 1(10%) Very scared/anxious= 0%	Not at all scared/anxious= 7(28%) Little scared/anxious=6(24%) Scared/anxious=8(32%) Very scared/anxious= 4(16%)
Perceived level of danger to fishing from weather changes	Not at all dangerous= 0% Slightly dangerous=1(10%) Dangerous= 3(30%) Very dangerous=2(20%)	Not at all dangerous= 0% Slightly dangerous=7(28%) Dangerous= 9(36%) Very dangerous= 9(36%)
Degree of difficulty in finding/catching fish compared to the past	Not at all difficult= 2(20%) Slightly difficult= 3(30%) Difficult= 3(30%) Very difficult= 2(20%)	Not at all difficult=2(8%) Slightly difficult= 4(16%) Difficult= 8(32%) Very difficult= 11(44%)
The number of changes in marine species observed locally.	No changes= 2(20%) Few changes= 6(60%) Changes= 0% Many changes=2(20%)	NA/Not sure= 0% No changes= 8(32%) Few changes= 5(20%) Changes=7(28%) Many changes= 9(36%)
Number of ideas held to ensure the sustainability of the target fish species locally	No ideas= 3(30%) Few ideas=6(60%) Some ideas= 0% Many ideas=1(10%)	No ideas= 8(32%) Few ideas=8(32%) Some ideas= 5(20%) Many ideas= 4(16%)
<b>Climate change</b>	<b>Bitouville (n=10)</b>	<b>Melkhoutfontein (n=25)</b>
Awareness of climate change	Yes= 6(60%) No=4(40%)	Yes=19 (76%) No=6 (24%)
Experience of climate change	NA/Not sure=1(10%) Yes=7(70%) No= 2(20%)	Yes=25(100%) No= 0%
Access to climate change information	NA/Not sure= 0% No access= 0% Newspapers= 1(10%) TV/Radio= 1(10%) Academic society= 0% My friends and family= 2(20%) The internet= 1(10%) Observations= 3(30%) Other fishers= 1(10%) Skipper= 1(10%)	NA/Not sure= 0% No access= 0% Newspapers=5(20%) TV/Radio= 21(84%) Academic society=1(4%) My friends and family= 3(12%) The internet= 3(12%) Observations= 4(16%) Other fishers= 2(8%)

#### 4.4.2.3. Policy and Regulation

Table 4.29 summarises the 2013 findings on natural resource management, fishing rules, catch reporting, and community organisations.

All respondents in both Bitouville and Melkhoutfontein reported the presence of natural resource management institutions. In Bitouville, these included community agreements on marine-managed areas (10%), government-controlled management (70%), and industry-led management (10%). In Melkhoutfontein, 96% reported government-controlled management.

Regarding fishing rules, 100% of Bitouville respondents and 76% of Melkhoutfontein respondents noted changes due to environmental factors. In Bitouville, 50% reported stricter rules and 50% observed changes in fish catch and quantity. In Melkhoutfontein, 36% reported each for stricter rules and changes in catch and quantity, while one respondent noted no change and 24% were unsure.

In terms of fish catch reporting, 70% of Bitouville respondents did not report their catches, whereas 76% of Melkhoutfontein respondents did. Bitouville respondents who reported used a logbook and informed crew members, while in Melkhoutfontein, catches were recorded in a logbook and reported to the harbour or DFFE, crew members, middlemen, or Viking companies.

Community organisations in Bitouville were limited to police meetings and a fishers club, while Melkhoutfontein featured a creche, church, fishers club, and housing committee.

Table 4.29: Responses relating to the resource management institutions in 2013

Resource management institutions	Bitouville (n=10)	Melkhoutfontein (n=25)
The presence of natural resource management institutions in the community	Yes= 10(100%) No= 0%	Yes= 25(100%) No= 0%
Type of management system	NA/Not sure= 1(10%) No management system= 0% Traditional management= 0% Community agreement on a marine-managed area= 1(10%) Written management plan= 0% Government-controlled management= 7(70%) Industry-led management= 1(10%)	NA/Not sure=1(4%) No management system= 0% Traditional management= 0% Community agreement on a marine-managed area= 0% Written management plan= 0% Government-controlled management= 24(96%) Industry-led management= 0%
Level to which rules have changed due to environmental changes	NA/Not sure= 0% Yes= 10(100%) No= 0%	NA/Not sure= 1(4%) Yes= 19(76%) No= 4(16%)
Changes in fishing rules	NA/Not sure= 0% No changes= 0% Strict fishing rules=5(50%)	NA/Not sure=6(24%) No changes=1(4%) Strict fishing rules= 9(36%)

	Changes in fish catch and quantity= 5(50%)	Changes in fish catch and quantity= 9(36%)
Degree of recording/reporting of catches required	NA/Not sure= 1(10%) Yes= 2(20%) No= 7(70%)	NA/Not sure=1(4%) Yes= 19(76%) No= 4(16%)
Reporting catch	NA/Not sure=6(60%) No one= 1(10%) Harbour/DFFE= 0% Book available to fishers to record catch= 1(10%) Crew= 2(20%)	NA/Not sure= 1(4%) No one= 0% Harbour/DFFE= 14(56%) Book available to fishers to record catch= 6(24%) Crew=1(4%) Middlemen=2(8%) Viking company= 1(4%)
Community organisations	NA/Not sure= 7(70%) Rugby club= 0% Creche= 0% Church= 0% Neighbourhood watch= 0% Senior citizens club= 0% Youth wellness= 0% Fire rescue= 0% Police meetings= 2(20%) Fishers club= 1(10%)	NA/Not sure=11(44%) Rugby club= 0% Creche= 1(4%) Church= 1(4%) Neighbourhood watch= 0% Senior citizens club= 0% Youth wellness= 0% Melkhoutfontein association club= 0% Fire rescue= 0% Fishers club=9(36%) Housing committee= 3(12%)

Table 4.30 shows that in 2013 most respondents reported illegal fishing—90% in Bitouville and 80% in Melkhoutfontein—with only 10% and 20% respectively reporting no illegal fishing. Regarding rule-breakers, in Bitouville one respondent said no one broke the rules, four said a few did, two said most did, and three said everyone did; in Melkhoutfontein, four reported that no one did, nine said a few did, four said most did, and eight said everyone did. In terms of enforcement, 80% of Bitouville and 60% of Melkhoutfontein respondents felt that fishing rules were well enforced, although some reported minimal or no enforcement. Conflicts were generally uncommon, but they did occur among participants.

Table 4.30: Responses relating to the fishing compliance and conflict in 2013

Fishing compliance and conflict	Bitouville (n=10)	Melkhoutfontein (n=25)
Relative occurrence of illegal fishing locally	Does not occur at all= 1(10%) Occurs a little= 1(10%) Occurs= 4(40%) Occurs a lot= 4(40%)	Does not occur at all= 5(20%) Occurs a little= 8(32%) Occurs= 8(32%) Occurs a lot= 4(16%)
Number of people who know those who break the rules	No one= 1(10%) A few people= 4(40%) Most people= 2(20%) Everyone=3(30%)	No one= 4(16%) A few people= 9(36%) Most people= 4(16%) Everyone= 8(32%)

Enforcement of fishing rules in the area	Not enforced at all= 1(10%) Enforced a little= 1(10%) Just enforced= 0% Well-enforced= 8 (80%)	Not enforced at all= 0% Enforced a little= 4(16%) Just enforced= 6(24%) Well-enforced=15(60%)
Relative occurrence of conflict among fishers	Do not occur ever= 3(30%) Not very common=4(40%) Common=2(20%) Very common= 1(10%)	Do not occur ever= 5(20%) Not very common= 8(32%) Common= 9(36%) Very common= 3(12%)

#### 4.5. Social Vulnerability Scores

This section presents the overall social vulnerability scores from the 2013/2014 and 2023 studies (e.g. Table 4.31), comparing trends over the past 10 years. Table 4.31 indicates that the themes of resource scarcity, climate variability, and policy and regulation are consistent across both studies, with COVID-19 emerging as an additional theme in 2023. However, the factors driving social vulnerability have changed. Key components influencing sensitivity, exposure, and adaptive capacity include social and economic dependence on fishing, the COVID-19 pandemic, policy and regulation, occupational flexibility, and resource capitals (e.g. Table 4.31).

Table 4.31: Indicates a comparison of 2013/2023 vulnerability scores arranged by categories (sensitivity, exposure, and adaptive capacity), components and community: B-2013 and B-2023 representing Bitouville 2013 and 2023, and M-2013 and M-2023 representing Melkhoutfontein 2013 and 2023 results. Additionally, the following themes have been highlighted: resource scarcity (blue colour), climate change (green colour), policy and regulation (Gold colour), and pandemic (orange)

Categories	Components	Themes	B- 2023	B- 2013	M- 2023	M- 2013
Sensitivity	Social dependence on fishing	Resource scarcity	0,77	0,41	1,91	0,49
	Historical and cultural dependence on fishing		2,68	2,16	3,03	2,19
	Economic dependence on fishing		0,72	0,89	0,66	1,08
	Economic dependence on other resources		2,69	1,31	2,56	1,14
	<b>Overall Sensitivity</b>		<b>1,72</b>	<b>1,19</b>	<b>2,04</b>	<b>1,22</b>

Exposure	Environmental change	Climate change	2,86	1,23	2,48	1,19
	Pandemic	Pandemic	1,37	Not available	1,6	Not available
	Attitude and perception	Climate Change	2,86	1,32	2,75	1,47
	<b>Overall Exposure</b>		<b>2,36</b>	<b>1,27</b>	<b>2,28</b>	<b>1,33</b>
Adaptive Capacity	Personal flexibility	Resource scarcity	2,16	2,59	2,54	2,54
	Occupational flexibility		1,25	2	1,65	1,96
	Comprehensive policy and regulation	Policy and Regulation	1,17	1,6	1,56	1,91
	General Conflicts		2,19	2,6	2,57	2,53
	Attitude and perception	Climate change	2,95	2,54	3,18	2,81
	Social capital	Resource scarcity	1,58	1,93	1,8	1,96
	Human Capital		2,87	1,94	2,75	1,85
	Financial Capital		1,97	1,74	1,82	1,77
	Physical Capital		2,4	3,21	2,46	2,9
	Adaptation options	Climate change	1,92	2,27	2,06	3,01
	Economic dependence	Resource scarcity	1,9	2,73	1,86	2,64
	Historical and cultural dependence		1,83	2,7	1,82	2,67
	Social dependence		2,95	3,48	3,61	3,02
	Natural Capital		2,15	2,13	2,17	2,41
	<b>Overall Adaptive capacity</b>		<b>2,09</b>	<b>2,39</b>	<b>2,28</b>	<b>2,43</b>
<b>Vulnerability</b>		<b>1,94</b>	<b>0,63</b>	<b>2,03</b>	<b>0,66</b>	

Table 4.31 shows that overall social vulnerability scores varied among communities. In 2023, Bitouville's SSFs scored 1.94 (least vulnerable) and Melkhoutfontein's 2.03, while

in 2013, Bitouville and Melkhoutfontein scored 0.64 and 0.66 respectively (indicating higher vulnerability). These differences were driven by three factors: sensitivity, exposure, and adaptive capacity. Sensitivity, reflecting social, economic, and historical dependence on fishing, was the primary driver in both studies. Exposure, shaped by attitudes toward environmental changes and the COVID-19 pandemic, also contributed, while Adaptive Capacity, defined by available resource capitals (social, human, financial, and physical), further influenced vulnerability levels.

#### **4.6. Summary**

This chapter highlights the social vulnerabilities faced by SSFs in Bitouville and Melkhoutfontein in both 2013/14 and 2023, examining themes such as resource scarcity, climate variability, COVID-19, and policy and regulation.

The social vulnerability scores indicate that Bitouville was more vulnerable than Melkhoutfontein in both periods. This finding underscores the need to understand the drivers of social vulnerability and how they change over time to implement effective adaptive strategies. Failure to address these drivers may further marginalise SSFs and threaten the sustainability of the fishing sector.

The next chapter provides a discussion of the 2023 results, aligned with the identified emergent themes.

## **Chapter Five: Untangling Key Results and Significance from the Southern Cape Fishing Communities**

### **5.1. Introduction**

In South Africa, fisheries play an important role in coastal livelihoods, as discussed in Section 1.1, directly and indirectly supporting the livelihoods of thousands of people and contributing towards food security (FAO, 2020, 2022, 2024; WorldFish, 2023). In particular, fisheries play an important socio-economic role in impoverished coastal communities, including SSF communities located in Bitouville and Melkhoutfontein, which is the focus of the study. As discussed in Sections 1.2.1 and 3.2, these coastal towns are located in the southern Cape and are inhabited by marine-dependent fishing communities reliant on fishing to support their livelihoods (Martins *et al.*, 2019; Andra, 2022).

This chapter looks at the importance of understanding vulnerability among SSFs and its implications for them. Vulnerability, as discussed in the literature review (see Chapter Two, Section 2), incorporates three components: exposure, sensitivity, and adaptive capacity (e.g. Aswani *et al.*, 2019). This chapter discusses the results from Chapter Four to address the following research questions: 1) What are the drivers of vulnerability among SSFs in the southern Cape? and 2) What are the associated impacts of COVID-19 on the vulnerability of SSFs in the southern Cape?

The chapter has adopted the following structure: First, the demographic characteristics are highlighted, particularly the influence of age and gender on fishing activities. Second, a detailed discussion of the cross-cutting emergent themes (e.g. resource scarcity, climate variability, the COVID-19 pandemic, and policy and regulation) is provided. Lastly, concluding remarks for the chapter are provided.

### **5.2. The Influence of Gender and Age in Fishing Activities**

Gender and age emerge as two important demographic characteristics in these towns.

#### **5.2.1. Contributions and Challenges of Women Fishers**

Fishing in Bitouville and Melkhoutfontein has traditionally been dominated by male fishers (e.g. Andra 2022). Here too, most participants in Bitouville (73%) and Melkhoutfontein (91%) were male fishers (e.g. Section 4.2.1, Table 4.1 and Appendix G).

However, women, whose contributions have historically been undervalued in fishing all over the world (e.g. Kleiber, Harris and Vincent, 2015; Harper, 2017, 2019; Preez, 2018; Pedroza-Gutiérrez and Hapke, 2022), also participate in various fishing activities in these two towns. This observation is consistent with the broader findings of the FAO (Jennifer, 2016), which emphasise that while men are often at the forefront of commercial fishing activities, women play a critical role in supporting the sector through resource processing, marketing, and household sustenance. For example, in Bitouville, four women (27%) were directly involved in harvesting marine resources from the intertidal zone, while in Melkhoutfontein, one woman was observed undertaking similar activities while male fishers crewed small-scale line-fishing boats.

Within the context of this research, women fishers make important contributions to household livelihoods, some through their direct and indirect involvement in fishery activities. In addition to harvesting, women engage in seasonal employment, often in domestic work in larger holiday towns such as Gouritsmond and Still Bay, which further supplement household income. This is consistent with other studies where, in instances where male fishers are unable to secure sufficient earnings, women play a pivotal role in ensuring economic stability (FAO, 2018).

Notably, information relating to the involvement of women in decision-making processes, particularly in South Africa, is limited or, in some cases, unavailable (Harper, 2017). This lack of recognition not only undermines community resilience but also limits women's access to broader economic opportunities (e.g., Koralagama, Gupta and Pouw, 2017; Rohe, Schlüter and Ferse, 2018). Addressing these challenges requires empowering women through targeted training, the creation of inclusive decision-making platforms, and recognising their indispensable role in fisheries management.

Apart from the contributions and challenges faced by women fishers, age has also played an important role in shaping the fishing sector in Bitouville and Melkhoutfontein.

### **5.2.2. Age and Fishing Activities**

The median age of the participants of Bitouville town was 45 years in 2023 (see section 4.2.1), indicating that a cohort of younger fishers make up the fishing sector. Although

considering that the median age in South Africa is 28,5 years,<sup>10</sup> this cohort can be considered younger when contrasted with Melkhoutfontein. The entrance of younger fishers here is likely necessitated by the limited employment opportunities in other sectors and limited skills outside of the fishing sector in the town (Gammage, Jarre and Mather, 2017a). These factors certainly play an important role in their adaptive capacity when considering changing socio-economic and environmental conditions. This is not unique to Bitouville, with numerous authors (Maddox, Allison and Daw, 2009; Mbatha, Coulthard and Rohe, 2012; Krogseng, 2016; Gammage, Jarre and Mather, 2017a; Auld and Feris, 2022) highlighting that adaptive capacity through diversification is often constrained by conditions beyond the fishery. In Bitouville, the younger entrants to the fishery may also have long-term positive implications such as introducing new energy and new knowledge, perhaps moving the fishery towards better sustainability. This is echoed by Rubel (2022), who posits that the prevalence of younger fishers introduces new energy and perspectives into the fishery, thus improving adaptive capacity.

In contrast, the median age of the participants of Melkhoutfontein town was 57 years in 2023, indicating that an ageing cohort of fishers dominates the local linefishery, a finding that is similar to previous research by Gammage (2015) and Gammage, Jarre and Mather (2017a, b). In Melkhoutfontein, closer to the larger Still Bay with a diversity of economic activities, younger people have more employment prospects (including retail and construction work) and opt not to engage in more risky livelihood activities such as fishing. Education levels also played a role, with the older cohort of fishers being limited in opportunities for diversification due to lower levels of education (e.g. Appendix G). The culture of fishing (Gammage, Jarre and Mather, 2019) may also have contributed to the dominance of older fishers in the fishing sector as they hold knowledge about fishing that has been passed from generation to generation.

The dominance of an ageing cohort of fishers may also threaten the future existence of the fishing sector as most of the fishing activities that are carried out require physical strength and long working hours (e.g. Jeżewska, 2012), which may be challenging for older fishers, resulting in them retiring or being inactive. Additionally, the knowledge possessed

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<sup>10</sup> [https://census.statssa.gov.za/assets/documents/2022/P03014\\_Census\\_2022\\_Statistical\\_Release.pdf](https://census.statssa.gov.za/assets/documents/2022/P03014_Census_2022_Statistical_Release.pdf)

by the ageing cohort of fishers may not be passed on to future generations due to the limited number of younger fishers entering the fishing sector, thus making it difficult to plan, manage marine resources, and adapt to changing conditions (e.g. Oliveto-Andrade *et al.*, 2024).

Similar research conducted in the southern Cape with skippers, business owners, and rights holders revealed that approximately 12% of the fishers were retired or inactive (Gammage, Jarre and Mather, 2019). In Melkhoutfontein, informal conversations revealed that some of the fishers were inactive, indicating that SSFs in this town are leaving the sector over time and that the number of fish is declining in comparison to what was reported by the earlier work of Gammage (2019).

The issue of age influencing fishing activities is not unique to the southern Cape. Research undertaken in Ghana reported that age and health contribute to the retirement of fishers (Ewusi, 2021).

The next section provides a brief description of the cross-cutting themes (e.g. Table 4.20) that emerged during data analysis. These themes are linked to the GULLS framework (e.g. section 2.2.5)

### **5.3. Cross-Cutting Emergent Themes**

In this section, I provide a detailed discussion of the social vulnerability scores for Bitouville (1.94) and Melkhoutfontein (2.03) in 2023. These scores revealed that Bitouville faced more vulnerability than Melkhoutfontein (e.g. section 4.5, Table 4.31). This discussion of the social vulnerability scores is based on cross-cutting themes that emerged across this study's results (e.g. Table 5.1), including 1) resource scarcity, one of the key stressors contributing to the social vulnerability of SSFs by impacting their ability to maintain their livelihoods; 2) climate variability, which adds a layer of complexity to the marine SES of the southern Cape and continues to threaten the livelihoods of SSFs due to unpredictable weather and disruptions to the distribution patterns of marine species (Jarre, Ragaller and Hutchings, 2013; Gammage, Jarre and Mather, 2017b), 3) the COVID-19 pandemic, which exacerbated the social vulnerability of SSFs and 4) policy and regulation, particularly South Africa's SSFP, which is faced with challenges including rights allocation, and delay in implementation (Sowman and Sunde, 2021). Additionally,

the presentation of the emergent themes in line with the GULLS framework is to allow the readers to be able to continue to see the link.

Table 5.1: Emergent themes: resource scarcity (blue), climate change (green), the COVID-19 pandemic (orange), and policy and regulation (plum) in line with the GULLS framework

<b>Emergent theme</b>	<b>Components (in framework)</b>	<b>Subcomponents (in framework)</b>	<b>Category (in framework)</b>
<b>Resource Scarcity</b>	Social dependence on fishing	Attachment to place, fishing frequency, attachment to fishing	<b>Sensitivity</b>
	Historical and cultural dependence on fishing	Cultural importance of fishing, local ecological knowledge, and social mobility	
	Economic dependence on fishing	Competition for fish	
	Economic dependence on other resources	Social incentives and food sources	
	Personal flexibility	Employability, perception of risk, and interest in adapting	<b>Adaptive Capacity</b>
	Occupational flexibility	Occupational mobility and capacity to anticipate change and develop response strategies	
	Resource capital	Decision-making, networks, gender equity, leadership, and community cohesion	
		Education, skills, health, knowledge, age, and migration	
		Insurance, credit, debt, savings, household income, income shocks	
		Resource base change	
Built house and house conditions, boat assets, material assets, infrastructure			

<b>Climate Variability</b>	Environmental change	Storms, wind speed and direction, rainfall, sea state conditions, drought	<b>Exposure</b>
	Attitude and perception	Attitude to change, perceptions of change, interest in the environment	<b>Adaptive Capacity</b>
	Adaptation options	Climate change adaptation options	
<b>Pandemic</b>	pandemic	COVID-19	<b>Exposure</b>
<b>Policy and Regulation</b>	Comprehensive policy and regulation	Markets and resource management institutions	<b>Adaptive Capacity</b>
	General conflicts	Fishing compliance, access to institutional safety nets and information	

### 5.3.1. Resource Scarcity

As highlighted in Table 5.1, resource scarcity is one of the themes that emerged across this study's results. The issue is not new; previous research (including Gammage, Jarre and Mather, 2017 a, b) identified it as one of the stressors contributing to the inshore socio-ecological system in the southern Cape (e.g. section 2.4.1). Drawing on this study's results, the section below provides a description of fish scarcity and its implications for the vulnerability of SSFs.

#### 5.3.1.1. Confronting Fish Scarcity

Fishing is an important livelihood activity that provides income (Gammage, Jarre and Mather, 2017a; Gammage, Jarre and Mather, 2017b; Gammage, Jarre and Mather, 2019), an important contributor to the fisher's ability to respond to change. However, this livelihood activity is threatened by myriads of pressures (including inshore trawl fishery landing), leading to fish scarcity as well as exacerbating the vulnerability of SSFs (Visser, 2015; Gammage, Jarre and Mather, 2017a; Ward, 2018; Gammage, Jarre and Mather, 2019; Martins *et al.*, 2019). The decline in targeted fish species is one of the challenges faced by SSFs in Bitouville and Melkhoutfontein.

The top three most targeted fish species in Bitouville included silver kob, red roman, and shallow-water Cape hake in 2023 (e.g. Table 4.2). Conversely, in Melkhoutfontein, the top three most targeted fish species included silver kob, red roman, and carpenters or silvers

in 2023 (e.g. Table 4.2). The species targeted in Bitouville and Melkhoutfontein are not surprising, as prior research (Duggan, 2012; Duggan, Green and Jarre, 2014; Gammage, Jarre and Mather, 2017 a,b) also show similar trends in the species targeted. Surprisingly, Gammage, Jarre and Mather (2017a) found that shallow-water Cape hake had not been available in the recent past, but this study's results revealed some limited availability of shallow-water Cape hake, particularly in Bitouville. This suggests that the shallow-water hake stocks may be recovering in the area, and may in future be targeted more regularly (DFFE, 2023).

Participants in Bitouville (86%) and Melkhoutfontein (100%) in 2023 noted a decline in the availability of silver kob, red roman, and carpenter (only in Melkhoutfontein). According to the DFFE (2023), silver kob and red roman are considered to be overfished. The decline in the availability of these species can be attributed to various factors, such as overfishing (e.g. Haupt *et al.*, 2020; DFFE, 2023) and, in the case of silver kob, the inshore trawl fishery lands the silver kob as bycatch (Walmsley, Leslie and Sauer, 2007; Attwood, Petersen and Kerwath, 2011; Greenston, 2014; Besseling, 2023). The change in the availability of these species greatly affects the livelihood of SSFs by reducing their income (Auld and Feris, 2022) and threatening their food security, further exposing them to poverty.

Approximately half of the participants in Bitouville (53%) and most participants in Melkhoutfontein (91%) in 2023 indicated that their marine environment has deteriorated over time and attributed this to pollution (e.g. Islam and Tanaka, 2004; James, 2013; Cabral, 2019). Even though participants did not provide much detail on the issue of pollution, they reported that nutrient pollution due to agricultural runoff after heavy or extreme rainfall strongly affected the distribution and availability of fish resources. These results were consistent with other research highlighting that nutrient pollution threatened water quality, thus affecting the availability of fish and influencing the ecological resilience of marine systems (Adams *et al.*, 2020; Whitfield and Mann, 2023).

Some participants in Bitouville (27%) and Melkhoutfontein (27%) in 2023 linked climate variability to declining fish resources within the marine environment, leading to fish scarcity, which increased the vulnerability of SSFs. This is also echoed by Gammage, Jarre and Mather (2017 a, b) and Ward (2018), who found that climate variability was

leading to changing patterns in the sea surface temperatures and availability of nutrients, thereby affecting the abundance of fish species. The impacts of climate variability on SSFs are further unpacked in section 5.3.2.

Participants in Bitouville (80%) and Melkhoutfontein (45%) in 2023 reported that their marine resources were overharvested. The greater perception of overharvesting in Bitouville suggests that participants in this community are heavily dependent on marine resources to support their livelihoods and food security. This is concerning as the overharvesting of these resources poses serious threats to their ability to generate income, thus exacerbating their vulnerability and ability to adapt to changing conditions (Yanda, Mabhuye and Johnson, 2019). The next section discusses the economic vulnerability caused by fish scarcity among SSFs.

#### **5.3.1.2. Increased Economic Costs of Fish Scarcity**

The scarcity of fish resources in the marine environment is linked to threats such as the inshore trawl fishery, pollution, climate variability, and overharvesting, which have pushed SSFs to go beyond where they normally catch fish, which poses economic challenges. Participants highlighted those economic challenges, such as increased fishing distance from the coast, adversely impacted SSFs as travelling longer distances to catch fish resources requires more fuel. The increase in fuel cost makes it particularly challenging for SSFs who are already facing multiple levels of vulnerability, including poverty, where these added economic costs further worsen existing poverty levels. These results were consistent with other research (Gammage, Jarre and Mather, 2019) that found that fishers were travelling further to catch marine species in the absence of silver kob, confirming the scarcity of fish resources.

#### **5.3.1.3. Navigating Financial Pressures Amid Fish Scarcity**

SSFs in the southern Cape have limited access to financial resources, influencing fishers' adaptive capacity amid natural resource scarcity (e.g. Gammage, Jarre and Mather, 2017a, 2017b; Gammage, Jarre and Mather, 2019). Although the majority of the participants in this study did not want to provide details of their household income (see Table 3.4), previous research (Gammage, Jarre and Mather, 2019) conducted in the southern Cape found self-reported household incomes of less than ZAR 5,000.00 per

month. Some were below the national poverty lines: the food poverty line (ZAR 386), the lower-bound poverty line (ZAR 572) and the upper-bound poverty line (ZAR 883).<sup>11</sup>

Insufficient household income makes it challenging for SSFs to meet their basic needs (e.g. food and education). This is echoed by Gammage et al. (2017b), who found that limited financial capital resulted in a hand-to-mouth scenario where fishers are unable to meet basic needs through fishing as a livelihood.

The majority of the SSFs in Bitouville (67%) and Melkhoutfontein (63%) found it extremely challenging to endure income shocks due to little or no access to savings, credit, or loans. The little to no financial planning is attributed to SSFs not having enough money to save as they live on hand-to-mouth scenarios, and this is further corroborated by a quote from one participant who stated: “*At the moment, I only receive SASSA<sup>12</sup> grant for my child, but it is not enough to support my family*” (e.g. section 4.2.2.1, Table 4.7). The challenges of enduring income shocks by SSFs meant that they struggled to meet basic needs, such as food consumption, which is consistent with previous research (Gammage, Jarre and Mather, 2017b).

To cope with the pressures of fish scarcity, participants in these communities mentioned borrowing money from family, friends, and small money lenders (see Table 4.5). They also indicated that it is difficult to access finance from financial institutions such as banks due to a lack of collateral (e.g. housing, fishing boats, vehicles). These challenges of financial resource scarcity for SSFs increased their vulnerability to poverty and food security. These results reveal that there are limited financial alternatives for SSFs in these communities, as has been reported by other scholars in the global and southern Cape context (Gammage, Jarre and Mather, 2017b, 2017a; Gammage, Jarre and Mather, 2019; Duggan, Jarre and Murray, 2020; Maldonado et al., 2022; Saksono, Nissa and Suadi, 2023). This research supports findings that SSFs are challenged in accessing financial reserves, including financial institutions being hesitant to provide loans or credit to SSFs because they lack collateral (e.g. vehicles, fishing boats), difficulties in repaying back

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<sup>11</sup> <https://www.statssa.gov.za/publications/P03101/P031012021.pdf>

<sup>12</sup> South African Social Security Agency (SASSA) aims to provide social security services to vulnerable groups.

credit or loans, limited alternative livelihoods, and other barriers, such as age and education levels, limiting access to financial institutions.

The scarcity of financial resources has further revealed that participants face challenges with financial planning. The results show that many participants in Bitouville (74%) and Melkhoutfontein (45%) in 2023 engaged in little to no financial planning (e.g. Table 4.5). This is attributed to the lack of financial planning skills in these communities due to limited formal education, uncertain incomes, and lack of skills training (Gammage, Jarre and Mather, 2019). Little to no financial planning has several implications for SSFs, including influencing their ability to save and invest their income, challenges understanding markets (negotiating fish prices and profit margins), and further limiting them from accessing financial services (e.g. Pomeroy et al., 2020). The lack of financial planning skills also increases the vulnerability of SSFs by impacting their ability to adapt to changing conditions such as climate variability. Sowman (2020) ascertains that little to no financial planning exacerbates the vulnerability of SSFs, especially when faced with risks of adverse weather conditions and climate change.

The scarcity of financial resources can also be supported by the reliance of SSFs on government social grants. In this study, 33% of the participants in Bitouville and 36% in Melkhoutfontein in 2023 reported receiving social grants, such as old-age and child grants, from the government (e.g. Table 4.15). The reliance on social grants further proves that SSFs have limited employment opportunities, limited access to financial services, such as credit and loans, and income uncertainty. In addition, the reliance on social grants (Mbatha, 2021) may also negatively affect their livelihoods by limiting their economic growth and increasing their dependency cycle.

#### **5.3.1.4. Other Factors Exacerbating Vulnerability**

In addition to fish scarcity, other factors play a pivotal role in exacerbating the vulnerability of SSFs, including access to fishing rights, physical assets (boats, transport), markets, healthcare, and other basic services.

Many of the participants in Bitouville (73%) and Melkhoutfontein (91%) in 2023 reported not having access to fishing rights. Only four (27%) in Bitouville and one in Melkhoutfontein reported having access to fishing rights. The limited access to fishing

rights can be attributed to numerous factors, such as policy implementation delays (e.g. limited fishing rights (Sowman and Sunde, 2021) and political agendas (National Planning Commission, 2012). The limited access to fishing rights is concerning as many of the SSFs depend heavily on marine resources to support their livelihoods (e.g. Garcia, 2003; Auld and Feris, 2022; Saksono, Nissa and Suadi, 2023), and without secure fishing rights, SSFs are exposed to various vulnerabilities, including a limited ability to generate income (Mbatha, Coulthard and Rohe, 2012) and support their overall livelihoods, and are further marginalised.

Access to physical capital, such as fishing boats, also plays an important role in exacerbating the vulnerability of SSFs. Only two (18%) participants in Melkhoutfontein had access to fishing boats, while none had access in Bitouville (e.g. Table 4.6). SSFs who did not have access to fishing boats in Bitouville and Melkhoutfontein served as crew on the line fish boats of other fishers (Gammage, Jarre and Mather, 2019) or fished in the intertidal zone (e.g. section 5.2). The limited fishing boats among SSFs has several implications. In conjunction with the inability to access rights, the lack of fishing boats limits fishers' fishing activities, resulting in many SSF having to continue to serve as crew on linefish boats (e.g. Gammage, Jarre and Mather, 2017a; Muslim et al., 2023). This dependence on fishers with fishing boats may also influence the availability of sea days and limit SSFs' say in decision-making, further exposing them to exploitative situations (e.g. receiving low income and working long hours; e.g. Mengge, 2019; Simanjuntak, Sumarti and Kinseng, 2019). The limited fishing boats also made it difficult for SSFs to expand their fishing skills by restricting them from engaging in practical training that requires them to have experience working with boats.

SSFs highlighted transport and market access as challenges exacerbating their vulnerability. During an informal conversation, participants in Bitouville revealed challenges with accessing nearby markets (e.g. Mossel Bay (40km) and Albertinia (35km) because of limited access to transport services, impacting their ability to sell the fish catches. In contrast, in Melkhoutfontein, participants indicated that transport services to the nearby market and economic hub, Still Bay (11km), are available (e.g. Gammage, Jarre and Mather, 2017a). The limited access to transportation services in Bitouville had several implications on their overall livelihoods, including increased operational costs;

for example, participants in Bitouville reported that for them to go to the nearby markets, they had to hire a car which cost ZAR 500. For SSFs that are grappling with access to financial capital, hiring a car adds to their economic burdens, thus resulting in income insecurity. In addition, the limited access to transport may impact SSFs' ability to diversify their livelihoods beyond fishing. The results were consistent with other research (Béné and Friend, 2011), which found that it is common for rural areas to have higher business costs, challenges with transportation, little to no access to markets, and limited government infrastructures and services. These fishing communities were no exception to the issues highlighted by Béné and Friend (2011). To improve access to market and transportation, it is important to invest in the transportation system (e.g. subsidising public transport) and have online platforms where SSFs can market their fish catches like ABALOBI.<sup>13</sup>

Other contributing factors worsening the vulnerability of SSFs include chronic illness and limited healthcare services. As much as 60% of the participants in Bitouville and 55% in Melkhoutfontein reported chronic illnesses such as diabetes and heart disease among themselves and their households (Appendix I). The presence of chronic illnesses coupled with limited healthcare services exacerbates existing vulnerability due to limited access to healthcare services, often exposing them to further health risks. This places a burden on their ability to support their livelihoods, thus leading to a decrease in income generation. The incidence of chronic illnesses may also influence SSFs' ability to diversify their livelihoods (e.g. Aminu and Ayinde, 2014).

Limited access to education is one of the challenges highlighted by SSFs in Bitouville and Melkhoutfontein. None of the participants in Bitouville had a practical or technical education, while 27% indicated that they completed some courses. However, those courses were linked to the fishing industry (Appendix F). In contrast, in Melkhoutfontein, only one participant reported having attained a practical or technical education, while 55% of the participants reported completing some fishing-related courses. The low level of formal education and skills in SSFs may be attributed to limited access to educational

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<sup>13</sup> ABALOBI is a registered non-profit organisation which aims to establish sustainable small-scale fishing communities through social entrepreneurship and a knowledge-based approach (<https://abalobi.org/about/>).

institutions and the legacy of the Apartheid education system, given the median age of the cohort (e.g. Branch et al., 2002; Maddox, Allison and Daw, 2009; Gammage, Jarre and Mather, 2017a). Also, with limited formal education, SSFs struggled to diversify their livelihoods and adapt to changing conditions in the fishing industry, exacerbating SSFs' vulnerabilities (e.g. Sowman and Sunde, 2021; Auld and Feris, 2022).

In summary, SSFs are faced with multiple aspects of resource scarcity, including scarcity of fish and financial, physical, and other resources (e.g. limited access to transport and markets, healthcare services, and educational institutions). Declining fish stocks due to overfishing impacted SSFs' ability to go to sea and generate income, leading to economic burdens. SSFs are faced with difficulties accessing credit facilities from financial institutions and enduring income shocks. Difficulties are further exacerbated by their limited financial planning skills, increasing vulnerability. Limited access to fishing boats affects the ability of SSFs to go to sea, decreasing their profit margins, limiting their decision-making ability and, thus, increasing their vulnerability. Vulnerability of SSFs is also influenced by access to fishing rights, impacting their ability to fish. In addition, transport and market access challenges further play a large role in exacerbating SSFs' vulnerability. Challenges with transport services influence their ability to carry out fishing activities, including limiting access to nearby markets and impacting income. In both the fishing communities, the presence of chronic illnesses among SSFs and their households, together with limited access to healthcare services, impacts their ability to maintain and diversify their livelihoods. Lastly, limited access to formal education impacts their ability to acquire skills beyond fishing.

The next section discusses the theme of climate variability and its role in worsening the vulnerability of SSFs.

### **5.3.2. Climate Variability**

One of the themes that emerged across the results is climate variability (e.g. Table 5.1). This is not a new issue; prior research undertaken in the southern Cape has highlighted environmental changes, such as an increase in annual variability and changes in the marine ecosystem, that took place within the Agulhas Bank subsystem (Hutchings, Roberts and Verheye, 2009; Blamey et al., 2015; Lamont, 2018). Despite these environmental changes being noted, it is difficult to understand whether the occurrence

of the changes was due to fishing pressures or not. The difficulty in understanding these changes can be attributed to limited scientific data (Lamont et al., 2018). However, in the context of the southern Cape, Gammage *et al.* (2017a) also highlighted changes that took place within the marine environment, including changes in sea temperatures and prevailing wind conditions, to mention a few. (e.g. sections 2.3.3 and 2.4.2 for more details). This section provides an overview of climate variability and its impacts on the vulnerability of SSFs in the southern Cape.

### **5.3.2.1. Impacts of Changing Sea State Conditions**

The changing sea state conditions played an important role in impacting the vulnerability of SSFs. As many as 93% of the participants in Bitouville and 55% in Melkhoutfontein noted changes in the sea state conditions in 2023 (e.g. Table 4.12). They also highlighted that the changing sea state conditions resulted in an increase in the occurrence of accidents at sea, and this is corroborated by a quote from one of the participants who said, *“I struggle to predict sea state changes, and going to the sea brings a painful memory because I lost my uncle at sea and never found him.”* This study’s findings align with previous research undertaken (Gammage, 2019), which found that changes in the sea state conditions, such as strong winds and rough seas, increase the risk of accidents, thus making it difficult for fishers to navigate or access fishing areas.

Apart from incidents at sea, participants also highlighted that the sea state changes affected their ability to generate income due to the reduced number of available sea days, thus leading to financial instability. These findings align with Gammage et al. (2017a), who also found that sea state changes due to shifting wind conditions reduced the number of available sea days, forcing fishers to take dangerous trips to boost their profits, thus increasing SSF vulnerability.

### **5.3.2.2. Wind Speed and Direction Changes**

Changes in wind speed and direction are among the environmental factors SSFs are subjected to that affect their fishing activities, threatening their livelihoods and exacerbating their vulnerability. Participants noted changes in wind speed (80% in Bitouville and 73% in Melkhoutfontein) and wind direction (80% in Bitouville and 64% in Melkhoutfontein) in 2023 (e.g. Table 4.9) and attributed the changes to climate variability. These findings align with those of Ward (2018), who found that climate variability

influenced wind speed and direction. The findings also align with a case study conducted in the coastal communities of Togo, which highlighted that fishers observed changes in winds in comparison to previous decades (N'Souvi et al., 2024).

Participants indicated that the changes in wind speed and direction affected their ability to fish by reducing the number of available sea days. This resulted in a decrease in fish catches, thus increasing economic burdens. Other research in the southern Cape also noted that prevailing wind conditions determined the ability of fishers to go fishing and fish behaviour, where changes in wind patterns had short- and long-term effects on fishing activities (Ward, 2018). One can, thus, argue that the decreased ability to fish in these towns has exacerbated the vulnerability of SSFs, thus affecting their ability to adapt to changing conditions.

Furthermore, as a result of the changes in wind speed and direction, participants indicated unsafe conditions, which resulted in accidents at sea. For example, in August 2023, a fishing vessel had an accident at the Gouritsmond coastline, leaving four SSFs deceased (National Sea Rescue Institute, 2023). The accident was attributed to changes in weather conditions (e.g. rough seas and heavy waves) (National Sea Rescue Institute, 2023). This is not limited to the southern Cape; several studies have found that accidents at sea among fishers were linked to various factors, such as poor visibility during foggy conditions, high wind speeds and big swell conditions (Sam-Kon Kim and Kang, 2011; Kim et al., 2019; Reverté, Buxeda and de Osés, 2022).

Participants also raised the issue of increased boat maintenance costs due to changes in wind speed and direction. The increased maintenance costs strained participants' finances, as they were already dealing with increased fuel costs, which reduced their profits. These findings are consistent with previous research work undertaken in the southern Cape, which found that increased maintenance costs for fishing boats were impacting the economic sustainability of fishers (Gammage, Jarre and Mather, 2017a). The findings are also consistent with international literature (Defeo et al., 2013; Rofeekie Wanlem, Aujirapongpan and Songkajon, 2023), which reported that rising maintenance costs for fishing boats, including an increase in fuel costs, have reduced fishers' profits.

### **5.3.2.3. Safety at Sea**

SSFs highlighted that safety at sea is one of the issues that impact their livelihoods. Safety in the context of SSFs refers to the measures implemented to ensure that SSFs are not exposed to risks and hazards that might hinder their involvement in fishing activities. These risks and hazards include climate variability, the lack of fishing equipment maintenance, and accidents at sea.

This study's results revealed that 73% of the participants in Bitouville and 36% in Melkhoutfontein in 2023 reported feeling unsafe in their working environment (e.g. Table 4.8). They attributed unsafe working conditions to climate variability, which affects weather conditions as addressed by prior research (Gammage, Jarre and Mather, 2017a). Participants also highlighted that unpredictable weather conditions impacted their livelihoods, including increasing the occurrence of accidents at sea, and this can be corroborated by a quote from one participant: *"I still struggle to predict sea state changes, and going to the sea brings a painful memory because I lost my uncle at sea and never found him"*.

These findings are consistent with prior research undertaken in the southern Cape, which found that challenges of safety at sea were due to various stressors, such as climate variability, which affected the prediction of weather conditions, and infrastructure (Gammage, Jarre and Mather, 2017a; Gammage, 2019). These findings can also be corroborated by Gammage (2015), who highlighted that it is dangerous to launch through the river mouth, particularly in Bitouville, while in Still Bay harbour, where more formal structures (e.g. breakwater) exist, fishers are less affected by changing conditions (e.g. sea state changes). Safety at sea may have also been affected by the limited availability of equipment such as GPS (e.g. Sowman and Rebelo, 2022) and weather-predicting tools, thus resulting in SSFs being unable to make informed decisions when going to sea. This also limits the ability of SSFs to maintain their livelihoods.

### **5.3.2.4. Extreme Weather Events**

Extreme weather events such as storms, rainfall, and drought threatened the livelihoods of SSFs in Bitouville and Melkhoutfontein by exacerbating their vulnerability. Participants' observations about extreme events are also consistent with the regional climate models

predicting increased variability in weather patterns due to climate change (Zhang *et al.*, 2021).

93% of the participants in Bitouville and 55% in Melkhoutfontein in 2023 noted the occurrence of large storms (e.g. Table 4.8), stating that the occurrence of large storms impacted their livelihoods by reducing the availability of sea days, which resulted in the reduction of their income sources. These findings align with numerous studies conducted globally and in the southern Cape, which found that storms negatively affected fishers' livelihoods by creating unsafe working conditions (e.g. Wu, Pelot and Hilliard, 2009; Pfeiffer, 2020).

Apart from storms reducing the availability of sea days, 87% of the participants in Bitouville and 64% in Melkhoutfontein (e.g. Table 4.8) reported that they were personally impacted by storms, including housing damage. This further exacerbated the vulnerability of these participants as they had to make repairs, thus putting a strain on their finances. Some of the participants highlighted that the housing damages due to storms forced them to seek financial capital for repair, thus increasing their vulnerability to poverty. These findings align with international case studies, which found that the occurrence of storms within fishing communities was impacting the livelihoods of fishers by restricting their engagement in fishing activities and causing further economic burdens through the loss of household assets, resulting in poverty (Vincent–Akpu and Annor-Frempong, 2017; Lisa Pfeiffer, 2020; Islam *et al.*, 2022; Hery Saksono, Nissa and Suadi, 2023).

Importantly, while fishers have taken actions such as fixing their household roofing and listening to local news and radio for updates to minimise storm effects (e.g. Table 4.8), these fishing communities lack the assets to cope with storm damage. This is echoed by other research, which highlighted that fishers lacking assets to recover from storm damage relied on coping mechanisms such as informal loans and government incentives (Binkley, 2000; Nurhayati and Purnomo, 2019).

Concerning rainfall, 93% of the participants in Bitouville and 73% in Melkhoutfontein in 2023 noted changing rainfall patterns. They attributed the changes to climate variability. However, regarding the implications of rainfall, they highlighted only that the changes in

rainfall patterns reduced their available sea days, thus reducing their income sources. They did not provide clear indications of other impacts of rainfall. This is not surprising, as the impacts of rainfall patterns in the southern Cape are not well documented due to the lack of climatic data (Ward *et al.*, 2021b). The results aligned with the international literature of case studies in Brazil and the Philippines, which highlighted that unpredictable rainfall patterns were affecting fishers' ability to maintain their livelihoods by limiting their capacity to plan trips and catch fish through changes in water quality and modified fish abundance patterns (Martins and Gasalla, 2018; Macusi *et al.*, 2021).

One of the challenges that participants highlighted as exacerbating their vulnerability is drought. Table 4.10 shows that 93% of the participants in Bitouville and 64% in Melkhoutfontein in 2023 observed an increased occurrence of drought conditions. This exacerbates the vulnerability of SSF communities, as noted by one participant: "In 2018, we experienced drought, and it was a difficult year for the community, as we had a water shortage". This aligned with research, which found that the southwestern Cape region in South Africa experienced severe drought between 2015 and 2017, resulting in water shortages (Odoulami, Wolski and New, 2023).

Drought conditions also influence the conditions of aquatic ecosystems (i.e. rivers and estuaries) by changing their flows, which affects the distribution and abundance of marine species (e.g. James *et al.*, 2013; Moloney *et al.*, 2013; Scharler, Bownes and Jerling, 2023). For example, changes in the estuarine ecosystems strongly affect silver kob, which spawns in the river mouth. In addition, drought conditions may exacerbate the economic vulnerability of SSFs by indirectly reducing the income sources of SSFs, exposing them to numerous challenges, such as less money for boats.

The next section provides an overview of the potential mitigation measures to help SSFs cope with the broader implications of climate variability. It is important to note that while these results did not directly highlight measures SSFs can use to cope with climate variability, highlighting potential mitigation measures may aid in improving SSFs' resilience.

### **5.3.2.5. Potential Mitigation Measures**

As highlighted in section 5.3.2, SSFs are faced with challenges from climate variability ranging from changing sea state conditions, wind speed and direction, rainfall patterns, storms, and drought. Potential mitigation measures are important for helping SSFs cope with climate variability.

A participant stated: *“I still struggle to predict sea state changes, and going to the sea brings a painful memory because I lost my uncle at sea and never found him”*. To address the issue of predicting marine environment conditions, it is important to make use of technology such as location-aware mobile devices (Merrifield et al., 2019) and stay informed about the weather conditions before undertaking trips to the fishing areas (Malakar, Mishra and Patwardhan, 2018). Diversifying their livelihoods will also help SSFs cope with climate variability and reduce their vulnerability (Yanda, Mabhuye and Johnson, 2019). Livelihood diversification would mean a reduction in hand-to-mouth scenarios. There has been a decline in the availability of targeted fish species, as discussed in section 5.3.1; changing fishing areas and targeting new species may help SSFs cope with this consequence of climate variability (Deb and Haque, 2017).

Other potential mitigation measures that SSFs can employ to cope with climate variability include learning alternative skills (e.g. Mozumder et al., 2023), being psychologically prepared and planning for worst-case scenarios (Deb and Haque, 2017), and going to the sea only when a profitable catch can be guaranteed (Gammage, Jarre and Mather, 2017b). Moreover, since the majority of SSFs in Bitouville and Melkhoutfontein (e.g. section 5.3.1) are grappling with access to credit, improving their access to credit may also improve their adaptive capacity (e.g. Mozumder et al., 2023). Other practical strategies that SSFs can use include diversification of livelihood, and the government can offer better healthcare services (Macusi, 2021; Mozumder et al., 2023).

This section provides a summary of the climate variability theme, which revealed that numerous environmental conditions such as changing sea state, wind speed and direction, safety at sea, storms, rainfall and drought conditions exacerbated the vulnerability of SSFs. The changing sea state conditions made it challenging for SSFs to launch and access fishing areas, thus resulting in reduced income sources and increased accidents at sea. Furthermore, the changing wind speed and direction

reduced the number of available sea days, thus resulting in reduced fish catches, further exacerbating their economic burdens. The unpredictable weather conditions impacted SSFs' safety within their working environment, resulting in unsafe working conditions, which caused accidents. The occurrence of storms also reduced the number of available sea days and damaged infrastructure, such as their homes, putting further strain on their finances, as they had to repair the damage. Changes in rainfall patterns also led to a reduction in fishing days, which reduced the income generation of SSFs. In relation to increased drought conditions, SSFs did not provide a clear indication of the impacts. However, drought conditions have influenced changes in marine ecosystems, resulting in changes in the distribution and abundance of fish species. In addition, increased drought conditions may indirectly impact the income generation capacity of SSFs.

### **5.3.3. The COVID-19 Pandemic**

The COVID-19 pandemic is one of the overarching themes that emerged across the results (e.g. Table 5.1 and Table 4.20). A number of case studies (America, Ginindza and Isaacs, 2020; Bennett et al., 2020; Mbatha, 2021; Sowman, 2021) have shed light on it and identified it as one of the stressors impacting fishers. This section outlines the implications of COVID-19 for the vulnerability of SSFs in the southern Cape.

#### **5.3.3.1. SSFs' Vulnerability During the Pandemic**

Participants in Bitouville (100%) and Melkhoutfontein (82%) in 2023 reported being affected by the COVID-19 pandemic. They highlighted the COVID-19 lockdown restrictions as one of the activities that severely affected them. This is corroborated by a quote from one of the participants who said, *“When lockdown restrictions were implemented, I was unable to go fishing. Even though the police were not constantly monitoring me, I was scared to go fishing. It was a challenging year for my family, and I also suffered from COVID-19 and had a stroke simultaneously”*.

All the participants in Bitouville and Melkhoutfontein in 2023 reported that the lockdown restrictions affected their fishing frequency (e.g. Table 4.15). This resulted in the loss of fishing days, which in turn affected their income and exacerbated their vulnerability, considering that they were already struggling with limited financial assistance. These results are not surprising as several studies undertaken in South Africa, Japan, and China

also found that the COVID-19 lockdown restrictions impacted the fishing frequency of fishers (Bennett et al., 2020; He et al., 2021; Mbatha, 2021; Sowman et al., 2021).

Participants also reported that the lockdown measures in 2023 resulted in the closure of markets, thus impacting sales of their fish catches and their ability to generate income. This aligned with other case studies that have demonstrated the difficulties of fishers accessing fishing grounds due to the lockdown restrictions, which resulted in declining fish catches and affecting their ability to generate income. This led to them taking loans as a coping mechanism (Bennett et al., 2020; Hashim et al., 2021; Mbatha, 2021; Scarcella et al., 2022; Ngodigha, 2023; Phuong et al., 2023).

Only one participant in Melkhoutfontein reported that fish prices went up, making it difficult to purchase fish, which can be attributed to the disruption of the supply chain, as addressed by other research (e.g., Mbatha, 2021). On the other hand, all the participants in Bitouville and 93% in Melkhoutfontein noted a reduction in fish prices, which may have been due to the limited access to fishing grounds that have been the subject of other studies (Mbatha, 2021; Russo et al., 2021; Alam et al., 2022). They also mentioned that the reduction in fish prices severely affected them as they relied on fish to sustain their livelihoods; the reduced income resulted in significant financial strain.

Some of the issues that emerged during the lockdown restrictions included fear and anxiety among participants. Participants stated that the South African government instilled a fear of getting arrested during lockdown restrictions because arrests resulted in heavy fines, and can be corroborated by a quote: *“When lockdown restrictions were implemented, I was unable to go fishing. Even though the police were not constantly monitoring me, I was too scared to go fishing. It was a challenging year for my family, and I also suffered from COVID-19 and had a stroke simultaneously”*. This study’s findings aligned with a study undertaken by Sowman et al. (2021), which revealed that during the lockdown restrictions, some fishers in South African fishing communities went against the rules and regulations and were charged a fine of ZAR 10,000. The fines imposed by the South African government for violating lockdown rules and regulations put a financial strain on fishers who were already grappling with economic burdens. The results were also consistent with a case study undertaken in Kenya, which revealed that SSFs were

also in fear of the COVID-19 infection and restriction measures put in place (Okronipa *et al.*, 2023).

### **5.3.3.2. Limited Relief During the Pandemic**

The limited alternative livelihood options that persisted during the COVID-19 pandemic led to participants relying on social incentives such as child, pension, and COVID-19 social relief of distress (SRD) grants. However, only 20% of the participants in Bitouville and 18% in Melkhoutfontein reported having access to the COVID-19 SRD grant. Those who did not access the COVID-19 SRD grant reported not knowing how to apply for the grant, and this was corroborated by a quote from one participant who said, *“I knew about the COVID-19 SRD grant but did not know how to apply. I am not good with technological things”*. The limited access to government grants, particularly the COVID-19 SRD grant, exacerbated the vulnerability of SSFs, who were already grappling with economic and social shocks, including access to basic resources such as water and food (Sowman *et al.*, 2021). For participants who were aware of the COVID-19 SRD grant, the terms and conditions of the grant were restrictive. To qualify for the grant, the applicant had to: 1) hold South African citizenship, 2) be 18 years of age or older, and 3) not be receiving any social grant, e.g. child or old-age grant (Mbatha, 2021). These terms and conditions prevented many SSFs from accessing the COVID-19 SRD grant, thus increasing their vulnerability to poverty.

Only one participant in Bitouville reported having access to the food relief scheme (e.g. Table 4.15), while the rest of the participants in Bitouville (93%) and all Melkhoutfontein participants reported not having access to the food relief scheme. The limited access to food relief schemes was due to the limited awareness of support from the government (e.g. Mbatha, 2021). In addition, the remoteness of these fishing communities also influenced their access to food relief schemes. The limited access to food relief schemes exacerbated the vulnerability of SSFs by increasing their food insecurity and impacting their overall livelihoods.

These findings are echoed by Mbatha (2021), who also highlighted limited aid to support South African fishers in the midst of the COVID-19 pandemic. In the Western Cape, the DFFE provided food parcels during a once-off event (Mbatha, 2021). However, that was not the case for Bitouville and Melkhoutfontein participants, except for one participant.

These findings are also consistent with case studies conducted in the Philippines, Peru, Canada, and the United States, which have shown that fishers faced barriers when accessing relief and limited support to maintain their livelihoods (Bassett et al., 2022).

#### **5.3.3.3. Health Implications of the Pandemic**

Only one participant in Bitouville reported contracting COVID-19, while the rest reportedly did not contract the virus (e.g. Table 4.15). However, most participants reported not testing for COVID-19 due to a lack of testing equipment, suggesting that they might have contracted COVID-19 without being aware of it. This was echoed by other studies (Bennett *et al.*, 2020; Orłowski, 2020), which have highlighted that rural fishing communities face challenges in accessing healthcare services. This study's findings also aligned with those of Brumwell et al. (2023), who found that COVID-19 testing rates were lower in rural than urban areas due to limited access to testing facilities and the high cost of self-test kits.

Participants also revealed that the enforcement of the lockdown restrictions to curb the spread of COVID-19 impacted their mental well-being in several ways, including increasing fear and anxiety due to the close of markets and a reduction in income sources. The limitation of SSFs to attend social gatherings or movements due to the lockdown restrictions may also have resulted in feelings of loneliness. In addition, a reduction in income sources may have affected fishers' mental well-being because of worries about meeting basic needs and maintaining their overall livelihoods. The uncertainty and economic burdens that stem from the lockdown restrictions may also have had long-term psychological effects on SSFs, resulting in conditions such as depression and other related health conditions (e.g. Bennett et al., 2020).

In summary, this section provided a detailed overview of the COVID-19 pandemic theme, which is important for this study. The discussion revealed that the lockdown restrictions enforced by the South African government to curb the spread of COVID-19 infections impacted the ability of SSFs to fish and limited their ability to sell their catches, resulting in income instability. Changes in fish prices also contributed to their vulnerability; a reduction in fish prices led to a reduction in income. SSFs were also afraid of being arrested during the lockdown restrictions. In addition to the impacts highlighted, SSFs also faced multiple difficulties, including limited access to COVID-19 relief schemes,

leaving them vulnerable to food insecurity and economic burdens. The COVID-19 pandemic also had health implications for SSFs, including the risk of contracting COVID-19, and affecting their overall mental well-being, potentially resulting in long-term psychological effects.

#### **5.3.4. Policy and Regulation**

Policy and regulation emerged as one of the themes across the results (e.g. Table 5.1). Policy and regulation, particularly the SSFP, is not a new issue, as prior research (Sowman, 2006, 2011, 2014; Isaacs, 2011b; Gammage, Jarre and Mather, 2017a; Pretorius, 2017; Sowman and Sunde, 2021) has found policy and regulation to be a major stressor within the fishing sector (for more detailed information, e.g. sections 2.3.4 and 2.4.4). This section provides an overview of the SSFP and its implications for the vulnerability of SSFs in the southern Cape.

##### **5.3.4.1. SSFs' Experiences With SSFP**

One of the challenges that SSFs stated to be exacerbating their vulnerability is the SSFP, which was promulgated in 2012 (Department of Agriculture, Forestry and Fisheries, 2012). SSFs in Bitouville and Melkhoutfontein reported having negative experiences when dealing with the SSFP in 2020. For example, they identified the implementation process as one of the central challenges impacting the fishing sector. Notably, the SSFP was still in its implementation phase when this research was undertaken, highlighting the delays associated with the implementation of this policy. Sowman et al. (2021) also highlighted delays in the implementation of the SSFP.

Apart from the SSFP implementation delays, SSFs were not optimistic about the foundational principles of the policy, including, particularly 1) adopting a holistic human rights value, 2) adopting community-based approaches to ensure equal access to resources, and 3) involving SSFs in decision-making processes (Sowman and Sunde, 2021). Furthermore, they felt that even though the foundational principles are to be put in place, their insights will still not be taken into consideration. Additionally, the delay in the implementation of SSFP heavily impacted the ability of SSFs to support their livelihoods and exposed them to various levels of vulnerability, including poverty.

#### **5.3.4.2. Fishing Rights Limitations**

In this study, most participants in Bitouville (73%) and Melkhoutfontein (91%) in 2023 did not have access to fishing rights. The lack of access to fishing rights may be attributed to the delay in the implementation of the SSFP (Sowman and Sunde, 2021). To add to this, in March 2023 (during the process of data collection), the DFFE released a list of SSFs that were successful in acquiring interim relief permits,<sup>14</sup> which revealed that only three SSFs in Gouritsmond (including Bitouville) and nine in Melkhoutfontein were successful in acquiring interim relief permits. This was concerning, considering that most of the SSFs rely heavily on marine resources for consumption and income generation (e.g. Mbatha, Coulthard and Rohe, 2012; Sowman and Rebelo, 2022; Saksono, Nissa and Suadi, 2023) yet few of them have fishing rights.

Participants highlighted that limited access to fishing rights severely affected them by reducing their income, resulting in financial instability. The prolonged and complex policy implementation process meant that SSFs had to rely on recreational or interim relief permits, which included limitations (restrictions on fish catches and quantity) and reduced their potential income. The limited access to fishing rights among SSFs in Bitouville and Melkhoutfontein also exposed them to various levels of vulnerability, including poverty. For example, limited access to fishing rights impacted their food security, resulting in hand-to-mouth scenarios (Gammage, 2019) and increasing their poverty levels.

This study's results were consistent with those of Auld and Feris (2022), which revealed that regulatory policy (including SSFP) is a progressive move. However, there are still weaknesses in these regulatory policies, including challenges with the fishing rights eligibility criteria and presenting solutions for marginalised groups. The issue of access to fishing rights is not limited to South Africa; a case study in Canada highlighted the ongoing challenges that are associated with access to fishing rights within the Canadian fisheries, including the exclusion of Indigenous people and a need for policy reforms (Bennett et al., 2021). Challenges with SSFP are not only limited to South Africa as case

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<sup>14</sup> Refer to <https://www.dffe.gov.za/The-DFFE-announces-final-list-of-declared-small-scale-fishers-in-the-Western-Cape-Province>

studies in Brazil also found ineffective institutions which fail to regulate marine resources (Reis-Filho and Leduc, 2017).

#### **5.3.4.3. Decision-making Process Limitations**

The limited involvement of SSFs in decision-making processes, particularly regarding MPAs, is another factor exacerbating the vulnerability of SSFs. 65% of the participants in Bitouville and 27% in Melkhoutfontein reported not being involved in decision-making processes. Nevertheless, they demonstrated an understanding of the importance of the conservation of marine resources for sustainability (e.g. Parker, 2013; Norton, 2022). However, SSFs do not trust the government and the conservation bodies which claim to involve SSFs in decision-making processes, as these processes do not adequately involve them (e.g. Martins et al., 2019).

The limited involvement of SSFs in decision-making processes had several implications, including changes to their way of fishing and ineffective implementation of regulations and this is corroborated by a quote from a participant; *“Not all fishing rules are effective; some people report incorrect fish catch in an available book”*. These findings are corroborated by Norton (2022), who also found that the development of the MPA, particularly in Still Bay, did not affect those fishers operating on commercial vessels due to their ability to fish on outer banks. However, it changed the way in which fishing takes place, particularly for fishers located closer to the MPAs, thus influencing the relationship with the environment. The issue of fishers’ limited involvement in decision-making is not just a South African problem but a global problem, as various studies conducted in Southern Brazil, Kenya, and Tanzania have shown that fishers are excluded from decision-making surrounding MPAs, thus impacting their livelihoods (De Oliveira Leis, Chuenpagdee and Medeiros, 2019; Thoya et al., 2022).

In summary, this section revealed that SSFs have had negative experiences when dealing with the SSFP. Although the SSFP has not yet been implemented, it has already deviated from its original plans. SSFs continue to struggle with accessing fishing rights due to implementation delays, which affects their income and leads to financial instability. The limitation of SSFs in decision-making processes exacerbated the vulnerability of SSFs by changing their way of fishing and influencing their relationship with the environment through poor implementation of the regulations.

#### **5.4. Summary**

This chapter highlighted the drivers of change in the two selected towns from the recent 2023 survey, including resource scarcity, climate variability, policy and regulation and COVID-19. Resource scarcity, such as fish scarcity (e.g. from overfishing and inshore trawl landing), physical resource (e.g. fishing boats) scarcity and other resource scarcity, such as limited access to transport and markets, compromised the livelihoods of SSFs and impacted their resilience. In addition, numerous environmental conditions, such as changing sea state conditions, wind speed and direction, and rainfall and drought conditions, exacerbated the vulnerability of SSFs by reducing their available sea days and income sources, increasing accidents at sea, and damaging infrastructure. The COVID-19 pandemic lockdown restrictions exacerbated the vulnerability of SSFs by reducing their available sea days, limiting their ability to sell, and thereby reducing their income. Lastly, the SSFP implementation delays exacerbated the vulnerability of SSFs by limiting their access to fish. Policy and regulation, particularly SSFP implementation delays limited fishers from accessing fishing rights, thus impacting their income sources.

The next chapter compares the earlier GULLS results from 2013/14 with those of 2023, to examine the changes that took place over time in the fishing communities of Bitouville and Melkhoutfontein.

## **Chapter Six: The Evolution of the Drivers of Change Within the Southern Cape Fishing Communities in Comparison to Earlier GULLS Research**

### **6.1. Introduction**

Prior research under the GULLS project (Gammage, Jarre and Mather, 2019; Martins et al., 2019; Andra, 2022) has shed light on the challenges faced by small-scale fishers (SSFs) in the southern Cape, highlighting key themes such as resource scarcity, climate variability, and policy and regulation. Importantly, the availability of a dataset from 2013, collected using the same methodology as the current study, provides a unique opportunity to understand how social vulnerability has evolved over the span of a decade. This longitudinal perspective is critical for assessing what has worked or not in terms of adaptive strategies and community resilience, and it offers essential insights for policymakers tasked with designing interventions that respond to the current social and environmental changes in the region's marine systems.

This chapter seeks to address the following research question: How did social vulnerability and the drivers of change evolve in the southern Cape fishing communities compared to earlier GULLS research? By examining changes in exposure, sensitivity, and adaptive capacity among SSFs, who rely heavily on marine resources for their livelihoods, this study offers a comprehensive analysis of evolving vulnerabilities in these communities.

Building on the empirical evidence presented in Chapters Four and Five, this discussion synthesises key themes, including demographic trends, resource scarcity, climate variability, and policy and regulation, to provide a structured understanding of the challenges facing SSFs through the lens of the GULLS framework. This framework, which categorises vulnerability into exposure, sensitivity, and adaptive capacity, offers a systematic approach to interpreting the findings.

### **6.2. Reeling into the Fishing Trends: Age and Gender**

Age and gender are crucial factors in assessing the vulnerability of SSFs, which is at the core of this research. These factors also influence SSFs' capacity to sustain their livelihoods, affecting access to marine resources and opportunities for income source

diversification, among others. This section delves deeper into how gender and age contribute to the increasing vulnerability of SSFs.

### **6.2.1. Gender Dynamics**

The findings on gender composition suggest that in the 2013/14 study, the fishing sector in Bitouville and Melkhoutfontein was dominated by male fishers (e.g. Andra, 2022). However, in the 2023 study, there was a slight shift, with women (9%) participating in fishing activities (e.g. Table 4.1). This involvement of women in fishing activities in Bitouville and Melkhoutfontein has resulted in the diversification of income sources. In addition to fishing, the women fishers in both towns engage in seasonal work (e.g. domestic work) in the nearby larger towns of Still Baai and Gouritsmond. The additional income has played an important role in reducing overall household vulnerability. Moreover, women's engagement in the fishing sector in these towns has also played an important role in their social empowerment. Their involvement in fishing activities also challenged societal roles and norms, including their involvement in household financial decision-making (Groenmeyer, 2014).

Despite their involvement in the fishing sector in these towns, women fishers still face challenges, including balancing the responsibility of taking care of their household (e.g. children and chores), fishing, and seasonal work (e.g. domestic work). This affects their capacity to proceed to sea. In addition, as women were not previously involved in fishing in these towns, they possessed little to no knowledge about fishing methods or strategies. The challenges faced by women are not limited to South Africa; a case study conducted in a coastal fishing community of Sri Lanka revealed that women fishers face social exclusion, which, in turn, impacts their ability to engage in decision-making processes. Additionally, women were faced with limited employment opportunities (Riswan and Mustafa, 2017).

A follow-up conversation in the 2023 study revealed that women in Bitouville and Melkhoutfontein are harvesting marine resources in the intertidal zone. This can be challenging as physical strength is required to walk long distances to the fishing areas and carry heavy loads. This, in turn, challenges the women fishers who have multiple responsibilities, as stated in the above paragraph. In the face of these multiple

responsibilities, women fishers have limited support systems and, consequently, limited opportunities to work with other fishers and a reduced availability of sea days.

### **6.2.2. Age Analysis**

The results, as seen in Tables 4.1 and 4.20, indicate an increase in the median age of SSFs in Bitouville from 38 years in 2013/14 to 45 years in 2023, suggesting that the fishing sector is still made up of young to middle-aged SSFs. The younger median age within the fishing sector in 2023 was due to various factors, such as the unemployment rate (e.g. Statistics South Africa, 2011; Wesgro, 2023), limited skills beyond fishing (e.g. Gammage, Jarre and Mather, 2019), and low levels of education (e.g. Gammage, Jarre and Mather, 2017a). The low level of education was particularly prevalent among middle-aged SSFs, which can be attributed to the apartheid era, during which older people were not well-educated (e.g. Gallo, 2020). This had several implications for their vulnerability, including the fact that the younger generations of SSFs have different practices from the older generations. Apart from the different practices among the age groups, younger SSFs had limited experience compared to middle-aged SSFs, and they faced challenges in establishing a stable income and accessing financial resources.

In Melkhoutfontein, the median age of SSFs increased from 48 years in 2013/14 to 57 years in 2023, with the majority of the older generations of SSFs (> 45 years) making up the fishing sector. This domination of the fishing sector by older generations of SSFs is concerning, as the majority of these SSFs are approaching retirement age. Gammage (2015) revealed that some of the fishers have retired or are no longer active. The approach of SSFs into retirement age without a plan (e.g. Ewusi et al., 2021) can impact their vulnerability by resulting in financial instability. Most importantly, the older generations of SSFs hold valuable knowledge about fishing (e.g. Palmer, 2023). This can be corroborated by one of the participants in the 2023 study, who stated, “*I know a lot about fishing, climate change, and was included in a book titled Transformation and the South African Fishing Industry*”. The lack of participation or engagement in fishing by younger SSFs could result in the loss of this valuable knowledge. Similarly, the ageing status of the fishing sector has weakened community cohesion and networks—key coping mechanisms in changing conditions. For instance, in 2013/14, a fishers club provided

social support, but by 2023, it no longer existed. This decline in social participation has reduced their adaptive capacity.

The next section discusses the cross-cutting themes that emerge across the results of both the 2013 and 2023 surveys.

### **6.3. Cross-Cutting Emergent Themes**

This section presents a detailed discussion of the social vulnerability scores from the 2013/14 and 2023 studies. In Bitouville, the scores increased from 0.63 in 2013/14 to 1.94 in 2023, while in Melkhoutfontein, they rose from 0.66 to 2.03 (e.g. Table 4.31). Overall, Bitouville experienced higher vulnerability than Melkhoutfontein, a trend driven by factors related to sensitivity, exposure, and adaptive capacity. The analysis is framed around cross-cutting themes such as resource scarcity, climate variability, and policy and regulation (e.g. Table 5.1).

#### **6.3.1. Resource Scarcity**

Challenges with resource scarcity in the southern Cape have been extensively studied (see section 2.4.1). Prior research has shown that resource scarcity has directly impacted the ability of SSFs to harvest marine resources and placed constraints on their activities (Gammage, Jarre and Mather, 2017a; Gammage, Jarre and Mather, 2019; Martins et al., 2019). This result is consistent over both the 2013 and 2023 surveys.

##### **6.3.1.1. Confronting Fish Scarcity**

Fish scarcity threatens the livelihood of SSFs (including Bitouville and Melkhoutfontein), who depend on marine resources for their livelihoods, income generation, and consumption. Tables 4.22 and 4.3 show an increase in the proportion of participants reporting perceived changes in the marine environment (including fish scarcity) in Bitouville from 2013/14 (70%) to 2023 (80%). This increase, particularly relating to fish scarcity, suggests a worsening situation within the town. Participants in this town attributed the perceived changes to various factors, such as overfishing, pollution, competition between fishing sectors, and climate variability (James *et al.*, 2013; Mead, 2013; Ward, 2018). In contrast, in Melkhoutfontein, participants also noted perceived changes in their marine environment, but the proportion of participants doing so declined from 2013/14 (88%) to 2023 (45%). They attributed the perceived changes to overfishing,

competition between fishing sectors, changes in rainfall patterns, and climate variability (Engelbrecht, 2015; Ward, 2018; Besseling, 2023).

The three most targeted fish species in Bitouville changed slightly from silver kob, red roman, and shark in the 2013/14 study to silver kob, red roman, and shallow-water Cape hake in this study (2023). This slight shift reveals that shark fish may not have been available as a result of overfishing, having low economic value or through bycatch. Additionally, the shift toward targeting shallow-water Cape hake, which was not available in the recent past (Gammage, Jarre and Mather, 2017a), may indicate some species recovery (Lwamoto, 2015; DFFE, 2023) together with the decline of other species. However, the reliance on this recovering species has several implications. If it is not managed sustainably, its recovery process may be threatened.

In contrast, the three most targeted fish species in Melkhoutfontein in 2013/14 were red roman, shark, and silver kob, while in 2023, carpenters, red roman and silver kob were the three most targeted fish species (e.g. Table 4.2 and 4.21). The consistent targeting of silver kob and red roman over time suggests that these species are important for economic stability as they are part of a small basket of commercially exploitable fish in the southern Cape (e.g. Gammage, Jarre and Mather, 2017a; Gammage, Jarre and Mather, 2017b). However, the consistency in targeting these species is concerning because it may result in overfishing, especially if the recovery process is not allowed for. The shift from sharks to carpenters in 2023 reflects the absence of sharks due to overfishing.

Pollution was also cited as one of the potential stressors contributing to fish scarcity. A shift regarding the perceived impacts of pollution on fish scarcity is evident in this study. In the 2013/2014 study, participants in Bitouville did not state that pollution impacted fish availability, but in the 2023 study, some participants (20%) indicated fish scarcity due to pollution (e.g. Tables 4.3 and 4.22). Additionally, the impacts of pollution on fish resources (Mead, 2013; Whitfield et al., 2018) was indicated to have several implications for SSFs, including reducing their fish catches, which, in turn, affected their income generation, increased their exposure to poverty and food insecurity, and made it challenging for SSFs to adapt.

Competition between the fishing sectors was reported as another factor contributing to fish scarcity in Bitouville and Melkhoutfontein across 2013/14 and 2023. Participants highlighted that the inshore trawling targets fish species that are commercially viable to them (e.g. the SSFs) through bycatch. This exacerbated the vulnerability of SSFs by reducing fish resource availability and fish catches, thereby increasing their income shocks or instability. These findings align with other research, which highlighted the impacts of inshore trawl fisheries (including bycatch) on line fisheries (Attwood, Petersen and Kerwath, 2011; Greenston, 2014; Besseling, 2023). Visser (2015) showed the historical interaction of the inshore fishery and commercial handline fishers in the southern Cape (particularly Mossel Bay and Still Bay) and the economic and political challenges that existed in the 1900s that are still relevant in the present.

In addition to the effects of competition between the fishing sectors, pollution, and overfishing pressures, SSFs also face challenges with navigating financial pressures amid fish scarcity.

#### **6.3.1.2. Challenges Navigating Financial Pressure Amid Fish Scarcity**

Most participants in Bitouville and Melkhoutfontein in 2013/14 and 2023 indicated difficulties in accessing financial reserves when unemployed (including amid fish scarcity) (e.g. Tables 4.5 and 4.24). Challenges or the impossibility of accessing financial reserves resulted in financial instability, which, in turn, impacted SSFs' ability to support their livelihood, including getting essentials like food, resulting in hand-to-mouth scenarios (e.g. Gammage, Jarre and Mather, 2019).

In Bitouville, most participants stated that they did not have savings in 2013/14 (90%) and all participants did not have savings in 2023. The pattern was similar in Melkhoutfontein, where 88% of participants in 2013/14 and 73% in 2023 reported having no savings. The lack of savings meant that participants were reliant on support from their fellow fishers, friends and family, and social incentives from the government (including child and old-age pension grants). The lack of savings was also worsened by the emergence of the COVID-19 pandemic. The results aligned with a case study undertaken in South Africa and Zimbabwe, which found that the COVID-19 pandemic limited the ability to have emergency finance (Isaacs, Ginindza and Mhlanga, 2022).

The limited access to financial reserves and savings had several implications for SSFs, including undermining their ability to adapt amidst fish scarcity. This rendered them dependent on friends and family, and they even borrowed money from small moneylenders to support their livelihoods. In addition, the 2013/2014 and 2023 results revealed that these fishing towns faced challenges when enduring income shocks associated with periods of fish scarcity. In 2013/2014, half (50%) of the participants in Bitouville and 56% of the participants in Melkhoutfontein stated the impossibility of enduring surviving income shocks during fish scarcity (e.g. Table 4.25 for details). In 2023, the majority of the participants in Bitouville (67%) and Melkhoutfontein (63%) also stated the impossibility of enduring income shocks during fish scarcity (e.g. Table 4.5 for details). Furthermore, the inability to endure income shocks has increased in these fishing towns over time. The increase may be attributed to various factors, such as the low levels of education stated in prior research (Gammage, Jarre and Mather, 2017a; Gammage, Jarre and Mather, 2019), limited access to financial reserves (e.g. Table 4.5 and Table 4.25), COVID-19 restrictions (Mbatha, 2021; Sowman et al., 2021), and climate variability (Ward, 2018). The results of this research show that limited alternative livelihood opportunities, fishing rights, and climate variability contributed to participants inability to endure income shocks during fish scarcity.

These results are consistent with a case study in Seychelles, which found that climate variability affected the livelihoods of SSFs, where fishers grappled with fish scarcity for approximately three months, resulting in financial instability and affecting their ability to endure income shocks (Etongo and Arrisol, 2021). According to Saksono, Nissa, and Suadi (2023), the inhabitants of coastal areas of Indonesia also grappled with overfishing, limited educational opportunities, and livelihood alternatives. These challenges impair fishers' abilities to access financial capital, resulting in income shocks.

#### **6.3.1.3. Other Factors Exacerbating Vulnerability**

In addition to fish scarcity and limited access to financial resources, several other factors increased the vulnerability of SSFs, including physical capital, such as limited possession of fishing boats and limited maintenance of fishing gear.

Many of the participants in Bitouville and Melkhoutfontein in the 2013/14 and 2023 studies did not have fishing boats (e.g. Tables 4.6 and 4.26). Only five (20%) participants

in Melkhoutfontein had ski-boats in 2013/14, while in the 2023 study, only two had ski-boats – suggesting a decline in the availability of ski-boats. The decline in the availability of ski-boats in Melkhoutfontein can be attributed to several factors, such as limited available sea days, which resulted in income instability, thus making it challenging for SSFs to maintain their ski-boats due to high cost. My findings are consistent with prior research conducted by Gammage *et al.* (2017a), which highlighted that regular maintenance of fishing boats was neglected due to high associated costs.

The limited maintenance of ski-boats indirectly impacted SSFs. In South Africa, operating fishing boats, including ski-boats, requires passing a test administered by the South African Maritime Safety Authority (SAMSA) to verify the boat's seaworthiness.<sup>15</sup> SSFs who are already struggling financially (e.g. Gammage, Jarre and Mather, 2017a; Gammage, Jarre and Mather, 2019) may not be able to pay the associated costs of the SAMSA test, resulting in them not operating their boats, which in turn leads to the decline in ski-boats. Additionally, the lack of compliance with the SAMSA rules and regulations may have resulted in the confiscation of SSFs' fishing boats, causing the decline in fishing boats.

The limited access to fishing boats in these communities can be attributed to the inability of SSFs to access credit from financial institutions due to the lack of collateral (i.e. housing, land etc.) to secure loans. The results were consistent with a case study undertaken in Namibia which revealed that SSFs were facing challenges when it comes to accessing fishing boats and credit from financial institutions due to a lack of possessions for collateral or bank accounts, thus impacting their ability to conduct fishing activities sustainably (Kanyimba and Jonas, 2023).

Most participants who did not have fishing boats served as crew on other fishing boats, thus increasing their dependency on boat owners to sustain their livelihoods. This dependency has resulted in power dynamics. Some participants, during a follow-up conversation in the 2023 study, highlighted that boat owners often dictated their income. Additionally, dependence on boat owners meant that participants did not have job security, thus hindering their ability to plan, have savings, or even become business owners.

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<sup>15</sup> <https://www.gov.za/services/fishing-permits/register-fishing-vessel>

Some of the participants in the 2023 study reported that they could not afford to buy new fishing gear. The inability of SSFs to acquire new fishing gear (e.g. baited hooks) in both Bitouville and Melkhoutfontein further revealed that SSFs are facing financial constraints. Using old fishing gear may have several implications, including reduced catches, increased maintenance requirements, and greater reliance on boat owners. Most importantly, outdated gear affects their adaptive capacity in the face of fish scarcity and climate variability. This can be corroborated by a study conducted in Struisbaai Noord which revealed that fishers were making use of fishing vessels close to 50 years old, which impacted their ability to harvest marine species sustainably (Parker, 2013).

In summary, the discussion on resource scarcity has revealed key aspects when it comes to the vulnerability, sensitivity, exposure, and adaptive capacity of SSFs. Regarding overall vulnerability, SSFs highlighted that fish scarcity reduced their income. They also had to travel further along the coast to catch fish, leading to competition with the inshore trawl fishery. This situation further exacerbated their vulnerability. Regarding sensitivity, the changes in the target fish species, such as from shark to shallow-water Cape hake, revealed that SSFs are sensitive to changes in their marine environment. For exposure, SSFs were exposed to numerous factors, such as pollution, competition with the inshore trawl fishery, and climate variability, which contributed to their economic strain. In addition, limited access to financial and physical capital exacerbated SSFs by making it challenging for SSFs to adapt to changing conditions.

The next section discusses the climate variability theme that emerged across my results from 2013/14 and 2023.

### **6.3.2. Climate Variability**

Climate variability emerged as one of the themes across this study's results (see Table 6.1) as it was a key stressor impacting SSFs. This is confirmed by prior research undertaken in the southern Cape (Gammage, Jarre and Mather, 2017a; Lyttle, 2018; Ward, 2018; Lyttle, 2021; Ward et al., 2021), which revealed climate variability as one of the stressors impacting SSFs (e.g. section 2.4.4). It is also important to note that no direct comparison could be made for certain climatic stressors due to differences in survey design; thus, there was limited comparison scope. This section looks deeper into

understanding the associated impacts of climate variability in Bitouville and Melkhoutfontein and examines the nuanced changes that took place over time.

#### **6.3.2.1. Extreme Weather Events**

Extreme events in the context of this study refer to any unusual natural phenomena, such as storms and droughts. These events played a pivotal role in exacerbating the vulnerability of SSFs by threatening their lives and livelihoods and damaging SSFs' properties. Here, a comparison of the extreme events that impacted SSFs within the 2013/14 and 2023 studies is discussed. It is important to note that some of the questions asked in the 2013 study were different from those in the 2023 study.

The results, as seen in Table 4.8 and Table 4.26, indicated that the majority of the participants in Bitouville in the 2013/14 (70%) and 2023 (93%) studies noted the occurrence of large windstorms. Melkhoutfontein participants also stated the occurrence of large storms in the 2013/14 (40%) and 2023 (56%) studies. The occurrence of large storms within these towns can be attributed to changing wind patterns due to climate variability. For instance, the south-easterly winds are blowing for longer periods than in the past, thus impacting SSFs (Gammage, Jarre and Mather, 2017a; Lyttle, 2021).

The occurrence of large storms in these towns across different time frames (2013/14 and 2023) were also indicated as exacerbating the vulnerability of SSFs. SSFs stated that large storms posed safety risks when going to sea, resulting in accidents at sea. This is corroborated by a quote from one participant in the 2023 study who stated, *“Going to the sea brings a painful memory because I lost my uncle at sea and never found him.”* SSFs also stated that the occurrence of large storms impacted their ability to access fishing areas, which, in turn, reduced their available sea days. In addition, the reduction in available sea days had implications, including a reduction in the fish catches, thus reducing their income sources. These results also aligned with research undertaken by Gammage (2015) and Ward (2018), which found that storms and rough sea conditions in the southern Cape affected day-to-day fishing activities.

A small number of SSFs in Bitouville and Melkhoutfontein in the 2023 study indicated that large storms had a profound impact on their households. SSFs in these towns indicated that due to large storms, they had to repair household roofing (and even a community hall

in Bitouville). This is supported by a quote from one of the participants who stated, *“Windstorms were very severe, and we could not go fishing as we were afraid; I remember we even had to fix the roof of the community hall”*. Repairing household roofing further exacerbated the financial situation of SSFs who were already grappling with economic shocks (e.g., Gammage, Jarre and Mather, 2017a; Gammage, Jarre and Mather, 2017b; Gammage, Jarre and Mather, 2019; Mbatha, 2021).

In response to the household damages, clear indications of the actions taken to provide large storm damages were not provided in the 2013/2014 study. However, in the 2023 study, SSFs provided actions taken to prevent household damages from storms, including fixing roofing, staying indoors during storms, and tuning in to local radio and news for updates (e.g. Table 4.8). The adaptive strategies that were employed in the 2023 study indicate an increased awareness of storms and resilience and an adaptive spirit within these towns.

Another stressor that emerged in the 2013/2014 and 2023 studies that played an important role in exacerbating the vulnerability of SSFs was the increased drought. Half (50%) of the participants in Bitouville and 56% in Melkhoutfontein in the 2013/2014 study noted the occurrence of drought (e.g. Tables 4.10 and Table 4.28). In contrast, in the 2023 study, 93% of the participants in Bitouville and 64% in Melkhoutfontein also noted the occurrence of drought. Participants attributed the occurrence of drought conditions to climate variability.

Participants in the 2023 study stated that increased drought conditions affected their livelihoods by hindering their access to the sea and altering the marine environment, including changes in the distribution and availability of fish species. In addition, the changes in the distribution and availability of fish species resulted in increased economic burdens. The reliance of SSFs on fish resources to support their livelihoods also contributed to food insecurity.

Apart from drought changing the distribution and availability of fish resources, participants also reported that drought resulted in water shortages. This was corroborated by one participant in the 2023 study who stated that the drought in 2018 resulted in water shortages (e.g. Table 4.14). These findings aligned with Odoulami,

Wolski and New (2023), who found that the southwestern Cape region of South Africa experienced severe drought between 2015 and 2017, resulting in water shortages. However, prior research (Gammage, Jarre and Mather, 2017a, 2017b, 2019) conducted in the southern Cape did not highlight the impacts of drought events. Gammage (2019) found that little to no fishing days were lost due to drought events, and this suggests that drought was not among the major climatic stressors that affected fishers during the research. Notably, while drought events had little to no impacts on fishers previously, currently, drought events were indicated by participants to impact the livelihood of these fishers heavily by reducing their catches.

#### **6.3.2.2. Safety at Sea**

The occurrence of extreme weather events attributed to climate variability was indicated by participants to increase their vulnerability due to the increasing unsafe working conditions at sea. Participants in both the 2013/2014 and 2023 studies reported feeling unsafe in their fishing environments due to environmental or climatic exposure (e.g. Tables 4.8 and 4.27). Participants in both the 2013/2014 and 2023 studies also highlighted that the unsafe conditions in marine environments resulted in accidents. The results of this study are consistent with prior research in the area (e.g. Lyttle et al., 2021), which revealed that waves also influence safety at sea. The occurrence of large waves exacerbated the vulnerability of fishers by causing the fishing vessels to roll, which can result in boats capsizing or loss of life.

In the 2023 study, a participant noted that fishers have increasingly struggled to predict the sea state conditions, which resulted in the loss of loved ones (e.g. Table 4.14). The struggle to predict sea state conditions may have been due to the limited availability of weather-predicting tools and GPS (Sowman and Rebelo, 2022). This can impact the ability of participants to make informed decisions as they are often reliant on fellow fishers and their own observations, as revealed by some participants in both the 2013/2014 and 2023 studies.

Apart from the environmental or climate stressors, the neglect of maintenance for fishing boats and gear (as highlighted in section 6.3.1) may also have contributed to an increase in accidents at sea, making fishers more vulnerable. This is corroborated by prior

research from Gammage (2015), which found that large boats with outboard engines were difficult to maintain, leading some fishers to choose smaller boats to reduce costs.

### **6.3.2.3. Other Climatic Stressors**

Apart from the extreme weather events, other climatic stressors such as wind speed and direction, rainfall patterns, and changing sea state conditions also played an important role in exacerbating the vulnerability of SSFs. However, there is no direct comparison between the 2013/2014 and 2023 studies in terms of these climatic drivers, as the 2013/2014 survey was designed with limited consideration of the local context of the southern Cape (e.g. Appendix A and Table 3.2), and thus these conditions were not adequately explored.

Regarding wind speed and direction, participants in Bitouville and Melkhoutfontein in the 2023 study noted changes in the frequency of these climatic drivers (e.g. section 5.3.2 for a more detailed discussion). However, these participants did not provide a clear explanation for their cause. Gammage (2015) found that prevailing wind conditions were unseasonal, with winds arriving late and shifting direction from either south-easterly or south-westerly. Similarly, Duggan (2012) found that skippers noticed an increase in wind conditions during the fishing season. Furthermore, participants indicated that changes in wind speed and direction affected their fishing ability, reducing the number of available sea days. This, in turn, impacted fishers' income and further exposed them to economic burdens.

Participants also noted changes in rainfall patterns in the 2023 study. This aligns with other research (Du Plessis and Schloms, 2017) that found a shift in rainfall patterns along the south coast region, including a longer rainfall season. In addition, in the southern Cape, Ward et al. (2021) found that fishers view rainfall as increasingly variable. Participants reported that rainfall affected them to varying extents, causing moderate to major damage (e.g. Table 4.11). They noted that rainfall patterns reduced the number of available sea days, reduced fish catches, and increased safety risks at sea. The decline in fish catches may be due to the changes in the freshwater runoff that affected fish distribution and availability, as suggested by other studies (e.g. James et al., 2013; Ward, 2018).

Most participants in Bitouville and Melkhoutfontein reported changes in sea state conditions attributed to climate variability. Other studies have also highlighted that sea state conditions are influenced by wind conditions (Gammage, 2015; Ward, 2018). Participants reported that these sea state changes affected them (e.g. Table 4.12), citing challenges such as the loss of fishing days, reduced fish catches, lower income, and increased safety concerns at sea. One participant expressed safety concerns, stating, “*I still struggle to predict sea state changes, and going to the sea brings a painful memory because I lost my uncle at sea and never found him*” (e.g. Table 4.14). These findings are consistent with Gammage (2015), who also found that the prevailing sea state affected river mouth conditions, making navigation hazardous for fishers.

The adaptation of fishers to climate variability involved using different short-term strategies such as fixing roofs, staying indoors, and tuning in to the local radio and news for updates (e.g. Table 4.8). To further cope with climate variability, fishers rely on social grants, which is not very effective as it results in the dependency cycle on grants and proceeds to the sea despite changing weather conditions. My results were consistent with Gammage et al. (2017b), who highlighted the short-term coping strategies employed by fishers, such as taking temporary employment.

In summary, findings from the climate variability theme revealed that safety at sea exacerbated the vulnerability of participants in both the 2013/2014 and 2023 studies. Safety at sea is also exacerbated by the inability to make informed decisions due to the lack of accessibility to accurate weather-predicting tools. The extent of windstorms and drought conditions further exacerbated the vulnerability of participants by reducing the availability of sea days, causing income instability, and affecting their overall ability to maintain their livelihoods. Beyond windstorms and drought conditions, other climatic stressors (including wind speed and direction, rainfall patterns, and sea state conditions) differently affected these communities. However, no direct comparison could be made due to the modifications to the GULLs survey made in 2023 to suit the southern Cape context.

The next section examines the theme on policy and regulation.

### **6.3.3. Policy and Regulation**

Policy and regulation emerged as a significant theme in this study's findings for Bitouville and Melkhoutfontein in the 2013/14 and 2023 studies (e.g. Table 5.1). This section delves into policy and regulation, focusing on the SSFP and its role in exacerbating the vulnerability of SSFs.

#### **6.3.3.1. SSFP Impacts on SSFs Livelihoods**

The SSFP has played a central role in exacerbating the vulnerability of SSFs in the southern Cape by restricting their access to fishing areas due to limited fishing rights. The majority of the SSFs in Bitouville in the 2013/14 (100%) and 2023 (73%) studies did not have fishing rights (e.g. Tables 4.2 and 4.21). Similar patterns were observed in Melkhoutfontein, where the majority of SSFs lacked fishing rights in 2013/14 (88%) and 2023 (91%). These results revealed slight progress in Bitouville in 2023 regarding access to fishing rights, as an increased four (27%) participants had fishing rights. In contrast, Melkhoutfontein saw little change in the fishing rights allocation process as only one additional participant had fishing rights.

The slow progress in securing fishing rights has been attributed to delays in the implementation of the SSFP (e.g. Sowman, 2014; Sowman and Sunde, 2021). Participants expressed their frustration over these delays, citing a lack of trust in government institutions, including the DFFE, and limited involvement in decision-making processes. These findings align with those of Sowman and Sunde (2021), who highlighted SSFP challenges such as inadequate stakeholder engagement and poor communication between SSFs and government bodies. Participants in both Bitouville and Melkhoutfontein expressed little confidence that the SSFP would prioritise or address their needs. Some SSFs even felt their voices were disregarded. This mistrust was evident when participants were questioned about the effectiveness of the fishing regulations, where most were dissatisfied, particularly with delays in SSFP implementation (e.g. Table 4.18). This growing lack of trust is concerning, as it may lead SSFs to prioritise their own interests, such as food security, over community cohesion. Delays in SSFP implementation have resulted in uncertainty in Bitouville and Melkhoutfontein, where older generations of SSFs have discouraged their children from entering the fishing industry, which may affect community resilience.

Furthermore, SSFs noted the economic impacts of SSFP delays. For instance, most of the participants in Bitouville and Melkhoutfontein across the 2013/14 and 2023 studies were without fishing rights and therefore relied on interim relief permits, which increased their operational costs, including application fees and other permit-related costs. Another consequence of SSFP implementation delays reported by SSFs was limited access to markets. Without fishing rights, some SSFs encountered challenges with market access (including selling their catches). The delays also made SSFs more vulnerable to other economic shocks, such as the COVID-19 pandemic, which further impaired their ability to adapt to change.

In summary, delays in the implementation of the SSFP have had a significant impact on SSFs in the southern Cape, which has affected their ability to sustain their livelihoods. This was particularly highlighted through the lack of access to fishing rights and limited involvement in decision-making processes experienced by participants over time. To increase the involvement of SSFs in decision-making processes, it is important to create or set up forums in these towns wherein the government can be an active participant and share information, as well as empower each other in the towns by ensuring that they select leaders to stand in during governmental meetings. Additionally, to ensure trust, the government should recognise the challenges faced by SSFs and be transparent on how challenges can be better addressed. To improve communication with policymakers, fishers may organise or set up workshops wherein policymakers are invited to sit down and have joint conversations with impacted communities (Thoya, 2022).

#### **6.4. Summary**

This chapter highlighted the changes that took place over time, including how climate variability has led to unpredictable conditions that limited SSFs from proceeding to the sea, thus reducing their fish catches and income. Fish scarcity led to reduced income sources and forced SSFs to travel longer distances along the coast to catch fish, worsening their economic situation and intensifying competition with the inshore trawl fishery. Additionally, limited access to financial and physical capital exacerbated the vulnerability over time by making it difficult for SSFs to adapt to changing conditions. It also highlighted how limited access to fishing rights because of SSFP implementation delays has further affected SSFs' ability to sustain their livelihoods. Additionally, SSFs

expressed a lack of trust in government institutions and frustration over their limited involvement in decision-making processes.

The chapter that follows will provide concluding remarks based on the discussions from Chapters Five and Six and offer recommendations for future research.

## **Chapter Seven: Conclusion**

### **7.1. Introduction**

The importance of studying social vulnerability of fishing communities in the southern Cape regions, particularly Bitouville and Melkhoutfontein, is highlighted in my study as follows: 1) through improving the understanding of vulnerabilities that are faced by SSFs in these communities, 2) developing a better understanding of the fisher's in Bitouville and Melkhoutfontein's ability to adapt to changing conditions within the context of the southern Cape and 3) assess how vulnerabilities have changed over time for fishers from these two towns. In this concluding chapter, I provide a summary of the key findings, highlighting the differences and similarities in the 2023 and 2013/14 research findings, contributions of the study to the wider vulnerability discourse of SSFs in South Africa, and next steps for future work.

### **7.2. Summary of Key Findings**

Several key findings related to resource scarcity, climate variability, the Covid-19 pandemic and policy regulation emerge from across the analysis. These are discussed in more detail below.

#### **7.2.1. Resource scarcity:**

The research indicates that declining fish stocks continue to be a critical driver of vulnerability. In both study periods, SSFs reported reduced catches attributable to overfishing, intensified competition with inshore trawl fisheries, and the impacts of environmental degradation. In Bitouville, these factors have forced fishers to travel longer distances to access diminishing stocks, leading to increased operational costs and further economic strain. In Melkhoutfontein, limited access to financial capital compounded these issues, reinforcing dependency on intermittent government support and external aid.

#### **7.2.2. Climate variability:**

Unpredictable weather patterns have emerged as a significant factor affecting SSFs. The study highlights that extreme weather events, such as increased windstorms, erratic rainfall, and altered sea state conditions, have become more pronounced in 2023 compared to 2013/14. These changes have not only reduced the number of available sea days but have also heightened safety risks, contributing to accidents and further reducing income stability. Furthermore, emerging evidence of drought conditions affecting local

water resources points to a broader environmental shift that may have long-term implications for marine ecosystems and fish populations.

### **7.2.3. COVID-19:**

The impact of the COVID-19 pandemic represents a notable addition to the stressors faced by SSFs. Lockdown measures severely disrupted market access and curtailed fishing activities, leading to a marked reduction in both income and food security. The economic repercussions were compounded by declining fish prices during the lockdown period, while the pervasive uncertainty and social isolation exacerbated mental health issues among fishers. These findings underscore the vulnerability of SSFs to sudden, large-scale disruptions.

### **7.2.4. Policy and regulation:**

Despite the promulgation of the Small-Scale Fisheries Policy (SSFP) in 2012, delays in its effective implementation continue to hamper the sector. A recurrent theme across both timeframes is the persistent lack of access to fishing rights and the limited involvement of SSFs in decision-making processes related to marine management and planning. This regulatory shortfall has resulted in ongoing marginalisation and has hindered the ability of SSFs to develop robust adaptive strategies. My study further highlights that bureaucratic inefficiencies and top-down governance approaches have contributed to a cycle of dependency on state assistance.

## **7.3. Highlighting Similarities and Differences**

When comparing the data from the 2013/14 and 2023 studies, several clear similarities and differences emerge, which are discussed below.

### **7.3.1. Similarities**

Across both study periods, resource scarcity and climate variability have consistently been the primary drivers of vulnerability. SSFs in both Bitouville and Melkhoutfontein continue to experience challenges related to declining fish stocks and limited access to critical capital, whether financial or physical. In both timeframes, policy and regulatory constraints, especially delays in the SSFP's implementation, have remained a constant barrier to improving fishers' livelihoods. The core issues, such as the impact of environmental degradation on fish populations and the resulting economic instability, have persisted over time.

### **7.3.2. Differences**

The 2023 study reveals several emerging trends that were less apparent or absent in the earlier research. Notably, extreme weather events, such as intensified windstorms and altered sea conditions, have been reported more frequently, signalling a shift in local climate patterns. Additionally, the COVID-19 pandemic introduced a new layer of complexity by severely restricting fishing activities and market access, thereby exacerbating pre-existing vulnerabilities. These differences indicate that while the fundamental challenges have remained, the context within which SSFs operate is evolving, requiring updated adaptive strategies and policy responses.

### **7.4. Recommendations for Future Research**

Drawing on my research, I expand on recommendations for future research below.

Looking at my research findings on the social vulnerabilities faced by SSFs, various recommendations for local and regional policymakers are important. The recommendations include ensuring that SSFs are involved in the decision-making process, especially in MPAs, through various workshops. Establishing policies that consider SSFs' voices and needs while dealing with their socio-economic challenges. Additionally, the policies should focus on developing training about the sustainability of marine resources, the recognition of female fishers, and their contribution to the fisheries.

For community leaders and stakeholders, numerous strategies are important for the mitigation of social vulnerability. These strategies include making sure that everyone in the communities (including SSFs, and community leaders) is involved in decision-making processes. Strengthening of support systems, especially establishing a platform for sharing employment opportunities and enhancing skills.

For the consideration of resource allocation and intervention programs in Bitouville and Melkhoutfontein to deal with the social vulnerabilities faced by SSFs, several important aspects should be taken into consideration, including the needs of SSFs and the resource allocation process. Additionally, it is important to ensure that the intervention programs are rolled out, bearing in mind the different policies' objectives. The intervention programs should consider making sure that the allocation of resources is done equitably.

The proposed recommendations for future research work are provided below to further understand the implications of vulnerability on fishers as well as to improve their adaptive capacity:

- Future research making use of longitudinal studies should be undertaken to monitor and understand the climatic trends in Bitouville and Melkhoutfontein.
- Further research is needed on the roles and contributions of women towards the fishing sector and at a household level.
- Future research should also concentrate on the development of adaptive strategies with a particular focus on creating alternative livelihood opportunities and resource management.
- When arranging interview sessions bear in mind the peak fishing months (September to April) and the timing. It is recommended to conduct interviews in the morning and evening (if possible) when fishers are well rested.
- For longer interview sessions (one to two hours), consider taking breaks in between the interviews to cater for the participants and observe any fatigue signs.

### **7.5. Concluding Remarks**

My research has contributed to improving the understanding of the social vulnerabilities faced by SSFs in Bitouville and Melkhoutfontein; including resource scarcity, climate variability and policy and regulation – as well as events such as the COVID-19 pandemic. It has highlighted that resource scarcity (particularly limited access to fishing rights), physical assets and financial capital exacerbated the food security and the economic situations of SSFs in the southern Cape. In previous research, SSFs in Bitouville and Melkhoutfontein indicated that increased variability in terms of established weather patterns in the area makes it difficult to predict sea days. Continued decrease in the number of available sea days removes livelihood opportunities and has led to more risks being taken at sea.

Since the GULLS research was conducted in 2013/14, some changes in SSFs' observations have taken place in Bitouville and Melkhoutfontein, including an increase in the occurrence of rainfall and windstorms. Furthermore, the occurrence of the COVID-19 pandemic had a major impact on these already vulnerable SSFs. These changes

impacted the ability of SSFs to support their livelihoods by reducing their available sea days, decreasing their income generation and limiting their ability to diversify their livelihoods. Policy and regulation remain the biggest drivers of change, even though the SSFP was promulgated in 2012. SSFs remain excluded from decision-making processes that are characterised by top-down and untransparent processes. The continued dependence on state assistance by these communities further hinders SSFs to diversify in a changing environment, which affects the long-term sustainability of fisheries and human wellbeing in the southern Cape.

The vulnerability of these two fishing communities in Bitouville and Melkhoutfontein is increasing due to compounding stressors such as resource scarcity, climate variability, the COVID-19 pandemic and policy and regulation. Addressing the social vulnerabilities faced by SSFs is of paramount importance, particularly in decision-making processes of policy and regulation, as it allows them to make decisions that cater for the specific needs of SSFs. This also improves the ability of SSFs to adapt to changing environmental and socio-economic conditions, to ensure sustainability of the southern Cape fisheries and strengthen the community networks for social cohesion.

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## Appendix A: The Amended GULLS Survey

Surveyor name(s)	
Date	
Start time:	

### Basic respondent data

Respondent name: <b>Répondent se naam</b>	
House No/ address <b>Huis No/ adres:</b>	
Gender: Male / Female <b>Geslag:</b>	
Age: <b>Ouderdom</b>	
Village/Community: <b>Dorp/ Gemeenskap</b>	
First language: <b>Eerste taal</b>	
Race: <b>Ras</b>	

### Fishing activity

1.1	Is fishing your main occupation? Yes/No Is u hoof beroep visvang? Ja / Nee	
1.2	How many days per week do you go fishing? Hoeveel dae 'n week gaan u visvang?	
	Every day of the week                      3 to 5 days a week Elke dag van die week                      3 tot 5 dae 'n week	
	2 to 3 days a week                            1 to 2 days a week 2 tot 3 dae 'n week                            1 tot 2 dae 'n week	
	Once a week                                    Less than once a week Eenkeer 'n week                                < eenkeer 'n week	
1.3	What is the average (typical) length of a fishing trip? Wat is die gemiddelde tydsduur van visvangstogte?	
	Less than 1 hour                      One day                      More than one week < 1 uur                                    alle die dag                      Meer as 'n week	
	1-3 hours                                    Two days 1-3 ure                                        Twee dag	
	3-6 hours                                    One week 3-6 ure                                        Een week	
1.4	What was your highest catch ever on a day of fishing and when was that? Wat was die grootste vangs wat u al op een enkele dag gevang het? En wanneer was dit (jaar)? (Kilos – Jaar)	
1.5	What has been your best catch this year? Wat was u grootste vangs die jaar? (Kilos)	
1.6	What is the average distance from the coast that you fish at now? Hoe ver van die 202ort202n vang u nou vis, gemiddeld? (metres – kilometres)	
1.7	Has this average distance increased, decreased or not changed in the time you have been fishing? Het die gemiddelde afstand toegeneem, afgeneem of nie verander in die tyd wat u visvang? Increased / Decreased / Not changed Toegeneem, afgeneem of nie verander	
1.8	List the three most important fish species you target for commercial purposes? Lys die drie mees belangrikste vis spesies wat u teiken vir kommersiele doeleindes? 1    2    3	
1.9	Have these top three species changed in the past five years? Het die hoof drie spesies verander in die laaste vyf jaar? Ja / Nee    Yes / No	

### Basic household data

#### Household income

2.1	Is there much variation in your household income between the summer and the winter period? Is daar 'n groot verandering in julle gesin se inkomste van die somer na die winter? Ja / Nee    Yes/No	
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2.2	What is your average household income per month before tax and from all sources? Wat is julle gesin se gemiddelde inkomste, van alle bronne, per maand voor belasting? (R/maand)	

#### Fishing business

3.1	Do you own your own fishing business (the licences to go fishing)? Besit u u eie vissersbesigheid (lisensie vir visvang)? Ja / Nee                      Yes/ No	
3.2	How many people (outside of family) did you employ over the last 12 months? Hoeveel mense (behalwe familie) het u in die laaste 12 maande werk gegee? (nommer)	
3.3	Approximately how much income does your fishing business turn over each month? Hoeveel inkomste word ongeveer deur u besigheid gemaak per jaar? (R/jaar)	

#### Household expenditure

4.1	Where do you mainly go to buy your food purchases? Waar koop u hoofsaaklik u kos? (Winkel en plek)	
4.2	What percentage of foods are (by volume) Watter persentasie van kos is: (per volume)	
	Bought from the store                      % in die winkel/supermark gekoop	
	Exchanged                                      % Geruil vir ander goed	
	Grown by yourself                              % Aangeplante deur u self?	
	Total food                                      100% Total kos	

#### Sensitivity

##### Household dependence on marine resources

##### Social dependence (SD) on fishing

5.1	I depend on the following institutions and people for day-to-day resources to go fishing Ek is afhanklik van die volgende vir daaglikse bronne om te gaan visvang	
	Weather predictions and news                      My family Weer voorspelling en nuus                      My familie	
	Buyers of fish                                      Fellow workers Mense wat vis koop                                      Ander werkers	
	None Geen	
5.2	Who do you interact with when going fishing? Met wie het u interaksie/praat u as u gaan visvang?	
	Other fishers                                      Safety authorities Ander vissermanne                                      Veiligheid autoriteite	
	Suppliers fishing tackle/fuel                                      Scientists Verskaffers van materiale / petrol                                      Wetenskaplikes	
	Marine reserve managers                                      Company officials MPA bestuurder                                      Mense van maatskappe	

##### Economic dependence (ED) on fishing

	Food consumption	
6.1	How many days a week do you and your household consume fresh marine food? Hoeveel dae per week eet u en u huis gesin vars seekos? (uit 7 dae)	
6.2	Is the fish you eat from your own catch of fish or do you buy fish? As u vis eet by die huis, is dit van u eie vangs of gekoop?	
6.3	Which type of fish do you consume most often? Watter tipe vis eet u gereeld?	

##### Economic dependence (ED) on other resources

7.1	How many days a week do you and your household consume fresh vegetable products? Hoeveel dae per week eet u en u huis gesin vars groente? (uit 7 dae)	

7.2	How many days a week do you and your household consume fresh meat? Hoeveel dae per week eet u en u huis gesin vars vleis? (uit 7 dae)	
7.3	What is the most important food source for your family's household? Wat is die mees belangrikste bron van kos vir u gesin? We grow it in the garden we buy it in the local shop kos wat in die tuin gegroei word word dit gekoop in die winkel/supermark we fish for food/a small portion from catch vis wat gevang word vir kos / 'n klein gedeelte van die vangs we collect our food from the bush/sea other ons versamel ons kos van die veld/ see ander	
7.4	How do you pay for the goods you don't grow or catch yourself? Hoe betaal u vir u behoeftes (benodighede) wat u nie self aanplant of vang nie? We exchange goods for it we obtain it on credit verruil u met ander goed vir kos word dit gekoop op skuld (krediet) we pay for it using cash other betaal u kontant ander	
7.5	Do you (or anyone in your household) receive a government grant (SASSA)? Ontvang u (of enige iemand in u houshouding) 'n regerings toelaag (SASSA)? Ja/Nee Yes/No	
7.6	Did you (or anyone in your household) receive the COVID-19 Distress grant? Het u (of enige iemand in u houshouding) die COVID-19 noodtoelaag ontvang? Ja/Nee Yes/No	
7.7	Do you (or anyone in your household) currently receive the social relief of Distress R350 grant? Ontvang u (of enige iemand in u houshouding) die R350 sosiale verligting van nood toelaag? Ja/Nee Yes/No	
7.8	What type of social incentives do you receive? Watter tiepe sosiale insentiewe ontvang u? SASSA Grant Food Relief Scheme SASSA Toelaag Voedingskema	
7.9	How many people in your household receive grants? Hoeveel mense in u huishouding ontvang 'n toelaag? None 1-3 people Geen 1-3 mense 4-6 people 7 and above 4-6 mense 7 en meer	
7.10	Would you say that you are financially better off from the incentives? Sal u sê u is finansieel beter af weens die toelae? Yes/No Ja/Nee	

**Historical & Cultural dependence (H&CD) on fishing**

	<b>Historical involvement</b>	
8.1	How long have you been a fisher? Hoe lank is u al 'n visserman? (jaar)	
8.2	When did the fishery you are involved with begin in this area? Wanneer het die visbedryf waarby u betrokke is begin in hierdie area? (jaar)	
8.3	Were previous generations of your family/ancestors' fishers? Was vorige generasies van u familie/ voorvaders vissers? Ja / Nee Yes / No	
8.4	Which family relations were fishers in the past? Watter van jou familie verhoudings was vissers in die verlede? 1 2 3	
8.5	Would you describe your family as having a fishing identity/culture? Sal u sê dat u familie 'n visser identiteit/kultuur het? Ja / Nee Yes / No	

Social mobility		
9.1	What is/was the main occupation of your parents? Wat was die hoof beroep van u ouers?	
	Vader (Father)	
	Moeder (Mother)	
9.2	Did your parents attend school? Het u ouers skool gegaan?	
	Vader (Father)	
	Moeder (Mother)	
9.3	To what level did your parents attend school? Indien ja, tot watter vlak?	
	Vader (Father)	
	Moeder (Mother)	
9.4	Did your parents own their own house? Het u ouers hulle eie huis besit?	
	Ja / Nee                      Yes/ No	
9.5	Did your parents own their own boat? Het u ouers hul eie boot besit?	
	Ja / Nee                      Yes/ No	
9.6	Would you say you are financially better off than your parents? Sal u sê dat u finansieel beter af is as u ouers?	
	Ja / Nee                      Yes/ No	

#### Adaptive Capacity

##### Flexibility

##### Personal flexibility (PF)

10.1	Right now if you had a chance would you: Op hierdie oomblik, as u 'n kans sou hê, sou u:	
	Change your job                      Stay doing what you are doing U werk verander                      Bly doen wat u doen	
10.2	At this time do you feel you could find work in a different sector? Op hierdie oomblik dink u u kan werk vind in 'n ander 205ort205n?	
	Ja / Nee                      Yes/ No	
10.3	How many options for a different type of job/work would you say you have? Hoeveel opsies vir ander werk of tipe werk dink u het u?	
	Many options (>3)                      Some options (1-3) Baie opsies 'n Paar opsies	
	No options Geen opsies	
10.4	Have you done any courses to improve your employability? Het u enige kursusse gedoen om u kans om werk te kry te verbeter?	
	Ja / Nee                      Yes/ No	
10.5	If yes, what courses were they? Indien ja, watter kursusse?	
10.6	Would you be happy working for someone else? If so, why? Sal u vir iemand anders werk? Indien ja, hoekom?	
	Ja / Nee                      Yes/ No	

##### Occupational flexibility (OF)

11.1	Have you had a change of employment in the past 5 years? Het u van werk verander in die laaste vyf jaar?	
11.2	If so, what was your previous occupation? Indien ja, wat was u vorige werk?	
11.3	Do you prefer your new occupation to your previous occupation? Verkies u u nuwe werk of u vorige werk?	
11.4	Would you be interested in doing a job other than fishing if you could earn as much as you do fishing? Sal u belangstel om 'n werk anders as visvangs te doen as u ewe veel betaal sou word?	

	Ja / Nee	Yes/ No	
11.5	List the factors that a new job must possess for you to take it (tick any that apply) Lys die eienskappe wat 'n nuwe werk moet hê voor u dit sal aanvaar (merk enige wat van pas is)		
	Adventure Avontuurlustig	Flexibility Buigsamheid	
	Part-time options Tydelike opsies	Intellectual challenge iets wat my intelligensie sal toets	
	Personal safety Persoonlike veiligheid	Low risk & Certain income Lae risiko en vaste inkomste	
11.6	List the alternative employment sectors that you would consider to take another job in (tick any that apply) Noem die alternatiewe werkssektore wat u sal oorweeg om 'n ander werk in te neem.		
	Tourism Toerisme	Service industry Diens nywerheid	
	Aquaculture Mariene kultuur – (Vis boedery)	Different fishing sector Ander visserssektore	
	Office work Kantoor werk	Mining Mynbou	
	Masonry /Carpentry/Daily wage labour Messelwerk/houtwerk/ daaglikse loon arbeid	Other Ander	
11.7	What do you see as the biggest risk to the fishing livelihoods in this community? Wat is die grootste risiko vir 'n bestaan maak van visvang in die gemeenskap?		
	The market Die mark	Injury /Health Besering/Gesondheid	
	Environmental change Omgewings verandering	Management changes Bestuur veranderinge	
	Reduced fish abundance Minder vis	Other Ander	
11.8	In which sector do people who have left fishing find work in this community? Watter werk doen die vissermanne in die gemeenskap as hulle ophou visvang?		
11.9	List of tourism activities available to fishers Noem tiepes toerisme-verwante aktiwiteite waarin vissers betrokke kan raak		
	1	2	3

#### Comprehensive Policy and Regulation (CPR)

	Markets		
12.1	How many markets are there in your community where you can buy fish? Hoeveel 206ort206n is daar in u gemeenskap waar u kan u vis koop? (nommer)		
12.2	By which avenue do you sell your fish? By watter afdeling verkoop u direk u vis?		
	Local individual fish buyer Plaaslike individuele vis aankoper	Large processor Groot ondernemings	
	Directly off the boat Direk uit die boot	Intermediary /middlemen middelmanne	
	Other Ander		
12.3	If you sell through middlemen, how would you describe your relationship with middlemen in this community? As u verkoop deur middelmanne, wat is u verhouding met die middelmanne in u gemeenskap?		
12.4	If NOT through middlemen, how would you describe your relationship with companies or buyers you sell your fish to? Indien NIE deur middelmanne nie, hoe goed of hoe sleg is u verhouding met die maatskappye of kopers van u vis?		
12.5	How many markets/auction sites are there in your community where you can sell your fish directly? Hoeveel 206ort206n /veiling plekke is daar in u gemeenskap waar u direk vis aan mense kan verkoop? (nommer)		
12.6	Do you ever sell fish to a fish market outside your community? Verkoop u ooit vis aan 'n vismark buite u gemeenskap?		
	Ja / Nee	Yes/ No	
12.7	If yes, how far is that market from your house?		

	Indien ja, hoe ver is die mark van u huis? (km/ ure/min walking)	
12.8	Are you fishing for orders from the markets? Vang u volgens bestellings van die vismarkte? Ja / Nee                      Yes/ No	
12.9	Have fish prices been relatively stable over the past 3 years? Is die pryse van vis oor die laaste drie jaar 207ort207n207e (bly dit min of meer dieselfde)? Ja / Nee                      Yes/ No	
12.10	What do you think dictates the price of fish most in the local market? Wat dink u oorheers/beïnvloed die prys van vis die meeste in die plaaslike mark? The power of the middlemen                      The price the fisher demands Die mag van die middelmanne                      Die prys wat die visserman vra The quantity of the fish that is available that day                      Other Die kwantiteit van die vis wat beskikbaar is die dag                      Ander	
12.11	How many markets are there in your community where you can buy/sell fresh meat and vegetables? Hoeveel 207ort207n vir vars vleis en groente is daar in u gemeenskap? (nommer)	
<b>Resource management institutions</b>		
13.1	Does your community have any type of marine resource management? Is daar in u gemeenskap enige vorm van marine bronne bestuur? Ja / Nee                      Yes/ No	
13.2	If yes, what kind of management Indien wel, watter tipe bestuur? Traditional management; managed by chiefs/custom Tradisionele bestuur; bestuur deur hoofman/ tradisie Community has agreed on a marine-managed area or MPA Gemeenskap het ooreengestem op 'n Mariene Beskernde Gebied Written management plan with a monitoring or decision-making process and a committee that is in charge 'n geskrewe bestuursplan met 'n monitor of besluitnemings proses en 'n kommitee aan die stuur van sake Government-controlled management Regering beheerde bestuur Industry-led management Bedryf geleide bestuur Other Ander	
13.3	Have rules, practices changed in the past in response to environmental changes? Het 207ort207/ praktyke in die verlede verander in reaksie tot omgewings veranderinge? Ja / Nee                      Yes/ No	
13.4	If yes, how have the rules changed? Indien so, hoe het dit verander?	
13.5	Do you have to report/record your catches at a landing site or to an authority? Moet u u vangste 207ort207n207er207/ aanteken by 'n landingsarea of by 'n owerheid? Ja / Nee                      Yes/ No	
13.6	If yes, to whom do you have to report? Indien wel, aan wie?	
13.7	List the three community organisations that are active in your village/town that come to mind? Is daar enige drie gemeenskaps organisasies wat u aan kan dink wat aktief is in die dorp? 1                                      2                                      3	
13.8	Is there been any change in the management of the fishery in the last five years? Was daar enige verandering in hoe die vissery bestuur word in die laaste vyf jaar? Ja/Nee                                      Yes/No	
13.9	If yes, what kind of management changes have you observed? Indien Ja, watter tipies vernaderinge het u opgemerk? Implementation of new regulations                      Other Implementasie van nuwe regulasies                      Ander Co-management of fishery resources	

	Medebestuur van vissery bronne	
13.10	In the last five years, were there management conflicts? Was daar enige bestuursverwante konflik in die laaste vyf jaar?	
	Ja/Nee Yes/No	
13.11	If yes, how did you resolve the conflicts? Indien ja, hoe is die konflik opgelos?	
	Inform police officials Inform Traditional leaders Polisie ingelig Tradisionele leiers ingelig	
	Mediation of dispute within community Other Mediasie van dispuut binne gemeenskap Ander	

**Social dependence – Rating questions**

		1	2	3	4
	<b>Attachment to place</b>				
14.1	Would you say you feel like you belong or do not belong to this community/town? Sou u sê dat u voel u behoort in die gemeenskap of dorp?	Strongly belong Rerig behoort	Belong Behoort	Slightly belong Min behoort	Not at all belong Glad nie behoort
14.2	How important are the friendships/relationships you have in this town? Hoe belangrik is die vriendskappe/verhoudings wat u in die dorp het?	Very important Baie belangrik	Important Belangrik	Slightly important Effens belangrik	Not at all important Glad nie belangrik
	<b>Recreational dependence</b>				
15.1	How often do you fish recreationally? Hoe gereeld vang u vis vir ontspanning?	Very often Gereeld	Somewhat often Minder gereeld	Rarely Min	Never Nooit
	<b>Attachment to fishing</b>				
16.1	How proud are you to tell people that you are a fisher? Hoe trots is u om vir mense te vertel dat u 'n visserman is?	Very proud Baie trots	Proud Trots	Slightly proud Effens trots	Not proud at all Glad nie trots
16.2	Would you like your children to continue in the fishing profession? Hoe sal u daarvan hou dat u 208ort208n208er208k visvang?	Like very much Baie hou	Like Hou	Not like Nie hou	Not like at all Glad nie hou

**Economic Dependence– Rating questions**

	<b>Economic dependence on fishing</b>				
17.1	How possible would it be to feed your family if you did not go fishing? Hoe moontlik is dit vir u om u familie kos te gee as u nie vis gevang het nie?	Highly possible Baie moontlik	Possible Moontlik	Slightly possible Effens moontlik	Not at all possible Glad nie moontlik
	<b>Competition for fish</b>				

18.1	<p>Would you say there are too many or too few fishers in the fishing industry in this community?</p> <p>Sou u sê daar is te veel of te min vissermanne in die visbedryf in die gemeenskap?</p>	Too many Te veel	Slightly too many Effens te veel	Slightly too few Effens te min	Too few Te min
18.2	<p>Would you say there are too many or too few fishers working in the areas you fish?</p> <p>Sou u sê daar is te veel of te min vissermanne in die areas waar u visvang?</p>	Too many Te veel	Slightly too many Effens te veel	Slightly too few Effens te min	Too few Te min
18.3	<p>How concerned are you about the level of illegal fishing that is occurring?</p> <p>Hoe besorg is u oor die hoeveelheid onwettige visvang wat gebeur?</p>	Very concerned Baie besorg	Concerned Besorg	Slightly concerned Effens besorg	Not concerned at all Glad nie besorg

#### Historical & Cultural Dependence – Rating questions

Cultural importance of fishing					
19.1	<p>How much was your local knowledge about fishing included in local marine resource management plans?</p> <p>Hoeveel van jou u plaaslike kennis oor visvang was ingesluit in u plaaslike marine bronne bestuur planne?</p>	Very Baie	Minder	Slightly Min	None Glad nie
19.2	<p>How concerned are you by the lack of young people entering the fishing industry in your area?</p> <p>Hoe besorg is u oor die hoeveelheid jong mense wat die visbedryf binne gaan?</p>	Very concerned Baie besorg	Concerned Besorg	Slightly concerned Effens besorg	Not concerned at all Glad nie besorg
Local ecological knowledge					
20.1	<p>How much do you think you know about the environment in which you fish?</p> <p>Hoeveel dink u weet u oor die omgewing waarin u visvang?</p>	A lot Baie	Quite a lot Redelik	A little Min	Nothing Niks
20.2	<p>How important do you think it is to pass on local knowledge about fishing to younger generations?</p> <p>Hoe belangrik dink u is dit om plaaslike kennis oor visvang aan die jonger generasie te oor te dra?</p>	Very important Baie belangrik	Important Belangrik	Slightly important Effens belangrik	Not at all important Glad nie belangrik
20.3	<p>Would you say local knowledge about fishing is being lost or maintained in this community?</p> <p>So u se plaaslike kennis oor visvang word behou of raak verlore in die gemeenskap?</p>	Well-maintained Goed behou	Maintained Redelik behou	Partly lost Effens verloor	Almost all lost Heeltemal verloor

#### Personal flexibility – Rating questions

Perception of risk in approaching change					
21.1	<p>How used would you say you are to the changes in everyday life?</p> <p>Hoe gewoon sou u sê is u aan daaglikse veranderinge?</p>	Very used to it Baie gewoon	Used to it Gewoon	Not used to it Effens gewoon	Not at all used to it Glad nie gewoon

21.2	<p>Would you say that only big companies or only small-scale fishers will survive future changes in the industry?</p> <p>Sou u sê dat net groot maatskappye of net klein skaal vissermanne die toekomstige veranderinge in die visbedryf sal oorleef?</p>	Small-scale fishers Net klein skaal vissermanne	More small-scale than big company Meer	More big companies than small-scale Meer groot as	Only big companies Net groot maatskappye
<b>Ability to plan, learn and reorganise</b>					
22.1	<p>How well have you planned for your financial security?</p> <p>Hoe goed het u vir u finansiele sekuriteit beplan?</p>	Very well-planned Baie goed beplan	Well-planned Goed beplan	Planned a little Min beplan	No plan at all Geen beplanning
22.2	<p>How interested are you in learning new skills outside of your area of expertise?</p> <p>Hoe geïnteresseerd is u daarin u om nuwe vaardighede buite u area aan te leer?</p>	Very interested Baie geïnteresseerd	Interested geïnteresseerd	Slightly interested Effens geïnteresseerd	Not interested at all Glad nie geïnteresseerd
22.3	<p>How possible is it for you to make a personal difference in improving the health of the marine environment in this area?</p> <p>Hoe moontlik is dit vir u om persoonlike verandering te maak aan die gesondheid van die marine omgewing in die area?</p>	Very possible Baie moontlik	Possible moontlik	Slightly possible Effens moontlik	Impossible Glad nie moontlik
<b>Perception of the ability to cope with change</b>					
23.1	<p>How confident are you that things will turn out well regardless of the changes and challenges you confront?</p> <p>Hoe seker is u dat dinge goed sal uit draai ten spyte van veranderinge en uitdagings wat jy teekom?</p>	Very confident Baie seker	Confident seker	Slightly confident Effens seker	Not at all confident Glad nie seker
<b>Level of interest in adapting to change</b>					
24.1	<p>How responsible do you feel to protect the marine environment?</p> <p>Hoe verantwoordelik voel u om die marine omgewing te bewaar?</p>	Very responsible Baie verantwoordelik	Responsible verantwoordelik	Slightly responsible Effens verantwoordelik	Not at all responsible Glad nie verantwoordelik
<b>Attitude to change</b>					
25.1	<p>How likely are you to adapt to change compared to others you know?</p> <p>Hoe geneig is u om te verander in vergelyking met ander mense wat u ken?</p>	Very likely Baie geneig	Likely geneig	Not likely Effens geneig	Not likely at all Glad nie geneig
<b>Employability</b>					
26.1	<p>How useful would your skills be in setting up a business other than in fishing?</p> <p>Hoe bruikbaar sal u vaardighede wees as u ander besigheid behalwe visvang begin?</p>	Very useful Baie bruikbaar	Useful bruikbaar	Slightly useful Effens bruikbaar	Not at all useful Glad nie bruikbaar

**Occupational flexibility- Rating questions**

Capacity to anticipate change and develop response strategies				
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27.1	How suitable do you think your community is for tourism activities? Hoe geskik dink u is u gemeenskap vir toerisme?	Very suitable Baie geskik	Suitable geskik	Slightly suitable Effens geskik	Not suitable at all Glad nie geskik
27.2	How healthy are the marine resources in your area for tourism? Hoe gesond is die mariene bronne in u area vir toerisme?	Very healthy Baie gesond	Healthy gesond	Not very healthy Nie so gesond	Not at all healthy Glad nie gesond
27.3	How important is fishing as an economic activity in this community? Hoe belangrik is visvang as 'n ekonomiese aktiwiteit in u gemeenskap?	Very important Baie belangrik	Important Belangrik	Slightly important Effens belangrik	Not at all important Glad nie belangrik
27.4	Would you say that there are too many or too few tourism activities available to fishers? Dink u daar is te veel of te min toerisme aktiwiteite beskikbaar vir vissers?	Too many Te veel	Slightly too many Effens te veel	Slightly too few Effens te min	Too few Te min
<b>Occupational mobility</b>					
28.1	How often are you employed in more than one job per year? Hoe gereeld het u meer as een werk per jaar?	Very often Gereeld	Often Minder gereeld	Rarely Min	Never Nooit
28.2	How willing are you to move to a bigger town or community for work if necessary? Hoe gewillig is u om na 'n groter stad of gemeenskap te trek vir werk indien nodig?	Very willing Baie gewillig	Willing Gewillig	Slightly willing Effens gewillig	Not willing at all Glad nie gewillig
<b>Business approach</b>					
29.1	How possible is it to guess how much money your business will make each month? Hoe moontlik is dit om te weet hoeveel geld u besigheid sal maak elke maand?	Very possible Baie moontlik	Possible moontlik	Slightly possible Effens moontlik	Impossible Glad nie moontlik
29.2	How detailed a business plan do you have for the following year? Hoe gedetailleerd 'n besigheid plan het u vir volgende jaar?	Very detailed Baie gedetailleerd	Detailed gedetailleerd	Slightly detailed Effens gedetailleerd	Not at all detailed Glad nie gedetailleerd

**General Conflicts (GR)- Rating questions**

<b>Fishing compliance and conflict</b>					
30.1	Would you say that illegal fishing does not occur or does occur in the community in which you fish? Sou u sê dat onwettige visvang gebeur of nie gebeur in die gemeenskap waar u visvang?	Occurs a lot Gebeur dikwels	Occurs Gebeur	Occurs a little Gebeur effens	Does not occur at all Glad nie Gebeur

30.2	<p>Would you say that everyone or no one knows who the individuals are that break the fishing rules?</p> <p>Sou u sê dat almal of niemand weet wie die reels oor visvang breek nie?</p>	Everyone Almal	Most people Byna almal	A few people 'n paar mense	No one Niemand
30.3	<p>How well-enforced are the fishing rules that apply in this area?</p> <p>Hoe goed word die visvang reels toe gepas in die area?</p>	Well-enforced. Goed toe gepas	Just enforced Toe gepas	Enforced a little Effens toe gepas	Not enforced at all Glad nie toe gepas
30.4	<p>How common are conflicts between fishers in this area?</p> <p>Hoe algemeen is konflik tussen vissermanne in die area?</p>	Very common Baie algemeen	Common algemeen	Not very common Effens algemeen	Do not occur ever Glad nie algemeen
30.5	<p>How happy are you with the fishing rules implemented in the last five years?</p> <p>Hoe gelukkig is u met die visvangsreels wat in die laaste vyf jaar geïmplementeer is?</p>	Very happy Baie Gelukkig	Happy Gelukkig	Slightly unhappy Effens gelukkig	Not Happy at all Glad nie gelukkig nie
<b>Access to institutional safety nets &amp; information</b>					
31.1	<p>Would you say there are none or many government safety nets in case disaster strikes fishing activities in this community?</p> <p>Sou u sê daar is baie of min veiligheids netwerke in plek ingeval rampe visvang aktiwiteite tref in die gemeenskap?</p>	Many Baie	Some Minder	Few Min	None Geen
31.2	<p>How happy are you with the government safety nets used in your community during disasters?</p> <p>Hoe gelukkig is u met regerings 'vang-nette' wat tydens rampe in u gemeenskap geïmplementeer word?</p>	Very happy Baie Gelukkig	Happy Gelukkig	Slightly unhappy Effens gelukkig	Not Happy at all Glad nie gelukkig nie
31.3	<p>How well linked is this community to government departments and/or academic institutions so you receive up-to-date information about fishing?</p> <p>Hoe goed is die gemeenskap gekoppel aan regerings departement en/of akademiese institusies om nuwe inligting oor visvang te kry?</p>	Very well linked Baie goed gekoppel	Well linked goed gekoppel	Linked slightly Effens gekoppel	Not at all linked Glad nie gekoppel
31.4	<p>Would you say the information received from government departments regarding the fishery is valuable?</p> <p>Sou u sê dat die informasie wat u aangaande die vissery van regerings departemente ontvang waardevol is?</p>	Very valuable Baie waardevol	Valuable Waardevol	Slightly valuable Effens waardevol	Not valuable Geen waarde
31.5	<p>Would you say the information received from academic institutions regarding fishery is valuable?</p> <p>Sou u sê dat die informasie wat u aangaande die vissery van akademiese instellings ontvang waardevol is?</p>	Very valuable Baie waardevol	Valuable Waardevol	Slightly valuable Effens waardevol	Not valuable Geen waarde
31.6	<p>How involved is the DFFE in communicating information to fishers?</p> <p>Hoe betrokke is die DFFE in kommunikasie van informasie aan vissers?</p>	Very Involved Baie Betrokke	Involved Betrokke	Slightly uninvolved Effens onbetrokke	Uninvolved Onbetrokke

31.7	How happy are you with the communication of information by DFFE? Hoe gelukkig is u met die kommunikasie wat u van DFFE ontvang?	Very happy Baie Gelukkig	Happy Gelukkig	Slightly unhappy Effens gelukkig	Not Happy at all Glad nie gelukkig nie
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**Attitude and perception - Rating questions**

<b>Attitude to change</b>					
32.1	How much of a risk do you think environmental change poses to the community you live in? Hoe groot 'n risiko dink u is omgewings veranderinge vir die gemeenskap?	High Groot risiko	Medium Mdeium risiko	Low Lae risiko	None Geen risiko
32.2	How anxious/scared do you feel about the changes you are seeing in the environment in your area? Hoe angstig of bang voel u oor omgewings veranderinge wat u kan sien in u area?	Very scared/ anxious Baie angstig/bang	Scared/ anxious Angstig/bang	Little scared/ anxious Effens angstig/bang	Not at all scared/ anxious Glad nie angstig/bang
<b>Perceptions of change</b>					
33.1	How dangerous are changes in the local weather making fishing? Hoe gevaartlik is die plaaslike weer veranderinge vir visvang?	Very dangerous Baie gevaartlik	Dangerous Gevaartlik	Slightly dangerous Effens gevaartlik	Not at all dangerous Glad nie gevaartlik
33.2	How difficult has it become to catch fish in the areas you fish? Hoe moeilik het dit geword om vis te vang in die areas waar jy visvang?	Very difficult Baie moeilik	Difficult moeilik	Slightly difficult Effens moeilik	Not at all difficult Glad nie moeilik
33.3	How many changes would you say you have noticed in the marine species you see? Hoeveel veranderinge sou u sê het u self gesien in marine spesies?	Many changes Baie veranderinge	Changes Veranderinge	Few changes 'n paar veranderinge	No changes Geen veranderinge
<b>Interest in the environment</b>					
34.1	How many ideas would you say you have about how to ensure the sustainability of the main species you catch? Hoeveel idees het u oor hoe om die volhoubaarheid te verseker van die vis spesies wat u die meeste vang?	Many ideas Baie idees	Some ideas Minder idees	Few ideas Min idees	No ideas Geen idees
34.2	Would you say a good fisher knows a lot or a little about the biology of the main species they catch? Sou u sê 'n goeie visser weet baie of min van die biologie van die hoof spesie wat hy/sy vang?	A lot Baie	Some Minder	Little Min	Nothing Niets

**Social capital (SC)**

<b>Social capital, networks and community cohesion</b>					
35.1	When I need help financially or in terms of food or basic needs I ask for assistance from: As ek hulp nodig het met finansies, kos of basiese behoeftes dan vra ek vir hulp van:				
	Family Familie	Neighbours Bure			
	Friends Vriende	Local organisation plaaslike organisasies			
	Take loans Lenings	Other Ander			
	<b>Gender equity</b>				

36.1	Are any women in leadership roles in this community? Is daar enige vroue in leierskap rolle in die gemeenskap?	
	Ja / Nee                      Yes / No	
36.2	If yes, what positions do women mostly hold? Indien ja watter posisies het hulle?	

**Human capital (HC)**

	<b>Local knowledge</b>	
37.1	List the top three sources of information you regularly consult for information about local fishing and conditions. Noem die drie belangrikste bronne van informasie waar u gereeld informasie by kry oor die plaaslike visvang toestande.	
	1                                      2                                      3	
	<b>Health</b>	
38.1	Do you have anyone in your house who was infirm or needed assistance to undertake daily chores in the past 12 months? Het u enige iemand in u huis wie siek is of was of wie hulp nodig gehad het om daaglikse take te verig?	
	Ja / Nee                      Yes / No	
38.2	Is anybody in your family chronically ill (was very sick for at least 3 months in the last year and could not work or do normal activities)? Is enige persoon in u familie kronies siek (was baie siek vir ten minste 3 maande die laaste jaar en kon nie werk of normale aktiwiteite doen nie)?	
	Ja / Nee                      Yes / No	
	<b>Education</b>	
39.1	What is the highest level of education reached by you Wat is die hoogste vlak van skool wat u bereik het?	
	Primary school                      High school Primere skool                      Hoer skool	
	Skills/practical/technical education                      University Vaardighede/praktiese/tegniese opleiding                      Universiteit	
	Other Ander	
	<b>Skills</b>	
40.1	Do you have basic skill in any of the following fields Het u basiese vaardighede in enige van die volgende?	
	Gardening/horticulture                      Mechanics (e.g. fixing a car) Tuinmaak                      Meganika	
	Electronics                      Welding Elektronika                      Sweiswerk	
	Emergency first aid                      Other Ongevalle/ eerste hulp                      Ander	
	<b>Knowledge</b>	
41.1	Do you feel you have basic knowledge in any of the following areas Dink u u het 'n basiese kennis in enige van die volgende?	
	Local environmental issues                      Local marine issues Plaaslike omgewings kwessies                      Plaaslike marine kwessies	
	Fish biology                      Running a business Vis biologie                      Besigheid bestuur	
	Other Ander	
	<b>Labour</b>	
42.1	Is it easy to find work outside of fishing if you are known to be a fisher? Is dit maklik om werk buiten visvang te kry as u bekend is as 'n visser?	
	Ja / Nee                      Yes / No	
42.2	List any community organisations you an active participant in? Noem enige organisasies in die gemeenskap waarvan u aktief deel is?	
	1                                      2                                      3	

**Financial capital (FC)**

	<b>Household sharing income</b>	
43.1	Does each working household member contribute to basic household expenses (electricity, food, water etc)? Dra elke werkende persoon in die gesin by tot die uitgawes?	
	Ja / Nee                      Yes / No	

43.2	If you needed cash today for an emergency – would you be able to get that cash? As u geld benodig vandag vir 'n noodgeval sal u instaat wees om die geld in die hande te kry?	
	Ja / Nee                      Yes / No	
<b>Savings</b>		
44.1	Do you have any savings or money put aside for emergencies? Het u geld opsy gesit as spaargeld of vir noodgevalle?	
	Ja / Nee                      Yes / No	
<b>Debt</b>		
45.1	Do you have a mortgage on your house? Het u 'n verband op u huis?	
	Ja / Nee                      Yes / No	
45.2	If yes, how much? Indien ja, hoeveel? (R)	
45.3	Do you owe money to anyone (aside from a mortgage on your house)? Skuld u geld aan enige iemand? (buiten die verband op u huis)	
	Ja / Nee                      Yes / No	
<b>Credit</b>		
46.1	Who/where do you normally borrow money from? Wie/ waar leen u normaalweg geld?	
	Friends and family                      Small money lenders Vriende en familie                      Klein geldskierter	
	Large companies                          Banks Groot maatskapye                      Banke	
	Other Ander	
46.2	Have you loaned money to anyone in the last year? Het u aan enige iemand geld geleen in die laaste jaar?	
	Ja / Nee                      Yes / No	
<b>Insurance</b>		
47.1	What insurance policies do you have at the moment? Watter versekeringspolisse het u op die oomblik?	
	Life    House Lewens    Huis	
	Contents                                      Vehicle Inhoud    Motor	
	Boat    Income Boot    Inkomste	
	Other Ander	

#### Physical capital (PC)

<b>Built house</b>		
48.1	Do you own or rent the house you live in? Besit u of huur u die huis?	
48.2	Age of building? Ouderdom van gebou? (years)	
48.3	Number of rooms Getal kamers (number)	
48.4	Estimated value of main building: Beraamde waarde van hoof gebou (R)	
48.5	Does your house need much renovation and maintenance? Het u huis enige regmaak of onderhoud nodig?	
	Ja / Nee                      Yes / No	
48.6	What is the outside of the house mainly made of? Waarvan is u huis gebou?	
	Concrete                                      Concrete block / bricks Sement    Sement blokke	

	Wood Hout	Plywood Laaghout	
	Metal/tin Metaal/tin	Thatch Riet	
	Other Ander		
<b>Household assets</b>			
49	What sort of boat do you own? Watter soort boot besit u? [49.1]	Number of boat [49.2]	Size of boat [49.3]
	I do not own a boat Ek besit nie 'n boot nie		
	Bakkie boot		
	Recreational boat Ontspanning boot		
	Outboard motor boat Boot met outboard		
	Ski-boat Ski boot		
	Other (please specify) Ander (spesifiseer)		
<b>Freshwater supply</b>			
50.1	Do you have a water tank? Het julle 'n watertenk(e)?		
	Ja / Nee                      Yes / No		
50.2	What is your main source of drinking water Wat is u hoof bron van drinkwater:		
	Public system only                      Community system only Slegs openbare stelsel                      slegs gemeenskap stelsel		
	Public & community system                      Stand-pipe Openbare en gemeenskap stelsel                      Staan-pyp		
	Bottled                      Catchment, drums Gebottel                      opvangs, tenke, dromme		
	Well/ borehole                      Spring/river put/ boorgat                      fontein/ rivier		
<b>Energy</b>			
51.1	What is your main source of energy? Wat is u hoof bron van energie?		
	Power is not connected                      Mains connected Krag is nie aangekoppel                      Hoofleiding verbinding		
	Solar panels                      Own generator Son paneel                      Eie kragopwekker		
	Other power sources Ander energie bronne		
51.2	What source of water heating do you have? Het u warm water?		
	No water heating                      Solar Geen                      Sonverhitting		
	Gas                      Electric Gas                      Elektries		
	Firewood Brandhout		
<b>Cooking fuels</b>			
52.1	What is the main source of fuels you use for cooking (tick only one)? Wat is die hoof tipe brandstowwe gebruik u om te kook (merk net een)?		
	Firewood                      Gas Brandhout                      Gas		
	Electric                      Other Elektries                      Ander		
<b>Waste</b>			
53.1	Do you have your own toilet? Het u u eie toilet?		
	Ja / Nee                      Yes / No		

53.2	What type of toilet do you have (tick only one)? Watter tipe toilet het u? (merk net een)	
	No toilet Geen	Pour flush Ingooi en spoel
	Flush Spoel	Long drop Put toilet
	Composting Kompost	
53.3	What happens to waste water? Wat gebeur met afvalwater?	
	Wastewater disposal Afvalwater dreinerings	Septic tank septiese tenk
	Waste water treatment Afvalwater behandeling	None Geen
	Other Ander	Soak pit Week put
53.4	How do you get rid of most of your rubbish? Hoe raak julle ontslae van julle vullis?	
	Collected Kolleksie	Hole Gat
		Open burning Oop verbrand
	Take it to the tip myself Ek neem dit self tot by die vullisgate myself	Other Ander

**Natural capital (NC)**

	<b>Changing resource base</b>	
54.1	Have you noticed changes in your communities' marine resources during your lifetime? Het u veranderinge opgemerk in die marine bronne in hierdie area gedurende u leeftyd?	
	Ja / Nee	Yes / No
54.2	If yes, what do you believe is the main cause of these changes? Indien wel, wat dink u veroorsaak hierdie veranderinge?	
54.3	Do you think that the sea habitat in your area is Dink u dat die see habitat in u area:	
	the same as it always was dieselfde is as wat dit altyd was	slightly damaged effe beskadig is
	badly damaged erg beskadig is	irrecoverably damaged onherstelbaar beskadig
	improved since you were a child verbeter het sedert u 'n kind was	
	<b>IF ANSWER TO ABOVE QUESTION IS "THE SAME" – SKIP NEXT 2 QUESTIONS</b>	
54.4	What do you think are the factors that cause declines in fish numbers in your area? Wat dink u is die faktore wat 'n afname in vis getalle in u area veroorsaak?	
54.5	What do you think could help to increase the number of fish in the sea in your area? Wat dink u kan die toename van vis in die see in u area aanhelp?	
54.6	Do you think your local marine resources are being overharvested at the moment? Dink u dat julle plaaslike see hulpbronne tans oorbenut word?	
	Ja / Nee	Yes / No
54.7	Have you noticed any changes to your livelihood as a result of changes to the marine habitat? Het u enige veranderinge in u lewensmiddele opgemerk as 'n oorsaak van veranderinge tot die see habitat?	
	Ja / Nee	Yes / No

**Social Capital - Rating questions**

	Networks and social capital				
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55.1	How confident are you that you can call on someone (friend or family) if you need help financially?  Hoe seker is u dat u finansiële hulp kan vra van iemand (vriend of familie) as u dit nodig het?	Very confident Baie seker	Confident seker	Slightly confident Effens seker	Not at all confident Glad nie seker
<b>Decision-making</b>					
56.1	How involved are you in community decision-making?  Hoe betrokke is u in besluite neem in die gemeenskap?	Very involved Baie betrokke	Involved betrokke	Slightly involved Effens betrokke	Not at all involved Glad nie betrokke
56.2	How involved are you in marine protected area management?  Hoe betrokke is u in die bestuur van plaaslike beskermde marine areas?	Very involved Baie betrokke	Involved betrokke	Slightly involved Effens betrokke	Not at all involved Glad nie betrokke
<b>Leadership</b>					
57.1	How strong is your community leadership?  Hoe sterk is leierskap in u gemeenskap?	Very strong Baie sterk	Strong Sterk	Slightly strong Effens sterk	Not at all strong Glad nie sterk
57.2	How often can you talk to (have access to) a community leader if you need to?  Hoe dikwels kan u praat met 'n leier in die gemeenskap as u nodig het?	Always Altyd	Often Dikwels	Sometimes Somtyds	Never Nooit
<b>Equity</b>					
58.1	How equal is women's access and control over livelihoods and resources compared to men?  Hoe gelyk is vrouens se toegang en beheer oor gesins lewe en bronne in vergelyking met mans?	Totally equal Baie gelyk	Nearly equal Minder gelyk	Quite unequal Min gelyk	Not at all equal Geen gelyk
58.2	Would you say that everyone in this community is vulnerable or are some people more vulnerable than others in the community?  Sou u sê dat almal in die gemeenskap kwesbaar is of is party mense meer of minder kwesbaar as ander?	Everyone Almal	Most people Meeste mense	Some people Party mense	No one Niemand

#### Human Capital –Rating questions

<b>Skills</b>					
59.1	Would you say that, with the technology available to the industry now, that anyone or only certain people can be a skillful fisher?  Sou u sê, met hedendaagse tegnologie beskikbaar, dat almal of net party mense vaardige vissers kan wees?	Anyone Almal	Many people Baie mense	Some people Party mense	Very few people Baie min mense
59.2	How confident are you that your skills will mean that you are successful in the industry?  Hoe seker is u dat u vaardighede u 'n sukses sal maak in die visbedryf?	Very confident Baie seker	Confident seker	Slightly confident Effens seker	Not at all confident Glad nie seker

**Financial Capital –Rating questions**

60.1	How possible is it for you to endure some income shocks if it should occur?  Hoe moontlik is dit vir u om met 'n verlies in inkomste te “cope” (reg te kom) sou dit gebeur dat u minder geld verdien?	Very possible Baie moontlik	Possible moontlik	Slightly possible Effens moontlik	Impossible Glad nie moontlik
60.2	How possible is it for you to access financial reserves if you end up without work for a while?  Hoe moontlik is dit vir u om spaargeld in die hande te kry, sou u nie werk vir 'n ruk nie?	Very possible Baie moontlik	Possible moontlik	Slightly possible Effens moontlik	Impossible Glad nie moontlik

**Physical Capital - Rating questions**

61.1	How much money do you owe on your main assets (house – mode of transport)?  Hoeveel geld skuld u op u grootste besittings/bates?	Much Baie	Some Minder	Little Min	None Geen
61.2	How many of the things you own are in good condition and do not need to be replaced anytime soon?  Hoeveel van die dinge wat u besit is in goeie kondisie en sal nie binnekort vervang hoef te word nie?	All Alle	Most Mees	Some Sommige	None Geen

**Natural Capital– Rating questions**

62.1	How diverse (number of species) is the marine habitat of your community?  Hoe divers is die marine habitat van u gemeenskap?	Very high Baie hoe	High Hoe	Low Lae	Very low Baie lae
62.2	How has the number of fish in the area changed compared to 5 years ago?  Hoe het die vis getalle verander in die area in vergelyking met vyf jaar gelede?	Big increase Groot toeneem	Increase toeneem	Decrease Afneem	Big decrease Groot Afneem
62.3	Has the marine environment worsened or improved over the past 5 years?  Het die marine omgewing agteruit gegaan of verbeter in die laaste 5 jaar?	Improved a lot Baie verbeter	Improved verbeter	Worsened versleg	Worsened a lot Baie verbeter

**Exposure –Rating questions**

63.1	Would you say for safety reasons you prefer to work with many boats around whilst at sea?  Sou u sê dat u vir veiligheids redes verkies om met baie bote rondom u te werk as u op see is?	Many boats Baie bote	Some boats Minder bote	Few boats Min bote	No boats Geen bote
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**Exposure (Ex)**

	<b>Personal exposure</b>	
64.1	How safe do you feel you are in your main occupation in the context of climatic exposure? Hoe veilig voel u is u in u hoofberoep in die konteks van klimaat blootstelling?	
	Very safe Baie veilig	Somewhat dangerous Effens gevaarlik
	Safe Veilig	Dangerous Gevaarlik
	Very dangerous Baie gevaarlik	
	<b>Environmental Change</b>	

Storms		
65.1	Has there been a large storm in the last 5 years in your area? Was daar'n groot storm in die laaste 5 jaar?	
	Ja/Nee Yes/No	
65.2	Were you directly impacted by the large storm? Was u direk beïnvloed deur die groot storm?	
	Ja/Nee Yes/No	
65.3	If yes, how bad was the large storm's damage to your household? Indien ja, hoe sleg was die skade aan u gesin?	
	No damage Moderate damage Geen Skade matige skade	
	Little damage major damage Min skade groot skade	
	Catastrophic (property damage and loss of lives) Katastrofies	
65.4	Have actions been taken by the household to prevent large storm damage? Watter aksies is gedoen deur die gesin om die skade van die groot storm te voorkom?	
	Ja/Nee Yes/No	
65.5	If yes, what has been done to prevent damage? Indien ja, wat is gedoen?	
65.6	How many fishing days did you lose due to the large storms in the past year? Hoeveel visvang dae het u weens storms verloor gedurende die laaste jaar?	
	None 1-3 months Geen 1-3 maande	
	<10 days >3 months <10 dae >3 maande	
	10-30 days 10-30 dae	
Wind speed		
66.1	Have you noticed any changes in wind speed in the last five years in your area? Het u enige verandering in windspoed die afgelope 5 jaar opgemerk?	
	Ja/Nee Yes/No	
66.2	How were you impacted by the changes in wind speed? Het hierdie veranderinge in windspoed 'n impak op u gehad?	
	No Impact Slight Impact Geen impak Effense impak	
	Impacted Greatly Impacted Impak Groot impak	
66.3	How severe were the changes in wind speed? Hoe ernstig van die graad van verandering in wind spoed?	
	Very severe Severe Baie Ernstig Ernstig	
	Slightly severe Not severe at all Effens Ernstig Glad nie ernstig nie	
66.4	How many days did you go fishing when changes in wind speed occurred? Hoeveel dae kon u gaan visvang na gelang van die verandering in wind spoed?	
	Every day of the week 3 to 5 days a week Elke dag van die week 3 tot 5 dae 'n week	
	2 to 3 days a week 1 to 2 days a week 2 tot 3 dae 'n week 1 tot 2 dae 'n week	
	Once a week Less than once a week Eenkeer 'n week minder as een keer 'n week	
Wind direction		
67.1	Have you noticed any changes in wind direction in the last five years in your area? Het u enige verandering in windrigting die afgelope 5 jaar opgemerk?	
	Ja/Nee Yes/No	
67.2	How were you impacted by the changes in wind direction?	

	Het hierdie veranderinge in windrigting 'n impak op u gehad?	
	No Impact Geen impak	Slight Impact Effense impak
	Impacted Impak	Greatly Impacted Groot impak
67.3	How severe were the changes in wind direction? Hoe ernstig van die graad van verandering in wind rigting?	
	Very severe Baie Ernstig	Severe Ernstig
	Slightly severe Effens Ernstig	Not severe at all Glad nie ernstig nie
67.4	How many days did you go fishing when changes in wind direction occurred? Hoeveel dae kon u gaan visvang na gelang van die verandering in wind rigting?	
	Every day of the week Elke dag van die week	3 to 5 days a week 3 tot 5 dae 'n week
	2 to 3 days a week 2 tot 3 dae 'n week	1 to 2 days a week 1 tot 2 dae 'n week
	Once a week Eenkeer 'n week	Less than once a week minder as een keer 'n week
	<b>Rainfall</b>	
68.1	Have you noticed any changes in rainfall patterns in the last five years in your area? Het u enige verandering in reeval patrone die afgelope 5 jaar opgemerk?	
	Ja/Nee	Yes/No
68.2	How were you impacted by the changes in rainfall patterns? Het hierdie veranderinge in vernadering in reeval patrone 'n impak op u gehad?	
	No Impact Geen impak	Slight Impact Effense impak
	Impacted Impak	Greatly Impacted Groot impak
68.3	How severe were the changes in rainfall patterns? Hoe ernstig van die graad van verandering in reeval patrone?	
	Very severe Baie Ernstig	Severe Ernstig
	Slightly severe Effens Ernstig	Not severe at all Glad nie ernstig nie
68.4	How many days did you go fishing when changes in rainfall patterns occurred? Hoeveel dae kon u gaan visvang na gelang van die verandering in reeval patrone?	
	Every day of the week Elke dag van die week	3 to 5 days a week 3 tot 5 dae 'n week
	2 to 3 days a week 2 tot 3 dae 'n week	1 to 2 days a week 1 tot 2 dae 'n week
	Once a week Eenkeer 'n week	Less than once a week minder as een keer 'n week
	<b>Sea state</b>	
69.1	Have you noticed any changes in sea state in the last five years in your area? Het u enige verandering in see toestande die afgelope 5 jaar opgemerk?	
	Ja/Nee	Yes/No
69.2	How were you impacted by the changes in sea state? Het hierdie veranderinge in seetoestand 'n impak op u gehad?	
	No Impact Geen impak	Slight Impact Effense impak
	Impacted Impak	Greatly Impacted Groot impak
69.3	How severe were the changes in sea state? Hoe ernstig van die graad van verandering in see toestand?	
	Very severe	Severe

	<b>Baie Ernstig</b>	<b>Ernstig</b>	
	Slightly severe	Not severe at all	
	Effens Ernstig	Glad nie ernstig nie	
69.4	How many days did you go fishing when changes in sea state occurred? Hoeveel dae kon u gaan visvang na gelang die verandering in see toestand?		
	Every day of the week	3 to 5 days a week	
	Elke dag van die week	3 tot 5 dae 'n week	
	2 to 3 days a week	1 to 2 days a week	
	2 tot 3 dae 'n week	1 tot 2 dae 'n week	
	Once a week	Less than once a week	
	Eenkeer 'n week	minder as een keer 'n week	
	<b>Drought</b>		
70.1	Have you noticed any changes in drought conditions in the last five years in your area? Het u enige verandering in droogte toestande die afgelope 5 jaar opgemerk?		
	Ja / Nee	Yes / No	
70.2	Did the changes in drought conditions have an impact on you? Het hierdie veranderinge in droogte toestande 'n impak op u gehad?		
	No Impact	Slight Impact	
	Geen impak	Effense impak	
	Impacted	Greatly Impacted	
	Impak	Groot impak	
70.3	How severe were the changes in drought conditions? Hoe ernstig van die graad van verandering in droogte toestande?		
	Very severe	Severe	
	Baie Ernstig	Ernstig	
	Slightly severe	Not severe at all	
	Effens Ernstig	Glad nie ernstig nie	
70.4	How many days did you go fishing when changes in drought conditions occurred? Hoeveel dae kon u gaan visvang na gelang van die verandering in droogte toestande?		
	Every day of the week	3 to 5 days a week	
	Elke dag van die week	3 tot 5 dae 'n week	
	2 to 3 days a week	1 to 2 days a week	
	2 tot 3 dae 'n week	1 tot 2 dae 'n week	
	Once a week	Less than once a week	
	Eenkeer 'n week	minder as een keer 'n week	
	<b>Pandemic</b>		
71.1	Were you affected by COVID -19 lockdown restrictions? Is u deur die COVID-19 grendeltydperk beïnvloed?		
	Ja/Nee	Yes/No	
71.2	How were you affected by the different COVID-19 restrictions? Hoe is u geaffekteer deur die verskillende COVID-19 inperkings?		
71.3	Did you notice any changes caused by the COVID-19 restrictions on fishing and livelihoods? Het u enige veranderinge opgemerk op visvang en lewensbestaan wat deur die deur COVID-19-beperkings veroorsaak is?		
	Ja/Nee	Yes/No	
71.4	Would you say that your ability to travel or rely on local marketers was affected during the different levels of lockdown restrictions? Sou u sê dat u vermoë om te reis of op plaaslike bemarkers staat te maak, geraak is tydens die verskillende vlakke van beperkings?		
	Ja/Nee	Yes/No	
71.5	Are you satisfied with the measures that were employed to deal with the impacts of COVID-19? Is jy tevrede met die maatreëls wat aangewend is om die impak van COVID-19 te hanteer?		
	Ja/Nee	Yes/No	

**Adaptation options (AdOp)**

72.1	What will you do if weather conditions continue to worsen or change? Wat sal u doen as die weersomstandighede aanhou om te versleg of te verander?	
72.2	What will you do if it becomes too difficult to find enough fish? Wat sal u doen as dit te moeilik raak om genoeg vis te vind?	
72.3	What would you do in the event of a 50% decline in fish catches? Wat sal u doen as die vangste met 50% afneem?	
72.4	What would you do in the event of market prices dropping by 50% and remaining there? Wat u sal u doen as die verkoopsprys met 50% afneem en daar bly vir drie jaar?	
72.5	If you were in charge of the fishing activity in this area what would you do? (2 or 3 changes) As u in beheer was van visvang in die area, wat sou u doen? (2 of 3 veranderinge)	

	<b>Climate change institutions</b>	
73.1	Are there institutions or government departments working on climate change or facilitating adaptation to change in the community? Is daar enige institusies of regerings organisasies wat die gemeenskap help met klimaatsverandering?	
	Ja / Nee                      Yes / No	
73.2	IF YES, Which institutions work on climate change or facilitating adaptation? Indien ja, wie?	

**Attitude and perceptions**

	<b>Climate Change</b>	
74.1	Have you ever heard of climate change? Het u al van klimaatsverandering gehoor?	
	Ja / Nee                      Yes / No	
74.2	Do you think the climate has changed over time? Dink u die klimaat het oor tyd verander?	
	Ja / Nee                      Yes / No	
74.3	List the top 3 changes in the climate you have noticed. Noem die drie grootste veranderinge van die klimaat wat u kan sien?	
	1                                      2                                      3	
74.4	Where do you mainly get your information about climate change? (tick any that apply) Waar kry u hoofsaaklik u informasie oor klimaatsverandering? (noem alle bronne)	
	Newspapers                      My friends and family Koerante                              My vriends en familie	
	TV/Radio                              The internet TV/ Radio                              Die internet	
	Academic society                      Other Akademiese wereld                      Ander	

**A**

	<b>Approximately how much of your household expenses are on the following categories?</b>	
	<b>Expense</b>	<b>R/week/month/year</b>
	Rent - Huur	75.1
	Food - Kos	75.2
	Water - Water	75.3
	Electricity - Elektrisiteit	75.4
	School fees - Skool geld	75.5
	Loan repayments - Skuldterugbetalings	75.6
	Insurances - Versekering	75.7

7.7. Do you own the following?

- Vehicle
- Fishing gear
- Television
- Gas or electric stove
- Cell phones
- Piped water
- Refrigerator
- Radio/ cassette player
- Video/ DVD player
- Generator
- Electricity
- Washing machine
- Kerosene lamps
- Electric lamps
- Solar panel
- Garden/power tools

## Appendix B: Rationale Table

Category	Component	Subcomponent	Indicator	Q Type	Q No	Survey Question	Scoring Method	Rationale / Notes	Availability of questions in both the original and 2023 surveys	References
S	Social Dependence on Fishing	Attachment to place	Feeling of Belonging	Likert	14.1	Would you say you feel like you belong or do not belong to this community/town?	NA/Not sure=0; Not at all=1; Slightly belong=2; Belong=3; Strongly belong=4	The greater feeling of belonging indicates a higher attachment and therefore a higher social dependence on fishing and increased sensitivity to change.	Available in both the surveys	Marshall et al.2007
S			Importance of friendships in the community	Likert	14.2	How important are the friendships/relationships you have in this town?	NA/Not sure=0; Not at all important=1; slightly important=2; Important=3; Very important=4	Meaningful friendships indicate a higher attachment to a place. Changed the directionality of original scoring to match this rationale.	Available in both the surveys	Marshall et al.2007
S		Recreational Dependence	Recreational fishing	Likert	15.1	How often do you fish recreationally?	NA/Not sure=0; never=1; rarely=2; somewhat often=3; Very often=4	Recreational fishing indicates a higher social dependence on fishing and increasing sensitivity to change	Available in both the surveys	
S		Attachment to fishing (occupation)	Degree of pride in telling others one is a fisher	Likert	16.1	How proud are you to tell people that you are a fisher?	NA/Not sure=0; Not at all proud=1; slightly proud=2; proud=3; very proud=4	High levels of pride show a high attachment to fishing.	Available in both the surveys	Marshall et al.2007
S			Level of interest in one's children becoming fishers	Likert	16.2	Would you like your children to continue in the fishing profession?	NA/Not sure=0; Not like at all=1; Not like=2 like=3; Like very much=4	Fishers who want their children to become fishers show a high attachment to the place.	Available in both the surveys	Marshall et al.2007

S			Level of occupational diversity throughout the year	Likert	28.1	How often are you employed in more than one job per year?	NA/Not sure=0; Never=1; Rarely=2; Often=3; Very often=4	Many different jobs indicate lower attachment to fishing.	Available in both surveys	Bennet et al.2014
S			Number of employment changes in the past 5 years	Binary	11.1	Have you had a change of employment in the past 5 years?	NA/Not sure=0; Yes=1; No=2	A higher number of job changes indicates a lower attachment to fishing.	Available in both the surveys	Bennet et al.2014
S			Response to hypothetical change in primary livelihood (fishing)	Open-ended	72.2	What will you do if it becomes too difficult to find enough fish?	NA/Not sure=0; Find other work=1; Already difficult but remain fishing=2; Fish other species/relocate=3; use other sources of income (including social grant) =4	Finding other works shows the least amount of attachment to fishing, acknowledging that it is difficult/showing effort to change = less attached, fishing other species shows attachment but adaptability, 'keep fishing' is the most 'attached' answer.	Available in both the surveys	
S			Occupational dependence	Binary	1.1	Is fishing your main occupation?	NA/Not sure=0; Yes=4; No=1	Main occupation = greater attachment	Available in both the surveys	
S		<b>Recreational dependence</b>	Regularity of recreational fishing	Likert	15.1	How often do you fish recreationally?	NA/Not sure=0; Never=1; Rarely=2; somewhat often=3; very often=4	More recreational fishing = greater dependence.	Available in both the surveys	

S		Social dependence	Level of interaction and dependence on other people and institutions	Multiple choice	5.1	I depend on the following institutions and people for day-to-day resources to go fishing: Weather predictions and news, family, buyers of fish, fellow workers, and none.	NA/Not sure=0; weather prediction and news=1; my family=2; buyers of fish=3; fellow workers=4; Boat owner=5; Skipper=6	High levels of interaction show a greater social dependence of fishers on the community around them.	Available in both the surveys	
S			Level of interaction and dependence on other people and institutions	Multiple choice	5.2	Who do you interact with when you go fishing? (Other fishers, safety authorities, suppliers of fishing tackle/fuel, Marine Reserve Managers, & Company officials)	NA/None=0; Other fishers/crew/skipper=1; Safety authorities=2; Scientist=3; Marine reserve managers=4; Company officials=5; Suppliers of fishing tackle=6; DAFF officials=7; God=8; Tourists=9; suppliers of fishing fuel=10	High levels of interaction show a greater social dependence of fishers on the community around them.	Available in both the surveys	

	<b>Fishing Business</b>	<b>Household Expenditure</b>	Place of food Purchase	Open-ended	4.1	Where do you mainly go to buy your food purchases?	NA/Not sure=0; Albertinia (Usave)=1; Bitouville/Gouritsmond=2; StillBaai (Spar/OK) = 3; Melkhoutfontein=4; Mossel Bay=5	The correlation between the accessibility of food sources and the degree of exposure is such that when the distance of shops increases from individual households, the cost incurred also increases. Moreover, unforeseen events may arise that serve as impediments to individual access to food, thereby engendering food insecurity.	Available in both the surveys	Cinner & Aswani papers
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S	Historical & Cultural Dependence on Fishing	The cultural importance of fishing	Length of time as a fisher	Open-ended	8.1	How long have you been a fisher?	NA/Not sure=0; 1-5 years=1; 6-10 years=2; 11-15 years=3; 16-20 years=4; 21-25 years=5; 26-30 years=6; 31-35 years=7; 36-40 years=8; >40 years=9	A longer involvement in the fishing sector means that fishing is likely important to the participant. A change fish availability could mean that the impact for these long-term participants is likely to be greater	Available in both the surveys	
S			Beginning of fishery	Open-ended	8.2	When did the fishery you are involved with begin in this area?	NA/Not sure=0; 1-10 years=1; 11-20 years=2; 21-30 years=3; 31-40 years=4; 41-50 years=5; > 50 years=6	An older fishery is more established in the community and will have more historical and cultural ties meaning that the older the fishery the more likely participants will be more attached to the fishery. Therefore, they are less likely to move into alternative livelihoods.	Available in both the surveys	
S			Family relations that are fishers	Open-ended	8.4	Which family relations were fishers in the past?	NA/ Not sure=0; Father/Stepfather=1; mother=2; brother(s)=3; Uncle=4; Cousins=5; Grandparents=6; husband=7; Father-in law=8	The family tradition of fishing= greater importance.	Available in both the surveys	
S			Perception of a "fishing" family identity	Binary	8.5	Would you describe your family as having a fishing identity/culture?	NA/Not sure=0; Yes=1; No=4	Closer identification with fishing means a change in the fishery could impact cultural identification.	Available in both the surveys	
S			The extent of ancestral involvement in fishing	Binary	8.3	Were previous generations of your family/ancestors' fishers?	NA/Not sure=0; Yes=1; No=4	The family tradition of fishing= greater importance. Qualitative data to compliment = 8.4.	Available in both the surveys	

S			Concern regarding the continuation of fishing as a livelihood among the next generation	Likert	19.2	How concerned are you by the lack of young people entering the fishing industry in your area?	NA/Not sure=0; Not concerned at all=1; Slightly concerned=2; Concerned=3; Very concerned= 4	if people are concerned, there might be a lack of focus on fishing as a lucrative future income. Therefore, decreased dependence for future generations.	Available in both the surveys	
S		<b>Local ecological knowledge</b>	Inclusivity of local ecological knowledge within marine resource management planning	Likert	19.1	How much was your local knowledge about fishing included in local marine resource management plans?	NA/Not sure=0; Not at all=1 Slightly=2; Less=3; Very=4;	More LEK indicates lower sensitivity because including LEK can improve management plans and their acceptance by the community.	Available in both the surveys	
S	Level of knowledge about marine environment		Likert	20.1	How much do you think you know about the environment in which you fish?	NA/Not sure=0; Nothing=1; A little= 2; A lot= 3; Quite a lot=4	If fishers have greater knowledge about the marine environment, they might notice change earlier and prepare in anticipation, thus reducing sensitivity.	Available in both the surveys		
S	Importance to ensure LEK is passed on to younger generations		Likert	20.2	How important do you think it is to pass on local knowledge about fishing to younger generations?	NA/Not sure= 0; Not at all important=1; slightly important= 2; important=3; very important= 4	Greater importance means the younger generation will be better informed and sensitivity would be reduced.	Available in both the surveys		

S			Relative maintenance of LEK between generations	Likert	20.3	Would you say local knowledge about fishing is being lost or maintained in this community?	NA/Not sure= 0; Almost all lost= 1; Partly lost= 2; Maintained=3; Well-maintained=4	As above, if the information is passed to the younger generation, they will be better informed - reducing sensitivity.	Available in both the surveys	
S		<b>Historical involvement</b>	Occupation of father	Open-ended	9.1 (a)	What is/was the main occupation of your father?	NA=0; Fisher=1; Farmer=2; Builder/bricklayer=3; Railway worker=4; Municipal services=5; Butcher=6; Policemen=7; Maintenance=8; Cook=9; harbour management=10; Teacher=11; gardening=12; labourer=13	If the difference in occupation of father is associated with higher education and greater income earning potential this would mean reduced sensitivity	Available in both the surveys	
S			Occupation of mother	Open-ended	9.1 (b)	What is/was the main occupation of your mother?	NA=0; Fisher=1, Fish processor and associated industry=2; Domestic worker=3; Housewife (home maker) =4; Chef=5; farmer=6; gardening=7; Nurse= 8	If the difference in occupation of mother is associated with higher education and greater income earning potential this would mean reduced sensitivity	Available in both the surveys	

S		<b>Social mobility</b>	The difference in occupation from parents	Binary	9.2 (a)	Did your father attend school?	NA/Not sure=0; Yes=1; No=4	The higher the education required for the main occupation, the greater likelihood of a higher income. Majority answered = Fisher	Available in both the surveys	
S			The difference in occupation from parents	Binary	9.2 (b)	Did your mother attend school?	NA/Not sure= 0; Yes=1; No=4	The higher the education required for the main occupation, the greater likelihood of a higher income. Majority answered = Housewife	Available in both the surveys	
S			The difference in occupation between parents	Open-ended	9.3 (a)	To what level did your father attend school?	NA/not sure=0; No schooling = 1; Grade 1-4=2; Grade 5-7=3; Grade 8-11=4; Grade 12=5; post-school education =6; Technikon, College, University = 7	Higher educations are associated with greater opportunity and therefore, lower sensitivity.	Available in both the surveys	
S			The difference in occupation from parents	Open-ended	9.3 (b)	To what level did your mother attend school?	NA/not sure=0; No schooling = 1; Grade 1-4=2; Grade 5-7=3; Grade 8-11=4; Grade 12=5; post-school education =6; Technikon, College, University = 7	Higher education is associated with greater opportunity and therefore, lower sensitivity.	Available in both the surveys	
S			House ownership of parents' vs interviewee	Binary	9.4	Did your parents own their own house?	NA/Not sure=0; Yes=1; No=4	Greater house ownership of the interviewee reduces sensitivity.	Available in both the surveys	
S			Boat ownership of parents' vs interviewee	Binary	9.5	Did your parents own their own boat?	NA/Not sure=0; Yes=1; No=4	As above, increasing ownership of the younger generation reduces sensitivity.	Available in both the surveys	

S			Level of financial well-being compared to parents	Binary	9.6	Would you say you are financially better off than your parents?	NA/Not sure=0; Yes=1; Same=2; No=4	Greater well-being compared to parents suggests upward mobility and reduced sensitivity.	Available in both the surveys		
S		<b>Economic dependence</b>	Most important targeted fish species	Open-ended	1.8	List the three most important fish species you target for commercial purposes	NA/Not sure=0; Kob=1; silvers=2; Red fish=3; Black tail=4; Muscle cracker=5; Grunter=6; Sharks=7; Target fish= 8; Leather fish=9; Barber fish=10; white Steenbras=11; Galjoen=12; Hake=13; Blue stumpnose=14; snappers=15; snoek=16; santer=17	The increasing vulnerability is indicated by changes in the occurrence, distribution, and species composition.	Available in both the surveys		
S			Options available for work without fishing	Binary	1.9	Have the top three species change in the past five years?	NA/Not sure= 0; Yes=1; No=4	Changes in the Occurrence/distribution/species composition indicates increasing vulnerability.	Available in the 2023 survey		
S	<b>Economic dependence on fishing</b>		Number of nights per week that household consumes seafood	Open-ended	6.1	How many days a week do you and your household consume fresh marine food?	NA/Not sure=0; 1 day=1; 2-5 days=2; 6 days=3; 7 days=4	More fish consumption shows a greater impact if fishing resource availability is negatively impacted. Scored on own.	Available in both the surveys		
S				Source of seafood consumed	Open-ended	6.2	Is the fish you eat from your own catch, or do you buy fish?	NA/Not sure= 0; Own catch=1; Bought=2; Both=3	Greater variety in the sources of seafood spreads the risk of food security being affected in the case of any adverse event.	Available in both the surveys	

S			The type of fish consumed often	Open-ended	6.3	What type of fish do you consume most often?	NA/Not sure=0; Kob=1; Red Roman=2; Snoek=3; Shad=4; Blacktail=5; Silver fish=6; Hake=7; Snappers=8; Grunter=9; leervis=10; white steenbras=11; stumpnose=12; Kolstert=13	Greater variety in the sources of fish spreads the risk of food security being affected in the case of any adverse event	Available in both the surveys	
S			Possession of own fishing business	Binary	3.1	Do you own your own fishing business? (Licence)	NA/Not sure=0; No=1; Yes=4	Owning a fishing business indicates stronger dependence on fishing and greater sensitivity to change in the fishing resource.	Available in both the surveys	
S			Number of people employed in a fishing business	Open-ended	3.2	How many people did you employ over the last 12 months?	NA/Not sure=0; None=1; 1-3 people=2; 4-6 people=3; >7 people=4	Employing people within a fishing business indicates a strong dependence on fishing and greater sensitivity to change in the fishing resource.	Available in both the surveys	
S			Income generated by fishing business	Open-ended	3.3	Approximately how much income does your fishing business turn over each month?	NA/Not sure=0; <R1000=1; R1000-2500=2; R2501-5000=3; R5001-75000=4; R7501-10000=5; >10000=6	Income generated from the fishing = Better Adaptive Capacity	Available in both the surveys	
S			Possibility to feed the family without fishing	Likert	17.1	How possible would it be to feed your family if you did not go fishing?	NA/Not sure=0; Not at all=1; Slightly=2; possible=3; Highly possible= 4	If there are few feeding alternatives this means that families are more sensitive.	Available in both the surveys	
S		<b>Competition for fish</b>	Perception of whether too many or too few fishers operate in the community	Likert	18.1	Would you say there are too many or too few fishers in the fishing industry or in this fishing community?	NA/Not sure=0; Too few=1; Slightly too few=2; Slightly too many=3; Too many=4; Enough=5	Too many fishers = high pressure on fishing resources.	Available in both the surveys	

S			Perception of whether too many or too few fishers operate in the community	Likert	18.2	Would you say there are too many or too few fishers working in the areas that you fish?	NA/Not sure=0; Too few=1; Slightly too few=2; Slightly too many=3; Too many=4; Enough=5	Too many fishers = high pressure on fishing resources.	Available in both the surveys	
S			Degree of concern about illegal fishing levels locally	Likert	18.3	How concerned are you about the level of illegal fishing that is occurring?	NA/Not sure=0; Not at all=1; Slightly =2; Concerned=3; Very =4	Little concern = adequate monitoring and surveillance.	Available in both the surveys	

S	Economic dependence on other resources	Different food sources	Relative contribution of different methods obtaining food	Multiple choice	4.2	What percentage of foods (by volume) are: Bought from the store, Exchanged, Grown by yourself?	<p>NA/Not sure=0; 1-10% bought/exchanged/grown=1 ; 20-30% bought/exchanged/grown=2 ; 40-50% bought/exchanged/grown=3 ; 60-70% bought/exchanged/grown=4 ; 80-90% bought/exchanged/grown=5 ; 100% bought/exchanged/grown=6</p>	Greater diversity in the method used to obtain food would suggest a greater number of options to fall back on in bad times. (Most alternatives: grown. Little exchange seen).	Available in both the surveys	
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S		<b>Vegetables consumed</b>	Number of nights per week that household consumes vegetables	Open-ended	7.1	How many days a week do you and your household consume fresh vegetable product?	NA/Not sure=0; Never=1; 1-3 days=2; 4-5 days=3; 6-7 days=4	Although more veg would have a positive effect on nutrition, lower contribution of animal protein in diet might be an indicator of poverty. Here, high vegetable consumption is an indicator for sensitivity	Available in both the surveys	
S	<b>Economic dependence on other resources</b>	<b>Meat consumed</b>	Number of nights per week that household consumes meat	Open-ended	7.2	How many days a week do you and your household consume fresh meat?	NA/Not sure=0; Never=1; 1-3 days=2; 4-5 days=3; 6-7 days=4	Higher meat consumption might be an indicator of affluence. Higher number = lower sensitivity.	Available in both the surveys	
S		<b>Self-sufficiency</b>	The relative importance of household's food source	Multiple choice	7.3	What is the most important food source for your family's household?	NA/Not sure=0; Garden=1; shops=2; Fish for food/a small portion from catch=3; collect food from the bush/sea=5	Better access to own home-grown food sources = less exposure to changes in food market prices. Greater self-sufficiency = lower sensitivity.	Available in both the surveys	
S			Ways of purchasing goods	Multiple choice	7.4	How do you pay for the goods you do not grow or catch yourself?	NA/Not sure=0; Pay using cash=1; Obtain it on credit=2; Exchange goods for it=3	The method by which we compensate for the commodities is equivalent to the degree of sensitivity.	Available in both the surveys	
S		<b>Social incentives</b>	Government incentives available	Binary	7.5	Does anyone in your household receive a government grant (SASSA)?	NA/Not sure=0; Yes=1; No=4	Support from the government leads to a decrease in sensitivity.	Only available on the 2023 survey	

S			COVID-19 Distress grant	Binary	7.6	Did you receive the COVID-19 Distress grant during all levels of restrictions?	NA/Not sure=0; Yes=1; No=4	Receiving the COVID-19 Distress grant means that the households can support their livelihoods indicating low sensitivity to impacts	Only available on the 2023 survey	
S			Support from the government	Binary	7.7	Do you currently receive the social relief of Distress R350 grant?	NA/Not sure=0; Yes=1; No=4	Support from the government indicates low sensitivity e.g. if households are getting more support from the government, they are most likely to support their livelihoods indicating low sensitivity.	Only available on the 2023 survey	
S			Time of being assisted with support	Multiple choice	7.8	What type of social grant do you receive?	NA/Not sure=0; None=1; SASSA grant=2; Food relief scheme=3	The type of social grant received indicates the level of support thus low sensitivity level	Only available on the 2023 survey	
S			Number of people receiving financial support	Multiple choice	7.9	How many people in your household receive grants?	NA/Not sure=0; None=1; 1-3 people=2; 4-6 people=3; 7 people and above=4	The number of people within the household receiving financial=low sensitivity	Only available on the 2023 survey	
S			Financial better off	Binary	7.10	Would you say that you are financially better off from the incentives?	NA/Not sure=0; Yes=1; No=4	Financial better off from the incentives indicates the level of sensitivity e.g. Not financially better off indicates high sensitivity level	Only available on the 2023 survey	
AC	Natural capital	Changing resource base	Observed changes in communities' marine resources during lifetime	Binary	54.1	Have you noticed changes in your communities' marine resources during your lifetime?	NA/Not sure=0; Yes=1; No=4	Changes observed in communities' marine resource base usually indicate a decrease in natural capital.	Available in both surveys	

AC			Cause of climate change	Open-ended	54.2	What do you believe is the cause of climate change?	NA/Not sure=0; Changes in rainfall patterns=1; Sea water Temperature =2	Changes observed in communities' marine resource base usually indicate a decrease in natural capital.	Available in both surveys	
						current=2; Rainfall patterns, wind, and drought=3; Climate change (in general) =4; Changes in seasons=5; sea level increase= 6				
AC			Perception of changes in the local sea habitat	Multiple choice	54.3	Do you think that the sea habitat in your area is damaged?	NA/Not sure=0; Irreversibly damaged=1; Badly damaged=2; slightly damaged=3; improved since you were a child=4; the same=5	Higher levels of damage to the local sea habitat indicates larger decrease in natural capital and AC.	Available in both surveys	
AC			Factors cause fish number declines locally	Open-ended	54.4	What do you think are the factors that cause declines in fish numbers in your area?	NA/Not sure=0; Pollution=1; Climate change (in general) =2; Trawlers=3; Changes in rainfall patterns =4; Changes in wind direction=5; changes in weather patterns=6; Overfishing=7; Damages to the reefs=8; pipeline=9; fishing in closed areas=10	A higher number of factors of causes for fish declines indicate a decrease in natural capital decrease NC and AC to a greater extent than past, discrete causes of change.	Available in both surveys	
AC			Factors increasing the number of fish in the sea	Open-ended	54.5	What do you think could help increase the number of fish in the sea in your area?	NA/Not sure=0; Removing trawlers=1; Enforce strict rules=2; Monitoring fish catches=3; fish farming=4; stop fishing to allow recovery=5; make plans for anchors=6	The higher number of factors of increasing the fish indicates an increase in natural capital	Available in both surveys	
AC			Perception of overharvesting of marine resources locally	Binary	54.6	Do you think your local marine resources are being overharvested at the moment?	NA/Not sure=0; Yes=1; No=4	Perceived overharvested marine resources indicate lower natural capital and AC	Available in both surveys	

AC			Observed changes to livelihood due to changes in marine environment locally	Binary	54.7	Have you noticed any changes to the marine habitat?	NA/Not sure=0; Yes=1; No=4	Evidence of observed changes in livelihoods due to changes in the marine environment indicate higher natural capital and AC	Available in both surveys	
AC			Relative diversity of marine habitat locally	Likert	62.1	How diverse is the marine habitat of your community?	NA/Not sure=0; Very low=1; Low=2; High=3; Very high=4;	higher scores for the diversity of the marine habitat indicate higher natural capital and AC	Available in both surveys	
AC			Perception of change in fish numbers in past 5 years	Likert	62.2	How has the number of fish in the area changed compared to 5 years ago?	NA/Not sure=0; Big decrease=1; Decrease=2; Same=3; Increase=4; Big increase=5	Perception of increasing number of fish indicate higher natural capital and AC (vice versa).	Available in both surveys	
AC				Likert						
AC	<b>Social Capital</b>	<b>Decision-making</b>	Degree of involvement in community decision-making	Likert	56.1	How involved are you in community decision-making?	NA/Not sure=0; Not at all = 1; Slightly Involved = 2; Involved = 3; Very involved = 4;	Involvement in community decision-making yields greater interest in finding community rather than individual solutions.	Available in both surveys	

AC			Degree of involvement in MPA management/decision-making	Likert	56.2	How involved are you in marine protected area management?	NA/Not sure=0; Not at all = 1; Slightly Involved = 2; Involved = 3; Very involved = 4;	Involvement in MPA planning precipitates greater interest in protecting marine resources and activities	Available in both surveys	
AC		<b>Networks</b>	Relative confidence in calling on someone for help financially	Likert	55.1	How confident are you that you can call someone if you need help financially?	NA/Not sure; Not at all = 1; Slightly = 2; Confident = 3; Very = 4	More confidence to call someone the better financial support to face adversity	Available in both surveys	Siegel and Alwang, 1999
AC		<b>Gender equity</b>	Number of women in leadership roles in the community and positions	Binary	36.1	Are any women in leadership roles in this community?	NA/Not sure=0; No = 1; Yes = 4	More women in leadership indicate greater community equity	Available in both surveys	
AC			Roles that women hold	Open-ended	36.2	What positions do women mostly hold?	NA/Not sure=0; No position=1; Fire department=2; community welfare leadership=3; church leadership= 4; neighbourhood watch=5; mentorship=6; community health care=7; Harbour Committee=8; Early childhood development=9; old age home/carer=10; Municipal services=11	More women in leadership indicate greater community equity	Available in both surveys	

AC		<b>Equity</b>	Degree of vulnerability to future harm among different community members	Likert	58.2	Would you say that everyone in this community is vulnerable or are some people more vulnerable than others in this community?	NA/Not sure=0; No one= 1; Some = 2; Most = 3; Everyone = 4	Higher levels of equality in community vulnerability indicate the potential for the community to work together to overcome future impacts	Available in both surveys	
AC			Equality of access and control over livelihoods and resources between men and women	Likert	58.1	How equal is women's access and control of livelihoods and resources compared to men?	NA/Not sure=0; Not at all equal = 1; Quite unequal = 2; Nearly equal = 3; Totally equal = 4	Higher levels of equality indicate equal distribution of power and access between men and women	Available in both surveys	
AC		<b>Leadership</b>	Strength of community leadership	Likert	57.1	How strong is your community leadership?	NA/Not sure=0; Not at all = 1; Slightly strong = 2; Strong = 3; Very strong = 4	Stronger leadership = greater representation of the community	Available in both surveys	
AC			Accessibility of community leadership	Likert	57.2	How often can you talk to a community leader if you need to?	NA/Not sure=0; Never = 1; Sometimes = 2; Often = 3; Always = 4	More access to community leaders = greater community representation.	Available in both surveys	
AC		<b>Social capital, networks, and community cohesion</b>	Types of community organisations actively participated in	Open-ended	42.2	List any community organisations you are an active participant in:	NA/Not sure=0; No organisations=1; church=2; Rugby club=3; Farmers club=4; Rastafarian club=5; Small-scale fishers club=6; neighbourhood watch=7; Senior citizens club = 8; women's league=9; Police meetings=10; Netball club=11; Community gardening=12	The more household participation in community organisations, the greater the interest in discovering solutions to problems.	Available in both surveys	Cinner et al., 2009; Cinner et al., 2012

AC			Main source of assistance when have financial, food or basic needs	Multiple choice	35.1	When I need help financially or in terms of food or basic needs I ask for assistance from:	NA/Not sure=0; No one=1; money lenders/loans=2; skipper/Boss=3; neighbours=4; friends=5; family=6; company members=7	Source of help can increase AC (family) or decrease AC (loan sharks). No one = 1 (less adaptive capacity).	Available in both surveys	
AC			Possibility to obtain cash for an emergency today	Binary	43.2	If you needed cash today for an emergency - would you be able to get that cash?	Not sure=0; No = 1; Yes = 4	Greater possibility to obtain cash, better capacity to respond to change	Available in both surveys	Siegel and Alwang, 1999
AC	social capital	Access to institutional safety nets and information	Number of governmental safety nets for fishers	Likert	31.1	Would you say there are none or many government safety nets in case disaster strikes fishing activities in this community?	NA/Not sure=0; None = 1; Few = 2; Some = 3; Many = 4	More of a government safety net indicates a more excellent adaptive capacity to respond to change: more government safety nets= low sensitivity	Available in both surveys	
AC			Strength of links between fishers and institutions or government	Likert	31.3	How well linked is this community to government departments and/or academic institutions so you receive up-to-date information about fishing?	NA/Not sure=0; Not at all = 1; Slightly = 2; Well linked = 3; Very well linked = 4	Stronger link = better access to up-to-date information on fishing-related matters	Available in both surveys	
AC			Strength of links between fishers and institutions or government	Likert	31.2	How happy are you with the government safety nets used on the fishing community during disasters?	NA/Not sure=0; Not happy at all=1; Slightly happy=2; Happy=3; Very happy=4	Fishers being happy= better response in case disaster strikes of fishing activities	Available on the 2023 survey	

AC			Strength of links between fishers and institutions or government	Likert	31.4	Would you say that the information received from government departments and/or academic institutions regarding fishery is valuable?	NA/Not sure=0; Not valuable=1; slightly valuable=2; valuable=3; Very valuable= 4	Valuable information= greater adaptive capacity to respond to change	Available on the 2023 survey	
AC			Strength of links between fishers and institutions or government	Likert	31.5	How involved is the DFFE in communicating information to SSFs?	Not involved at all=1; NA/Not sure=0; Slightly involved=2; Involved=3; Very involved=4	DFFE involvement in communicating information= greater adaptive capacity to respond to change	Available on the 2023 survey	
AC			Strength of links between fishers and institutions or government	Likert	31.6	How happy are you with the communication of information by DFFE?	NA/Not sure=0; Not happy at all=1; slightly happy=2; Happy=3; Very happy=4	Fishers being happy with the communication of information indicates that there is a greater possibility for adaptive capacity	Available on the 2023 survey	
AC	<b>Physical capital</b>	<b>Built house</b>	Tenant or owner of house	Open-ended	48.1	Do you own or rent the house you live in?	Do not own = 1; Rent=2; Own = 4	Owning a house indicates greater physical capital	Available in both the surveys	

AC			Need for maintenance or renovations	Binary	48.5	Does your house need much renovation and maintenance?	NA/Not sure=0; Yes = 1; No = 4	The need for maintenance lowers physical capital and AC	Available in both the surveys	
AC			Main construction material of house	Multiple choice	48.6	What is the outside of the house mainly made of?	NA/Not sure=0; Brick wall wood=1; Brick/panel=2; reinforced concrete/concrete=3; lightweight concrete=4; wood/masonry=5	Permanent and long-lasting materials = higher physical capital, temporary low-quality materials = lower physical capital	Available in both the surveys	Henilane, 2016
AC		<b>House Conditions</b>	Age of building	Open-ended	48.2	Age of building	NA/Not sure=0; <1 year =1; 1-5 years=2; 6-10 years=3; 11-15 years=4; 16-20 years=5; 21-25 years=6; 26-30 years=7; 31-35 years=8; >35 years=9	Age of building = greater physical capital	Available in both the surveys	
AC			Number of rooms	Open-ended	48.3	Number of rooms	NA/Not sure=0; None=1; 1-2 rooms=2; 3-4 rooms=3; 5-6 rooms=4; 7-8 rooms=5; >8 rooms=6	Number of rooms = greater physical capital	Available in both the surveys	
AC			The estimated value of the building	Open-ended	48.4	The estimated value of the building	NA/Not sure=0; <R1000=1; R1000-2000=2; R2001-4000=3; R4001-8000=4; R8001-15000=5; R15001-25000=6; R25001-50000=7; >50000=8	The estimated value of the building= greater physical capital	Available in both the surveys	
AC			Possession of a boat	Multiple choice	49.1	What sort of boat do you own?	No boat = 1; Ski-boat = 2	Owning a boat means greater physical capital.	Available in both the surveys	
AC		<b>Boat assets</b>	Number of boats	Open-ended	49.2	Number of boats	NA/Not sure=0; None=1; 1-2 boats=2; 3-4 boats=3; > 5 boats=4;	Number of boats= greater physical capital	Available in both the surveys	
AC			Size of boats	Open-ended	49.3	Size of boats	None=1; 1-5m=2; 6-10m=3; >10m= 4	size of boats= greater physical capital	Available in both the surveys	

AC		<b>Debt on main assets</b>	Amount of money owed on main assets	Likert	61.1	How much money do you owe on your main assets?	NA/Not sure=0; None=1; Some=2; Little=3; Much=4	More money owed means less physical capital and lower adaptive capacity	Available in both the surveys	
AC		<b>Condition of assets</b>	Amount of possessions/assets in good condition	Likert	61.2	How many of the things you own are in good condition and do not need to be replaced anytime soon?	NA/Not sure=0; None =1; Some = 2; Most = 3; All = 4	Better condition = greater physical capital	Available in both the surveys	
AC		<b>Fresh Water Supply</b>	Possession of freshwater tank	Binary	50.1	Do you have a water tank?	NA/Not sure=0; No = 1; Yes = 4	A water tank indicates access to fresh water and greater physical capital	Available in both the surveys	
AC			The main source of drinking water	Multiple choice	50.2	What is your main source of drinking water?	NA/Not sure=0; regional/local water scheme=1; borehole=2; spring=3; rainwater tank=4; Dam/pool/stagnant water=5; river/stream=6; water vender=7; water tanker=8	A more reliable source of water indicates higher physical capital.	Available in both the surveys	StatsSA, 2011
AC		<b>Energy</b>	The main source of energy	Multiple choice	51.1	What is your main source of energy?	NA= 0; Power is not connected=1; Mains/electricity=2; solar=3; generator=4; coal=5; paraffin=6; Animal dung=7	A more reliable source of energy indicates greater PC and AC	Available in both the surveys	
AC			The main source of water heating	Multiple choice	51.2	What source of heating do you have?	NA/Not sure=0; electricity=1; gas=2; paraffin=3; solar=4; candles=5; wood=6; coal=7; animal dung=8	A more reliable source of water heating indicates higher physical capital and AC.	Available in both the surveys	StatsSA, 2011
AC		<b>Cooking Fuels</b>	The main source of cooking fuel	Multiple choice	52.1	What is the main source of fuel you use for cooking?	NA/Not sure=0; None = 1; Wood = 2; Gas = 3; Electric = 4; Electric & Gas=5; Electric & Wood=6	More reliable sources of fuel = higher PC and AC.	Available in both the surveys	
AC		<b>Waste</b>	Possession of own toilet	Binary	53.1	Do you have your own toilet?	NA/Not sure=0; No=1; Yes = 4	Own toilet = higher PC and AC	Available in both the surveys	

AC			Type of toilet	Multiple choice	53.2	What type of toilet do you have?	No Toilet = 1; Compost/Long Drop = 2; Pour flush = 3; Flush = 4	more reliable/technologically advanced toilet = higher PC and AC	Available in both the surveys	
AC			Route of wastewater	Multiple choice	53.3	What happens to the waste?	None = 1; Soak pit = 2; Septic Tank 3; Disposal = 4; Runs into garden/street=5	More advanced route = higher PC and AC	Available in both the surveys	
AC			Disposal of rubbish	Multiple choice	53.4	How do you get rid of most of your rubbish?	NA/Not sure=0; Hole/Open Burning = 1; Collected = 4;	as above.	Available in both the surveys	
AC		<b>Material assets</b>	Assets	Binary	76.1-76.16	Do you own a vehicle, fishing gear, TV, Gas/Stove, Cell phone, Piped water, Fridge, Radio, Video, Generator, Electricity	No = 1; Yes=4. Average the answers.	More material assets = better adaptive capacity	Available in both the surveys	
AC	<b>Financial capital</b>	<b>Insurance</b>	Types of insurance policies held	Multiple choice	47.1	What insurance policies do you have now?	NA/Not sure=0; Life=1; House=2; car=3; funeral policy=4	The existence of insurance policies indicates the ability to withstand potential losses	Available in both the surveys	
		<b>Credit</b>	Loan provision	Multiple choice	46.1	Who/where do you normally borrow money from?	No one=0; Friends and family=1; Large companies=2; small money lenders/banks=3; skipper=4; Boss/employer=5; Priest=6	Respondents who provide loans to others indicate disposable incomes and higher financial capital and AC	Available in both the surveys	
AC			Loan provision for others in the past year	Binary	46.2	Have you loaned money to anyone in the last year?	NA/Not sure=0; No = 1; Yes = 4	Respondents who provide loans to others indicate disposable incomes and higher financial capital and AC	Available in both the surveys	
AC		<b>Debt</b>	Mortgage repayments	Binary	45.1	Do you have a mortgage on your house?	NA/Not sure=0; Yes = 1; No = 4	Mortgage = lower financial capital	Available in both the surveys	

			Money owed on the mortgage	open-ended	45.2	How much Mortgage do you have on your house?	NA/Not sure=0; <R1000=1; R1000-2000=2; R2001-4000=3; R4001-8000=4; R8001-15000=5; R15001-25000=6; R25001-50000=7; >R50000=8	Mortgage = lower financial capital	Available in both the surveys	
AC			Money owed excluding mortgage	Binary	45.3	Do you owe money to anyone?	NA/Not sure=0; Yes = 1; No = 4	Money owed indicates higher debt and lower FC	Available in both the surveys	
AC		<b>Savings</b>	Possibility to access financial reserves during periods without work	Likert	60.2	How possible is it for you to access financial reserves if you end up without work for a while?	NA/Not sure=0; Not at all = 1; Slightly = 2; Possible = 3; Very = 4	Access to financial reserves during a workless period indicates higher FC	Available in both the surveys	
AC			Presence of savings for emergencies	Binary	44.1	Do you have any savings or money put aside for emergencies?	NA/Not sure=0; Yes = 1; No = 4	Presence of savings allows fall-back money in times of emergency and thus, higher FC	Available in both the surveys	
AC		<b>Household income</b>	Monthly income	Binary	2.1	Is there much variation in your household income between the summer and the winter period?	NA/Not sure=0; No = 1; Yes = 4	Higher amounts of income = higher FC	Available in both the surveys	
AC		<b>Socio-economic Index</b>	Monthly income	Open-ended	2.2	What is your average household income per month before tax and from all sources?	NA/Not sure=0; <R1400= 1; R1401-3000=2; R3001-4500=3; R4500-R6000=4; R6001-10000=5; R10001-R15 000 = 6; R15001 – R20 000= 7; R20 000 – R26 000 =6;> R26001 = 7	The more money you have, the less vulnerable you become	Available in both the surveys	

AC		<b>Household sharing income</b>	Contribution of each household members income to household expenses	Binary	43.1	Does each working household member contribute to basic household expenses?	NA/Not sure=0; No = 1; Yes = 4;	More household members contributing = multiple income generators for households and higher FC	Available in both the surveys	
			Emergency Cash	Binary	43.2	If you need cash today for an emergency- would you be able to get that cash?	NA/Not sure=0; Yes=1; No=4	Ability to get cash when needed = better adaptability	Available in both the surveys	
AC		<b>Income shocks</b>	Ability to endure some income shocks	Likert	60.1	How possible is it for you to endure some shocks if it should occur?	NA/Not sure=0; Not at all = 1; Slightly = 2; Possible = 3; Very = 4	Ability to endure income shocks = higher FC	Available in both the surveys	
AC	<b>Financial Capital</b>	<b>Household expenses</b>	Money spent on household	Open-ended	75.1	Approximately how much of your household expenses are on rent	NA/Not sure=0; <R1000=1; R1000-2000=2; R2001-4000=3; R4001-8000=4; R8001-15000=5; R15001-25000=6; R25001-50000=7; >50000=8	AC decreases when a disproportionate amount of your disposable income is spent on rent	Available in both the surveys	
AC					75.2	Approximately how much of your household expenses are on food	NA/Not sure=0; <R1000=1; R1000-2000=2; R2001-4000=3; R4001-8000=4; R8001-15000=5; R15001-25000=6; R25001-50000=7; >50000=8	AC decreases when a disproportionate amount of your disposable income is spent on food	Available in both the surveys	
AC					75.3	Approximately how much of your household expenses are on water	NA/Not sure=0; <R1000=1; R1000-2000=2; R2001-4000=3; R4001-8000=4; R8001-15000=5; R15001-25000=6; R25001-50000=7; >50000=8	AC decreases when a disproportionate amount of your disposable income is spent on water	Available in both the surveys	
AC					75.4	Approximately how much of your household expenses are on electricity	NA/Not sure=0; <R1000=1; R1000-2000=2; R2001-4000=3; R4001-8000=4; R8001-15000=5; R15001-25000=6; R25001-50000=7; >50000=8	AC decreases when a disproportionate amount of your disposable income is spent on electricity	Available in both the surveys	

AC	Financial Capital	Household expenses			75.5	Approximately how much of your household expenses are on school fees	NA/Not sure=0; <R1000=1; R1000-2000=2; R2001-4000=3; R4001-8000=4; R8001-15000=5; R15001-25000=6; R25001-50000=7; >50000=8	AC decreases when a disproportionate amount of your disposable income is spent on school fees	Available in both the surveys	
AC					75.6	Approximately how much of your household expenses are on loan repayments	NA/Not sure=0; <R1000=1; R1000-2000=2; R2001-4000=3; R4001-8000=4; R8001-15000=5; R15001-25000=6; R25001-50000=7; >50000=8	AC decreases when a disproportionate amount of your disposable income is spent on loan repayments	Available in both the surveys	
AC				Money spent on household		75.7	Approximately how much of your household expenses are on insurance	NA/Not sure=0; <R1000=1; R1000-2000=2; R2001-4000=3; R4001-8000=4; R8001-15000=5; R15001-25000=6; R25001-50000=7; >50000=8	AC decreases when a disproportionate amount of your disposable income is spent on insurances	Available in both the surveys
AC	Personal flexibility	Perception of risk in approaching change	Level of habituation to changes in everyday life	Likert	21.1	How used would you say you are to the changes in everyday life?	NA/Not sure=0; Not at all used to it = 1; Not used to it = 2; Used to it = 3; Very used = 4;	Those habituated to everyday changes are more likely to be adaptable in the future	Available in both the surveys	
AC			Perception of which user groups are most at risk to future changes	Likert	21.2	Would you say that only big companies or only small-scale fishers will survive future changes in the industry?	NA/Not sure=0; More small-scale than big = 1; Small-scale fishers only = 2; More big companies than small = 3; Big companies only = 4; Depends on what the changes are=5	Higher perception of risk for themselves and others indicates higher ability to be aware of future risk (more perception of risk = better adaptive capacity).	Available in both the surveys	
AC		Ability to plan, learn and reorganise	Level of financial planning	Likert	22.1	How well have you planned for your financial security?	NA/Not sure=0; No plan at all = 1; planned a little = 2; well-planned = 3; Very well-planned = 4	High levels of financial planning indicate higher ability to plan	Available in both the surveys	

AC			Level of interest to learn new skills outside of fishing	Likert	22.2	How interested are you in learning new skills outside of your expertise?	NA/Not sure=0; Not interested at all = 1; slightly = 2; Interested = 3; Very Interested = 4	Interest to learn new skills indicates higher potential to develop alternative skills for future livelihoods	Available in both the surveys	
AC			Perception of possibility to personally improve the marine environment	Likert	22.3	How possible is it for you to make a personal difference in improving the health of the marine environment in this area?	NA/Not sure=0; Not at all possible = 1; Slightly = 2; Possible = 3; Very possible = 4	Higher perception of ability to improve marine environment indicates passion and stewardship towards the marine environment	Available in both the surveys	
AC		<b>Perception of the ability to cope with change</b>	Level of confidence that events will work out well regardless of everything else	Likert	23.1	How confident are you that things will turn out well regardless of the changes and challenges you confront?	NA/Not sure=0; not at all = 1; slightly = 2; Confident = 3; Very confident = 4	Higher confidence indicates a positive-minded, optimistic mind set about the future regardless of change.	Available in both the surveys	
AC		<b>Level of interest in adapting to change</b>	Perception of responsibility to protect the marine environment	Likert	24.1	How responsible do you feel to protect the marine environment?	NA/Not sure=0; Not at all = 1; Slightly = 2; Responsible = 3; Very = 4	Higher perception of responsibility to protect the marine environment indicates level of stewardship.	Available in both the surveys	

AC			Level of interest in changing employment	Multiple choice	10.1	Right now, if you had a chance would you:	NA/Not sure=0; Stay doing what you are doing = 1; Change your job = 4	High interest in changing occupation indicates dissatisfaction in current employment and/or interest in alternatives if marine-based occupations become untenable in the future	Available in both the surveys	
AC		Employability	Perception of finding work in the alternative sector	Binary	10.2	At this time do you feel you could find work in a different sector?	NA/Not sure=0; Yes = 4; No = 1	High perception inability to find work outside of fishing indicates higher adaptability	Available in both the surveys	
AC			Number of options for alternative work	Multiple choice	10.3	How many options for a different type of job/work would you say you have?	NA/Not sure=0; No options = 1; Few = 2; Some = 3; Many = 4	Greater number of options = greater adaptability	Available in both the surveys	
AC			Number of courses taken to improve employability	Binary	10.4	Have you done any courses to improve your employability?	NA/Not sure=0; Yes = 4; No = 1	Greater number of courses = greater chance of finding alternative occupations	Available in both the surveys	
AC			Number of courses done to improve employability	Open-ended	10.5	If yes, what courses were they?	NA/Not sure=0; None=1; Counselling=2; First Aid=3; Safety and Security=4; Life skills=5; diving course=6; skipper course=7; agriculture=8	Greater number of courses = greater adaptability	Available in both the surveys	
AC			Level of interest in working for someone else	Binary	10.6 (a)	Would you be happy working for someone else?	NA/Not sure=0; Yes = 4; No = 1	Higher interest in working for someone else indicates greater adaptability	Available in both the surveys	

AC			Level of interest in working for someone else	Open-ended	10.6 (b)	Why would you be happy working for someone?	NA/Not sure=0; No reason=1; Get more income=2; support from my family=3; Help grow in business=4; gain skills=5; make a difference in the community=6	Higher interest in working for someone else indicates greater adaptability	Available in both the surveys	
AC			Perception of utility of own skills to set up a business outside of fishing	Likert	26.1	How useful would your skills be in setting up a business other than in fishing?	NA/Not sure=0; Not at all = 1; Slightly = 2; Useful = 3; Very useful = 4	Higher perception indicates positive mindset in setting up a business and finding alternative income if fishing becomes untenable	Available in both the surveys	
AC	Attitude and perception	Attitude to Change	Perception of ability to adapt to change compared to others locally	Likert	25.1	How likely are you to adapt to change compared to others you know?	NA/Not sure=0; Not likely at all = 1; Not likely = 2; Likely = 3; Very likely = 4	Higher perception to adapt to change better will result in greater willingness to accept and adapt to change	Available in both the surveys	
AC			Perceived level of risk to community from environmental change	Likert	32.1	How much of a risk do you think environmental change poses to the community you live in?	NA/Not sure=0; None = 1; Low = 2; Medium = 3; High = 4	High level of risk perceived indicates a better capacity to anticipate and adapt to change.	Available in both the surveys	
AC			Degree of anxiety felt about environmental changes observed locally	Likert	32.2	How anxious/scared do you feel about the changes you are seeing in the environment in your area?	NA/Not sure=0; Not at all = 1; Little = 2; Scared/Anxious = 3; Very = 4	High anxiety indicates higher likelihood that community and individuals will take steps to adapt	Available in both the surveys	

AC		<b>Attitude and perception to climate change</b>	Awareness of Climate Change	Binary	74.1	Have you ever heard of climate change?	Yes = 4; No = 1	Awareness of climate change = more knowledge and higher capacity to anticipate change	Available in both the surveys	
AC			Experience of Climate Change	Binary	74.2	Do you think the climate has changed over time?	NA/Not sure=0; Yes = 4; No = 1	Awareness of climate change = more knowledge and higher capacity to anticipate change	Available in both the surveys	
AC			Changes in the climate	open-ended	74.3	List the top 3 changes in the climate you have noticed	NA/Not sure=0; None=1; changes wind patterns=2; rainfall=3; storms=4; drought=5; sea state=6; Veldfire=7; changes come with seasons=7; Temperature changes=8; Others=9	Different climatic changes = more exposure	Available in both the surveys	
AC			Access to climate change information	Multiple choice	74.4	Where do you mainly get your information about climate change?	NA/Not sure=0; None=1; newspapers=2; Tv/radio=3; academic society=4; My friends and family=5; the internet=6; Observations=7; Other fishers=8; Skipper=9	Access to climate change information = better adaptive capacity	Available in both the surveys	
AC		<b>Interest in the Environment</b>	Amount of knowledge good fishers possess about target fish biology	Likert	34.2	Would you say a good fisher knows a lot or a little about the biology of the main species they catch?	NA/Not sure=0; Nothing = 1; Little = 2; Some = 3; A lot = 4	Greater knowledge indicates greater interest in the environment and understanding of the system, which makes them more likely to wish to preserve the ecosystem.	Available in both the surveys	
AC			Number of ideas held to ensure sustainability of the target fish species locally	Likert	34.1	How many ideas would you say you have about how to ensure the sustainability of the main species you catch?	NA/Not sure=0; No ideas /cannot say= 1; Few = 2; Some = 3; Many ideas = 4	High number of ideas = greater possibility to keep the activity for a longer time.	Available in both the surveys	

AC	Occupational flexibility	Capacity to anticipate change and develop response strategies.	Relative importance of tourism to community and natural resources to tourism	Likert	27.1	How suitable do you think your community is for tourism activities?	NA/Not sure=0; Not at all = 1; Slightly = 2; Suitable = 3; Very suitable = 4	Higher suitability indicates more promising opportunity for tourism as an alternative source of income = greater adaptability	Available in both the surveys	
AC			Health of the marine resources locally	Likert	27.2	How healthy are the marine resources in your area for tourism?	NA/Not sure=0; Not at all = 1; Slightly = 2; Healthy = 3; Very healthy = 4	Healthy marine resources = high potential for suitable tourism	Available in both the surveys	

AC			The relative importance of fishing as economic activity locally	Likert	27.3	How important is fishing as an economic activity in this community?	NA/Not sure=0; Not at all = 1; Slightly = 2; Important = 3; Very = 4	The high relative importance of fishing indicates the importance to safeguard the fishing industry.	Available in both the surveys	
AC			Tourism activities available to fishers	Likert	27.4	Would you say that there are too many or too few tourism activities available to fishers?	NA/Not sure=0; Too few=1; slightly too few=2; slightly too many=3; Too many=4	Many tourism activities indicate higher adaptive capacity	Available in the 2023 survey	
AC		<b>Occupational Mobility (attachment to fishing)</b>	Number of employment changes in past 5 years	Binary	11.1	Have you had a change of employment in the past 5 years?	NA/Not sure=0; Yes = 4; No = 1	The large number of employment changes = more skills to work in different sectors OR inability to work in one sector successfully for long periods of time. Here, employment change is positive for adaptive capacity.	Available in both the surveys	
AC			Previous occupation	Open-ended	11.2	What was your previous occupation?	NA/Not sure=0; No previous occupation=1; selling wood=2; fisher=3; builder=4; other=5	The large number of employment changes = more skills to work in different sectors OR inability to work in one sector successfully for long periods of time. Here, employment change is positive for adaptive capacity.	Available in both the surveys	
AC			Preference of new occupation to the previous occupation	Open-ended	11.3	Do you prefer your new occupation to your previous occupation?	NA/Not sure=0; No=1; Yes=2; prefer not to say=3	Large number of employment changes = more skills to work in different sectors OR inability to work in one sector successfully for long periods of time. Here, employment change is positive for adaptive capacity.	Available in both the surveys	
AC										

AC			Level of interest in working in the non-fishing sector	Binary	11.4	Would you be interested in doing a job other than fishing if you could earn as much as you do fishing?	NA/Not sure=0; Yes = 4; No = 1	High level of interest = greater interest in alternative livelihoods = greater adaptability	Available in both the surveys	
AC			Factors that a new job must possess	Multiple choice	11.5	List the factors that a new job must possess for you to take it	NA/Not sure=0; Personal safety=1; Intellectual challenge=2; Low risk & certain income =3; Flexibility=4; Adventure = 5; Part-time options=6	The different factors that a job must possess= higher adaptability	Available in both the surveys	
AC			Employment sectors you would consider taking a job	Multiple choice	11.6	List the alternative employment sectors that you would consider taking another job in	None=0; Tourism=1; Service industry=2; Aquaculture=3; Different fishing sectors=4; office work=5; mining=6; Masonry/carpentry/Daily wage labour=7	Alternative employment sectors indicate higher adaptability	Available in both the surveys	
AC			Biggest risk to the fishing livelihoods	Multiple choice	11.7	What do you see as the biggest risk to the fishing livelihoods in this community?	None=0; The market=1; Injury/health=2; Environmental change=3; Management changes=4; Reduced fish abundance=5	The identified risk to the fishing livelihoods= higher adaptability	Available in both the surveys	
AC			Types of livelihoods found by fishers leaving the fishery	Open-ended	11.8	In which sector do people who have left fishing find work in this community	NA/Not sure=0; unemployed=1; farming=2; construction=3; gardening=4; woodwork=5; painting=6; Maintenance=7	Indication of the options available locally to those who have exited the fishery recently.	Available in both the surveys	
AC			Tourism Activities	Open-ended	11.9	List of tourism activities available to fishers	NA/Not sure=0; None=1; Hiking trail=2; walking tours=3; going to the sea=4; local fishing competition=5; fishing=6	The different tourism activities= higher adaptability	Available in the 2023 survey	

AC			Level of occupational diversity throughout the year	Likert	28.1	How often are you employed in more than one job per year?	Never = 1; Rarely = 2; Often = 3; Very often = 4	high level of occupational diversity = greater adaptability	Available in both the surveys	
AC			Ability to respond to weather conditions	Open-ended	72.1	What will you do if weather conditions continue to worsen or change?	NA/Not sure=0; Nothing much to do=1; find employment in other sectors=2; keep fishing=3; Stop fishing= 4; Pray to God= 5; strike=6; starve=7	The ability to respond to changes in weather conditions indicates the better adaptive capacity	Available in both the surveys	
AC			Response to hypothetical change in primary livelihood (fishing) - what will you do if it becomes too difficult to find fish?	Open-ended	72.2	What will you do if it becomes too difficult to find enough fish	NA/Not sure=0; Nothing much to do=1; find employment in other sectors=2; keep fishing=3; Stop fishing= 4; Pray to God= 5; strike=6; starve=7	Indication of what it would take to get a fisher to stop fishing. Willingness to find other work = greater adaptability.	Available in both the surveys	
AC			Response to hypothetical change in primary livelihood (fishing) - what will you do if it becomes too difficult to find fish?	Open-ended	72.3	What would you do in the event of a 50% decline in fish catches?	NA/Not sure=0; Nothing much to do=1; find employment in other sectors=2; keep fishing=3; Stop fishing= 4; Pray to God= 5; strike=6; starve=7	Indication of what you would do in the event of a 50% decline in fish catches= greater adaptability.	Available in both the surveys	

AC			Response to hypothetical change in primary livelihood (fishing) - what would you do in the event of market prices dropping by 50% and remaining there?	open-ended	72.4	What would you do in the event of market prices dropping by 50% and remaining there?	NA/Not sure=0; Nothing much to do=1; find employment in other sectors=2; keep fishing=3; Stop fishing= 4; Pray to God= 5; strike=6; starve=7	Indication of what you would do in the event of a market prices dropping by 50% and remaining there= greater adaptability.	Available in both the surveys	
AC			Ability to change if you were in charge of fishing activity	open-ended	72.5	If you were in charge of the fishing activity in this area, what would you do?	NA/Not sure=0; Nothing much to do=1 change fishing rule=2; issue fishing permits=3; reduce fish catch=4; Increase fish selling prices=5; listen to the fishers' complains=6; open fish farms=7; have fewer boats at the sea=8; give more access to fishing areas=9; tourism activities at the harbour=10; change payment system=11	Indication of what you would do if you were in charge of fishing activity = greater adaptability.	Available in both the surveys	
AC			Willingness to relocate for livelihood purposes	Likert	28.2	How willing are you to move to a bigger town or community for work if necessary?	Not willing at all = 1; Slightly = 2; Willing = 3; Very = 4	Willingness to relocate = higher adaptability	Available in both the surveys	

AC	Comprehensive policy and regulation	Resource management institutions	Presence of natural resource management institutions in community	Binary	13.1	Does your community have any type of marine resource management?	NA/Not sure=0; Yes = 4; No = 1	Presence of natural resource management improves the possibilities to keep ocean related livelihoods long-term	Available in both the surveys	
AC			Type of management system	Binary	13.2	If yes, what kind of management system?	NA/Not sure=0; None=1; traditional management=2; community agreement on a marine-managed area=3; written management plan=4; government-controlled management=5; industry-led management=6; other=7	Community participation = better capacity that the local issue be attended by marine resource management.	Available in both the surveys	
AC			Level to which rules have changed due to environmental changes	Binary	13.3	Have rules, practices changed in the past in response to environmental changes?	NA/Not sure=0; Yes = 4; No = 1; same=2	Changing rules shows the institutions work to keep livelihoods and preserve marine resources in the face of climate change	Available in both the surveys	
AC			Changes in fishing rules	Multiple choice	13.4	How have the fishing rules changed?	NA/Not sure=0; No change=1; strict fishing rules=2; changes in fish catch and quantity=3; other=4	Changing rules shows the institutions work to keep livelihoods and preserve marine resources in the face of climate change	Available in both the surveys	
AC			Degree of recording/reporting of catches required	Binary	13.5	Do you have to report/record your catches at a landing site or to an authority?	NA/Not sure=0; Yes = 4; No=1	High degree of recording = better data for marine resource managers to make well-informed decisions	Available in both the surveys	

AC			Reporting of catch	Open-ended	13.6	To whom do you report your catch?	NA/Not sure=0; No one=1; Harbour/DFFE=2; Book available to fishers to record catch=3; other=4	High degree of recording = better data for marine resource managers to make well-informed decisions	Available in both the surveys	
AC			Community organisations	Open-ended	13.7	List the community organisations that are active in your village/town that come to mind.	NA/Not sure=0; Rugby club=1; Creche=2; church=3; Neighbourhood watch=4; Senior citizens club=5; Youth wellness=6; Melkhoutfontein association=7; Fire rescue=8	Community organisations= have better adaptability	Available in both the surveys	
AC	General Conflicts	Fishing conflicts	Management of fishery	Binary	13.8	Is there any change in the management of fishery in the last five years?	Yes=1; No=4	Changing rules shows the institutions work to keep livelihoods and preserve marine resources in the face of climate change	Available in the 2023 survey	
AC			Fishery Management changes	Multiple choice	13.9	What kind of management changes have you observed?	NA/Not sure=0; None=1; Implementation of new regulations=2; co-management of fishery resources=3; other=4	Changing fishing rules= Better adaptability	Available in the 2023 survey	
AC			Fishery conflicts	Binary	13.10	Were there management conflicts?	Yes=1; No=4	Fishery conflicts are indicative of the degree of exposure.	Available in the 2023 survey	
AC			Fishery conflicts	Multiple choice	13.11	How did you resolve the conflicts?	NA/Not sure=0; None=1; inform traditional leaders=2; mediation of dispute=3; Inform police officials=4	Resolving conflicts within fishery operations has been identified as a key factor in improving adaptive capacity within the industry.	Available in the 2023 survey	
AC	Attitude and perception	Climate Change focused institutions	Presence of climate change centred institutions or government departments in the area/community	Binary	73.1	Are there institutions or government departments working on climate change or facilitating adaptation to change in the community	Yes = 4; No = 1	The existence of established institutions correlates positively with enhanced adaptability.	Available in both the surveys	

AC				Open-ended	73.2	Which institutions work on climate change or facilitate adaptation?	NA/Not sure=0; None=1; Government=2; Melkhoutfontein organisation=3	The existence of established institutions correlates positively with enhanced adaptability.	Available in both the surveys	
AC	Institutional flexibility	Fishing compliance and conflict	Relative occurrence of illegal fishing locally	Likert	30.1	Would you say that illegal fishing does not occur or does occur in the community in which you fish?	Does not occur at all = 1; Occurs a little = 2; Occurs = 3; Occurs a lot = 4	High levels of illegal fishing indicate lack of compliance and an individualistic profit-making mindset of local fishers.	Available in both the surveys	
AC			Number of people who know those who break the rules	Likert	30.2	Would you say that everyone or no one knows the individuals are that break the fishing rules?	No one = 1; Few people = 2; Most people = 3; Everyone = 4	High numbers of people who know people who fish illegally indicates how overt or covert illegal behaviour is.	Available in both the surveys	
AC			Relative occurrence of conflict among fishers	Likert	30.4	How common are conflicts between fishers in this area?	Never occurs = 1; Not very common = 2; Common = 3; Very common = 4	High levels of conflict = high levels of conflict and inequality (in gear, space, and access).	Available in both the surveys	
AC			Level of enforcement of fishing rules	Likert	30.3	How well-enforced are the fishing rules that apply in this area?	Not at all enforced = 1; enforced a little = 2; just enforced = 3; Well-enforced = 4	Indication of level of enforcement	Available in both the surveys	

AC			Effectiveness of implemented fishing rules	Likert	30.5	How happy are you with the fishing rules implemented in the last five years?	Not happy at all=1; slightly Happy=2; Happy=3; Very happy=4	The high number of people that are happy with the fishing rules indicates that the fishing rules implemented are effective.	Available in both the surveys	
AC		<b>Markets</b>	Markets available in the community	Open-ended	12.1	How many markets are there in your community where you can buy fish?	NA/Not sure=0; No markets=1; 1-2 markets=2; 3-4 markets=3	High number of markets indicates the degree of choice fishers have to sell their catch and therefore more markets often provides better prices and options when both large and small catches are landed	Available in both the surveys	

			Avenues to sell fish	Multiple choice	12.2	By which avenue do you sell your fish?	NA/Not sure=0; No avenue=1; middleman=2; local individual fish buyer=3; Directly off the boat/boat owners=4; Large processor=5; Big companies=6; Skipper=7;	The type of relationship whether good or bad will determine the effectiveness or ineffectiveness of avenues for selling fish	Available in both the surveys	
AC			Relationship with middlemen	Open-ended	12.3	If you sell through middlemen, how would you describe your relationship?	NA/Not sure=0; None=1; Good relationship=2; Bad relationship=3	The type of relationship whether good or bad will determine the effectiveness or ineffectiveness of avenues for selling fish	Available in both the surveys	
AC			Relationship with companies or buyers you sell your fish to	Open-ended	12.4	If not through middlemen, how would you describe your relationship?	NA/Not sure=0; None=1; Good relationship=2; Bad relationship	The type of relationship whether good or bad will determine the effectiveness or ineffectiveness of avenues for selling fish	Available in both the surveys	
AC			Number of markets to sell fish in the community	Open-ended	12.5	How many markets/auction sites are there in your community where you can sell your fish directly?	NA/Not sure=0; No markets = 1; 1-2 markets = 2; 3-4 markets = 3; 5 markets and above = 4	The higher number of markets to sell fish provides more options to fishers and may contribute to better price competition	Available in both the surveys	
AC			Possibility of selling fish outside the community	Binary	12.6	Do you ever sell fish to a fish market outside your community?	NA/Not sure=0; Yes = 4; No = 1	higher possibility to sell fish outside of the community indicates higher adaptability.	Available in both the surveys	
AC			Distance from the market	Open-ended	12.7	How far is the market from your house?	NA/Not sure=0; None=1; 1-5km=1; 6-10km=2; 11-15km=3; 16-20km=4; 21-25km=5; 26-30km=6; 31-35km=7; >35km=8	The distance from the markets determines the adaptive capacity	Available in both the surveys	
AC			Fishing for orders from the markets	Binary	12.8	Are you fishing for orders from the markets?	NA/Not sure=0; Yes=1; No=4	higher possibility to sell fish outside of the community indicates higher adaptability.	Available in both the surveys	

AC			Stability of fish price	Binary	12.9	Have fish prices been relatively stable over the past three years?	NA/Not sure=0; Yes = 4; No = 1	The higher stability of fish can be good or bad. In this case, higher stability indicates greater adaptive capacity and reduced vulnerability.	Available in both the surveys	
AC			Fish prices in the local market	Multiple choice	12.10	What do you think dictates the price of fish most in the local market?	NA/Not sure=0; The power of middlemen=1; the price the fisher demands=2; the quantity of the fish that is available=3; Companies=4	The higher stability of fish can be good or bad. In this case, higher stability indicates greater adaptive capacity and reduced vulnerability.	Available in both the surveys	
AC			Number of markets to sell meat and vegetables	Open-ended	12.11	How many markets are in your community where you can buy/sell fresh meat and vegetables?	NA/Not sure=0; None=0; 1-3 markets=1; 4-5 markets=2; 6-7 markets=3; 8 markets and above=4	The high number of markets to sell fruits and vegetables reduces vulnerability and increases adaptive capacity for those who have farm animals and products to sell for cash when fishing is not good.	Available in both the surveys	
AC	Occupational Flexibility	Business Approach	Possibility to guess how much a business can make per month	Likert	29.1	How possible is it to guess how much money your business will make each month?	Very possible=4; Possible=3; Slightly possible=2; None/impossible=1	Possibility to guess how much money your business makes = higher adaptability	Available in both the surveys	
AC			Detailed business plan	Likert	29.2	How detailed a business plan do you have for the following year?	Not at all detailed=1; slightly detailed=2; Detailed=3; Very detailed=4	A detailed business plan indicates adaptive capacity	Available in both the surveys	
AC	Human Capital	Skills	Confidence in own skills results in success in fishing industry	Likert	59.2	How confident are you that your skills will mean that you are successful in the industry?	NA/Not sure=0; Not at all confident = 1; slightly confident = 2; Confident = 3; Very confident = 4	Greater confidence in own skills, a greater chance of being successful	Available in both the surveys	

AC			Perception of the relationship of role of technology and skill of fishers	Likert	59.1	Would you say that, with the technology available to the industry now, anyone or only certain people can be a skillful fisher?	Very few = 1; Some = 2; Many people = 3; Anyone = 4	The perception that with just technology anyone can be a successful fisher, indicates a decreased perception of the importance of traditional fisher knowledge	Available in both the surveys	
AC			Possession of skill sets outside of fishing-related activities	Multiple choice	40.1	Do you have basic skills in the following fields: Gardening, Electronics, Emergency/first aid, Mechanics, Welding, or other	NA/Not sure=0; Gardening/Horticulture=1; Mechanics=2; Electronics=3; Welding=4; Emergency First aid=5; other=6	More skills outside of fishing indicate lower dependence on fishing. (Self-Scored).	Available in both the surveys	
		<b>Local Knowledge</b>	Sources of information	Open-ended	37.1	List the top three sources of information you regularly consult for information about local fishing and conditions	NA/Not sure=0; None=1; TV/Radio=2; friends=3; post office=4; other fishers=5; harbour=6; family=7; internet=8	Access to climate change information = better adaptive capacity	Available in both the surveys	

AC		<b>Health</b>	Presence of infirm or unwell person in the household in the last year	Binary	38.1	Do you have anyone in your house that is or was infirm or needed assistance to undertake daily chores in the past 12 months?	Yes = 1; No = 4	The presence of an infirm person reduces adaptive capacity.	Available in both the surveys	
AC			Presence of a chronically ill person in the household	Binary	38.2	Is anybody in your family chronically ill?	Yes = 1; No = 4	The presence of chronically persons reduces adaptive capacity.	Available in both the surveys	
AC		<b>Labour</b>	Degree of difficulty in finding alternative work if known as a fisher	Binary	42.1	Is it easy to find work outside of fishing if you are known to be a fisher?	Yes = 4; No = 1	The easier it is to find work, the easier it would be to find another source of income if the fishing sector is negatively impacted.	Available in both the surveys	

AC		<b>Knowledge</b>	Possession of basic knowledge in environmental, marine, fishing, or business knowledge	Multiple choice	41.1	Do you feel you have basic knowledge in any of the following areas: local environmental issues, local marine issues, fish biology, running a business, other	NA/Not sure=0; Local environmental issues and local marine issues=1; fish biology=2; Running a business=3	Basic knowledge = greater ability to be successful in the fishing industry.	Available in both the surveys	
AC		<b>Age</b>	Different age groups on vulnerability	Open-ended	household data	How old are you?	20-29=1; 30-39=2; 40-49=3; 50-59=4; >60=5	Vulnerability increases with age	Available in both the surveys	
AC		<b>Education</b>	The level of formal education attained	Multiple choice	39.1	What is the highest level of education reached by you?	No schooling=0; Primary school=1; High school=2; Skills/practical/Technical education/university=3; Other=4	The higher the level of formal education, the better ability to cope with change.		
E	<b>Personal exposure</b>	<b>Safety at sea</b>	Preference for presence of other boats at sea while fishing	Likert	63.1	Would you say for safety reasons you prefer to work with many boats around whilst at sea?	NA/Not sure=0; None =1; Few = 2; Some = 3; Many = 4	Preference of working with others at sea indicate the need to work with others to identify fishing ground and kerb eventualities at a minimum level. This preference = dependence = higher exposure.	Available in both the surveys	
E			Perception of safety in current livelihood despite environmental/climatic exposure	Multiple choice	64.1	How safe do you feel you are in your main occupation in the context of climate exposure?	NA/Not sure=0; Very safe=1; Safe=2; slightly Safe=3; Not safe at all=4; Dangerous=5; very dangerous=6; Somewhat dangerous=7	Better awareness on safety leads them to take more precautions and reduce exposure.	Available in both the surveys	

E		Storms	Occurrence of large storm in past 5 years (moment – adverse; long time – advantageous)	Binary	65.1	Has there been a large storm in the last 5 years?	Yes = 4; No = 1	Large storm = high personal exposure.	Available in both the surveys	
E			Personally, directly impacted by storm	Binary	65.2	Were you directly impacted by the large storm?	NA/Not sure=0; Yes = 4; No = 1	Direct impact and incidence of casualties/ fishing days lost = higher exposure	Available in both the surveys	
E			Degree of damage to household	Multiple choice	65.3	If yes, how bad was the storm damage to your household?	NA/Not sure=0; No damage=1; little damage=2; moderate damage=3; major damage=4; catastrophic=5	Increased degree of damage to household from storms = high personal exposure	Available in both the surveys	
E			Action taken to prevent future large storm damage	Binary	65.4	Have actions been taken by the household to prevent large storm damage?	NA = 0; Yes = 1; No = 4	Any mitigation or adaptation to prevent future large storm damage lessens exposure (NA answers also receive a 0).	Available in both the surveys	
			Actions taken to prevent future storm damage	Open-ended	65.5	If yes, what has been done to prevent damage?	NA/Not sure=0; Fixed roof=1; Other=2; stayed indoor=3; Municipality storm water drains and pipes precautions=4	Any mitigation or adaptation to prevent future large storm damage lessens exposure (NA answers also receive a 0).	Available in both the surveys	
E			Number fishing days lost to large storms in past year	Multiple choice	65.6	How many fishing days did you lose due to the large storms in the past year?	None=0; <10 days=1; 10-30 days= 2; >1-3 months=3; other=4	Loss of fishing days = high exposure.	Available in both the surveys	

E		Wind Speed	Fishing effort in an area prone to changes in wind speed	Binary	66.1	Have you noticed any changes in wind speed in the last five years in your area?	Yes = 4; No = 1	Changes in wind speed increase the likelihood of destruction to personal assets and overall exposure	Available in the 2023 survey	
E			Extent of wind speed	Multiple choice	66.2	How were you impacted by the changes in wind speed?	No impact=1; slight impact=2; impacted=3; Greatly impacted=4	Changes in wind speed determine the level of exposure to livelihood	Available in the 2023 survey	
E				Degree of damage to fisheries	Multiple choice	66.3	How bad were the changes in wind speed?	Not bad at all=1; slightly bad=2; Bad=3; Very bad=4	Increased degree of damage to fishing effort from wind speed = high personal exposure	Available in the 2023 survey

E			Number of fishing days when changes occurred	Multiple choice	66.4	How many days did you go fishing when changes in wind speed occurred?	NA/Not sure=0; 1-2 days a week=1; 2-3 days a week=2; 3-5 days a week=3; others=4	The higher number of fishing days= low exposure	Available in the 2023 survey	
E		<b>Wind Direction</b>	Changes of wind direction on fishing.	Binary	67.1	Has there been changes in wind direction in your area in the past five years?	Yes = 4; No = 1	Changes in wind direction determine the level of exposure to livelihood, for example, wind direction tends to influence fishing effort	Available in the 2023 survey	
E			Impacts	Multiple choice	67.2	How were you impacted by the changes in wind direction?	NA/Not sure=0; No impact=1; slight impact=2; impacted=3; greatly impacted=4	High extent of impact = high exposure; low impact=low exposure	Available in the 2023 survey	
E			Severity of wind direction	Multiple choice	67.3	How severe were the changes in wind direction?	Very severe=4; Severe=3; Slightly severe=2; Not severe at all=1	Exposure levels increase as severity increases	Available in the 2023 survey	
E			<b>Drought</b>	Occurrence of drought in past 5 years	Binary	70.1	Has there been a Drought in the last 5 years?	Yes = 4; No = 1	Droughts limit access to natural capital and overall livelihood activities and therefore increases exposure	Available in the 2023 survey

E			Personally, directly impacted by drought	Binary	70.2	Were you directly impacted by the Drought?	Yes = 4; No = 1	Personal impact = higher exposure	Available in the 2023 survey	
E			Degree of damage to fishing ability	Multiple choice	70.3	How severe were the changes in drought conditions?	NA/Not sure=0; Not severe=1; Slightly=2; Severe=3; Very severe=4	Exposure levels increase as severity of damage increases	Available in the 2023 survey (question different from the original survey)	
E			Action taken to prevent future drought damage	Binary	70.4	Have actions been taken by the household to prevent drought damage?	Yes = 4; No = 1	Any mitigation or adaptation to prevent future negative impacts of drought lessens exposure.	Available in the 2023 survey	
E			Number of fishing days lost to droughts in the past year	Multiple choice	70.4	How many fishing days have you lost to the drought in the last year?	None=0; <10 days=1; 10-30 days=2; >1-3 months=3; other=4	Loss of fishing days = high exposure.	Available in the 2023 survey	
E		<b>Rainfall</b>	Household in area prone to changes in rainfall patterns	Binary	68.1	Have you noticed changes in rainfall patterns in your area?	Yes = 4; No = 1	Changes in rainfall patterns increases likelihood of destruction to personal assets and overall exposure	Available in the 2023 survey	

E			The extent of rainfall Patterns	Multiple choice	68.2	How were you affected by the changes in rainfall patterns?	No damage=1; Moderate damage=2; Little damage=3; Major/Catastrophic damage=4	Changes in rainfall patterns and sea state determines the level of exposure on livelihood	Available in the 2023 survey	
E			Degree of damage to household	Multiple choice	68.3	How bad were the changes in rainfall patterns on the livelihood?	Very bad=1; Bad=2; slightly bad=3; Not bad at all=4	Exposure levels increase as severity of damage increases	Available in the 2023 survey	
E			Impacts on water source	Multiple choice	68.4	Does your water source get dirty during heavy rainfall?	Yes = 4; No = 1	Changes of water source due heavy rainfall = higher exposure	Available in the 2023 survey	
E			Actions taken to prevent the damages caused by the heavy rainfall	Binary	68.5	Have actions been taken to prevent further damage caused by heavy rainfall patterns?	Yes = 4; No = 1	Mitigation measures prevent negative impacts of heavy rainfall	Available in the 2023 survey	
E		<b>Sea State</b>	Changes in sea state	Binary	69.1	Has the sea state in your area changed over the years?	Yes = 4; No = 1	Changes in sea state= high exposure	Available in the 2023 survey	

E			Activities that resulted in changes	Multiple choice	69.2	List some of the activities that resulted in changes in the sea state.	None=1; 1-2 Activities=2; 2-3 activities=3; 4 activities and above=4	Activities that resulted in changes of sea state = higher exposure	Available in the 2023 survey	
E			Extent of damage	Multiple choice	69.3	How bad were the changes in the sea state?	No damage=1; Moderate damage=2; Little damage=3; Major/Catastrophic damage=4	The extent of damage to the sea state= high exposure level	Available in the 2023 survey	
E			Actions taken to prevent the damages to sea state	Binary	69.4	If there is a damage, have actions been taken to prevent damage?	Yes=4; No=1	Mitigation measures prevent negative impacts on sea state	Available in the 2023 survey	
E		<b>Fishing Activity</b>	Fishing frequency	Multiple choice	1.2	How many days per week do you go fishing?	NA/Not sure=0; less than once a week=1; 1-2 days a week=2; 2-3 days a week=3; 3-5 days a week=4; Every day of the week=5; weather-dependent=6	Higher frequency relates to lower fish availability OR higher dependency on fishing AND higher exposure to risk.	Available in both the surveys	
E			Duration of Trips	Multiple choice	1.3	What is the average length of a fishing trip?	NA/Not sure=0; Less than 1 hour=1; 1-3 hours=2; 3-6 hours=3; more than 7 hours=4; one day=5; Two to six days=6; One week=7; More than one week=8	Increased fishing duration relates to lower catch and increased vulnerability because of higher exposure to risk.	Available in both the surveys	

E			Fish Catch	Open-ended	1.4 (a)	What was your highest catch?	NA/Not sure=0; 1-150 kilos=1; 151-300kilos=2; 301-450kilos=4; 451-600 kilos=4; 601-750 kilos=5; 751-900 kilos=6; 901 kilos- 1 tonne=7; >1 tonne=8	Increased fish catch relates to increased vulnerability because of higher exposure to risk	Available in both the surveys	
E				Open-ended	1.4 (b)	What year was your highest catch?	NA/Not sure= 0; 1960-1970=1; 1971-1980=2; 1981-1990=3; 1991-2000=4; 2001-2010=5; 2011-2020=6; 2021-2023=7	Increased fish catch relates to increased vulnerability because of higher exposure to risk	Available in both the surveys	
E				Open-ended	1.5	What has been your best catch this year?	NA/Not sure=0; 1-150 kilos=1; 151-300kilos=2; 301-450kilos=3; 451-600 kilos=4; 601-750 kilos=5; 751-900 kilos=6; 901 kilos- 1 tonne=7; >1 tonne=8	Increased fish catches relate to higher exposure to risk	Available in both the surveys	
E			Duration of Trips	Open-ended	1.6	What is the average distance that increased, decreased, or not changed in the time you have been fishing?	None/Not sure=0; 1-5km=1; 6km-10km=2; >10km=3	Increased fishing duration relates to lower catch and increased vulnerability because of higher exposure to risk.	Available in both the surveys	
E			Directionality of any change in the distance from the coast where fishing takes place	Multiple choice	1.7	Has the average distance increased, decreased, or not changed in the time you have been fishing?	NA/Not sure=0; decreased=1; Stayed the same=2; Increased = 3	Increased distance of fishing from coast indicates lower CPUEs, higher exposure, and increased vulnerability	Available in both the surveys	
E			Observed change in main target species in past 5 years	Binary	1.11	Have you noticed any changes in your main target species in the past 5 years?	Yes = 4; No = 1	Changes in the occurrence / distribution / species composition indicates increasing exposure and vulnerability.	Available in both the surveys	

E	<b>Attitude and perception</b>	<b>Attitude to change</b>	Perceived level of risk to community from environmental change	Likert	32.1	How much of a risk do you think environmental change poses to the community you live in?	Not at all = 1; Little = 2; Scared/Anxious = 3; Very = 4	High level of risk perceived indicates high exposure.	Available in both the surveys	
E			Degree of anxiety felt about environmental changes observed locally	Likert	32.3	How anxious/scared do you feel about the changes you are seeing in the environment in your area?	Not at all = 1; Slightly = 2; Dangerous = 3; Very Dangerous = 4	High anxiety indicates higher exposure.	Available in both the surveys	
E		<b>Perceptions of change</b>	Degree of difficulty in finding/catching fish compared to the past	Likert	33.2	How difficult has it become to catch fish in the area's you fish?	Not at all = 1; Slightly = 2; Difficult = 3; Very = 4	Difficulty to catch fish indicates less capacity to adapt and higher level of current exposure	Available in both the surveys	
E			Perceived level of danger to fishing from weather changes	Likert	33.1	How dangerous are changes in the local weather making fishing?	None = 1; Low = 2; Medium = 3; High = 4	The danger in local weather increase exposure	Available in both the surveys	
E			Number of changes in marine species observed locally	Likert	33.3	How many changes would you say you have noticed in the marine species you see?	NA/Not sure=0; None =1; Few = 2; Some = 3; Many Changes = 4	The high number of observed changes indicate a better capacity to adapt AND higher exposure	Available in the 2023 survey	

E	Pandemic	COVID-19	Impacts of COVID-19	Binary	71.1	Were you affected by the immediate lockdown restriction?	Yes=1; No=4	The impact of COVID-19 on fishing and livelihoods indicates increasing exposure	Available in the 2023 survey	Snowman et al., 2021
E			Impacts from different COVID-19 restrictions	Open-ended	71.2	How were you affected by the COVID-19 restrictions?	NA/Not sure=0; restricted to travel to fishing areas=1; contracted COVID-19=2	Different levels of lockdown restrictions indicate the extent of exposure	Available in the 2023 survey	
E			Ability to Fish during	Binary	71.3	Did you notice any changes caused by the COVID-19 restrictions on fishing and livelihoods?	Yes=1; No=4	The changes that occurred because of COVID-19 restrictions indicates the extent of exposure (i.e., high/low exposure)	Available in the 2023 survey	Bennet et al.2020
E			Fishing Frequency	Binary	71.4	Would you say that your ability to travel or rely on local marketers was affected during the different levels of lockdown restrictions?	Yes=1; No=4	The ability to travel or rely on local marketers during the lockdown period indicates the level of vulnerability (i.e. whether low/high exposure)	Available in the 2023 survey	Sowman et al., 2021

E			Measures employed to deal with COVID-19	Binary	71.5	Are you satisfied with the measures that were employed to deal with the impacts of COVID-19?	Yes=1; No=4	The level of satisfaction with the measures implemented to deal with the impacts of COVID-19 indicates a better capacity to adapt	Available in the 2023 survey	
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## Appendix C: Ethical Clearance



**UNIVERSITY OF CAPE TOWN**  
IYUNIVESITHI YASEKAPA • UNIVERSITEIT VAN KAAPSTAD

### Faculty of Science

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27 February 2023

Humbelani Netshithuthuni  
Department of Biological Sciences

**Social Vulnerability of fishing communities in the southern Cape to change, including additional pressures of COVID-19**

Dear Humbelani Netshithuthuni

I am pleased to inform you that the Faculty of Science Research Ethics Committee has approved the abovenamed application for research ethics clearance, subject to the conditions listed below.

- Restrictions on involving human participants in research must be adhered to, given current concerns about the spread of Covid-19. Please ensure that you are aware of and comply with UCT policy on this, as communicated by management.
- Implement the measures described in your application to ensure that the process of your research is ethically sound; and
- Uphold ethical principles throughout all stages of the research, responding appropriately to unanticipated issues: please contact me if you need advice on ethical issues that arise.

Your approval code is: **FSREC 009 – 2023**

Expiration date: **February 2024**

I wish you success in your research.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Melissa Densmore'.

**A/Prof Melissa Densmore**

**Chair: Faculty of Science Research Ethics Committee**

## Appendix D: Participant Consent Form

### DEPARTMENT OF BIOLOGICAL SCIENCES

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### Informed Voluntary Consent to Participate in Research Study

**Project Title: Social Vulnerability of fishing communities in the southern Cape to change, including additional pressures caused by COVID-19**

**Invitation to participate, and benefits:** You are invited to participate in a research study conducted with southern Cape Small-Scale Fishers (SSFs). The study's aim is to assess the social vulnerability of fishing communities in the southern Cape to change. I believe that your experience would be a valuable source of information, and hope that by participating, you may gain useful knowledge.

**Procedures:** During this study, you will be asked to complete a household survey with the assistance of the researcher and translator if so required.

**Recording:** We may record audio as part of the study. This will be used for the documentation of the survey questions. If you object to this, please indicate below.

**Risks:** There are no potentially harmful risks related to your participation in this study.

**Feedback:** You will receive feedback about the results of this research through a pamphlet that will be shared among participants or made available online for easy access.

**Disclaimer/Withdrawal:** Your participation is completely voluntary; you may refuse to participate, and you may withdraw at any time without having to state a reason and without any prejudice or penalty against you. Should you choose to withdraw, the researcher commits not to use any of the information you have provided without your signed consent. Note that the researcher may also withdraw you from the study at any time.

**Confidentiality:** All information collected in this study will be kept private in that you will not be identified by name or by affiliation to an institution. Confidentiality and anonymity will be maintained as pseudonyms will be used.

**What signing this form means:** By signing this consent form, you agree to participate in this research study. The aim, procedures to be used, as well as the potential risks and benefits of your participation, have been explained verbally to you in detail, using this form. Refusal to participate in or withdraw from this study at any time will have no effect on you in any way. You are free to contact me, to ask questions or request further information, at any time during this research.

I agree to participate in this research (tick one box)  Yes  No \_\_\_\_\_ (Initials)

I agree to be audio-recorded  Yes  No \_\_\_\_\_ (Initials)

\_\_\_\_\_  
Name of Participant

\_\_\_\_\_  
Signature of Participant

\_\_\_\_\_  
Date

\_\_\_\_\_  
Name of Researcher

\_\_\_\_\_  
Signature of Researcher

\_\_\_\_\_  
Date

# Appendix E: Translator Confidentiality Form

## DEPARTMENT OF BIOLOGICAL SCIENCES

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department-biological-sciences](https://science.uct.ac.za/department-biological-sciences)



## CONFIDENTIALITY AGREEMENT

### Translators/Transcribers

As a translator/transcriber working on the project titled “**Social Vulnerability of fishing communities in the Southern Cape to Change, including additional pressures caused by COVID-19**”, you will have access to confidential information and data from interviews with study participants. These participants have consented to participate in the study with the understanding that their identities and personal information, as well as their interview responses, will be kept confidential. Once you have assisted with/transcribed each interview, the interview transcripts will be anonymized so that participants cannot be identified from their transcripts.

By signing this confidentiality agreement, you agree to treat all information and data that you have access to through this project as confidential. You agree not to share any of the material with which you will be working with anyone else, whether verbally, physically, or electronically. You agree not to discuss individual participants or their interview responses with anyone else. You agree to protect the confidentiality of both the data and the study participants. Where relevant, you agree to delete all audio files and transcripts from your personal computer once you have completed this work, unless otherwise agreed with the researcher of the project.

Name: \_\_\_\_\_

Signature: \_\_\_\_\_


Date: \_\_\_\_\_


## Appendix F: Community Feedback Pamphlet

# Social-Vulnerability of Small-Scale Fishers to Climate change and COVID-19


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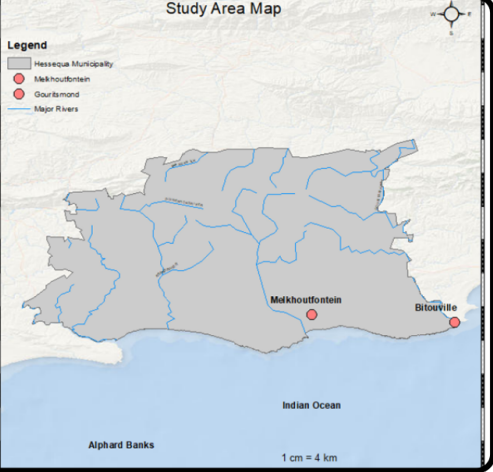




**South Africa**



**Study Area Map**



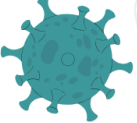
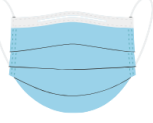
**Legend**

- Hesseque Municipality
- Melkhoutfontein
- Gauritmond
- Major Rivers

**Research questions:**



- What are the drivers of vulnerability among Small-Scale fishers (SSFs) in the southern Cape?
- What are the associated impacts of COVID-19 on the vulnerability of SSFs in the southern Cape?
- How did social vulnerability and the drivers of change evolve in the southern Cape fishing communities compared to the earlier GULLS research?

### Emergent Themes



**COVID-19 Pandemic**

- Fishers Impacted: 100% in Bitouville and 82% in Melkhoutfontein
- Travel restrictions
- Limited access to markets
- Limited ability to fish
- Health impacts i.e., COVID-19 Contraction



**Policy and Regulations**

- Limited fishing rights
- SSFP implementation delays
- Food insecurity due to limited fishing rights
- Limited involvement in decision-making processes
- Trust issues between SSFs and governmental authorities

**Climate variability**

- Increased risks at sea due to changing weather conditions
- Drought, rainfall, and wind speed and direction impacts i.e., reduction in sea days and income
- Adaptive capacity challenges due to limited resources

**Resource Scarcity**

- Scarcity of fish stocks
- Limited fishing boats and gears
- Low levels of education attributed to apartheid system and limited educational institutions
- Transportation and market access challenges
- Limited healthcare services
- Dependency cycle on social grants

## Appendix G: Demographic characteristics and fishing activities for 2023

Demography	Bitouville (N=15)	Melkhoutfontein (n=11)
<b>Gender</b>	Male= 11 (73%)	Male= 10 (91%)
	Female= 14 (27%)	Female= 1 (9%)
<b>Race</b>	Coloured= 14 (93%)	Coloured= 11 (100%)
	Black= 1 (7%)	White= 0%
<b>First language</b>	Afrikaans= 14 (93%)	Afrikaans= 11 (100%)
	Sotho= 1 (7%)	
<b>Age</b>	20-29 years= 1 (7%)	20-29 years= 0%
	30-39 years= 3 (20%)	30-39 years= 0%
	40-49 years= 5 (33%)	40-49 years= 2 (18%)
	50-59 years= 3 (27%)	50-59 years= 5 (45%)
	>60 years= 2 (13%)	>60 years= 4 (36%)
<b>Fishing as a primary occupation</b>	Main occupation= 11 (73%)	Main occupation= 10 (91%)
	Not main occupation= 4 (27%)	Not main occupation= 1 (9%)
<b>Level of Education</b>	No schooling= 0%	No schooling= 0%
	Primary school= 6 (40%)	Primary school= 6 (55%)
	High school= 9 (60%)	High school= 4 (36%)
	Skills/practical/Technical Education/university= 0%	Skills/practical/Technical Education/university= 1 (9%)
<b>Courses completed</b>	Yes= 4 (27%)	Yes= 6 (55%)
	No= 11 (73%)	No= 5 (45%)

## Appendix H: Responses Pertaining to the Sensitivity Category for 2023

Social dependence on fishing	Bitouville	Melkhoutfontein
<b>Dependence on institutions and people for day-to-day resources to go fishing</b>	Weather prediction & news= 87% Family= 80% Buyers of fish= 0% Fellow workers= 7%	Weather prediction & news= 82% Family= 55% Buyers of fish= 64% Fellow workers= 27%
<b>Food consumption</b>	Bitouville	Melkhoutfontein
<b>The number of days a week households consume fresh marine food.</b>	NA/Not sure= 0% One day= 33% Two to five days= 67% Six days= 0% Seven days= 0%	NA/Not sure= 0% One day= 9% Two to five days= 64% Six days= 9% Seven days= 18%
<b>Fish from own catch or bought</b>	NA/Not sure= 0% Own catch= 100%	NA/Not sure= 0% Own catch= 100%
<b>The type of fish consumed most often.</b>	Kob= 73% Blacktail= 7% Red Roman= 7% Shark= 0% Shad= 7% Silver= 0% Hake= 33%	Kob= 91% Blacktail= 9% Red Roman= 0% Shark= 0% Shad= 0% Silver= 9% Hake= 9%
<b>Food consumption</b>	Bitouville	Melkhoutfontein
<b>The number of days a week households consume fresh vegetable products.</b>	NA/Not sure= 0% Never= 0% One to three days= 87% Four to five days= 0% Six to seven days= 13%	NA/Not sure= 0% Never= 10% One to three days= 45% Four to five days= 0% Six to seven days= 45%
<b>The number of days a week households consume fresh meat.</b>	NA/Not sure= 0% Never= 7% One to three days= 67% Four to five days= 20% Six to seven days= 7%	NA/Not sure= 0% Never= 0% One to three days= 91% Four to five days= 0% Six to seven days= 9%
<b>Important food source for household</b>	NA/Not sure= 0% Garden=0% Shops= 7% Fish for food/ a small portion from catch= 67% Collect food from the bush= 26%	NA/Not sure= 0% Garden= 0% Shops= 18% Fish for food/ a small portion from catch= 64% Collect food from the bush= 18%
<b>Government incentives available</b>	Yes= 73% No= 27%	Yes= 64% No= 36%
<b>COVID-19 Distress grant</b>	Yes= 20% No= 80%	Yes= 18% No= 82%
<b>Support from the government</b>	Yes= 7% No= 93%	Yes= 18% No= 82%
<b>Type of social incentives received</b>	None= 60% SASSA grant= 33% Food relief scheme= 7%	None= 64% SASSA grant= 36%
<b>Number of people in the household that receive grants</b>	NA/Not sure= 0% None= 27% One to three people= 73% Four to six people= 0% >seven people= 0%	NA/Not sure= 0% None= 18% One to three people= 82% Four to six people= 0% >seven people= 0%

<b>Financially better off from the social incentives</b>	Yes= 7% No= 93%	Yes= 55% No= 45%
<b>Historical involvement</b>	Bitouville	Melkhoutfontein
<b>Longevity of fishers</b>	NA/Not sure= 0% One to five years= 7% Six to ten years= 20% Eleven to fifteen years= 13% Sixteen to twenty years= 7% Twenty-one to twenty-five years= 7% Twenty-six to thirty years= 13% Thirty-one to thirty-five years= 7% Thirty-six to forty years= 7% >Forty years= 20%	NA/Not sure= 0% One to five years= 0% Six to ten years= 0% Eleven to fifteen years= 9% Sixteen to twenty years= 18% Twenty-one to twenty-five years= 0% Twenty-six to thirty years= 18% Thirty-one to thirty-five years= 9% Thirty-six to forty years= 18% >Forty years= 27%
<b>The extent of ancestral involvement in fishing</b>	Yes= 67% No= 33%	Yes= 91% No= 9%
<b>Perception of a fishing family identity</b>	Yes= 67% No= 33%	Yes= 91% No= 9%
<b>Inclusivity of local ecological knowledge within the marine resource management planning</b>	Not at all included= 20% Slightly= 47% Less= 13% Very= 20%	Not at all included= 64% Slightly= 0% Less= 18% Very= 18%
<b>Concern regarding the continuation of fishing as a livelihood among the next generation</b>	NA/Not sure= 0% Not concerned at all= 47% Slightly concerned= 27% Concerned= 13% Very concerned= 13%	NA/Not sure= 0% Not concerned at all= 45% Slightly concerned= 18% Concerned= 18% Very concerned= 18%
<b>Relative maintenance of local ecological knowledge between generations</b>	Almost all is lost= 67% Partly lost= 0% Maintained= 33% Well-maintained= 0%	Nearly all is lost= 55% Partly lost= 0% Maintained= 18% Well-maintained= 27%
<b>Social mobility</b>	Bitouville	Melkhoutfontein
<b>The main occupation of the father</b>	Fisher= 60% Farmer= 7% Builder/bricklayer= 13% Railway worker= 20%	Fisher= 82% Farmer= 9% Railway worker= 9%
<b>The main occupation of the mother</b>	Fisher= 87% Fish processor & associated industry= 13%	Fish processor & associated industry= 55% Housewife= 45%
<b>School attendance of the father</b>	Grade one to four= 20% Grade five to seven= 33% Grade eight to eleven= 47%	Grade five to seven= 64% Grade eight to eleven= 36%
<b>School attendance of the mother</b>	Grade one to four= 13% Grade five to seven= 27% Grade eight to eleven= 60%	Grade one to four= 0% Grade five to seven= 73% Grade eight to eleven= 27%
<b>Level of financial well-being compared to parents.</b>	Yes= 60% No= 40%	Yes= 73% No= 27%
<b>Attachment to place</b>	Bitouville	Melkhoutfontein
<b>Feeling of belonging</b>	Not at all belong= 0% Slightly belong= 13% Belong= 33% Strongly belong= 53%	Not at all belong= 0% Slightly belong= 0% Belong= 36% Strongly belong= 64%

<b>Importance of friendships in the community</b>	Not at all important= 0% Slightly important= 0% Important= 27% Very important= 73%	Not at all important= 0% Slightly important= 0% Important= 0% Very important= 100%
<b>Recreational fishing</b>	Never= 13% Rarely= 20% Somewhat often= 40% Very often= 27%	Never= 0% Rarely= 36% Somewhat often= 45% Very often= 18%
<b>Degree of pride in telling others one is a fisher</b>	Not at all proud= 0% Slightly proud= 0% Proud= 20% Very proud= 80%	Not at all proud= 0% Slightly proud= 0% Proud= 0% Very proud= 100%
<b>Level of interest in one's children pursuing fishing</b>	Not like at all= 13% Not like= 7% Like= 20% Like very much= 60%	Not like at all= 55% Not like= 0% Like= 27% Like very much= 18%
<b>Economic dependence on fishing</b>	Bitouville	Melkhoutfontein
<b>Possibility of feeding the family without fishing</b>	Not at all possible= 7% Slightly possible= 73% Possible= 20% Highly possible= 0%	Not at all possible= 45% Slightly possible= 36% Possible= 18% Highly possible= 0%
<b>Perception of whether too many or too few fishers operating in the community</b>	Too few= 87% Slightly too few= 13% Slightly too many= 0% Too many= 0%	Too few= 91% Slightly too few= 9% Slightly too many= 0% Too many= 0%
<b>Degree of concern about illegal fishing</b>	Not at all concerned= 20% Slightly concerned= 40% Concerned= 7% Very concerned= 33%	Not at all concerned= 18% Slightly concerned= 0% Concerned= 0% Very concerned= 82%

## Appendix I: Responses Pertaining Exposure Category for 2023

Personal exposure	Bitouville	Melkhoutfontein
<b>Perception of safety in current livelihood despite environmental/climatic exposure</b>	Very safe= 0% Safe= 27% Slightly unsafe=73% Not safe at all= 0%	Very safe= 27% Safe= 36% Slightly unsafe= 0% Not safe at all= 36%
<b>Windstorms</b>	<b>Bitouville</b>	<b>Melkhoutfontein</b>
<b>Occurrence of large storms in the past five years</b>	Yes= 93% No= 7%	NA/Not sure= 9% Yes= 55% No= 36%
<b>Personally, directly impacted by the storm</b>	Yes=87% No= 13%	Yes= 64% No= 36%
<b>Degree of damage to household</b>	Very bad= 53% Bad= 7% Somewhat bad= 27% Not bad at all= 13%	Very bad= 9% Bad= 18% Somewhat bad= 36% Not bad at all= 36%
<b>Actions that were taken to prevent future considerable storm damage</b>	Yes= 60% No= 40%	Yes= 64% No= 36%
<b>Actions that were taken to prevent future considerable storm damage</b>	Fixed roof= 33% Stayed indoor= 67%	Fixed roof= 55% Tuned in to local radio and news for updates= 45%
<b>Wind speed</b>	<b>Bitouville</b>	<b>Melkhoutfontein</b>
<b>Fishing effort in an area prone to changes in wind speed</b>	Yes= 80% No= 20%	Yes= 73% No= 27%
<b>Extent of wind speed</b>	No damage= 20% Moderate damage= 27% Little damage= 20% Major damage= 33%	No damage= 36% Moderate damage= 18% Little damage= 27% Major damage= 18%
<b>Degree of damage to fisheries</b>	Very bad= 27% Bad= 27% Slightly bad= 20% Not bad at all= 27%	Very bad= 36% Bad= 9% Slightly bad= 36% Not bad at all= 18%
<b>Wind direction</b>	<b>Bitouville</b>	<b>Melkhoutfontein</b>
<b>Changes in wind direction on fishing</b>	Yes= 80% No= 20%	Yes= 64% No= 36%
<b>Impacts of wind direction</b>	No impact= 20% Slight impact= 20% Impacted= 40% Greatly impacted= 20%	No impact= 36% Slight impact= 9% Impacted= 27% Greatly impacted= 27%
<b>The severity of wind direction</b>	Not severe at all= 20% Slightly severe= 33% Severe= 47% Very severe= 0%	Not severe at all= 45% Slightly severe= 0% Severe= 45% Very severe= 9%
<b>Drought</b>	<b>Bitouville</b>	<b>Melkhoutfontein</b>
<b>Occurrence of drought in the past five years</b>	Yes= 93% No= 7%	Yes= 64% No= 36%
<b>Degree of damage to the fishing ability</b>	Not severe= 7% Slightly severe= 13% Severe= 60% Very severe= 20%	Not severe= 45% Slightly severe= 18% Severe= 0% Very severe= 36%
<b>Rainfall</b>	<b>Bitouville</b>	<b>Melkhoutfontein</b>

<b>Households in areas prone to changes in rainfall pattern</b>	Yes= 93% No= 7%	Yes= 73% No= 27%
<b>The extent of rainfall patterns</b>	No damage= 7% Moderate damage= 7% Little damage= 67% Major damage= 20%	No damage= 27% Moderate damage= 27% Little damage= 45% Major damage= 0%
<b>Severity of rainfall</b>	Very bad= 7% Bad= 27% Slightly bad= 67% Not bad at all= 0%	Very bad= 27% Bad= 27% Slightly bad= 36% Not bad at all= 9%
<b>Sea state</b>	<b>Bitouville</b>	<b>Melkhoutfontein</b>
<b>Changes in sea state</b>	Yes= 93% No= 7%	Yes= 55% No= 45%
<b>Impacts of sea state changes</b>	No impact= 7% Slight impacted= 13% Impacted= 60% Greatly impacted= 20%	No impact= 45% Slight impacted= 0% Impacted= 36% Greatly impacted= 18%
<b>The severity of sea state changes</b>	Not severe at all= 7% Slightly severe= 7% Severe= 73% Very severe= 13%	Not severe at all= 45% Slightly severe= 18% Severe= 18% Very severe= 18%
<b>Pandemic</b>	<b>Bitouville</b>	<b>Melkhoutfontein</b>
<b>Impacts of COVID-19</b>	Yes= 100% No= 0%	Yes= 82% No= 18%
<b>Impacts of different COVID-19 restrictions</b>	NA/Not sure= 0% Restricted to travel to fishing areas= 93% Contracted COVID-19= 7% Fish prices went up= 0% Unable to sell fish= 0%	NA/Not sure= 18% Restricted to travel to fishing areas= 64% Contracted COVID-19= 0% Fish prices went up= 9% Unable to sell fish= 9%
<b>Ability to fish during COVID-19</b>	Yes= 87% No= 13%	Yes= 82% No= 18%
<b>Fishing frequency</b>	Yes= 100% No= 0%	Yes= 100% No= 0%
<b>Measures employed to deal with COVID-19</b>	Yes= 53% No= 47%	Yes= 45% No= 55%

## Appendix J: Responses Pertaining to Adaptive Capacity for 2023

Personal flexibility	Bitouville	Melkhoutfontein
<b>Level of interest in changing employment</b>	NA/Not sure= 0% Stay doing what I am doing= 53% Change my job= 47%	NA/Not sure= 0% Stay doing what I am doing= 82% Change my job= 18%
<b>Perception of finding work in the alternative sector</b>	NA/Not sure= 0% Yes= 60% No= 40%	NA/Not sure= 0% Yes= 18% No= 82%
<b>Number of options for alternative work</b>	NA/Not sure= 0% No options= 20% Few options= 0% Some options= 60% Many options= 20%	NA/Not sure= 0% No options= 64% Few options= 0% Some options= 36% Many options= 0%
<b>Number of courses taken to improve employability</b>	Yes= 27% No= 73%	Yes= 55% No= 45%
<b>Level of interest in working for someone else</b>	Yes= 67% No= 33%	Yes= 64% No= 36%
<b>Level of habituation to changes everyday life</b>	Not at all used to it=7% Not used to it= 0% Used to it= 53% Very used to it= 40%	Not at all used to it= 27% Not used to it= 0% Used to it= 18% Very used to it= 55%
<b>Perception of which groups are most at risk of future changes</b>	NA/Not sure= 0% More small-scale than big= 0% Small-scale fishers only= 33% More big companies than small= 40% Big companies only= 27% Depends on what the changes are= 0%	NA/Not sure= 0% More small-scale than big= 0% Small-scale fishers only= 18% More big companies than small= 18% Big companies only= 64% Depends on what the changes are= 0%
<b>Level of financial planning</b>	No plan at all= 27% Planned a little= 47% Well-planned= 13% Very well-planned= 13%	No plan at all= 36% Planned a little= 9% Well-planned= 55% Very well-planned= 0%
<b>Level of interest in learning new skills outside of fishing</b>	Not interested at all= 0% Slightly interested= 7% Interested= 20% Very interested= 70%	Not interested at all= 9% Slightly interested= 18% Interested= 9% Very interested= 64%
<b>Perception of the possibility of personally improving the marine environment</b>	Not at all possible= 20% Slightly possible= 20% Possible= 27% Very possible= 33%	Not at all possible= 9% Slightly possible= 18% Possible= 18% Very possible= 55%
<b>Level of confidence that events will work out well regardless of everything</b>	Not at all confident= 13% Slightly Confident= 7% Confident= 53% Very Confident= 27%	Not at all confident= 18% Slightly Confident= 9% Confident= 9% Very Confident= 64%
<b>Perception of responsibility to protect the marine environment</b>	Not at all responsible= 0% Slightly responsible= 13% Responsible= 7% Very responsible= 80%	Not at all responsible= 0% Slightly responsible= 9% Responsible= 18% Very responsible= 73%
<b>Perception of ability to adapt to change compared to others locally</b>	Not likely at all= 53% Not likely= 0% Likely= 27% Very likely= 20%	Not likely at all=36% Not likely= 18% Likely= 27% Very likely= 18%

<b>Perception of the utility of own skills to set up a business outside of fishing</b>	Not at all useful= 0% Slightly useful= 27% Useful= 40% Very useful= 33%	Not at all useful= 9% Slightly useful= 0% Useful= 27% Very useful= 64%
<b>Occupational flexibility</b>	Bitouville	Melkhoutfontein
<b>Number of employment changes in the past five years</b>	Yes= 27% No= 73%	Yes= 18% No= 82%
<b>Level of interest in working in the non-fishing sector</b>	Yes= 80% No= 20%	Yes= 9% No= 91%
<b>Factors that a new job must possess</b>	NA/Not sure= 0% Personal safety= 73% Intellectual challenge= 47% Low risk & certain income= 27% Flexibility= 13% Adventure= 0% Part-time options= 0%	NA/Not sure= 0% Personal safety= 18% Intellectual challenge= 27% Low risk & certain income= 55% Flexibility= 18% Adventure= 0% Part-time options= 9%
<b>Employment sectors you would consider taking a job</b>	None= 0% Tourism= 18% Service industry= 0% Aquaculture= 87% Different fishing sectors= 53% Office work= 13% Mining= 0% Masonry/carpentry/daily wage labour=47%	None= 0% Tourism= 18% Service industry= 0% Aquaculture= 36% Different fishing sectors= 18% Office work= 0% Mining= 0% Masonry/carpentry/daily wage labour= 36%
<b>The most significant risk to the fishing livelihood</b>	None= 0% The market= 27% Injury/health= 60% Environmental change= 67% Management changes= 13% Reduced fish abundance= 53%	None= 0% The market= 64% Injury/health= 18% Environmental change= 45% Management changes= 0% Reduced fish abundance= 55%
<b>Type of livelihoods found by fishers leaving the fishery</b>	NA/Not sure= 0% Unemployed= 20% Farming= 67% Construction= 13% Gardening= 0% Woodwork= 7% Painting= 0% Maintenance= 7%	NA/Not sure= 27% Unemployed= 18% Farming= 9% Construction= 27% Gardening= 45% Woodwork= 27% Painting= 9% Maintenance= 0%
<b>Tourism activities</b>	NA/Not sure= 13% None= 0% Hiking trail= 80% Walking tours= 0% Going to the sea= 40% Local fishing competition= 0% Fishing= 7%	NA/Not sure= 27% None= 0% Hiking trail= 9% Walking tours= 9% Going to the sea= 27% Local fishing competition= 27% Fishing= 0%
<b>The relative importance of tourism to community and natural resources to tourism</b>	Not suitable at all= 7% Slightly suitable= 7% Suitable= 40% Very suitable= 47%	Not suitable at all= 0% Slightly suitable= 9% Suitable= 18% Very suitable= 73%
<b>The health of the marine resources locally</b>	Not at all healthy= 0% Not very healthy= 0% Healthy= 20%	Not at all healthy= 0% Not very healthy= 0% Healthy= 36%

	Very healthy= 80%	Very healthy= 64%
<b>The relative importance of fishing as an economic activity locally</b>	Not at all important= 7% Slightly important= 0% Important= 0% Very important= 93%	Not at all important= 9% Slightly important= 0% Important= 0% Very important= 91%
<b>Level of occupational diversity throughout the year</b>	Never= 20% Rarely= 60% Often= 7% Very often= 13%	Never= 27% Rarely= 45% Often= 18% Very often= 9%
<b>Willingness to move to a bigger town or community</b>	Not willing at all= 47% Slightly willing= 7% Willing= 13% Very willing= 33%	Not willing at all= 64% Slightly willing= 9% Willing= 0% Very willing= 36%
<b>Business Approach</b>	Bitouville	Melkhoutfontein
<b>Possibility to guess how much a business can make per month</b>	Impossible= 14 (93%) Slightly possible= 1 (7%) Possible= 0% Very possible= 0%	Impossible= 9 (82%) Slightly possible= 1 (9%) Possible= 0% Very possible= 9%
<b>Detailed business plan</b>	Not at all detailed= 14 (93%) Slightly detailed= 1 (7%) Detailed= 0% Very detailed= 0%	Not at all detailed= 10 (91%) Slightly detailed= 1 (9%) Detailed= 0% Very detailed= 0%
<b>Markets</b>	Bitouville	Melkhoutfontein
<b>Avenues to sell fish</b>	NA/Not sure= 0% No avenue= 0% Middlemen= 80% Local individual fish buyer= 7% Directly off the boat= 27% Large processor= 13%	NA/Not sure= 0% No avenue= 0% Middlemen= 64% Local individual fish buyer= 36% Directly off the boat= 0% Large processor= 9%
<b>Relationship with middlemen</b>	NA/Not sure= 20% No relationship= 0% Good relationship= 60% Bad relationship= 20%	NA/Not sure= 36% No relationship= 0% Good relationship= 45% Bad relationship= 18%
<b>Relationship with companies or buyers you sell your fish to</b>	NA/Not sure= 67% No relationship= 0% Good relationship= 20% Bad relationship= 13%	NA/Not sure= 36% No relationship= 0% Good relationship= 64% Bad relationship= 0%
<b>Possibility of selling fish outside the community</b>	Yes= 7% No= 93%	Yes= 27% No= 73%
<b>Distance from the market</b>	NA/Not sure= 93% None= 0% One to five kilometres= 0% Six to ten kilometres= 0% Eleven to fifteen kilometres= 0% Sixteen to twenty kilometres= 0% Twenty-one to twenty-five kilometres= 0% Twenty-six to thirty kilometres= 0% Thirty-one to thirty-five kilometres= 7% >Thirty-five kilometres= 0%	NA/Not sure= 73% None= 0% One to five kilometres= 0% Six to ten kilometres= 18% Eleven to fifteen kilometres= 0% Sixteen to twenty kilometres= 0% Twenty-one to twenty-five kilometres= 0% Twenty-six to thirty kilometres= 0% Thirty-one to thirty-five kilometres= 0% >Thirty-five kilometres= 9%
<b>Fishing for orders from the markets</b>	Yes= 0% No= 100%	Yes= 9% No= 91%

<b>Stability of fish price</b>	Yes= 7% No= 93%	Yes= 73% No= 27%
<b>Fish prices in the local markets</b>	NA/Not sure= 13% The power of middlemen= 87% The price the fisher demands= 20% The quantity of fish that is available= 7%	NA/Not sure= 9% The power of middlemen= 91% The price the fisher demands= 9% The number of fish that is available=
<b>Number of markets to sell meat and vegetables</b>	None= 0% One to three markets= 100% Four to five markets= 0% Six to seven markets= 0% >Eight markets= 0%	None= 0% One to three markets= 91% Four to five markets= 0% Six to seven markets= 9% >Eight markets= 0%
<b>Resource management institutions</b>	<b>Bitouville</b>	<b>Melkhoutfontein</b>
<b>The presence of natural resource management institutions in the community</b>	Yes= 0% No= 100%	Yes= 0% No= 100%
<b>Level to which rules have changed due to environmental changes</b>	Yes= 87% No= 13%	Yes= No=
<b>Changes in fishing rules</b>	No changes= 0% Strict fishing rules= 60% Changes in fish catch and quantity= 20%	No changes= 0% Strict fishing rules= 27% Changes in fish catch and quantity= 27%
<b>Degree of recording/reporting of catches required</b>	Yes= 13% No= 87%	Yes= 73% No= 27%
<b>Reporting catch</b>	NA/Not sure= 73% No one= 7% Harbour/DFFE= 7% Book available to fishers to record catch= 13%	NA/Not sure= 27% No one= 0% Harbour/DFFE= 73% Book available to fishers to record catch= 0%
<b>Community organisations</b>	NA/Not sure= 0% Rugby club= 93% Creche= 80% Church= 60% Neighbourhood watch= 20% Senior citizens club= 0% Youth wellness= 7% Fire rescue/ department= 0%	NA/Not sure= 0% Rugby club= 45% Creche= 9% Church= 45% Neighbourhood watch= 55% Senior citizens club= 36% Youth wellness= 18% Melkhoutfontein association club= 36% Fire rescue/ department= 9%
<b>Management of fishery</b>	Yes= 60% No= 40%	Yes= 45% No= 55%
<b>Fishery management changes</b>	NA/Not sure= 40% No changes= 0% Implementation of fishery resources= 60% Co-management of fishery resources= 0%	NA/Not sure= 45% No changes= 0% Implementation of fishery resources= 36% Co-management of fishery resources= 18%
<b>Fishing compliance and conflict</b>	<b>Bitouville</b>	<b>Melkhoutfontein</b>
<b>Relative occurrence of illegal fishing locally</b>	Does not occur at all= 55% Occurs a little= 27% Occurs= 9% Occurs a lot= 9%	Does not occur at all= 55% Occurs a little= 27% Occurs= 9% Occurs a lot= 9%

<b>Number of people who know those who break the rules</b>	No one= 73% A few people= 18% Most people= 36% Everyone= 9%	No one= 73% A few people= 18% Most people= 0% Everyone= 9%
<b>Enforcement of fishing rules in the area</b>	Not enforced at all= 9% Enforced a little= 18% Just enforced= 36% Well-enforced= 36%	Not enforced at all= 9% Enforced a little= 18% Just enforced= 36% Well-enforced= 36%
<b>Relative occurrence of conflict among fishers</b>	Do not occur ever= 27% Not very common= 0% Common= 36% Very common= 36%	Do not occur ever= 27% Not very common= 0% Common= 36% Very common= 36%
<b>Effectiveness of implemented fishing rules</b>	Not happy at all= 73% Slightly happy= 0% Happy= 9% Very happy= 18%	Not happy at all= 73% Slightly happy= 0% Happy= 9% Very happy= 18%
<b>Access to institutional safety nets and Information</b>	<b>Bitouville</b>	<b>Melkhoutfontein</b>
<b>Number of government safety nets for fishers</b>	None= 67% Few= 27% Some= 0% Many= 7%	None= 9% Few= 45% Some= 9% Many= 36%
<b>Happy with government safety nets used in the fishing community during disasters</b>	Not happy at all= 67% Slightly unhappy= 7% Happy= 20% Very happy= 7%	Not happy at all= 64% Slightly unhappy= 18% Happy= 9% Very happy= 9%
<b>Strength of links between fishers and institutions or government</b>	Not at all linked= 47% Slightly linked= 47% Well linked= 0% Very well linked= 7%	Not at all linked= 9% Slightly linked= 45% Well linked= 18% Very well linked= 27%
<b>Strength of links between fishers and institutions or government</b>	NA/Not sure= 40% Not involved at all= 20% Slightly involved= 33% Involved= 7% Very involved= 0%	NA/Not sure= 0% Not involved at all= 27% Slightly involved= 27% Involved= 9% Very involved= 36%
<b>Strength of links between fishers and institutions or government</b>	NA/Not sure= 0% Not happy at all= 73% Slightly happy= 20% Happy= 7% Very happy= 0%	NA/Not sure= 0% Not happy at all= 55% Slightly happy= 0% Happy= 27% Very happy= 18%
<b>Attitude and perception</b>	<b>Bitouville</b>	<b>Melkhoutfontein</b>
<b>Perceived level of risk to the community from environmental change</b>	None= 7% Low= 13% Medium= 13% High= 67%	None= 9% Low= 0% Medium= 36% High= 55%
<b>Degree of anxiety felt about environmental changes observed locally.</b>	Not at all scared/anxious= 0% Little scared/anxious= 7% Scared/anxious= 13% Very scared/anxious= 80%	Not at all scared/anxious= 18% Little scared/anxious= 18% Scared/anxious= 27% Very scared/anxious= 36%
<b>Perceived level of danger to fishing from weather changes</b>	Not at all dangerous= 13% Slightly dangerous= 7% Dangerous= 33%	Not at all dangerous= 0% Slightly dangerous= 18% Dangerous= 36%

	Very dangerous= 47%	Very dangerous= 45%
<b>Degree of difficulty in finding/catching fish compared to the past</b>	Not at all difficult= 0% Slightly difficult= 7% Difficult= 13% Very difficult= 80%	Not at all difficult= 9% Slightly difficult= 9% Difficult= 36% Very difficult= 45%
<b>The number of changes in marine species observed locally.</b>	No changes= 13% Few changes= 27% Changes= 33% Many changes= 27%	No changes= 27% Few changes=18% Changes= 9% Many changes= 45%
<b>Number of ideas held to ensure the sustainability of the target fish species locally</b>	No ideas= 0% Few ideas= 20% Some ideas= 20% Many ideas= 60%	No ideas= 9% Few ideas= 36% Some ideas= 9% Many ideas= 45%
<b>Climate change</b>		
<b>Awareness of climate change</b>	Yes= 93% No= 7%	Yes= 82% No= 18%
<b>Experience of climate change</b>	Yes= 93% No= 7%	Yes= 82% No= 18%
<b>Access to climate change information</b>	NA/Not sure= 0% No access= 0% Newspapers= 33% TV/Radio= 93% Academic society= 0% My friends and family= 40% The internet= 53%	NA/Not sure= 0% No access= 0% Newspapers= 36% TV/Radio= 82% Academic society= 0% My friends and family= 45% The internet= 64%
<b>Social capital, networks, and community cohesion</b>		
	Bitouville	Melkhoutfontein
<b>The main source of assistance when you have financial, food, or basic needs</b>	Family= 53% Neighbours= 33% Friends= 40% Local organisation= 0% Take loans= 20%	Family= 100% Neighbours= 27% Friends= 36% Local organisation= 0% Take loans= 0%
<b>Gender equity</b>		
<b>Number of women in leadership roles in the community and positions</b>	Yes= 80% No= 20%	Yes= 73% No= 27%
<b>Roles that women hold</b>	NA/Not sure= 0% No position= 0% Fire department= 7% Community welfare leadership= 7% Church leadership= 53% Neighbourhood watch= 20% Mentorship= 0% Community healthcare= 20% Harbour committee= 7% Early childhood development= 0% Nursing home/Carer= 0% Municipal services= 0%	NA/Not sure= 0% No position= 0% Fire department= 55% Community welfare leadership= 0% Church leadership= 27% Neighbourhood watch= 27% Mentorship= 0% Community healthcare= 27% Harbour committee= Early childhood development= 0% Nursing home/Carer= 0% Municipal services= 9%
<b>Networks</b>		
<b>Relative confidence in calling on someone for help financially</b>	Not all confident= 53% Slightly confident= 40% Confident= 7% Very confident= 0%	Not all confident=36% Slightly confident= 27% Confident= 18% Very confident= 18%

<b>Decision-making</b>		
<b>Degree of involvement in community decision-making</b>	NA/Not sure= 0% Not at all involved= 15% Slightly involved= 19% Involved= 13% Very involved= 8%	NA/Not sure= 0% Not at all involved= 27% Slightly involved= 45% Involved= 27% Very involved= 0%
<b>Degree of involvement in MPA management/decision-making</b>	NA/Not sure= 0% Not at all involved= 65% Slightly involved= 23% Involved= 8% Very involved= 4%	NA/Not sure= 0% Not at all involved= 55% Slightly involved= 9% Involved= 18% Very involved= 18%
<b>Leadership</b>		
<b>Strength of community leadership</b>	Not at all strong= 13% Slightly strong= 53% Strong= 20% Very strong= 13%	Not at all strong= 27% Slightly strong= 27% Strong= 9% Very strong= 36%
<b>Accessibility of community leadership</b>	Never= 27% Sometimes= 47% Often= 27% Always= 0%	Never= 18% Sometimes= 18% Often= 36% Always= 27%
<b>Equity</b>		
<b>Equality of access and control over livelihoods and resources between men and women</b>	Not at all equal= 0% Quite unequal= 6 (40%) Nearly equal= 3 (20%) Equal= 6 (40%)	Not at all equal= 1 (9%) Quite unequal= 2 (18%) Nearly equal= 2 (18%) Equal= 6 (55%)
<b>Degree of vulnerability to future harm among different community members</b>	NA/Not sure= 0% No one= 40% Some= 27% Most= 33% Everyone= 0%	NA/Not sure= 0% No one= 45% Some= 18% Most= 36% Everyone= 0%
<b>Health</b>		
	Bitouville	Melkhoutfontein
<b>Presence of an infirm or unwell person in the household in the last year</b>	Yes= 53% No= 47%	Yes= 36% No= 64%
<b>The presence of a chronically ill person in the household</b>	Yes= 60% No= 40%	Yes= 55% No= 45%
<b>Labour</b>		
<b>The degree of difficulty in finding alternative work is known as a fisher.</b>	Yes= 53% No= 47%	Yes= 18% No= 82%
<b>Perception of the relationship between the role of technology and the skill of fishers</b>	Very few people= 47% Some people= 27% Many people= 27% Anyone= 0%	Very few people= 45% Some people= 18% Many people= 9% Anyone= 27%
<b>Confidence in own skills results in success in the fishing industry</b>	Not at all confident= 7% Slightly confident= 33% Confident= 47% Very confident= 13%	Not at all confident= 9% Slightly confident= 18% Confident= 9% Very confident= 64%
<b>Household sharing income</b>		
	Bitouville	Melkhoutfontein
<b>Contribution of each household member's income to household expenses</b>	Yes= 80% No= 20%	Yes= 91% No= 9%
<b>Possibility to obtain cash for an emergency today</b>	Yes= 13% No= 87%	Yes= 27% No= 73%

<b>Savings</b>		
<b>Money set aside for emergencies</b>	Yes= 0% No= 100%	Yes= 27% No= 73%
<b>Credit</b>		
<b>Loan provision</b>	Friends and family= 73% Large companies= 0% Small money lenders= 0% Banks= 0%	Friends and family= 82% Large companies= 0% Small money lenders= 18% Banks= 0%
<b>Loan provision for others in the past year</b>	Yes= 27% No= 73%	Yes= 9% No= 91%
<b>Insurance</b>		
<b>Insurance policies available</b>	None= 7% Life= 93% House= 0% Vehicle= 0% Income= 0% Boat= 0%	None= 0% Life= 100% House= 0% Vehicle= 0% Income= 0% Boat= 0%
<b>Ability to endure some income shocks</b>	Impossible= 20% Slightly impossible= 47% Possible= 27% Very possible= 7%	Impossible= 36% Slightly impossible= 27% Possible= 27% Very possible= 9%
<b>Ability to access financial reserves if unemployed</b>	Impossible= 87% Slightly impossible= 7% Possible= 0% Very possible= 7%	Impossible= 36% Slightly impossible= 27% Possible= 27% Very possible= 9%
<b>Built house</b>	Bitouville	Melkhoutfontein
<b>Own/rent a house.</b>	Do not own= 7% Own= 73% Rent= 20%	Do not own= 0% Own= 82% Rent= 18%
<b>Age of building</b>	NA/Not sure= 13% Less than a year= 0% One to five years= 0% Six to ten years= 7% Eleven to fifteen years= 40% Sixteen to twenty years= 0% Twenty-one to twenty-five years= 13% Twenty-six to thirty years= 20% Thirty-one to thirty-five years= 0% >Thirty-five years= 7%	NA/Not sure= 27% Less than a year= 18% One to five years= 0% Six to ten years= 0% Eleven to fifteen years= 0% Sixteen to twenty years= 0% Twenty-one to twenty-five years= 0% Twenty-six to thirty years= 0% Thirty-one to thirty-five years= 0% >Thirty-five years= 45%
<b>Number of rooms</b>	NA/Not sure= 0% None= 0% One to two rooms= 100% Three to four rooms= 0% Five to six rooms= 0% Seven to eight rooms= 0% >Eight rooms= 0%	NA/Not sure= 0% None= 0% One to two rooms= 55% Three to four rooms= 27% Five to six rooms= 9% Seven to eight rooms= 9% >Eight rooms= 0%
<b>The estimated value of the building</b>	NA/Not sure= 13% <R1000= 0% R1000 to R2000= 0% R2001 to R4000= 0% R4001 to R8000= 0% R8001 to R15000= 0%	NA/Not sure= 18% <R1000= 0% R1000 to R2000= 0% R2001 to R4000= 0% R4001 to R8000= 0% R8001 to R15000= 0%

	R15001 to R25000= 27% R25001 to R50000= 60% >R50000=0%	R15001 to R25000= 0% R25001 to R50000= 27% >R50000= 55%
<b>Renovation and maintenance of the house</b>	Yes= 67% No= 33%	Yes= 45% No= 55%
<b>Boat assets</b>		
<b>Possession of a boat</b>	No boat= 100% Ski-boat= 0%	No boat= 82% Ski-boat= 18%
<b>Number of boats</b>	NA/Not sure= 0% None= 100% One to two boats= 0% Three to four boats= 0% >Five boats= 0%	NA/Not sure= 0% None= 83% One to two boats= 18% Three to four boats= 0% >Five boats= 0%
<b>Size of boat</b>	None= 100% One to five metres= 0% Six to ten metres= 0% >Ten metres= 0%	None= 82% One to five metres= 18% Six to ten metres= 0% >Ten metres= 0%
<b>Freshwater supply</b>		
<b>Possession of freshwater tank</b>	Yes= 33% No= 67%	Yes= 55% No= 45%
<b>Energy</b>		
<b>The main source of energy</b>	Power is not connected= 0% Mains/electricity= 100% Solar= 0% Generator= 0% Coal= 0% Paraffin= 0% Animal dung= 0%	Power is not connected= 0% Mains/electricity= 100% Solar= 0% Generator= 0% Coal= 0% Paraffin= 0% Animal dung= 0%
<b>The main source of water heating</b>	None= 20% Electricity= 47% Gas= 33% Paraffin= 0% Solar= 0% Candles= 0% Wood= 0% Coal= 0% Animal dung= 0%	None= 18% Electricity= 36% Gas= 45% Paraffin= 0% Solar= 0% Candles= 0% Wood= 0% Coal= 0% Animal dung= 0%
<b>Cooking fuels</b>		
<b>The main source of cooking</b>	None= 0% Wood= 33% Gas= 7% Electric= 60% Electric & gas= 0% Electric & wood= 0%	None= 0% Wood= 0% Gas= 27% Electric= 55% Electric & gas= 18% Electric & wood= 0%
<b>Waste</b>		
<b>Possession of own toilet</b>	Yes= 87% No= 13%	Yes= 100% No= 0%
<b>Disposal of rubbish</b>	None= 0% Hole/open burning= 0% Collected= 100%	None= 0% Hole/open burning= 0% Collected= 100%
<b>Route of wastewater</b>	None= 0% Soak pit= 0% Septic tanks= 13%	None= 0% Soak pit= 0% Septic tanks= 0%

	Disposal= 87%	Disposal= 100%
	Runs into garden/street= 0%	Runs into garden/street= 0%
<b>Type of toilet</b>	No toilet= 0%	No toilet= 0%
	Compost/long drop= 7%	Compost/long drop= 0%
	Pour flush= 20%	Pour flush= 9%
	Flush= 73%	Flush= 91%
<b>Money owed on main assets</b>	None= 73%	None= 91%
	Little= 20%	Little= 0%
	Some= 7%	Some= 0%
	Much= 0%	Much= 9%
<b>Things owed that are in good conditions</b>	None= 0%	None= 9%
	Some= 67%	Some= 27%
	Most= 27%	Most= 45%
	All= 7%	All= 18%
<b>Natural Capital</b>	Bitouville	Melkhoutfontein
<b>Observed changes in communities' marine resources during the lifetime</b>	Yes= 80%	Yes= 82%
	No= 20%	No= 18%
<b>Perception of changes in the local sea habitat</b>	NA/Not sure= 0%	NA/Not sure= 0%
	Irreversibly damaged= 0%	Irreversibly damaged= 0%
	Badly damaged= 0%	Badly damaged= 27
	Slightly damaged= 87%	Slightly damaged= 45%
	Improved since you were a child= 13%	Improved since you were a child= 27%
	The same= 0%	The same= 0%
<b>Factors cause fish numbers to decline locally.</b>	NA/Not sure= 3 (20%)	NA/Not sure= 1 (9%)
	Pollution= 3 (20%)	Pollution= 1 (9%)
	Climate change (in general) = 4 (27%)	Climate change (in general) = 3 (27%)
	Trawlers= 1 (7%)	Trawlers= 6 (55%)
	Changes in rainfall patterns= 1 (7%)	Changes in rainfall patterns= 0%
	Changes in wind direction= 3 (20%)	Changes in wind direction= 0%
	Changes in weather patterns= 0%	Changes in weather patterns= 0%
<b>Factors increasing the number of fish in the sea</b>	NA/Not sure= 33%	NA/Not sure= 9%
	Removing trawlers= 7%	Removing trawlers= 73%
	Enforce strict rules= 47%	Enforce strict rules= 18%
	Monitoring fish catches= 13%	Monitoring fish catches= 0%
<b>Perception of overharvesting of marine resources locally</b>	Yes= 80%	Yes= 45%
	No= 20%	No= 55%
<b>Observed changes to livelihood due to changes in the marine environment locally</b>	Yes= 80%	Yes= 45%
	No= 20%	No= 55%
<b>Diversity of marine habitat</b>	NA/Not sure= 0%	NA/Not sure= 0%
	Very low= 7%	Very low= 18%
	Low= 20%	Low= 18%
	High= 53%	High= 36%
	Very high= 20%	Very high= 27%
<b>Changes in the number of fish</b>	NA/Not sure= 0%	NA/Not sure= 0%
	Big decrease= 33%	Big decrease= 45%
	Decrease= 53%	Decrease= 55%
	Same= 13%	Same= 0%
	Increased= 0%	Increased= 0%
	Big increase= 0%	Big increase= 0%

<b>The marine environment worsened or improved in the last five years.</b>	NA/Not sure= 0%	NA/Not sure= 0%
	Worsened a lot= 0%	Worsened a lot= 0%
	Worsened= 53%	Worsened= 91%
	Improved= 47%	Improved= 0%
	Improved a lot= 0%	Improved a lot= 9%
	Stayed the same= 0%	Stayed the same= 0%

## Appendix K: Demographical Characteristics and Fishing Activities for 2013

Demography	Bitouville	Melkhoutfontein
<b>Gender</b>	Male= 100%	Male= 100%
	Female= 0%	Female= 0%
<b>Race</b>	Coloured= 100%	Coloured= 96%
	Black= 0%	White= 4%
<b>First language</b>	100% Afrikaans	100% Afrikaans
<b>Age</b>	20-29 years= 10%	20-29 years= 0%
	30-39 years= 50%	30-39 years= 12%
	40-49 years= 10%	40-49 years= 48%
	50-59 years= 20%	50-59 years= 28%
	>60 years= 10%	>60 years= 12%
<b>Fishing as a primary occupation</b>	Main occupation= 70%	Main occupation= 84%
	Not main occupation= 30%	Not main occupation= 16%
<b>Level of Education</b>	No schooling= 1 (10%)	No schooling= 0%
	Primary school= 9 (60%)	Primary school= 56%
	High school= 4 (30%)	High school= 44%
	Skills/practical/Technical Education/university= 0%	Skills/practical/Technical Education/university= 9%
<b>Courses completed</b>	Yes= 20%	Yes= 52%
	No= 80%	No= 48%

## Appendix L: Responses Pertaining to the Sensitivity Category for 2013.

<b>Social dependence (SD) on fishing</b>	<b>Bitouville</b>	<b>Melkhoutfontein</b>
Dependence on institutions and people for day-to-day resources to go fishing	Weather prediction & news= 40% Family= 10% Buyers of fish= 0% Fellow workers= 0% Boat owner= 10% Skipper= 20%	Weather prediction & news= 68% Family= 4% Buyers of fish= 12% Fellow workers= 0% Boat owner=8% Skipper= 12%

### Economic dependence (ED) on fishing

<b>Food consumption</b>	<b>Bitouville</b>	<b>Melkhoutfontein</b>
The number of days a week households consume fresh marine food.	NA/Not sure= 20% One day= 30% Two to five days= 50% Six days= 0% Seven days= 0%	NA/Not sure= 16% One day= 28% Two to five days= 52% Six days= 0% Seven days= 4%
Fish from own catch or bought	NA/Not sure= 0% Own catch= 90% Bought= 10%	NA/Not sure= 0% Own catch= 90% Bought= 10%
The type of fish consumed most often.	Kob= 80% Blacktail= 0% Red Roman= 10% Shark= 0% Shad= 0% Silver= 0% Hake= 0% Blue stumpnose= 20% Santer= 0% Grunter= 20% Snappers= 0%	Kob= 91% Blacktail= 9% Red Roman= 0% Shark= 0% Shad= 0% Silver= 9% Hake= 9% Blue stumpnose= 4% Santer= 4% Grunter= 0% Snappers= 8%

### Economic dependence (ED) on other resources

<b>Food consumption</b>	<b>Bitouville</b>	<b>Melkhoutfontein</b>
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The number of days a week households consume fresh vegetable products.	NA/Not sure= 0%	NA/Not sure= 0%
	Never= 0%	Never= 0%
	One to three days= 60%	One to three days= 80%
	Four to five days= 0%	Four to five days= 4%
	Six to seven days= 40%	Six to seven days= 16%
The number of days a week households consume fresh meat.	NA/Not sure= 0%	NA/Not sure= 0%
	Never= 0%	Never= 0%
	One to three days= 60%%	One to three days= 88%
	Four to five days= 10%	Four to five days= 8%
	Six to seven days= 30%	Six to seven days= 4%
Important food source for household	NA/Not sure= 0%	NA/Not sure= 0%
	Garden= 20%	Garden= 0%
	Shops= 80%	Shops= 96%
	Fish for food/ a small portion from catch= 0%	Fish for food/ a small portion from catch= 4%
	Collect food from the bush= 0%	Collect food from the bush= 0%

#### Historical & Cultural dependence (H&CD) on fishing

Historical involvement	Bitouville	Melkhoutfontein
Longevity of fishers	NA/Not sure= 0%	NA/Not sure= 4%
	One to five years= 30%	One to five years= 0%
	Six to ten years= 0%	Six to ten years= 0%
	Eleven to fifteen years= 30%	Eleven to fifteen years= 8%
	Sixteen to twenty years= 0%	Sixteen to twenty years= 12%
	Twenty-one to twenty-five years= 10%	Twenty-one to twenty-five years= 20%
	Twenty-six to thirty years= 10%	Twenty-six to thirty years= 12%
	Thirty-one to thirty-five years= 0%	Thirty-one to thirty-five years= 24%
	Thirty-six to forty years= 7%	Thirty-six to forty years= 16%
>Forty years= 0%	>Forty years= 4%	
The extent of ancestral involvement in fishing	Yes= 90%	Yes= 84%
	No= 10%	No= 16%
Perception of a fishing family identity	Yes= 80%	NA/Not sure= 4%
	No= 20%	Yes= 72%

		No= 24%
Inclusivity of local ecological knowledge within the marine resource management planning	Not at all included= 100% Slightly= 0% Less= 0% Very= 0%	Not at all included= 88% Slightly= 4% Less= 0% Very= 4%
Concern regarding the continuation of fishing as a livelihood among the next generation	NA/Not sure= 0% Not concerned at all= 20% Slightly concerned= 0% Concerned= 40% Very concerned= 40%	NA/Not sure= 0% Not concerned at all= 20% Slightly concerned= 40% Concerned= 28% Very concerned= 48%
Relative maintenance of local ecological knowledge between generations	Almost all is lost= 0% Partly lost= 30% Maintained= 50% Well-maintained= 20%	Nearly all is lost= 16% Partly lost= 44% Maintained= 24% Well-maintained= 16%

<b>Social mobility</b>	<b>Bitouville</b>	<b>Melkhoutfontein</b>
The main occupation of the father	NA/Not sure= 0% Fisher= 10% Farmer= 70% Builder/bricklayer= 0% Railway worker= 0% Policemen= 10% Cook= 10%	NA/Not sure= 4% Fisher= 80% Farmer= 8% Builder/Bricklayer= 4% Railway worker= 4% Butcher= 4% Maintenance= 4% Harbour management= 4% Teacher= 4% Gardening= 4%
The main occupation of the mother	NA/Not sure= 0% Domestic worker= 20% Housewife= 10% Chef= 50% Farmer= 10%	NA/Not sure= 8% Domestic worker= 48% Housewife= 24% Chef= 4% Farmer= 4%

	Gardening= 10%	Gardening= 4%
		Nurse= 8%
School attendance of the father	NA/Not sure= 40%	NA/Not sure= 52%
	Grade one to four= 0%	Grade one to four= 12%
	Grade five to seven= 30%	Grade five to seven= 24%
	Grade eight to eleven= 10%	Grade eight to eleven= 8%
	Grade twelve= 10%	Grade twelve= 4%
	Technikon/College/University= 10%	Technikon/College/University= 0%
School attendance of the mother	NA/Not sure= 60%	NA/Not sure= 36%
	Grade one to four= 0%	Grade one to four= 16%
	Grade five to seven= 40%	Grade five to seven= 36%
	Grade eight to eleven= 0%	Grade eight to eleven= 8%
	Grade twelve= 0%	Grade twelve= 4%
	Technikon/College/University= 0%	Technikon/College/University= 0%
Level of financial well-being compared to parents.	Yes= 60%	Yes= 72%
	No= 30%	No= 28%
	Same= 10	

### Social dependence

Attachment to place	Bitouville	Melkhoutfontein
Feeling of belonging	Not at all belong= 0%	Not at all belong=0%
	Slightly belong= 0%	Slightly belong= 4%
	Belong= 40%	Belong= 24%
	Strongly belong= 60%	Strongly belong= 68%
Importance of friendships in the community	Not at all important= 0%	Not at all important= 0%
	Slightly important= 0%	Slightly important= 4%
	Important= 20%	Important= 24%
	Very important= 80%	Very important= 72%
Recreational fishing	Never= 0%	Never= 32%
	Rarely= 40%	Rarely= 28%
	Somewhat often= 0%	Somewhat often= 8%
	Very often= 60%	Very often= 32%

Degree of pride in telling others one is a fisher	NA/Not sure= 0%	NA/Not sure= 12%
	Not at all proud= 10%	Not at all proud= 0%
	Slightly proud= 0%	Slightly proud= 0%
	Proud= 10%	Proud= 12%
	Very proud= 80%	Very proud= 76%
Level of interest in one's children	Not like at all= 10%	Not like at all= 40%
	Not like= 0%	Not like= 28%
	Like= 50%	Like= 28%
	Like very much= 40%	Like very much= 4%

### Economic dependence

<b>Economic dependence on fishing</b>	<b>Bitouville</b>	<b>Melkhoutfontein</b>
Possibility of feeding the family without fishing	Not at all possible= 20%	Not at all possible= 56%
	Slightly possible= 30%	Slightly possible= 12%
	Possible= 50%	Possible= 12%
	Highly possible= 0%	Highly possible= 8%
Perception of whether too many or too few fishers operating in the community	Too few= 50%	Too few= 64%
	Slightly too few= 10%	Slightly too few= 12%
	Slightly too many= 10%	Slightly too many= 4%
	Too many= 10%	Too many= 12%
	Enough= 20%	Enough= 0%
Degree of concern about illegal fishing	Not at all concerned= 20%	Not at all concerned= 12%
	Slightly concerned= 0%	Slightly concerned= 4%
	Concerned= 50%	Concerned= 16%
	Very concerned= 30%	Very concerned= 68%

## Appendix M: Responses Pertaining to the Exposure Category for 2013

Personal exposure	Bitouville	Melkhoutfontein
Perception of safety in current livelihood despite environmental/climatic exposure	Very safe= 20%	Very safe= 0%
	Safe= 30%	Safe= 48%
	Somewhat dangerous= 40%	Somewhat dangerous= 20%
	Slightly safe= 0%	Slightly safe= 0%
	Dangerous= 0%	Dangerous= 12%
	Very dangerous= 10%	Very dangerous= 16%
	Not safe at all= 0%	Not safe at all= 0%
<b>Windstorms</b>		
Occurrence of large storms in the past five years	Yes= 7 (70%)	NA/Not sure= 0%
	No= 3 (30%)	Yes= 10 (40%)
		No= 15 (60%)
Actions that were taken to prevent future considerable storm damage	NA/Not sure= 10 (100%)	NA/Not sure= 24 (96%)
	Yes= 0%	Yes= 0%
	No= 0%	No= 1 (4%)
Actions that were taken to prevent future considerable storm damage	NA/Not sure= 10 (100%)	NA/Not sure= 25 (100%)
	Fixed roof= 0%	Fixed roof= 0%
	Stayed indoor= 0%	Tuned in to local radio and news for updates= 0%

## Appendix N: Responses Pertaining to the Adaptive Capacity Category for 2013

Personal flexibility	Bitouville	Melkhoutfontein
Level of interest in changing employment	NA/Not sure= 0%	NA/Not sure= 0%
	Stay doing what I am doing= 70%	Stay doing what I am doing= 72%
	Change my job= 30%	Change my job= 28%
Perception of finding work in the alternative sector	NA/Not sure= 0%	NA/Not sure= 4%
	Yes= 90%	Yes= 40%
	No= 10%	No= 56%
Number of options for alternative work	NA/Not sure= 0%	NA/Not sure= 0%
	No options= 10%	No options= 36%
	Few options= 50%	Few options= 32%
	Some options= 20%	Some options= 12%
	Many options= 20%	Many options= 20%
Number of courses taken to improve employability	Yes= 20%	Yes= 52%
	No= 80%	No= 48%
Level of interest in working for someone else	NA/Not sure= 10%	NA/Not sure= 16%
	Yes= 60%	Yes= 48%
	No= 30%	No= 36%
Level of habituation to changes everyday life	Not at all used to it= 0%	Not at all used to it= 0%
	Not used to it= 30%	Not used to it= 12%
	Used to it= 50%	Used to it= 68%
	Very used to it= 20%	Very used to it= 20%
Perception of which groups are most at risk of future changes	NA/Not sure= 0%	NA/Not sure= 4%
	More small-scale than big= 0%	More small-scale than big= 16%
	Small-scale fishers only= 0%	Small-scale fishers only= 0%
	More big companies than small= 70%	More big companies than small= 20%
	Big companies only= 30%	Big companies only= 60%
	Depends on what the changes are= 0%	Depends on what the changes are= 0%
Level of financial planning	NA/Not sure= 10%	NA/Not sure= 0%
	No plan at all= 0%	No plan at all= 56%
	Planned a little= 0%	Planned a little= 16%
	Well-planned= 30%	Well-planned 20%

	Very well-planned= 60%	Very well-planned= 8%
Level of interest in learning new skills outside of fishing	Not interested at all= 40%	Not interested at all= 8%
	Slightly interested= 30%	Slightly interested= 28%
	Interested= 10%	Interested= 28%
	Very interested= 20%	Very interested= 36%
Perception of the possibility of personally improving the marine environment	Not at all possible= 40%	Not at all possible= 24%
	Slightly possible= 0%	Slightly possible= 20%
	Possible= 30%	Possible= 36%
	Very possible= 30%	Very possible= 20%
Level of confidence that events will work out well regardless of everything	Not at all confident= 30%	Not at all confident= 8%
	Slightly Confident= 10%	Slightly Confident= 24%
	Confident= 30%	Confident= 44%
	Very Confident= 30%	Very Confident= 20%
Perception of responsibility to protect the marine environment	Not at all responsible= 10%	Not at all responsible= 0%
	Slightly responsible= 0%	Slightly responsible= 0%
	Responsible= 10%	Responsible= 32%
	Very responsible= 80%	Very responsible= 68%
Perception of ability to adapt to change compared to others locally	Not likely at all= 0%	Not likely at all= 4%
	Not likely= 10%	Not likely= 8%
	Likely= 60%	Likely= 28%
	Very likely= 30%	Very likely= 60%
Perception of the utility of own skills to set up a business outside of fishing	Not at all useful= 20%	NA/Not sure= 8%
	Slightly useful= 10%	Not at all useful= 20%
	Useful= 50%	Slightly useful= 4%
	Very useful= 20%	Useful= 48%
		Very useful= 20%