Characteristics of fishers: a case study of Zeekoevlei, Cape Town

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ABSTRACT

Fisheries are complex socio-ecological systems consisting of both human and ecological components. Managing fishery resources has almost always focused on ecological concerns without due consideration being given to the human dimensions. However, increasingly more scholars are recognising the need to integrate the human dimensions of fisheries management with the ecological concerns. Managing a fishery solely on the basis of ecological information will result in the management strategies being unsuccessful. Understanding the human dimensions is important as it provides insights into who participates in the fisheries industry, and what the behavioural patterns and motivations of the fishers are. This study focused on understanding the human dimensions of fishing at Zeekoevlei, focusing on *who* the fishers are and *why* they engage in fishing. It also addressed the source of conflicts at Zeekoevlei. The management of Zeekoevlei and fishing activities is also considered. A mixed methods approach, using a case study design, was adopted. The sample included fourteen fishers and six individuals involved on various levels of management of Zeekoevlei. Data-collection methods included the use of a structured questionnaire and semi-structured interviews. On the basis of this study, the demographics show that two types of fishers were found at Zeekoevlei – recreational and small scale. These fisher groups display contrasting socio-demographic profiles; however, a correlation between socio-demographics and motivations was observed. Recreational fishers appear to be white, educated males who are employed and engage in fishing for a sense of achievement, which is underpinned by the size of the fish. Small-scale fishers, on the other hand, are unemployed coloured males, with low levels of education and to this group of fishers the Zeekoevlei fishery system has an important function as it is used to diversify livelihoods. As with many fisheries, conflicts are prevalent at Zeekoevlei. These conflicts arise between fishers because Zeekoevlei has limited demarcated fishing spots and fishers display ownership over these spots; to exacerbate this situation, Zeekoevlei is located in an open reserve, which makes it easier for fishers to enter the reserve illegally. The management of the vlei appears to be based on recreational considerations with unclear measures to accommodate small-scale fisheries.

PLAGIARISM DECLARATION

This dissertation is my own work. I know that plagiarism is wrong. Plagiarism is to use another's work and pretend that it is one's own. I have used the Harvard convention for citation and referencing. Each contribution to, and quotation in, this dissertation from the work(s) of other people has been attributed and has been cited and referenced. I have not allowed, and will not allow, anyone to copy my work with the intention of passing it off as their own work.

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To my late father, Ivan Meyer, your untimely death at a critical point in my research was a major blow. It also intensified my motivation to continue this journey no matter how hard it was, so that I can make you proud.

I dedicate this thesis to you.

GLOSSARY

Fisher	Any individual who engages in fishing. Fisher is used synonymously with fishermen.
Small-scale fisheries	Fishing to sustain a livelihood and/or for direct consumption. Uses low-technological fishing gear. This group of fishers usually engages in trade, sale or barter of catch. 'Small-scale fisher' is often used interchangeably with artisanal, local, traditional and subsistence fisher.
Recreational fisheries	Fishing for sport and leisure. The purpose is not to derive a livelihood from fishing.
Commercial fisheries	Always harvest fish for profit and engage in the sale or trade of resources caught. In these fisheries large sophisticated and technologically advanced vessels and machinery are used in place of manual labour. 'Commercial fisheries' is often used interchangeably with large-scale fisheries.
Management	The strategies and regulations which are used to achieve objectives. They include procedures such as consultation, decision making, resource allocation, formulation and implementation of such strategies.
Human dimensions	This refers to the social attitudes, processes, knowledge, values and behaviours that fishers possess.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND AND MOTIVATION

Inland fisheries support millions of people by contributing to food security, creating employment, alleviating poverty and providing a safety net to those in need. It is also a form of recreation and leisure activity for many people (Hara & Brackenberg, 2014; McCafferty et al., 2012; Béné et al., 2007; Arlinghaus, 2005). Inland fisheries are growing steadily, particularly in developing countries where they are predominantly used on a small-scale basis. Small-scale fishing is often done for direct consumption on a household level and appears to make a minimal socio-economic contribution to economies. This is because the resource is consumed almost immediately and rarely enters formal markets; hence its importance is often overlooked (Béné et al., 2010). The importance of inland fisheries is also overlooked because it is poorly monitored, and therefore the social, economic and cultural importance of the resource is often undervalued (Grantham & Rudd, 2015; Welcomme et al., 2010).

Globally, the small-scale sector employs 95% of all fishers (directly and indirectly) (Britz et al., 2015), yet they remain the most marginalised and make little or no input to the management of fishery resources. Fish resources have almost always been managed from a biological and ecological perspective with little attention being paid to the human dimensions (Fulton et al., 2011; Ellender et al., 2009; Cadieux, 1980). A fishery is considered a 'human phenomenon' (McGoodwin, 2006) and disregarding the knowledge of local fishers and managing it only on the basis of an ecological, biological and economic understanding can result in management failing, non-compliance and conflicts between fishers and authorities (Granek et al., 2008; McGoodwin, 2006). Miller and Van Maanen's (1979) article entitled 'Boats don't fish, people do' highlights the importance of the human dimension as people use the resource; it therefore becomes impossible to ignore them in the management of the resource (Hall-Arber et al., 2009).

Scholars are recognising that fisheries needs to include both the ecological and the human dimensions, and therefore management should be the bridge between these components (Berkes, 2010). Fishers have always been seen as operating on the periphery of the system and their behaviour almost strictly controlled through management strategies. Fulton and Adelman (2003:4) argue that 'fisheries management is 10% biological resource management and 90% people management.' To ensure that fishery management has a comprehensive understanding of a fishery ecosystem it should therefore include the perspectives of those who use the resource (Hall-Arber et al., 2009). Thus, if a resource is to be conserved and used in a sustainable manner, it is necessary to have not only an understanding of the resource to be conserved, but also of the resource users as they play a key role in conserving the resource (Johannes, 1978).

Hence, there is an urgency to adopt a management and governance approach that is holistic and integrated and which takes into account the ecological as well as the human dimensions of fishery systems (Fulton et al., 2011). Human dimensions research should be incorporated from the start into managing any natural resource (Kaplan & McCay, 2004. This will increase the capacity for managers to make improved decisions that will not be negatively perceived by fishers (Enck & Decker, 1997).

The paucity of such information is a global issue and in South Africa. Inland fisheries in South Africa also play a significant role in many poor communities and households as they are often a sustainable and accessible source of food and livelihood, and an economic safety net (Ellender et al., 2009). It is also a very well established recreational sport for many. Inland fisheries in South Africa mirror international experience as management of fish resources has almost always been based on a focus on the biological and ecological component (Britz, 2015; Britz et al., 2015; Ellender et al., 2009) and not informed by an understanding of the human dimensions (Ellender et al., 2009; Cadieux, 1980). As more people enter fisheries the user dynamics change, and it therefore becomes important to understand *who* are the resource users and *why* do they engage in fishing. This information is what managers need to use to design their strategies (Arlinghaus & Mehner, 2004; Ellender et al., 2009).

This study contributes to human dimensions literature on inland fisheries in South Africa by specifically documenting the socio-demographics of fishers and their motivations to fish, the conflicts between users and the management strategies used to manage Zeekoevlei.

1.2 Objectives of the study

This study aims to understand the human dimensions of fishing at Zeekoevlei. The study is particularly interested in understanding who the resource users are, what their motivations are, conflicts between users and what the management approach is to fishing at the vlei. To address this objective, four research questions are posed.

1.2.1 Research questions

- Research question 1: What is the socio-demographic profile of the fishers' at Zeekoevlei? This question identifies 'who' the resource users are.
- Research question 2: What are fishers' motivations for fishing at Zeekoevlei? This question identifies 'why' people fish at Zeekoevlei.
- Research question 3: What is the source of conflicts at Zeekoevlei? This question addresses the issue of conflict at Zeekoevlei.
- Research question 4: How is fishing managed at Zeekoevlei? This question addresses the management approach adopted at Zeekoevlei.

1.3 Study area

Zeekoevlei is one of the largest vlei's in the Western Cape, spanning 290 hectares. The vlei is part of the False Bay Ecology Park (FBEP), which covers a total area of approximately 1,200 hectares of land on the southern edge of Cape Town (City of Cape Town, 2011). The FBEP includes the Zeekoevlei Nature Reserve, the Rondevlei Nature Reserve, the Cape Flats Waste Water Treatment Works (CFWWTW) and its associated Strandfontein Birding Section, the Coastal Park Landfill site and a section of coastal strip. The vlei is surrounded by 700 hectares of wetland and low-, middle- and high-income urban residential areas such as Grassy Park, Pelican Park, Retreat and Zeekoevlei. The racial makeup of these residents are

predominately coloured.[1] In 2000 Zeekoevlei was proclaimed part of Zeekoevlei Nature Reserve, which is managed and owned by the City of Cape Town. Much of the boundary of Zeekoevlei is open access and shared with private home owners (City of Cape Town, 2011).

FIGURE 1: AERIAL VIEW OF ZEEKOEVLEI WITH A CLOSE-UP OF THE DATA COLLECTION SITE

SOURCE: GOOGLE MAPS (2016**)**

Figure 1 depicts an aerial view of Zeekoevlei, with a close-up image of Eastern Shore, which is the data collection site. Eastern Shore is a 2 km stretch of land bordering the vlei. It is a multi-purpose open space and serves predominantly as a recreational site containing picnic facilities, ablution facilities and fishing spaces. Zeekoevlei is also popular for its water sports. More than twenty-three registered clubs use Zeekoevlei for various water sports such as angling, sailing, rowing and skiing (Tapela et al., 2015). Fishing is widely practised at Zeekoevlei and the fish species consist only of alien species such as carp *(Cyprinus Carpio),*

[1] Other racial categories in South Africa that reference will be made to in this study, include white, Black, Indian/Asian. In this study it is necessary to refer to these racial groups as it assists in answering research question one. A 'coloured' is an individual who is of mixed ancestry (Bantu, Khoisan, Asian and European). 'Whites' are individuals who are of European decent. 'Blacks' are descendant of indigenous people from Africa. 'Indians/Asian' are South Africans who are of Indian decent. Indian is often used interchangeably with Asian,

branded tilapia (*Tilapia sparramanii*), and Mozambique tilapia (*Oreochromismossambicus*) (personal communication from reserve supervisor).

1.4 STRUCTURE OF THESIS

The thesis is divided into five chapters. Chapter One provides a brief overview of the background, motivation, research questions and the study area. Chapter Two presents the literature review and outlines the theoretical basis for the study. Chapter Three discusses the research methodology, data collection and analysis. Chapter Four presents the research findings and a discussion of them. Chapter Five concludes the study and suggests directions for future research.

1.5 SUMMARY

This chapter introduced the background and motivation for the study. Fisheries are complex socio-ecological systems comprised of both human and ecological components. A consideration of both these components will result in improved management. This study therefore focuses on the human dimensions of fishing at Zeekoevlei. This chapter also introduced the research questions, study area and structure of the thesis.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

The purpose of this chapter is to provide an overview of the literature in terms of which the research questions will be addressed. This literature review provides a global overview of inland fisheries and makes reference to marine fisheries where applicable. It then scales the issues down to the South African situation. This chapter commences by providing a brief overview of the types of fishing and the sectors involved. It then delves into the question of inland fisheries to discuss their importance and their management approaches. Next the chapter explores inland fisheries in South Africa; it provides a history of the development of inland fisheries, their management and the importance and contributions of inland fisheries in South Africa. It further shows that in order to understand a fishery holistically and for management to be successful, it needs to include the human dimensions.

2.2 MARINE AND INLAND FISHING

There are two distinct ecosystems where fishing can take place – marine (saltwater) and inland (freshwater). Marine fisheries occur in oceans and seas, which cover 71% of the Earth's surface. Inland fisheries occur in lakes, rivers, wetlands, reservoirs, swamps and floodplains and this water sources cover a total area of 7.8 million km^2. These two ecosystems provide a rich environment for food, income, livelihoods and leisure (De Graaf et al., 2015). However, the fish resources in these ecosystems are in crisis as many of the stocks have declined or become degraded and are overexploited (Welcomme et al., 2010; Mahon et al., 2008). Population growth, overfishing, destructive and illegal fishing practices and an increased demand for the resource have contributed to this deteriorating situation (Young et al., 2016).

In marine and inland fisheries, the fish resources can be harvested through aquaculture or capture fisheries (wild fisheries). Capture fisheries are sites where aquatic resources are

extracted from the coastline, or natural or constructed water bodies containing fresh or brackish water. The fish resources also occur naturally in these habitats or have spent most of their life cycle there (Grantham & Rudd, 2015) as opposed to aquaculture, which is the intentional farming of aquatic species in constructed hatcheries or water bodies under controlled conditions (Youn et al., 2014). Aquaculture has increased significantly since the 1980s and it is often used to mitigate the declines in fish stocks and can assist in supplying additional food (Youn et al., 2014; Welcomme et al., 2010). While aquaculture is beneficial in terms of providing a source of food and increasing stocks, the reality is that it is often difficult for the poor to engage in aquaculture as it requires capital, access to land and water, and many fishers often do not have access to such resources (Allison, 2011; Sheriff et al., 2008). In that regard capture fisheries are more easily accessible to the poor.

Fisheries are commonly divided into three subsectors, namely recreational, commercial and small-scale fisheries. These categories are very broad, as they are often country or context specific and there often tends to be an overlap of categories. Carvalho and Edward-Jones (2011) suggest that the terms 'artisanal', 'traditional', 'subsistence' and 'small-scale' are often used interchangeably. Similarly, 'commercial' is often used synonymously with 'large-scale' and 'industrial' fisheries. These sectors vary significantly from each other in terms of size, gear used, employment, participation and economic contribution (Isaacs, 2012).

Recreational fisheries are typically associated with engaging in fishing for 'leisure', 'fun' and 'sport,' where the aim is not to meet primary survival needs through trade, sale or bartering of catch. There are instances, however, where they trade, sell or barter their catch to offset fishing expenses. Some recreational fishers do consume part of their catch to supplement their diet, but they are not dependent on fishing to survive (Arlinghaus & Cooke, 2009). This is in contrast to commercial and small-scale fishers, where the primary aim is to sustain a livelihood, albeit on different scales.

Commercial fisheries are profit orientated and use modern technologies, which include large vessels and are often a substitute for manual labour. The landings are large and require specialised catch preservation and distribution. This is in contrast to small-scale fisheries, which use small fishing vessels with relatively low-technology equipment, or no

vessels at all. It is therefore a more labour-intensive approach as the productivity and landings are usually lower. The resources are directed mainly at local consumption and selling, or trading on informal markets. However, many small-scale fisheries are becoming economically efficient by producing high-value products for international markets. This is a result of technological advancements. Many commercial fisheries often try to remain classified as small scale, as there are generally fewer restrictions on small-scale fisheries (FAO, 2005). Small-scale fishers often have limited, if any, input in decision making and have to a large extent been marginalised and overlooked in favour of commercial fisheries and recreational fisheries (FAO, 2005; Berkes et al., 2001).

Recreational fisheries have high participation rates; it is estimated that there are approximately 140 million recreational fishers (marine and inland) in North America, Europe and Oceania alone. Giving an accurate global figure of participation in recreational fishing is difficult, because fishing data are often not captured and the lack of accurate statistics is common. It is, however, estimated that between 220 million to 700 million people globally engage in recreational fishing (Cooke et al., 2016; World Bank, 2012) with an economic contribution of approximately $190 billion annually. The expenditure on fishing-related items, tourism-related expenditures and licensing in some countries makes a greater economic contribution than commercial fisheries do. This is indicative of the fact that this sector has the potential to make a significant contribution economically and socially.

The importance of the small-scale sector is at the micro level, within communities and households. The benefits are more tangible in terms of income, food security and livelihood functions (Béné, 2006). Small-scale fisheries play a significant role (pre- and post-harvest) in the lives of nearly 200 million people and therefore should not be underestimated (De Graaf et al., 2015; Welcomme et al., 2010; Andrew et al., 2007). In addition, small-scale fisheries should not only be seen an activity that has economic benefits, but as a way of life because for many it has social and cultural benefits (Sharma, 2011). It is commonly believed that small-scale fisheries make a minimal contribution to a country's gross domestic product (GDP) compared to other agricultural sectors (Béné et al., 2007). However, Barnes-Mauthea et al. (2013) assert that we should avoid this perception, because the economics of small-scale fisheries are poorly quantified and therefore appears as if it makes a minimal

contribution to the GDP. This is a plausible explanation as to why it is habitually overlooked at policy level and priority is often given to other sectors. However, in Small Island Developing States (SIDS) small-scale fisheries make a substantial contribution to their GDP.

Despite the importance of small-scale fisheries, it is only in the past two decades that they have been granted the recognition and appreciation due to them (Li, 2015; Béné & Heck, 2005; Berkes et al., 2001; MacGoodwin, 2001; Andrew et al., 2000). But their benefits have not yet been sufficiently investigated (Li, 2015; Andrew et al., 2000). This study therefore makes a contribution in this regard.

The economic benefits of commercial fisheries are accrued through labour as they employ 120 million full-time and part-time workers globally (World Bank, 2012). However, commercial fisheries have been at the forefront of research investigations, hence the limited attention to the small-scale fisheries sector. The lack of accurate and reliable information on this sector has resulted in decision makers not realising its potential and the mechanisms through which it can contribute to local development (Béné, 2006).

2.3 INLAND FISHERIES

2.3.1 GLOBAL INLAND FISH PRODUCTION

Ninety percent of all freshwater fish is caught in developing countries on a small-scale basis. In 2010 11.6 million tonnes of fish was harvested globally (Grantham & Rudd, 2015) and it is widely acknowledged that this figure is likely to be much higher as underreporting and inaccurate reporting are widespread, particularly on a small-scale basis as fish is consumed almost immediately and traded on informal markets (De Graaf et al., 2015; Grantham & Rudd, 2015; Welcomme et al., 2010). This has major implications for policy, one being undervaluing the social and economic importance of the resource; hence it is often not recognised in national policy both globally and in South Africa (Grantham & Rudd, 2015; Britz et al., 2015; Ellender et al., 2009).

Figure 2 shows the global inland fisheries production by region from 1950 to 2010. It shows that inland capture fisheries are found predominantly in Asia and Africa. Between 1950 and

2010 global fish production increased significantly, with some fluctuations. However, the catch data for North America, South America, Europe, Oceania and the former Union of Soviet Socialist Republics (USSR) are remarkably less than for Asia and Africa. This is indicative that the growth of inland fisheries production is particularly large in developing countries. Youn et al. (2014) state that this could be a reflection of increased dependence on the resource, or a result of improved reporting (FAO, 2012). Asia and Africa have also shown an increase in culture-based fisheries, and this can explain why these two continents show a marked increase in fisheries production (Surugan et al., 2007).

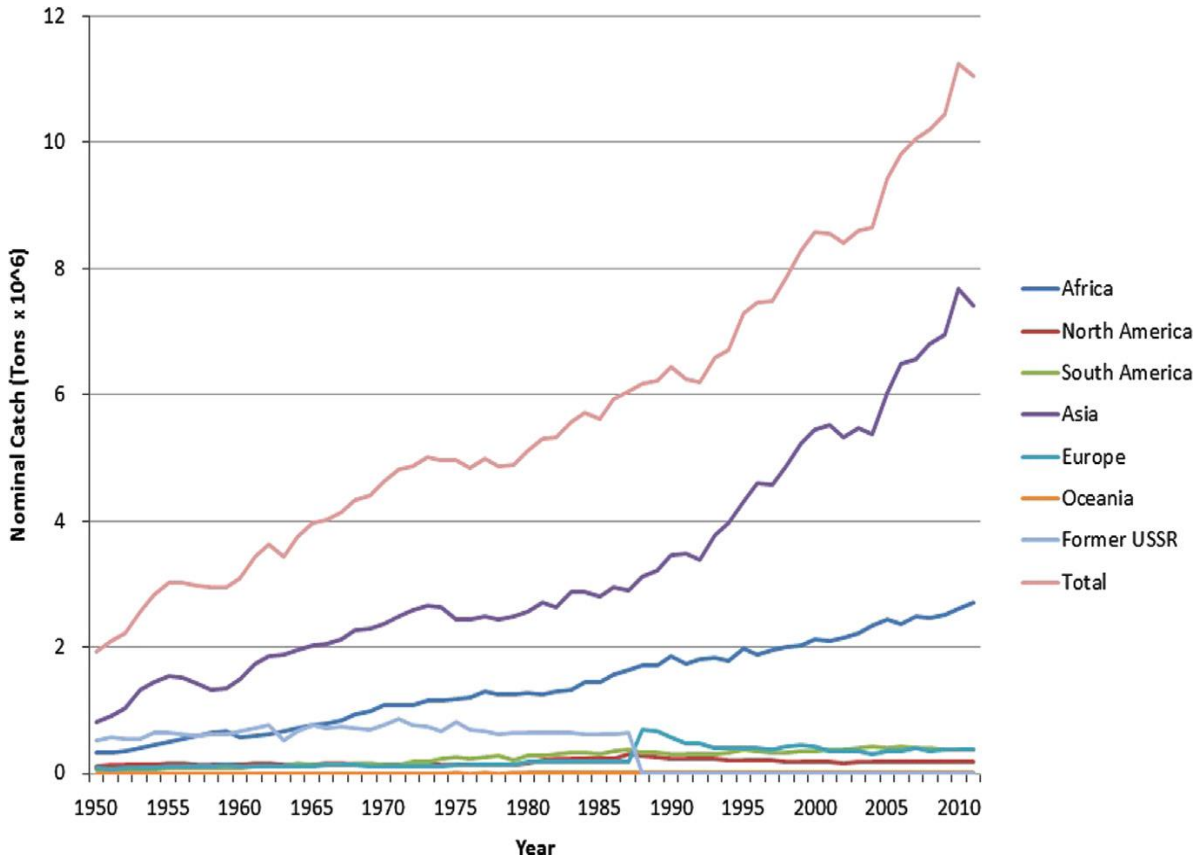

FIGURE 2: GLOBAL INLAND FISHERIES PRODUCTION FROM 1950-2010

SOURCE: YOUN ET AL., 2014

2.3.2 INLAND COMMERCIAL FISHERIES

Commercial fisheries in developing countries are declining and recreational fisheries are increasing as national economies are changing (Raby et al., 2011; FAO, 2010; Allan et al.,

2005; Arlinghaus & Mehner, 2004; Cooke & Cowx, 2004). Although recreational fishing is more prominent in developed countries, it is also growing rapidly in South America and Asia, often outweighing the socio-economic contribution from commercial fisheries (FAO, 2010).

2.3.3 INLAND RECREATIONAL FISHERIES

Similar to the marine recreational sector, the inland recreational fishing sector is highly organised with high participation rates. In the European Union there are an estimated 25 million recreational fishers with expenditure (direct and indirect) exceeding US$8 billion (Cowx, 2015). Recreational fishing generates income through the sale of national fishing licences and secondary income through the purchase of fishing equipment, bait, accommodation and travel, boat rental and other services. However, the past 20 years have seen a reduction in the number of fishing licenses sold as a result of the greater diversity of leisure activities or dilution of interest in fishing (Cowx, 2015).

The socio-demographic characteristics of fishers are a useful indicator for participation in recreational fishing. Characteristics such as being male, full-time working status, higher monthly income increase the probability of participating in recreational fishing (Cooke et al., 2016). While socio-demographics are a good indicator of who the resource users are, understanding what motivates or drives people to engage in fishing is important. Recreational fishers are, however, not motivated to sustain a livelihood nor are they dependent on the resource. Taking into account the socio-demographics of recreational fishers, particularly the fact that they tend to be employed, explains why fishing is not used as a primary means to sustain a livelihood among them.

The experience sought by recreational fishers can be categorised into two: activity specific and activity general. Activity specific experiences are those sought by performing the activity itself; they include elements such as the need to catch a specific species, size of fish, number of fish, pulling strength of fish. Activity general experiences refer to the satisfactions that can be achieved from being outdoors and not merely by engaging in fishing. These include relaxation, sharing the experience with friends, experiencing natural surroundings, escapism and pleasure (Kyle et al., 2007; Arlinghaus, 2006; Fedler & Ditton, 1994).

Recreational fishing is a multifaceted experience and fishers seek multiple benefits, mainly relating to being in nature. Research shows that recreational fishers are predominantly motivated by activity general elements, although this does vary amongst fishers (Frijlink & Lyle, 2010; Kyle et al., 2007; Ditton & Sutton, 2004).

2.3.4 INLAND SMALL-SCALE FISHERIES

Globally small-scale fisheries are the dominant inland fishing subsector. This mirrors international trends in terms of the benefits being tangible in terms of income, food security and livelihood functions for the poor (Béné, 2006), which serve as their key motivations for engaging in fisheries. In the developing countries fish is a cheap and accessible source of food for poor households where other sources of protein are too expensive. It is often the main and only supply of animal protein (Youn et al., 2014).

Information on consumption and supply patterns are limited and are in most cases based on estimates. It is therefore difficult to give exact figures because inland fisheries are predominantly managed on a household basis and the fish is consumed almost immediately and rarely enters the formal markets; therefore the process does not get recorded. The consumption patterns of many fishing communities are changing because there is a strong economic need for informal fish trading, which provides opportunities to sell, trade or barter fish; this alone cannot ensure food security but can provide fisher communities with a regular meal (Kurien, 2004).

Fisheries can be seen as the 'bank in the water' from which people 'withdraw' fish to sell or barter their catch when other economic opportunities are limited (Béné & Friend, 2011; Mindjimba et al., 2003; Allison & Ellis, 2001). The employment created by small-scale fisheries may not provide decent living conditions for these people; however, fishing and related activities contribute to the livelihoods of a very significant number of households in developing countries. Small-scale fishing is not always a full-time occupation, but forms part of a range of activities and provides a matrix for livelihood strategies developed by individuals and households when other economic opportunities do not bring in sufficient income or are impeded; hence it can provide an economic safety net (Jul Larsen et al., 2003; McKenney & Tola, 2002).

These livelihood strategies are often not accounted for in statistics, and hence its importance goes undervalued. However, these strategies cannot be captured quantitatively as this will not reflect the intricacy of these strategies. It can only be done by engagement with resource users, to understand why and how they are implemented and should serve as the basis for management.

2.4 MANAGEMENT OF INLAND FISHERIES

Most inland fisheries throughout the world are managed and controlled by a centralised authority, with a top-down science-based approach where fishery authorities make decisions that are informed by ecological and biological considerations. They regulate and control fishing through the use of various management strategies such as access control and catch regulations including bag limit and minimum size limit (Welcomme, 2010).

Inland fisheries management in developing and developed countries often has contrasting objectives (Welcomme, 2010; Cowx, 2002). In developed countries the focus is almost exclusively on conservation and the recreational use of the resource as opposed to developing countries, where the focus is more on achieving food security and for income generation (Cowx et al., 2010; Welcomme, 2010). In developing countries big international non-governmental organisations (BINGOs) often employ a top-down approach that imposes Western conservation objectives. From a conservation and ecological point of view the intentions might be good; however, in doing this they often do not consider the needs, values and motivations of fisher communities (Young et al., 2016). However, with the increase in globalisation, developing countries are placing an ever-increasing emphasis on resource conservation (Cowx et al., 2010; Welcomme, 2010; Cowx, 2002). Governments are faced with having to achieve multiple objectives such as biodiversity conservation, creating employment, contributing to the rural economy, managing urbanisation and ensuring a water supply, which are often given a higher priority than inland fisheries (Welcomme, 2010; Andrew et al., 2007). This is often because there is limited information and a poor knowledge base to appreciate the social, economic and cultural importance of inland fisheries, particularly for poor communities.

In developing countries small-scale fisheries are often seen as an 'open-access' resources (Bailey & Jentoft, 1990). In reality this is rarely the case as most of the time there is some form of management regime at local or community level (Welcomme, 2010). Many inland fisheries, most notably in Africa, are managed through traditional systems which have developed within local communities based on traditional and indigenous knowledge. For example, in Malawi fisheries are controlled by a community-based management, where the community comes together to manage the resource. This form of co-management is successful as it is participatory and consultative (Neiland et al., 2000).

As inland fishing becomes increasingly important, so does the need for better fisheries management, which includes addressing the human dimensions. Scholars have called for the implementation of an approach to management that is participatory, consultative, encourages engagement with fishers and allows them to have a voice. Resource users will not support a management initiative if it is not considered 'legitimate' and consistent with their worldviews, values and practices. This is likely to result in poor compliance with regulations as well as in conflicts, frustration and marginalisation of fishers (Heyman & Granados-Dieseldorffb, 2012; Sowman, 2011; McConney & Chalse, 2009; Berkes et al., 2001). Poor compliance with regulation and conflicts between fishers and the authorities are rife in many fisheries. Conflicts are ubiquitous and may surface at various levels from local, provincial or national.

'Conflicts arise when the many dynamic interactions among natural resources, humans and institutions clash because of the underlying differences in priorities pursued by different fisheries players' (Murshed-e-Jahana et al.,2009:113). To alleviate and avoid conflicts it is therefore important to consult and involve fishers prior to implementing measures and in this way they are likely to support the measure. Conflicts should, however, not be seen only in a negative light, because it can act as a catalyst for positive change which creates an opportunity for management to engage with resource users. This is related to the issue of addressing the human dimensions, as Arlinghaus (2005) states that conflict is in fact a human dimension issue that manifests in fisheries if fisher's do not support management measures. Increasing research is being done on conflicts and natural resources, but not much of this research focuses on conflicts and fisheries (Wilson, 2003; Bennet et al., 2001).

2.5 INLAND FISHERIES IN SOUTH AFRICA

In South Africa inland fisheries are predominately used by recreational fishers with increasingly more small-scale fishers using inland water bodies. Inland fisheries in South Africa mirror international trends as it provides a social welfare, food security and economic safety net in many rural areas; it increases the resilience of local communities to deal with unemployment and lack of other economic opportunities as fishers are offered an opportunity to diversify their livelihood (Weyl et al., 2007; Andrew et al., 2000). Despite the importance of inland fisheries, it is still marginalised as it does not enjoy national and provincial support as marine fisheries do. Inland fisheries do not have a dedicated national policy, despite the fact that South Africa has more than 4,703 dams and vast freshwater water bodies which support a growing number of small-scale and recreational fisheries (Britz et al., 2015). The lack of a coherent policy leads to a major bottleneck and impediment for the potential and sustainable development of inland fisheries.

2.5.1 HISTORY AND DEVELOPMENT OF INLAND FISHERIES IN SOUTH AFRICA

The introduction of inland fisheries in South Africa dates back to the 17th century when British colonialist introduced non-native carp (*Cyprinus Carpio*), for ornamental purposes. The official introduction of carp took place in 1896 when the species was imported from England into the Jonkershoek hatchery in Stellenbosch (Britz et al., 2015; McCafferty et al., 2012). Thereafter, carp was distributed to many farm dams across South Africa in the 1900s. Other non-native species such as Florida bass *(Micropterus floridanus),* largemouth bass *(Micropterus salmoides),* smallmouth bass *(Micropterus dolomieu)* and spotted bass *(Micropterus punctulatus)* were also introduced specifically for recreational fishing. In the 1920s legislation was promulgated to stop the introduction of non-native fish species because of the negative impact this was having on South Africa's indigenous species by introducing parasites and altering habitats (Britz et al., 2015). Before the 1940s the focus of research was primarily on analysing the suitability of stocking non-native species in inland water bodies for recreational fishing (McCafferty et al., 2012).

During the 1960s and 1970s dams were constructed in South Africa predominantly to supply water and hydro-electrical power to urban areas (McCafferty et al., 2012). Fishing in these dams therefore occurred as a secondary activity and the dominant focus during this time was to examine the production potential and commercialising fisheries on the dams. Commercial fishery projects were established, but many failed because of the low market value for freshwater fish in South Africa and the low productivity of the dams (Britz et al., 2015; McCafferty et al., 2012). Consequently, much of the research in the 1960s and 1970s focused on the production potential of inland fisheries. The 1960s and 1970s also saw radical changes to the South African inland fisheries arena as increasingly more concerns were raised about the negative impact that non-native species were having on indigenous species from a biodiversity perspective. Hence, the conservation department at that time shifted its mandate to eliminating the non-native species that they had once promoted towards now conserving indigenous species. Consequently, state-owned hatcheries were privatised, closed and some were even converted to stocking indigenous fish species only (Britz et al., 2015; Marr et al., 2012).

By the 1970s and 1980s the role of inland fisheries as a source of food received attention as part of the apartheid homeland development polices (Van de Berg et al., 1975). Some subsistence-level projects were proposed with various degrees of success. From the 1990s to the present the focus has been on achieving food security, alleviating poverty and rural development in a sustainable manner (Britz et al., 2015; Seti, 2002; Andrew et al., 2000). To this day governance, resource allocation, policy development, qualifying and quantifying participation is receiving increasingly greater attention.

This section has shown that ecological concerns have been the dominant focus of research in this field (Ellender et al., 2009), although even so it was rather scattered. The studies were specifically focused on determining the biological sustainability of harvesting fish in dams by specifically documenting the impact that non-native species have on indigenous species (Britz et al., 2015; Richardson et al., 2009). Hence, the recent shift of focus from ecological and biological concerns to the socio-economic and livelihood benefits of inland fisheries for rural development and sustaining the poor (Britz et al., 2015; McCafferty et al., 2012).

2.6 MANAGING INLAND FISHERIES IN SOUTH AFRICA

The use of all freshwater resources in South Africa is governed by the National Water Act (Act 36 of 1998). The resources contained within any water body fall under the jurisdiction of provincial environmental departments, which manage them in terms of the National Environmental Management Act (Act 107 of 1998) (NEMA) and the National Environmental Management and Biodiversity Act (Act 10 of 2004) (NEM:BA).

Each province also has its own provincial legislation to ensure biodiversity conservation and environmental management, which are guided by NEMA and NEM:BA. NEM:BA provides a framework that categorises non-native species according to the risk that they pose to biological diversity. NEMA provides guiding principles on the management of environmental resources, which needs to be based on sustainability, co-operative governance and equitable allocation of resources. Thus, management is largely at the core of biodiversity conservation and mainly falls under the mandate of provincial environmental management agencies (Britz et al., 2015; Weyl et al., 2007).

The Western Cape Nature Conservation Laws Amendment Act (Act 3 of 2000) (WCNCLA) regulates the use of fish in inland waters in the Western Cape. Section 57 (b) prohibits the 'sale, buying, or transporting any live carp'. This is similar to the Mpumalanga Nature Conservation Act (Act 10 of 1999) (MNCA) and the Limpopo Environmental Management Act (Act 7 of 2003) (LEMA), which explicitly state that no person may catch fish other than by angling and catch-and-release. None of these provincial Acts makes reference to fishing for livelihoods. It is thus safe to argue that provisions are made for recreational fishers and provincial legislation does not legislate to harness the socio-economic and livelihood benefits of inland fisheries.

When these livelihoods are not recognised and managers of water bodies do not acknowledge the activities of these fishers, the result is likely to be misunderstanding, conflict and disregard of management's initiatives as well as a loss of potential development. In line with international trends, Britz et al. (2015) argue that conflicts between fisher groups and fishery managers are widespread in South Africa. However, the nature and the root cause of these conflicts are poorly understood and documented (Britz

et al., 2015; Weyl, 2010; Weyl et al., 2007). Thus, there is a knowledge gap that highlights the need for a more comprehensive understanding of conflicts between fishers and management; this research makes a contribution in this regard.

In order to manage the day-to-day fishing activities on water bodies, some of the management strategies used include the use of a recreational fishing permit, daily bag limits, minimum size and methods of harvesting as stipulated by provincial legislation. The daily bag limit and minimum size are determined by local authorities. These provisions, however, are applicable to recreational fishers and do not take into account those who fish other than for leisure and sport. In accordance with provincial legislation, local management authorities need to enforce these provisions. Thus, to ensure that the full benefits of inland fisheries are harnessed, the management strategies need to be revised to become inclusive of those who fish to sustain a livelihood.

2.7 INLAND FISHERIES SECTORS

Inland fisheries in South Africa does not have a dedicated inland fisheries policy and therefore there are no concrete definitions to use. It therefore allows one to draw on the definitions from the Marine Living Resource Act (Act 18 of 1998) (MLRA) and the Marine Small-scale Fishing Policy of 2012. The MLRA governs aquatic marine resources and is guided by the principles of sustainability and equity. The MLRA recognises commercial and recreational fishers and not small-scale fishers; thus small-scale marine fishers have also been marginalised and overlooked in favour of recreational and commercial fisheries. To address these injustices and imbalances with regard to small-scale fishers, the Marine Small-scale Fishing Policy was promulgated in 2012. Similar to the international fisheries sector inland fisheries can also be categorised into commercial, recreational and small-scale. But it is necessary to point out that these categories cannot always be neatly demarcated; these are the broad categories used in the South African context, but there might also be overlaps.

2.7.1 COMMERCIAL FISHERIES

Commercial fisheries are operated by individuals who have been granted a predetermined yield and their operations are profit orientated (Weyl et al., 2007). The MLRA defines commercial fishing as fishing for species which have been predetermined in terms of allowable catch (MLRA, Act 18 of 1998).

Inland commercial fisheries in South Africa are underdeveloped. This is the result of the perceived low market demand for freshwater fish, no dedicated inland fisheries policy and vague fisheries management objectives (Weyl et al., 2007). There have been attempts to commercialise inland fisheries in South Africa, for example, on the Kalkfontein, Bloefhom and Darlington dams, but they have been largely unsuccessful (McCafferty et al., 2012). This is because of the perceived low value of freshwater fish, lack of a dedicated inland policy and a cultural resistance to freshwater fish (Britz et al., 2015; Andrew et al., 2000). Currently there are a limited number of commercial fisheries in operation on the Gariep, Bloemhof and Moletedi Dams. The main reason why commercial inland fisheries are poorly developed is most likely economic as the price of freshwater fish is relatively low (R6.00 - R10.00 per kilogram) and there is no formal marketing system, which makes the enterprise not economically viable (McCafferty et al., 2012). The marine commercial sector yields approximately 600,000 tons per year, in comparison to the major dams, from which the estimated yield is only 15,000 tons per year.

2.7.2 RECREATIONAL FISHERIES

For recreational fishers, ‘the resource is used exclusively for recreation by anglers using hook and line. Users are neither dependent on the resource for survival, nor for economic gain’ (Weyl et al., 2007:499). The MLRA defines recreational fishing as fishing for sport and leisure. The definition by Weyl and others (2007) does not stipulate whether the fisher is allowed to remove his catch; however, section 20(1) of the MLRA stipulates that ‘no person shall sell, barter or trade any fish caught through recreational fishing’. Similar to the defining characteristics of international recreational fishers, in South Africa recreational fishers do not depend on fishing to sustain their livelihood.

In South Africa inland water bodies are predominantly used by recreational fishers (Ellender et al., 2009; Weyl et al., 2007). They contribute significantly to the regional economy through the utilisation of tourist-related services and through the expenditure on fishing-related equipment. Recreational fishing is divided into two categories, formal and informal. Informal recreational fishers include those who do not belong to a fishing society or group. Formal fishers belong to a club and usually participate in competitions. It is estimated that there are approximately 1.5 million freshwater recreational fishers in South Africa with a fraction linked to clubs and associations, as only 15,000 recreational fishers are registered with recreational fishing societies and clubs (Britz et al., 2015).

The economic impact of recreational fisheries for inland and marine fisheries is astounding and in the some instance has a larger economic impact than commercial fisheries (Leibold & Van Zyl, 2008). The economic and social benefits received from recreational fishing are substantial. However, because of the lack of information and knowledge of such benefits, they often go unvalued. Leibold and Van Zyl (2008) studied the economic benefits for marine and freshwater recreational fisheries and estimated that a formal freshwater recreational fisher spends approximately R7, 500 per year on fishing equipment and activities. Collectively the total economic contribution is approximately R900 million per annum, making a significant economic contribution to South Africa's GDP and local economies (Leibold & Van Zyl, 2008). Recreational fishing is thus a well organised subsector with institutional support from government, which allows it to contribute towards the economy. This subsector is predominantly used by recreational fishers, but since the mid-1990s an increasing number of fishers have been using the resource for livelihood purposes (Britz et al., 2015; Ellender et al., 2009; Weyl et al., 2007; Van De Waal, 2000).

2.7.3 SMALL-SCALE FISHERIES

According to the Marine Small-Scale Fishing Policy, small-scale fishers are defined as:

> persons that fish to meet basic livelihood needs or are directly involved in harvesting/processing or marketing of fish, traditionally operate on near-shore fishing grounds, predominantly employ traditional low technology or passive fishing gear, usually undertake single day fishing trips and are

> engaged in sale or barter or are involved in commercial activity (DAFF, 2012:7).

Fishing for livelihoods is not a new phenomenon, but the emergence of small-scale fishing on dams is fairly new associated in the post-apartheid period. Hence, it is only since the demise of apartheid that small-scale fishing has been receiving attention as a way of achieving food security, poverty alleviation and enhancing economic rural development (Britz, 2015; McCafferty et al., 2012; Weyl et al., 2007). In post-apartheid South Africa inland small-scale fishing is not legally recognised, although some water-management authorities even allow for informal small-scale fishing. This has resulted in more people entering fisheries. Without a guiding mandate that ensures sustainable and equitable access and utilisation of the resource, many fishers who engage in small-scale fishing are criminalised and are often considered 'poachers'. This is in contrast to the marine sector, as subsistence fishers in coastal communities have been formally recognised with the promulgation of the Marine Small-scale Fishing Policy of 2012 (Sowman, 2006).

While small-scale fishing on inland water bodies is not the dominant use in South Africa, evidence suggests that increasingly more people are relying on small-scale fishing to diversify their livelihood. As more users are entering fisheries, user dynamics change as people with different socio-economic backgrounds, values, perceptions and motivations enter the arena. The user dynamics, however, have not been well documented in South Africa (Ellender et al., 2009; Andrew et al., 2000). Ellender et al. (2009) were the first team to document the human dimensions of fisheries at the Gariep dam. They focused on the characteristics of the user groups and their primary motivations for engaging in fishing. The findings show that 61% of the fishers were fishing for livelihoods and lived in close proximity to the dam. They further showed that there are two types of fishers fishing on the Gariep dam – recreational and subsistence. This is consistent with international practice as recreational fishers engage in fishing for leisure and subsistence to sustain a livelihood.

The study revealed that socio-demographic characteristics are consistent with these users; recreational fishers tend to be White males who are employed, reside further from the dam as opposed to subsistence fishers, who are Coloured and Black males, unemployed and who live close to the dam. Prior to this no study had assessed the social dynamics at any large

dam in South Africa (Ellender et al., 2009; Andrew et al., 2000). Ellender et al. (2010) argue that on the Gariep dam there are approximately 450 regular fishers who engage in fishing for a livelihood. Rouhani (2003) observed that on the Ntenetyana dam in the Eastern Cape there are approximately 30 small-scale fishers, who live in close proximity to the dam. This also suggests that a fishery can have important livelihood functions, particularly to people living in close proximity to the source. Given that small-scale fisheries are largely unmonitored, these statistics could be an underestimate of their utilisation.

It is thus evident that there is a lack of research on the human dimensions of inland fisheries, which constrains the development of effective management strategies. This is not unique to South Africa, however, as it mirrors international practice (Ellender et al., 2009; Arlinghaus & Mehner, 2004). Hence, this lack of information shows that there is a need for qualitative studies that documents human dimensions of inland fisheries. Understanding the socio-demographics and motivations of the resource users affects the extent to which the resource is harvested and used, and allows for improved management (Arlinghaus & Mehner, 2004). In this regard, in addition to the ecological information, understanding the human dimensions of fisheries is useful.

2.8 HUMAN DIMENSIONS IN FISHERIES

Studying the human dimensions aims to understand and describe those who participate in fisheries as well as the behavioural patterns and perceptions of the fishers. It also seeks to evaluate management actions and how resource users perceive management policies and rules. Weber (2014:88) suggests that the human dimensions

> are the aspects of resource management and decision-making that involve value judgments, especially around: how and why people value resources, the benefits people seek and derive from them, and how people affect and are affected by resources and their management.

There has been a pressing need to incorporate the human dimensions into the management of fishery resources (Hunt et al., 2013) as managing a fishery only on the basis of biological, economic and ecological considerations and ignoring the knowledge of the local fishers is likely to result in failure (Granek et al., 2008; Arlinghaus, 2006). In theory, incorporating the

human dimensions into the management of fish resources is ideal, but in practice the vast majority of fisheries have been managed with little, if any, consideration of the human dimensions of the fishers lives. Despite the importance of the human dimensions in fishery resource management, consideration of these dimensions in the fisheries management process is fairly recent, taking root only over the past 25 years. Research has focused primarily on the ecological and biological considerations of fish stocks and aquatic ecosystems (Arlinghaus, 2006).

Insights into the human dimensions of fisheries will assist in improving aquatic stewardship and encourage commitment to protect and conserve natural resources (Hunt et al., 2013; Arlinghaus, 2006; Kaplan & McCay, 2004). As Hara (1999:12) eloquently puts it, 'no management scheme will work unless it enjoys the support of those whose behaviour it is intended to affect.' Therefore, it is imperative to incorporate the human dimensions into management of fisheries to understand whether users will support the measures to be implemented, or if they are considered legitimate in the eyes of the resource users (Hauck et al., 2002). Thus, the fishers' perceptions, apprehensions and needs have to be taken into account and be understood. Such understanding is necessary as conservation of fish resources is closely linked to fishers' actions and perceptions. Given that the human and the ecological dimensions are so important to the overall success of any fishery, this study is informed by complex socio-ecological systems thinking.

2.9 FISHERIES AS COMPLEX SOCIO-ECOLOGICAL SYSTEMS

If any fishery is to be successful, it should be informed by a consideration of the ecological and human dimensions; this research consequently sees fisheries as complex socio-ecological systems (CSES). Taking a complex social-ecological systems approach means that a natural system should be seen as a whole that consists of multiple components that are linked (Cooke et al., 2016; Hunt et al., 2013; Berkes, 2003). Chalse (2001) asserts that a fishery system essentially has three components: a human system, a natural system and a fishery management system (see Figure 3).

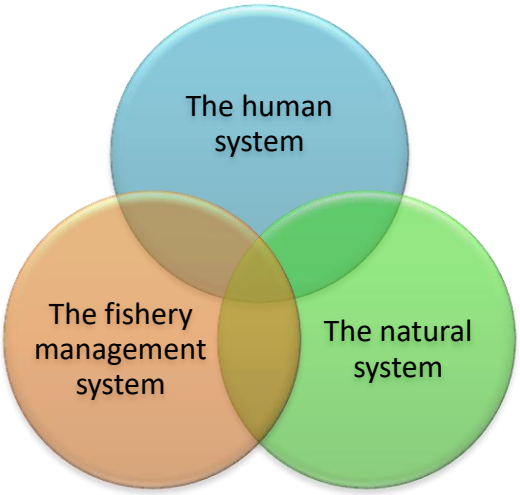

FIGURE 3: THE THREE COMPONENTS OF A FISHERY SYSTEM

SOURCE: CHARLSE, 2001

These three components are interrelated and interconnected, and to ensure that fishery is sustainable, it needs to be seen as a tripartite whole. The importance of incorporating the human system into fishery management is well recognised; however, in practice this is rarely done, as many fishery managers still focus exclusively on the natural system to inform their decision making (Young et al., 2016). This relates well to the point made by Cooke et al. (2016:455), who state that fishery managers should refrain 'from breaking the system into pieces and studying them in isolation.' When decisions are based on only one component (ecological) then conflicts, poor compliance and unsustainable fisheries emerge.

Conventional management approaches have failed to recognise and integrate other disciplines and forms of knowledge to ensure that a more holistic approach is adopted for fisheries management. Fisheries science has viewed people as being on the periphery of the system; hence the social sciences were often not included in decision making and deemed not necessary. Management of fisheries therefore has to span across disciplines to create a holistic approach. Hence the need for collaboration between the natural and the social sciences (Cooke et al., 2016; Hunt et al., 2013). Fishery management has a strong Western bias, which is adopted from first world countries and this has implications for the management of fisheries in developing countries. This is because in first world and third world countries fishers have different socioeconomic characteristics, resource needs and livelihood issues. The human dimensions therefore make an important contribution as they

allow for an understanding of these socio-economic and resource needs as well as livelihoods. In addition, because complex socio-ecological systems span across multiple scales, they cannot be captured using a single perspective (Berkes, 2003) as it is virtually impossible for any one party to possess the full suite of knowledge to manage resources. Many ecosystems are far too complex to be managed successfully by a single agency and therefore require the joint action of multiple parties involved (Berkes, 2009). In this case fishers are involved as resource users and should therefore be consulted. In addition, complex socio-ecological systems are constantly changing, this relates well to fisheries as new users enter fisheries, so the dynamics within it change. Therefore, information cannot be static and should accommodate for the changes within the system.

2.10 SUMMARY

The purpose of this chapter was to present the relevant literature. It has shown that inland fisheries are becoming an increasingly important way of diversifying livelihoods; they are an accessible source of food and employment, as well as acting as an economic safety net and can thus contribute to poverty alleviation. It has shown that inland fisheries are predominantly used by recreational and small-scale fishers. Small-scale fishers are engaging in fishing mainly to sustain livelihoods and ensure food security; therefore, the benefits are seen in a more tangible way as opposed to recreational fishing, which is done for leisure enjoyment, and recreational fishers make a substantial socio-economic contribution to the national economies of countries. While inland fisheries are increasingly playing a major role in the lives of the disadvantage poor, they still remain poorly documented and unmonitored. Despite their importance, many small-scale fishers are still marginalised in favour of recreational and commercial fisheries. Fisheries are complex socio-ecological systems that need to be managed holistically, inclusive of the natural and the human components.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

Research methodology focuses on ways to produce and analyse data, as well as on the processes, tools and procedures used in a study (Babbie & Mouton, 2001). There are essentially three research paradigms: the traditional quantitative and qualitative research paradigms and the more contemporary mixed-method paradigm, which is the approach adopted for this study.

This chapter discusses the methodological framing of the study to address the research questions. It discusses the sampling methods adopted for the study and the data-analysis process. It further discusses the challenges encountered in this research and the ethical considerations of this study.

3.2 QUANTITATIVE AND QUALITATIVE RESEARCH

Quantitative research is associated with the positivist school of thought. It is a formal, objective and deductive approach to problem solving. It uses methods such as surveys, questionnaires, statistical analysis, experiments, structured observation and content analysis. It emphasises the quantification of constructs which the researcher believes is the best means of measuring a particular phenomenon (Babbie & Mouton, 2001). This approach shows the differences between certain objects of analysis in numerical form. It answers simple questions, such as 'How many of them are there?' where 'them' refers to any object that can be assigned a numerical value (Landman, 2000).

Qualitative research is associated with the constructivist or interpretivist school of thought. It uses data-gathering methods such as open-ended interviews and direct observation of participants in a particular setting and the use of written documents. Here the researcher studies the phenomenon from an insider perspective and the aim is to develop an in-depth

understanding of the subject being researched (Babbie & Mouton, 2001; Landman, 2000). Qualitative approaches have the advantage of showing detail, nuance and context, which cannot be achieved with the quantitative paradigm alone.

Both approaches view their paradigms as the ideal research approach and implicitly advocate for the 'incompatibility theses' (Howe, 1988 cited in Johnson & Onwuegbuzie, 2004:14), which posits that the quantitative and qualitative approaches and their associated research methods 'cannot and should not be mixed' (Johnson & Onwuegbuzie, 2004:14). However, contemporary research is becoming increasingly complex and to understand this requires that research spans across multiple disciplines. Researchers therefore need to complement one method with the other. It is also important for researchers to understand multiple methods to facilitate communication and promote collaboration. Contemporary scholars have thus shifted from the quantitative versus qualitative debate, as there are compelling reasons for using both quantitative and qualitative research methods. Given this, there has thus been a shift away from an either/or approach towards a mixed-method research (MMR) approach based on pragmatism (Johnson & Onwuegbuzie, 2004).

3.3 MIXED-METHOD RESEARCH

From a philosophical perspective, MMR is the 'third research movement' (Tashakkori & Teddlie, 2010:804), which moves beyond the quantitative/qualitative paradigm debate by offering a coherent and practical alternative (Johnson & Onwuegbuzie, 2004). This alternative approach has its roots in the social and behavioural or human sciences, with researchers believing that both quantitative and qualitative viewpoints are useful (Hall, 2012). Patton (2002:14) points out that,

> because qualitative and quantitative methods involve different strengths and weaknesses, they constitute alternative, but not mutually exclusive, strategies for research [and that therefore] …Both qualitative and quantitative data can be collected in the same study.

In addition, Tashakkori and Teddlie (2010:803-804) state that the MMR community has:

> gone through a relatively rapid growth spurt…it has acquired a formal methodology that did not exist before and is subscribed to by an emerging community of practitioners and methodologists across the disciplines. In the process of developing a distinct identity, as compared with other major research communities of researchers in the social and human sciences, mixed methods has been adopted as the de facto third alternative, or 'third methodological movement.'

The *Journal of Mixed Methods Research* (2006 cited in Tashakkori & Creswell, 2007:4) defines MMR as 'research in which the investigator collects, analyses, mixes, and draws inferences from both quantitative and qualitative data in a single study or a program of inquiry'. Cresswell and Plano Clark (2007:5) provide a more inclusive definition of MMR as:

> a research design with philosophical assumptions as well as methods of inquiry. As a methodology, it involves philosophical assumptions that guide the direction of the collection and analysis of data and the mixture of qualitative and quantitative data in a single study or series of studies. Its central premise is that the use of quantitative and qualitative approaches in combination provides a better understanding of research problems than either approach alone.

MMR is becoming increasingly popular as a methodological choice for many academics and researchers across a number of disciplines (Cameron, 2011) as it allows them to draw from design components that best answer the research question (Johnson & Onwuegbuzie, 2004). It legitimises the use of multiple methods rather than restricting researchers (Johnson & Onwuegbuzie, 2004). The aim is thus not to replace either research method, but to draw from the strengths of both approaches. Johnson and Onwuegbuzie (2004) argue that the researcher needs to ascertain when a particular approach is most helpful and how different approaches should be mixed. It is therefore not that one approach is preferred over the other, but that the approach is underpinned by the research problem and question, and by what can provide the most suitable data-collection methods.

This study follows an MMR approach drawing on both quantitative and qualitative data-collection methods. The quantitative data will be obtained from administering questionnaires to participants and qualitative data will be obtained through semi-structured interviews.

3.4 CASE STUDY DESIGN

The study adopts a case study approach with Zeekoevlei being the empirical case of inquiry. Case studies investigate a particular issue in a real-life setting and provide an 'in-depth, multi-faceted understanding of a complex issue in its real-life context' (Crowe et al., 2011:1). A case study design also allows for multiple methods to be used. Crowe et al. (2011:9) state that:

> in order to develop a thorough understanding of the case, the case study approach usually involves the collection of multiple sources of evidence, using a range of quantitative (e.g. questionnaires, audits and analysis of routinely collected healthcare data) and more commonly qualitative techniques (e.g. interviews, focus groups and observations).

Using multiple methods has the potential to increase the validity of the study and provides for a more comprehensive and holistic account of the phenomenon under investigation (Crowe et al., 2011). See section 1.3 for an overview of the study area.

3.5 SCOPING VISIT 2015

Between March and April 2015 three vlei's in Cape Town were visited: Zeekoevlei, Rondevlei and Princess Vlei. This was done to evaluate the fishing activity at each vlei and to identify a suitable site and case for investigation. Zeekoevlei appeared to have a higher level of fishing activity.

3.5.1 PILOT STUDY

A pilot study is a 'small-scale versions(s), or trial run(s), done in preparation for the major study' (Polit et al., 2001:467). It is particularly useful as it can identify whether the main research project would fail and if the proposed methods are suitable to answer the research questions. Increasingly more scholars are advocating for the use of pilot studies. De Vaus (1993) argues that researchers should 'not take the risk. Pilot test first' (De Vaus, 1993:54).

A pilot study with eight fishers was conducted in January 2016. The aim was to test the preliminary questionnaire and interview schedule. This process resulted in some of the questions being revised and amended. The pilot study also provided a platform to build relationships with fishers and gain their trust. This relates to stages one and two of the fieldwork process (see Figure 4).

The pilot provided a sense of what to expect in the actual fieldwork. The pilot study started by approaching two fishers who called some of the other fishers closer. This was an awkward experience as the fishers were quite hostile and thought that the study was the reserve management's initiative. One fisher assisted by calming the other fishers and explained to them the purpose of the research visit. This was an uncomfortable experience as it was not anticipated that a group of eight men would all raise their voices and speak at the same time. Eventually, however, they calmed down and became willing to participate. This process required constant reassurance that the research and researcher were in no way affiliated to the City of Cape Town or the reserve management.

3.6 SAMPLING

A critical aspect in research is 'what' or 'who' to observe (Marshall, 1996). Purposive sampling was adopted in this study, it is also termed judgment sampling. It is the 'deliberate choice of a participant due to the qualities they possess' (Tongco, 2007:147). The researcher plays an important role in identifying people who are willing to provide information to answer the research questions based on their experiences or knowledge. The sample consisted of two types of participants, fishers and reserve management. Fishers are those individuals who visit the vlei to engage in fishing activities. These individuals were only approached when they were in the process of fishing. The fishers sample included fourteen fishers. The management sample consisted of six participants who were directly involved in the management of Zeekoevlei. It was considered appropriate to interview these stakeholders because they are responsible for the management of the vlei and are able to

provide an alternative viewpoint to that of the fishers. The management sample consisted of participants employed in various capacities.

The total sample composition consisted of 20 participants of whom 14 were fishers and 6 were management stakeholders. The sample size was deemed appropriate as it allowed for a more in-depth investigation.

TABLE 1: SAMPLE DISTRIBUTION OF FISHERS AND MANAGEMENT

Type of participant	Number of participants
Fishers	14
Management	6
Total sample	**20**

TABLE 2: MANAGEMENT SAMPLE DISTRIBUTION BY OCCUPATION

Position	Number of participants
Junior rangers	2
Reserve supervisor	1
Project supervisor	1
Area manager	1
Visitor control officer	1
Total management	**6**

3.7 DATA COLLECTION

Data collection is the process of collecting and gathering information using various tools and methods. Two data-collection methods were used in this study: a structured questionnaire and semi-structured interview schedules. This relates to stage three of the fieldwork process (see Figure 4).

3.7.1 STRUCTURED QUESTIONNAIRE

The structured questionnaire[2] was administered to fishers *to identify the socio-demographic profile of fishers at Zeekoevlei* (research question 1). Questionnaires were used to collect and record quantitative information about a particular issue. They did not allow participants

[2]See Appendix A for questionnaire administered to fishers.

to give their opinion, but rather asked them to select one of the predefined responses which the researcher drafted. The themes explored in the questionnaire included background and demographics, livelihood and food security, fishing expenditure and management.

3.7.2 SEMI-STRUCTURED INTERVIEWS

Semi-structured interviews were conducted with both fishers and management. They were used to investigate the *motivations to fish at Zeekoevlei* (research question 2), *identify the conflicts at Zeekoevlei* (research question 3) and ascertain the *management approach to fishing at the vlei* (research question 4). The researcher designed three interview schedules, one for fishers[3], one for the area manager, reserve and project supervisor[4], and one for rangers and the visitor control officer[5].

Semi-structured interviews allow for a conversational tone which allows participants to be comfortable about expressing their views. They also allow for additional issues to be raised and explored. Interviews were conducted individually and lasted between 30 to 60 minutes. All interviews were audio recorded and transcribed verbatim to ensure accurate capturing of information. The audio recordings amounted to 560 minutes in total.

3.7.2.1 SEMI-STRUCTURED INTERVIEWS WITH FISHERS

Interviews were conducted weekdays (10:00 – 15:00) and weekends (11:00 – 15:00) between February 2016 and April 2016. The interviews with fishers were limited to the Eastern Shore of the vlei. The Eastern Shore was selected as it was the site with the most fishing activity. The pilot study was beneficial as it revealed the time and site where fishing activity was at a peak. Twelve interviews were conducted on site while participants were waiting for a bite on their line. Two interviews were conducted at the houses of the fishers because of changes in the weather and the time constraints of the participant.

[3] See Appendix B for interview schedule for fishers

[4] See Appendix C for interview schedule for the area manager, project supervisor and reserve supervisor

[5] See Appendix D for interview schedule for rangers and visitor control officer

3.7.2.2 SEMI-STRUCTURED INTERVIEWS WITH MANAGEMENT

The interview schedules were designed based on their position and the suitability of answering questions concerning the basis of their daily job activity and responsibility to the vlei and reserve. The rangers at the vlei are outsourced by the City of Cape Town to an external security company. Access to rangers had to be negotiated with the company.

3.8 DATA MANAGEMENT AND ANALYSIS

3.8.1 TRANSCRIBING THE INTERVIEWS

The interview recordings were transcribed verbatim using Microsoft Word. A unique ID was assigned to each transcript. The transcription process took 20 days to complete and 360 minutes per transcript. This was a useful and iterative process allowing the researcher to become familiar with the data. This relates to stage 4 of the fieldwork process (see Figure 4).

3.8.2 STORING QUANTITATIVE DATA

The numerical data on the questionnaire were captured in Microsoft Excel against the participants unique IDs and required variables.

3.8.3 CODING

Coding is an important component in analysis and is the first step towards a thorough and meticulous analysis and interpretation of the data (Saldana, 2009; Dey, 1993). It is an 'all-encompassing activity that continues throughout the life of the project' (Basit, 2003:145). It is the method that allows you to segregate and organise similar coded data into categories because they display the same characteristics (Gläser & Grit, 2013; Saldana, 2009; Basit, 2003; Dey, 1993).

A code is a short phrase, word or paragraph that encapsulates the essence of a text. It involves a careful reading of transcribed data, line by line, and dividing data into meaningful analysis segments (Saldana, 2009; Basit, 2003). This does not merely entail assigning a label

to a datum, but it is also a method of linking data. It is a time-consuming process as the data are often recoded numerous times. This helps with refining the data and allows for deeper reflection (Saldana, 2009). This study adopted three stages of coding.

3.8.3.1 Stage 1: Manual coding

The first-level coding consisted of manually coding five transcripts. This incorporated both pre-set and emergent codes. Five pre-set codes emerged from the interview schedule, while the emergent (open) codes emerged from the data. This process was undertaken to familiarise the researcher with the data. To ensure validity and reliability of the codes, a fellow researcher with no prior knowledge of the study was asked to independently code the same five transcripts.

3.8.3.2 Stage 2: Coding in Nvivo

The second coding stage used Nvivo software. Nvivo is a data management and analysis package. It allows one to electronically upload, store and individually code and analyse the data transcripts (NVivo qualitative data analysis Software, 2014).The 20 transcripts were uploaded and stored. The pre-set and emergent codes that emerged from the five manually coded transcripts were inserted into Nvivo. This formed the pre-set codes for Nvivo. Emergent or open coding was also used as it emerged from the remaining transcripts. This second level of coding took five days to complete. It resulted in 23 parent codes and 54 child codes.

3.8.3.3 Stage 3: Merging the codes in Nvivo

Stage-three coding involved merging and collapsing codes which were similar or related into parent or child codes. This resulted in 6 parent codes and 40 child codes. This process is supported by Abbort (2004:215), who states that rearranging codes is like ‘decorating a room; you try it, step back, move a few things, step back again, try a serious reorganization, and so on’. The third level of coding was used as the foundation for interpretation and analysis.

Thematic analysis was used to identify, interpret and reach conclusions in the data. 'A theme captures something important about the data in relation to the research question and represents some level of patterned response or meaning within the data set' (Braun & Clarke, 2006:82). Thematic analysis assists the researcher to move from their analysis based on a broad reading of the data towards discovering nuance, deeper meanings in patterns and/or 'themes' within the data. It is a way of getting close to the data and developing an appreciation of the deeper meaning of the content. This relates to stages 5 and 6 of the fieldwork process (see Figure 4).

3.9 CHALLENGES AND LIMITATIONS

3.9.1 LANGUAGE

The primary language of the fishers was Afrikaans, with English being the primary language of the researcher. This was challenging for both parties and required a lot of patience. The researcher, however, made every effort to speak in Afrikaans to make sure the participant felt at ease.

3.9.2 CHANGING WEATHER PATTERNS

Fishing activity is highly dependent on good weather conditions. The changes in weather patterns often affected the data collection and resulted in days being spent at the vlei without a single interview being conducted.

3.9.3 KOI HERPES VIRUS

The Koi herpes virus (fish kill) proved to have a major impact on data collection. Data collection was initially scheduled for December 2015. The first fish kill outbreak, however, occurred in December 2015 and resulted in fieldwork being postponed to February and March 2016. In March 2016 the second fish kill situation occurred at the peak of data collection resulting in a reduced sample. There was a significant decline in fishing activity during and after this period, compared to the scoping visit.

3.10 ETHICAL CONSIDERATIONS

Ethics refers to the norms and standards which should guide acceptable and unacceptable behaviour of the researcher. Ethical clearance for this study was obtained from the University of Cape Town[6] and the City of Cape Town[7]. The study did not pose any threat to the integrity, emotional or physical capacity of participants. The study adhered to the basic principles of ethical research which are outlined below.

3.10.1 CONSENT AND VOLUNTARY PARTICIPATION

All participants were approached and provided with information on the objectives of the study. They were informed that their participation was voluntary without duress and no reward would be offered and they had the right to withdraw at any point. They were also required to sign a consent form[8] and provide written permission to participate in the study and to be audio recorded.

3.10.2 ANONYMITY

Participants were informed that their anonymity and identity would be respected. Pseudonyms were assigned to each fisher. Pseudonyms were assigned at the stage of audio filing, transcription and coding of data. The use of pseudonyms means that no statement can be traced to a particular participant. There was, however, one participant who requested that his real name is used. As the management sample is relatively small and individuals could be traced by their occupation, the term 'management official' or 'reserve management' will be used to reference a quote or comment.

[6] See Appendix E for ethical clearance from the Faculty of Science.

[7] See Appendix F for landowner's permission from the City of Cape Town.

[8] See Appendix G for consent form for all participants.

3.11 SUMMARY

This chapter introduced the research methodology used in the study by showing how the various paradigms in research have evolved and how mixed methods are suitable to answer the research questions posed in this study. The study thus used a questionnaire (for quantitative data collection) and semi-structured interviews (for qualitative date collection) as data-collections tools to answer the research questions. It further noted that purposive sampling was used and the sample included 20 participants, of whom 14 were fishers and 6 were in management. The fieldwork process was discussed as well as the data-analysis process. It also considered the limitations and challenges encountered during the study and the relevant ethical considerations.

CHAPTER 4

FINDINGS AND DISCUSSION

4. 1 INTRODUCTION

This chapter is divided into four sections. The first section outlines the socio-demographic profile for fishers surveyed at Zeekoevlei. These data were obtained through the use of a structured questionnaire. The second section provides an in-depth analysis which looks at the motivations for fishing. The third presents the source of the conflicts experienced by the fishers at Zeekoevlei, and the final section addresses the management strategies used for managing fishing at Zeekoevlei. These data were obtained through the use of semi-structured interviews. Findings are discussed in relation to the literature and insights obtained throughout the study.

4.2 SOCIO-DEMOGRAPHIC PROFILE AND TYPOLOGY OF FISHERS AT ZEEKOEVLEI

This section answers research question one, which was to identify the socio-demographic profile of the fishers at Zeekoevlei. Where possible, comparisons are made between the various fishing groups at Zeekoevlei. Socio-demographic variables significantly influence the type of fisher one is and the motivation to fish. These variables include income, occupation, employment status, marital status, age, race, gender, level of education and place of residence (Hall & Dornan, 1990). The insights from this section are valuable for the more detailed analysis in the following sections of the chapter. Two types of fishers were identified at Zeekoevlei: recreational and small scale (see Figure 6).

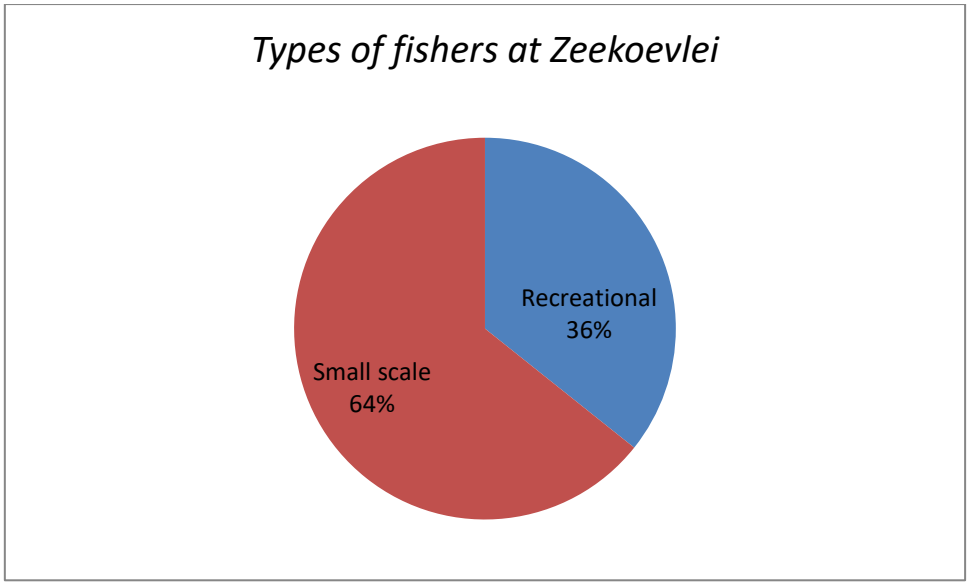

FIGURE 4: THE TWO TYPES OF FISHERS WHO FISH AT ZEEKOEVLEI

Recreational fishers are those who fish for leisure and do not engage in fishing as a primary means of sustaining a livelihood (Arlinghaus, 2005). They have formal employment, tend to fish less often and do not derive a livelihood from fishing (MLRA, 1998). Small-scale fishers engage in fishing on a part-time or full-time basis and include 'persons that fish to meet basic livelihood needs or are directly involved in harvesting/processing or marketing of fish, traditionally operate on near-shore fishing grounds, predominantly employ traditional low technology or passive fishing gear, usually undertake single day fishing trips and are engaged in sale or barter or are involved in commercial activity' (DAFF, 2012:7). This section will show that these definitions from the MLRA and the Small-Scale Fishing Policy 2012 are applicable to this inland fishery context, and are consistent with the findings.

4.2.1 GENDER, RACE AND AGE

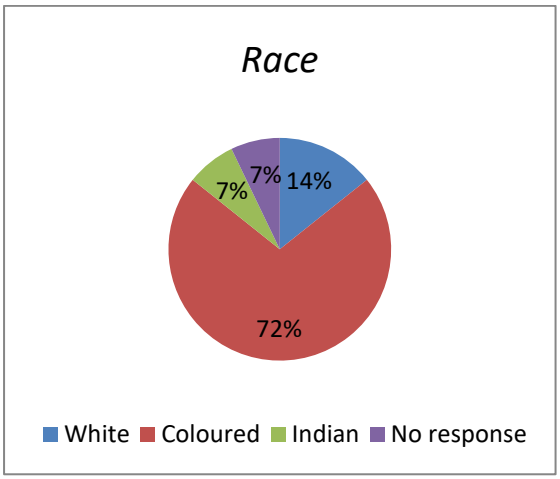

FIGURE 6: RACIAL COMPOSITION OF FISHERS AT ZEEKOEVLEI

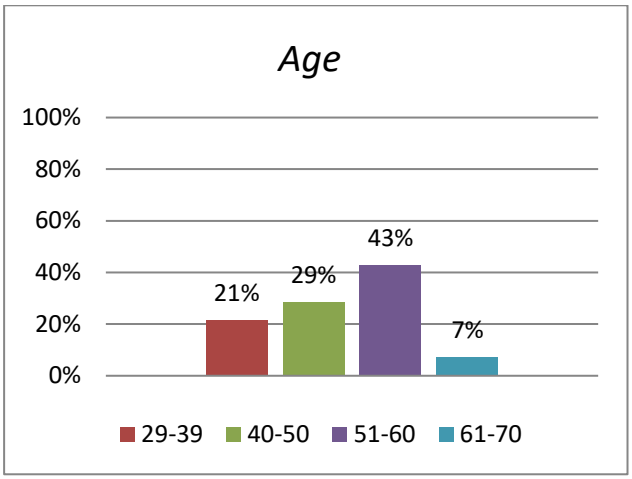

FIGURE 5: AGE CATEGORIES OF FISHERS AT ZEEKOEVLEI

All fishers were male across a diverse racial spectrum. The racial profile was, however, predominantly Coloured (72%), followed by White (14%) and Indian (7%). One fisher chose not to declare his race (7%). A correlation between type of fisher and race was observed, with recreational fishers being predominantly White and small scale fishers being Coloured. The fishers are also a relatively mature group in the 51-60 (43%) and 40-50 (29%) age categories, with a smaller group in the 29-39 (21%) and 61-70 (7%) age categories. No participants below the age of 29 participated in the study.

4.2.2 LEVEL OF EDUCATION

Fishers at Zeekoevlei have relatively low levels of education (primary and secondary) with the majority of the small-scale fishers having only secondary (57%), primary (21%) or tertiary (14%) education. A small minority has no formal education (7%). It was also found that those with a tertiary qualification were recreational fishers.

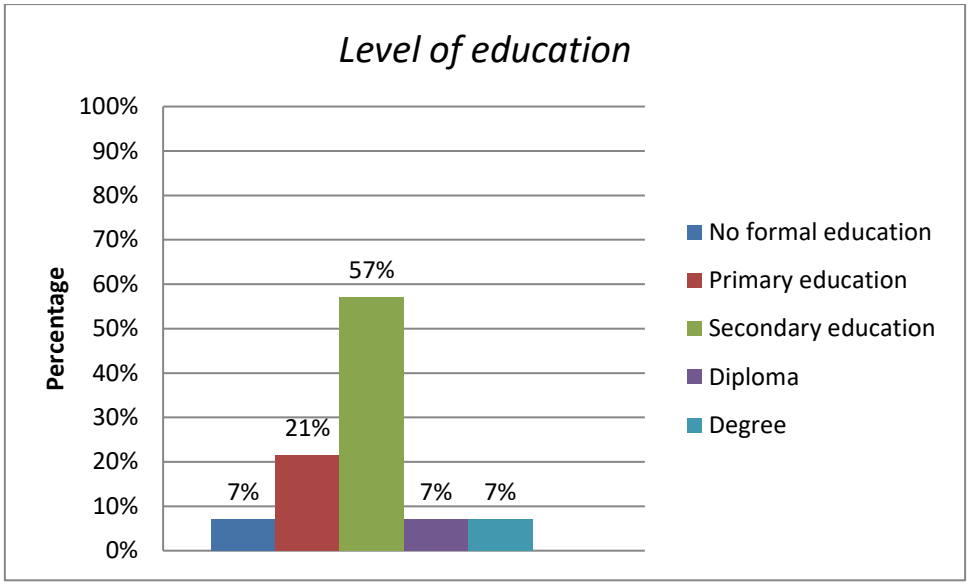

FIGURE 7: THE LEVEL OF EDUCATION OF FISHERS AT ZEEKOEVLEI

4.2.3 EMPLOYMENT STATUS AND MONTHLY HOUSEHOLD INCOME

A large proportion of participants are unemployed (36%) or self-employed (29%), with informal and formal employment having equal numbers (14%)[9] (see Figure 10). Figure 11 depicts the monthly household income of the fishers. It is interesting to note that despite a high unemployment level (36%), 57% of participants have a relatively decent monthly household income in the range of R0-R5000 and 43% with R20 000 and above.

[9] It is necessary to note that there might be an overlap with the employment status categories; i.e. a fisher might be self-employed but could also fall within the informal employment category.

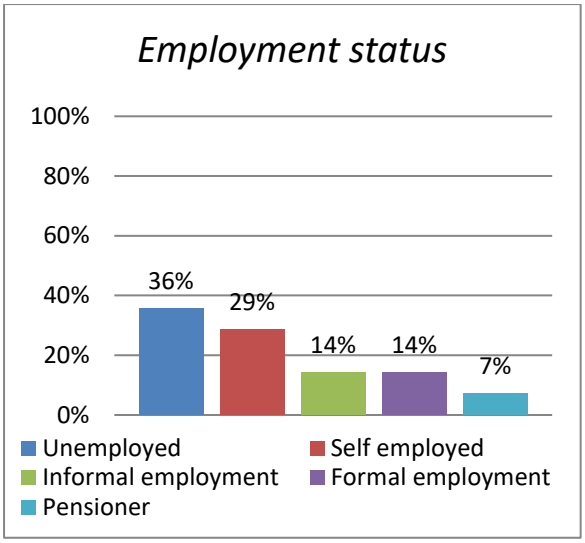

FIGURE 9: EMPLOYMENT STATUS OF FISHERS AT ZEEKOEVLEI

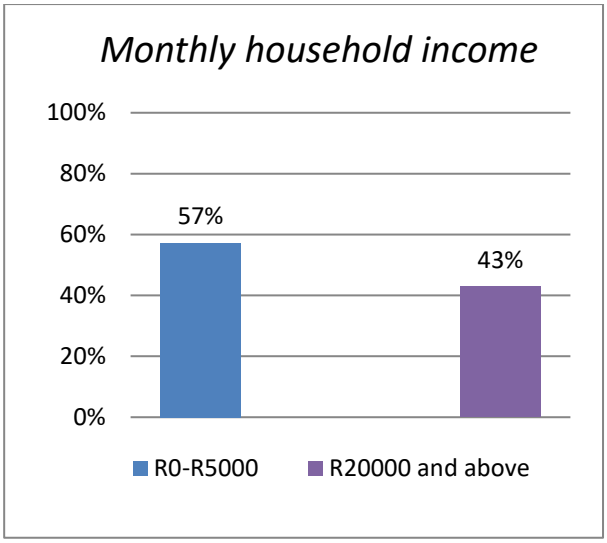

FIGURE 8: MONTHLY HOUSEHOLD INCOME OF FISHERS AT ZEEKOEVLEI

Recreational fishers who are all employed engage in fishing on a monthly basis as opposed to the small-scale fishers who are either unemployed, pensioners or informally employed, who engage in fishing on average five days per week (see Appendix H). Small-scale fishers likely more able to fish more frequently for two possible reasons: first, if one considers that a high percentage of these fishers are unemployed or informally employed, it is likely that they have more time available to engage in this activity; or second, it could also mean that they are prioritising this livelihood. This is in contrast to recreational fishers who are employed; hence there is no need for them to prioritise fishing, because they do not depend on it for a livelihood. This will be further discussed in the sections to follow.

On the basis of this study, the demographics of the fishers show that there appears to be two socio-demographic profiles. The first is recreational fishers: mature White males, employed, with tertiary level education and a relatively high monthly household income. The second profile is small scale fishers: mature Coloured males in the 40-50 age category, unemployed, with relatively low levels of education and low monthly household income. This is consistent with findings by Ellender et al. (2009), who identified two types of fishers at the Gariep Dam: 1) recreational and 2) subsistence. Recreational fishers were predominantly male, White, employed or retirees (60 years or younger); subsistence fishers

were predominantly Coloured males who were unemployed. Ellender et al. (2009) did not include income and education variables.

4.3 FISHERS' MOTIVATIONS

This section addresses research question two, which was to understand why fishers engage in fishing at Zeekoevlei. Understanding what drives a fisher is crucial as this can influence management strategies (Cowx et al., 2010; Arlinghaus, 2005). This section draws on the qualitative semi-structured interviews and reports on the motivations as to why fishers engage in fishing at Zeekoevlei. These motivations are discussed in relation to the two types of fishers at Zeekoevlei.

4.3.1 RECREATIONAL FISHERS

Reserve management was under the impression that there are no longer recreational fishers present at Zeekoevlei. However, the study found that there are indeed recreational fishers at Zeekoevlei. According to reserve management, the fishers who engage in fishing to make 'profits' had harvested all the larger fish, and consequently recreational fishers do not fish at Zeekoevlei.

> we used to have people that used to come fish here for sport, but that doesn't happen anymore because these fishermen [small-scale fishers] have kind of chased them off and they can't get the big carp anymore. So the competitions have stopped (Management official).

It does appear, however, that either management is not aware that 'sport fishing' is in fact recreational fishing, or they could be referring to it in a formal sense where fishers engage in competitions. No fishers were formal recreational fishers, but only informal recreational fishers. The recreational fishers sampled in the study are motivated by factors such as 'leisure,' 'hobby', 'sport' and 'fun'. The aim is to get a good catch and they always catch and release, and not to derive an income from fishing. Peter (recreational fisher) explains his motivation for fishing:

> what we do is catch and release. So we don't take anything from the vlei. But we are here purely to try and get a good catch, good size, anything from 10 kg. If we can pull out that size, basically for our own personal, ja [yes] just for achievement of it, nothing specific role in it, in term of kg what we can pull out to see what the vlei actually holds out there (Peter: recreational fisher).

The recreational fishers in this study are particularly fulfilled by a sense of 'achievement', which is underpinned by the size of the fish. This finding is in contrast to international trends as relaxation, experiencing natural surroundings and being outdoors tend to be much more important to recreational fishermen (Frijlink & Lyle, 2010). Similarly, Young et al. (2016) assert that it is much more common for recreational fishers to be motivated by relaxation and escapism; therefore many reports have concluded that primary motivation is not necessarily activity specific. Thus, recreational fishers place a high value on 'being in nature' and experiencing nature. This is not the primary motivation for fishing amongst recreational fishers at Zeekoevlei.

It did not appear as if recreational fishers are interested in experiencing the wider physical environment and nature at Zeekoevlei, but this can also be explained by the fact that modern societies have become more 'insular, consumer oriented and appear to have less appreciation and understanding of natural processes' and the benefits that nature provides (Young et al., 2016:121). It is therefore imperative that we steer away from the stereotypical view of recreational fishers as placing high importance on the environment and nature, as it clearly is not the case at Zeekoevlei. This also shows that fishers' motivations are diverse and often context specific.

A discrepancy between the type of fisher and the reason for targeting a particular species was observed. The study found that both recreational and small-scale fishers target carp. However, recreational fishers target carp because the fish 'puts up a fight'. This is also consistent with recreational fishers' motivations to engage in fishing, but is in contrast to the motivation of small-scale fishers, who target carp for two different reasons. Firstly, according to them [small-scale fishers], carp is abundant in the vlei and therefore easily catchable, and secondly, carp is in demand by buyers. Considering that recreational fishers

participate in fishing for sport but are also motivated to catch a particular size, it also explains why they target a specific species.

Recreational fishers are said to have their interests closely aligned to those of nature conservationists (Young et al., 2016; Granek et al., 2008). While recreational fishers do not show concern about the fauna around the reserve, they do appear to be concerned about the conservation of the resource, in particular overfishing by small-scale fishers. This is in contrast to the small-scale fishers, who believe that overfishing can never happen at Zeekoevlei. This view could be influenced by the fact that small-scale fishers justify the point that over-fishing cannot occur, as carp is a rapid-breeding and abundant species. It is interesting that small-scale fishers, whose livelihood depends on fishing, are not concerned about the prospect of over-fishing.

Young et al. (2016) suggest that if a fishery is valued by fishers, they are more inclined to protect it. The fact that small-scale fishers do not explicitly show that they want to protect the resource does not imply that they do not value the resource, but likely that they are poorly informed about the risks of over-fishing, or that they are merely desperate and actively seeking to survive. The study reveals that recreational fishers display great interest in the protection of the fish resources and this should be embraced and harnessed. However, further consideration needs to be given to why small-scale fishers have the perception that over-fishing cannot occur at the vlei.

Considering the motivations of recreational fishers in this study, it also shows that the definition of recreational fishers is consistent with the MLRA and is applicable to this fishery context, as fishers do not derive a livelihood from fishing and they do not engage in the sale, trade or bartering of fish caught at Zeekoevlei.

4.3.2 SMALL-SCALE FISHERS

Small-scale fishers at Zeekoevlei engage in fishing for a ‘livelihood’ and ‘survival’. ‘My reason for fishing is for a living, to give something in the house because I don’t work’ (Paul: small-scale fisher). Another fisher states that ‘it is my living, I live by the fish that I catch so that’s

how I make my life, how I earn the money that I live off, by fishing' (Clinton: small-scale fisher).

4.3.2.1 FISHING TO DIVERSIFY LIVELIHOODS

The quantitative data analysis indicated that 36% of participants report being unemployed. Interviews, however, reveal that many do have some form of informal employment or income. The income derived from these sources is not sufficient to sustain a living, therefore they use fishing to diversify their livelihood. Frank succinctly emphasises this:

> *Ek verkoop ma my bierkie daar by die huis om die kinders se skool fees en daai te betaal en oek so dat ons kan eet en leef. En dan kom ek soe hier vis vang om by te add daar waar ek nie my ends kan meet nie. So dit is nou ma daai* (Frank: small-scale fisher).
>
> [I sell a bit of beer at home to pay the children's school fees and things, and so that we can eat and survive. Then I also come here to catch fish to add where I cannot make ends meet. So that's how it is.

Cyril adds:

> *Ons is meeste al by die huis want ons het min werk. Sea bly grof, vlei… as ons nie vlei toe kom nie is daar nie broot vir ons nie* (Cyril: small scale fisher).
>
> [We are at home most of the time because we have little work. The sea stays rough, the vlei, if we do not come to the vlei then there is no bread for us].

The other informal jobs that fishers have include selling pigs at informal settlements, being a security guard and a carpenter. One fisher is also a pensioner. Considering the nature of these jobs and the incomes generated from these sources, it is evident that the fishers are often not well paid and these are also not stable and guaranteed sources of income. For these fishers Zeekoevlei provides a way of diversifying their livelihood as the income derived from other sources is not economically sufficient. For Salie, selling his catch is a means to supplement his monthly state pension as he says 'I won't be able to survive with my pension alone' (Salie: small-scale fisher).

Zeekoevlei is therefore a 'bank in the water' where fishers 'withdraw' fish to diversify their livelihood (Béné & Friend, 2011; Mindjimba et al., 2003; Allison & Ellis, 2001). Although Zeekoevlei serves as a form of informal employment, it is in itself still not a high-end paid job and it is also not a fixed job where you are guaranteed an income. Thus, if on any given day fishers do not have a good catch or cannot sell their fish, they are unable to earn any income and their livelihood will be affected. This is because fisheries is an unpredictable activity that depends on various factors, such as weather conditions and also whether fishers have money to purchase bait, a point which was raised by fishers as they say that if they do not make sufficient income on a particular day, they are unable purchase bait and go fishing the following day. Fishing at Zeekoevlei is therefore not a full-time occupation, but forms part of a range of activities and livelihood strategies developed by individuals when other economic opportunities do not bring in sufficient income or are impeded.

It is thus clear that the small-scale fishers of Zeekoevlei are dependent on fishing as it provides them with a safety net to ensure that they can sustain a basic living and provide for their families. It is mainly used to support or supplement an already minimal income from other informal sources of employment.

4.3.2.2 CARP IS NOT THE NEXT MEAL FOR FISHERS

Small-scale fishers have indicated that they engage in fishing at Zeekoevlei for 'survival,' or for the 'next meal'; however, freshwater fish caught at Zeekoevlei is not the most suitable fish for a fisher's meal. The fish is generally not part of the fishers' diet, with just over half (56%) of small scale fishers stating that they have never been forced to eat the fish. One would expect if they are fishing for survival, they would most likely consume their catch. Fred (small-scale fisher) says: 'No, I'm not going eat this fish...because the bottom of this [vlei] is full of mud and the sewerage is going out into this dam so I won't. I will never eat this'.

This can be explained by the fact that freshwater fish is generally not part of the South African community's tradition and even less so eating it (Britz et al., 2015; McCafferty et al., 2012; Ellender et al., 2009). Andrew and colleagues (2000), however, show that people are

willing to consume freshwater fish as a source of food, if need be. Pollution also plays a role in explaining why fishers are not willing to consume the fish, as many fishers are aware of the amount of pollution in the vlei, as Clinton (small-scale fisher) explains: '… inside the vlei you get old mattresses and chairs and all this old stuff you get'. Frank also describes his experience with pollution in the vlei:

> There was one time I catch a fish, a big one. It was inside of a plastic bag and you can check there somebody, there was wood inside of that plastic bag. They just make a hole there cause of that wire still on top of the, they took the wood out and they just leave that plastic bag. It go in the water and the water go in there and the fish get in there (Frank: small-scale fisher).

The fact that fishers have alternative livelihoods is likely to be the key reason as to why they do not consume the fish. It is usually when they do not have an alternative livelihood that they are likely to consume the fish (Ellender et al., 2009).

4.3.2.3 CARP AS A SOURCE OF FOOD FOR FOREIGNERS

Small-scale fishers sell their fish to foreign citizens from Bangladesh, Zimbabwe, China and Pakistan, as local South Africans tend to not consume freshwater fish (Tapela et al., 2015). Salie (small-scale fisher) states that it is 'mainly foreigners that come buy the fish there by us'. In addition, Cyril adds that 'the Nigerians, the Jappies [Japanese]' buy this fish from them. A recreational fisher explains his observations to whom fish is being sold and the price:

> What we have seen since coming here, there is actually a lot of buyers that pop up here during the day. Some of the okes [guys] even rock up here with a cold storage van or something like that. And if I may mention there is Asian, Nigerian and in the African market there is also something where this fish is sort of going to. They are willing to pay you good money for a decent catch. If you can give them a fish of 10 kg up they will probably give about a R100. For the smaller fish I saw guys at the bottom selling anything from about 1 kg to 2 kg selling for about R10 each. So if you can pull 10 of those fish a day over here you can make a R100 quite easily. This has been happening over here (Peter: recreational fisher).

The foreign market is often an ideal target as consuming freshwater fish is part of their diet and it is also a cheap and accessible source of food (Tapela et al., 2015). The fish is sold alive; however, section 65 (b) of the Western Cape Nature Conservations Amendment Act of 2000 prohibits the selling of any fish caught, yet this is the prevailing practice at Zeekoevlei. The selling price of the fish is determined by the size of the fish with the price fluctuating according to the size and availability of fish.

The influx of foreigners to Cape Town has created a market for freshwater fish at Zeekoevlei. These small-scale fishers have therefore taken the opportunity to supply this market and in turn supplement their own livelihood. It is unlikely that this 'industry' would have thrived without the foreign market, because local South Africans evince a cultural resistance to consuming freshwater fish (Andrew et al., 2000). Hence, it appears as if this small-scale fishery at Zeekoevlei is only occurring because there is a demand from foreign consumers and fishers have taken that opportunity.

The small-scale fishery at Zeekoevlei is prone to environmental shocks. It has been affected by the Koi herpes virus 2015 and 2016, which resulted in tonnes of carp dying off. During this time fishers had no alternative livelihood and stopped fishing at Zeekoevlei. This did not only affect the fishers and their livelihoods, but most probably also the foreigners who depend on the fishery. Gradually, as the stocks increased, so did the number of fishers. While fishing does provide an economic safety net to fishers, the reality is that their livelihoods can easily be restricted and negatively affected.

4.3.2.4 INCOME GAINED FROM SELLING FISH

Given that small-scale fishers sell their catch to diversify their livelihoods, it became important to investigate whether this generates a sufficient income. It was found that a fisher derives an average weekly income of R1, 902.12. Based on a sample set of nine small-scale fishers, the following variables were used to calculate the average weekly income. The average number of fish caught per person per day was 30, with an average selling price of R14.44 per fish. A fisher spent on average five days per week fishing and spent on average

R263.88 a week on tackle and bait[10] (see Appendix H for detailed calculations and formula used). It is thus clear that the selling of their catch does provide the fishers with an additional source of income and a safety net to diversify and sustain their livelihoods.

The definition of small-scale fisheries adopted from the Small-Scale Fisheries Policy (refer to section 4.2) is applicable to the Zeekoevlei fishery context as it is evident that these fishers are fishing for their basic livelihood and they engage in the selling of their fish to diversify and supplement their existing livelihoods. This section has shown that the socio-demographic profile of participants influences the types of fishers and their motivations for fishing. The socio-demographic analysis allowed for a deeper understanding of the motivations of both small-scale and recreational fishers. Recreational fishers are motivated by the pursuit of leisure, fun and sport and the adrenaline rush of getting a good catch, which is underpinned by the size of the fish. Small-scale fishers, however, are motivated to diversify their livelihoods and fish for survival. The chapter further shows that the foreign market has provided small-scale fishers with an opportunity to diversify their livelihood and this generates much-needed income.

4.4 CONFLICTS AT ZEEKOEVLEI

This theme answers research question three, which was to address the source of conflicts at Zeekoevlei. This was investigated through the use of semi-structured interviews. Conflicts are often rooted in the emotional or cognitive make-up of individuals and are therefore considered a human dimension issue (Arlinghaus, 2005). This section provides insights into the source of conflicts experienced by fishers at Zeekoevlei.

4.4.1 INCOMPLETE FENCING AND ENTRY TIME

Zeekoevlei is an open reserve which is not fully fenced off along its boundary. This results in openings which make it possible for fishers to enter the reserve outside of the stipulated entry times and not through the main security gate. The reserve gate opens at 7:30 am;

[10] While it might be that fishers have other additional expenditure, fishers pointed out only this expenditure.

however, because of the incomplete fencing some fishers come in the early hours of the morning through the openings. This causes frustration amongst those fishers who wake up early to stand in a queue and wait for the official entry time. By the time these fishers enter the reserve at 7:30 am all the 'good fishing spots', which are already limited in number, have taken by the 'fence jumpers'. Jack expresses his concerns and stresses:

> Now what happens and where the conflict starts, my dear, I come with my vehicle right? I get here six o-clock in the morning I can only get in here at half pass seven. Now I stand at the gate. Now I'm first in line, by the time I get here all these spots are taken, by people walking through opening (Jack: recreational fisher).

This is a frustration shared by both recreational and small-scale fishers. In addition, some reserve management officials acknowledge that the fencing is incomplete and they do not have proper access control to the reserve, which makes it easier for people come in, but another official adds that this does not happen as rangers patrol along the fence. It also appears as if there is a lack of consensus amongst officials whether or not fishers' entre illegally through the fencing.

4.4.2. LIMITED FISHING SPOTS

All fishers interviewed indicated that Zeekoevlei has limited space to fish. The boundary of the vlei has prolific reed growth, which is not removed. According to fishers, there are only three openings in between the reeds, which fishers have trampled to make space, while the Eastern Shore, which is 2 km long, has only 1 km of space to fish. Coupled with the fact that there is limited space, what adds to the fishers' frustration is that when they do enter at 7:30, the spots have already been taken by fishers who have illegally entered through the fencing. Reserve management does acknowledge that there are conflicts between fishers for space, as one individual suggests:

> So there is problems with them fighting over fishing spots, so we've had like people attacking each other with broken glass bottles and stuff, so it can get quite vicious between the fishermen (Management official).

It is also evident that conflict over fishing spots results in violence between fishers. Reserve management argues that the fishing spots have been demarcated for recreational fishers and not for those who 'harvest' the resource.

> We've got designated fishing holes and we tend to keep those spots open for fishermen, but it wasn't designed for harvesting of fish; it was always designed for club fishing, for sport fishing. So there would be x amount of holes and spaces, spaced evenly over a section of shoreline (Management official).

This also indicates that the development of fishing at Zeekoevlei was arranged in favour of recreational fishers. This was also highlighted by Weyl et al. (2007), who stated that the development of inland fisheries in South Africa was for recreational fishers and this was the situation at Zeekoevlei. An individual in management makes reference to the layout of the fishing spots. It is apparent that reserve management justifies the limited fishing spots on the basis of the initial design, which was to accommodate recreational fishers. Management does not intend to open up more fishing spots and have not intervened effectively to resolve this conflict. The problem is further exacerbated by the fact that the reserve allows more fishers in than the spots available; for example, there is only X amount of shoreline that can accommodate only X number of fishers whom they are aware of. Therefore, they should allow only X number of fishers in at a time. However, the incomplete fencing perpetuates this as those fishers' entering illegally take up the limited fishing spots. Going back to management's point that rangers patrol along the fencing, there is clearly a mismatch between what management is saying and the situation at Eastern shore regarding the fishing spots. If the fence was to be patrolled efficiently and consistently, then officials at the main gate should be aware of exactly how many people come in for fishing.

According to management, they encourage those who engage in sport fishing rather than fishers who harvest the resource for a livelihood; as one individual in management states: 'you still very much want to encourage people to look at sports fishing rather than harvesting of species'. While recreational fishing can contribute significantly to local economies (Britz et al., 2015) and this should therefore be encouraged, cognisance also

needs to be given to the fact that there are poor people who come to Zeekoevlei who use this resource for a livelihood and this should also be encouraged. The idea that they encourage sports fishing as opposed to fishing for a livelihood supports the idea that recreational fishing is still given preference at Zeekoevlei, while the livelihood function of this fishery is not realised and appreciated.

4.4.3 OWNERSHIP OVER FISHING SPOTS

Many fishers display what amounts to ownership over fishing spots. This occurs when a fisher has had a good catch on a particular day and believes that he is entitled to the same spot when he comes fishing the following day. This is well articulated by Clinton:

> because of the little space that there is, say for instance, you fish here now I see Michael[11] caught maybe thirty forty fish I only caught ten. Now tomorrow morning that gate only opens at half past seven – at least that is the time that they let the fishermen go through – then you must sign in then I see that I'm before you in the queue. Now tomorrow morning I get to that spot before you, but you also in the queue now when you come there, you see me. Now that's when the trouble starts. Then you tell me, 'Listen here, I did fish here yesterday'. No it doesn't work like that, I'm before you in the queue so I can pick and choose whichever spot I want to take but they don't understand that. They don't seem to understand that system and that is why they fighting with one another (Clinton: small-scale fisher).

Franks corroborates this and adds:

> *As een nou gister hier gewerk het, gaan hy mol om weer hier te kom. En as hy laat kom dan is hier mos nou iemand anders. Dan verstaan die man nie miskien dit so nie. Kyk as jy nou laat gekom it, kan jy mos nie weer by die plek [vis nie]. Iemand anders kan mos nou weer daai [vat]. Jy moet mos nou soe verstaan* (Frank: small-scale fisher).
>
> [If someone worked here yesterday, then he is going to rush to come here again. And if he comes late then obviously there is someone else. Then the man does not understand that. Look, if you came late, then you can't fish again at the place. Someone else can take that place. You must just understand that].

[11] Pseudonym

An individual in management says that he was involved in trying to resolve an altercation over so-called ownership over fishing spots:

> well, I also went in there and asked the guys what the problem is about, the fishermen now. The fishermen said…if you come early on the reserve, the one person will go to that spot. Now the next day that other guy that came later, he will go to that spot and there the conflict will start (Management official).

Arlinghaus (2005:151) also notes that it is not uncommon for fishers to display 'place attachment.' It is the emotional attachment that a fisher displays to a fishing site or area and often attach great importance to 'their' water and may prevent other fishers from entering 'their back yard'. The conflict over the ownership of fishing spots is most prominent amongst the small-scale fishers who fish daily. Hence, if they have a good catch, they are likely to want to fish on the same spot on the assumption that they would have the same catch. Small-scale fishers tend to display place attachment to 'their back yard' because that is where they earn their bread and butter.

The conflicts that have emerged at Zeekoevlei occur at a localised level, implying that it is at the level of the fishermen. Murshed-e-Jahan et al. (2009) argue that conflicts can also turn violent at any point, especially when there is no management strategy in place to deal with such incidents. This is consistent with the findings of this study as these conflicts have turned rather violent between fishers and resulted in police and law enforcement being involved. Management's approach to resolving these conflicts will be discussed in the sections to follow.

This section has discussed the nature of the conflicts between fishers. The conflicts stemmed largely from the incomplete fencing, making it possible for other fishers to enter before entry time. These fishers who enter before entry time take up fishing spots and by the time the other fishers do get to enter the reserve all the spots are taken. Some fishers also display a sense of ownership of fishing spots and this adds to the other fisher's frustration.

4.5 MANAGEMENT AT ZEEKOEVLEI

This section addresses research question four, which was to understand how fishing is managed at Zeekoevlei. Managing reserves and fishing activity is necessary to protect the reserve resources, ensure that users are compliant, and ensure that the reserve runs smoothly and incident free. Zeekoevlei manages fishing activity through the use of permits, bag limits, and inspections and patrols.

4.5.1 PERMIT

Fishing is allowed at Zeekoevlei provided that fishers have a freshwater angling license as stipulated in section 53 of the Western Cape Nature Conservation Laws Amendment Act (WCNCLA) (Act 3 of 2000). Zeekoevlei's management, however, implemented this only in 2015 because of arguments and conflicts amongst fishers. The permits are valid for one year and cost R60. They can be purchased from registered bait and tackle shops. According to reserve management, they do not sell the permits themselves because they do not have proper safety measures in place to accept money on the premises. When the permits were introduced at Zeekoevlei, it was very challenging as many fishers did not want to accept that Zeekoevlei now requires a permit to fish. However, reserve management indicated that the introduction of the permits has helped in terms of fishers being more compliant and reducing conflicts between fishers.

> we only brought in the permit system last year [2015] because I was getting fed up with the fishermen squabbling all the time. So they have calmed down a hell of a lot (Management official).

Permits are supposed to be checked upon entry to the reserve and patrols on the reserve and Eastern Shore are done weekly to ensure compliance to the permit requirements and bag limit. There was, however, a lack of consensus amongst management staff regarding the effectiveness of the permit. While some reserve officials pointed out that the introduction of the permit is working and that fishing has been more manageable since its introduction, others stated that it is not working. An individual in management points out that the permit

is not working at Zeekoevlei because the reserve is accepting the marine recreational fishing permit. This is in contradiction to the WCNCLA, however, which states that only a freshwater recreational fishing permit can be used to fish in freshwater. Hence, a marine permit cannot be used. This individual further adds that the reason why the marine permit is not working is because freshwater species are not listed on the marine recreational permit. It is thus clear that there is a lack of consistency and enforcement amongst reserve officials regarding the type of permit that can be used.

Participants were asked if they were aware of the new permit system implemented at Zeekoevlei, and 93% said yes, but only 71% were in possession of a permit. There were, however, contrasting views on the use of permits. Recreational fishers feel that permits are useful and necessary to control and conserve the fish.

> I think purely so we can hopefully control what is coming out of the waters over here... and basically in terms of the environment as well, just looking out for the area as well. Like I said, it would keep a lot of people out of here if there was stricter control and the permits was enforced properly (Peter: recreational fisher).

Small-scale fishers have a different view, however, as they do not see the need for a permit as the fish are all alien species and there is nothing to protect. Small-scale fishers are under the impression that because carp is an alien species it does not require protection. This is a view shared by all the small-scale fishers surveyed in this study.

> We actually doing the government a favour because if this fish is illegal [alien species] we take it out of here. Nobody's paying us to do it. We doing the government a favour so I don't see a permit necessary for this (Fred: small-scale fisher).

The reason for small-scale fishers not agreeing with needing a permit can also be explained by the fact that they are not informed about the legislation that governs alien species. The sample of small-scale fishers were poorly educated and may not always have access to such information. Management has done very little to educate these fishers. At Zeekoevlei there is no signage or any notice boards that have visible information for fishers and the public about the permit system being implemented and other laws regarding fishing. Management

points out that it is the responsibility of fisher to educate himself about the laws. However, it has to be acknowledged that these fishers may not always have access to such information, hence contributing to their limited understanding.

Fishers have stressed that the permit is not clear in terms of its purpose as this is not stipulated on the permit (refer to Appendix I). This can explain why many fishers are inclined to argue that if they have the permit, then they are allowed to harvest any amount of fish. This has resulted in confusion amongst fishers as they are not sure if the permit is simply to gain entry or if the permit allows them to take all their catch. This confusion can easily be resolved by consulting fishers and explaining to them why the permit is necessary and allow them to give their input. This indicates that the fishers are not aware of the regulations as set out by the WCNCLA governing inland fisheries and management has not taken sufficient steps to inform these fishers.

4.5.2 BAG LIMIT

Section 55 (a) of the WCNCLA prohibits exceeding the daily bag limit as set out by the local authority. The daily bag limit at Zeekoevlei is set at five fish per person. Management indicated that it is very difficult to set a bag limit because it is an alien species fishers are catching. This is a view shared by the small-scale fishers as they do not deem a bag limit necessary since carp is an alien species and abundant. However, according to management, a bag limit is necessary as the vlei is already overfished, yet in the same vein management points out the vlei has not been tracked in a long time to confirm overfishing, but they know the vlei is overfished by the limited number of fishers. It also emerged that there are conflicting views between the fishers and management about whether or not this fishery is overfished.

The bag limit, however, is not stipulated on the permit (refer to Appendix I). Fishers were only informed of this bag limit verbally by management officials. According to reserve management, the purpose of the bag limit is, firstly, to conserve the stocks to ensure that all fishers can get equal access to the resource. Secondly, as a local authority, they cannot give the fishers permission to harvest in order to sell. Management states that they would rather

encourage a fisher who comes to catch a fish for food, but not someone who wants to make a 'profit'. Management also needs to take into account that fishers feel that Zeekoevlei is polluted and also show a cultural resistance to consuming freshwater fish. Such information and views can only be known if they were considered. Reserve management further adds that if someone catches five fish per day they cannot make significant 'profits' from selling their fish. The literature shows that there is a strong economic need for fishers to engage in the selling or trading of fish. It appears as if management holds the view that fishing for a meal is sufficient to sustain one's life, without taking into account that there are many aspects in life that can only be fulfilled financially. Therefore, the importance of Zeekoevlei as an economic safety net that provides fishers with a source of livelihood is clearly not recognised by management. Reserve management is under the impression that without a bag limit fishers come to Zeekoevlei to make a 'profit', but the findings show these fishers are struggling to make ends meet with their existing financial means and engage in fishing to supplement their livelihoods and support their families.

Zeekoevlei as an economic safety net for small scale fishers is also not recognised since the WCNLCA does not legislate for harvesting of the resource for livelihoods and largely supports those who fish for recreation. Although it appears as if management is making provision for these fishers by allowing them to harvest five fish per day, these provisions are largely influenced by ecological concerns such as conserving the stocks and protecting recreational interests.

Small-scale fishers are dissatisfied with the bag limit as it does not generate an income for them. They explain this by illustrating their expenses in order to come to the vlei and still provide for their families.

> *daai mense se ons kry net vyf vissies 'n dag...ek is nou so ontvrede met daai van net vyf vissies vang. Wat gaan ek op my tafel sit om my kinders aan die lewe te hou? En vir my met die geld aan die lewe te hou? Hulle kan nie van ons expect om net vyf vissies tevang, dit gaan nie werk nie. Dan kan jy maar die vissery besigheid los want jy kan niks maak nie. Vyf visse gaan jou nie betaal nie. Check alles wat jy moet koop, mielie meal koop, al daai goed. As daai goed klaar gekoop is, is daar nog geld vir die huis? Ek weet nie hoe hulle tevrede kan wees om vyf vissies te vang nie* (Cyril: small-scale fisher).

> [That people said that we can only take five fish per day... I am not satisfied with the five fish. What am I going to put on the table to keep my children alive? And to keep myself alive with the money? They can't expect us to only catch five, that is not going to work. Then you might as well leave this fishing business because you will make nothing. Five fish are not going to pay. Look at everything that you must buy, meilie meal and all that stuff. If that stuff is bought, is there money left for the house? I don't know how they can be satisfied with catching five fish].

Restricting fishers to a bag limit of five fish per day does not generate much income. Findings show that a bag limit of five fish per day would only generate a measly average income of R97.12 a week (see Appendix H for calculation). This is significantly less than what they could have potentially earned without a bag limit restriction (see section 4.3.2.4). While small-scale fishers are concerned by the bag limit as it will affect their income, recreational fishers are motivated by other factors and therefore do not oppose the bag limit as they all 'catch and release' and their livelihood does not depend on fishing. The fact that the bag limit is not stipulated on paper is a loophole and this provides room for the small-scale fishers to challenge this limit as implemented by Zeekoevlei nature reserve. This was supported by a management official, who pointed out that when fishers come to the vlei they have grounds on which to challenge the bag limit as it is not stipulated on paper.

Fishers are challenging this bag limit as they want 'evidence' that stipulates the number of fish that they are legally allowed to catch. This is confirmed in Young et al. (2016), who states that fishers often request evidence of degradation and over-fishing, and this can often not be provided, as seen at Zeekoevlei regarding over-fishing and the bag limit. Fishers are likely to be supportive of regulations if they are justified and discussed with them, and evidence is provided (Sutton & Tobin, 2009).

Prior to the permit and bag limit system being implemented management officials has caught fishers harvesting up to 400 fish per day. These fishers worked in teams of four to split the amount of work. However, reserve management argues that fishing is well controlled at Zeekoevlei as fishers now adhere to the bag limit. This is in contrast to what the study found as all small scale-fishers sampled indicated that they exceed the daily bag

limit. If one considers that fishers harvest on average in excess of 30 fish per day, then the implementation of a bag limit is largely ineffective because somehow these fishers are managing to exit the reserve with this amount of fish. It is thus clear that small-scale fishers do not comply with the bag limit; this also speaks volumes about the lack of an official bag limit stipulated on paper and the enforcement of this limit, which warrants further discussion.

4.5.3 INSPECTIONS AND PATROLS

To ensure that the bag limit is adhered to and that other reserve uses are compliant and no illegal activities are conducted on the reserve, patrols and inspections are conducted. Inspections for permits by reserve rangers are done weekly at Eastern Shore and patrols are also done weekly. According to reserve management, fishers are required to declare their fish upon exiting the reserve. However, it is apparent that the inspections of vehicles upon entry and exit are not done consistently as fishers have indicated that this does not happen and this has also been confirmed by a reserve official. Clinton (small-scale fisher) adds 'Never ever have they inspected my bakkie [pickup truck]. Not when I enter, not when I leave.'

Inspecting vehicles upon exit could also result in more fishers complying because they will be aware that their vehicles will be inspected. It is pointless to enforce a bag limit and simply assume that fishers will comply, but no additional measures such as inspections upon exit are applied to ensure that fishers are abiding to the bag limit. Similarly, permits are not checked regularly upon entry at the reserve. A reserve official adds that it is easy for fishers to harvest over 30-40 fish per day, because of the incomplete fencing and no inspections being done upon fishers' exiting the reserve. This lack of inspections of vehicles upon entry and exit thus provides fishers with an opportunity to exceed the bag limit. Frank eloquently identifies his strategy for exceeding the bag limit.

> *Man, my vis hou ek altyd in so n krat. Nou daai vis, kyk hy is al die tyd nog in die water, in n krat, so hulle kan nie vir my whatever sê nie, want dit is nog altyd in die water. Maar ek kan mos vir hulle sê ek het niks vis op my nie. Die*

> *vis is mos nog altyd in die water. Dan het hulle nie eintlik ... been om op te staan nie* (Frank: small-scale fisher).
>
> [Man, I always keep my fish in a crate. Now that fish, it is still in the water, in a crate. They cannot actually say anything to me because the fish is still in the water. Because I can tell them that I do not have any fish on me because the fish is still in the water. Then they do not actually have leg to stand on].

This section has shown that it is difficult to get fishers to comply with an unofficial bag limit. The reserve management has put the measure in place and yet they have failed. The incomplete fencing and weekly patrols do not alleviate the problem and allow room for fishers to exceed this limit. Patrols should be done daily at Eastern Shore and inspections for permits and vehicles should be conducted on entry. This can reduce the number of fishers who exceed the bag limit. But, most importantly, it will harm the livelihoods of the small-scale fishers. It is also likely that small-scale fishers exceed the bag limit because they are desperate and need the fish as a source of income and because they know that there is no explicit stipulation which suggests that five is a suitable limit. Therefore, it is important that prior to implementing a measure fishers should be consulted, and this could have alerted reserve management to the crucial role that the vlei plays in sustaining people's livelihoods and how a bag limit could negatively affect them.

Given that the permit system and bag limit were implemented only in 2015 when all this conflict started, it appears as if management wanted a 'quick fix' for these conflicts that were manifesting between fishes. But implementing a bag limit and introducing a permit system did not prevent these conflicts. Reserve management is conducting patrols and inspections for permits, but it is not done consistently. Management constantly makes reference to the fact the reserves boundary is incomplete, which without a doubt does exacerbate the problem of controlling the reserve and fishing activities, but simple strategies that they can employ they have largely failed to do. These conflicts are a manifestation of the poor access control and limited recognition of fishers who fish for their livelihood. Consistent with other small-scale fishers in South Africa, the small-scale fishers of Zeekoevlei are often considered as 'poachers' or 'skelms' [thieves], but this is purely because this is not a recognised livelihood.

4.6 PARTICIPATION IN MANAGEMENT

To ensure that any management initiatives are successful, it is important to involve local fishers in decisions which may affect them, as 'no management scheme will work unless it enjoys the support of those whose behaviour it is intended to affect' (Hara, 1992:2). The study reveals that fishers made no input and do not participate in any decision making regarding the management of the vlei.

According to the fishers, management only came to the vlei to inform them informally about the decisions after they have already been taken, for example, the decision to implement the permit system and the bag limit. Here a small-scale fisher shares his views:

> I come here this guys come to me and say, "You must have a permit". I asked them, "But why is it now?" because they say guys is fighting and all that stuff is happening, but I'm thinking to myself no man it's not necessary to catch with a permit here (Jacob: small-scale fisher).

Fishers express a keen interest in wanting to be involved in decision making which can assist in improving the fishing experience for all and ensuring compliance with the rules. In rare instances there is interaction between fishers and managers when fishers go to management to complain about the conflicts at Eastern Shore regarding fishing spots.

It is also evident that decisions that have been implemented are simply imposed upon fishers, as fishers claim that they have never been consulted and are only informed about these rules. This is also the likely reason why the bag limit has failed as fishers will not easily accept management strategies when they do not 'make sense in the way they see their problem, know their industry, and have learned to understand nature' (Jentoft et al., 1998:434). In order to understand their 'problem', management needs to consult with them and understand the importance of this fishery by further involving them in the management process and decision making. In addition, any initiative that is established should guide and take cognisance of the realities of these fishers.

It was shown that local fishers are aware that they are not being consulted and would like to be involved in the process, as a fisher explains:

> They [management] need to consult with all of us that is around there [the vlei] because we are the people that is using the vlei. You see, we try and strive for a living out of the vlei. So they must help us actually because we don't want to go break in [commit crimes] and stuff like that, then it's not right (Paul: small-scale fisher).

Murshed-e-Jahan et al. (2009) argue that conflicts between fishers can be resolved if fishers understand the regulations before conflict resolution becomes necessary. The mere fact that fishers are not aware of the regulations governing alien species, and even less involved in decision making, means that conflict resolution is likely to be unsuccessful and that they will oppose it.In addition, some fishers mentioned that ad hoc meetings were held between fishers and some members in management were present. However, any decision directly affecting fishers does not follow a consultative and participatory process. It emerged that decisions and consultation take place with the Zeekoevlei Protected Area Advisory Committee (PAAC), which includes residents, *formal* recreational fishers and individuals in management. This is inconsistent with the literature, which states that decisions should be informed by the resources users themselves (Hauck et al., 2002). Decisions are informed by the needs of formal recreational fishers, who have different worldviews and socio-economic characteristics and engage in fishing for different reasons. A management official makes reference to the approach adopted in the small-scale sector where local marine fishers are consulted and involved in the decision-making process, as he acknowledges that any decisions they [management] make affect the local users:

> I mean I'm in the marine thing so quite often they will have their road shows and that's what I like about them. They come out to the community; they will ask questions, they listening to what the community wants... So they listened to what the people's saying like there's more fishermen out there, we need rights, you don't give us rights, we going to poach (Management official).

This is the same concern raised by small-scale fishers who point out that if management do not understand their grievances and the importance of this vlei in ensuring their livelihood, they will go against the norms as seen in this fishery. This is also the likely reason why small-scale fishers display non-compliant behaviour to the bag limit. Thus, the management of Zeekoevlei do not adequately engage and consult with local fishers and do not consider the human dimensions of these fishers; hence the importance of this fishery to small-scale fishers is under-estimated. Given that decision making takes place at management level and does not follow a consultative and participatory process, it becomes apparent that Zeekoevlei follows a top-down approach with measures which are unclear and based on ecological considerations, which largely favour the needs of recreational fishers.

4.7 SUMMARY

The purpose of this chapter was to present the research findings. A number of key findings emerged. It was shown that Zeekoevlei has two types of fishers: recreational and small-scale fishers. Their respective socio-demographic profiles significantly influence the type of fishing they do and their motivations to fish. Recreational fishers are educated, White, employed and have relatively high household monthly incomes, and they engage in fishing for leisure and sport, being particularly motivated by a sense of achievement which is underpinned by the size of the fish. They do not depend on fishing for their livelihood. Zeekoevlei is particularly important to small-scale fishers as they are often informally employed or unemployed; they use Zeekoevlei to diversify their livelihood and this acts an economic safety net to provide for their families. Small-scale fishers predominantly supply foreigners as there appears to be a market for freshwater fish amongst them. The findings also suggest that conflicts between fishers are widespread at Zeekoevlei.

The most pressing factor contributing to conflicts between fishers is the fact that the reserve is not fully fenced off and it allows fishers to enter through the openings illegally and occupy the limited fishing spots. Fishers also occupy these spots and often do not give others an opportunity to fish. These conflicts often lead to violence between fishers. To assist in curtailing these conflicts and assist in the overall management of the fishery

resources, management implemented the system of inland fishing permits, a daily bag limit and also patrolling and inspections. The implementation of these strategies, in particular the bag limit, did not take into account how the livelihoods of the small-scale fishers and are dependent on fishing. Finally, Zeekoevlei management follows a top-down decision-making process, as management makes all decisions and does not include local fishers in arriving at any decisions which affect them. Decisions are based on ecological considerations and the interests of recreational fishers, and hence the potential of Zeekoevlei to diversify and sustain livelihoods and an economic safety net is not recognised.

CHAPTER 5

CONCLUSION

This chapter provides a summary of the research and its key findings, and suggests directions for future research. This study has shown that inland fisheries play a significant role in the lives of millions of people globally, for whom it is a source of food as well as having an important livelihood function and being recreational activity. However, inland fisheries have almost always been managed on the basis of ecological and biological considerations, and limited recognition has been given to the human dimension. Without taking into consideration and gaining the support of the fishers, management strategies are likely to be unsuccessful and ineffective. Human dimensions are therefore important as they allow an understanding of resource users, their perceptions and motivations. The needs of resource users need to inform management decisions and this can only be done through engagement with them. The study has contributed to an understanding of the existing human dimensions mentioned in the literature by examining the human dimensions of the Zeekoevlei fishery system, in particular understanding *who* the fishers of Zeekoevlei are and *why* they fish at Zeekoevlei. It aimed to identify the conflicts present at Zeekoevlei and the how fishing is managed at Zeekoevlei.

Zeekoevlei attracts two types of fishers: small scale and recreational. These fishers display contrasting socio-demographic profiles. Recreational fishers tend to be mature, educated and employed White males with a relatively high household monthly income. The small-scale fishers are mature, unemployed Coloured males, with a low monthly household income. Recreational fishers engage in fishing at Zeekoevlei for leisure and self-achievement and do not derive an income from fishing, as these fishers all catch and release. Zeekoevlei is undoubtable a complex system which is male dominated and has a racially informed resource-use base. For the small-scale fishers Zeekoevlei has a very important livelihood function; it is a form of informal employment where fishers diversify their livelihoods to generate much-needed income. There is thus a direct relationship between fishers' socio-demographics and their motivation to engage in fishing. Yet fish is not a primary source of

food for the fishers as they display a resistance to consuming it. The influx of foreigners from Sub-Saharan Africa and the Middle East has created a market for freshwater fish and fishers have exploited it as their financial safety net.

Zeekoevlei is an open reserve and this has made it difficult for management to have proper access control, particularly because it provides room for non-compliant fishers to enter. This is further exacerbated by the fact that the reserve has limited fishing spots and fishers argue over these spots. Fishers also tend to display a sense of ownerships over these spots and are inclined to believe that they are entitled to the fishing spot. This sort of attitude is almost expected, because it is a resource they use to sustain their livelihood and would prioritise it.

Management has intervened to try and alleviate these conflicts between fishers by implementing a permit system, a daily bag limit and inspections and patrols. However, this has also proven difficult because the reserve is open. When the bag limit was implemented, very little consideration was given to the needs of small-scale fishers who derive a livelihood from Zeekoevlei, as the limit was justified based purely on ecological considerations. The introduction of the bag limit is largely ineffective, as the study shows that small-scale fishers consistently exceed this limit, since the fishers are desperate and simply need to sustain a livelihood. Patrols and inspections are also infrequent and vehicles are not inspected upon exist. Regarding the limited fishing spots, reserve management should adopt a system of allowing only a certain number of fishers to use the amount of fishing space. Most importantly, reserve management should also consider fencing off the boundary as this would make it easier to control who enters the reserve. Zeekoevlei also lacks educational material and management should take the lead in providing this. Local fishers are not consulted in any decision-making processes and all regulations are implemented with no prior consideration of, or engagement with, the fishers. The management of the vlei appears to be based on consideration of the needs of recreational fishers as well as ecological concerns, and there is little acknowledgement of, and unclear measures to accommodate, the small-scale fishers.

The potential of Zeekoevlei as an economic safety net for small-scale fishers is not realised by management as these fishers are merely seen as wanting to make profit. Zeekoevlei

nature reserve uses the WCNCLA as a guide to manage fishing activities and this adds to the limited consideration given to small-scale fishers as the Act makes no provision for small scale fishers and therefore they continue to be a marginalised group. Not only are the fishing activities controlled by these management strategies, but they also have an impact on the livelihoods of these fishers. This thesis therefore makes an important contribution in highlighting the livelihood function of the Zeekoevlei fishery system. This research stresses the critical importance of understanding the human dimensions (*who* and *why*) of the Zeekoevlei fishery system in order to fully appreciate its complexity and importance. It is thus important to understand the local realities and how livelihoods are dependent upon fishing. Hence, it is virtually impossible for management to fully understand the realities of these fishers without engagement and collaborative consultation with them. This study has also shown that Zeekoevlei is far too complex to be managed by a single entity, and requires joint action from all affected parties. In addition, complex socio-ecological systems are constantly changing, this is evident at Zeekoevlei because new fishers entre this fishery, so the dynamics within it change and therefore it is necessary that information cannot be static and should accommodate for the changes within the system.

Conflicts should not be perceived in a negative light and management should use them as a catalyst for change. Furthermore, imposing a permit and bag limit has led to non-compliance. In order to reverse this injustice, particularly to small-scale fishers, it is more appropriate to embark on a journey with the fishers that is more participatory with strong consideration given to the human dimensions. Hence, the importance of human dimensions should not be underestimated. Management needs to recognise the socio-economic conditions of the fishers, their precarious livelihood and their dependence on harvesting inland fish. The need to educate fishers by encouraging and strengthening participatory decision-making processes is likely to foster a relationship between fishers and management which can improve the decision-making process by making it more accommodative of both ecological and human needs.

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APPENDIX A

UNIVERSITY OF CAPE TOWN

Department of Environmental and Geographical Science

Part 1: Questionnaire

Section A – Demographics							
1. Gender		**2. Age**					
Male	Female	18-28	29- 39	40 -50	51-60	61-70	71 and above

3. Home language				**4. Self declared population group**					
English	Afrikaans	Xhosa	Other	Black	White	Coloured	Asian	Indian	Other

5. Nationality (If **NOT** a citizen, please specify)		
SA citizen	Foreign within neighbouring countries	Outside of Africa

6. What area do you currently reside in?

7. Highest level of education					
No formal education	Primary	Secondary	Diploma	Degree	Postgraduate

8. Marital status				
Single	Married	Divorced	Widow	Widower

9. Employment status				
Unemployed	Pensioner	Self employed	Informal employment	Formal employment

10. Monthly household income			
R0 –R5000	R5001 – R10 000	R10 001- R20 000	R20 000 and above

Section B – Visitation/ Fishing effort					
11. What other activities do you engage in at Zeekoevlei, besides fishing?					
Bird watching	Water sports	Socialising	Picnicking	None	Other

12. How often do you fish at Zeekoevlei?					
Daily	Weekly	Monthly	Every three months	Every six months	Every year

13. On which days do you prefer to come to Zeekoevlei?		
Weekday's	Weekend's	Both

14. What time do you usually fish?					
Before 7:00	7:00 -10:00	10: 00-12:00	12:00-15:00	15:00-18:00	After 18: 00

15. On average, how many fish do you catch per visit?						
0 -5	5-10	10-15	15-20	20-25	25-30	30 and above

16. Do you belong to any fishing groups/societies?	
Yes	No

Section C – Livelihoods, food security and fisheries	
Are you ever forced to eat freshwater fish as a source of food?	
Yes	No

How much of your income comes from fisheries- related activities?			
All of it	Most of it	Some of it	None of it

Section D – Expenditure on fishing related items			
In the past year, approximately how much have you spent on fishing related items?			
Entrance fees	R	Transport	R
Accommodation (if you did overnight trips)	R	Food	R
Alcohol and beverages	R	Boat fuel and oil	R
Bait	R	Terminal fishing tackle	R
Insurance of fishing equipment	R	Parking	R
Competition fees	R	Fish cleaning and filleting	R
Boat hire	R	Gillies	R

Section E – Management / Policy	
Are you aware that you require a recreational freshwater permit?	
Yes	No

Are you currently in possession of a recreational freshwater permit?	
Yes	No

Have you ever been checked/ inspected by a fisheries control officer at Zeekoevlei?	
Yes	No

Thank you for your participation.

APPENDIX B

UNIVERSITY OF CAPE TOWN

Department of Environmental and Geographical Science

Guide interview questions

MOTIVATIONS AND PERCEPTIONS

1. Tell me about yourself (background)
2. What are your reasons/motivation/factors for fishing?
3. Why do you fish at Zeekoevlei, as opposed to any other vlei?
4. Why inland fishing as opposed to marine fishing? Do you only do inland fishing?
5. What do you consider to be the greatest threats (pollution, overfishing etc) to Zeekoevlei?
6. How do you fish (alone/group) and why?
7. What fish species do you prefer to catch? Why?
8. Are there sufficient facilities at Zeekoevlei? (fishing platforms, toilets)

MANAGEMENT AND POLICY

9. Are there conflicts amongst fishers? What is the nature of these conflicts?
10. Are there any conflicts/issues between reserve management and fishers?
11. How do you feel about inspections at Zeekoevlei? Are they necessary?
12. What are your views on requiring an inland fishing permit at Zeekoevlei? Do you understand the rationale for permits?
13. What, if any, are the changes you would like to see at Zeekoevlei or things that will improve fishing?

APPENDIX C

UNIVERSITY OF CAPE TOWN

Department of Environmental and Geographical Science

Guide interview questions

1. Tell me about yourself (background, where are you from, job description)
2. What do you consider to be the main activities at Zeekoevlei?
3. What fish species are found at Zeekoevlei?
4. What is the nature of the relationship between reserve management and fishers?
5. What are the types of conflicts at Zeekoevlei and with whom? How are conflicts resolved?
6. What do you know about fishermen at Zeekoevlei? (Where they are from, their reasons for fishing?)
7. How is access control managed? I notice that there is no parameter around the vlei? Does this not negatively affect access control? Does it not provide room for conflicts?
8. What is the purpose of the permit system at Zeekoevlei? On what is the number of fish based, since there is currently no Inland fisheries policy? How effective is the permit system at Zeekoevlei?
9. Are you aware that many people fish at Zeekoevlei to sustain a living? (How are provisions made for this?)
10. How often are inspections conducted and by whom?
11. Which parties are involved in decision making process regarding the vlei/reserve? (Are local fishers involved or consulted? if yes, what strategies are used?)
12. How has the fish kill situation in March 2016 affected activities at the Zeekoevlei?

APPENDIX D

UNIVERSITY OF CAPE TOWN

Department of Environmental and Geographical Science

Guide interview questions

1. Tell me about yourself (background, where are you from, job description)
2. What do you consider to be the main activities at Zeekoevlei?
3. Are there conflicts at Zeekoevlei and with whom? How are conflicts resolved?
4. How is access control managed? I notice that there is no parameter around the vlei? Does this not negatively affect access control? Does it not provide room for conflicts?
5. What is the purpose of the permit system at Zeekoevlei? How effective is the permit system?
6. What in your opinion is the main reason why people fish at Zeekoevlei?
7. During which times do people mainly fish at Zeekoevlei?
8. Are inspections conducted at Zeekoevlei? How often are inspections conducted and by whom?
9. Are you involved in decision making process regarding the vlei/reserve? (If yes, how?)
10. How has the fish kill situation in March 2016 affected activities at the Zeekoevlei?

APPENDIX E

UNIVERSITY OF CAPE TOWN
IYUNIVESITHI YASEKAPA • UNIVERSITEIT VAN KAAPSTAD

Faculty of Science
University of Cape Town
RONDEBOSCH 7701 South Africa
E-mail: richard.hill@uct.ac.zaTelephone: +
27 21 650 2786
Fax: + 27 21 650 3456

23 November 2015

Miss Toschca-Lee Chevonne Gilliland
Department of Environmental and Geographical Sciences
Characteristics of small scale and recreational fishers: a case study of Zeekoevlei, Cape Town

Dear Miss Gilliland

I am pleased to inform you that the Faculty of Science Research Ethics Committee has approved the above-named application for research ethics clearance, subject to the conditions listed below. You are required to:

- Implement the measures described in your application to ensure that the process of your research is ethically sound;

- 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.

A member of the committee asked me to let you know that Prof Theo Stewart of the Department of Statistics facilitated a similar study some years ago ,and that the Organisational Research group in this department has extensive experience in these kind of studies, should you wish to avail yourself of this knowledge.

Your approval code is: FSREC 63 – 2015

I wish you success in your research. Yours sincerely

Signed

Dr Richard Hill
Chair: Faculty of Science Research Ethics Committee
Cc: Dr Serge Raemaekers ,Supervisor

APPENDIX F

CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

ENVIRONMENTAL RESOURCE MANAGEMENT

Victoria Day
Reserve Supervisor

T: +27 21 396 4283**F**: +27 21 396 4291
E: Victoria.Day@capetown.gov.za

2016-01-12

For Attention:
Ms Toshca-Lee Gilliland
Email: toshca1402@gmail.com
Tel:

LAND OWNERS PERMISSION TO CONDUCT RESEARCH AT FALSE BAY NATURE RESERVE – ZEEKOEVLEI SECTION

In response to your email dated 24 November 2015, the City of Cape Town Biodiversity Management Branch and management of False Bay Nature Reserve have no objection to you conducting the fieldwork specified below for your Masters Research Project, to be conducted at Zeekoevlei section of False Bay Nature Reserve.
The research will form part of a study entitled "Characteristics of subsistence, small scale commercial and recreational fishers: A case study of Zeekoevlei, Cape Town"[12]. The overall aim of the study is to understand the interface between purely subsistence, recreational, and small scale commercial fishers by utilising False Bay Nature Reserve Zeekoevlei section as a study site to profile the respective fishing groups.

A questionnaire that has been approved by False Bay Nature Reserve Management will be used to interview local fisher men round Zeekoevlei.

[12] This was the provisional study title.

This permission allows access to the specified study site for observation and sampling purposes, as outlined in this letter. This is with the understanding that no physical samples of flora and fauna will be purposely collected; neither will any soil or water (or other) samples be removed off site, following the specified conditions listed below.

Permission is granted with the following conditions:

1. This letter of permission is ONLY valid for Toshca-Lee Gilliland
2. This is merely a letter of permission and not an official permit. This letter is to be kept on person at all times while carrying out research in the nature reserve and may be presented for entry into the nature reserve.
3. Sampling / fieldwork is anticipated to be undertaken from January – April 2016 at the Zeekoevlei section of the False Bay Nature Reserve.
4. Arrangements to access the study site must be made in advance with the relevant section ranger (i.e. Victoria Day 021 396 4283 or Victoria.Day@capetown.gov.za).
5. Extreme care must be used as so not to move invasive fauna or flora between research sites. All equipment must be cleaned before being transferred between sites (if applicable).
6. Every effort must be made as not to unduly disturb wetland and terrestrial vegetation.
7. No vehicles driven off-road.
8. No fires are permitted.
9. No littering is allowed.
10. The by-laws of the City of Cape Town must be adhered to.
11. Care must be taken not to interfere with other users of the site, including day visitors, fishermen and bird watchers. All members of the research team must be courteous and respectful to the public at all times.
12. The City of Cape Town Biodiversity Management Branch (False Bay Nature Reserve - reserve manager) must be provided with a copy of the final report on the findings of this research.

Any transgression of any of the above conditions will result in the cancellation of this permission, as well as potential prosecution for any contravention of relevant legislation. The City of Cape Town reserves the right to withdraw this permission at any time.
This letter of permission is valid from12th January till 30th April 2016. Please feel free to contact me for any queries or additional information.

Yours faithfully

Victoria Day
Section Ranger: False Bay Nature Reserve – Zeekoevlei Section
Biodiversity Management Branch

APPENDIX G

UNIVERSITY OF CAPE TOWN

Department of Environmental and Geographical Science

INFORMATION SHEET AND CONSENT FORM

Dear Sir/Madam

My name is **Toshca-Lee Gilliland**, I am a 2nd year Master's student in the Department of Environmental and Geographical Science at the University of Cape Town (UCT). I am conducting research into identifying the characteristics and motivations of the various fisher groups at False Bay Nature Reserve (Zeekoevlei section). This study consists of two parts – (1) questionnaire and (2) interview.

Your participation

To contribute to this overarching research purpose, I am inviting you to participate in this research. If you agree to participate, the questionnaire and interview will last approximately 30-45 minutes.

Participation in this research is voluntary

Please understand that you are not being forced to take part in this study and the choice whether to participate or notare yours alone. If you choose not to take part in answering these questions, you will not be affected in any way. You may stop me at any time and tell me that you do not want to go on with the questionnaire and/or interview.

Confidentiality

For accurate capturing of information, I am also asking you to give me permission to tape record your responses. The audio recordings and notes taken during the interview will not be made available to any persons other than the researcher concerned and the project leader.

Your responses will be linked to a fictitious code number or a pseudonym (another name). No responses can thus be traced to you.

Who to contact if you have any concerns regarding this research

This research has been approved by the UCT Faculty of Science Ethics Committee and the City of Cape Town Biodiversity Management Branch and False Bay Nature Reserve.

If you have concerns or questions about the research you may call the project leader **Dr. Serge Raemaekers +27 (0)21 650 2879/ Serge.raemaekers@uct.ac.za**

CONSENT

I hereby agree to participate in this research project. I understand that I am participating freely and without being forced in any way to do so. I also understand that I can stop the questionnaire and interview at any point, should I not want to continueand that this decision will not in any way affect me negatively.

I understand that this is a research project whose purpose is not necessarily to benefit me personally.

I have received the telephone number of a person to contact should I need to speak about any issues which may arise during the questionnaire and interview

I understand that my answers will remain confidential.

I agree to participate in the questionnaire

……..

Signature of participant **Date**: ……..

I agree to participate in the interview

……..

Signature of participant **Date**: ……..

I agree to the audio tape recording of my participation in the study

……..

Signature of participant **Date**: ……..

Thank you for your participation

Toshca-Lee Gilliland

© 076 845 1646 / E-mail toshca1402@gmail.com

APPENDIX H

The data was used to calculate the income generated from selling fish caught at Zeekoevlei. This data was obtained through the questionnaire.

TABLE 3: DATA USED TO CALCULATE AVERAGE INCOME BASED ON A SAMPLE SET OF NINE SMALL-SCALE FISHERS

Fisher	Number of days spent fishing per week	Number of fish caught per day	Price of fish per unit	Expenditure on bait per week	Expenditure on tackle per week
Paul	7	30+	R15	R300	R125
Clinton	7	30+	R10	R100	R100
Cyril	7	30+	R10	R80	R175
Xavier	2	30+	R30	R150	R25
Fred	2	30+	R20	R150	R100
Salie	7	30+	R15	R300	R125
Jacob	2	30+	R10	R100	R50
Frank	7	30+	R10	R50	R75
Daniel	7	30+	R10	R250	R120
Average	**5**	**30+**	**R14.44**	**R164.44**	**R99.44**
				R263.88	

The following formula was used to calculate the average income derived from selling fishing caught at Zeekoevlei

$$(x \times y \times z) - t = N$$

where x is the selling price of the fish,
y is the total number of fish caught for the day,
z is the number of days spent fishing per week,
t is the total cost of tackle and bait spent per week,
and N is the net profit

Average income per week based on an average fish of 30 fish per day (i.e not adhering to the bag limit)

$$(R14.44 \times 30 \times 5) - R263.88 = R1902.12$$

Average income per week based on a bag limit of five fish per day

$$(R14.44 \times 5 \times 5) - R263.88 = R97.12$$

APPENDIX I

CapeNature

2817

VARSWATER HENGELLISENSIE / FRESHWATER ANGLING LICENSE / IPHEPHA-MVUME LOKULOBA EMLANJENI

NIE OORDRAAGBAAR NIE / NOT TRANSFERABLE / ALINAKUGQITHISELWA KOMNYE UMNTU

NAAM / NAME / IGAMA

TELEFOONNOMMER / TELEPHONE NUMBER / INOMBOLO YOMNXEBA

FAKSNOMMER / FAX NUMBER / INOMBOLO YEFEKHSI

E-POS ADRES / E-MAIL / ADDRESS / IDILESI YE-IMEYILE

POS ADRES / POSTAL ADDRESS / IDILESI YEPOSI

IDENTITEITSNOMMER / ID NUMBER / INOMBOLO YESAZISI

GELDIG VANAF / VALID FROM / LISEBENZA UKUSUSELA KUMHLA

TOT / TILL / UKUYA KUTSHO

Are you affiliated to a club / Behoort u aan 'n klub / Ingaba ulilungu lombutho na:

Yes / Ja / Ewe

No / Nee / Hayi

KLUBNAAM / CLUB NAME / IGAMA LOMBUTHO

Hierdie lisensie tree in werking slegs indien dit deur die houer daarvan onderteken is / This license takes affect only if it is signed by the holder thereof. Eli phepha-mvume lisebenza kuphela ukuba ngaba lityikitywe ngumnini

Datumstempel
Date Stamp
Isitampu somhla

Kontant / Cash / Imali eyikhashi

Tjek / Cheque / Itsheki

Ander / Other / Enye

TUCKERS TACKLE
FRED TUCKER AGENCIES
79-81 Main Road
Diep River | Cape Town | 7800
Tel: 021 715 5626
Email: info@tuckerstackle.co.za

BEDRAG IN WOORDE / AMOUNT IN WORDS / ISIXA-MALI ESIBHALWE NGOKWAMAGAMA

RAND / RAND / IRANDI

SENT / CENT / ISENTI

UITGEREIK DEUR / ISSUED BY / LIKHUTSHWE NGU

LISENSIEHOUER / LICENCE HOLDER / UMNINI WEPHEPHA-MVUME