"ALL FISHERS ARE EQUAL BEFORE FISH"

The Significance of Integrating the Recreational Sector into Fisheries Management

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Abstract

There is increasing recognition of the sociocultural, economic, and ecological significance of recreational fishing as a fundamental element of the global wild capture fisheries. In New Zealand, recreational fishing is a very popular activity that many New Zealanders identify with, and that provides a variety of social, cultural and economic benefits for New Zealanders. Despite the significance of the recreational fishing sector as a resource user and contributor to fisheries impacts, it has gained little attention within fisheries management in New Zealand.

Using the Hauraki Gulf as a case study, this research investigates the efforts to manage the New Zealand recreational fisheries sector within the current centralised management regime. To ensure the future sustainability of the fisheries resources and the health of the marine ecosystem, this research argues the importance of integrating the recreational fisheries sector into fisheries management. This involves examining current fisheries management in New Zealand, specifically the Quota Management System (QMS), and factors affecting the integration of the recreational sector. This research also considers the potential of Ecosystem Based Management (EBM) as a holistic approach to provide for the interests, needs and values of all stakeholders while also maintaining the health and function of the marine ecosystem.

To achieve the research objectives, a qualitative methodology was adopted. In addition to the case study, key methods employed for this research were semi-structured interviews with recreational fishers and other stakeholders, and questionnaires with recreational fishers. The key findings highlight the importance of understanding the complex and dynamic nature of the sector so as to improve management of the sector. The research also indicates that participation and involvement of the recreational sector in fisheries management would remain limited if the legislative rights of the recreational sector under the Fisheries Act were not addressed and the distrust recreational fishers have towards the commercial sector and government was not resolved. Finally, the successful integration of the recreational sector also depends on the ability of recreational fishers to organise themselves and resolve their internal issues. The failure to do so would most likely see the continuation of current centralised fisheries management regime, where recreational fishers remain reliant on the voting booths to make their voices heard, and their direct influence on decision making remains limited.

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List of Acronyms

ACE	Annual Catch Entitlement
DoC	Department of Conservation
EBM	Ecosystem Based Management
GDP	Gross Domestic Product
HGMPA	Hauraki Gulf Marine Park Act
IPP	Initial Position Paper
ITQ	Individual Transferable Quota
LFK	Local Fisher Knowledge
MoF	Ministry of Fisheries
MPA	Marine Park Act
MPI	Ministry of Primary Industries
NZRFC	New Zealand Recreational Fishing Council
NZSFC	New Zealand Sports Fishing Council
PIS	Participant Information Sheet
QMS	Quota Management System
RMA	Resource Management Act
SNA1	Snapper 1 zone
TAC	Total Allowable Catch
TACC	Total Allowable Commercial Catch

Chapter

1 Introduction

Marine recreational fishing is a highly developed activity that a large number of people globally undertake primarily for sport, enjoyment, and to supplement their food supply (Cooke and Cowx, 2006). As a coastal country, recreational fishing in New Zealand is a fundamental part of the New Zealand lifestyle with recreational fishers making up an estimated 19.5% of the population (Ministry for Primary Industries, 2010). Recreational fishing contributes many benefits to society including economic, ecological and social benefits at both local and national levels (Lewin et al., 2006, Post et al., 2002). At the same time, recreational fishing is increasingly recognised as having adverse effects on fish stocks and the environment (Cooke and Cowx, 2004, Lewin et al., 2006). Despite the significance of recreational fishing, fisheries management has tended to focus on commercial practices and limiting commercial catch numbers to ensure sustainability of targeted species, with little consideration given to other resource users such as recreational fishing (Lindner and McLeod, 2011). This is reflected by the extensive literature on commercial fisheries management. In contrast, relatively little research has been undertaken about recreational fisheries (Abbott et al., 2009, McPhee et al., 2002). The lack of attention given to understanding the significance and impacts of the recreational sector coupled with the tendency to focus on managing commercial activities has led to concerns that current management approaches are insufficient to ensure the protection of marine habitats and the sustainability of fisheries resources (McPhee et al., 2002).

This research investigates recreational fishing in New Zealand and efforts to manage recreational fishing within the current centralised management regime. In achieving this, the importance of recreational fishing as a social and economic activity will be illustrated and the environmental impacts of recreational fishing investigated. To accomplish this, it is necessary to determine what recreational fishing encompasses and what motivates people to participate. Using the Hauraki Gulf Marine Park as a case study, which encompasses the entire Hauraki Gulf region (see: Figure 1.1), I argue that integration of the recreational sector into fisheries management is fundamental for the long term sustainability of fisheries resources. In arguing the importance of integrating the recreational sector in fisheries management, the research considers the potential of ecosystem-based management (EBM) to provide for the interests, values, and needs of all stakeholders in an integrated and inclusive fashion (Berkes, 2012, Curtin and Prellezo, 2010). This involves examining the effectiveness of the current fisheries management in New Zealand; specifically, the Quota Management System (QMS). Accordingly, the research considers some of the limitations present under the QMS such as the propensity under the QMS to focus on managing single species, and the difficulties encountered when addressing the wider ecological impacts caused by unsustainable fishing practices.

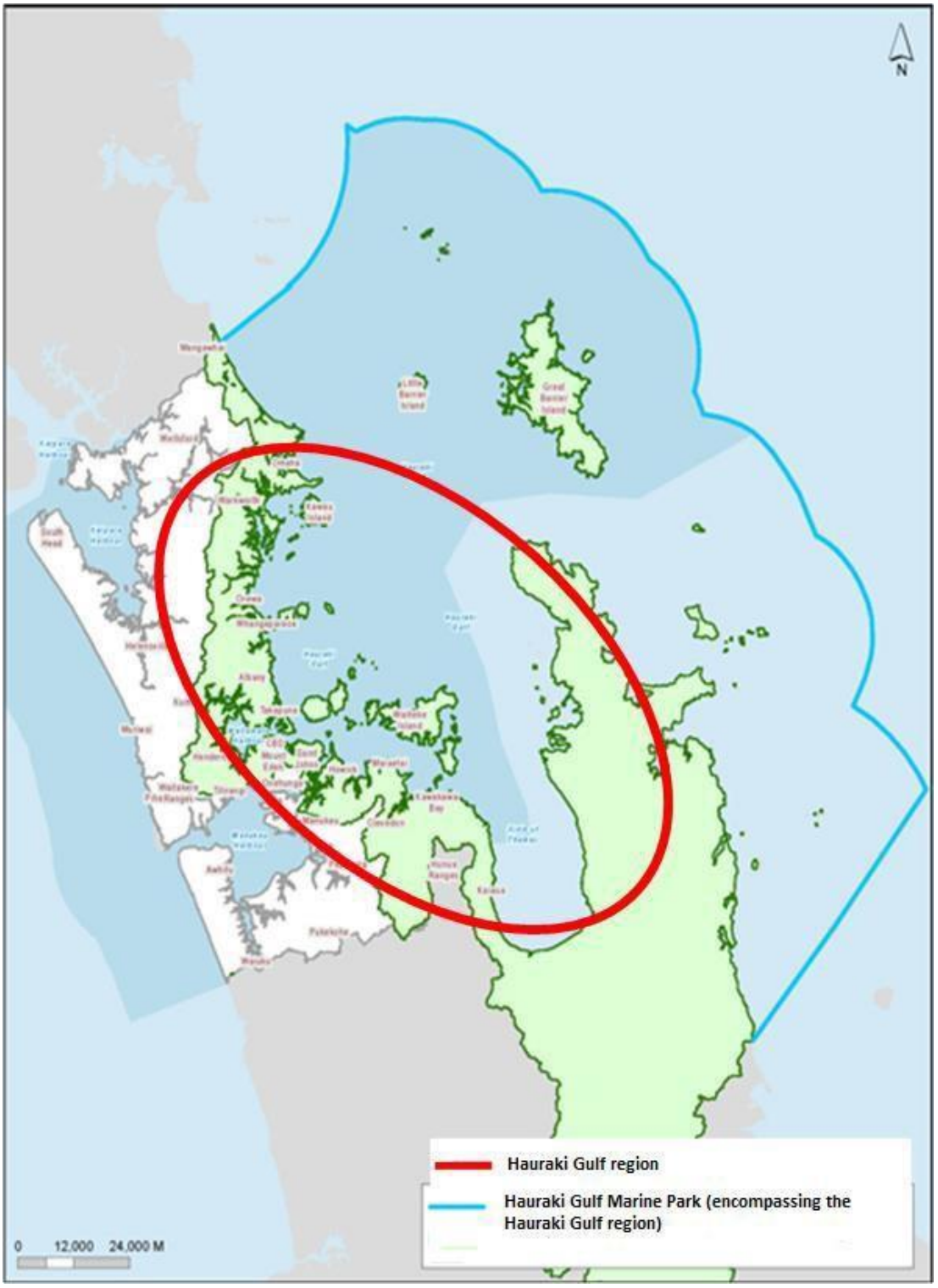

Figure 1.1: Map showing the Hauraki Gulf region and Hauraki Gulf Marine Park Areas: adapted from NIWA presentation (Hartill, 2014).

1.1: Research rationale, research question and objectives

Current fisheries management has mainly focused on managing commercial fisheries because they are believed to be responsible for the majority of the catch and are the more economically significant sector. The increasing rise of recreational fishing participation and catch capacity has created sustainability challenges, which has caused many nations, including New Zealand, to consider ways to integrate recreational fishers into fisheries management (Borch, 2010). Governments increasingly acknowledge that a fishery cannot be efficiently managed without the participation and cooperation of fishers to make control measures and regulations effective (Pomeroy and Berkes, 1997). In the case of recreational fishing, several challenges have to be addressed to enable the inclusion of recreational fishers into resource management. For decision makers challenges include: defining the sector; determining the motivations for different groups or individuals; and, determining the social and economic contributions of the sector. Challenges also exist within the recreational sector itself. These include: the lack of organisation of the recreational sector; conflict between competing recreational fishing representative groups; the lack of experience in fisheries management among recreational fishers; and, the lack of trust fishers have towards the government and commercial sector. This research is motivated, therefore, by an interest in investigating ways to better clarify the diversity of fisher motivations, social values, and interests so that recreational fishers are better able to have an active role in fisheries management.

The main question informing this research is:

> How can enhancing understanding of recreational fishing activities and their impacts lead to better management decisions in the future?

This question acknowledges the recreational sector as a substantial resource user and stakeholder in fisheries management, as well as a sector that adversely impacts marine ecosystems. In answering this question, I identify who recreational fishers are and elucidate the reasons why they choose to fish. In doing this, I reveal the diversity among recreational fishers and explain how such diverse interests and motivations complicate efforts to organise the sector to enable it to influence fisheries management. I consider the role recreational fishers currently have in fisheries management by reviewing the consultation process to reduce the bag limit in the Snapper 1 fishery (SNA1) in 2014, and examine previous efforts made by recreational fishing advocates to influence fisheries management. This highlights the tensions between recreational fishers and commercial fishers, recreational fishers' distrust towards the government, and poor organisation within the recreational fishing sector as key factors affecting the integration of the recreational fishing sector into fisheries management. I also identify the impacts of recreational fishing on the Hauraki Gulf and evaluate the extent to which recreational fishers understand the impact of their activities on the ecosystem. This allows me to investigate how science and fisher knowledge can contribute to fisheries management and to explore the possibilities afforded by, and constraints to, an ecosystem-based management approach.
With this in mind the objectives of this project are:

1. To investigate the motivations of why recreational fishers choose to participate in recreational fishing and how they are involved in the management of fisheries.
2. To examine the impacts of the recreational fishing sector and their contribution to declining fish stocks and marine ecosystems.
3. To determine how well recreational fishers are managed under the current New Zealand fisheries management regime.
4. To explore the potential for ecosystem-based management to reconcile the competing interests of fishers while promoting the sustainable management of fisheries.

1.2: Understanding recreational fishing and fisheries management

Attempts to define recreational fishing and distinguish it from subsistence, cultural and commercial fishing have proven difficult and culminated in the propagation of numerous definitions (Aas, 2007, Arlinghaus et al., 2010, F.A.O, 2012). The development of definitions frequently reflects the location and culture in which the activity takes place; this also leads to the proliferation of definitions. Definitions serve a variety of purposes including for research, for legal uses, and for management (EAA, Pawson et al., 2008). A lack of clarity around what recreational fishing is could potentially lead to communication problems between fishers, politicians, fishery policy makers, and scientists.

The interchangeable use of terms such as sport fishing, leisure fishing, hobby fishing, recreational angling and subsistence fishing can cause confusion for policy makers and scientists as well as among recreational fishers who engage in different forms of fishing (Pawson et al., 2008). The myriad activities that can be grouped under the umbrella of recreational fisheries make it difficult to apply one generic definition to cover all non-commercial fishing activities (Aas, 2007). For example, in many less developed countries, as well as some countries in Europe, a large proportion of the population engage in recreational fishing for sustenance (Cowx, 2002). Similarly, in defining recreational fishing as a sport, only certain type of fishing are considered valid; for instance, those that involve competition (Arlinghaus et al., 2010). Other definitions that emphasise leisure define recreational fishing as fishing carried out during free-time (Aas, 2007); however, such definitions often fail to include indigenous people, unemployed people and others who do not experience the difference between working days and free time, such as retirees.

This thesis conceptualises recreational fishing according to the definition offered by Arlinghaus et al. (2010):149, which states: “Recreational fishing is fishing of aquatic animals that do not constitute the individual’s primary resource to meet nutritional needs and are not generally sold or otherwise traded on export, domestic or black markets”. Within this definition, recreational fishing is distinguished from commercial and subsistence fishing on economic grounds (in the former) and physiological grounds (in the latter) (Pawson et al., 2008).

Fisheries in New Zealand are currently managed through the QMS established under the Fisheries Act 1986. Under this act, the Ministry of Primary Industries (MPI) sets the regulations for the sector, which includes, among other things, setting size restrictions, bag limits, declaring fishing seasons, closing off areas to fishing, and placing restrictions on fishing gear and methods (Yandle, 2007). The QMS was implemented to address problems of overcapitalisation and fish stock depletion largely as a consequence of commercial fishing activity (Borch, 2010); however, recreational fisheries were largely overlooked in the initial implementation of the QMS. As a consequence, the collective rights of the recreational sector to a share of the fisheries resource are poorly defined in comparison to the commercial sector and customary fishers, whose rights are protected under the QMS and the Treaty of Waitangi, respectively (McMurran, 2000, Yandle, 2007). The loosely defined share of the fisheries resource for the recreational sector is allocated annually at the Minister's discretion as an allowance under the total allowable catch (TAC). The lack of a legislatively protected and well defined share of the fisheries resource (Kearney, 2001) means recreational fishers are not incentivised to conserve and protect the fisheries resource because they lack the ability to influence fisheries management decisions (McMurran, 2000). This creates the feeling amongst recreational fishers that the government is unlikely to accommodate their needs and interests (McMurran, 2000). The continued growth of recreational fishing has increased pressure on stocks, which in turn has created tension with the commercial sector as they also demand access to fish. This highlights the inherent problem regarding current management, particularly for recreational fishers who are not well placed under the act to protect their interests when government chooses to implement changes such as reducing fishing effort (McMurran, 2000).

It is increasingly recognised that, for future fisheries management to be successful in sustaining fishery resources and protecting the marine environment, it is necessary to allocate fairly the available resource among various competing users and to acknowledge and incorporate the rights of all stakeholders/user groups within the management regime (Jentoft et al., 1998, Miller et al., 2010). For this to occur, it is necessary to allow the formal inclusion of the recreational sector as well as other user groups into the decision making process (Bess and Rallapudi, 2007, Kearney, 2001, Sutinen and Johnston, 2003). Ecosystem-based management (EBM) focuses on achieving the sustainability and protection of marine ecosystem structures and processes necessary to deliver goods and services. EBM seeks to move away from fragmented governance and management approaches to marine and fisheries management, which sees decisions made sector-by-sector or issue-by-issue (Beddington et al., 2007, Hauraki Gulf Forum, 2011, Hickley and Tompkins, 1998, Leslie and McLeod, 2007). EBM is not a replacement for current fisheries management but, rather, a system that can build upon and widen the scope of conventional resource management by pushing towards a broader frame of governance to enable the consideration of a wider range of social-ecological, environmental and human factors.

This research uses the Hauraki Gulf as a case study to explore fisheries management with a particular focus on recreational fishing. The Hauraki Gulf is a coastal feature in the North Island of New Zealand. It is considered to be New Zealand's ultimate maritime treasure with immense lifestyle and conservation value to New Zealanders (Bercusson, 2008). The Hauraki Gulf is

home to a large variety of marine life and is a central hub for recreational as well as commercial and customary fishers. The current high level of fishing activities, coupled with other human and environmentally induced impacts, is placing immense pressure on the marine environment of the gulf. The importance the Hauraki Gulf and the need to sustain and conserve its environment have been identified by the Hauraki Gulf Marine Park Act (HGMPA). The HGMPA seeks to integrate the management of the Hauraki Gulf's natural, physical, and historical resources, with the overall aim of protecting the identity and lifestyle of the Hauraki Gulf for current and future generations of New Zealanders (see: Sections 3.5, 3.6 and 3.7).

1.3: Thesis Overview

This chapter has presented the research questions and objectives that underpin this research. I argued the importance of integrating recreational fishing into fisheries management to enhance the sustainability of fisheries resources. I also argued that this involves understanding who recreational fishers are and what motivates people to participate in recreational fishing as this provides insight that might usefully inform fisheries management. The chapter also introduced EBM as an alternative management practice that is inclusive in its approach to conserving ecosystem quality and sustaining its ecological benefits. The chapter provided background on the problems currently confronting fisheries in New Zealand, including the recreational fishing sector. The difficulty of defining recreational fishing was explained and the definition used in this thesis was presented. Finally, the Hauraki Gulf was introduced as the case study for the research.

Chapter Two provides a theoretical overview of the debates surrounding the recreational fishing sector and draws upon contemporary insights from scholars to examine the importance of understanding why people participate in fishing. It argues that without clarifying the motives behind fisher participation, and without an understanding of the interests and needs of fishers, it will be difficult to integrate recreational fishers into fisheries management and acknowledge their socio-economic benefits. Furthermore, this chapter discusses the impacts of recreational fishers on the environment, and discusses the limitations of conventional management approaches that have lacked the ability to sustain resources and protect the environment. This chapter argues the need for a more holistic approach for fisheries management that integrates all users into this management, and provides a balance between economic, social and environmental interests.

Chapter Three provides a contextual historical background of fisheries management in New Zealand and discusses the Hauraki Gulf study site as a geographically important social, ecological and economical hub for New Zealand. It also explores the importance of the Hauraki Gulf for fisheries resource users, and the pressure caused by fishing as well as other marine and offshore activities. This chapter also reviews the historical trajectory of fisheries management in New Zealand and the continued development of the QMS to integrate the recreational fisheries sector into fisheries management. Finally, the HGMPA's objective to implement EBM in the Hauraki Gulf by 2030 is also briefly discussed.

Chapter Four presents the research methodology and research design, including the techniques that were used to collect the information for this research. This chapter explains the rationale for using an interpretive, qualitative research methodology to collect the information and provides contextual information about the significance of the recreational sector within fisheries management and as a fundamental resource user in the Hauraki Gulf.

Chapter Five presents the data collected from interviews and questionnaires and highlights the current relationship of the recreational sector with other stakeholders including government. Furthermore, it discusses the importance of acknowledging the values, interests, and motivations, as well as the environmental impacts of recreational fishers, and touches upon the barriers and opportunities of integrating the recreational sector into fisheries management.

Chapter Six interprets and discusses the results presented in the previous chapter. It discusses and analyses the issues surrounding the current management system, barriers and opportunities for the participation of fishers in knowledge gathering and management, conflicts between different sectors, as well as the governance and management requirements for a more holistic approach to fisheries management.

Chapter Seven provides the final conclusions for the thesis and reaffirms the significance for acknowledging fisher rights and incorporating them formally into legislation. It also highlights the need for further research to better understand recreational fisher motivations, values and needs. This chapter also states the need for a shift from single species or single sector management into a holistic integrated ecologically focused marine ecosystem management that incorporates all stakeholders in a dynamic and complex environment such as the Hauraki Gulf.

Chapter 2 Literature Review

This chapter reviews the debates surrounding recreational fishing and its place in fisheries management. As stated in the previous chapter, the increase in recreational fishing activity in countries including New Zealand has led fisheries managers to consider ways of integrating recreational fishers into fisheries management. I argue that the integration of the recreational sector into fisheries management is, therefore, fundamental for the long term sustainability of fisheries resources. A number of challenges arise, however, which complicate efforts to integrate recreational fishers in to management and decision making.

In this chapter I consider the multiple factors that motivate recreational fishers to fish. I highlight the significance of understanding the potential impacts caused by recreational fishing for management purposes and consider how identifying and acknowledging such impacts can help policy makers to produce policy and control measures that best suit the management of the recreational sector. I review how increased participation in fishing, the open access nature of New Zealand recreational fisheries, the tragedy of common pool resources, enhanced fishing methods, and gear technology are producing considerable problems on targeted resources and marine ecosystems. This leads me to consider the possibilities offered by co-management and ecosystem based management for ensuring the sustainability of fish resources and the marine environment for present and future generations.

2.1: Managing common pool resources

Part of the difficulty in managing recreational fishing derives from the fact that fish are common pool resources. The potential for common pool resources to be overused or overexploited has been subject to much deliberation, particularly in light of the phenomenon labelled the 'tragedy of the commons' (Dutta and Sundaram, 1993). The 'tragedy of the commons' is a theory posited by Dr Garrett Hardin in 1968 to explain the eventual degradation or overexploitation of commonly used open access resources (Hardin, 1968). According to Hardin (1968), commonly held resources on land, air, and oceans were susceptible to massive degradation in the absence of incentives to manage resources, or coercion to prevent exploitation for individual gain. In the absence of such rules, individuals have an incentive to free-ride; that is, to maximise their utility without giving consideration to others. Hardin argued that the only way to prevent tragedy was through the use of state control measures and regulations, or through establishing private property rights to limit access to the resource (Hardin, 1968).

Ostrom (2008), among others, criticised Hardin for implying resource users are self-interested individuals with a short-term focus, who possess homogeneous skills, assets, beliefs, and cultural views (Ostrom, 2008). The 'tragedy' has also been criticised for misinterpreting commons and common property as open access resources. Ostrom (1990) presented research

refuting Hardin's claims about self-interested individuals, which highlighted the existence of formal and informal institutional arrangements for regulating access to and use of common pool resources. The distinction is made between common property resources, where rules and institutional arrangements regarding access and use exist, and open access resources, where there is an absence of rules.

In the case of open access resources, there are two classifying features that lead to the demise of the resource. The first feature is "excludability" or control of access. The ability to exclude users from a resource is made difficult when the resource encompasses a large spatial range, such as in the case of migratory fish, since restricting access would be very costly or, in some cases, virtually impossible. The second feature of open access resource is subtractability. This is where one individual's use of the resource adversely affects the next individual wanting to access to the resource (Feeny et al., 1996, Kassa, 2008).

Competition for access to resources where there is no excludability and high subtractability intensifies the risk of exploitation of common pool resources such as fisheries. Gordon (1954):135 states that "the fish in the sea are valueless to the fisherman, because there is no assurance that they will be there for him tomorrow if they are left behind today". As with Hardin (1968), Gordon (1954) emphasises the need for some form of social control to assign private property rights to a common pool resource. According to Gordon (1954), the economic efficiency of private property rights would end the race to fish because individual ownership reduces competition among competing interests. Moreover, some form of control system would prevent community resources from being destroyed by over-fishing and competition (Hardin, 1968).

Hardin (1968) argues strongly that, in the absence of self-organisation, resource users were unable to overcome the 'tragedy' on their own. Therefore, to control and conserve the resource, institutions are required (Hardin, 1968). Hardin (1978) and Bajema (1991) conclude that public or private property rights regimes were needed to effectively control common resources. As a consequence of these arguments, central management has been used by policy makers and scholars to justify central government control for common pool resources such as fisheries (Ostrom, 2008, Ostrom, 2000).

Contrary to the 'tragedy' thesis (Hardin, 1968, Gordon, 1954), there are multiple international studies which demonstrate that users have created institutions and organised themselves to regulate their own resources (Jentoft and Kristoffersen, 1989, Pomeroy and Berkes, 1997). Common characteristics of these institutions are that they developed spontaneously, were informally organised and were community based (Jentoft and Kristoffersen, 1989). Evidence of community based and collective management refutes the assertions made by Gordon (1954) and Hardin (1968) that fishermen are unorganised, competitive individuals who are unable to work together for their mutual benefit of managing the fishery resource. These studies also contradict the assumption made by Gordon and Hardin that a fishery which is not regulated by central government, is not regulated at all (Jentoft and Kristoffersen, 1989).

Centralised government management is not immune to failure. Sometimes the failures are high; for example, 70% of the world's centrally managed marine fisheries are depleted or endangered (Acheson, 2006). The outcome of many of these centralised government efforts have been the opposite of what was hoped (Dietz et al., 2003). A substantial amount of evidence suggests that central regulation has contributed significantly to resource degradation, which is accelerated further by problems of corruption and inefficiency (Acheson, 2006, Robbins, 2000). Acheson (2006) states that the establishment of central policies and measures restricting resource use in the pursuit of long term conservation and sustainability efforts is the key to managing common pool resources. This would benefit all stakeholders by preventing the misuse of the resource as well as preventing the resource from being completely exploited (Acheson, 2006). In the case of recreational fishers, however, scholars have noted that, if recreational fishers have no incentives or reasons to voluntarily conserve and protect the resource for the public good, they will most likely free ride (Arlinghaus, 2006, Jentoft et al., 1998, Wade, 1987).

Acheson (2006) claims resource degradation to be the result of institutional failures; if suitable and carefully considered governance structures and rules are established, natural resources can be conserved and used wisely. Where there is evidence of high exploitation, this suggests institutional failure (Acheson, 2006). Acheson (2006) and Ostrom (1990) note that, even though many share the view that institutions are necessary to fix the resource problems, no one can agree as to which institutions would be the most effective since there are strong advocates for each property regime: private property, common property and public (state) property. Acheson (2006) further argues that none of the above institutions provide a universal solution: examples exist where each institutional arrangement has been successful in conserving a natural resource, but each institution has also experienced failures.

Contrary to assumptions that decentralised management would not work due to individualistic interests and lack of organisation of stakeholders (Bajema, 1991, Gordon, 1954, Hardin, 1968), many social scientists support management at the local level as well as communities in partnerships with governments. Co-management has been strengthened by a number of cases where such management arrangements have been successful (discussed further below) (Granek et al., 2008, Jentoft and McCay, 1995, Pomeroy and Berkes, 1997).

2.2: Managing recreational fishing

Recreational fisheries are typically considered to be different from commercial fisheries because they are self-sustaining and not governed by the economic and social forces of the open market that have driven many commercial fisheries to collapse. Commercial fishing has been blamed for major declines in fish stocks; however, the extent of recreational fishing impact is often underestimated. While a single recreational fisher has negligible impact in comparison to a commercial vessel, the cumulative impact that millions of recreational fishers have on fish stocks can be significant (Lewin et al., 2006). Recently, focus has shifted to considering recreational fisheries and their potential impact on fish stock declines. Post et al. (2002) note the lack of literature addressing the decline in fish stocks linked to recreational fisheries; however,

they identified four major Canadian fisheries with decline in fish stocks attributed to recreational fishing. These declines have usually gone unnoticed by policy managers due to the belief that recreational fisheries do not have a significant effect on fish stocks.

Based on Canadian and US estimates, reviews by Coleman et al. (2004) and Cooke and Cowx (2004) illustrate numerous examples where recreational fisheries' harvest rates of targeted species are more than those of commercial fisheries. Coleman et al. (2004) also highlight that fish populations across the United States are decreasing as a result of recreational and commercial activities with both having the same kinds of effects on targeted fish populations. Both sectors cause reduction to size and age structures, alter community composition, and reduce biomass. While commercial fisheries fish on both upper and lower levels of the food chain, the recreational sector is more focused on the upper level. Both sectors have cascading trophic effects that affect the structure, function, and productivity of marine ecosystems (Coleman et al., 2004).

There are many conservation issues attributed to recreational fishers (Arlinghaus and Cooke, 2009, Cooke and Cowx, 2006, Lewin et al., 2006). These issues include the exploitation of fish stocks, selective fishing, trophy fishing (targeting oversized, rare, and sometimes uneatable fish), discards and by-catch, retention of juvenile fish, system level changes arising from fishing, and reproduction period disturbance. Understanding these pressures will help in customising management protocols.

2.3: The motivation to fish

Over the last century there has been a major increase in participation in recreational fishing; millions of people now consider themselves recreational fishers. Along with the increase in fisher numbers, reasons for participation are changing towards those that favour recreation over food subsistence (Kearney, 2007). The majority of recreational catch is used for human consumption; however, catching fish for food is not necessarily the main objective of recreational fishing. For example, in competitive sport fishing, the catch is usually released after being caught. There are many reasons why people participate in recreational fishing and many factors as to why people choose to prioritise their reasons (Kearney, 2007); for example, Holland and Ditton (1992) examined the reasons behind why people go fishing, and found relaxation and escape, and appreciation of nature, were given more priority by individuals than catching fish.

The research on factors associated with the motivations for participating in recreational fishing is fairly limited. Where research has been conducted, researchers identified age, gender and race as being the main factors influencing how fishers view the benefits of recreational fishing, which in turn motivates fisher participation (Floyd et al., 2006, Hunt and Ditton, 2001, Schroeder et al., 2008, Toth and Brown, 1997). Research into understanding the significance of social motivations around gender, race, and age has been debated by a number of scholars. Toth and Brown (1997) suggest race and gender have significant influence in structuring the motivation

for fishing within larger demographic groups whereas Burger (2002, 2004) argues ethnicity was not a determinant of fishing activity. Differences based on gender have been suggested, with research by McManus et al. (2011) noting that women generally perceived recreational fishing as a family orientated activity, while more men than women enjoyed catching fish for sport and challenge, and landing trophy catch (see: McManus et al., 2011, Fedler, 2000). Age was found to be negatively correlated with fishing participation, with the number of participants declining as individuals get older; Floyd et al. (2006) estimate that only 8% of recreational fishers in the United States Of America (USA) who are aged over 65 years are fishing.

In terms of recreational fishing for sustenance, research suggests this is reasonably low (Burger, 2002). Pawson et al. (2008) argue the importance of determining the economic benefit and value of recreational fishing to promote better legislation and management, and to design future research initiatives. Estimating the economic value of recreational fishing is difficult, however, partly because of the different factors motivating recreational fishers and also because of the differences in how fishing activities are undertaken (Hickley and Tompkins, 1998, Kearney, 2001). Attempts to estimate the economic value of recreational fishing focus on the contribution recreational fishing makes to local and national economies as well as ancillary activities. The estimated annual contribution in 2003 of recreational fishers in the EU was €25 billion with €8-10 billion specifically from marine fishing (Dillon, 2004, Pawson et al., 2008). This contribution consisted of 25 million fishers spending on transport, equipment, and lodgings in 15 EU states (Dillon, 2004). In comparison, the commercial fisheries trade value in 25 European Union states was estimated in 2005 to be around €26 billion a year (Pawson et al., 2008). Findings from the USA are similar for recreational fisheries (Ihde et al., 2011). F.A.O (2012) reports that one of the most obvious economic benefits recreational fishing provides is employment generated by recreational fishing expenditure, which can establish a multi-million dollar industry in some fishing nations. Global estimates report that 58 million recreational fishers generate a total of US$40 billion annually, and provide more than 954 000 jobs (F.A.O, 2012).

Benefits of recreational fishing stretch beyond the economic sphere and encompass the social and cultural domains (F.A.O, 2012). For example, recreational fishing strengthens family bonding (Hunt and Ditton, 2001, Toth and Brown, 1997), is a form of relaxation, stress release, provides an opportunity for enjoying nature (Fedler and Ditton, 1994, Floyd et al., 2006, Pitcher and Hollingworth, 2007), and can improve health and wellbeing (McManus et al., 2011, Schroeder et al., 2008). The diverse and idiosyncratic reasons why people value recreational fishing make it extremely difficult to articulate a single measure of value (Kearney, 2007). This also makes it difficult for fishers to claim fishing rights, and to justify management and allocation priority (Kearney, 2007).

2.4: Why managing recreational fishing impacts is difficult

The difficulty involved with integrating the recreational fishing sector into fisheries management is due to the lack of data on the environmental impacts related to recreational fishing activities. Part of this difficulty is associated with the insufficient acknowledgement of recreational fishing

impacts in fisheries research and public discussion and the focus on impacts attributed to commercial fishing (Borch, 2010, Cooke and Cowx, 2006, Cooke and Cowx, 2004, Lewin et al., 2006). Additional issues include the lack of efficient monitoring programs for control measures, variability in temporal and spatial targeted fish populations, the complexity of fisher behaviour and motivations, and the unorganised structure of recreational fishery communities. These all contribute to the difficulty of accurately analysing the impacts of recreational fishing and accepting recreational fishers as contributors to fisheries declines (Lewin et al., 2006). This section explores the potential impacts of recreational fishing, while also highlighting the profound influence that fishers have on the functioning and sustainability of the marine ecosystems and its ability to provide goods and services.

2.4.1: The potential consequences of high recreational fishing effort

This section outlines the potential impacts of high fish stock exploitation and the consequences of such impacts on the sustainability of targeted fish stocks and the biodiversity of the marine environment. Understanding the effects of high exploitation can assist policy makers in designing more effective control measures and policing in order to improve compliance.

The increase in fishing effort is associated with an increase in participants and the possibility for improvements in efficiency among current fishers. The exploitation of fish stocks by recreational fishers is helped by the easy access to technology and fishing gear that is similar to the equipment used in the commercial fishing sector (Allan et al., 2005, Cooke and Cowx, 2006). Where an increase in effort causes harvest rates to exceed sustainable levels, this can affect the abundance and size structure of targeted species and also affect repopulation of fish stock (recruitment overfishing) when extreme overfishing occurs. Exploitation rates vary with the duration of fishing period, fishing effort, and fishing gear used. Furthermore, exploitation rates can also be influenced by the management policies and compliance by fishers to those policies. In addition, weather and environmental conditions, fishing location, and experience of the fisher can have a significant effect on exploitation rate (Lewin et al., 2006).

Overexploitation of recreational fish species can affect biodiversity and cause trophic imbalance by targeting higher trophic level species. This can cause an increase in the population of lower trophic species and thus impact entire ecosystems (Cooke and Cowx, 2006, Granek et al., 2008).

2.4.2: Big-game fishing: the impacts of recreational fishing selectivity and trophy fishing

This section highlights the potential impacts of selective fishing on the genetic diversity and phenotypic characteristics of the targeted fish populations and how such selective methods can eventually lead to permanent evolutionary changes. Recreational fishing is selective in the sense that emphasis is given to fish size, age, species, and physiological and behavioural traits. Angling tends to target larger and faster growing individuals, thus the removal of these fish results in the future production of fewer faster growing, larger offspring (Arlinghaus and Cooke,

2009). Similarly, trophy fishing selectively targets fish of extremely large size or certain phenotypic characteristics.

Selective fishing has the potential to genetically modify the target populations in several ways. Selective fishing could alter the demographic structure of the targeted population (sex ratio, age structure), which can cause changes to the genetic diversity and the effective population size. Selective harvesting can also impose breeding selection based on certain phenotypic characteristics for the targeted populations. Certain phenotypic characteristics (e.g. minimum body size, fin shape, length of bill) that are genetically associated to the selection criterion of recreational fishers can lead to an evolutionary response over time; however, the harvesting of the targeted population has to occur before the age of maturity in order for the evolutionary response to ensue. The result will be largely contingent on both the strength of selection and the means in which the target of selection is genetically associated to other characteristics (Coltman, 2008).

The reason it is important to consider the selective nature of recreational fishers and the dynamic and varied nature of the recreational community is because these factors can affect the integration of the recreational sector into fisheries management. Managing the recreational sector using a generic policy may be insufficient since the biological and environmental conditions of fish populations differ from one fishing region to another, as does the reaction of fish populations to fisheries policies and control measures (Grafton et al., 2006, McMurran, 2000, Post et al., 2008). Therefore, it is fundamental to understand the characteristic and genetic effects of selective fishing behaviour on the targeted fish population to adequately adjust control measures to individual fish populations at different locations, based on the productivity of each fishery (Beard et al., 2003, Lewin et al., 2006).

2.4.3: Recreational fishing discards and by-catch: Is catch and release a conservation measure?

While catch and release is used as a conservation approach in fisheries management, there are many factors that could affect the survival rate of the released fish. This section examines the issues associated with catch and release practices on targeted fishing populations and provides examples of the likely impacts catch and release can have on released fish.

The high mortality and injury rates caused as a result of discards and by-catch is a fundamental concern within the commercial sector (Cooke and Cowx, 2006). The majority of heavily regulated fisheries are managed using minimum mesh sizes, quota systems, and total allowable catch (TAC) (Cooke and Cowx, 2006). Such systems can lead to instances of dumping excessive catch and under-sized fish resulting in high mortality. Global marine data conservatively estimate the annual by-catch of the commercial sector to be 38.5 million tonnes (40.5%) of global marine catches (Davies et al., 2009). This highlights systematic gaps in global fisheries management and policy. The lack of understanding of the extent of by-catch is due to several unresolved issues such as measurements, definition, and quantification; regardless of

these factors, Davies et al. (2009) note that 40.5% of wastage would not be tolerated in any other industry.

Recreational fishing has an equivalent problem with by-catch; many fish are caught and released under the presumption that they will live (Arlinghaus and Cooke, 2009). Catch and release is used as a way to control the rate of exploitation. There are various restrictions on harvest used in open-access fisheries with some methods more successful than others. The majority of the methods employed use the release of live fish either because the daily bag limit has been reached but the fisher continues to practice catch and release; the fish is legally undersized; or the fishery is a designated catch and release area (Cooke and Schramm, 2007). Policy makers and fishers consider catch and release to be fundamental to enhancing fish numbers (Cooke and Schramm, 2007); however, as the survival rates for fish caught and released vary dramatically, the theory that the released fish always survive is subject to criticism (Arlinghaus and Cooke, 2009, Bartholomew and Bohnsack, 2005, Muoneke and Childress, 1994). Nevertheless, Coltman (2008) argues that catch and release is still beneficial since it reduces the mortality rate considerably in comparison to harvesting 100% of the fish caught.

There are several factors that affect the survival of the fish after release including the species of fish, handling time outside of water, hook type and hook location, water depth and water temperatures (Bartholomew and Bohnsack, 2005, Fairchild and Howell, 2004). Catch and release by recreational fishers can also have effects on the overall population of the targeted species. Danylchuk et al. (2007) argue that the physiological stresses on fish imposed by recreational fishers can cause disruptions to the natural behaviours and physiological processes, which could eventually affect survival. This was demonstrated on the native North American black bass (*Micropterus salmoides*) species. Black bass is a popular game fish for sport fishers, the males of the species are known for their extended periods of parental care to developing offspring which makes them more vulnerable to predation (Cooke and Schramm, 2007). Hanson et al. (2007) report that black bass males caught then released displayed behavioural changes; specifically, abandonment of the nest and the total destruction of offspring. Cooke and Cowx (2006) reported faster metabolic rates among targeted individuals of largemouth bass (*Micropterus salmoides*) enabling them to reach reproduction age and reproduce more quickly in comparison to species with lower angling vulnerability (Cooke and Schramm, 2007).

Catch and release can also have an effect on fish feeding. Studies show that fish released back into the population after being caught showed signs of reduced feeding, which either could be caused by stress during the process of catch and release, or chronic injury from the fishing method used. Delayed feeding in targeted individuals can negatively affect the growth rate of some fish as demonstrated in individual rainbow trout (*Onchorhynchus mykiss*). Such disruptions in behaviour can impact the wider population if the species is heavily targeted. Individual rainbow trout in southwest Alaska, USA showed signs of reduced feeding, which affected the growth rate of fish. However, results vary depending on the fishing method used and handling technique before release (Cooke and Schramm, 2007, Meka and Margraf, 2007).

Physiological stresses are caused by factors such as prolonged air exposure, and handling time, which can cause changes to the cardiovascular and respiratory rhythm of fish (Danylchuk et al., 2007). Physiological stresses during the process of catch and release or chronic injury from the fishing method used can affect fish feeding behaviour. Such physiological trauma could lead to the slow recovery of the fish, which may cause it to die prematurely (Danylchuk et al., 2007, Fairchild and Howell, 2004). There is substantial scientific proof that the mortality of post released fish and the related sub-lethal impacts can be minor or at least considerably lessened if the fish is correctly managed and not released when conditions are unsuitable such as caught from deep water, or in high water temperatures (Arlinghaus and Cooke, 2009, Arlinghaus, 2007, Muoneke and Childress, 1994).

2.4.4: Recreational fishing habitat disruption and pollution

Recent studies show that recreational fishing can cause environmental disturbance and pollution in a variety of ways, which differ to those caused by commercial fishing (Cooke and Cowx, 2006, Lewin et al., 2006). This section gives an overview of the potential damage caused to the wider ecological marine ecosystem as a result of recreational boating activities and fishing gear. Understanding such impacts will allow policy makers to design suitable measures to improve the long term sustainability and biodiversity of the marine ecosystem.

The use of recreational fishing boats to gain access to coastal areas and inshore fishing spots can have damaging effects on localised habitats, fishing behaviour, shoreline erosion induced by waves and a rise in the suspension of sediment which can cause disturbance to wildlife (birds) and fish (Blaber et al., 2000). Recreational fishing and boats can also cause damage to the environment through the dumping of marine debris (Derraik, 2002). Chiappone et al. (2005) and Donohue et al. (2001) consider habitat degradation to be the main threat in preventing the recovery of exploitable fisheries stocks and ecosystem health in the future. Fishing activities are known to have various ecological effects through the use of certain fishing gear in both commercial and recreational fisheries (Chiappone et al., 2005, Donohue et al., 2001).

Several ecological impacts are associated with the use of bottom trawls, nets and traps in the commercial sector. Consequently, the large majority of recreational fishers use hook and line gear to fish, especially in open access fisheries where there are no limitations on the number of boats or fishers. Lost and abandoned fishing equipment can eradicate benthic organisms and entangle both mobile and benthic fauna, including endangered species, which can end in injuries or death (Chiappone et al., 2005, Cooke and Cowx, 2006, Donohue et al., 2001, Lewin et al., 2006).

2.4.5: Fishing during the spawning period: Reproduction period disturbance

Intensive fishing activity during the reproductive period of the targeted fish populations can have ecological and behavioural consequences. Using the North Atlantic salmon species as an example, this section looks at the impacts that recreational activity can have on targeted

species. The catch and release of fish during their reproductive period, whether intentionally or accidentally, can have negative effects on individual health, success in reproduction, and recruitment of offspring (Cooke and Suski, 2005). An example of the impact of recreational fishing during the reproductive period is observed with the Atlantic salmon (*Salmo Salar*) in the Conne River, Newfoundland, Canada (Dempson et al., 2002). This species of salmon are found in the North Atlantic Ocean and in the rivers that flow into the North Atlantic. During their upriver spawning migrations, *salmo salar* is commonly targeted. Even though they are released, the species suffer from a high rate of post-release mortality due to higher water temperatures (Dempson et al., 2002). Arlinghaus and Cooke (2009) further state that if fish are caught and released shortly before reproduction, it can decrease larval size at hatch and output of offspring. In response, a number of countries protected fish by implementing close seasons during the period of reproduction (Arlinghaus and Cooke, 2009).

Implementation of a closed fishing season during the reproductive period is not always suitable as a management tool and does not always increase the reproductive output of the fish population. The success of closed seasons depends on the traits of the targeted species and whether they aggregate while breeding, which makes them more vulnerable to capture or prone to disturbance during reproduction (Arendse et al., 2007). The realisation that both commercial and recreational fishing have negative impacts on fisheries warrants collective efforts to focus on effective management approaches and conservation instead of blaming each other for the damages caused (Coleman et al., 2004).

2.5: Input vs. output controls

There is an extensive range of management tools available to fisheries managers. The majority of these tools are intended to restrict how the fisheries operate and enhance the chances that various social, ecological and economic objectives are met (Beddington et al., 2007, John, 2002). An effective management regime requires regulations to protect ecological targets which are enforceable and achievable (Beddington et al., 2007); however, achieving this can be difficult where there is partial or weak enforcement. Therefore, where management regimes fail, this can lead to increases in illegal fishing and failure to meet ecological and economic targets (Beddington et al., 2007). This section reviews the use of output controls (quotas) or input controls (effort limitation) to manage fisheries. These tools attend to a range of fishery problems such as places where fishing is allowed, who is allowed to fish, and how much catch is permitted. Charles (2002) views these controls from the perspective of use rights, defined as the rights held by fishing groups or individual fishers to use the fishery resource (Charles, 2002).

Input controls refer to restrictions put on gear use intensity. Such measures can involve control over the number of vessels permitted to fish (licencing), restrictions on size and number of fishing vessels, the time that fishing vessels are permitted to fish (season length controls), or area management (zoning) (John, 2002, MacKenzie and Cox, 2013). Input controls can also include restrictions on recreational fishing supplies such as the amount of fuel use permitted (John, 2002).

Recreational fisheries can also be limited using output controls. Output controls limit the number of fish able to be caught by individuals and groups; for example, through a TAC. In reality, however, it more accurately refers to total allowable landings because of by-catch, which is either returned to the sea or disposed of. Another example of an output control is the use of bag limits (i.e. limiting the amount of catch landed daily). Regulating by-catch can also be regarded as an output control (John, 2002). There are major problems involved with encouraging recreational fishers to comply with both input and output controls. MacKenzie and Cox (2013) argue that, even though the recreational fishing community may accept output approaches such as bag and size restrictions, they are seen by recreational policy managers as ineffective in enforcing total harvest due to the failure of restricting total fishing effort in open access fisheries. Open access fisheries place no restrictions on the number of vessels or fishers allowed access to the resource (Charles, 2002, McPhee et al., 2002), and are found in countries such as New Zealand, Australia, USA and Netherlands (Squires et al., 1995).

While it has been suggested that output controls are not effective enough as a management tool, Gardner (1995) argues that input controls are largely ineffective in limiting fishing effort since they fail to address the common pool characteristics of the resource or decrease the incentives for overcapitalisation. Moreover, input controls can give rise to misreporting and overfishing due to insufficient monitoring measures, which can undermine management objectives (Gardner, 1995). Other measures to control recreational fishing efforts might be more suitable such as a mix of input and output controls (licencing, and size and bag limits). Grafton et al. (2006) argue such controls might need to be supported by other measures such as zoning allocations to keep commercial fishing away from favoured recreational locations. Furthermore, input control methods such as limiting the number of boats or applying seasonal closures are considered to be more easily enforced than output controls such as TAC and size and bag limits.

There is general agreement within the literature that input controls are too expensive to enforce and often fail if implemented alone because they are vulnerable to effort creep (Kompas, 2005, Grafton et al., 2006, Beddington et al., 2007). Grafton et al. (2006) define effort creep as “the gradual expansion of effort” (Grafton et al., 2006:2). This is achieved by substituting unregulated effort with controlled effort through enhancing the technical capacity of the boats to fish more efficiently (Grafton et al., 2006, MacKenzie and Cox, 2013). The enforcement of policies and control of fish resources remains a major problem in recreational fisheries. Attempts to restrict efforts using input control methods have created conflict and sustained opposition from the recreational sector (John, 2002, MacKenzie and Cox, 2013). There are some success stories; for example, the Australian western rock lobster fishery in which both managers and fishers strongly promoted the use of input control measures in the form of total allowable effort. In contrast, output controls have been less favoured (Phillips and Melville-Smith, 2005).

2.6: Incorporating the recreational sector into quota management regime

Modern fisheries management was implemented to improve sustainability and economic efficiency in fisheries. In the past, fishery management focused on limiting commercial catches to ensure a sustainable level was harvested since it was accountable for the majority of fish catches, and had the largest economic contribution (Borch, 2010). The growth in the recreational sector has placed pressure on fish stocks and, therefore, increased the competition between commercial and recreational fishers for access to the resource. This has led to the acknowledgment by many fishing nations that the recreational sector needs to be included in fisheries management systems (Lindner and McLeod, 2011). Thus, it is now widely accepted that, to ensure the successful management of fish resources, decisions must be made regarding sharing the available resources between all of the competing users (Jentoft et al., 1998, Miller et al., 2010). The importance of determining suitable allocation systems that satisfy competing users, and the need for official inclusion of both recreational and commercial fishers in the decision making process is, therefore, vital (Kearney, 2002, MacKenzie and Cox, 2013, Sutinen and Johnston, 2003).

The full integration of the recreational sector into fisheries management systems is dependent on the effectiveness of the management measures placed on the sector. These measures must be adequate enough to enable policy decision makers to achieve the objectives of fishery management. These goals include sustainability and socio-economic wellbeing, and achieving the arranged catch allocation among recreational, commercial, and other user groups (Sutinen and Johnston, 2003). Sutinen and Johnston (2003) provide seven principles for enhancing the management of recreational fisheries, and are all considered important elements for the integration of the recreational sector. All principles must be implemented together as each principle enhances on the previous principle and all are connected to unlock the benefits of integrated management (See:Sutinen and Johnston, 2003: 4). These principles highlight the importance of guaranteeing equal allocation of resources between user groups. They also emphasise the significance of having strong legislative rights for fishers as well as effective measures to control recreational fishing mortality. Ensuring the management regime is decentralised to allow effective participation of recreational fishers in decision making is also considered to be an important feature for effective integration of recreational fisheries into management. Finally, ensuring the costs of recreational fishing integration do not outweigh the social and economic benefits for fishers is also considered part of the formula for effective management (Sutinen and Johnston, 2003).

Social values are one of the primary elements of recreational fishing. Therefore, it is important that fisheries management seek to balance social benefits and costs. The inclusion of recreational fisheries into fisheries management regimes vary between nations based on the socio-cultural environment, recreational traditions, the current condition of recreational fish stocks and the institutional arrangements in both management of the fisheries and in the recreational fishing sector (Borch, 2010). Management measures to actively monitor

recreational fishing mortality are also identified as important considerations for fisheries management (Sutinen and Johnston, 2003). Where fisheries management procedures offer weak or little control over recreational fishing mortality, or where the procedures would entitle one sector to take away from the entitled catch quota of another sector, then the recreational sector cannot be considered fully integrated into fisheries management (Charles, 1988, Sutinen and Johnston, 2003).

McMurran (2000) suggests the integration of the recreational sector in management could lead to two outcomes: 1) The recreational sector is given a chance to have a significant part in the management of fisheries and decision making; or 2) it could result in more restrictions being placed on the activities of recreational fishing. Recreational fishers globally are calling for their legitimate share of the resource; however, for the recreational sector to be allocated their share, they need to become a legitimate fishery stakeholder alongside commercial and government interests. This means recreational fishers need to work in agreement with the standards, rules, or principles established in a fishery (MacKenzie and Cox, 2013).

Recreational fisheries are seldom faced with the same management measures as commercial fisheries, and there are no incentives to prompt recreational fishers to implement any conservation standards for catch reporting monitoring aside from personal ethics (MacKenzie and Cox, 2013). In the majority of developed countries, contributions to sustainable fisheries management have not been required from recreational fishers (for example, in cost recovery, monitoring, and catch reporting) to the same degree as commercial fishers. With that said, they have not received the same benefit in terms of allocation rights either.

There are many reasons why recreational fishers have not been involved as heavily in management in comparison to commercial and customary sectors. A key reason is the perceived political risks associated with integrating recreational fishers in fisheries management since they make up a large number of the voting population (Borch, 2010). The lack of organisation and the large number of participants makes self-reporting and self-compliance almost impossible in places with open access fisheries such as New Zealand (MacKenzie and Cox, 2013). When governments attempt to regulate the recreational sector through licencing or other input control methods such as closed seasons or zoning, it is usually met with considerable resistance and protests from fishers who fear that their fishing rights will be reduced and their activities restricted (Borch, 2010).

Integration also requires the availability of credible data to monitor and enforce rules and regulations. Information on recreational landings is usually considered as minimum requirement for managing a fishery. MacKenzie and Cox (2013) highlight, how the lack of basic data regarding catch numbers can hinder the ability to accurately measure the effect of recreational harvest on targeted stocks or determine equitable quota allocation between user groups. Furthermore, lack of data could also hinder the fisheries policy analysis (MacKenzie and Cox, 2013). Unlike the commercial sector, access to credible data is an on-going difficulty in the recreational sector (Griffiths et al., 2010, Ihde et al., 2011, Walters and Cox, 1999). In places

where catch data does exist, creel surveys funded from license sales are usually used to collect this data (MacKenzie and Cox, 2013). Collecting this information is costly and cannot be done without funding from the resource user or government.

As mentioned previously, there are major complications involved with gaining recreational fisher acceptance of input or output management controls. Measures such as size and bag limits are usually accepted by the recreational sector; however, fisheries managers view such measures as insufficient in controlling harvest since they do not control the overall fishing effort (Beard et al., 2003, Lewin et al., 2006). Sutinen and Johnston (2003) note that, even in rare cases where the recreational sector has been allocated a TAC quota, control has not been efficient. An example of this is the mixed-use red snapper fishery in the Gulf of Mexico, which had a TAC established for each of the commercial and recreational sectors (Sutinen and Johnston, 2003). This did not stop the recreational sector from frequently surpassing their allocated TAC, and often by substantial margins during the periods from 1990-2000 (Sutinen and Johnston, 2003). A likely reason why the quota allocation system failed in terms of the recreational sector is explained by MacKenzie and Cox (2013) who argue that:

> Commercial fisheries are characterised by high catchability, low effort, and fewer fishers, whereas recreational fisheries have low catchability, high effort, and many fishers. The costs and complexity of adequately managing a quota system within such a large and diverse group of recreational fishers does not appear to be feasible.

Ihde et al. (2011) and Walters and Cox (1999) stress that the differences in management goals, objectives, harvest rights, and responsibilities between the various sectors create major conflicts between the different user-groups. Differences will always arise in mix-use fishery situations (Cooke and Cowx, 2006). For example, poor monitoring and control over the harvest rates of recreational fishers under open-access is frequently seen by the commercial sector as biased or unfair, mainly due to the fact that they have to follow stricter rules and regulations and there is stronger control on compliance with catch limits and protocols (Charles, 1988).

Exclusive use rights as a strategy in mixed-use fisheries is quickly becoming common and popular. This involves closing areas to the commercial sector to become a recreational only zone. Due to the ease of implementation, the approach is considered to be the best option for recreational fishers in comparison to individual quota and limited entry strategies (MacKenzie and Cox, 2013). Recreational only zones are more commonly applied in situations where open access is no longer a viable option (Cooke and Cowx, 2006, MacKenzie and Cox, 2013). Conflicts still occur with the commercial sector, however, who blame the government and the recreational sector for the remaining commercial fishing areas becoming crowded and having increased competition (MacKenzie and Cox, 2013). The exclusion of commercial fishers from some fishing areas will lead to increased costs and effort in order to harvest the same levels before the exclusion. Thus, it could also mean the need for new technology to increase opportunities of landing similar numbers before being excluded (MacKenzie and Cox, 2013).

Kearney (2001) suggests governments are becoming more conscious of the need for active strategies to protect the marine resources for both sustainable development and their intrinsic value as a species. Kearney (2001) also highlights the need to devolve management to user-groups by allocating them more responsibility and costs of resource management under the principle of user pays. The initial step of allocating rights to those claiming an entitlement to the resource, in this case recreational fishers, is a major challenge facing management. This is at least partly due to the diversity among fishers and lack of organisation within the recreational sector itself. Kearney (2001) suggests the quandary now facing fisheries managers is that the resource will need to be allocated to competing users: in this case non-commercial recreational fishers; however, this is difficult to achieve in the absence of principles for allocation.

Despite the decentralised and heterogeneous nature of recreational fisheries worldwide, Granek et al. (2008) claim fishers' active participation in conservation and management can happen on multiple levels. Moreover, historically, recreational fishers have contributed indirectly to aquatic conservation in open-access fisheries through permit and license sales and self-monitoring of their fishing areas (Granek et al., 2008). Granek et al. (2008) also state that the type and probability of recreational fishers' cooperation with fisheries managers and their involvement with conservation and management depends on the source of the threat to the fishery.

In circumstances where fishers are protecting the fishery from external factors such as land-based contamination, habitat destruction, commercial fishing, or invasive species, fisher involvement in conservation and policy making process can be highly influential (Granek et al., 2008). Conversely, where the source of threat is recognised by fisheries managers to be the recreational fishers themselves, the government is likely to encounter greater resistance from recreational fishers to co-operate who fear that their participation in the management system would lead to further restrictions placed upon them (Granek et al., 2008).

2.7: Co-management

The efficiency of traditional centralised fisheries management regimes to accomplish sustainable resource utilisation has been questioned and debated by scientists since many fisheries around the world remain in crisis or under pressure (Raakjear-Nielsen and Vedsman, 1996, Sen and Raakjaer Nielsen, 1996). Thus, it can be argued that the current crises in fisheries management are, to some extent, caused by a lack of legitimacy of management regimes. Government centralised regulation (including, for example, quota management, individual fishing quotas, input restriction, and limited entry) generates motives for high grading, race for fish, misreporting catches, and breaking laws (Townsend, 1995). Transferring more management responsibility to stakeholders or consulting them during the policy making process can enhance the legitimacy of fisheries management, and strengthen compliance to the already established rules (Raakjær Nielsen et al., 1997). This section considers co-management as an alternative to the centralised fisheries management approach and a move towards a more inclusive and decentralised fisheries management that promotes the active participation and involvement of user groups in the decision making process.

There is growing recognition that fisheries management is seen to be more legitimate and effective where stakeholders are actively involved in decision making (Pomeroy and Berkes, 1997, Varjopuro and Salmi, 2003). Co-management is considered a suitable approach to move away from the impersonal, bureaucratic, and insensitive centralised governmental approach to fisheries management. As an alternative, co-management promotes shared management responsibility between stakeholder organisations at the national/regional, and local levels (Jentoft et al., 1998).

Co-management is commonly misinterpreted as a non-governmental fisheries management approach or community based resource management (CBRM) (Pomeroy, 1995); however, co-management consists of varying degrees of allocation of management authority and responsibility between governmental level (national/local) and local level (community and user groups) (Pomeroy, 1995). Co-management is considered the middle course between top-down centralised fisheries management for equity and efficiency, and local level bottom-up control for self-regulation, self-governance, and active participation (Pomeroy, 1995, Pomeroy, 1998). Co-management refers to: "a range of arrangements, with different degrees of power sharing, for joint decision-making by the state and communities (or user groups) about a set of resources or an area" (Berkes, 2009:2). This definition differentiates co-management from community based natural resource management since the government is also involved in the process of decision making regarding the management of the fishery (Sen and Raakjaer Nielsen, 1996).

Co-management is viewed as a type of crisis management approach to solve fisheries overexploitation (Chuenpagdee and Jentoft, 2007, Pomeroy and Berkes, 1997, Sen and Raakjaer Nielsen, 1996). It is also thought to be a viable approach to resolve or prevent conflicts between the government and user-groups, or within user-groups, (Chuenpagdee and Jentoft, 2007, Natcher et al., 2005, Sen and Raakjaer Nielsen, 1996). This is achieved by promoting a participatory and collaborative approach to regulatory decision making among representatives of agencies, user-groups, government, and research institutions (Jentoft et al., 1998, Pomeroy and Berkes, 1997, Varjopuro and Salmi, 2003). Factors identified as important to co-management dynamics include: building leadership, vision, and trust; supporting collaborative learning; combining a variety of knowledge; monitoring the environment; and creating legislation to enable political opportunities (Folke et al., 2002, Noble, 2000, Olsson, 2004).

Co-management encompasses notions of democracy (involvement of stakeholders in decisions concerning their own livelihoods) and efficacy (to enhance compliance and decrease implementation costs) (Nielsen et al., 2004, Viswanathan, 2003). Co-management is considered to signify a more democratic governance system because it promotes the decentralisation of decision making and management tasks to user groups (Noble, 2000). It is also expected to increase the legitimacy and efficacy of fisheries management since the acceptance of measures and controls is considered to be higher when users are involved in the decision making process (Sverdrup-Jensen and Raakjaer Nielsen, 1998). Viswanathan (2003) suggests that more adequate control measures and policies are also produced due to the input of local knowledge

in the decision making process. Sen and Nielsen (1996) state that, in a perfect co-management setup, both user groups and government would collaborate as equal partners in every task within the management process.

The arrangements between government and user groups vary depending on the country's political atmosphere and the emphasis on democracy and efficacy aspects (Sen and Raakjaer Nielsen, 1996). Pomeroy and Berks (1997) and Varjorpuro and Salami (2003) direct attention towards the presence of a hierarchy in co-management approaches; in some cases, fishers are directly involved during the design, implementation and enforcement stages of the management process, while in other situations fishers are only consulted by the government before policies are presented (Espectato et al., 2012). A strictly consultative process is more aligned to a centralised government based management than co-management (Pomeroy and Berkes, 1997, Varjopuro and Salmi, 2003).

The role of user groups in co-management depends on the importance of the user group in relation to the co-management task, as well as on the opportunities and interests of user group members to speak for themselves (Varjopuro and Salmi, 2003). Well organised recreational fisher groups are more likely to have greater representation in decision making at different scales. The amount of influence a user group will gain, as well as the capacity to be effective and forceful around the decision making table, will hinge on their ability to be organised and speak with one voice (Sen and Raakjaer Nielsen, 1996).

The more fishers are able to organise themselves and coordinate their strategies, the more likely it is that governments will have regard to their claims (Jentoft and McCay, 1995). Sen and Raakjaer Nielsen (1996)) illustrate that government advisory or informative co-management occurs in conditions where the user-groups are organised and prepared to take on responsibility. With that being said, globally the vast majority of marine recreational fishers are not organised and are usually not well represented in decision making. Factors such as poorly represented or unorganised user groups, lack of empowerment and low levels of education affect the participation of the user groups in the decision making process (Sen and Raakjaer Nielsen, 1996). Sen and Raakjaer Nielsen (1996) claim that the type of co-management arrangements in non-organised user groups will most likely be instructive or consultative. User groups who are able to be more organised have the capacity to take on greater responsibilities (Sen and Raakjaer Nielsen, 1996).

Varjopuro and Salmi (2003) further argue that it may not be a crisis for the majority of recreational fishers who are not organised and don't seem interested in participating, as long as they are provided with reasonable fishing opportunities to satisfy them. For example, the interests of tourist fishers and part-time fishers can be supported by tourism businesses and other organised recreational fishing organisations that provide them with fishing opportunities. Therefore, if a tourism business is represented well in decision making, then the rights and interests of the non-local fishers are taken care of (Varjopuro and Salmi, 2003). It is important to note, however, that, although co-managed fisheries are based on an agreement between

user groups and government, these agreements can evolve over time and, thus, co-management should be considered a process rather than a steady state (Berkes, 2009, Carlsson and Berkes, 2005).

Despite all the attention and international application of co-management, it remains poorly understood (Gilmour, 2013). Co-management sceptics are doubtful about the success of co-management and question the motives and sincerity of governments to collaborate and share power (Lele, 2000, Wilson et al., 2003). Fishers and user groups have a severe lack of trust for the government and therefore initiatives to implement co-management, and decentralisation of policy making is met with considerable scepticism. Fishers and user groups identify the government as the legislation and policy setter. Thus, if the government begins to trust fishers and user groups, devolves power to them, and is satisfied with only a monitoring or advisory role, it may appear suspicious to user groups and fishers (Lele, 2000). This is because the government has usually expressed a lack of trust in fishers and user groups in managing their own resources and a sudden shift in management style can be perceived as being not genuine.

Government resource managers' lack of trust in local level management should not be interpreted as an excuse for government to hold on to power. Resource managers have viable reasons to be sceptical about the success of local level management (de Vos and van Tatenhove, 2011). Therefore, unless government and fisheries managers become convinced that fishers and user groups have the capacity and motivation to manage themselves, co- management could prove difficult to achieve (Pomeroy and Berkes, 1997). Government fisheries managers may question the capability of fishers to be organised enough to manage themselves long term in order to achieve long term sustainability. There is also scepticism around the lack of formal knowledge in resource management on the part of user groups and fishers (Charles, 1988, Pomeroy and Berkes, 1997). However, traditional or local fisher knowledge (LFK) and knowhow held by fishers, especially in traditional societies, can be highly valuable to policy making and resource management (Pomeroy and Berkes, 1997).

The ability to cooperate can be hindered by the relationship between the recreational fishing community and the science community (Conway, 2007). The poor relationship emerges from the lack of trust scientists have for recreational fishers' knowledge. Robertson et al. (2000) and Mackinson et al. (2001) argue that scientists dismiss LFK as biased and, therefore, recreational fishers' knowledge is seldom analysed or recorded, which contributes to the alienation of recreational fishers from conventional scientific knowledge. Saenz Arroyo et al. (2005) and Pauly (1995) argue that LFK can be a reliable source of information, which can reinforce fishery data collected through conventional scientific approaches. In addition for the potential for LFK to fill gaps in fisheries data (particularly regarding shortcomings in historical fisheries knowledge), scientists may also benefit from recreational fisher knowledge to assist research direction and data collection. Further, Conway, (2007) argues that recreational fisher participation in knowledge gathering and management may build stronger relationships between the recreational fishers, scientists and government. This could potentially improve the quality of future scientific knowledge, management policies and practice.

A process that involves fishers leads to greater bureaucratic legitimacy and improves the quality of regulations due to the access of more different forms of knowledge about the resource and the dispersal of consequences in regards to regulation outcomes (Conway, 2011, de Vos and van Tatenhove, 2011). Furthermore, the inclusion of both local and scientific knowledge can make co-management stronger than any CBRM and government management (Pomeroy and Berkes, 1997).

Since co-management is more focused on managing human relationships than resources, understanding the fundamental cultural conditions that shape these arrangements between different user groups is critical for the eventual success or failure of co-management (Natcher et al., 2005). Moreover, constructing an effective co-management arrangement requires degrees of compatibility between stakeholders. Such compatibility is generally based on mutual respect and trust, even when reasonably different interests and expectations exist. Thus, it is vital to promote community support in fisheries co-management and development opportunities, and it is essential that differences are overcome and commonalities in interests be found as the building blocks for consensus (Noble, 2000). This is considered vital in regards to building resilience in a social-ecological system (Olsson, 2004).

Berkes (2012) states that overall findings do indicate that co-management reduces conflict and enhances participation amongst user groups. It also enhances compliance with legislation and outcome indicators associated with economic and social benefits. The next section discusses ecosystem based management (EBM) and addresses the barriers and opportunities to implementing a more ecologically, economically and socially inclusive approach to fisheries resources and marine ecosystem management. Like co-management, EBM also considers the full integration of stakeholders in knowledge gathering and decision making as an important ingredient to achieve effective management outcomes (Appledoorn, 2011). Co-management is seen as complimentary to EBM and can be effective when combined with the learning by doing approach of adaptive management which is one of the tools used by EBM (Berkes, 2012).

2.8: Ecosystem based management

EBM is an approach that attempts to include all user groups in defining sustainable alternatives for the interaction of people and their environments. Its main aim is to sustain and restore the productivity, biodiversity, and health of ecosystems. This is achieved using an ecologically focused natural resource management approach that is entirely integrated with economic and social requirements (Szaro et al., 1998). EBM takes into consideration the interdependent nature and interconnectedness of ecosystem constituents, and stresses the significance of ecosystem functions and structures which deliver an array of ecosystem services. An ecosystem is interpreted by Odum (1969) in terms of energy and material flows as: “The ecosystem, or ecological system, is considered to be a unit of biological organisation made up of all of the organisms in a given area (that is, community) interacting with the physical environment so that a flow of energy leads to characteristic trophic structure and material cycles within the system” (Odum, 1969:1). Ecosystems are energy generating units regulated by the

availability of vital nutrient elements and water, which is controlled by climate. Energy is regarded as the fuel to enable ecological process to occur, however, the speeds at which processes occur within the ecosystem are controlled by nutrient availability (Reichle et al., 1975). Ecosystem management combines the use of scientific knowledge on ecological interactions within a composite of values and socio-political frameworks with the long term goal of protecting and maintaining the integrity of the native ecosystem (Grumbine, 1994).

The term ecosystem management is undoubtedly relevant for fisheries systems, although the concept of EBM is still in its evolutionary stage and it has no common definition or consistent application (Brodziak and Link, 2002). Grumbine (1994 cited in, Thanh, 2012:3) reviewed ten dominant working themes that authors identified as vital for the successful implementation of EBM. These themes are: “hierarchy, ecological boundaries, ecological integrity, data collection, monitoring, adaptive management, interagency co-operation, organisational change, humans embedded in nature, and values. These ten dominant themes formed the basis for a working definition”(Thanh, 2012:3). In theory, EBM is an integrated approach that manages the ecosystem in a holistic manner with all its complexities. The strength of EBM lies in its ability to instantaneously explore all the spatial and temporal interactions among cultural, social, environmental and economic factors that could impact an ecosystem, and to create the optimal solution for the health of the marine ecosystem for current and future generations (Leslie and McLeod, 2007).

EBM emerged because of concerns that conventional management had failed to sustainably harvest fish resources, and that a more holistic approach to understanding how ecosystems operate was required (Berkes, 2012, Curtin and Prellezo, 2010, Leslie and McLeod, 2007). There are two primary reasons why EBM is preferred over the conventional approach to marine fisheries management. Firstly, there is substantial evidence that ecological interactions in ocean and coastal systems are vital to the health and resilience of the marine ecosystem. Therefore, the disruption of those interactions will consequently cause decline in the ability of coastal and marine systems to recover (Leslie and McLeod, 2007). Secondly, conventional management focuses solely on specific sectors or species of interest without consideration to the rest of the ecosystem (Norse, 2010). Globally this approach has not been able to sufficiently sustain ocean and coastal resources (Leslie and McLeod, 2007).

The disconnected sectoral management of oceanic activities (e.g. fishing, tourism and shipping) under the conventional approach creates fragmentation, as well as temporal and spatial mismatches. Agencies managing different sectors in the same zone will largely overlook the desires of other sectors (Norse, 2010). Curtin and Prellezo (2010) argue that these activities create stresses on marine ecosystems through, destruction of habitats, pollution and eutrophication. These factors exert incremental impacts on the entire ecosystem and thus, managing these activities separately is seen as inadequate and outdated (Curtin and Prellezo, 2010).

The way EBM is designed allows for the consideration of the drivers and impacts on the environment as a whole as well as factors outside the domain of ecology (Berkes, 2012, Curtin and Prellezo, 2010). This can be achieved by widening the scope of conventional resource management and moving towards a broader frame of governance to deal with marine ecosystems in an integrated fashion. This would enable the consideration of a broader range of social-ecological, human, and environmental factors, rather than just ecosystems (Berkes, 2012, Curtin and Prellezo, 2010). Thus, it is considered to be an evolutionary rather than a revolutionary change to current fisheries management, since there is no suggestion of the abandonment of the conventional fisheries approach (Francis et al., 2007, Marasco et al., 2007). Marasco et al. (2007) further highlighted that EBM should be regarded as an incremental extension to fisheries management and not a replacement.

With increasing interest in EBM, more policy makers are incorporating the concepts of EBM into management procedures and plans. Research by Arkema et al. (2006) shows scientific ecological and economic principles of EBM are only loosely incorporated into policy actions and plans, with only few principles being put into practice (Arkema et al., 2006). This highlights a gap between scientific concepts and the interpretation of those concepts into management plans, which need to be more effectively translated if EBM is to be implemented effectively (Arkema et al., 2006). Arkema et al. (2006) evaluated whether the scientific interpretation of EBM is consistent with management practice. This is achieved by identifying the gaps in translation of EBM principles into management plans and actions. By reviewing definitions to identify the relevant criteria for implementing EBM, Arkema et al. (2006) grouped the specific criteria under three major groups: ecological, management, and socio-economic or human aspect.

The purpose of the ecological criterion is to focus on multiple features of the complexity of the ecosystem, including the structure, composition, and the function. This will help in recognising the ecological processes occurring on a variety of spatial and temporal scales. The human dimension criterion is designed to integrate stakeholders and economic factors into the ecosystem management process. Finally, the management criterion discusses the various management strategies that can be beneficial to EBM such as co-management, spatial zoning, marine protected areas, and adaptive management approaches, as well as using technology and science (Arkema et al., 2006, Curtin and Prellezo, 2010). Although other EBM criteria or principles were provided by other authors (see: Francis et al., 2007, Leslie and McLeod, 2007), Arkema et al. (2006) and Curtin and Prellezo (2010) argue that the principles provided by other authors were too general and did not specify EBM concepts well enough for implementation. Arkema et al. (2006) and Curtin and Prellezo (2010) suggest that if such general criteria is used, it could be difficult for managers to quantify any progress made towards the management objectives. The three specific criteria groups discussed by Arkema et al. (2006) and Curtin and Prellezo (2010) will be touched on briefly (see: Table 2.1) before discussing the implementation of EBM and the challenges faced.

Ecological Criteria	
Complexity	Acknowledges the complex interwoven structure and function of the ecosystem; for example, prey-predator, food chain structure, biotic and abiotic. The focus of management is the entire ecosystem rather than a single targeted species or sector. Also recognises that the legal, economic and social dimensions of resource management are not enough to accomplish sustainable outcomes in the absence of a strong understanding of ecology.
Temporal Scale	Integrates temporal scale and addresses the complex and dynamic structure and function of marine ecosystems.
Spatial Scale	Acknowledges that marine ecosystem life and processes operate over large spatial scales, which includes taking into account the migratory behaviour of some marine species.
Management Criteria	
Adaptive approach	Acknowledges adaptive management as a way to integrate feedbacks from ecosystem monitoring. This allows for the adaptation of management policies to enable work from new understandings or changing circumstances.
Boundaries and interdisciplinary knowledge	Management initiatives must be spatially defined and integrated in a manner that enables the use of scientific knowledge from different sources.
Precautionary approach	Recognises that expanding management to encompass the entire marine ecosystem would require a wider range of ecological data. Emphasis given to precautionary techniques and adaptive management to compensate for insufficient data.
Technological	Incorporates the use of control measures and industrial technology to manage user groups. These include MPAs, co-management, season closures of fishing grounds, and the prohibition of certain fishing gear or harvesting methods.
Co-management	Promotes the sharing of management responsibilities and decision making between user groups and government.
Socio-economic Criteria	
Ecosystem goods and services	Recognises the interconnectedness and interdependencies of humans and ecosystems. As such, humans are a vital part of ecosystems.
Economic	Acknowledges that the relationship between socio-economic and biological systems is essential to the success of management.
Stakeholder	Recognises the characteristics of each user group are important for future conservation and management schemes.
Science-based	Promotes the integration of stakeholders into the decision making process through co-management to promote and improve trust and relationship building. This can help to incentivise sustainable behaviour among users, including recreational fishers, and improve compliance.

Table 2.1: Criteria for the effective implementation of EBM

Sources: (Arkema et al., 2006, Cooke and Cowx, 2006, Cowx and Gerdeaux, 2004, Curtin and Prellezo, 2010, Francis et al., 2007, Gaichas, 2008, Garcia and Cochrane, 2005, Garcia, 2003, Hilborn, 2007, Hughes et al., 2005, Johannes, 1998, Lauck et al., 1998, Marasco et al., 2007, Pereira and Hansen, 2003, Pikitch et al., 2004, Varjopuro and Salmi, 2003).

2.8.1: Implementation of Ecosystem Based Management for fisheries.

According to Leslie and McLeod (2007) there are four main problems that need to be solved to implement EBM successfully. The first is the need to define a common vision between all the different stakeholders in marine EBM to identify the different interests among stakeholders to find a common ground. This may prove difficult, however, because of temporal and spatial scales. Secondly, it is necessary to establish appropriate governance frameworks, institutions and organisations to represent the different sectors and to assist in co-management and collaboration efforts, as well as to monitor the implementation of policies and set guidelines of what activities are deemed acceptable. Thirdly, Leslie and McLeod (2007) identify the need to identify examples of successful ecosystem based approaches with visions grounded in EBM and if these measures have actually led to improvements in fisheries management. Finally, the need for the appropriate indicators and management tools in order to measure progress and the successful implementation of adaptive measures (Cury et al., 2005).

The successful implementation of EBM requires that fisheries' goals are definite and clear, and appropriate indicators and tools are available to measure progress and monitor outcomes (Curtin and Prellezo, 2010). Moreover, stakeholders need to be involved throughout the planning and the implementation stages of EBM to ensure that all interests are taken into consideration. Furthermore, Cury et al. (2005) acknowledge the significance of adaptive management and continuous monitoring to ensure that objectives are continuously updated. Different tools should also be examined to allow for the best combination of tools in a particular fishery (Curtin and Prellezo, 2010).

2.9: Conclusion

The rise in recreational fishing participation over the last century has increased the stress on fisheries resources and increased competition amongst other fishing sectors. This has made many policy makers and scientists pay closer attention to the significance of recreational fishing and the need to manage it more effectively. Until recently the majority of research completed on fisheries has focused on the commercial sector. This chapter explored the difficulties associated with managing and integrating the recreational sector into fisheries management. Some of these difficulties are caused by the lack of data and knowledge on recreational fishing motivations, social and economic contributions, and ecological impacts.

This chapter accentuated the need to acknowledge the diverse and complex structure of the recreational sector, which involves understanding their motivations for fishing, their impacts, interests, and fishing behaviour. Understanding all these factors could help fisheries management to improve the future long term sustainability and health of the fisheries resources and marine ecosystems by producing better science, policies, and practice. As part of enhancing future fisheries management, it was argued that more flexible and holistic approaches of managing the ecosystem are needed. This chapter emphasised the need to shift

away from conventional fisheries management, which focuses on single species or a sector of the ecosystem while discarding the rest, and move towards a system that is inclusive of all economic, social and environmental factors. In theory, an ecosystem management approach is designed to promote integration of stakeholders in decision making and managing the ecosystem with all its complexities and variability. Implementing such a marine management plan could prove difficult and costly since there are many different interests going after the same resource and competing for the same patch of sea which creates conflicts between competing sectors.

The following chapter presents the context of the research including: background of recreational fishing in New Zealand, quota management system and the reform process. This outline also provides a background of the case study area (Hauraki Gulf), and the impacts caused by fishing activities in the Hauraki Gulf.

Chapter 3 Context

This chapter seeks to characterise the importance of the Hauraki Gulf region as an economic, lifestyle and conservation hub for New Zealand. More specifically, the objective in this chapter is to highlight the importance of the Hauraki Gulf for the fisheries sector, and the pressure caused by fishing and other marine and offshore activities in and around the Gulf region. A review of the historical trajectory of fisheries management in New Zealand, which ultimately led to the development of the 1986 neoliberal property rights regime present today, is carried out. Particular attention is given to the recreational fishing sector and its role within the QMS.

3.1: Quota Management System and the recreational sector

As noted in Chapter 1, recreational fishing holds an important cultural value in New Zealand. A substantial number of people from a variety of social and ethnic backgrounds participate in recreational fishing each year (Lock and Leslie, 2007). It is estimated that nearly 20% of the population participate in recreational fishing at some stage every year, whether it is occasionally or on a regular basis, with an average recreational sector catch of 2500 tonnes annually (MPI, 2014, Ministry for Primary Industries, 2010). Indications are that participation in recreational fishing is increasing (Borch, 2010). Reasons for the increase in participation include the recent increase of Asian immigration, marine tourism, and increasing free time for leisure (Borch, 2010). Recreational fishing is also closely linked to the boating culture in New Zealand, with estimates indicating 19% of the country's households are boat owners.

Research shows that the majority of recreational fishers in New Zealand consider the opportunity to go out fishing is a birth right and not a privilege (Borch, 2010). Moreover, in addition to its cultural significance, recreational fishing also provides some economic benefit. The annual expenditure of recreational fishers to catch the five major targeted species was estimated to be $973.15 million annually (Lindsay et al., 1999). This is based on the number of individual participants and the amount they spent on consumables, fishing gear, equipment and services (Lindsay et al., 1999). It is acknowledged, however, that calculating the economic value of recreational fishing is difficult. To some degree this is due to the wide variety of factors motivating recreational fishers to fish, and also because of the differences in how fishing activities are undertaken (Hickley and Tompkins, 1998, Kearney, 2001).

New Zealand fisheries, including the recreational sector, are managed by the Ministry of Primary Industries (MPI) using a quota management system (QMS). The MPI sets a total allowable catch (TAC) for all commercially targeted species under the QMS. The TAC is divided between the different fisheries sectors (commercial, customary, and recreational). The commercial sector is allocated through individual transferable quota (ITQ) to individuals or

commercial fishing companies to harvest their share of the total allowable commercial catch (TACC) of a particular stock. The recreational and customary shares of the TAC are not assigned as a fixed quota but, rather, as allowances, with the customary allowance allocated first (Morgan, 2011, Straker et al., 2002, Walrond, 2012). The Minister of Primary Industries uses their discretionary judgement in setting TACC and the subsequent allowance for the recreational sector (Borch, 2010, Morgan, 2011). Neither the commercial nor the recreational sector can have priority over the other (Borch, 2010, Hersoug, 2002, Morgan, 2011). Individually, recreational fishers are free to carry out their fishing activities in the sea as long as they abide by all the legislative conditions relevant to recreational fishing and do not sell their fish for profit (Borch, 2010, McMurran, 2000). Recreational fishers can also use a variety of fishing gear and bag limits are more than sufficient. It has been argued (Morgan, 2011) that the enforcement of recreational fishing activity is limited due to the government's restricted capacity to monitor compliance to regulations.

In 1986, the QMS was established to address overharvesting and overcapitalisation in New Zealand's inshore fisheries (Borch, 2010). The QMS was considered a reformist regime that included the adoption of legislative fishing rights, output controls, and allocation of ITQ (Borch, 2010). Due to the revolutionary nature of the QMS, many legislative and operational changes were applied in the first years after implementing the system (Lock and Leslie, 2007). The failure of the QMS to address the political and social rights of Maori led to a lengthy court process between Maori and the Crown (Lock and Leslie, 2007), which led to the government providing for indigenous Maori rights to customary fishing under the Treaty of Waitangi in the Fisheries Act (Bess and Rallapudi, 2007, Hersoug, 2002). The general focus during the first years after the implementation of the QMS was on both the commercial and customary sectors. The recreational sector was allocated few resources since it wasn't seen as a major threat to the decline of fish stocks in comparison to the commercial sector (Hersoug, 2002). Recently, however, the recreational sector has come to be seen as a significant harvester of fisheries resources (Morgan, 2011).

The recreational sector in New Zealand fisheries came to be seen as the 'forgotten sector' in the first decade following implementation of the QMS (Morgan, 2011). As a consequence of the new rights-based management regime, recreational fishers were forced to fight for their rights on two fronts: the commercial sector and the customary sector (Hersoug, 2002). At the same time, recreational fishers were faced with dwindling stocks of their major targeted species.

In 1989, the Ministry of Fisheries (MoF) released the National Policy Document for Marine Recreational Fisheries to address some of the issues arising in the recreational sector (Option4, 2014). In this document, the then Minister of Fisheries, Colin Moyle, stated that, in a situation where the targeted fish stock is at insufficient levels to support both commercial and recreational sectors, the recreational sector will have priority. This came to be known as Moyle's Promise. Regrettably for the recreational sector, this strategy was never implemented due to the potential economic consequences such an approach could have on the commercial sector (Hersoug, 2002). In the 1990s the government initiated the process of incorporating the recreational sector into the QMS. This move by the government led to protests by the recreational sector, who were

concerned that the integration of their sector into the QMS regime would lead to significant limitations of their activities (Borch, 2010). The frustration from recreational fishers regarding the dismissal of Moyle's Promise and the government's attempt to integrate them led to the creation of a dedicated task force to research more effective approaches to manage the recreational sector.

3.2: The history of option4

In August 1991, the Minister appointed the Fisheries Task Force to review all fisheries legislation and develop an integrated, coherent, and practical management regime. The Task Force provided a comprehensive analysis of the recreational sector in comparison to both the customary and commercial fisheries sectors. It highlighted the threats to fish stocks from both commercial and customary sectors, as well as the growing number of recreational fishers armed with more sophisticated fishing gear and more powerful boats. The Task Force viewed the recreational sector as "strong in claims but weak in rights" (Hersoug, 2002:88). In order for the recreational fishers to have stronger rights, the Task Force submitted four suggestions as demonstrated in the grid below:

	Government Control	Recreational Control
Allowance of TAC	Government allocated allowance under government control and monitoring	An allowance allocated by the Minister under recreational control and monitoring
Allocated share of TAC	An allocated fixed share under government control and monitoring	An allocated fixed share of the TAC under recreational control and monitoring

Table 3.1: Grid showing the four suggested options by the Fisheries Task Force (Hersoug, 2002, Borch, 2010).

The Task Force presented an "allocated share under recreational control" (Borch, 2010:658) as the favoured option for the government to consider, and stated that this would enable the recreational fishers to manage their own stock and to exchange quotas with the commercial fishing sector (Borch, 2010, Hersoug, 2002). If implemented, this would allow for the possibility of adjusting the quotas in case of increased fishing pressure. Moyle's Promise was brought up again by the Task Force as one of their recommendations; however, it was never reflected in law.

Recreational fishers rejected the Task Force's suggestions regarding the fixed quota proposal and voiced their anger to the Minister of Fisheries. The political backlash and protest by the recreational sector led the MoF to shelve the entire issue in 1993 (Borch, 2010, Hersoug, 2002). Fishers were worried that a fixed quota would cause their bag limits to be reduced if fish stocks were under pressure. It was not until 1997, when the High Court handed down its judgement on the relationship between different fisheries, that the recreational fisheries issue was placed back on the table. The High Court provided privileges to the Minister of Fisheries to use discretionary

judgement concerning the recreational allowances. The High Court also advised the Minister to consider introducing further control measures to manage the growing recreational sector (Borch, 2010, Hersoug, 2002, Sharp, 1998).

During the yearly New Zealand Recreational Fishing Council (NZRFC) symposium in 1998, the MoF put out a challenge to the NZRFC to work closely with the government to gather information regarding the public view on recreational fisheries management and rights. This led to the formation of the Joint Working Group (JWG), formed as collaboration between the NZRFC and the MoF. The JWG outlined a vision for achieving sustainability within the recreational sector by 2010 following an investigation into the existing management approach for recreational fisheries. JWG highlighted the importance of establishing the direct involvement and integration of the recreational sector into fisheries management (Borch, 2010). Three options were provided to enhance the management of recreational fishing (Borch, 2010, Hersoug, 2002). These were: to retain a discretionary share; to establish an on-going proportional share; and, to establish proportional shares and a recreational management group. The three options suggested by JWG are outlined following Sharp (2005) in Table 3.2 below.

	Description
Option 1	Under this option, spatial management would be achieved through fisheries management plans. Government would continue to provide management services, in which the Minister allocates an allowance for the recreational sector after the TAC is fixed for each targeted fish species under the QMS.
Option 2	This stipulates the allocation of a proportion of the TAC to the recreational sector. The recreational allocated share will vary depending on the fluctuations in the TAC. New coastal zones will also be established to provide access for recreational fishers. Under this option the government would continue the management of the recreational sector.
Option 3	This option outlined a clearer definition of recreational rights in law. The day to day management of the recreational fisheries shared between the government and recreational groups. This option required recreational fishers to accept licencing in order to fund management costs.

Table 3.2: The Joint Working Group (JWG) suggested options to government (Sharp, 2005)

The MoF (2000) Soundings Document presented the three options suggested by JWG in response to recreational fishers' concerns that they were left out of the QMS. While most recreational fishers remained quiet and passive regarding the three options suggested, a group of organised recreational fishers voiced their objection to the three options, which led to the formation of the option4 group (Option4, 2013b). Option4 claimed the JWG suggestions presented in the Soundings Document provided a set of biased and defenceless assumptions about the relationship New Zealand citizens have with the marine environment, and their right to fish (Option4, 2013b).

Option4 rejected both the idea of a discretionary share (Option 1) and a fixed quota (Option 2). They argued that the goal of the government allocating a discretionary share (Option 1) of the fisheries to the public would mean the fisheries would be removed from public ownership and entrusted into private owners (Borch, 2010). They also argued that the proposal of a fixed quota (Option 2) would not be adequate to handle the future rise in population growth and enthusiasm for recreational fishing (Borch, 2010). Thus, the public would have to restrain themselves to stay within that overall quota limit. This would lead to bag limits being constantly altered and decreased and, eventually, the bag limits would be so low it would not be worth going fishing (Option4, 2013a). Option 3 proposed the introduction of license purchases to support and fund the formation of a recreational sector organisation that would organise recreational fishers to better serve their interests, as well as contribute to the costs of overall management. Option4 rejected this option claiming recreational fishing was a birth right of all New Zealanders, and that every individual should have free access to fish for now and future generations (Option4, 2013c).

The purpose of option4 was to ensure all recreational fishers were considered in management decisions. In response to the Soundings Document, the group provided four options they thought represented the rights and needs of the recreational sector. These are provided in Table 3.3 below. Option4 requested these options be implemented into legislation.

Option 1	"A priority right over commercial fishers for free access to a reasonable daily bag limit to be written in legislation".
Option 2	"The ability to exclude commercial methods that deplete recreationally important areas".
Option 3	"The ability to devise plans to ensure future generations enjoy the same or better quality of rights while preventing fish conserved for recreational use being given to the commercial sector".
Option 4	"No licensing of recreational fishers".

Table 3.3: Alternative options provided by option4 to government. Source: (Option4, 2013b)

Option4 urged the recreational fishing community to submit their objection to the 2000 Soundings Document and the options therein. Option4 claim 98% of the submissions from the recreational fishing community voted against the three options in the Soundings Document, and in favour of the four alternative options suggested by option4 as above. Due to the inability to reach an agreement, negotiations over the Soundings Document were dropped. Despite the fact that an agreement to the options given by the government would have provided recreational fishers with a greater amount of property rights, the recreational fishers represented preferred to rely on their political leverage of their large voting population instead (Yandle, 2007).

One of the major points of disagreement between the Ministry and option4 in the Soundings Document reform process was over priority rights. Option4 argued that the public right to fish should take priority over commercial catch (Option4, 2013a). The group also wanted the priority right to be enshrined in law. In addition to their priority right request, they also demanded that the commercial sector be excluded from recreationally important fishing areas. The likelihood of the New Zealand Government accepting the priority right for recreational fishers over commercial fishers was low due to the strong focus of the New Zealand economy on economic growth and export (Borch, 2010).

3.3: The formation of LegaSea

After more than 10 years, option4 was replaced as the main representative of recreational fishers by LegaSea (LegaSea, 2013a). LegaSea is an organisation developed by the New Zealand Sport Fishing Council. LegaSea's goal is to ensure the vision of healthier fish stocks for future generations in New Zealand is protected. The current immediate threats identified by LegaSea on the recreational sector are summarised in Table 3.4 below.

1) "A passive and silent public that is vulnerable to being a victim of government and commercial sector plans to increase export of fish."
2) "The reduction of bag limits to subsidise exports."
3) "The push towards a constitutional organisation to manage and restrain recreational fishing activities. The organisation will be supported financially by introducing compulsory license fees to support its sprawling bureaucracy."
4) "Degradation of inshore marine ecosystems."

Table 3.4: Issues with recreational fishing as identified by LegaSea (LegaSea, 2013b).

The current objectives of LegaSea are focused on conservation of fish stocks and the environment. One of the objectives is to ensure conservation of fish stocks, to which the recreational sector is seen to play an important role. Another objective is focused on reducing the use of inappropriate fishing methods that lead to the killing of juvenile fish. The last objective is targeted at the commercial sector and the banning of bottom trawling in habitats of special significance (LegaSea, 2013b).

In 2013, the MPI announced plans to reduce the snapper bag limit in the Hauraki Gulf. MPI claimed the snapper stock levels in Snapper 1 (covering the Hauraki Gulf to the top of the country) to be unsustainable (Durrant, 2013). Recreational interests labelled this proposed change as outrageous and unfair (Pearl, 2013). A full consultation process initiated by the Minister of Primary Industries, Nathan Guy, took place in July 2013 to discuss the changes to the recreational and commercial limits in the Snapper 1 area. The limit in Snapper 1 for recreational fishers was nine snapper per person, with each fish over 27cm in length. LegaSea expressed concerns that the new regulations would unfairly penalise the public trying to catch fish for their family (Pearl, 2013). This argument by LegaSea was very similar to the one used by option4. LegaSea spokesman Trish Rea blamed the decline in fish stock on the by-catch of the commercial sector, and expressed concern that the cuts in catch limits would be solely focused on the recreational sector (Ireland, 2013, Pearl, 2013). Despite the concerns and arguments presented by LegaSea, the Minister decided to reduce the snapper bag limit to 7 fish, each at least 30cm in length.

3.4: Evaluation of the QMS

The establishment of the QMS in New Zealand has led to the reversal of unsustainable stock trajectories, marked up economic exports, created more jobs and investment, and improved productivity of industry (Gibbs, 2007). Nevertheless, in spite of the success of the QMS in ending the race to fish for the majority of the marine fisheries and reducing overfishing, there are still problems that must be addressed. This includes the need to integrate recreational fishing into the management regime, and integrated ecosystem management instead of single species management. This section discusses the economic, environmental and social improvements and conflicts caused after the introduction of the New Zealand QMS.

3.4.1: Economy

The QMS was implemented in New Zealand during a period of economic difficulty, which led the government to undertake a series of economic reforms to address the worsening economy (Morgan, 2011). The objective of the QMS was to improve the value and productivity of the fishing industry, and to reduce fishing capacity. Part-time and small scale commercial fishers, defined as those who did not receive 80% of their annual income from fishing, were given two options: either sell their quota and leave the industry, or buy more quota. This resulted in around 3000 fishers (approximately 46%) leaving the industry (Connor and Shotton, 2000, Stewart et al., 2006, Straker et al., 2002). This helped reduce the fishing capacity and decreased the number of commercial vessels in the water by 53% between the mid-1980s and mid-1990s (Morgan, 2011).

The political and economic changes that occurred in New Zealand, whereby market forces were seen to provide answers to social and economic concerns, affected the perceived options available for managing fisheries (Bess, 2006). Compared to economic considerations, conservation received little attention in the context of the QMS. Where conservation was considered, this was in terms of the need to safeguard the long term sustainability of the resource rather than the long term sustainability of the marine ecosystem (Morgan, 2011).

Since the implementation of the QMS and the reduction of fishing capacity, export earnings of New Zealand catch has gradually increased and currently stands at NZ$1.57 billion (Statistics New Zealand, 2013). The QMS does, however, have some shortcomings. Even though biological status has improved for some species, many deep water species are not managed in the most profitable way (Aranda and Christensen, 2009). This is mainly due to the lack of knowledge about impacts on fisheries, particularly where there has been heavy exploitation. This is evident in the orange roughy species' in Challenger Plateau where the fishery was heavily exploited in the 1980s due to the underestimation of the species slow reproductively rate (Clark, 2001, Morgan, 2011).

The QMS has helped to raise the value of New Zealand's seafood exports by preventing the race to fish while contributing to the economy. This allows fishers to focus on enhancing the value of product, reducing fishing costs to increase profitability (Grafton et al., 2006), and to contribute to fisheries management costs (Aranda and Christensen, 2009). The commercial quota value is now calculated to be around NZ$4 billion (Seafood New Zealand, 2013). The value of the commercial quota is a strong measure of the economic success of the QMS and the overall health of the stock (Aranda and Christensen, 2009, Morgan, 2011).

3.4.2: Environment

The QMS has helped to repair the ecological status of fisheries resources (Bess and Rallapudi, 2007). The regulatory procedures incorporated in the Fisheries Management Act 1996 provide multiple stages of protection of the marine ecosystem (Ministry of Primary Industries, 2007). The purpose of the Fisheries Act is to ensure and cater for the sustainable utilisation of fisheries resources, which involves mitigating, remedying, or avoiding the negative impacts caused by fishing (Bess and Rallapudi, 2007).

As noted above, the QMS has been mainly successful at curtailing and, in some situations, overturning the declines of stocks through setting catch limits and reducing fishing capacity (Gibbs, 2007, Morgan, 2011). This has resulted in large reductions in over-capitalisation in some areas of the inshore fisheries (Gibbs, 2007). The QMS also introduced the deemed value system to prevent disregards and dumping of unwanted stock, and also to prevent fishers from fishing over their quota limit (Aranda and Christensen, 2009). While the QMS provides some incentives for commercial and customary fishers to look after fish stocks, there are no incentives to look after the environment unless it can be proven that it has effects on the health of fish stocks (Wallace and Weeber, 2005). Moreover, the loosely defined right of the recreational sector provides no incentive or benefit for recreational fishers to look after the resource since the reward of any conservation effort may not be enjoyed by recreational fishers. This suggests that there is still a race to fish from the perspective of recreational fishers in some inshore stocks (Morgan, 2011, Option4, 2013c, Sharp, 2005).

3.4.3: Equality between user groups

Conflict between institutions and user groups is a common occurrence in a bio-socio-economic system such as a fishery (Charles, 1992). The complex and dynamic nature of a fishery, with its various interactions amongst humans, natural resources, and institutions, can give rise to disputes both internally and externally (Bennett and Neiland, 2014, McClanahan et al., 2013, Murshed-e-Jahan et al., 2014). Internal conflicts typically arise over limited fish stocks, the allocation of quota rights and benefits, and the management structure between fishers and management regimes. At the same time, external conflicts are also a common occurrence in the management of a marine environment. Competing sectors such as tourism, aquaculture, and farming regularly vie for access to marine spaces and fish habitat. Competition between different user groups for access to a resource is considered to be the main reason for the

increase in utilisation pressure, and tends to result in competing sectors blaming each other for the impacts (Charles, 1992).

New Zealand's experience with the QMS illustrates the importance of rights. As discussed above, failure to clarify recreational fishers' rights or assign them an adequate allocation can lead to conflict between user groups, and loss of trust with the government's policy making process. Much of the conflict between the fishery sectors has occurred as a result of the failure to initially specify and provide for the rights of the customary and recreational sector during the implementation process. McMurran (2000) highlights that for sustainability to be achieved within any fisheries management system, the rights and impacts of all fishing sectors have to be taken into account. Aligning all the management systems used for different user groups can be difficult, since each sector have differing objectives and mechanisms that are available in each system (McMurran, 2000).

A current problem within New Zealand fisheries is the competition for resource access between the recreational and commercial sectors. The conflict concerning allocation of rights and the importance of including the recreational and commercial sectors in decision making has been generally acknowledged (Bess and Rallapudi, 2007, Kearney, 2001, Sutinen and Johnston, 2003). Consequently, the creation of additional mechanisms within the QMS could facilitate management collaboration between recreational and commercial sectors.

3.5: Background of Hauraki Gulf region

The Hauraki Gulf is a highly productive and diverse 4,000km^2 coastal marine feature located on the north-eastern coastline of the North Island (Chang et al., 2003, Hauraki Gulf Forum, 2010, Zeldis et al., 1995), with immense lifestyle and conservation value to New Zealanders (Bercusson, 2008). Before human arrival, the Hauraki Gulf was highly productive and had diverse marine life. The inshore shallow sheltered waters provided exceptional nursery zones for juvenile fish, while large schools of fish used the deeper waters for congregating and spawning (Hauraki Gulf Forum, 2010). The extensive range of marine life was sustained by expansive kelp forests, mussel beds and sprawling sea grass meadows. The Hauraki Gulf habitat also supported a broad range of wading and sea birds, including migratory birds from the northern hemisphere, as well as schools of whales and dolphins which regularly visited the area (Hauraki Gulf Forum, 2010).

Since the arrival of humans, the Hauraki Gulf has been continuously fished with Maori settlers fishing the area for sustenance, trade and ceremonial occasions. The arrival of European settlers led to the establishment of a thriving commercial fishery in the Hauraki Gulf. The introduction of more advanced fishing methods in the early 1900s provided the tools required for bulk fishing, which soon led to the depletion of fish stocks and damaged fragile marine habitats (Hauraki Gulf Forum, 2010).

The Hauraki Gulf continues to support a substantial commercial fishery, a growing number of customary fishers, and recreational fishers. The Hauraki Gulf contains New Zealand's largest commercial port and many other important harbours (Cassels-Brown, 1997). Moreover the Hauraki Gulf's marine resources continue to be of great significance to local iwi (tribes) and hapū (sub-tribes). The popularity of recreational fishing in the Hauraki Gulf is exemplified by the high levels of activity on weekends and holidays. Bercusson (2008) highlights that on a typical Saturday, Sunday or public holiday in the Hauraki Gulf harbour sees up to 1,000 recreational boats used for fishing. It has been estimated that recreational fishers were responsible for fishing 1,345 tonnes of snapper, 95 tonnes of kahawai, and 2 tonnes of kingfish during the seasons of 2004/2005 (Hauraki Gulf Forum, 2011). It is also important to note, however, that recreational fishers are not required to provide any information on their catch. Data is usually collected using a combination of boat ramp surveys, aerial surveys, and phone surveys to estimate these numbers (Hauraki Gulf Forum, 2011).

Fishing takes place in most places around the Hauraki Gulf, with regulations governing how, where and when fishing can occur. For example, regulations manage where trawling can occur, the time of trawling, as well as the size of the vessels that can be used for trawling. In recent years, trawling has been limited to the outer and central areas of the Gulf, in contrast to commercial long-lining which is more widely spread (Hauraki Gulf Forum, 2011). Recreational fishing efforts are extensively concentrated along the coast, with the largest concentration of activity in Rangitoto Channel, Kawau Bay, Wilsons Bay, Motuihe Channel, around Tiritiri Matangi and Pakatoa islands, and in the Motukawao and Motuoruhi island clusters north of Coromandel Harbour (Hauraki Gulf Forum, 2011). Just off Coromandel's harbour, a pair of islands called Cow and Calf are considered to be prime spots for fishing and diving (Cassels-Brown, 1997). Diving is another common form of recreational fishing, which mainly targets species such as scallops and crayfish. While the majority of recreational fishers prefer diving methods to access the scallops and crayfish, there are some who choose to use pots and dredges. Other species targeted by divers include green-lipped mussels and kina. Spear fishing is also a method for catching fish, and is usually used to target butterfish, kingfish, and john dory. Long lining has also become popular among recreational fisheries recently, and is being used to target kahawai, snapper, trevally and gurnard. Trawling methods used by game fishers have also seen a renaissance last few years, being used to catch swordfish, tuna, and marlin.

In the commercial sector, finfish are mostly harvested by bottom trawling, bottom long-lining and Danish seining, which in total delivered between (85%-90%) of the combined catch of kahawai, tarakihi, snapper, john dory, gurnard, pipi, crayfish, cockles, and trevally from 2007 to 2010 fishing seasons. A smaller quantity of the fish catch is acquired by set netting, which is mostly used to target parore, flatfish and mullet (Hauraki Gulf Forum, 2011).

3.6: Impacts caused by activities in Hauraki Gulf

The Hauraki Gulf's location and proximity to dense population centres increases pressure on the marine ecosystem (Cassels-Brown, 1997). This is due to population growth, economic

growth, and urbanisation which have been identified as the main driving forces of change in the Hauraki Gulf (Hauraki Gulf Forum, 2008). The growth in these areas is likely to be responsible for the large amounts of both recreational and commercial fishing in the Hauraki Gulf. However, the Hauraki Gulf is not only threatened by overfishing. It is also threatened by many other factors including, animal pests, siltation, weeds, sedimentation, natural disasters, habitat loss, and pollution, some of which are due to the increase in population in locations in the vicinity of the Hauraki Gulf.

Recreational fishers cause increasing pressures on intertidal shellfish species from targeted hand gathering (Hauraki Gulf Forum, 2011). The severest impacts are caused near urban areas in and around the Coromandel Peninsula and Auckland. Major species targeted by hand are cockles, pipi, and mussels. Almost all intertidal shellfish species found within the Hauraki Gulf are collected. There are also signs of heavy decline in the populations of cockle, rock oyster and pipi, due to overexploitation by recreational fishers (Bercusson, 2008, Hauraki Gulf Forum, 2008).

Commercial fishing within the Hauraki Gulf, including the eastern part of the Coromandel Peninsula, harvested an average of 6816 tonnes of fish (all species) per year during the periods of 2004 to 2007. The most valued species targeted is snapper with an average take of 2047 tonnes caught annually (Hauraki Gulf Forum, 2008). In comparison to the recreational sector, it is estimated that the recreational fishery take is 35% higher than the commercial catch for snapper (Hauraki Gulf Forum, 2008). This is supported by NIWA data which also indicates that recreational fisher's snapper landings have surpassed that of the commercial sector (see: Figure 3.1). The recreational sector has also seen a change in the average number and size of landings, with NIWA data suggesting that recreational fishers are landing more and bigger fish than previous years. Figure 3.2 illustrates that on average, each recreational fisher is catching 3.4kg of snapper and 0.72kg of kahawai.

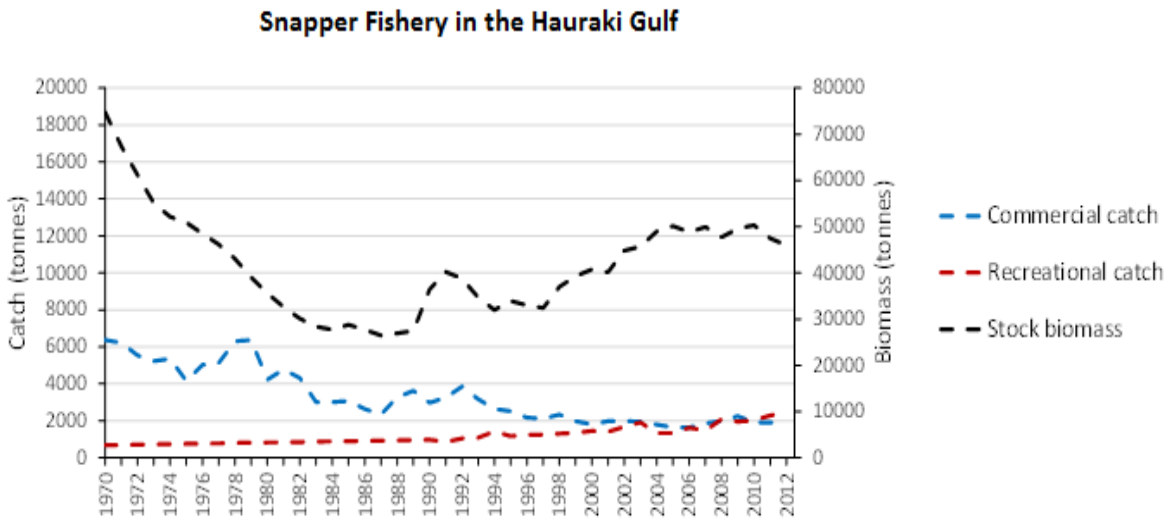

Figure 3.1: NIWA graph showing the overtake of the commercial sector's snapper catch by the recreational sector in the Hauraki Gulf: Adopted from Marine Futures Project Poster (Hartill et al., 2014).

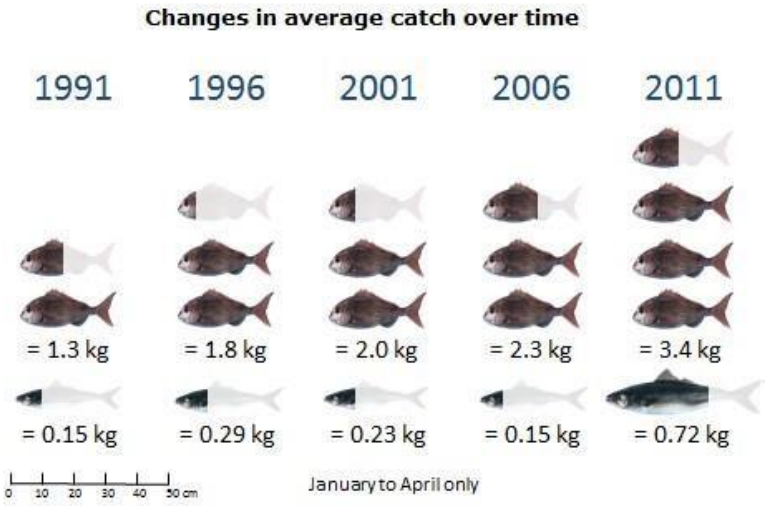

Figure 3.2: NIWA graph showing the increase in average catch of recreational catch for snapper and kahawai from the period of 1991-2011: Adopted From Marine Futures Project Poster (Hartill et al., 2014).

3.7: Hauraki Marine Park Act 2000

In recognition of the Hauraki Gulf's national significance and the pressures caused by increased population and urbanisation, the Hauraki Gulf Marine Park Act (HGMPA) was established in February 2000. The purpose of the HGMPA is to incorporate the management of natural, physical and historical resources of the Hauraki Gulf including its catchments and islands across the boundaries of statutes and districts. Other objectives include the formation of the Hauraki Gulf Forum, and the Hauraki Gulf Marine Park. It also recognises the fundamental spiritual, cultural and historic and traditional relationship that tangata whenua (people of the land) have with the area (DoC, 2013, Waitangi Tribunal, 2013). In the preamble it states: "The Hauraki Gulf has a quality and diversity of biology and landscape that makes it outstanding within New Zealand" (DoC, 2013:3). The Act covers 21 statutes including the Fisheries Act, the Conservation Act, and the Resource Management Act.

The Hauraki Gulf Marine Park is an area that covers 1.2 million hectares of sea, and includes the Hauraki Gulf, the east coast of the Coromandel Peninsula, the Firth of Thames, and the Waitemata Harbour (DoC, 2006). The park is comprised of more than 50 islands and islets. The nature and complexity of the Hauraki Gulf is witnessed in a highly diverse and productive marine ecosystem. It encloses five marine reserves which protect and shelter different marine species and habitats within the park (Hauraki Gulf Forum, 2011).

The Hauraki Gulf Forum is a statutory body made up of representatives from local and regional councils, central government organisations such as Maori Affairs, Department of Conservation (DOC), and the Ministry of Fisheries (MFish), which became MPI in April 2012, and six representatives from tangata whenua. Its main purpose is to integrate the management of the marine park across all districts and organisations in the Hauraki Gulf region by facilitating communication, co-operation and co-ordination among the member organisations (Conservation, 2013, Hauraki Gulf Forum, 2011). HGMPA emphasises the importance of integrated

management of natural, physical and historical resources, and between different organisations and districts.

Integration was also highlighted in Fisheries 2030 (Hauraki Gulf Forum, 2010, Hauraki Gulf Forum, 2011), which was published by MoF in 2009. The purpose of this document is to provide a clearer strategic plan on how fisheries in New Zealand will be managed under the Fisheries Act and Resource Management Act. The objective of Fisheries 2030 is to achieve the sustainable utilisation of fisheries resources which provides the maximum overall social, economic, and cultural benefit to New Zealanders, while protecting the integrity and capacity of the marine ecosystem (Hauraki Gulf Forum, 2011). The document outlines key principles, values, strategic approaches and outcomes to be taken in order to achieve the overall sustainable utilisation of fisheries resources in New Zealand. The document also supports the move towards a more integrated and ecosystem based fisheries management system (Hauraki Gulf Forum, 2011). The Hauraki Gulf can, therefore, be seen as a test case for the Government's future plans for fisheries (Hauraki Gulf Forum, 2010).

3.8: Summary

This chapter highlighted how recreational fishing has always been an integral part of identifying as a New Zealander; however, the introduction of New Zealand's QMS changed the way in which recreational fishing was managed. Immediately following the establishment of the QMS, the recreational sector was viewed as a negligible activity that posed no significant threat to sustainability (Borch, 2010). The consequences for the failure to integrate all sectors during the planning stages of the QMS were felt later by the government and the sectors involved. In the years following the implementation of the QMS, the focus shifted on addressing the customary rights, which involved lengthy court room battles. It was not until the early to mid-1990s that the focus shifted to incorporating the recreational sector. By this stage, the conflict between the recreational sector and the government began to intensify as claims and counterclaims about how best to manage recreational fisheries were put forward. This conflict and the difficulties in managing recreational fisheries were reignited with the bag limit reductions in SNA1 in 2013.

The following Chapter outlines the methodological approach taken to conduct this research. Including the techniques and tools that were used to collect and analyse the information for this research. This chapter describes the rational for using an iterative qualitative methodology approach to collect and provide the information.

Chapter

4 Methodology

This chapter describes the research design and techniques employed for gathering, interpreting and reporting findings. This research focuses on current approaches used to manage recreational fishing, and how the possibilities for an ecosystem based management (EBM) approach to protect the environment and provide for better fishing opportunities. The research uses a qualitative methodology in which a mix of qualitative and quantitative methods was adopted. The use of a case study, questionnaires, and semi-structured interviews enabled me to reveal the challenges confronting recreational fishers and fisheries managers in the context of the Hauraki Gulf. This form of data collection strategy is described as one of convergent methodology or triangulation (Erzberger and Prein, 1997, Mathison, 1988). Triangulation supports the idea that qualitative and quantitative methods should be viewed as complementary to each other rather than conflicting (Jick, 1979). Moreover, the use of different approaches or agreement between two methods allows for the results to be validated using different techniques (Jick, 1979, Mathison, 1988).

4.1: Research design

4.1.1: Methodology versus methods

Methodology is described as the "theoretical frameworks that guide how the research should proceed" while methods represent the "tools, techniques, and procedures used to gather the evidence" (Caelli et al., 2008:11). Thus, methodology is a reference to an 'epistemological position' and methods are the techniques we use to gather the required data (Bryman, 1984). Both terms are often used synonymously or are used in an interchangeable manner, which can create confusion (Bryman, 1984, Caelli et al., 2008). Both the terms 'method' and 'methodology' indicate analysis at different levels (Bryman, 1984). Rawnsley (1998) argues that 'methodology' or the practice of science is a process of enquiry that utilises acceptable scientific methods for yielding information that is generally applicable and credible in reality. Bryman (1984) claims the term 'methodology' refers to an epistemological position, regardless of whether it is described as quantitative or qualitative. The goal of a qualitative approach is to understand how individuals interpret the world around them (Hesse-Biber, 2010). In this approach, the researcher treats the participant as the expert: "it is his or her view of reality that the researcher seeks to interpret" (Hesse-Biber, 2010:2).

The choice of research methodology is guided by the nature of the problem and the objectives of the researcher (Näslund, 2002). To explain and understand social phenomena, this research uses qualitative data, for example participant observations and interviews (Myers, 1997). In qualitative research, findings are presented in the form of words rather than numbers, and case

studies are used to analyse and present information (Chesebro and Borisoff, 2007). This is described as an interpretive approach.

Qualitative researchers look to analyse the experiences and content of social phenomena rather than submit it to formal transformations such as mathematical transformations (Caelli et al., 2008). Qualitative research methods provide the ability to interact with the participants with whom research is being undertaken, thus allowing researchers to see the world from their perspective and to produce data with depth and richness (Bryman, 1984).

In this thesis a qualitative methodology was chosen for its multi-method focus. The arrangement of multiple methods, viewpoints, and empirical data within a single study is considered a strategy that adds rigor, richness, complexity, breadth and depth into any enquiry (Denzin and Lincoln, 2005). Rigor is established by having validity and reliability and that it cannot be achieved without the researcher following a number of rigorous strategies or a set of criteria throughout the research project. (Morse et al., 2008). The strategies used to establish rigor were:

1. Ensuring the interview sample comprised participants who represented the recreational sector, used the Hauraki Gulf as a fishing location, or had knowledge of the research topic.
2. Ensuring the questionnaire sample comprised participants who use the Hauraki Gulf as a fishing location.
3. Collecting and analysing data concurrently to form a mutual interaction between what information is known and what further information needs to be known. Using an iterative process between data and analysis is essential to attaining reliability and validity of data.

The use of all of these verification strategies contributed to the establishment of reliability and validity of data, and thus rigor.

As mentioned above, in this research I adopted an iterative process. This involved a continuous shift between research questions and evidence and frequent alteration to research questions and approaches to provide for more critical examination of newly discovered information (Knigge and Cope, 2006). The complexity of fisheries management and the many uncontrolled and unidentified variables meant I chose to gather the information using multiple methods. It is important to highlight, however, that the use of qualitative methodology does not hinder the use of quantitative methods. Methods are the tools while a researcher's methodology is what determines the way the tool is used (Hesse-Biber, 2010).

The methods used included a case study, semi structured interviews, questionnaires, and policy analysis. This approach allowed for a deeper understanding of the case while providing detailed information that would have otherwise been impossible with quantitative methods alone. My objective was to uncover multiple viewpoints and perspectives from individuals and organisations with different beliefs and interests.

4.1.2: Case study

Qualitative case study methodology provides an opportunity for the researcher to explore complex phenomena within their contexts. This ensures the case is studied through a variety of lenses instead of just one. A key principle of a case study methodology is triangulation; the combination of different methods and techniques both qualitative and quantitative provides different viewpoints to the case being studied (Johansson, 2003). As a form of research, a case study is defined "as a detailed, intensive study of a particular contextual, and bounded, phenomena that is undertaken in real life situations" (Luck et al., 2006:2). The case study is generally determined by the subject of interest, not by the pragmatic approach or methods of inquiry used (Johansson, 2003, Luck et al., 2006). In this research, an intrinsic case study approach was adopted. An intrinsic case study is a situation in which the researcher is focused on examining and understanding a particular case of interest instead of generalising and building theories (Stake, 1995). My choice of employing intrinsic case study was organised around the research question and objectives, which are focused on understanding the complexities of recreational fisheries management.

This case study was chosen for its environmental, economic, and cultural significance, political complexity and social popularity. The rationale for choosing the Hauraki Gulf was based on the importance of the Hauraki Gulf to New Zealand. The Hauraki Gulf is arguably one of New Zealand's most important and contested marine spaces. It is also the one of the most valued and intensively harvested. This is at least partly due to Auckland's position as the largest population centre in the Hauraki Gulf, since this concentrates economic, social and cultural uses in the area. It is a site for commercial fishing, tourism, recreational uses such as boating, recreational fishing, and maintenance of cultural identity such as food gathering. The recreational fishing sector in the Hauraki Gulf was selected as a case study to highlight the significance and impact of the recreational sector on fish stocks and the environment, and its current position as a stakeholder and participant in fisheries management.

4.2: Research methods

4.2.1: Questionnaires

Questionnaires were used to collect general information on recreational fishing activities, fisher motivation and behavioural factors in the Hauraki Gulf. Questionnaires are a good method to approach a large number of people and gain information without consuming too much time. The questionnaire approach helped to facilitate a conversation about recreational fishing practices in the Hauraki Gulf. Furthermore, on some occasions the questionnaire was the initial step to approach fishers and opened the way for arranging an interview. The questionnaire comprised 13 questions (see: Appendix C) and included a map to enable participants to identify their top three fishing locations.

To raise awareness of the questionnaire I used three different approaches: online forum, hand delivery, and leaving hard copies at a fishing equipment and tackle shop. For the online

questionnaire, the questionnaire was hosted on Qualtrics. To distribute the URL to participants, I contacted the director of a popular recreational fishing website and requested permission to post an invitation and link to the questionnaire in the discussion forums within the website. The directors, along with some participants, were helpful throughout the launch process of the questionnaire. Participants forwarded my questionnaire to their friends and posted the link in other forums. The sampling strategy for the online participants was based on fishing location. After clicking on the questionnaire link, potential participants were asked whether or not they fished in the Hauraki Gulf; those who answered 'no' to this question were not able to continue and therefore did not participate.

In an attempt to gain a uniform demographic of the recreational fishing community I hand delivered the questionnaires by travelling to various fishing hotspots and boat ramps as well as recreational fisher meetings within the Auckland and Coromandel region. I also ensured I targeted people using different fishing methods such as boat fishers, surfcasters, kayak fishers, saltwater fly fishing, and fishing from the rocks. Additionally, all of the recreational fishers who participated in the interview process were also asked to fill in a questionnaire. While using this method I encountered a few participants who were suspicious of the motivations behind this research and were unwilling to participate. During one of the recreational fisher meetings held at a local yacht club, I was introduced to a tackle shop owner who was interested in my research and offered to help distribute my questionnaires by handing them out to customers at the store. In all of the above techniques used, participants were provided with and asked to read the participant information sheet (PIS). In the PIS I explained the objective of the study and also stressed that the questionnaire was voluntary and anonymous. A total of 132 questionnaires were completed.

4.2.2: Semi-structured interviews

Semi-structured interviews were the most important method for obtaining information. The reason for choosing semi-structured interviews was because they provide an appropriate format for sensitive topics. This method is considered versatile for collecting data as it allows for a deeper understanding of complicated research questions (Fylan, 2005). Semi-structured interviews are described as a way to "allow informants the freedom to express their views in their own terms" (Cohen and Crabtree, 2006:2). Interviewing enabled me to examine the different views, beliefs, behaviours, and motivations of those involved in the recreational fishing sector and to gain understanding of why they behaved the way they did. The interviews also provided me with insight into the interactions between different organisations, and participants.

Semi-structured interviews provided clarification on what issues the recreational sector diverged or converged on. The semi-structured interviews provided "a subjective view and is thus not obstructed by questions structured by a question-answer scheme" (Witzel, 2000:4). It empowered fishers to give their view and share their experience without being hindered by closed-style questions in the questionnaire. The interview process enabled recreational fishers to express their opinions and concerns for their sector, and to explain their motives for fishing

and the factors that drive their behaviour. My approach was to use a list of predetermined questions to direct the conversation while also allowing the interview to unfold in a conversational manner (Mathers et al., 1998). This provided an opportunity for participants to explore issues they felt were important (Longhurst, 2003), and to respectful debates. In some instances where the interviewee had difficulty answering a question or provided only a brief response, I used prompts or cues to encourage them to consider the question further.

A total of 15 people from five different stakeholder groups were interviewed; these groups were: scientific research representatives, MPI staff, other stakeholder representatives, recreational fishers, and recreational fishing lobby groups (see: Appendix A). Some of the participants were identified through my supervisor's established contacts (within the industry), and by attending meetings and seminars which provided me with access to interest groups and stakeholders. Recreational fishers targeted had to be saltwater fishers from the Hauraki Gulf. I ensured that I talked to advocates of the sector as well as the average fisher who is not affiliated with any advocacy group. A wide variety of fishers with different fishing methods, cultural, economic, and experience backgrounds were interviewed to gain an insight at the different perspectives, values, beliefs and behaviours.

4.3: Data Analysis

4.3.1: Initial data analysis - Interviews and questionnaire data

After completing the interview process, all 15 interviews were transcribed. Participants were provided with an opportunity to provide feedback on the transcripts; however, none of the participants requested to check their transcripts before analysis. Analysis was conducted on the transcripts using the QSR international NVivo 10 computer software. Nvivo 10 provided the required tools to interpret and code this dynamic and complex data. This program established the required connections and correlations among data sets related to the management of the Hauraki Gulf fisheries and marine environment, with a particular focus on recreational fishing.

Questionnaire data collected online was exported from Qualtrics into Excel, while hand collected data was entered into Excel manually. Using Excel, the numerical data was analysed and graphed to clarify some patterns and correlations with the interview data. Details and specific analysis techniques conducted for the interview transcripts in NVivo 10, and the questionnaire data using Excel are discussed in more depth in the next section.

4.3.2: In depth data analysis-coding and correlating

Coding was central to analysing the content of my interview data. Coding qualitative data has three main purposes: the reduction of data to help researchers filter themes and reduce large amounts of data and analyse it, organisation, and the creation of searching aids (Zhang and Wildemuth, 2009). In this research, qualitative content analysis was carried out using the NVivo 10 program to construct themes, patterns, and relations between variables in the data. Qualitative content analysis has been defined as "a research method for the subjective

interpretation of the content of text data through the systematic classification process of coding and identifying themes or patterns" (Hsieh and Shannon, 2005:1278). Qualitative content analysis is primarily an inductive process used to examine the meanings behind texts. This enables the research to produce themes and patterns and to examine the inferences drawn from them, thus allowing researchers to recognise patterns and themes in a subjective but scientific approach (Zhang and Wildemuth, 2009). The methodology employed in this study for transcript analysis and outlined in Table 4.1 is based on qualitative content analysis (Zhang and Wildemuth, 2009).

Step 1	Recorded and transcribed verbatim transcripts for interviews.
Step 2	Proofread material and noted key phrases.
Step 3	Defined and identified potential themes (unit analysis).
Step 4	Identified categories and concepts, with interview text data allocated to each category.
Step 5	Coding categories were validated and checked for consistency by coding a sample of my data and checking the consistency with previously coded text in the category. This iterative process of validating coding consistency was repeated for each coding category to prevent drifting into an eccentric sense of what codes mean (Schilling, 2006).
Step 6	After all coding was completed for the entire data set, the coding of the entire text was rechecked again to ensure accuracy. As the coding process continues, coders become more subject to error due to fatigue. The validation process also ensures that the coders understanding of the categories has not changed during the process with could cause inconsistency.
Step 7	Revised the categories and themes identified to uncover patterns and meanings from the data, as well as to identify any connections and relationships between categories.
Step 8	Final results reported and displayed by presenting verbatim quotes that represent themes and concepts, the interview text results were also combined with questionnaire findings to support the concepts discussed.

Table 4.1: Methodology employed to analyse transcript data (Zhang and Wildemuth, 2009).

4.3.3: Finding themes

Themes as a coding unit are used to express an idea. For example, a theme can be presented using a single word, sentence, paragraph, or an entire transcript providing that text presents a theme or an issue relevant to the research (Zhang and Wildemuth, 2009). In this research, themes were expressed using chunks of text from interview participant data. Qualitative content analysis allowed me to assign coded sections of text to multiple categories in an attempt to express the complexity and dynamic nature of my research (Tesch, 2013). Recording themes and issues addressed in interviews, and linking these themes and interview data under a comprehensive category is very difficult. The first problem the researcher needs to consider is whether the statements of one participant should be considered reasonable and accurate to compare with the statements made by another participant. Moreover, it is also difficult when dealing with interview data to conclude that one participant's view is shared with the views of another, or the principal view of the entire sector. The researcher needs to question whether the

common themes in interviews are really common (Burnard, 1991). In the case of my research, I used questionnaire data to support the claims made by my interview participants. For the most part, quantitative data from my questionnaires supported my themes by confirming the patterns, and ideas extracted from interview data; however, some of the questionnaire data also contradicted comments made by a few interview participants. This demonstrates that the views of some interview participants were not in line with the majority of the people surveyed. This helped the themes to be expressed in a more refined way, exposing relationships and connections between the interview and questionnaire data sets as the data analysis process continued.

4.3.4: Processing interview text and constructing codes using Nvivo 10

The qualitative data analysis tool Nvivo 10 encourages researchers to organise and analyse text data by classifying, sorting, and arranging qualitative data to identify relationships in the information available. Using the Nvivo 10 website tutorials, I was able to identify trends and cross examine chunks of text using the program's query functions and search engine. Coding using computer assisted qualitative data analysis systems (CAQDAS) such as Nvivo provides access to powerful techniques for managing documents and concepts, as well as constructing and expressing theories (Marshall, 2002). Using Nvivo made my data coding process much faster and much more organised. Folders were allocated for each category, and query function mode was used to reduce the messy interview data and extract the shared concepts from each transcript.

4.3.5: Analysis of Questionnaire Data

Including questionnaires in my research provided me with a cost effective means to carry out extensive research over a large and geographically dispersed population of fishers in the Hauraki Gulf. While there are limitations in terms of the depth and extent of qualitative data questionnaires are capable of gathering, they also have many strengths. One of the reasons for choosing questionnaires as a data collection tool is their flexibility to work alongside more intensive forms of qualitative research such as in-depth interviews, and their ability to provide insights into social trends and interpretations (Hay, 2000). Questionnaires provided the means to identify variability in interpretation and understanding across the recreational fishing public, thus providing the groundwork for further investigation through my additional complementary semi structured in-depth interview method (Hay, 2000).

Once the questionnaires were completed, the data was exported into Excel. Data was organised and sorted into different Excel spreadsheets and all incomplete questionnaire questions were eliminated from the data to simplify data processing. Graphs, maps and pivot tables were produced to clarify themes and concepts. The questionnaire data was cross examined with coded interview data to form linkages, support and highlight relationships between the two sets of data.

4.3.6: The relationship between the researcher and researched

An important aspect of this research involved considering my role as the researcher and how that may influence the questions asked, the data collected and the information that becomes coded as knowledge (Rose, 1997). McDowell (1992) highlights the importance of recognising and taking one's own position as well as that of the research participants and reflects this back into research practice; however, it is very difficult to accomplish.

Corbin Dwyer and Buckle (2009) discuss how the views of the researcher could be influenced on the basis of membership. The issue of membership is critical to take into account in all the approaches of qualitative methodology since the researcher plays a very close and direct role in data collection and analysis. Researchers can move between being considered an insider sharing the characteristic, experience, and role of participants in the study, or an outsider to the commonality shared by participants. However, both situations have their advantages and disadvantages.

While I do not consider myself to be a fisher, I have participated in fishing in the past. Although my experience was very brief, this enabled me to understand why many individuals around the country participate in the activity. Considering my background as a biologist and an enthusiast of the marine wildlife and the coral reef environment, my viewpoint and position towards recreational fishers during the early stages of framing my research was shaped by the scientific literature I read, which highlighted the impacts caused by recreational fishing activities.

As an outsider I had to consider my position and, given the fact that the time of my research coincided with some very important conflicting political events involving the SNA1 bag limit reduction, I had to be aware of my biases and preconceptions. Although the majority of the people I approached were willing to participate after a brief explanation of my project, a few of them provided more help than I anticipated. This gave me the feeling that those few may have misinterpreted what I had set out to achieve in this research. My sense was that they thought I was going to be advocating on their behalf but in reality this is not the nature of the research.

There were also a few who were very sceptical about my intentions and refused participation or did not want me to use audio recording. While I presented myself as a master's student, one of the participants asked me if I was an environmentalist with the agenda of trying to ban recreational fishing in New Zealand. Some others suggested that my timing of doing this research was suspicious and aligned with the political events at the time. After further explaining my reason for doing the research, most people were satisfied and agreed to participate in the research.

Being an insider (an avid recreational fisher) might have eased the data gathering process. Participants may have been more willing to share their experiences since they might assume that I (researcher) would be more understanding of their views. In this case, research participants may feel, "You are one of us and it is us versus them (those on the outside who don't understand)" (Corbin Dwyer and Buckle, 2009:5). Corbin Dwyer and Buckle (2009) state

that, while being an insider means participants may be more open and accepting of the researcher and more likely to provide greater in-depth data, it is not without its disadvantages. They suggest that researchers might find it difficult to negotiate their position, which can lead to conflict in the role they play and give rise to feelings of being trapped between “loyalty tugs” and “behavioural claims” that affect the way in which data are interpreted (Corbin Dwyer and Buckle, 2009).

4.4: Ethical considerations

Due to the nature and sensitivity of the subject being studied, it was imperative to protect the rights and privacy of the participants. Prior to conducting data collection, ethical approval was obtained from the University of Auckland Human Participants Ethics Committee. Potential participants were provided with Participant Information Sheets (PIS), which explained the purpose of the research, how data would be used, and procedures to ensure privacy of information. Interview participants were also required to sign consent forms prior to commencing interviews (see: Appendix B). Participant names have not been used in the thesis to help protect the identity and privacy if individuals. Instead participants were identified using the name of the organisation or group to add significance to data analysis (see: Appendix A).

Questionnaire participants (recreational fishers) were also provided with a PIS specific to the questionnaire. Each participant was made aware that the completion of the questionnaire will be regarded as consent to participate in this research study, and that once completed and submitted, he/she will not be able to withdraw the questionnaire as it is anonymous and therefore not identifiable.

Chapter 5 Results

This chapter presents the data collected from 15 interviews and 132 surveys conducted to better understand the difficulties associated in managing the recreational fishing activities and allowing for the rights of the sector under the QMS. The data reported here are also used to identify management approaches that may encourage the development of a more resilient, holistic and adaptive management system for the marine ecosystem and fisheries resources in the Hauraki Gulf. Information regarding data collection methods, data analysis, participant choice, and survey data collection were described in Chapter 4. Additional context regarding the data sets may be obtained by reading the appendices.

5.1: Motivations for fishing

In this research it is argued that understanding what motivates people to fish can improve the management of recreational fishing activities and their effects. To investigate the diverse factors that motivate recreational fishers to fish, surveys were conducted with fishers who fish in the Hauraki Gulf. As shown in Figure 5.1, 'fishing as a hobby (leisure and fun)' was the most common motivating factor (42%) followed by 'fishing as a source of food' (31%) and 'spending time with nature' (18%); only 2% of participants identified 'cultural reasons' as a motivation. For participants who identified 'other' motivational factors (7% of respondents), the factors identified included pleasure associated with sailing and boating and recreational fishing as a family bonding activity.

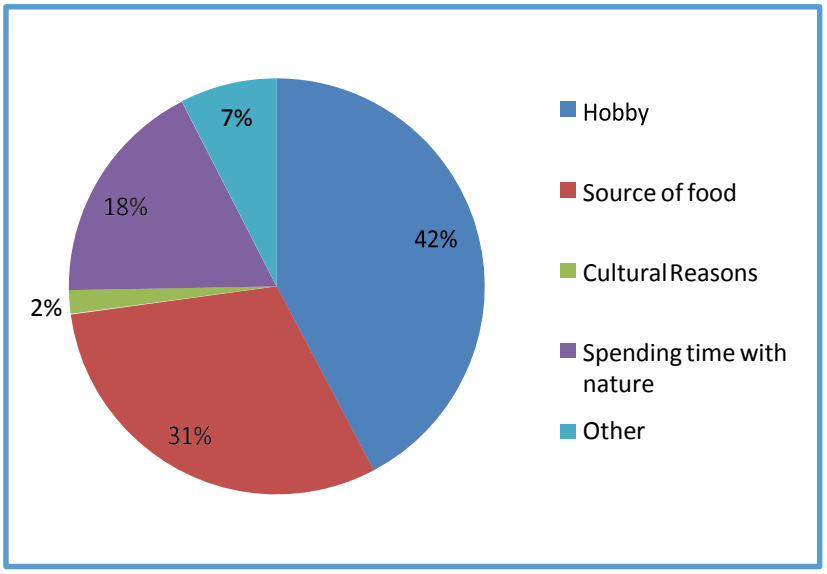

Figure 5.1: Reported motivations for fisher participation.

The results highlight the social nature of recreational fishing, with the majority of people surveyed (96%) saying they fished in a group of two people or more (see: Figure 5.2).

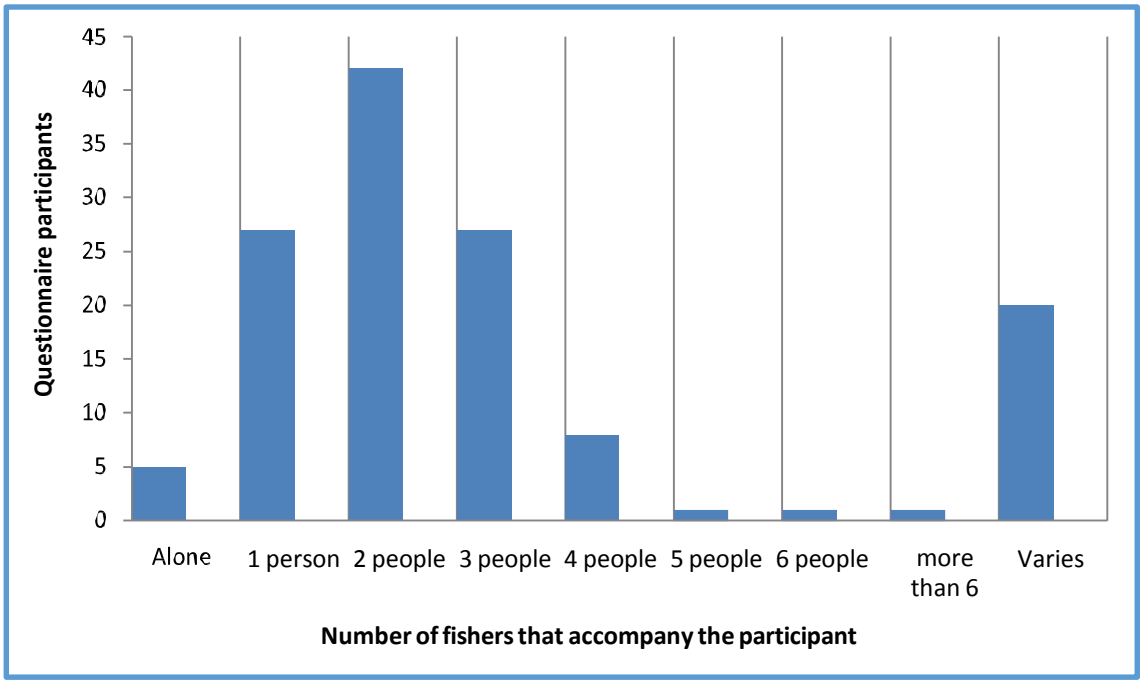

Figure 5.2: Number of fishers accompanying respondent.

Recreational fishers interviewed shared similar motivations for fishing to the fisher participants surveyed. Interview participants identified spending time with family, enjoyment of nature and other boating activities as significant motivations (Participant 10, and Participant 13). Both interview and survey participants did not consider fishing for sustenance as the main motivation for participating, although they did describe it as 'a motivation'.

5.2: The monetary and non-monetary benefits of the recreational sector

As noted above, recreational fishing is a very popular activity in New Zealand with Ministry of Primary Industries data indicating that 19.5% of the New Zealand population participate in marine recreational fishing annually and growing (Ministry for Primary Industries, 2010). Participants were asked how long they had been fishing to gain insight into the changes in terms of numbers of people fishing. The results indicate that the current aging group of fishers in the Hauraki Gulf is being replaced with new participants (see: Figure 5.3).

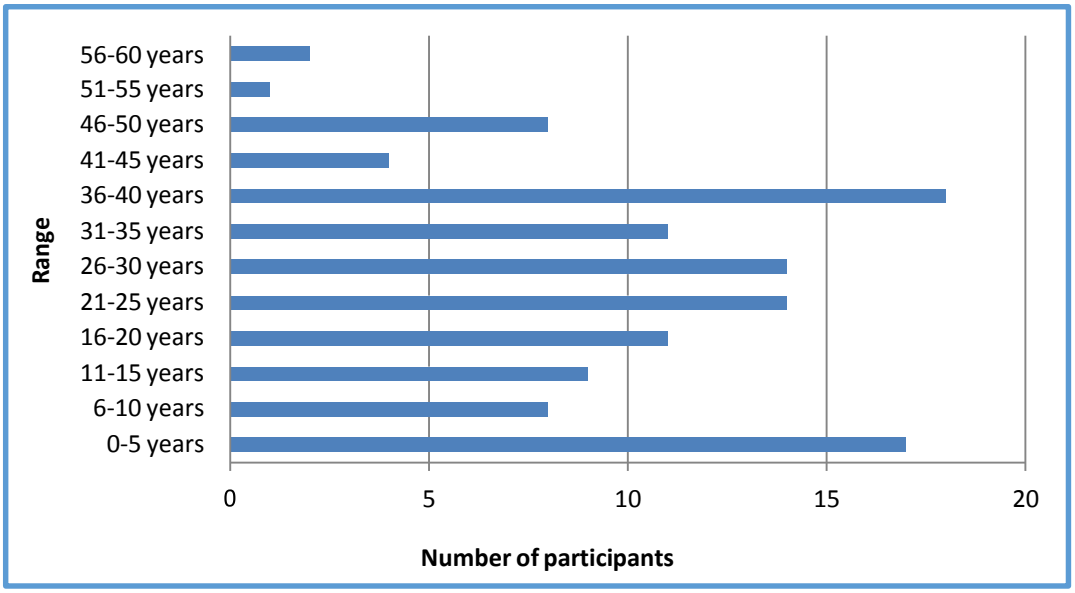

Figure 5.3: Graph showing the fishing experience of participants in years.

As new recreational fishers participate in fishing, the recreational fishing population increases as does the economic contribution made by the sector in terms of fishing related expenses. The contribution of recreational fishing to the New Zealand economy was commented upon by several interview participants (Participant 4, Participant 8, and Participant 11). All fishers expressed frustration towards MPI for failing to acknowledge the economic value and contribution associated with recreational fishing. Fishers claimed the economic support generated by the recreational sector through boat sales, employment, equipment suppliers, charter boat operators, tackle shops, and other tourist facilities is significantly underestimated by the government. In their opinion, MPI should carry out more in depth studies on the economic benefits of recreational fishing (Participant 8 and Participant 11). This information would then allow decision makers to introduce fairer policies that address the needs and interests of both sectors, recreational and commercial, depending on their economic contribution.

One participant claimed the recreational sector contributes much more on an annual basis to the economy in comparison to the commercial sector (Participant 4). The participant claimed that he and his friends spent $300-$400 dollars each on an average Labour Day weekend fishing trip. Based on this, he claimed that, if this amount was multiplied by 1,000,000 recreational fishers also out fishing, this would amount to $300,000,000 from just one weekend (Participant 4). Such claims by recreational fishers are difficult to verify in the absence of a robust methodology to accurately calculate economic contribution. Recreational fishers felt doubly disadvantaged because of the difficulty in determining the non-economic social values of recreational fishing.

In the absence of information about net social benefits of recreational fishing, decision makers tend to focus on measures that reflect the level of economic activity (McConnell, 1979). Decisions based on the level of economic activity and contribution to GDP may have unfavourable consequences for non-commercial activities such as recreational fishing,

especially when MPI has to make allocation decisions to optimize the economic benefit to the community.

The economic value of the commercial sector is much easier to calculate due to the availability of clear and measurable data; economists can directly calculate the contribution the commercial sector makes to GDP through the supporting and ancillary services associated with market transactions at harvesting, employment, fuel, vessel days at sea, processing and consumer levels. The difficulty of estimating the economic value of recreational fishers is reflected in the lack of research on the economic contribution of recreational fishing in New Zealand. One study looking into the economic value of recreational fishing estimated the expenditure made by recreational fishers for the top five key recreational species to be around $1 billion annually (Lindsay et al., 1999). In contrast, the commercial sector wild capture exports increased by $22.9 million (up by 1.9 %) to $1.22 billion in the year 2011. This figure does not take into account aquaculture exports, which brought in another $308.7 million in 2011. The commercial sector also provides direct employment to 5,680 people (Ministry for Primary Industries, 2010).

Recreational fishers felt they should be prioritised ahead of the commercial sector based on both their monetary and non-monetary benefits. The recreational sector representatives from LegaSea, and the New Zealand Recreational Fishing Council (NZRFC) I interviewed argued that the Ministry should follow Moyles Promise, which states the recreational sector should be prioritised over the commercial sector in situations where catch is limited (see: Chapter 3). If this was followed, these recreational fishers claimed it would incentivise the commercial sector to avoid destructive fishing practices (Participant 10 and Participant 11).

Although the recreational representatives did not explain what incentives there were to discourage destructive fishing among recreational fishers, they claimed the majority of recreational fishers were fishing sustainably and only harvested what was needed (Participant 10 and Participant 11). Another recreational fisher commented that, at the moment, it's a race for fish between the commercial and recreational sector. Thus, he did not see the benefit of conserving fish or practicing catch and release in order to sustain or increase to biomass of the fish stocks since that would mean more fish for the commercial fishers to catch (Participant 6). The participant asserted that if MPI installed proportional rights for both recreational and commercial, the recreational fishers could participate more in conservation but for now they will only follow the rules and would not do more than required to conserve the stocks.

5.3: Impacts of recreational fishing

During the interviews, recreational fisher participants were asked to identify the likely environmental impacts on the Hauraki Gulf and to identify the activities they believed were associated with these impacts. It is important to note that not all fishers linked the activities they considered to be harmful with actual impacts. For example; one fisher identified shipping and land-based impacts but did not provide reasons why these activities are harmful to the environment (Participant 13). The participants who were able to associate an activity with an

impact identified these impacts as: water pollution and algal growth; competition by invasive species for food and space; habitat degradation and disturbance of coastal finfish and bivalve species; and high exploitation rate of stocks; coupled with disregards and by-catch.

One of the factors seen to contribute to the decline of targeted coastal fish species such as gurnard, juvenile snapper, and bivalve population along the coast was water pollution from runoff (Participant 12 and Participant 10). Fishers associated the increased algal growth and water pollution with agricultural and urban runoff caused by poor farming practices and increased urban development near coastal areas (Participant 5, Participant 6, Participant 8, Participant 10, and Participant 12). Participant 10 gave a detailed explanation of the effects of leaching from agricultural and urban runoff. He noted that the higher levels of enriched nutrients, chemicals, and phosphates promote algae growth. The rise of algal growth increases oxygen consumption, which can disturb the fish habitat by reducing the amount of oxygen in the water. Participant 10 also commented that not enough recognition was being given to the threat of urban runoff in the Hauraki Gulf.

Most of the claims made by fishers regarding urban and agricultural runoff were based on observations made during their many years of fishing. Participant 12, who, since an early age fished in the Auckland Harbour, claimed that fishing in the late 1970s was difficult due to poor water quality; he associated the poor water quality with the release of storm and wastewater into the harbour. He pointed out that the water quality only improved after the diversion of storm and wastewater to the water treatment facility. A similar claim was made by Participant 10, who associated the decline in gurnard population, also known as 'carrot tops', with urban development in Browns Bay:

> If you wanted to catch gurnard you would steam up the Rangitoto channel and you would go up towards East Coast Bays. There was an area off Browns Island's big mud patch which had crabs and everything else. It was recognised as a good gurnard and flounder habitat. We had that carrot (gurnard) patch die 25-30 years ago after the development of all the housing at Browns Bay. We did not have the RMA enforced back then. All that mud from digging the ground during development went down the creeks and out to sea which ended up smothering the carrot patch habitat, the gurnard moved away.

Participant 10 also identified marine invaders as another cause for concern. Invasive species such as the invasive sea squirt (*Styela clava*), Asian paddle crab (*Charybdis japonica*), and the Mediterranean fan worm (*Sabella spallanzanii*) could have significant impacts on the Hauraki Gulf environment (Participant 10). For example, the Mediterranean fan worms can cause damage to fisheries and aquaculture by competing for food and space with native species; it also affects nutrient flows and promotes the establishment of new generations of some species (Silvano and Valbo-Jørgensen, 2008). The Mediterranean fan worm is believed to have been introduced in the ballast water of international ships or attached to the bottom of dirty charter vessels and yachts (Silvano and Valbo-Jørgensen, 2008). Ballast water discharged along coastal waters may cause the introduction of non-native organisms and biological materials

including plants, animals, viruses and bacteria (Participant 10). These non-native organisms and biological materials can have a significant impact on native fishing supplies and cause them to decline.

The use of certain fishing gear and methods were also identified by recreational fishers as impacting the marine environment. Methods such as commercial trawling, and dredging were identified by recreational fishers as some of the most destructive activities. Fishers criticised both trawling and dredging for their impact on the Hauraki Gulf environment (Participant 4, Participant 5, Participant 6, Participant 7, Participant 8, Participant 10, Participant 11, Participant 12, Participant 13, and Participant 15). In particular, recreational fishers noted the contribution of commercial trawling to the destruction of seafloor habitat, by-catch of juvenile snapper and non-targeted species that are either returned to sea through dumping, or brought to shore with negligible commercial value (Participant 4, Participant 6, and Participant 7). The use of trawl nets was also identified as causing damage to a high percentage of landed catch crushed under the weight of other fish in trawl nets (Participant 5). Wastage caused by trawl nets was considered unsustainable and was viewed as a major contributor to declines in snapper stocks. Participant 5 commented on the high percentage of wastage caused by trawl nets by stating:

> I have seen data that suggest that using a trawler to catch fish would damage 30-40% of the catch because they are not good enough to be used and sell in the market because they are too squashed to use. Then you have undersized fish that can't be used and is dumped.

Like trawling, dredging can also cause irreversible damage to the seafloor habitat (Participant 5, Participant 7, and Participant 8), and can place severe stress on scallop beds (Participant 5, Participant 8). The decline of scallops over the last few years in the Hauraki Gulf was associated with excessive commercial dredging activities along coastal areas (Participant 7, and Participant 8). Although dredging is used by both recreational and commercial fishers, only one participant associated the contribution of recreational fishers with dredging impacts (Participant 5). During the interview, Participant 5 highlighted the impacts caused by dredging on targeted species and the environment:

> There used to be a bed of mussels that used to be all the way from Maratai to the Firth of Thames, these have been reduced due to dredging and land use changes that added sediments in the water. There is dredging for scallops as well and catching of fish from both recreational and commercial. I witnessed tens of boats dredging in Whangarai for scallops.

The fact only one fisher expressed his concerns over recreational dredging impacts may indicate that the rest of the interview fisher participants were either unaware of dredging impacts, or were concerned that their acknowledgment of such impacts could harm their future interests and lead to further restrictions placed on recreational dredging.

5.3.1: The blame game

When questioned about factors that contribute to environmental impacts, the majority of recreational fishers interviewed did not identify themselves as contributors to the impacts (Participant 4, Participant 8, Participant 10, Participant 12, Participant 13, and Participant 15). Instead, participants blamed other industries or natural causes such as climatic change and disease for the impacts. Fishers also accused the government of conspiring against them by allocating more of the quota to the commercial sector for the purpose of economic gain, while ignoring the needs of recreational fishers (Participant 4, Participant 10, and Participant 11).

The findings from the interviews were consistent with the surveys. Among survey participants, 94% identified commercial fishing as having a significant environmental impact on the Hauraki Gulf, while 81% identified government policy, 57% land-based impacts, 0% climatic changes, and 21% shipping.

The tendency to blame impacts on other activities and to overlook the contribution of recreational fishing to environmental degradation was demonstrated in a comment made by Participant 4. Participant 4 identified commercial trawling as the activity responsible for the environmental impact, but did not provide reasonable support for his argument as to why trawling is harmful. Instead, he claimed recreational fishers were not responsible for any decline in fish stocks because the majority of fishers, especially land based fishers, only caught one or two fish during their fishing trip. To support his assertion, he provided an example of a surf casting competition known as 'Captain Morgan Snapper Bonanza' that takes place on 90 Mile Beach on the western far north coast of the North Island. This annual event sees up to a 1000 land-based fishers take part. He stated that the 1000 fishers catch an estimated total of only 50-60 fish, which he believes is a good measure of magnitude for the impact of land-based fishers on the fish resource (Participant 4). Despite the claims of Participant 4, the fishing competition does not provide a good example to support the argument that recreational fishers are not responsible for any decline in fish stocks. Such fishing competitions are usually based on catch and release rules, and are more focused on targeting the biggest fish rather than catching the bag limit. Furthermore, fishers involved in such competitions must abide by the rules and regulations and usually involve a limit on the number of fish allowed to be caught, which in the case of the example mentioned above the limit is 6 fish among 4 fishers. The example mentioned by Participant 4 also does not take into account the million other fishers who are not involved in fishing competitions, but are fishing for other reasons.

Recreational fishers declare themselves to be a responsible sector. Those interviewed claimed the majority of fishers practice conservational approaches such as catch and release of undersized fish, and only keep the amount of fish needed (Participant 6, Participant 10, and Participant 12). Fishers interviewed said they thought the source of environmental degradation was commercial fishers who illegally dumped undersized fish to avoid paying penalties for over-catch, also known as 'deemed value'. Deemed value only comes into play if commercial fishers over-catch their yearly allowance or annual catch entitlement (ACE) (Participant 6, Participant 10, and Participant 4).

When asked whether recreational fishing impacts need to be better managed, one recreational fisher argued the recreational sector is naturally self-managed because fishers are restricted by weather, unlike commercial fishers who have large vessels that can handle rough weather (Participant 4). Participant 4 also stated that the opportunity for recreational fishers to catch a fish is also limited. This is because most fishers come out for three weeks during the summer holidays in January rather than fishing regularly throughout the year.

> The information the government gets about recreational fishers raping and pillaging the seas is nonsense. …In winter you see only 20% of the fishers going fishing while the rest are waiting for the summer. Recreational fishers are not even out there, they only go out two times a week. My boat has done only 1000 hours in 4 years so I do around 250 hours of fishing a year, the average guy who parks his boat on the driveway does 14 hours a year (Participant 4).

Participant 4 further claimed the summer period was a bad time for fishing since it usually coincides with the end of the spawning time for snapper. The fisher argued that, since most recreational fishers wait for summer to go out fishing, the impacts on snapper fish stocks should not be blamed on recreational fishers. This is because the time frame those recreational fishers go out fishing overlaps with the spawning period of snapper and during the spawning period, the fish are tired and tend not to bite. Catching snapper is also is made more difficult with increased boat noises that scare the fish away.

Contrary to the claims of Participant 4, the questionnaire results show the majority of participants fished throughout the year and not just the summer months. As shown in Figure 5.4, 61% said they fished during the winter months, which is three times higher than the 20% suggested by Participant 4.

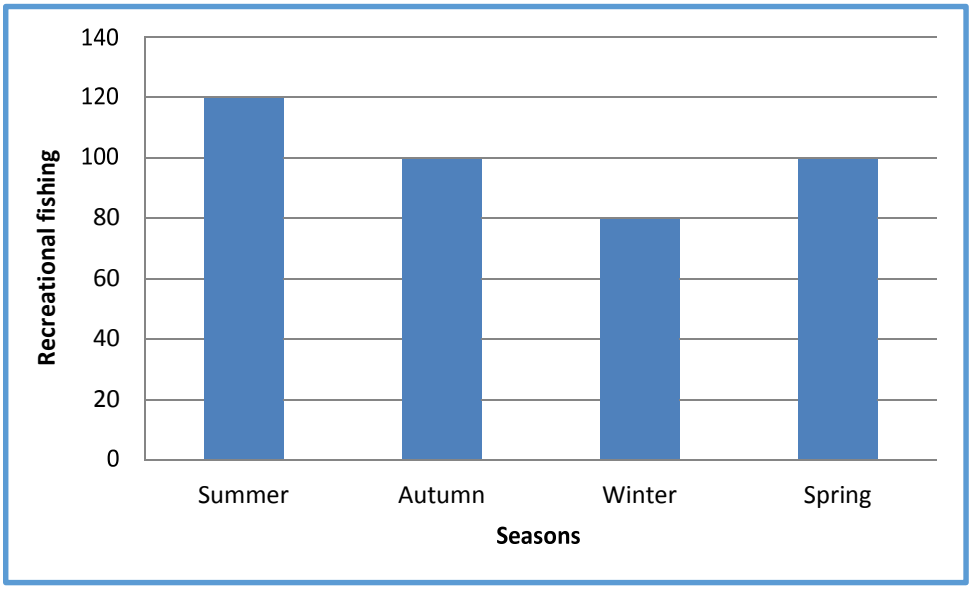

Figure 5.4: Reported seasons of the year that recreational fishers go fishing.

Recreational fishers accused the government of making policies that favoured the commercial sector for the sake of economic gain instead of working towards sustaining the resource (Participant 10 and Participant 4). Many recreational fishers spoken to claimed the government was trying to decrease their share of the allowance and daily bag limit to transfer the difference in available quota to the commercial sector to increase commercial profits. Comments made by Participant 4, who is also a recreational representative, highlighted this tension towards the government:

> The government always wants to take away something. And the bottom line is it's all about commercial fishers wanting to take as much as they can of the quota so they can make more profit. The kahawai challenge is a good example. You have people in Wellington sitting on their asses making policies when they don't know anything from what is going on in the water.

Participant 4 further claimed the government was trying to continuously restrict recreational fishing to discourage people from catching their own fish and to force people to purchase fish to increase market demand and economic gain for the commercial sector and the government.

The move in July 2013 by MPI to reduce the recreational fishing bag limit for snapper in Snapper 1 inflamed tensions even more. Government data suggested the recreational sector was not staying within their snapper allocations. Despite government data, recreational fishers argued they were initially under-allocated during the establishment of the QMS. Recreational fishers blamed the commercial sector for the wastage of snapper stocks caused by destructive fishing methods and illegal dumping (Participant 5, Participant 10, and Participant 11). Participant 10, who is also a recreational representative, emphasised the viewpoint echoed by the majority of recreational fishers regarding fairness of allocation: if snapper had been allocated fairly to the recreational sector in the beginning, they would not overfish their allocation today:

> We estimate that they underestimated the recreational catch way back then by some 1900-2200 tonnes. Now if they (government) have added that amount and allowed for it back then, and reduced it from commercial, we would probably not be facing the problem we are facing now.

Fishers considered the government data, which suggested recreational fishers were overfishing, to be baseless (Participant 4 and Participant 10). Fishers claimed 80% of fishers do not catch their bag limit and the 20% who took home the bag limit of nine snapper as at 2013 were experienced fishers (Participant 4 and Participant 10).

5.3.2: Potential impacts of recreational fishing

Recreational boating is a popular activity in New Zealand and is closely associated with recreational fishing. In 2011, it was estimated that around 19% of New Zealand households owned a boat, while in Auckland it was estimated that 25% of the households owned a boat

(Beca, 2012). The connection between boating and fishing was illustrated in the survey data. Results showed that 76% (100/132) of recreational fishers who fished in the Hauraki Gulf owned a private boat (see: Table 5.1 and Figure 5.5). Despite the popularity of recreational boating and fishing in New Zealand, there is little research which investigates potential impacts of boating. International research suggests the use of boats could have an important role in causing environmental impacts (European Commission, 2007). Impacts highlighted by the European Commission include: the release of hydrocarbons and other substances by the motors of recreational boats; excessive noise emissions; disturbance of sedimentation caused by aggressive boat movements; and, physical damage caused by anchorage of boats (European Commission, 2007). Another impact is linked to the use of antifouling paints applied to the hull of boats to prevent marine organisms from attaching (European Commission, 2007). These can contain biocide agents, which could be toxic to marine life. All these factors can cause damage to sensitive sea beds, disturb spawning behaviour, contribute to water pollution, and add stress to marine wildlife, especially in fragile coastal areas.

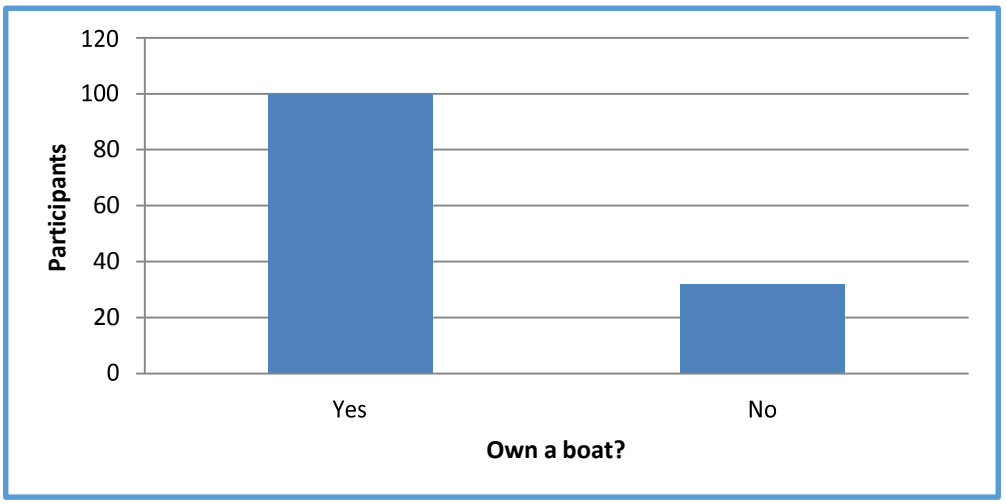

Figure 5.5: Reported number of boat ownerships for recreational fishers.

The questionnaire provided an opportunity to explore the link between recreational boat fishing and potential environmental impacts on the Hauraki Gulf's marine ecosystem. Findings from the questionnaire showed that, over the last 12 months, the majority of participants preferred to fish using rod and hand-line off a private boat (see: Figure 5.6). Of the 100 participants who said they owned a boat, 84 also fished from a boat; out of the 32 participants who did not own a boat, 21 of them also fished from a private boat. This suggests fishers who don't own a boat are not geographically limited and can expand their fishing activity beyond coastal shorelines by fishing with someone who does own a boat.

Fishing from a boat allows fishers to use other fishing techniques such as traps and nets to ease their catching effort. It also provides access to different species of fish and fishing grounds that were previously considered as undisturbed and remote as suggested in Figure 5.7. The map of the reported preferred fishing spots shows the highly fished areas highlighted in blue, regularly fished areas in purple, often fished areas in red and seldom fished areas in yellow. Most of the fishing activity is around Auckland city, which is expected as the city holds the

highest population in the country with 1 in 4 being boat owners. Based on the European Commission report discussed earlier, the heavy reliance on boats by recreational fishers for fishing throughout the year could cause added stress on the fishing resource and the ecosystem, although such impacts are hard to verify through this research (European Commission, 2007).

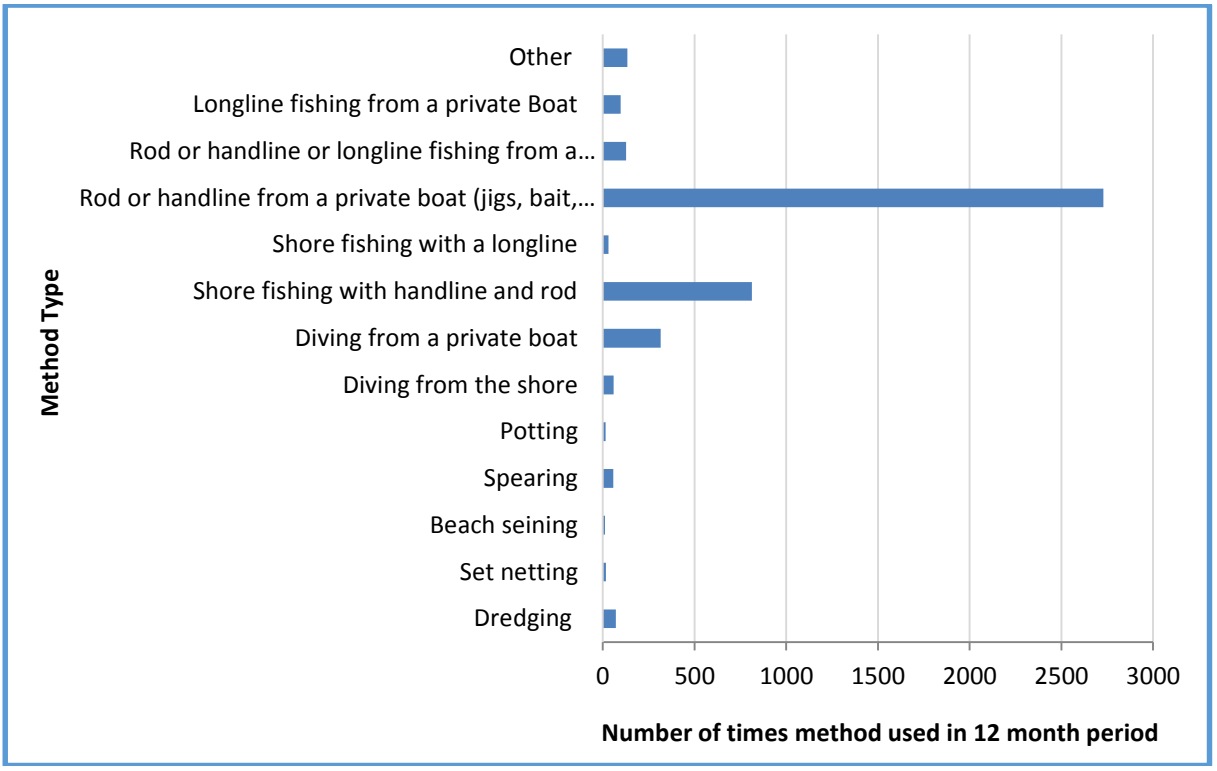

Figure 5.6: Reported most frequently used recreational fishing method during the last 12 month period.

		Most favoured method over 12 month period
Responses	Do you own a boat?	Using rod or hand-line from a private boat
Yes	100	84
No	32	21
Grand Total	132	105

Table 5.1: Boat ownerships and fishing from a private boat using rod or hand-line.

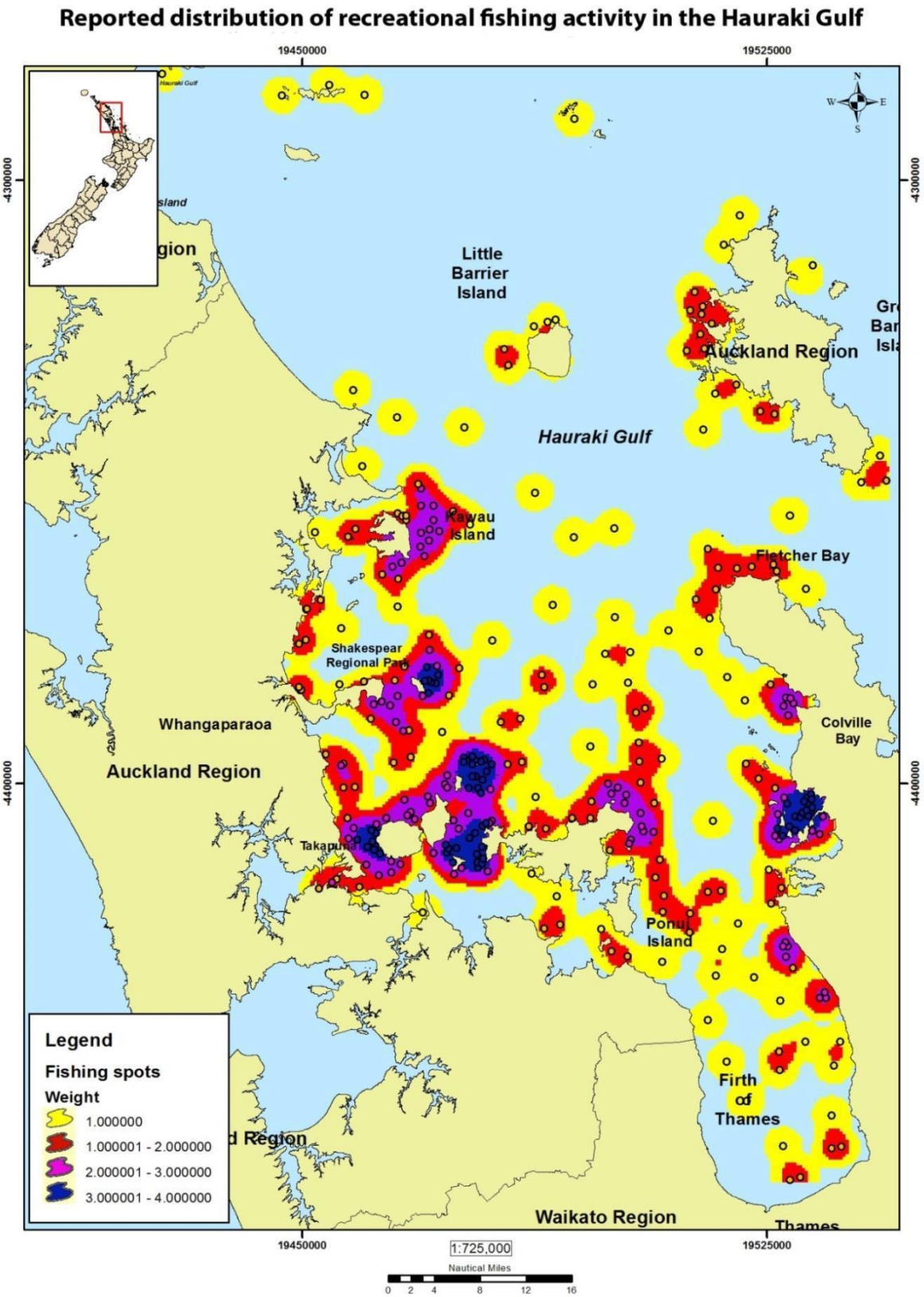

Figure 5.7: Reported distribution of recreational fishing activity in the Hauraki Gulf.

5.3.3: Scientific and governmental view of recreational fishing impacts on targeted fish species and food webs

NIWA scientists and MPI representatives interviewed in this research provided their perspective on the impacts caused by marine based activities and land based activities. MPI and NIWA scientists' identification of recreational fishing impacts on snapper fisheries were based on their knowledge of ecology. Both NIWA and MPI participants claimed recreational fishing activities were directly impacting targeted species. In the Hauraki Gulf, these species are snapper, kahawai, travelly, scallops and also cockle harvesting at beaches such as Shakespeare Bay, and Whangateau beach (Participant 1, Participant 2, Participant 9, and Participant 14). Snapper is the most valued, targeted, and caught species among recreational fishers, as suggested by the questionnaire responses in Figures 5.8 and 5.9. This supports catch data from NIWA, which estimated that 761,000 or 28% of snapper in the Hauraki Gulf are caught by recreational fishers each year (Morrison et al., 2008).

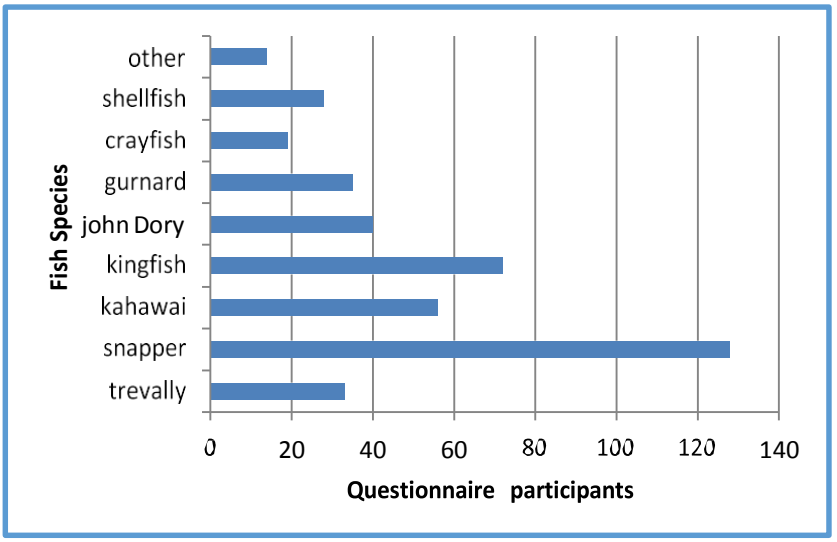

Figure 5.8: Most frequently targeted species by recreational fishers.

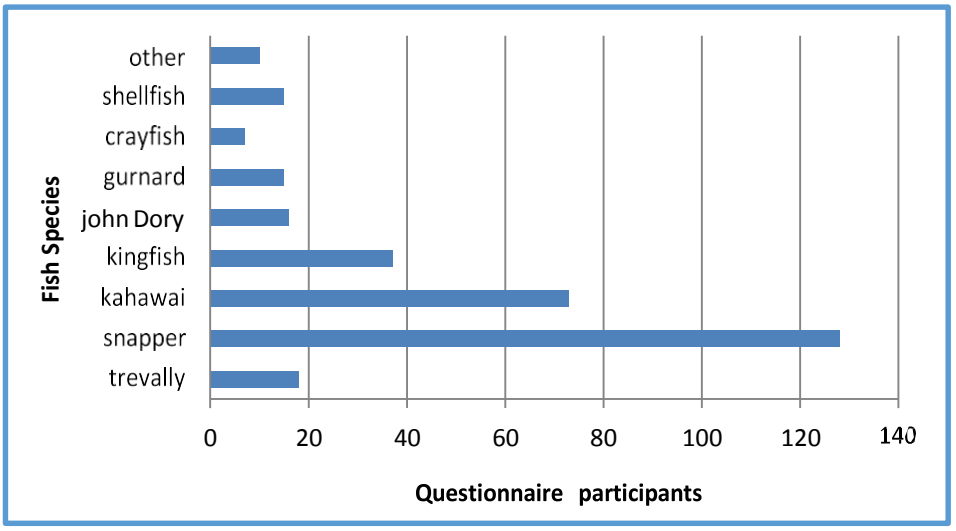

Figure 5.9: Most frequently caught species by recreational fishers.

The fishing habits of recreational fishers and their selection of fishing areas are influenced by snapper habitats. Snapper have a preference for areas and habitat patches with high structural complexity. The snapper environment consists of beds of sponges, sea squirts, burrows and pits, marine snails, and beds of horse mussels. Juvenile snapper are found hidden inside burrows and on top or close to such structures as these structures provide shelter from bigger predators (coastal sharks, kahawai, and john dory) and also provide better foraging opportunities (Morrison et al., 2008). Such biogenic habitats are targeted by recreational fishers because they provide better fishing opportunities for snapper, scallops, and mussels, which makes such habitats vulnerable to impacts caused by the high concentration of recreational fishing activity and the efforts which fishers go to catch them (Morrison et al., 2008).

Impacts on the habitat include being crushed by anchors and chains, structures being physically removed by lines and hooks, or clogged by high levels of sedimentation on the seafloor caused by aggressive boat movements and disturbance of the seafloor (Morrison et al., 2008). Considering that most of the marine animals living in such environments are filter feeders, high levels of sedimentation can affect their filter feeding ability, making it more difficult for them to filter food from suspended sediments in the water (Morrison et al., 2008). Rock lobsters can also be impacted since they are both carnivores and filter feeders, and feed on bivalve and molluscs. The reduction in rock lobster numbers due to recreational fishing impacts can have significant consequences on the balance of the benthic community.

One NIWA scientist suggested that the impacts of recreational fishing on bivalve species are more localised in comparison to finfish species like snapper, and other animals such as lobster are not as heavily affected, at least not directly within the borders of the Hauraki Gulf (Participant 1). He did argue, however, that other indirect effects of recreational fishing caused by targeting the top predators within the food chain can increase the relative abundance of other non-targeted herbivore species. This can change the construction of the food web where the predator becomes the prey (Participant 1).

While commercial fisheries fish heavily on both lower (e.g. shrimp) and upper levels (snapper, kingfish, and gurnard) of the food chain, the recreational sector mainly concentrates on the latter (Participant 14). The removal of top predators can therefore cause cascading trophic effects that alter the productivity, structure, and function of marine ecosystems (Coleman et al., 2004). Participant 2 explained that the trophic cascade caused by the removal of top predators such as snapper and crayfish has been demonstrated inside the Leigh Marine Reserve. The removal of these top predators causes a rise in herbivore populations, which leads to the suppression of sea plants such as kelp (Participant 2). When the predators recover, they suppress the herbivore populations such as sea urchins and as a result the kelp and sea plants can recover. This has the potential to make the ecosystem much more productive on rocky reefs (Participant 2).

These trophic effects on the ecosystem caused by the removal of top predators are more relevant to recreational fishers since they catch the bulk of the snapper and other top predators in the Hauraki Gulf, with their efforts concentrated mainly around coastal areas (Morgan, 2011). In comparison, commercial fishers fish more evenly across the food chain and in a wider area. The importance of the recreational fishing contribution to the depletion and targeting of top predators such as snapper was also acknowledged by Participant 2, who commented:

> Recreational take of snapper is actually greater than the commercial catch for the Hauraki Gulf. Based on that, I believe the impact of recreational fishers on the depletion of fish stocks is a very important component for snapper.

The claims of Participant 2 are supported by NIWA data which indicates that recreational catch for snapper is greater than that of the commercial sector in the Hauraki Gulf (see: Figure 3.1). There are also indications from NIWA research that shows an increase in the size and weight of fish landed by recreational fishers, specifically kahawai and snapper (see: Figure 3.2). Although recreational fishers are considered to be a significant factor in the sustainability of targeted species such as snapper, the MPI representative did not consider them to be the cause of depletion (Participant 9). The impact of recreational fishers on economically less favoured species was considered insignificant by the MPI representative; he claimed there was not enough science to suggest otherwise. Other broader impacts from recreational fishing activities such as disregarding of packaging, lost sinkers, and hooks can also have an effect on the Hauraki Gulf's ecosystem, but currently such impacts are not considered to be a priority in fisheries management.

The participants from NIWA held different views to the MPI representative in regards to the potential depletion of fish stocks caused by recreational fishers. Participant 2 claimed there was potential for localised fish depletion caused by recreational fishers. This was mainly due to the large separation of area between commercial fishing zones and recreational zones. Certain areas could receive a disproportionate amount of fishing effort relative to the rate of recruitment for that area, which could cause certain areas to be fished down lower than others. Snapper in shallow rocky reef areas targeted by recreational fishers are particularly vulnerable because snapper in those areas are more resident and only move a few 100s of meters in comparison to the snapper in deeper waters with soft sediment that can move an average of 10-20 km a year. This enables the fish in deeper waters to experience a much bigger genetic mixing pool. Therefore, removing fish from inshore rocky reefs are less likely to be replaced via movement alone (Participant 2). In addition, NIWA scientists identified the use of certain fishing gear by recreational fishers such as scallop dredgers and set nets as destructive to the Hauraki Gulf environment (Participant 1, and Participant 14). One of the NIWA scientists interviewed claimed to have observed the damage caused by recreational dredgers. The participant explained:

> This method is very destructive. If they are not used professionally. ...I have been in the water when those things have been used and it's just crazy. …what that does is it stops the system from recovering of disturbances that it had in the past (Participant 14).

The three participants from NIWA expressed discontent regarding the lack of government funding for research (Participant 1, Participant 2, and Participant 14). One of the NIWA scientists (Participant 14) explained that the Ministry (MPI) were only interested in researching the most valuable stocks; consequently, the majority of research funds are invested in high value deep water fisheries such as hoki, paua, crayfish, and snapper. Some research has been completed looking at the impacts of recreational dredgers on scallops; however, other less valued stocks such as gurnard and trevally are not researched as thoroughly (Participant 14). Researchers have some understanding of how things are interconnected within the food web but it has not been quantified; therefore, it is difficult to determine the extent of impacts on other species.

5.3.4: Suggested management controls by recreational fishers

Recreational fisher interviewees were asked to comment on the type of management controls they would like to see implemented to improve the Hauraki Gulf fishery and to better protect the environment. Several options were suggested to reduce the commercial fishing impact on the Hauraki Gulf. Many suggested the use of long lining as an alternative method for trawling (Participant 6, Participant 10, and Participant 15). In describing the benefits of long lining, Participant 5 commented:

> I suggest that if commercial fishers use long-line fishing then a high percentage of your catch is good quality, even if you reduce the amount of fish you catch, the quality would be much better.

The same participant also praised the Iceland fisheries management system, which is based on a no wastage policy. This means any fish caught, whether targeted or not, is harvested to nearly 100% to reduce the illegal dumping of by-catch and high-grading (dumping small size fish of the same species to target bigger ones). The extra by-catch is counted towards their annual fishery quota; however, exemptions are given for species with a high survival rate that can be returned to sea without any penalties towards the quota. Participant 5 argued this policy could challenge commercial fishers to develop and use more selective fishing methods to incentivise them to catch more economically valued species and decrease illegal dumping. He further proposed that New Zealand should follow the example of Iceland and implement the landing obligation for all commercial fishing activities (Participant 5).

In 2014, New Zealand commercial fishers had a minimum catch size of 25 cm for snapper. Recreational fishers argued that having a minimum size for snapper is pointless because trawling is not a selective fishing method and having a minimum size limit will promote high-grading by commercial fishers. Participant 6 and Participant 10 supported the introduction of new legislation that would see the removal of the commercial minimum size limit for snapper. They argued that, by removing the minimum legal size for snapper, it would force commercial fishers to land all the small snapper they catch, which tends to have a minimal market value. They believed such a policy would incentivise commercial fishers to fish more sustainably using

more selective techniques such as long-lining to land bigger snapper fish for better market value. Participant 6 further commented that, for the above restriction to be effective, commercial vessels would need to be fitted with surveillance cameras to monitor any illegal dumping (Participant 6).

In contrast, some of the recreational fishers interviewed wanted to see changes to recreational fishing practices (Participant 6, Participant 7, and Participant 8). Fishers promoted the combination of education and control over hook type and size as a suitable control measure for sustainable growth of the Hauraki Gulf recreational fisheries (Participant 6, and Participant 7, and Participant 8). Fishers highlighted that the use of large, barbless and circular hooks may reduce by-catch and hooking injuries. They also noted that the use of circular hooks can reduce the rate of gut hooked fish and, therefore, reduce mortality of caught and released fish, as well as allow them to target larger snapper and reduce injury. Another control measure that was previously presented to recreational fishers by government is licencing. Recreational fishers rejected licencing during time of option4 (see: Section 3.2) and when questioned about licensing the recreational sector in this research, the majority of fishers rejected the idea. All fishers viewed licensing as a revenue collecting tool for the government. Some argued that the only way the recreational sector would accept licensing would be if the customary sector accepted it as well otherwise licensing recreational fishers would create a racial divide within the country (Participant 4, Participant 6, Participant 7, and Participant 10). Other fishers suggested it would only be accepted if the licensing and funds were controlled, collected, and allocated by a representative fishing group and if the money was invested back into the sector (Participant 8, and Participant 12).

5.4: Barriers and opportunities for the establishment of ecosystem based management in the Hauraki Gulf

The intention of the Hauraki Marine Park Act (see: Chapter 3) is to foster a more integrative and proactive management framework for the Hauraki Gulf region. The purpose of this management framework is to form an alliance between resource users, government agencies and processes to sustain the life capacity of the Hauraki Gulf, rather than focusing on how to allocate the Hauraki Gulf's resources between conflicting and competing users. As part of *Fisheries 2030*, the government is using the Hauraki Gulf as a test case with the aim of implementing an integrative management framework in the form of EBM to achieve the greatest overall social, economic, cultural benefit for all resource users while maintaining the integrity and capacity of the ecosystem (Hauraki Gulf Forum, 2011). For EBM to be implemented successfully in the Hauraki Gulf, certain foundations need to be in place. These foundations include the availability of sufficient scientific knowledge about the Hauraki environment, and functioning governance structures with equal representation and participation opportunities for all resource users.

Fisher participants were asked to express their views on the idea of EBM as an integrative management tool in the Hauraki Gulf, and to identify the current barriers and opportunities of implementing such a regime. A representative from one recreational fishing group felt EBM was

a great way to manage the Hauraki Gulf since everything is connected and managed in a holistic way to achieve the greatest ecological and economic benefits (Participant 11). Participant 11 felt EBM would be a more viable option to replace the QMS that would overcome the influence exerted by the commercial sector. The discontent with QMS was highlighted by Participant 11, who stated:

> From where I am sitting as a recreational fisher, you got the quota management system managed almost totally by the commercial branch. Despite what they say, their rhetoric says they are about conservation, but their actions are all about raping and pillaging our seas to extract as much profits in the shortest amount of time.

The views of NIWA scientists in this research aligned with research elsewhere (see: Section 2.8), which states that EBM should be adopted to extend the existing management regime rather than to replace. This extension would reframe the way humans deal with nature (Participant 2, and Participant 14), and enable the management of fisheries and the marine ecosystem in a holistic manner

One of the visions of EBM is to manage the fisheries resources in a way that provides the highest social, environmental, cultural, economic benefits, while at the same time preserving the integrity and capacity of the marine environment, habitats and species. For that to be accomplished, however, there first needs to be a way to bring competing users together to find common interests and establish some trust. This could prove to be difficult since both commercial and recreational sectors are constantly blaming each other for the fisheries derived environmental impacts (Participant 14).

The recreational sector's ongoing conflict and distrust towards the commercial sector was demonstrated in the interview process. Recreational fishers claimed that, although they supported the idea of EBM, they felt the commercial sector was not prepared to compromise on their current approach of short-term economic gain for a long-term model of economic investment and resource restoration (Participant 6, and Participant 11). Participant 6 suggested that the only way EBM would work is if the conservation of the fishery was placed in the hands of recreational fishers and a permanent fixed quota for the commercial sector was instituted to prevent commercial fishers from overharvesting again once the fish stock numbers rebuilt from recreational fishing conservation efforts. Participant 6 and Participant 11 both stated that the commercial focus was on short term economic gain, while recreational fishers were working for the future of the sector. For Participant 11, the only way for bottom-up management to work between commercial and recreational was if the commercial sector was forced, through legalisation, to change their destructive fishing methods to reduce their impact on fishery and the ecosystem, or if there was incentives or economic benefits for the commercial sector to cooperate.

Other barriers to the successful implementation of EBM identified were the different values and interests that each stakeholder group and agency holds. For example; some stakeholders are

more interested in the harvesting for economic or recreational purposes, while other stakeholders are more interested in using the area for leisure and tourism. A representative of MPI highlighted that such differing values can hinder progress by causing misinterpretation and misdirection of management objectives (Participant 9). The participant stated that:

> You got groups that want to protect and preserve and make sure that the environment is good, and on the other hand you got the drivers to use the resources for the good of the economy. I think over time those interests are coming closer together but there are still a lot of conflicts (Participant 9).

Such conflicts can emerge from the differing approaches and objectives for management among organisations and user groups. An example is the different interpretations and understandings of what EBM constitutes for MPI and Hauraki Gulf Forum (Participant 9). Participant 9 claimed both agencies had differing interests, needs and values when it comes to managing the Hauraki Gulf. Each organisation holds a different interpretation and perspective of what sustainability meant, which could prove to be a limiting factor and, therefore, hinder the two organisations from working together in the future (Participant 9). The difference in views is centred on MPI's conviction that the QMS is in some way built upon an EBM approach to management (Participant 9). Participant 9 claimed MPI viewed the QMS as a management system that restricts and controls any activities that harm the biodiversity or impact the environment of marine animals (Participant 9); therefore, there is no need for a new management system because the QMS is not based on single species management as most critics of QMS claim. Contrary to the views of MPI, Participant 9 stated that the Hauraki Gulf Forum viewed the QMS as a single species management approach. From their perspective, he claimed, the QMS needs to be reformed to enable a more holistic management that acknowledges the complexity and interconnectedness of the ecosystem and society. With both organisations having a different interpretation of the QMS, it is difficult for them to reach a mutual understanding and work together.

The NIWA scientists and the Hauraki Gulf Forum representative shared similar views regarding the QMS (Participant 1, and Participant 2, participant 3). They viewed the QMS as a single species management regime and said they would prefer a more inclusive management regime. The scientists claimed fisheries management was currently being done in a piecemeal way without any consideration of the diversity and complexity of the user groups and the environment. Moreover, the management system was seen to be mostly reactive management (Participant 1, and Participant 2). NIWA scientists also claimed the barriers to implementing EBM were not due to the lack of scientific understanding but, rather, the lack of appropriate governance and management structures (Participant 2, Participant 3, and Participant 14). They argued that, although EBM would require a deeper understanding of the ecological interactions within the Hauraki ecosystem, the amount of knowledge currently available was sufficient to make a start (Participant 14, and Participant 2). The comments of Participant 14 reflect the shared view:

> What is holding us up is not science. Its management and governance, power sharing, getting people together, and getting them to trust each other. I would be the first to say we would need to do more research on the Hauraki Gulf because that is my job. But we know way more about that system than we are actually using in our decision making.

EBM in New Zealand is already underway with research projects looking at the interactions between mammals and seabirds (Participant 2). However, these projects are not fully integrated with other research being carried out. This was seen to be due to the lack of communication and organisation between different agencies and stakeholders (Participant 2). Participant 2 suggested one likely approach to improve integration and communication was to set up an adaptive platform led by an overarching management body with responsibility for integrating and directing the bodies below it. Apart from the benefit of information sharing through integration, Participant 14 suggested such a structure could create meaningful discussions between different agencies and sectors. He argued such a platform should focus on identifying the key targets and commonalities among user groups and organisations, with the aim of balancing the interests and values of different user groups and agencies in a comprehensive fashion. As part of an EBM approach, Participant 14 stressed the importance for such a platform to have the flexibility and inclusiveness to deal with constant environmental, political, and societal change, and to allow policy makers to revise and modify management steps every 5 years to ensure optimal results (Participant 14).

The implementation of EBM is financially costly and, therefore, there is a need for more effective funding to generate the integration of management and information sharing between different agencies and stakeholders (Participant 3). The implementation of EBM is further hampered by the national government funding cuts to many governmental organisations and research facilities (Participant 3).

5.5: The role of recreational fishers in fisheries management

Participation in decision-making processes provides for more successful management by calling upon the knowledge and experience of resource users. Participation can also contribute to more effective enforcement of regulations and policy by raising the probability of compliance. Co-management is a partnership arrangement focused on the sharing of responsibility and authority of management, between government and user groups. This management arrangement makes use of the user group's experience and knowledge in situations that science finds difficult to investigate. The government may complement this relationship by providing effective policy, conflict resolution and enforcement (Berkes, 2009).

The management arrangement between user groups and government can differ considerably, with varying levels of management arrangements between different user groups. (Jentoft and McCay, 1995). According to Participant 9, who is also an MPI representative, New Zealand's arrangement between recreational fishers and government is a consultative role at best. In this arrangement the government representative (MPI) consults recreational fishers through

submissions or by setting up an advisory board. The consultation process begins with a genuine intention of providing guidance and information from user groups; however the final decision is always made by the Minister of Primary Industries. As a representative of the government, the Minister may choose not to listen to the recommendations they receive from fishers. A comment made by Participant 9 during the interview supports the notion that participation exists only as consultation. The MPI representative was asked whether the recreational fishers could influence changes in policy. The representative stated:

> The Minister doesn't have to do what anyone says; it's his call. It's a centralised regime, the way the Fisheries Act is written, the Minister has most of the power and we, as managers and advisers, we try to work with the information be it scientific information or information from the public. We put a story together and provide options, alternatives, and how this might influence what people feel but it's his responsibility (Participant 9).

Participant 9 also claimed there were examples where recreational fishers' submissions had influenced the final decision; however, he did not provide details of what those examples were.

5.5.1: Recreational fishers' distrust towards government policy

An example of the level of distrust recreational fishing has towards government is exemplified in the process to reduce bag limit in SNA1 fishery. In July 2013, MPI issued a position paper and asked recreational fishers to provide feedback. Sentiments from recreational fishers involved in this research made it evident that recreational fishers felt as though the government was biased against them. Some fishers said they wanted more open dialogue and consultation and claimed the government only listens to the suggestions of commercial and customary sectors (Participant 4, Participant 6, Participant 11, and Participant 15). When asked about the proposed changes to control measures, Participant 15 noted the problems in the consultation process:

> I think it requires a lot of consultation and reviewing, if they don't consult than people are not going to come to the party. …The government are only interested in dealing with commercial and customary and they are not interested in dealing with recreational at all.

The SNA1 submissions process was seen by the fishers I spoke to during the July 2013 Half Moon Bay fisher meeting as a symbolic gesture intended to release the frustrations of recreational sector. Many fishers were unhappy with the way the Minister of Primary Industries handled the consultation process. Participant 7, who is also an active advocate for the recreational sector, shared his opinion on the consultation process and the fisheries legislation:

> The Minister has done a crap job of consulting in recent times. The process in which the minister addressed the issue was really bad. The options provided were not reasonable. The biggest problem is there is nothing in the legislation that says what is reasonable. You can't put a number on it, what is reasonable for you is not for me.

Judging by the attitudes and comments made by the attendees of the public hearing, as well as the interview participants, recreational fishers felt targeted and frustrated by what they claimed to be on-going favouritism by the Minister towards the commercial sector. Fishers said they did not trust the government and feared these restrictions would eventually take away all the freedoms of recreational fishers (Participant 4, and Participant 10). Fishers also predicted a move to further restrict recreational fishers without equal measures in place for commercial fishers would have political consequences for the Minister of Primary Industries and the government (Participant 4, Participant 10, and Participant 11). Participant 10 asserted that any decision taken by the Minister to restrict recreational fishing activities could result in a loss in coming elections. He commented:

> This is purely a political ploy. The Minister is about to realise he has brought a huge fight from the recreational sector, and it is probably about to get nasty. He has bitten off something that I don't think he can chew and if he stuffs up he will lose the election (Participant 10).

As discussed previously in Section 5.3.1, recreational fishers accused the Ministry of trying to allocate more fish to the commercial sector to increase commercial return. This was seen to be the reason the government sought to introduce new size and bag limits for the recreational sector (Participant 11, Participant 10, and Participant 4). The SNA1 bag limit reduction event highlights the existing conflict and lack of trust between stakeholders/user groups. The conflict and ongoing distrust of recreational fishers towards the commercial sector could hinder any future attempt for a co-operative approach to management. The successful implementation of a co-operative management approach between the recreational and commercial fishing sector requires active participation of both parties in policy making and management. Such a process would require direct negotiations between both parties which currently cannot be achieved without firstly solving the ongoing conflicts and distrust.

5.5.2: Challenges to Co-management

Fisheries management is a political issue related directly to conflicting interests, values, and views. In most instances fisheries management is controversial and tends to bring together user groups at odds with each other and with government. Decisions made by policy makers have to consider more than biological terms; they need to also consider the economic and social implications of their decisions. Therefore, fisheries management is more about managing people rather than managing fish. There is little that can be done to control non-fishing mortality caused by natural causes, but policy can put in place controls to control human related impacts including recreational fishing. This is where the conflict of interest starts. Decisions made may appear to be rational to one user group but not to others; what is beneficial from an economic perspective could be socially and culturally harmful; what makes biological sense could prove to be economically and socially unwise.

There are multiple conflicts of interest within the recreational sector itself and between user groups that need to be addressed if participation in policy making and knowledge gathering is to be successful. The scenario posed to recreational fishers during the interviews regarding the co-management of the Hauraki Gulf fishery with the commercial sector received mixed responses. Some fishers supported the idea of working closely with the commercial sector to manage the Hauraki Gulf fishery as long as clear rules and guidelines are installed to monitor and control procedures.

Comments from fishers suggested that shared management could only work if both sectors were on a more equal playing field under the QMS (Participant 6, and Participant 7). Some people suggested that it should be a proportional share, which would have to be flexible (Participant 6). It was also suggested that the only way for co-management to work between both sectors was with the presence of an unbiased mediator to control proceedings, as well as the need to find commonalities between the sectors to ease the tensions (Participant 8, and Participant 12). A mediator would need to be someone who is neutral to all user groups involved to prevent any claims of favouritism and corruption during the decision making process.

Other recreational fishers and sector representatives claimed it would be difficult to achieve co-operative management between the two sectors due to the influence and money the commercial sector has within the marine fishing industry as well as the inequality in QMS. The recreational sector was considered by participants to be hugely disadvantaged in terms of rights when compared to the commercial and customary sectors, which leaves them in a difficult position since the fishery is a shared resource (McMurran, 2000). Fishers expressed concerns that they would be overpowered by the commercial sector, which would lead to the loss of some of their fishing rights (Participant 4, and Participant 10). Participant 4, who has 54 years of fishing experience and has been a strong advocate for the sector, explained the difficulty of co-managing the fishery resources with the companies and co-operates of the commercial sector. When asked during the interview whether recreational fishers were willing to co-operatively work with the commercial sector to manage fisheries resources, Participant 4 argued that recreational fishers are average citizens with modest means and do not have the ability or influence to discuss policy and management issues with the commercial sector without getting overshadowed and overpowered:

> You can't get the average Joe talking to co-operates. You can't have average Joe going into the high buildings and into the meetings with chief executives holding board meetings. We are just normal people with average jobs.

When asked if co-operative management between the two sectors could work with a mediator controlling the proceedings to ensure fairness in the decision making. He replied: "Who would that be? What is his bias in the agenda? Who is paying him? No, of course not" (Participant 4).

Scientists and government representative's shared their views in regards to the possibility of co-management being successful between the two sectors. While all of the participants felt it would be a difficult task to achieve co-management, some were more optimistic than others. Overall,

the majority of NIWA and MPI participants viewed co-management between the two sectors as a difficult task to accomplish due to the unequal rights within the QMS (Participant 1, Participant 9, and Participant 14). The participants emphasised that, co-management would require both sectors to have similar power and influence in order to succeed. However, this is difficult to achieve with the current management system, which has strong policies in favour of commercial fishers and quota owners. Recreational fishers would lack the ability to bargain and have little to offer around the discussion table to incentivise commercial fishers. Therefore, if the process of managing the fishery under the current regulations was left up to the commercial and recreational sector alone, the recreational sector would be enormously outmuscled by the commercial sector (Participant 9, Participant 1, and Participant 14).

The inequalities in quota rights between the two sectors were highlighted by the MPI representative (Participant 9). Using an analogy, Participant 9 argued that the strength of the commercial sector under the QMS legislation in comparison to that of the recreational sector is similar to the maturity between an adult and a child. Participant 9 commented that the difference in maturity will always lead to the adult having the final say:

> With the commercial and recreational sector, it is like having a 20 year old and a 5 year old arguing about a bowl of candy. However, if the 20 year old is going to be really nice and come down to a level of the 5 year old then the process might work. But if the 20 year old decides, “It’s my candy,” what can the 5 year old do? He doesn’t have a hope.

Despite the inequalities in rights, Participant 9 claimed that MPI was optimistic about FishinFuture search (see: Section 5.5.3). He predicted that a recognised, official, and unified national body could substantially strengthen the stance of the recreational sector. It would allow them to speak with a common voice to a consistent strategy and approach when dealing with issues impacting recreational fishing. This could put them in a better position to negotiate with the commercial sector or anybody else. Nevertheless, Participant 9 highlighted that even though a national body could benefit the recreational sector by providing them with unified voice, it may not be sufficient to provide them an equivalent level of power under the law because the commercial quota rights are very powerful (Participant 9).

The uniting of both sectors (recreational and commercial) to manage the fisheries resource would require trust and a common vision, which would require compromise from all parties involved (Participant 1, and Participant 14). Participant 14 explained that with the current inequality of rights, a meeting today between the two parties would most likely be very hostile and chaotic with each sector blaming the other for the destructive fishing methods and over harvesting (Participant 14). Furthermore, the participant explained that this is made even more difficult when considering the different values each party holds, where the commercial sector focused on economic gains versus the social values of the recreational sector (Participant 14). Therefore, a facilitator would be required to control proceedings between the sectors and to maintain the overall shared vision and shared acknowledgment of the different values. Participant 1 highlighted that, to help build trust, both parties need to identify a common vision

and interest to work towards. This would allow both sides to focus on achieving this vision which could ease the tensions. He also suggested that there were two factors that could bring the sectors together:

1. The collapse of the fishery, they both come together to save the fishery

Or

2. If things are really rosy (everyone is happy with catch)

Participant 1 further stated that the current reality of shared fisheries is either in a reasonable state or depleted, and because of that, it is very important to have some kind of government involvement to manage the catch and the interests of both sectors.

During an interview with Participant 3, who is also a representative of the Hauraki Gulf Forum, he highlighted that it is imperative to realise there will always be competing interests within a shared resource. The objective is to focus on the shared interests to move forward. A shared interest could be the sustainability of the fishery for future generations and for all stakeholders to enjoy (Participant 14). It is also important to have any agreement reached between the sectors written into the legislation and enforced to prevent any future conflict (Participant 3).

While the initial planning process is difficult, Participant 14 speculated that, once achieved, it could prove very beneficial to the ecosystem of the Hauraki Gulf and the economy of the fishing industry in the long term. It could also prove to be politically powerful because the government would play more of a mentoring, mediator role and the minister would not be forced to make tough decisions that could lose him a future election from the voting fisher community (Participant 14). Before co-management arrangements between the commercial and recreational sector can be achieved, the conflict between the two recreational representative groups needs to be solved.

5.5.3: Conflict among recreational representative groups

The rift between the NZRFC and option4 can be traced back to the Soundings document. Option4 accused NZRFC of being traitors who shouldn't be trusted by recreational fishers because they joined forces with the Ministry to produce the Soundings document. NZRFC representative interviewed described LegaSea as "option4 on steroids" a group that is more active, organised, and determined than its predecessor (Participant 10). The NZRFC representative considers LegaSea as a "ginger group", he defined them as an antagonist group and who require someone to hate in order to operate. He explained:

> They are the antagonist; they are good at identifying who to hate. And coming up to the SNA1 case with the Ministry they will be fantastic. When it comes down to management and working with commercial, customary and officials they are not good at that, they don't have credibility. I support them as a ginger group, and that is where they should stay. But as a replacement for the recreational fishing council? No, I don't support them for that. …Legasea is only 5 people, they got no constitution (Participant 10).

Participant 10 further described LegaSea, as representing those who predominantly fish under the IGFA (International Game Fish Association). Fishers affiliated with LegaSea were viewed by Participant 10 as people who "play with their food, fishing for fun".

The NZRFC represents many groups including the Anglian casting group, marine transport, hand gatherers, land based fishers, kite fishers, and yacht clubs. By representing these groups directly, the NZRFC claims to indirectly represent all recreational fishers who don't have a voice. The reason NZRFC claim this is because any accomplishment, by default, benefits all recreational fishers.

The LegaSea website states that the goal of the group is to promote New Zealanders' interest in precautionary management of the marine resources (LegaSea, 2013b). Contrary to the statements on the LegaSea website, a different message was portrayed by its members during interviews. One LegaSea group member, who is heavily involved with advocating for the organisation, made it clear that it was not the ambition of LegaSea to represent every recreational fisher in New Zealand.

> I don't think LegaSea are trying to be everything to everyone. They [LegaSea] have a very good scientific base with professionals that are paid to lobby to work on science to figure out how to best represent their clubs and to manage and protect their fisheries and their clubs. …Their mandate is to represent the New Zealand Sport Fishing Council. Therefore, they don't want to represent every recreational fisher in New Zealand (Participant 6).

Participant 6 claimed the priority of LegaSea was to advocate for paying members of the fishing community, and to represent the NZSFC. The NZSFC is made up of 52 fishing clubs around the country and has approximately 32,000 paying members. As mentioned above, the LegaSea website claimed that it represents all New Zealanders who have a love for outdoors and fishing, but it fails to mention that they primarily represent paying members and affiliated groups. During an interview with a LegaSea representative, Participant 11, the participant was asked to clarify the confusion regarding the objectives of LegaSea and whether the group considers itself as a representative for the recreational sector. Participant 11 clarified that, although the position of LegaSea may appear to be confusing to the general public, the primary goal of LegaSea is to represent its members and affiliated clubs. In doing so, however, it also indirectly represents all recreational fishers because any achievements indirectly benefit the entire recreational sector (Participant 11). The position of LegaSea as elucidated by Participant 11 is similar to the answer given by Participant 10 who represents the opposition group, NZRFC, who also claim they are representing all recreational fishers indirectly.

As Participant 6 explained, both organisations share the same vision of sustaining the resource for current and future generations of recreational fishers, although they disagreed on how this could be achieved. Participant 6 said many attempts were made between 2011 and 2013 to bring the groups together and find commonalities; however, the directors of each group were distrusting of each other and unwilling to compromise (Participant 6). NZRFC is focused on

working alongside commercial fishers and the government to achieve collaborative management, while LegaSea interview participants viewed such a move as unproductive because they had little trust in government and the commercial sector (Participant 6, and Participant 11). LegaSea members did not recognise NZRFC as a representative of the recreational sector because they do not have enough paying members or clubs affiliated with them (Participant 6, and Participant 7). Participant 6 labelled NZRFC a "dead organisation" that would soon become insolvent. He claimed that the majority of recreational fishers did not like the secretive way that NZRFC operated, which has reflected in their low memberships (Participant 6).

NZRFC is currently in the process of rebuilding itself through FishinFuture Search. The project aims to form an accountable, recognised, and representative national body for the recreational sector focused on promoting and protecting responsible recreational fishing. The new national body would serve as a hub for information, science, facts, and to enable those involved in fisheries management to participate equally (Participant 13). The FishinFuture Search event held in February 2013 gathered a cross-section of stakeholders into one room to discuss and set goals towards the formation of a legitimate national body that will ensure the future of recreational fishing. The attendees consisted of recreational fishers and other user groups including representatives from the commercial, government agencies, customary fishers, and representatives interested in the sustainability of fishery resources and the health of the marine ecosystem. The second stage of the project in mid-2013 was focused on the formation of a steering group to turn the goals agreed upon in the first meeting into reality.

Participant 13, who was heavily involved in FishinFuture, stated that, while she agreed with the idea of uniting recreational fishers under one banner, there were many inherent difficulties associated with such a goal due to the diversity and flexibility of the sector. She commented "A rec fisher today might not be one tomorrow" (Participant 13). Participant 13 argued that the recreational sector is comprised of people from all walks of life: scientists, doctors, and fishing experts. Thus, this diversity should highlight the strengths of the recreational sector and should not be considered a weakness. FishinFuture Search has plans to exploit this diversity of backgrounds by promoting scientific research to anyone with the right expertise within the sector (Participant 13). This will enable the group to gain more credibility within the fisheries management arena.

This collaborative process is backed by multiple sponsors, both co-operate and private. The first event of FishinFuture Search raised $110,000 in funds and was put toward the formation of the group. Fifty percent of the funds came from the government with the rest from other organisations including the commercial sector and Maori organisations. This process showed signs of collaboration between user groups with a common goal of sustaining the fisheries for future generations. The Ministry of Primary Industries and The Department of Conversation (DoC) supported the initiative and contributed funding. Nevertheless, Participant 13 expressed doubts over the future success of the process. She felt the government had shown a lack of trust in the recreational sector in relation to the government proposal to reduce the snapper bag

limit in SNA1. The NZRFC, who initiated the FishinFuture initiative, viewed this as a setback to the six months of collaborative work with the commercial and government organisations. However, they remained hopeful the collaboration might lead to a more unified recreational sector with enough credibility to participate in fisheries management alongside commercial and customary sectors. To achieve this, the participation of LegaSea was seen to be important (Participant 6, and Participant 13). Both Participants 6 and 11 hoped some form of collaboration or alliance between the two organisations could happen in the near future; however, Participant 6 said LegaSea were not "holding their breath".

Participant 6 considered FishinFuture and NZRFC to be two organisations trying to be everything to everyone but failing miserably. LegaSea representatives argued it is difficult to unite a million recreational fishers under one national body and that the goals of the sector (clarifying the sector rights to the resource within the QMS) can still be achieved without unifying all fishers (Participant 7, and Participant 11). LegaSea representatives viewed claims around unification to be a ploy by the government and the commercial sector to delay efforts to address the needs of the recreational sector (Participant 7).

5.5.4: Participation of the recreational sector in knowledge gathering

The benefit of fisher knowledge may be difficult to determine, since scientists tend to dismiss local fisher knowledge (LFK) as anecdotal. Scientists interviewed regarded fisher information as subjective, and therefore, unreliable (Participant 1, and Participant 14). Scientists viewed fisher knowledge as biased observation and there was no scientific evidence to support their contributions. Participant 14 compared the observational method to gathering information to a scientist making scientific claims based on faith, and that user groups such as fishers or farmers consider their observations as a reason to validate their actions without any solid scientific proof (Participant 14). Furthermore, he inferred that the concept of science is morphing from one that is based on hypothesis testing and using particular methods to gather information to one that is more politically motivated. NIWA scientists were critical of introducing LFK as this could create unreliable data skewed by everyone's biases, personal motivations, and group interests.

It was recognised that scientists could be influenced by individual interests or political motivations, which could lead to some scientists pushing their agendas through their research. This undermined the position of science as a neutral and objective discipline (Participant 14).

Another barrier to fisher contribution in knowledge gathering was highlighted by Participant 1. Participant 1 argued that it is very risky for scientists to teach fishers who lack scientific background to carry out measuring and data collection tasks. He commented:

> It is very difficult sometimes to teach people without scientific background how to measure a fish, or why we do a sample in certain areas and not others. Therefore, scientists prefer to work with people who are experienced with scientific work. And find

> it too time consuming and risky in terms of data accuracy to train fishers to do their own measuring and data collection.

With all the objections and issues highlighted above, the scientists interviewed recognised the importance of fisher participation in knowledge gathering if EBM is to be implemented successfully. Participant 1 and Participant 14 claimed they did understand the holistic approach of EBM was to adopt and think about different approaches to information gathering and the implications as well as the benefits of it. Participant 14 claimed there are people who already engage and participate and some of the information they provide is credible science, and other times it is just voicing their values and opinions. For EBM to be successful, it is important for scientists to be more open-minded towards LFK, and the use of fisher and other stakeholder knowledge as one of the tools to source information. It is vital that people get to voice their opinions, observations and be part of the discussions regarding the health of our marine ecosystem.

5.6: QMS and the recreational sector

In 1986, the QMS was implemented to manage the declining fish stocks as a result of excessive commercial activities. During the implementation process, little attention was given to the rights of other sectors within the fishery; namely, recreational, and customary. Recreational fishing was considered to be an insignificant activity at that time, and therefore, not much consideration was given to incorporating recreational fishing into the QMS. Since its implementation, recreational fishers have fought for their shared rights to the resource (McMurran, 2000).

A number of participants from recreational fisheries emphasised the importance of having a representative set quota allocated to their sector. They further argued that the government performed inadequately in managing the interests of recreational fishers and that the initial quota allowance for the sector was underestimated and not representative of the millions of participants partaking in the activity (Participant 5, Participant 6, Participant 10, and Participant 11). Those participants felt that a fair allocation was needed to represent the large and growing recreational sector in New Zealand. This was highlighted by a comment made by Participant 11:

> I think there needs to be an allocation that represents the millions of rec fishers. …Let's assume there are a total of 20,000 people working for the commercial fishing sector and or are shareholders. 20,000 of the people in New Zealand having over 60% of the resource allocated to them. How can 20,000 people get 60% and a million people get 30%, I don't think that's fair.

Others found the allocation of a fixed quota too restrictive (Participant 7). They argued that the recreational sector is constantly increasing; therefore, a fixed quota would not be efficient to satisfy the needs of future generations. Those fishers preferred to stay with current system in which the Minister reviews and allocates a reasonable annual allowance to recreational fishers. This concern has been expressed against a set quota allocation:

> I don't support quota allocation. Because quota allocation is fixed and when the population of fishers increases we would have a problem. The amount we can catch would become less and less until it becomes a waste of time to go. I don't support the restriction of recreational fishing to a specific quota. I think the minister needs to keep doing his job and making a reasonable allowance (Participant 7).

The NIWA scientists interviewed in this research claimed the substantial expansion of the recreational sector needs to be accounted for and managed if the fish stocks are to be sustained (Participant 1, Participant 2, and Participant 14). Participant 1 explained that during the 2011-2012 seasons, recreational fishers were allocated 2300 tonnes of snapper but caught between 3800-4000 tonnes. This works out at more than 40% of the annual allowance allocated to them by the government. If stocks are not controlled, they would not be sustainable in the long term. Participant 1 suggested that ultimately the government would have to make an unpopular decision and slow down the current rate of harvesting for the recreational sector by implementing more control measures because at this rate, the future for the snapper fishery is not looking bright. One alternative to solve the issue for the increasing demands of the recreational sector would be to decrease commercial catch to accommodate recreational fishers, but that could create other problems. The alternative chosen by the government was a decrease in the bag limits of recreational fishers for snapper (from a daily limit of nine to seven) in the largest fishing zone in New Zealand (SNA1).

During my attendance at the 2013 SNA1 meeting at the Bucklands Beach Yacht Club on the proposed snapper bag limit cuts for recreational fishers who fish in the SNA1 zone, I witnessed hostility and anger towards MPI and the commercial sector representatives from many of the recreational fishers present who opposed the new restrictions. The meeting gave rise to debates and arguments between government staff and recreational fishers over the proposed bag limit cuts. Most of these arguments centred on the government blaming the recreational sector for not staying within their allocations. At the meeting recreational fishers argued that the current allocation of quota for recreational fishers was unrepresentative of the nearly 800,000 or 19% of the population who are active participants (Participant 6, and Participant 11). They blamed the government for not amending the allocated allowance despite the increased recreational fishing participation; therefore, it was inevitable that the current quota limit was crossed.

Some recreational fishers accused NIWA of being a puppet to MPI and the commercial sector because NIWA is funded by them. They also claimed that the purpose of these reductions was to increase commercial exports (Participant 4, and Participant 7). Other recreational fishers placed the blame on the QMS. Recreational fishers felt NIWA data and MPI policies were biased and favoured increasing export dollars (Participant 4, Participant 7, and Participant 11). Recreational fishers argued that the Ministry was not following the 1996 Fisheries Act legislation, which clearly emphasizes a reasonable allowance for the recreational sector. Recreational fishers accused the Ministry of always trying to target recreational fishers as soon as they are ready to propose new control measures, the latest being the SNA1 IPP document. Fishers

claimed the purpose of SNA1 was to elevate the export of snapper for the commercial sector. Participant 10, who is also the representative for NZRFC, commented that the government was trying to increase the quota of Sanford fisheries, whose broad members are part of the National Party (Participant 10). He claimed the situation of trying to cut the bag limit to be a political manoeuvre that could negatively affect the coming elections for the Minister (Participant 10).

The structure of the decision making process left recreational fishers frustrated. Participant 4 claimed there was a disconnection between policy makers and the availability of accurate information. He argued that policy makers at MPI were making decisions based on information provided to them by NIWA, which recreational fishers did not consider to be reliable. Participant 10 also acknowledged that the recreational sector lacked the required funding to carry out their own research, which makes them powerless and unable to discredit any data provided by NIWA. He further pointed out that, even if recreational fishers had the funding to carry out their own research, it would be dismissed by the government as biased or untrustworthy (Participant 4). The unwillingness of scientists to acknowledge the benefits of local fisher knowledge was considered by recreational fishers as a barrier to building trust that would affect their ability to participate in fisheries management and information gathering (Participant 4 and Participant 10).

Recreational fishers claimed the government wanted to double exports by 2020, and the only way they could do that was to take away from recreational fisher's allowance. The comments from recreational fishers indicate that MPI was not respected amongst recreational fishers and was seen as an organisation that lacked integrity, transparency, and credibility. Furthermore, recreational fishers voiced their anger towards the failure of MPI to recognise the economic (quantitative) value of recreational sector, or the social (qualitative) value it adds to New Zealander's lives. Therefore, by restricting the recreational sector, recreational fishers claimed MPI was also impacting on the economy because there would be fewer people buying bait from tackle shops, spending money on their boats, fuel, fishing gear and fishing technology (Participant 7, Participant 4, Participant 6, Participant 11, and Participant 12). Participant 10 shared a different view; he commented that recreational fishing was driven by two factors, access and availability. He argued that if fishers can't go out and catch their fish either because of the restrictions placed on the activity, or because of a bad fishing season, then fishers would divert their attention to other activities such as hunting or play sports (Participant 10). This suggested that fishers would ultimately spend their money on other activities if fish were no longer easily accessible.

The majority of the recreational sector representatives interviewed felt they had been short-changed since the introduction of the QMS (Participant 6, Participant 10, and Participant 11). Recreational fishers pointed out that the main issue of the QMS was the mandate which it operates under. They argued that the QMS and the Fisheries Act were created to enable the greatest extraction of fish from the oceans (sustainably) to provide an income for New Zealand. Participant 6 also pointed out that the rights of the customary sector were also acknowledged under the Treaty of Waitangi while the recreational fishers were left for the scraps.

Recreational sector representatives were also disgruntled at the 1996 Fisheries Act. They claimed the way the Act was written was up for interpretation and could sometimes be confusing (Participant 6, and Participant 10). This caused conflicts between the commercial and recreational sector, especially during policy reviews. One of the examples they highlighted related to Section 21 of the 1996 Act.

Section 21 states: "In setting or varying any total allowable commercial catch for any quota management stock, the Minister shall have regard to the total allowable catch for that stock and shall allow for

a. the following non-commercial fishing interests in that stock, namely
    i. Maori customary non-commercial fishing interests; and
    ii. recreational interests; and
b. All other mortality to that stock caused by fishing" (Ministry for Primary Industries, 2014:74).

Recreational representatives suggested the above section of the Act clearly states priority should be given to customary and recreational, before the commercial quota is allocated (Participant 6, and Participant 10). The representatives suggested the QMS needs to be rewritten to better define recreational fishing rights because, at the moment, they are very loosely defined. Participant 10 claimed only a small proportion of the Act addressed recreational fishers, while the majority of it addressed customary and commercial fisheries (Participant 10).

All fishers saw fishing as their birth right, and claimed those rights were being slowly taken away by the government (Participant 10). Recreational fishers claimed to be the 'forgotten' sector within the QMS; because of this, they sensed that the government considered them economically insignificant, which was why they did not get a fair say in decision making (Participant 12, and Participant 13). Recreational fishers saw fishing as their last freedom; the last opportunity for them to fulfil their primal urges for hunting; however, they perceived the government and MPI as always trying to restrict their freedom with new policies and laws to make it harder for them to fish.

5.7: Summary

Understanding the social and economic value of recreational fishing and the motivations that drive individuals to participate in the activity were identified as important factors to contemplate when considering future management approaches. The lack of information on the impacts from recreational fishing activities on the function and health of the marine environment of the Hauraki Gulf was also identified as an area of serious concern. The piecemeal single species management style of the current system is reflected in the way that fisheries scientific research is conducted. While some research is being done to understand the interactions and complexities between other species and biogenic structures of the marine ecosystem it remains limited, which participants felt was due to the fragmented nature of the QMS, the limited funding available, and the absence of appropriate governance structures and institutions to enable

integration that would allow for better information sharing and communication between different organizations. Integration was deemed particularly important for implementing EBM.

The conflict of interest between the multiple user groups was also made evident from the data. There was a clear distrust between all stakeholders. Recreational fishers discussed their worries about the impacts caused from commercial fishing activities, which they identified as the primary driver behind the declines in fish stocks. Several fishers asked for more prohibitive measures to monitor and control commercial fishing activities in the Hauraki Gulf. They also suggested that more education and management controls are required for recreational fishers to decrease injuries and mortalities associated with the handling and release of recreationally fished species. All fisher participants echoed their frustration towards the government for their continuous favouring of the commercial sector, which they claim is evident in the way MPI manages the fishery. Fishers voiced their concern about their diminishing rights under the QMS, which they believe is restricting their ability to enjoy their fishing. These findings will be discussed and analysed in more depth in the following chapter.

Chapter

6 Discussion

This chapter builds on Chapter five by analysing the information presented from recreational fisher interviews and questionnaires. It begins by examining the on-going issues and shortfalls of fisheries management, and how such issues have impacted the fisheries resources and the marine ecosystem. The legislative shortcomings of the QMS and the difficulties associated with the poorly defined rights of recreational fishers are discussed. This leads to a discussion of the effects of distrust and conflicting interests of the recreational sector towards the government and the commercial sector on stakeholder coordination and cooperation efforts for management. The challenges confronting the recreational fishing sector as a consequence of competing approaches to advocacy are discussed, with consideration of how the lack of organisation affects the ability of recreational fishers to participate in decision making. This involves considering the broader challenges, barriers and opportunities that arise when attempting to include the recreational sector into fisheries management. The chapter concludes with a discussion of the importance of understanding the impacts of recreational fishing for the sustainability of fish stocks and consideration of the possibilities offered by adaptive management tools to account for uncertainty and provide flexibility for scientists and government.

6.1: Governance failure of the QMS

The New Zealand QMS has been lauded as a revolutionary reformist regime that led to the overturning of unsustainable fish stock trajectories, elevated economic exports and investments, improved industry productivity, and created more jobs (Gibbs, 2007). The QMS was established to regulate the overexploitation of New Zealand's inshore fisheries by the commercial sector (Borch, 2010). During the first stages of its implementation, its main focus has been on the commercial sector initiatives. As a consequence, the non-commercial sectors, especially the recreational sector, has appeared to be of secondary concern (McMurran, 2000). While the customary sector has since been able to clarify their rights, the recreational sector remains poorly defined, which has been the reason behind the on-going conflict between the sectors (McMurran, 2000).

The ability of a quota management system to enhance the sustainability of fish beyond commercially valuable species or to improve ecosystem services is difficult to determine (Branch, 2009). Fisher representatives and scientists who participated in this research criticised the QMS for its single sector and single species approach, and advocated for an extended and more holistic system (see: Section 5.4). Participants called for a management approach that acknowledges the dynamic nature and interconnectedness of the Hauraki Gulf ecosystem, and manages all interactions between humans and the environment.

The QMS is a disconnected sectoral approach that creates fragmentation as well as temporal and spatial mismatches. The piecemeal way in which user groups and the marine environment are managed highlights the lack of consideration given to the dynamic and complex nature of user groups and the marine environment under the QMS. McMurran (2000) argues that the one size fits all approach such as is used by the Ministry of Primary Industries (MPI) is ineffective, particularly for recreational fishers. While regulations for commercial fishers are similar all around New Zealand, recreational fishers are diverse with different needs and local conditions; therefore, such an approach is unable to deal with recreational fisher concerns (McMurran, 2000).

As seen in Section 5.3.4 and 5.4, the majority of recreational fishers wanted to see more sustainable fishing methods used and were supportive of the EBM concept. They argued that banning harmful fishing methods such as trawling and dredging would reduce by-catch and improve the sustainability of the targeted species and, therefore, would mean better fishing for current and future generations (see: Sections5.3 and 5.3.4). While the majority wanted to see destructive commercial methods banned, only a few recreational fishers advocated for the introduction of more conservation-focused recreational fishing tools such as large circular and barbless hooks, which they claimed reduced catch and release mortality (see: Section 5.3.4). Studies by scholars such as Cooke and Suski (2004) Prince et al. (2002) and Alós et al. (2008) have shown a decrease in fish mortality and higher hooking and biting percentage when using circular hooks in comparison to the traditional J-style hooks. Significantly, more fish were jaw hooked in the side of the mouth compared to traditional J-style hooks, which resulted in more deep hooked fish in the throat or stomach. In general, circular hooks resulted in fishing success greater or equal to J-style hooks. Circular hooks also reduced the rate of deep hooking and bleeding. Promoting the use of circular hooks could improve the live release of fish in recreational fisheries (Prince et al., 2002), and could reduce catch and release mortality in the Hauraki Gulf.

The overarching focus of the QMS on economic gain affects the ability of the management system to focus on the broader ecological impacts (see: Section 5.3.3). The findings suggest that, from the recreational fishers' perspective, competition and conflict between user groups has manifested because of the unequal allocation of rights under the QMS (see: Sections 5.2, 5.5.2, and 5.6). This confirms research by (Kearney, 2002, MacKenzie and Cox, 2013, Sutinen and Johnston, 2003), which emphasises the importance of defining suitable allocation systems that satisfies all competing user groups in order to reduce competition and conflict, as well as increase the legitimacy of fisheries management. The control measures used under the QMS are, therefore, seen by recreational fishers to lack legitimacy.

6.2: Moving away from the Blame game

As shown in Chapter 5, fisheries management is a politically motivated issue that encompasses many user groups with various conflicting interests, values, and views. An important source of conflict in the Hauraki Gulf is the distrust among recreational fishers towards the commercial sector, which largely reflects the competing interests amongst different fishing groups. This is partly due to recreational fishers' concerns about the impact of commercial fishing on recreationally fished areas as well as recreationally popular species such as snapper. Recreational fishers accused commercial fishers of practising harmful fishing methods and, thus, considered them responsible for the current environmental impacts and pressures on recreationally targeted resources and fishing spots (see: Sections 5.3 and 5.3.1). Distrust and conflict between rival recreational fishing groups as well as the recreational sector towards both the commercial sector and government reduces the likelihood of effective collaboration and participation in management under an integrated EBM approach (see: Sections 5.5.1, 5.5.3, and 5.4).

The findings of this research echo research by authors such as Bess and Rallapudi (2007) Kearney (2001) and McMurran (2000), who identified unequal rights under the fisheries legislation as the main cause behind the ongoing conflict between user groups; moreover, their research showed that the failure to clarify the rights of disadvantaged user groups will hinder any attempt to collaborative management. This research suggests the unequal allocation of rights exacerbated the conflicts arising because of the lack of trust between different user groups. Recreational fishers were sceptical about the sincerity and motives of government to share power; similarly, the findings suggested a lack of faith of the government towards the ability of fishers to manage themselves. The lack of trust between recreational sector and the government has been identified elsewhere as presenting a barrier to collaboration and enabling the participation of the recreational sector in fisheries management (Lele, 2000, Wilson et al., 2003). This research affirms observations made by Olsson (2004), Folke et al. (2002), and Noble (2000), that reducing conflict and building trust between all government and user groups, as well as within user groups is fundamental to the success of collaborative approach to management.

The increasing interest in ecosystem based approaches and community involvement in decision making strategies has raised questions about whether EBM can be implemented successfully with recreational fisher involvement due to the individualistic selfish behaviour of participants (Pereira and Hansen, 2003). Authors such as Pomeroy and Berkes (1997) and Jentoft and Kristoffersen (1989) advocate for a system that encompasses all resource users in the decision making process and enables users to organise themselves to solve conflicts and participate in decision making to regulate their own resources. A change in management approach to incorporate recreational fishers in decision making could incentivise recreational fishers to move away from destructive fishing practices (Cowx and Gerdeaux, 2004). In the case of the Hauraki Gulf, this would require transferring more management responsibility to resource users, or providing opportunities for engagement in decision making. Sen and Raakjaer Nielsen (1996)

suggest this would most likely lead to the enhanced legitimacy in fisheries management and increase in compliance of resource users to established control measures.

6.2.1: The recreational/commercial standoff

Before meaningful improvements fisheries management in the Hauraki Gulf can be achieved, it is necessary to find ways to overcome the conflict and distrust between the recreational and commercial fisheries. One way in which conflict and distrust manifest was for recreational fishers to blame the commercial sector for the destruction of the marine environment through the use of unsustainable fishing methods that cause by-catch and disturbance to the benthic seafloor structures. Such a perspective reflects Gordon's (1954) claim that fishers, In this case recreational fishers, are selfish and competitive individuals who seek access to the same fisheries resource, but are unwilling to work together for the mutual benefit of managing it (see: Section 2.1). In a similar vein, claims made by recreational fishers that the by-catch caused by trawling pushes the commercial sector over their allocated quota and impacts the sustainability of the resource echoes research by Cooke and Cowx (2006) and Davies et al. (2009) which illustrates the concerns over excessive commercial discards and by-catch on a global scale. As seen in Section 5.2, recreational fishers labelled the current situation as a 'race to fish' between the commercial and recreational sector. This perspective resonates with Lindner and McLeod (2011), who link the increased race for access to fisheries resources to the growing recreational fisher population which has placed pressure on the targeted fish stocks.

In the case of the Hauraki Gulf, the need to more effectively allocate fish stocks between user groups to reduce conflict and competition will likely increase as the number of fishers increases over time. Recreational fishers claimed commercial fishers were self-interested and only focused on increasing their economic gain by overfishing to compensate for their by-catch which they believe makes up a significant amount of the catch caught in one trawling session (see: Sections 5.3.4 and 5.4). Therefore, recreational fishers in this research did not see the point in practicing conservative measures such as catch and release because it would allow for more fish to be caught by commercial fishers. This reflects research by Arlinghaus (2006) and Wade (1987), who showed how the unwillingness of recreational fishers to practice voluntary conservation was linked to the absence of incentives for recreational fishers to engage in activities that might benefit other user groups. Such free rider tendencies (MacKenzie and Cox, 2013, Arlinghaus, 2006, Jentoft et al., 1998, Wade, 1987) were also evident in this research, and work to constrain management efforts.

The race for fish in the Hauraki Gulf fishery contradicts the objective and purpose of the QMS. The QMS was established as a result of the sustainability challenges facing commercially targeted fish stocks due to overcapitalization and overfishing (Borch, 2010). While taking into consideration the short comings of the QMS discussed above, the QMS was successful at halting and, in some situations, overturning the declines in stock abundance by limiting yield (Gibbs, 2007). This was achieved in part because of the incentives given to commercial fishers to conserve and protect their allocated individual transferable quota (ITQ). The allocation of ITQ

affords holders with greater security of rights that help to prevent the 'tragedy of the commons'. Rather than self-interested individuals acting to maximise their utility by over-exploiting the resource, the allocation of quota provides incentives for commercial fishers to conserve and protect resources.

Stakeholder involvement in decision making processes is a necessary component for ecosystem based fisheries management (see: Chapter 2). Opinions obtained from recreational fishers regarding cooperative management with the commercial sector were mixed. While some fishers thought it would be impossible to achieve cooperative management with other fishing sectors due to the lack of influence and power the recreational sector holds under the QMS, others argued that a cooperative approach would be possible if the recreational sector rights were addressed and all user groups were represented equally (see: Section 5.5.2). This highlights the need to more clearly define recreational fisher rights (McMurran, 2000), and for recreational fishers to work towards improved organisation in order to have better representation and a stronger voice at the decision making table (Sen and Raakjaer Nielsen, 1996). Evidence from McMurran (2000), and (Charles, 1992) shows that having the rights of all user groups specified and represented helps to resolve conflicts between the recreational and commercial sector (see: Section 3.4.3). Addressing recreational rights and better organisation would also position recreational fishers on a more level playing field with the commercial sector (Sutinen and Johnston, 2003).

The difficulty of including recreational fishers in policy decisions and decentralising management to user groups emerged in the research as an important issue to be addressed. The lack of organisation within the sector and limited rights under the QMS were identified as constraints to recreational sector participation in decision making. Such findings reflect research by Sen and Raakjaer Nielsen (1996) who argued that an unorganised recreational sector lacks power, which could affect their ability to participate in the decision making process. In acknowledging the importance of integrating the recreational sector into the management of the Hauraki Gulf and the challenges presented because of unequal allocation of rights, this research aligns with authors such as Bess and Rallapudi (2007), Sutinen and Johnston (2003), Kearney (2001), McMurran (2000).

The feasibility of increasing participation of the recreational sector in management was linked to factors that included allocation rights, lack of trust, conflicting interests and organisational issues. Furthermore, there are also concerns from recreational fishers who fear their integration and participation into management would lead to them being further restricted (see: Section 5.5.2). (McMurran, 2000) explains that the inclusion of recreational fishers into decision making could lead to two outcomes: either they play a significant role in decision making process and are recognised by the government, or increased restrictions may be imposed on recreational fishing activities. Considering the strong legislative rights and the economic influence the commercial sector has on government decisions in New Zealand, the inclusion of the recreational sector would most likely lead to the latter outcome.

Based on the distrust that recreational fishers have towards the commercial sector and the government, it is also likely that recreational fishers would not participate in management if they sensed the social costs outweighed the benefits. Since social values are one of the primary benefits of recreational fishing, the research findings suggest fisheries managers should ensure that integrating the recreational sector would be socially beneficial. To reduce conflicts, fisheries managers require measures to accurately monitor the harvesting of stock from both sectors. Such measures are considered fundamental to control overharvesting and to prevent one sector from eroding the catch quota of another sector, which could damage the working relationship between both sectors (Sutinen and Johnston, 2003, Charles, 1988). Achieving this could, however, prove to be difficult. MacKenzie and Cox (2013) argue that, while the catch quota of commercial fishers is easily verified through catch reporting, monitoring and cost recovery, verifying the exploitation rates and catch numbers are much more difficult to achieve for recreational fishers. This was evident in this research, where the amount of fish caught by recreational fishers, and their subsequent impact on the Hauraki Gulf, was disputed. Furthermore, any attempt by the government to better regulate the recreational sector and monitor their activities was met with protests. In the context of this research, there was reluctance among recreational fishers to increase the level of government regulation and controls on recreational fishing in the Hauraki Gulf. This suggests any attempt by government to implement and verify a self-reporting and self-compliance system would be difficult to achieve.

6.2.2: Distrust between recreational sector and government

Distrust between the government and recreational sector was one of the main factors identified in this research that could potentially undermine fisheries management. As presented in Section 5.3.1, most recreational fishers accused MPI of favouring the commercial sector for the sake of economic gain. Fishers were frustrated with the lack of acknowledgment of the economic contribution of the recreational sector, which they believed was reflected in the policy decisions of the government. Pawson et al. (2008) argue that it is fundamental for fishery managers and scientists to acknowledge and determine the economic benefit and value of the recreational sector, since it would promote more effective legislation and management, as well as enhance future research and initiatives. Recreational fishers in this research believed their sector's economic contribution significantly outweighed that of the commercial sector (see: Section 5.2); however, without solid evidence provided from the recreational sector or government, these claims by recreational fishers are difficult to substantiate. Harrison and Schratwieser (2008), Hickley and Tompkins (1998), and Kearney (2001) highlighted that part of the reason for the lack of data on the economic contribution of the recreational sector is due to the difficulty of quantifying the sector's dynamic and complex social factors into economic terms. Evidence from this research confirms the difficulty of determining the value of recreational fisheries in social and economic terms, and the importance of developing more effective ways to quantify these values and incorporate them into management decisions.

Recreational fisher frustration over the lack of inclusion in consultation and decision making process compounded distrust toward the commercial sector and MPI (see: Section 5.5.1). For

MPI to promote successful participation and cooperative management it is necessary to break down all communication barriers between user groups (Hughes et al., 2005). Recreational fishers felt MPI did not listen to their views and only consulted the commercial and customary sectors in situations when big decisions were made. Such consultation was considered a symbolic gesture to show that decision making was inclusive (see: Section 5.5.1).

There were mixed opinions regarding whether recreational fishers favoured integration into the QMS or wished to continue with discretionary allocations by the Minister (see: Section 5.6). Previous attempts by the government to acknowledge the recreational sector's rights and to include them in fisheries management have been met with rejection and anger from recreational fishers (see: Section 3.2). While an allocation under the QMS would provide more secure property rights than presently, the majority of recreational fishers in this research preferred to rely on their political leverage as voters to influence MPI. For these fishers, they posited that their political leverage at the voting booths meant the government would be disinclined to decrease their limits because if government did decrease bag limits, they would risk losing their next election (see: Sections 5.5.1 and 5.6). Others who were opposed to an allocation under the QMS argued that a set quota would be too restrictive for current recreational fishers and future generations. This confirms the findings of Yandle (2007) who also concluded that the majority of recreational fishers would rather use the power of their vote to influence decisions rather than risk accepting a fixed allocated quota which they may outgrow as fishing participation increases. Not all fishers were against allocating a set share of the quota for the recreational sector as it was felt this would protect the rights of the sector (see: Section 5.6). These different perspectives on integration of recreational fishers into the QMS highlights the importance of an organised recreational sector, and supports Kearney (2001) claims that the lack of organisation and diversity of fisher's values and perspectives makes integrating recreational fishing into management very difficult.

There are several challenges confronting MPI with regard to the inclusion of recreational fishing sector into fisheries management. The main challenges are the lack of reliable data available about the size of fish targeted and caught, the number of fishers in each recreational fishing category (trophy fisher, or sustenance fisher), and lack of information regarding the economic dimensions of the activity (Borch, 2010). The integration of credible data pertaining to the recreational sector has been identified as being important (Ihde et al., 2011, Griffiths et al., 2010, Walters and Cox, 1999), because without sufficient information on recreational stock landings, policy makers find it difficult to retrieve stock assessments for the recreational sector, or allocate stocks fairly between users (MacKenzie and Cox, 2013). This could affect fisheries decision making and lead to conflicts between user groups and government. These authors note the difficulty of producing such credible data because of funding limitations. This sentiment was shared by recreational fishers and scientists participating in this research. Each group of respondents acknowledged the importance of assembling data to make informed management decisions; however, participants identified problems with lack of funding for non-commercial research, and the potential for bias.

The number of fishers in each recreational fishing category is similarly difficult to determine. The selective nature of recreational fishers and the dynamic and varied nature of the recreational community are important when considering the integration of the recreational sector into fisheries management. This is because a broad policy is likely to be ineffective in controlling a large number of fishers using a variety of fishing methods, all targeting different species, and spread over large spatial scales (Grafton et al., 2006, McMurran, 2000, Post et al., 2008). Recreational fishers have different motivations for fishing, utilise different gear types, and fish in geographically dispersed areas; therefore, the biological and environmental conditions of fish populations differ based on the conditions of the region they live in (Grafton et al., 2006, McMurran, 2000, Post et al., 2008). Related to this is the need to understand the characteristics and genetic effects of selective fishing behaviour on targeted fish populations and to adjust control measures to individual fish populations at different locations, based on the productivity of each fishery (Beard et al., 2003, Lewin et al., 2006). The importance of understanding the impacts caused by selective fishing behaviour on the genetic makeup of the targeted species was examined in this research and highlighted the differences in habitat between coastal and offshore snapper can have dramatic impact on the genetic mixing pool of the species (see: Section 5.3.3). Finally, as discussed earlier in this chapter, it is also important to understand the economic significance of the recreational sector. Understanding the economic value and benefit of the recreational sector would allow for policy makers to design and implement more effective legislation, control measures, and incentives.

The case study of the Hauraki Gulf demonstrates how conflict can arise when there is misunderstanding and a lack of acknowledgement of the social and economic importance of each sector. To promote better legislation, management, and future research initiatives, it is vital for to determine the economic value of the recreational sector (Pawson et al., 2008). The case study affirms research conducted elsewhere, which recognises the profound influence of resource users on the wellbeing of the marine ecosystem (Garcia and Cochrane, 2005, Garcia, 2003). With this in mind, it becomes apparent that recreational fisher concerns, interests, and needs should be considered and acknowledged if sustainability is to be achieved and conflicts resolved. As with research elsewhere, collaborative learning and efforts to combine different kinds of knowledge, to establish common vision and trust, and to create legislation to enable political opportunities for all stakeholders (Folke et al., 2002, Noble, 2000, Olsson, 2004) provide opportunities to improve management in the Hauraki Gulf; however, the research demonstrates that this is not an easy task.

6.2.3: Uniting recreational sector groups under one banner

The dominant factors affecting the ability of managers to integrate the recreational sector into fisheries management are the large number of recreational fishers, and lack of organisation of the sector (Borch, 2010, MacKenzie and Cox, 2013). The large population size and lack of a representative organisation makes self-compliance and self-reporting difficult to verify, especially in fisheries such as New Zealand (Borch, 2010, MacKenzie and Cox, 2013). As highlighted in Section 5.5.3, the difference in interests, perspectives, advocacy approaches, and

priorities between the two representative organisations of the recreational sector (Leagasea and the NZRFC) has the potential to prevent the formation of a united recreational sector. The conflict between the two organisations has mostly centred on differences in advocacy approach. The NZRFC are more open to collaborative working relationship with other sectors and government. In contrast, LegaSea are less trusting of commercial and government intentions and, therefore, are suspicious that such collaboration could lead to the recreational sector rights being further restricted (see: Section 5.5.3). Such disagreements among the advocacy groups could have a significant impact on the effectiveness of integrated management of fisheries resources and marine ecosystems. It could also limit the level of participation that the recreational sector has in fisheries decision making.

The distrust and conflict between the two recreational advocacy groups (LegaSea and NZRFC) emphasizes the significance of understanding the wide idiosyncratic reasons why people value recreational fishing (Kearney, 2007). Researching and understanding the social values of recreational fishers can assist policy makers in guiding both groups towards a common goal and bridging their differences. As argued in Section 2.6, it is important to realize that such differences will always arise in mixed-use fishery situations (Cooke and Cowx, 2006). Differences based on management goals, interests, values, objectives, and harvest rights between the various sectors creates major conflicts and competition between the advocacy groups (Cooke and Cowx, 2006). The difficulty lies in finding a solution to build trust between the rival recreational advocacy groups in order to form a recognized and representative recreational sector organization. Without such an organization, it will be difficult for the sector to justify their management participation rights and allocation priority, and therefore will have little influence in the decision making process (Kearney, 2007).

The level of influence that recreational fishers have in management decisions under their current disorganised state was reflected during the introduction of the new SNA1 policy (see: Section 5.5.1). During the SNA1 proposal and submissions process, recreational fishers played a passive role only. Recreational fishers were merely consulted by the government about the new control measures; the final decision was made fully by the Minister of Primary Industries. The passive consultative role of the recreational sector was an outcome of a more centralised governance and management system (Pomeroy and Berkes, 1997, Varjopuro and Salmi, 2003). This emphasises the importance for recreational fishers to unite and form a representative and organised recreational sector. An organized recreational sector will enable fishers to demonstrate their unity and coordinate their strategies, which would make it extremely difficult for government to ignore them (see: Section 2.7). As Sen and Raakjaer Nielsen (1996) explained, organised groups tend to have more influence around the decision making table within a co-management setting (Sen and Raakjaer Nielsen, 1996). Having one representative body for the recreational sector will give the sector more power and a stronger voice to negotiate with other stakeholders and claim their fishing rights (Jentoft and McCay, 1995).

Borch (2010) claims any attempt by government to integrate and organise the recreational sector through licencing or other control methods such as zoning is usually met with strong resistance and protest from recreational fishers. This was evident in the data obtained in this research, which elucidated the rejection of recreational fishers towards licencing (see: Section 5.3.4). The objections received were similar to those reported in the mid 1990's by the Joint Working Group (JWG) during their attempted integration of the recreational sector into shared management through licencing (see: Section 3.2). In this regard, the organisation and coordination of recreational fishers has to be accomplished from within.

Results from this research showed that some fishers were more accepting of licensing if the distribution, enforcement, and funds generated from licensing were managed by a recreational representative body (see: Section 5.3.4). An important aspect of ensuring both advocacy groups are able to work together to protect the interests of recreational fishers is providing opportunities to build a space for interaction and dialogue with each other to learn and identify solutions together. This has been observed by Natcher et al. (2005) who argue that, since co-management is more targeted towards that management of humans rather than resources, acknowledging the fundamental cultural conditions that form these arrangements between user groups is vital for the success of co-management. Arkema et al. (2006) argue that improving interactions among recreational fishers and between recreational fishers and other stakeholders such as MPI and the commercial sector requires an adaptive and flexible form of participation arrangements. This is also supported by authors such as (Espectato et al., 2012, Granek et al., 2008, MacKenzie and Cox, 2013, Pomeroy and Berkes, 1997, Sen and Raakjaer Nielsen, 1996, Varjopuro and Salmi, 2003), who highlight that participation arrangements occur on many levels depending on the country's political, and democracy atmosphere, as well as efficacy aspects. In some cases fishers and other user groups have direct involvement in decision making, while in other situations fishers are only consulted before decisions are implemented. The role of the user groups could also vary depending on the importance of the user groups to the co-management task at hand (Varjopuro and Salmi, 2003).

6.3: All fishers are equal before fish

The need to understand what recreational fishing signifies for fishers has been shown in this research to be important to improve management. The increase in size of the recreational sector has highlighted their significance as a user group and drawn attention to their impact on the environment. Addressing the allocation rights of the recreational sector is vital to achieving sustainability of the fisheries resources. By addressing recreational fisher's rights, it will incentivise them to participate in conservation measures and reduce harmful fishing practices.

The right to fish under the QMS was revealed as being highly contentious for recreational fishers. As seen in Section 5.5.2, recreational fishing representatives viewed their sector as being disadvantaged in comparison to the commercial and customary sectors. Recreational fishers involved in this research viewed disproportional rights as a barrier to participation in management. For authors such as (Bess and Rallapudi, 2007, Kearney, 2001, Kearney, 2007,

Sutinen and Johnston, 2003), the integration of the recreational sector into fisheries management cannot be accomplished without firstly clarifying the legislative rights of the recreational sector. This was seen to potentially affect attempts to participate in fisheries management since the commercial sector who overpowered and their rights diminished even further. MPI representatives and NIWA scientists also commented that the inferior rights of the recreational sector would hinder any attempt to incorporate the sector into management, and would most likely see the recreational sector disadvantaged (see section 5.5.2). This supports research by Kearney (2007), who argues that the lack of clear rights will make it very difficult for the recreational sector to justify management and allocation precedence.

The inequality of rights between sectors can also promote overfishing and high-grading (dumping small size fish of the same species to target bigger ones) because there are fewer incentives for the disadvantaged sector to conserve and protect the resource for the public good. The risk under the current system is that there are few incentives for recreational fishers to participate in, or carry out, voluntary conservation measures (Arlinghaus, 2006, MacKenzie and Cox, 2013). The recreational fishers in this research viewed the current situation under the QMS as biased against their sector and their rights; therefore, any conservation measures practiced, such as catch and release, would benefit commercial fishers by providing them with more fish to harvest (see: Section 5.2). This reflects research by authors such as Morgan (2011) and Sharp (2005) who also argue that, from the perspective of recreational fishers, the 'race to fish' still exists because their weak rights and influence provides them no incentives to conserve under the current QMS unless they voluntarily choose to do so. Evidence from the study suggests that any cooperation between the recreational and commercial sector in knowledge gathering and decision making would be difficult to accomplish while there is uneven relations between the sectors. An organised recreational sector represented by a politically acknowledged national body would still find it difficult to equally work alongside the commercial sector due to the strength of the commercial allocation rights under the current regime (see: Section 5.5.2).

The popularity and consistent growth of the recreational sector has placed increased pressure on fish stocks and caused tensions among other competing groups, specifically the commercial sector. As a consequence, it has been acknowledged that the recreational fishing sector is a major harvester of fish resources, which places ecologically and economically important resources at risk (Cooke and Cowx, 2004). The increased awareness of the significance of the recreational sector on a global scale has accentuated the need to integrate the recreational sector into fisheries management systems and decision making. It has also stressed the importance of determining resource allocation of the available resources to the recreational sector (MacKenzie and Cox, 2013, Lindner and McLeod, 2011, Miller et al., 2010, Sutinen and Johnston, 2003, Kearney, 2002, Jentoft et al., 1998). The full integration of the recreational sector must be sufficient to achieve fisheries management objectives. At the same time, it is important to consider the social values of the recreational sector so the integration of the sector is socially beneficial, ecologically sustainable, and financially viable.

Integrating the recreational sector into fisheries management by allocating them a share of the resource would require strong control measures to ensure the recreational sector is not overfishing their share of the quota and eroding the allocated share of other user groups (Sutinen and Johnston, 2003). Although the majority of recreational fishers who participated in this research felt their rights under the QMS needed to be better defined, not all agreed to a fixed allocated share of the fish resource (see: Section 5.6). Some argued that allocating a fixed share of the catch to the recreational sector does not take into account the constant growing population of the recreational sector. Further, it was claimed that a fixed quota allocation would not solve the on-going conflict between competing sectors. Data obtained indicates that recreational fishers were not satisfied with the annual allocations set by the Minister. Giving the recreational sector a permanent fixed share of the quota would eventually result in the recreational sector exceeding their allocated share as the sector expands, which would require an increase of their allocation. Some scholars have argued that managing the recreational sector under a QMS using output control measures such as bag limits and allocated catch quota may not be suitable (Sutinen and Johnston, 2003, Pereira and Hansen, 2003) because of the large number of fishers and diverse values and motivations of the sector make management extremely difficult and costly to control and monitor (see: Section 2.6). Moreover, the differences in management goals, objectives, harvest rights, and responsibilities always lead to conflict in a mixed-use fishery (Ihde et al., 2011, Walters and Cox, 1999).

6.4: Science and the Recreational sector

Ecosystem based management of the marine environment requires a refined understanding of ecosystem complexity, and the configuration of species within the marine food web (Szaro et al., 1998). Hughes et al. (2005) explain that sustainability cannot be achieved without a deep understanding of the ecological processes within an ecosystem. One of the principle factors that must be taken into account to achieve holistic ecosystem management is the consideration of multispecies interactions (Marasco et al., 2007, Hughes et al., 2005).

Fisheries science in New Zealand continues to be dominated by models focused on single species interactions rather than community ecology and oceanography (Marasco et al., 2007). Nevertheless, the importance of multispecies research and management was identified in this research and reiterates research by authors such as (Berkes, 2012, Curtin and Prellezo, 2010, Leslie and McLeod, 2007, Norse, 2010). The research suggests there is a gradual shift in fisheries research to investigate the different interactions between species; however, the extent to which this is utilised is fairly limited. This was partly due to the fact an EBM approach has been fully incorporated into fisheries management. Another constraining factor was seen to be the limited research funds available from government. MacKenzie and Cox (2013) also associated part of the difficulty of acquiring the required data to limited research funding. Scientists highlighted the selective approach to funding, which continued to favour research on single species. Scientists argued that the structure under which the QMS operates limits their research to an extent which enables them to focus on the economically viable species. Scientists saw such a management approach based on single species or sectoral management

as inadequate to sufficiently sustain ocean and coastal resources. These views are aligned with the research of authors (Leslie and McLeod, 2007, Norse, 2010) who view the approach of conventional single species or sectoral management as insufficient to achieve the sustainability of ocean and coastal resources. Scientists in this research further commented that the implementation of EBM would require a wider range of information on ecological interactions. This aligns with the views of authors (Francis et al., 2007, Johannes, 1998, Lauck et al., 1998, Pikitch et al., 2004) who acknowledge that expanding management initiatives to encompass the entire marine habitat would require a greater scope of ecological understanding.

As explained in Chapter 2, the implementation of EBM requires a much deeper understanding of the complex and dynamic nature of the ecosystem; however, obtaining sufficient information to implement an EBM approach is difficult. The findings of this research supports that of others who claim the absence of sufficient information should not be used as an excuse to prevent managers from enacting measures to conserve and protect fisheries resources and marine ecosystems (Francis et al., 2007, Johannes, 1998, Lauck et al., 1998). Studies (Curtin and Prellezo, 2010, Pikitch et al., 2004, Lauck et al., 1998, Johannes, 1998), suggest that EBM can be implemented based on currently available information and by taking a precautionary approach in the form of adaptive management. Curtin and Prellezo (2010) argue that while precaution should be taken, it should be proportional to the amount of information available, with more risk taken as more ecological information becomes to light. As reported in Chapter 5, the Scientists argued further research was not required to implement EBM; instead, despite the uncertainties, the potential benefits gained from the implementation of EBM would be similar to or greater than the potential risks of inaction. Given the complexity of the biosphere, scientists will never have enough information to understand the marine ecosystem completely, which means uncertainty will always be high (Francis et al., 2007); waiting until managers have 'perfect' information before implementing EBM is unrealistic.

The research highlighted the possibilities for incorporating adaptive measures in fisheries management. The use of local fisher knowledge (LFK) during the early implementation stages of EBM for regions that lack sufficient data has been identified in other research as an adaptive measure for fisheries management (Francis et al., 2007, Marasco et al., 2007). Local LFK can help scientists to link and explain missing patterns in the data, and provide sources of information to complement the scientific data collected through conventional means (Johannes, 1998, Ballard et al., 2008). Fisher knowledge can potentially improve fishery management by sharing users' knowledge through the experiences they encountered during their many years of fishing and provide scientists with information regarding fish behaviour, fish abundance and population trends (Pauly, 1995, Sáenz–Arroyo et al., 2005, Silvano and Valbo-Jørgensen, 2008). Furthermore, reported literature states that the decentralization of management tasks to user groups can increase the efficacy and legitimacy of fisheries management. The sense of responsibility that recreational fishers gain through involvement, whether it's in gathering information, or at the decision making level can incentivise them to accept new management measures and controls, and result in the decrease of overfishing and free riding (Sverdrup-Jensen and Raakjaer Nielsen, 1998, Noble, 2000).

According to existing research, there is a tendency among scientists to view fisher knowledge as anecdotal and unreliable (Silvano and Valbo-Jørgensen, 2008, Sáenz–Arroyo et al., 2005, Mackinson, 2001, Pauly, 1995). The findings from this research reflected those of other studies, whereby the lack of scientific knowledge held by fishers was seen as barrier to local fisher participation in knowledge gathering. The extent to which recreational fishers were seen to be able to contribute to efforts to carry out scientific measurements and collect data was seen to be fairly limited. While it was acknowledged that recreational fishers have increasingly been provided the opportunity to contribute information to management, the information provided has tended to be politically motivated and to support biased observations used to push personal and group interests (see: Section 5.5.4). Nevertheless, the importance of fisher participation in knowledge gathering as part of the holistic approach of EBM was seen to be important (see: Section 5.5.4); the challenge identified through this research was how to utilise fisher information and other forms of knowledge to expand the understanding of ecosystems (see: Section 5.5.4).

The research revealed how the lack of recognition of the potential value of fisher knowledge has caused frustration among fishers, who felt their input into decisions about management was being ignored (see: Section 5.6). The lack of trust recreational fishers had towards scientific information produced by NIWA and MPI could undermine future efforts to enhance cooperation and collaboration in fisheries management. As explained by Conway (2007), the science community's position on LFK has been one of the major challenges for building trust and cooperative relationship between fisheries scientists and fishers. The potential long term improvement of science, practice and management depends on the ability to strengthen the relationships and between scientists, fishers and managers (Conway, 2007). The findings of this research resonate with Haggan et al. (2007), who highlight that the effective use of LFK in fisheries science and management requires mutual collaboration and understanding between scientists and fishers. Fundamental to this is the need for fishers, natural scientists and social scientists to begin building relationships and cooperative measures to work together. In the absence of such efforts, it is unlikely that fish stocks will be protected (Haggan et al., 2007).

6.5: Understanding Recreational fisheries impacts

Part of acknowledging the significance of the recreational sector in fisheries management is acknowledging the recreational sector's potential environmental impact on the marine ecosystem. The potential impacts of recreational fishing are often underestimated; the impacts of the recreational sector are seen to be insignificant compared to the commercial sector (see: Section 2.2). Data obtained from this study highlights the limitations in scientific information to clearly determine (or refute) the impacts of recreational fishing on non-commercially targeted species (see: Section 5.3.3).

Research by Coleman et al. (2004) and Cowx and Gerdeaux (2004) show how the impacts of recreational fishing have been underestimated in the US and Canada. In the Hauraki Gulf, it was claimed that the recreational take of snapper in the Hauraki Gulf exceeded the commercial

sector; however, the magnitude and extent of impacts is largely unknown because of the lack of studies done within the Hauraki Gulf because of funding constraints, amongst other things. Understanding the impacts of recreational fishing requires credible data. Obtaining such data is difficult and costly because of the nature of the sector and the large spatial range within which recreational fishing takes place (MacKenzie and Cox, 2013). Unlike the commercial sector, recreational fishers are not obliged to record and report their landings; this makes it difficult to calculate the catch mortality. Without any incentives for recreational fishers to conserve and participate in data gathering, and with limited research funds from the government, understanding the indirect and direct impacts of the recreational sector will be very difficult if not impossible, especially in remote fishing areas where catch data doesn't exist.

The majority of recreational fishers struggled to identify the range of impacts occurring in the Hauraki Gulf as a consequence of their activities. Instead, recreational fishers who participated in this research pointed the blame towards other sectors and natural causes. The failure to identify their sector as a likely contributor to environmental impacts echoes the findings of (Granek et al., 2008). These authors suggest that fisher involvement and willingness to participate in conservation is greater when the threat is an external factor such as commercial fishing or land based contamination (Granek et al., 2008). If, however, the source of the threat is identified as being the recreational sector, the participation levels of fishers decreases and resistance to conservation rises due to the fear that their cooperation may lead to stricter measures against their sector (Granek et al., 2008).

6.6: Ensuring Decision making is flexible and adaptive

The relationship between scientific information and governance arrangements emerged in this research as important for fisheries management in general, and EBM in particular. Rather than seeking full or perfect information, it was claimed what was required were management and governance structures that provide for power sharing and can unite competing sectors through trust building and identifying common goals (see: Section 5.4). This research reinforces the argument that conventional approaches to management have limited credibility and lack the support of stakeholders. This is because the traditional top-down approach to fisheries management tends to ignore distributional fairness of the resource and limits stakeholder participation in decision making (Costanza et al., 1998). As demonstrated in Section 2.1, the problem with the current approach to the management of fisheries resources in New Zealand is institutional; natural resources can be used and conserved wisely if carefully considered and suitable governance and management strategies are put in place. Although there are disagreements regarding which institutional or governance structure is the most suitable, EBM principles for sustainable governance require the continuous participation of all major stakeholders, integrated assessment and adaptive management (Costanza et al., 1998, see: Section 2.8.1). As highlighted in Section 5.4, the differences in interests and values can vary significantly between agencies and user groups and such differences can lead to conflicts. Having a governance structure that promotes meaningful discussions between agencies and stakeholders can bring their views closer together by similar interests and commonalities.

6.7: Conclusion

The differences in allocation rights, management goals, interests, values and objectives are causes of conflict among stakeholders in the Hauraki Gulf. Many recreational fishers felt their voices were ignored and that they were disadvantaged compared to the commercial and customary sectors. This has exacerbated feelings of distrust among recreational fishers' towards MPI, commercial fishers and other key stakeholders, which ultimately affects the management of the Hauraki Gulf. The findings of this study suggest that fisheries management in the Hauraki Gulf requires an integrated and holistic approach to ensure the sustainability of fish stocks and the marine ecosystem. This is because the marine ecosystem is dynamic, interconnected and very complex. A major challenge, however, is obtaining sufficient scientific information to determine the extent of impacts caused by recreational fishing and other sectors. Moreover, finding ways to incorporate fisher knowledge in to decision making and management is also an important area of consideration. The integration of recreational fishers into decision making and knowledge gathering can facilitate better cooperation and conservation efforts among recreational fishers. Integrating the recreational sector into management will give recreational fishers a sense of responsibility and incentivise them to voluntarily participate in conservation measures, which may reduce overfishing and unsustainable fishing practices. The next chapter concludes the findings of this thesis and discusses the limitations of this research as well as provide suggestions for future research.

Chapter

7 Conclusions

This research project was designed to investigate the nature of recreational fishing management in the Hauraki Gulf under the current centralised management regime. Part of this investigation explored the extent of recreational sector involvement and participation in fisheries management decisions. I argued that the integration of the recreational sector into fisheries management is fundamental for the long term sustainability of fisheries resources. To accomplish this, it is necessary to better understand the social and economic significance of participating recreational fishers and to explore the motives that drive these individuals to fish. It is also necessary to consider the role of the recreational sector in management and their contribution to the environmental impacts. In arguing the importance of integrating recreational fishing into fisheries management, the research also considered the potential of EBM as a more inclusive approach to manage the marine ecosystem and resource users, particularly the recreational sector. This final chapter synthesises the key findings of the research and presents conclusions drawn regarding the future of fisheries management in New Zealand.

7.1: Addressing the research question

As explained in Chapter One, the main question this research was concerned with was:

> How can enhancing the understanding of recreational fishing activities and their impacts lead to better management decisions in the future?

In realising the significance of recreational fishing in New Zealand, this study focused on exploring the position of the recreational sector both as a substantial resource user as well as its role in current fisheries management, specifically the QMS. To answer this question, I elucidated the significance of better defining recreational fishing (Chapter One), and the motives behind their fishing activities (Chapter Two). This emphasised the diversity of the recreational sector with all their different interests, values, cultural influences, motivations and needs.

The examination of the current role of recreational fishers in fisheries management during the data collection process highlighted the tensions within the recreational fishing sector as well as between the recreational sector, commercial sector and the government. The Hauraki Gulf study provided a platform to investigate the difficulties of fisheries management in managing the needs and interests of the recreational sector. Another part of addressing this question acknowledged the increasing number of participants in the recreational fishing activity, which is likely to both add increased pressure on the marine ecosystem as well as increase their contribution to the economy. This underlined the importance of incorporating the recreational sector into fisheries management as part of the decision making process. This research argued

that the inclusion of the recreational sector can increase the legitimacy of legislation and control measures by enhancing the relationship and gaining the trust and cooperation of the recreational sector (Kearney, 2001).

In achieving the objectives of this thesis, this study provided some insights into the challenges involved in managing the recreational sector, and discussed the opportunities for and the barriers against the integration of recreational fishers into fisheries management. Furthermore, the discussion on the potential implementation of the EBM approach allowed me to explore how such integration can improve the long term sustainability of fisheries resources and the marine ecosystem.

The objectives of this research were also explained in Chapter One. These were:

- To investigate the motivations of why recreational fishers choose to participate in recreational fishing and how they are involved in the management of fisheries.
- To examine the impacts of the recreational fishing sector and their contribution to declining fish stocks and marine ecosystems.
- To determine how well recreational fishers are managed under the current New Zealand fisheries management regime.

The methodological approach taken in this research was fundamental to achieving these objectives. As explained in Chapter Four, a qualitative methodology was chosen for its multi-method focus and triangulation which enabled in-depth understanding of the researched topic. The complexity of fisheries management and the diversity of the recreational sector with its many uncontrolled and unidentified variables meant that I chose to gather information using multiple methods. The methods used in this research included, a case study, semi-structured interviews, qualitative analysis of questionnaire data, policy investigation, and the evolving process of discovering new issues and factors during the interview process which led to the evolution of some of the questions being asked in later interviews.

The use of these methods provided a better understanding of the underlying challenges and conflicts within user groups and government in fisheries management, which was presented in Chapter Five, and analysed in Chapter Six. Using the research objectives as a guideline, the key findings and implications of this research are presented in the next three sections.

7.2: Investigating recreational fisher motivations and their involvement in the fisheries management

As mentioned in Chapter One, governments around the world have increasingly acknowledged that, to manage a fishery effectively, it requires the participation and cooperation of fishers (Pomeroy and Berkes, 1997). This was emphasised in this research, where the integration of the recreational sector was identified as a fundamental factor to ensure the long term sustainability of the fisheries resource. Some of the challenges policy makers have faced in attempting to include recreational fisheries into fisheries management were the lack of data to

define the recreational sector and the ability to understand fisher motivations between different fishing groups and individuals (Borch, 2010). In this research it was argued that understanding what motivates people to fish can assist policy makers in developing more customised policies to manage recreational fisher's needs and their effects on the environment. Access to such information can ensure management practices and objectives are appropriate to the behaviour and motivational drivers of recreational fishers.

The difficulty associated with identifying who recreational fishers are, and understanding their motivations, is reflected in the fairly limited data available (see: Section 2.3). Kearney (2007) highlights that the difficulty in deriving a single measure to identify what recreational fishers value was due to the wide idiosyncratic reasons fishers choose to fish. This complex and varied nature of the recreational fishing sector makes it difficult for its participants to claim fishing rights, and to justify management and allocation priority (Kearney, 2007).

The difficulty in identifying a universally shared motivator or a single measure of social value or benefit was reflected in the findings of this research, which demonstrated the diversity of fisher interests in the Hauraki Gulf. Participants in this research identified multiple and varied sets of reasons which they believed motivated them to fish. Perhaps unsurprisingly, the findings of this research were similar to other studies that identified fishing as a hobby, and socialisation which includes family bonding, to be important motivations for recreational fishing (Hunt and Ditton, 2001). The diverse nature of recreational fishers suggests that any future efforts to manage recreational fisheries will need to accommodate such diversity, and design more specific policies and controls that deal with the various fishing reasons and interests instead of using the 'one size fits all approach'.

The lack of research about recreational fishing left many recreational fishers feeling frustrated and dissatisfied with the government. Recreational fisher participants in this research voiced their contempt at government for their lack of acknowledgement towards the social and economic value of recreational fishing (see: Section 5.6 and Section 5.2). They stated that the failure of government to understand and quantify their social and economic value is part of the reason why their sector is disenfranchised in comparison to other fishing user groups. Part of the reason for the lack of research investigating the economic and social benefits of the recreational sector could be linked to the constraints on research funds which were elucidated to by NIWA scientists (see: Sections 5.3.3 and 6.4). Another reason is the difficulty of quantifying the complex and dynamic social benefits into economic terms (Kearney, 2001). Estimating the economic benefit and value of recreational fishing is important because it could help promote the implementation of better legislation and management, as well as more targeted and research initiatives (Pawson et al., 2008).

The benefits of recreational fishing stretch beyond the economic sphere and encompass the social and cultural domains. This means it is important for the government to consider all recreational benefits to ensure the effective integration of recreational fisheries into management. A key part of considering the benefits of recreational fishing is to determine the

economic significance of the recreational sector (Pawson et al., 2008). The economic value of recreational fishing was mentioned numerous times through the course of this research; however, there has been little work done in the Hauraki Gulf and New Zealand to accurately assess the economic value of the sector. In the absence of such information, claims made about the value of the sector are fairly weak.

7.3: Examining recreational fishing impacts and their contribution to declining fish stocks

While recreational fishing contributes many benefits, including social, ecological and economic benefits at both the national and local level (Lewin et al., 2006, Post et al., 2002), it is also acknowledged that recreational fishing has adverse effects on fish stocks and environment (Cooke and Cowx, 2004, Lewin et al., 2006). Previously, fisheries management did not consider recreational fishers to be a threat to the health of fish stocks and the environment, and therefore the majority of the focus was on restricting commercial overfishing. Findings from this research revealed the significance of recreational fisher impacts on economically targeted species such as snapper and reflects research done elsewhere, which acknowledges the impact of recreational fishing on fish stocks and the environment (Coleman et al., 2004, Cowx and Gerdeaux, 2004, Lewin et al., 2006). In particular, the research showed that recreational fishing activities such as localised fishing, targeting of top predators, and dredging can cause localised fish depletion, trophic effects in the food web and disturbance of benthic seafloor habitat (see: Section 5.3.3). This aligns with research conducted elsewhere into the effects of recreational fishing (Beard et al., 2003, Coleman et al., 2004, Cooke and Cowx, 2006, Danylchuk et al., 2007, Davies et al., 2009, Lewin et al., 2006).

The findings of this thesis highlighted the need for more research into the impacts of recreational fishing activity in New Zealand to advance conservation efforts and to ensure the sustainability of fish resources. A large part of fisheries research funding in New Zealand is prioritised to studying the economically valuable species with little consideration given to other less valuable species and the wider ecological impacts caused by fishing sectors, in particular the recreational sector (see: Section 5.3.3). This is identified as a constraint to implementing an ecosystem approach, since priority is given to commercial species and not the ecosystem as a whole (Le Heron et al., 2008). At present, the majority of the research on recreational fishing impacts is conducted indirectly using predictive computer models and reported commercial catch data. While part of the reason is limited funding, it is also related to the lack of primary credible data. The difficulty of accessing credible data is due to the diversity and the large population size of the recreational sector, which makes data collection difficult. This supports research by MacKenzie and Cox (2013) who also identify limited funding, as well as the diversity and size of the recreational fisher population as the reason for the ongoing difficulty. MacKenzie and Cox (2013) argue the importance of reliable data for sustainable fisheries management and suggest that the lack of reliable data can severely hinder recreational stock assessments and fisheries policy analysis. Unlike commercial fishers, recreational fishers are not obliged to report their landing, which makes estimating their catch mortality difficult (see:

Section 2.6 and Section 6.5). Furthermore, under the centralised QMS, recreational fishers have no incentives to conserve and participate in data gathering (Berkes, 2012, Morgan, 2011, Sharp, 2005). This combined with the limited funds available makes researching the direct and indirect impacts of the recreational sector very difficult (see: Section 6.5).

While evaluating the extent to which recreational fishers understand the impact of their activities on the ecosystem, it was apparent that the majority of recreational fishers either refused to acknowledge themselves as contributors to the impacts, or dismissed their influences as minimal in comparison to other resource users (see: Section 5.3.1). This echoes research by Granek et al. (2008), who argues that the involvement and participation of recreational fishers is much higher in situations where fishers protect the fishery from an outside source such as land- based impacts or commercial sector. If recreational fishers sensed that the source of the threat was them, cooperation would be much lower and they would show greater resistance to participating in due to the fear that their participation would lead to further restrictions (see: Section 2.6). Another possible reason for the unwillingness of recreational fishers to identify themselves as a likely source of fishing impacts could be related to the timing of my research, which corresponded with a controversial period involving policy change which affected recreational fishers. Some fishers reflected a sense of distrust towards the intentions and timing of my research.

7.4: Determining how well recreational fishers are managed under the current New Zealand fisheries management regime

Since the introduction of the New Zealand QMS, the vast majority of policy development has focused on managing the commercial sector. This has led to non-commercial sectors, in particular the recreational sector, to be of secondary concern (see: Section 6.1). The recreational sector rights still remain poorly defined in comparison to the commercial sector, which is seen to be the main reason behind the tensions and conflicts between the two sectors and the government (see: Section 5.6).

Regarding the review of the QMS, the findings highlighted that the failure of the QMS to integrate and address the rights of all user groups, especially the recreational sector, has led to conflict between competing user groups, and loss of trust with the government's policy making process. This research argued that much of the conflict and distrust the recreational fishers have towards the commercial sector has occurred as a result of the failure to integrate the recreational sector during the implementation process of the QMS (see: Section 6.1 and Section 3.4.3).

The on-going distrust of the recreational sector towards the government was highlighted during the SNA1 bag limit cuts policy proposal in July 2013 (see: Section 5.5.1). During the process, recreational fishers argued the government had failed to curb the destructive fishing methods of the commercial sector and were continuously favouring the commercial sector in policy decisions for the purpose of economic gains (see: Sections 5.3.1 and 6.2.2). Recreational

fishers viewed their right to fish as a birth right; however, they felt those rights were slowly disappearing as the government continuously implemented new policies which impacted their interests (see: Section 5.6). This research supports the work of other authors Charles (1988) Cooke and Cowx (2006) and MacKenzie and Cox (2013), who argue that conflicts will always occur in mixed use fisheries, which could arise as a result of more lenient control measures for one sector in relation to another, thus making one user group feel unfairly treated and targeted by stricter policies and control measures. Research by Morgan (2011) and Sharp (2005) identifies loosely defined allocation rights to the recreational sector as being part of the reason for the unwillingness of the recreational sector to conserve the fish stocks (see: Section 3.4.2). A similar sense of unwillingness was encountered in this research as recreational fishers interviewed said they saw no incentive in taking extra conservation steps to protect the fishery since that would mean more fish for commercial fishers (see: Section 5.2 and Section 6.3). This suggests that the failure to incorporate the growing recreational sector during the implementation of the QMS could have future consequences for the long term sustainability of the fishery (see: Section 5.6).

The recreational sector's lack of trust towards the government is likely to hinder any future attempts by government to integrate the recreational sector into fisheries management. Previous attempts to integrate the recreational sector into the wider fisheries management regime failed and resulted in the recreational sector questioning the motives of the government (see: Section 3.2 and Section 6.2.2). Fishers and user groups have always considered the government as the policy setter; therefore any attempt by the government to decentralise fisheries management and take a more advisory role seems suspicious to fishers, especially recreational fishers (Lele, 2000). The scepticism among recreational fishers towards the government could be partly due to the way the government has previously shown a lack of interest and trust in the ability of fishers and user groups in managing their own resources (see: Section 2.7).

The findings of the research showed problems with a lack of trust between different groups as significantly affecting attempts to integrate recreational fishers into fisheries management. Recreational fishers' dissatisfaction over the government's lack of trust in local level management and attempts to hold on to power reflect research by (de Vos and van Tatenhove, 2011). Research by Pomeroy and Berkes (1997) highlights the need for the government to be convinced that recreational fishers are organised, and have the capacity and motivation to manage themselves, otherwise any co-operative management between fisher groups would be difficult to achieve. Previous calls by the New Zealand government for the recreational sector to get organised and unite to be heard have led to little progress (see: Sections 3.2 and 5.5.3). Until now, there has been an ongoing struggle within the recreational sector itself, which sees two representative groups who share different views on management approach competing for recognition (see: Section 5.5.3). While there are attempts by NZRFC to form a recognised national body to represent the recreational sector under the FishinFuture search initiative, it does not represent all groups of the recreational sector since the members of the competing

group LegaSea oppose any plans that sees them dealing directly with government and the commercial sector (see: Section 5.5.3).

Organised fisher groups who have the ability to speak with one voice have greater representation and capacity to be more effective and forceful at different levels in decision making (Sen and Raakjaer Nielsen, 1996). The lack of a representative body will likely hamper the sector's ability to represent, consult and advocate for the sector, which could potentially mean that the recreational sector could be inadequately considered in decision making about fisheries policy in the future.

Research findings highlighted that while some fishers supported the idea of cooperative management with the commercial sector, others saw it as too risky as it could result in the recreational sector losing further rights (see: Section 5.5.2). Cooperative management with the commercial sector would be difficult to achieve due to the unequal rights within the QMS, which favours the commercial sector (see: Section 5.5.2). Moreover, the lack of the required governance structures, institutions and rights to enable power sharing, meaningful discussions and information sharing would restrict the integration of the recreational sector. The current reliance of the recreational sector on the government (due to their unspecified rights and lack of self-management capacity) will hamper the ability of the recreational sector to participate in new governance arrangements. Therefore, it is important for recreational fishers to self-organise and unite under a representative body that has the capacity to advocate and consult on their behalf, and to have their legislative rights under the Fisheries Act defined and clearly specified in order to allow them to participate in management.

The lack of information (particularly in relation to impacts, and social/economic value) of the recreational sector could limit the management of the recreational sector (see: Section 6.2.2). The difficulty in acquiring sufficient information is due to the lack of organisation and the large number of participants within the recreational sector, which make self-reporting and self-compliance difficult to achieve (MacKenzie and Cox, 2013). Part of the difficulty for acquiring the required data could be due to the distrust issues between the recreational fishers and scientists. The inability of scientists to accept local fisher knowledge as a legitimate form of information, and likewise recreational fishers who view science as biased, could hinder efforts to integrate fisher knowledge in fisheries management (see: Sections 5.5.4 and 5.6). Contrary to the views of the scientists interviewed, Viswanathan (2003) and Pomeroy and Berkes (1997) suggest that the incorporation of local fisher knowledge can lead to more adequate control measures and polices (see: Section 2.7).

Finally, another issue highlighted in this research which is considered a barrier to enhancing the sustainability of fisheries resources and the marine ecosystem in the Hauraki Gulf is the piecemeal approach of the QMS. Scientists and fishers argued that the Hauraki Gulf, with all its complexities and uncertainties, requires a more holistic management approach that equally addresses the social, ecological, and economic factors into fisheries management (see: Section 5.4). This supported the argument of Marasco et al. (2007) who also argued that current

fisheries science with its single species focus is constrained in its understanding of marine ecosystem complexity.

An important finding in this research was the need to move away from single species and sectoral management, towards an EBM approach that extends the focus beyond single species or sector management (see: Section 5.4). This echoes EBM research conducted elsewhere (Berkes, 2012, Curtin and Prellezo, 2010, Leslie and McLeod, 2007) which emphasises the interdependent nature and interconnectedness of ecosystem constituents, while supporting the ecological processes which deliver a range of services. Rather than replacing the QMS with EBM, it was suggested that the QMS be adapted and reframed to consider the way humans deal with nature (see: Section 5.4). The focus of EBM is to widen the scope of conventional management and move towards a broader frame of governance to deal with marine systems in an integrated fashion which encompasses a wide range of environmental, social-ecological, and human factors (Berkes, 2012, Curtin and Prellezo, 2010). Therefore, EBM should be regarded as an addition to fisheries management and not a replacement (Marasco et al., 2007). For EBM to be accomplished it requires the involvement and participation of all stakeholders and user groups, which could be difficult to accomplish due to the conflict and distrust discussed earlier. The research suggests the main issue that could hamper the implementation of EBM in the Hauraki Gulf is not the lack of science, but the lack of suitable governance and institutional structures to facilitate the equal representation and power sharing between user groups (see: Section 5.4). Accomplishing such a system would also require substantial funding for research and a flexible management approach that can enable decision makers to implement changes as new challenges arise, which is also currently lacking.

7.5: Limitations of this research

This research attempted to understand the challenges and issues involved with managing the recreational sector in a culturally, socially and economically valuable region such as the Hauraki Gulf. Through this research I have attempted to highlight the importance of defining and understanding the motivations, values, and interests of the recreational sector by providing recreational fishers with a voice through which they can project their viewpoints, suggestions, and concerns. The findings have been drawn within the bounds of a transparent and iterative methodology based on the recognition of the situatedness, partiality, and subjectivity of all knowledge. My findings, therefore, are a reflection of the theoretical framework I have applied to this study and my own positionality. The data collection for this research was carried out during the sensitive period of the SNA1 proposal. During this time, there was a lot of tension among fisher user groups, especially between the recreational sector and government, which left many recreational fishers that I approached suspicious about the timing of my research. The overlapping of my data collection period with the SNA1 situation could have influenced the way participants responded to my research questions. It is not assumed that this research has revealed any ultimate truths about the best approach to address recreational fishing management in the Hauraki Gulf, but rather it contributes to the many scales of fisheries research and management in New Zealand.

7.6: Opportunities for future research

The increased growth in participation and popularity of the recreational sector has produced many sustainability challenges and presented potential ecological impacts on fisheries resources and the marine ecosystem. The increased popularity of the recreational sector has caused a paradigm shift in the focus of research, with more scientists and policy makers exploring ways to involve the recreational sector into policy making and knowledge gathering as a way to enhance the effectiveness of fisheries management. Research on recreational fishing is likely to gain increasing importance and merit as policy makers begin taking measures towards increasing the participation of recreational fishers in management.

This research has by no means exhausted the opportunities for recreational fishing research in relation to understanding the social, ecological, cultural, and economic benefits of recreational fishing. If anything this study has shown that there are a great many more questions to be asked regarding recreational fishing including: motivations, economic value, benefits of fisher knowledge, and ecological impacts. This study has identified that more work is required on better defining the recreational sector, and enhancing the understanding behind fisher motivations and economic significance of recreational fishing in New Zealand. The lack of acknowledgement for the social and economic value of the recreational sector was also acknowledged by fisher participants who identified the need for more research. Fishers argued that the reason behind their sector being disadvantaged is the inability of government to understand and quantify the social and economic benefits recreational fishing contributes to the economy and community.

Further research projects could focus on recreational fishing impacts on targeted species, especially on species with lesser economic value which the government currently does not see as a priority. A great deal more research could also be garnered on the wider ecological impacts of recreational fishing activities, and not just on the economically valued species such as snapper. NIWA participants in the research specified the need for a more holistic approach to science and to move away from single species research which fails to take into account the complexity and dynamic nature of the marine environment.

Appendix A – Research Participants

Participant 1	NIWA scientist	Head scientist for recreational fishing research at NIWA
Participant 2	NIWA scientist	Part of the recreational fishing research team
Participant 3	Auckland Council and Hauraki Gulf forum representative	Involved in Environment and Sustainability forum; also involved with Hauraki Gulf forum
Participant 4	Recreational fisher	Has over 30 years of experience
Participant 5	Recreational fisher	Recreational fisher of Maori background.
Participant 6		NZ Fisher Magazine representative and a member of LegaSea and sports fishing council
Participant 7	Recreational sector representative	Involved with a fishing website
Participant 8	Recreational Fisher	Involved in kayak fishing and in promoting fishing products through social and online media
Participant 9	MPI representative	Involved with recreational sector policy and management
Participant 10	Rereational sector representative	Involved with recreational fishing council.
Participant 11	recreational sector representative	Involved with the sport fishing lobbying group Legasea and a manager of a sports fishing club
Participant 12	Recreational fisher	Involved with salt water fly fishing
Participant 13	Recreational sector representative	Involved with a recreational sector project FishinFuture search
Participant 14	NIWA scientist	Involved with marine spatial planning and EBM
Participant 15	Recreational fisher	28 years of experience in surfcasting and fishing from the rocks.

Appendix B – Ethics Documents

Participant Consent Form (Manager interviews)

Participant Information Sheet (Manager interviews)

Participant Consent Form (Employee interviews)

Participant Information Sheet (Employee interviews)

Participant Consent Form (Recreational Fisher interviews)

Participant Information Sheet (Recreational Fisher interviews)

Recreational Fisher Questionnaire Information Sheet

CONSENT FORM (Manager)

THIS FORM WILL BE HELD FOR A PERIOD OF 6 YEARS

Project title: How can enhancing awareness of recreational fishing activities lead to better policy making decisions in the future?

Ahmad Shendi

Candidate for Master of Science (Environmental Management)
School of Environment
Faculty of Science
University of Auckland

My role in the research:

- I have read the Participant Information Sheet, have understood the nature of the research and why have been approached by the researcher. I have had the opportunity to ask questions and have them answered to my satisfaction.
- I agree/not agree to take part in the research.
- I understand the interview will take 1 hour to complete.
- I agree/not agree to give assurance that participation or non-participation by my staff will have no impact on their position within the company.
- I understand that I am free to withdraw my participation at any time and for any reason, and to withdraw any data traceable to me within a period of one month after the interview.
- I agree / not agree to be audio-taped.
- I consent/ do not consent to my job title being used in the research. I understand that although I will be identified by my job title, this may nonetheless mean that I become identifiable.
- I understand that if the information provided in the interview is reported or published, it will be done in a way that does not identify me as its source. However, I am aware that other community/organization members might be able to identify me as a source due to my position in the organization.
- I understand that the data obtained will be used by the researcher to complete his Master's thesis and may also be used in others publications and presentations.
- I understand that all data will be stored securely for 6 years, after which time it will be destroyed.

The role of my staff in the research

- I am aware that my staff participation in this research is voluntary.
- I agree/do not agree the researcher can approach my staff to ask them if they wish to participate
- I agree/do not agree to give my assurance, that my employee's decision to participate or not in this research will not affect his/ her employment status with this company.

- I understand that my staff may withdraw themselves and any information traceable to them up to 15th August 2013.

- I understand that my staff will not have to provide a reason for their withdrawal from this study and that any information traceable to them will be destroyed.

- I understand that although staff will be identified by a generic job title, that nonetheless this may mean that they may be identifiable.

Name _____--___- Signature _____Date _____

APPROVED BY THE UNIVERSITY OF AUCKLAND HUMAN PARTICIPANTS ETHICS COMMITTEE ON

…… for (3) years, Reference Number

Participant Information Sheet (Manager)

Project title: How can enhancing awareness of recreational fishing activities lead to better policy making decisions in the future?

Ahmad Shendi

Candidate for Master of Science (Environmental Management) School of Environment
Faculty of Science
University of Auckland

My name is Ahmad Shendi and I am post-graduate student currently enrolled in a Master of Science degree at the School of Environment at The University of Auckland, New Zealand. As part of my degree, I am carrying out a research project leading to a master's thesis. The field research component of this project will take place in Hauraki Gulf Region, New Zealand, between 3rd June 2013 and 31st July 2013.

I would like to invite you to participate in this project to share your experiences and expertise in marine fisheries management in the Hauraki Gulf Region. I also invite you to share your thoughts on what you perceive to be the barriers and opportunities to managing recreational fisheries.

THE RESEARCH PROJECT

Using Hauraki Gulf as the case study, this research will consider the significance of recreational fisheries in the Gulf. In addition to determining the effects of fishing and other activities in the Gulf through scientific data, the research will investigate the perceived role of recreational fishing and its impacts on targeted fish stocks as well as the ecosystem as a whole. An evaluation of the perceived effectiveness of current approaches used to manage recreational fishers, and how these may affect future efforts to achieve broader ecosystem management goals will also be explored. Finally, with the Hauraki Gulf Forum's goal of integrating Ecosystem Based Management with the Marine Park Act by 2030, this research will examine the complexities affecting this process.

INTERVIEW REQUEST

I would like to interview you about recreational fishing activities and the influence it is having on fish stocks as well as the marine ecosystem as a whole. I am interested in learning about the current approaches used to manage recreational fishers, and how these may affect future management efforts. Quota Management System clearly allocates quotas for commercial and customary fisheries but it lacks clear management strategy for recreational fishing. This research will provide insight into recreational fishing practices and the effectiveness of Quota Management System in managing these activities. This research will also try to answer the question of whether the Quota Management System will need to be reviewed to address those gaps. Finally, I am interested in hearing your thoughts on the challenges and opportunities facing the Hauraki Gulf Forum in achieving its goal of integrating Ecosystem Based Management with the Marine Park Act by 2030.

The interview will take approximately 1 hour. It will follow a semi-structured format. The exact time, date and location for the interview will be decided based on what is convenient for you. I will take notes during the interview and, if you agree I will also audio- record the interview. If agree to be audio-recorded, you may ask for the recorder

to be stopped at any time for any reason. Audio-recorded interviews will be transcribed by the researcher; no third parties will be involved in the process.

With your agreement, I would also like to approach members of your staff and request that they participate in this research. However, to conduct this research, I must first have your assurance in writing that the decision of your staff to participate or not in this research will not affect their relationship with you or their employment status. This assurance can be given by signing the attached Consent Form.

THE OUTCOME

The data collected during this research project will be used to complete master's thesis research and for the production of the thesis. Data and information will be used in seminar presentations undertaken as part of or related to the MSc program of study. Data may also be used in publications or presentations arising from this thesis.

A PDF copy of the thesis will be made available to participants if they choose to receive a copy. An electronic copy of the thesis will be available from the University of Auckland Library http://www.library.auckland.ac.nz/ upon completion.

CONFIDENTIALITY

The information collected about participants will be kept confidential. Personal information about participants will be excluded from academic publications and presentations arising from this research and every possible effort will be made to ensure the identity of participants remains anonymous. With your approval, a generic position descriptor (job position or organisation name) will be used. Although names will not be used in my research, the use of a generic position descriptor may mean that individuals became identifiable if you prefer a pseudonym will be used for all publications.

DATA STORAGE

The data collected during this research project will be kept in storage in a locked cabinet at the University of Auckland for six years and will then be destroyed. In the case of electronic data such as digital video, digital audio, digital photographs, and emails, data will initially be safeguarded by passwords and the deleted from all computerised storage spaces and hard drives after six years. Transcripts and other hard copies of data will be shredded after six years. Consent forms will be kept separate from data in a locked cabinet on University premises and kept for six years before being destroyed.

This Participant Information Sheet provides you with information that enables you to make an informed decision about whether or not you wish to participate in this research. It is recommended that you keep a copy of this document for future reference.

THE RIGHT TO WITHDRAW

You have the right to withdraw from the research at any time. Furthermore, you have the right to withdraw your data from the research within a one month period after the interview.

If you have any questions or concerns about this study, please feel free to contact me (the researcher) or my supervisor at any time. Important contact details are provided below.

Thank you

Contact details

Researcher Ahmad Shendi +64 021 292 9688 ashe054@aucklanduni.ac.nz	**Main Supervisor** Dr Karen Fisher Human Science Building 10 Symonds Street Auckland, New Zealand Phone +64 9 373 7599 ext 88410 k.fisher@auckland.ac.nz	**Head of Department** Professor Paul Kench Human Science Building 10 Symonds Street Auckland, New Zealand Phone: +64 9 373 7599 ext 88440 p.kench@auckland.ac.nz

For any queries regarding ethical concerns you may contact

The University of Auckland Human Participants Ethics Committee, The University of Auckland, Office of the Vice Chancellor, Private Bag 92019, Auckland 1142, Telephone +64 (0) 9 373-7599 extn. 83711.

APPROVED BY THE UNIVERSITY OF AUCKLAND HUMAN PARTICIPANTS ETHICS COMMITTEE ON

…… for (3) years, Reference Number …../

CONSENT FORM (Employee)

THIS FORM WILL BE HELD FOR A PERIOD OF 6 YEARS

Project title: How can enhancing awareness of recreational fishing activities lead to better policy making decisions in the future?

Ahmad Shendi
Candidate for Master of Science (Environmental Management)
School of Environment
Faculty of Science
University of Auckland

- I have read the Participant Information Sheet, have understood the nature of the research and why have been approached by the researcher. I have had the opportunity to ask questions and have them answered to my satisfaction.

- I agree to take part in the research.

- I understand the interview will take 1 hour to complete.

- I understand that I am free to withdraw my participation at any time and for any reason, and to withdraw any data traceable to me within a period of one month after the interview.

- I understand that my supervisor/manager has agreed that employees can be approached. They have also given assurances that my decision to participate or not in this research will not affect my employment status.

- I agree / not agree to be audio-taped.

- I consent/ do not consent to my job title being used in the research. I understand that although I will be identified by my job title, this may nonetheless mean that I become identifiable.

- I understand that if the information provided in the interview is reported or published, it will be done in a way that does not identify me as its source. However, I am aware that other community/organization members might be able to identify me as a source due to my position in the organization.

- I understand that the data obtained will be used by the researcher to complete his Master's thesis and may also be used in others publications and presentations.

- I understand that all data will be stored securely for 6 years, after which time it will be destroyed.

Name_____Signature_____Date _____

APPROVED BY THE UNIVERSITY OF AUCKLAND HUMAN PARTICIPANTS ETHICS COMMITTEE ON
…… for (3) years, Reference Number …../……

Participant Information Sheet (Employee)

Project title: How can enhancing awareness of recreational fishing activities lead to better policy making decisions in the future?

Ahmad Shendi
Candidate for Master of Science (Environmental Management) School of Environment
Faculty of Science
University of Auckland

My name is Ahmad Shendi and I am post-graduate student currently enrolled in a Master of Science degree at the School of Environment at the University of Auckland, New Zealand. As part of my degree, I am carrying out a research project leading to a master's thesis. The field research component of this project will take place in Hauraki Gulf Region, between 3rd June 2013 and 31st July 2013.

I would like to invite you to participate in this project to share your experiences and expertise in marine fisheries management in the Hauraki Gulf Region. I also invite you to share your thoughts on what you perceive to be the barriers and opportunities to managing recreational fisheries.

THE RESEARCH PROJECT

Using Hauraki Gulf as the case study, this research will consider the significance of recreational fisheries in the Gulf. In addition to determining the effects of fishing and other activities in the Gulf through scientific data, the research will investigate the perceived role of recreational fishing and its impacts on targeted fish stocks as well as the ecosystem as a whole. An evaluation of the perceived effectiveness of current approaches used to manage recreational fishers, and how these may affect future efforts to achieve broader ecosystem management goals will also be explored. Finally, with the Hauraki Gulf Forum's goal of integrating Ecosystem Based Management with the Marine Park Act by 2030, this research will examine the complexities affecting this process.

INTERVIEW REQUEST

I would like to interview you about recreational fishing activities and the influence it is having on fish stocks as well as the marine ecosystem as a whole. I am interested in learning about the current approaches used to manage recreational fishers, and how these may affect future management efforts. Quota Management System clearly allocates quotas for commercial and customary fisheries but it lacks clear management strategy for recreational fishing. This research will provide insight into recreational fishing practices and the effectiveness of Quota management System in managing these activities. This research will also try to answer the question of whether the Quota Management System will need to be reviewed to address those gaps. Finally, I am interested in hearing your thoughts on the challenges and opportunities facing the Hauraki Gulf Forum in achieving its goal of integrating Ecosystem Based Management with the Marine Park Act by 2030.

The interview will take approximately 1 hour. It will follow a semi-structured format. The exact time, date and location for the interview will be decided based on what is

convenient for you. I will take notes during the interview and, if you agree I will also audio- record the interview. If agree to be audio-recorded, you may ask for the recorder to be stopped at any time for any reason. Audio-recorded interviews will be transcribed by the researcher; no third parties will be involved in the process.

I have obtained permission from your manager to approach you and invite you to participate in this research. I have also gained his/her assurance that the decision of employees to participate or not participate in this research will not affect their employment status.

THE OUTCOME

The data collected during this research project will be used to complete master's thesis research and for the production of the thesis. Data and information will be used in seminar presentations undertaken as part of or related to the MSc program of study. Data may also be used in publications or presentations arising from this thesis.

A PDF copy of the thesis will be made available to participants if they choose to receive a copy. An electronic copy of the thesis will be available from the University of Auckland Library http://www.library.auckland.ac.nz/ upon completion.

CONFIDENTIALITY

The information collected about participants will be kept confidential. Personal information about participants will be excluded from academic publications and presentations arising from this research and every possible effort will be made to ensure the identity of participants remains anonymous. With your approval, a generic position descriptor (job position or organisation name) will be used. Although names will not be used in my research, the use of a generic position descriptor may mean that individuals became identifiable. If you prefer, a pseudonym will be used for all publications.

DATA STORAGE

The data collected during this research project will be kept in storage in a locked cabinet at the University of Auckland for six years and will then be destroyed. In the case of electronic data such as digital video, digital audio, digital photographs, and emails, data will initially be safeguarded by passwords and the deleted from all computerised storage spaces and hard drives after six years. Transcripts and other hard copies of data will be shredded after six years. Consent forms will be kept separate from data in a locked cabinet on University premises and kept for six years before being destroyed.

This Participant Information Sheet provides you with information that enables you to make an informed decision about whether or not you wish to participate in this research. It is recommended that you keep a copy of this document for future reference.

THE RIGHT TO WITHDRAW

You have the right to withdraw from the research at any time. Furthermore, you have the right to withdraw your data from the research within a one month period after the interview.

If you have any questions or concerns about this study, please feel free to contact me (the researcher) or my supervisor at any time. Important contact details are provided below.

Thank you

Contact details

Researcher	**Main Supervisor**	**Head of Department**
Ahmad Shendi +64 021 292 9688 ashe054@aucklanduni.ac.nz	Dr Karen Fisher Human Science Building 10 Symonds Street Auckland, New Zealand Phone +64 9 373 7599 ext 88410 k.fisher@auckland.ac.nz	Professor Paul Kench Human Science Building 10 Symonds Street Auckland, New Zealand Phone: +64 9 373 7599 ext 88440 p.kench@auckland.ac.nz

For any queries regarding ethical concerns you may contact

The University of Auckland Human Participants Ethics Committee, The University of Auckland, Office of the Vice Chancellor, Private Bag 92019, Auckland 1142, Telephone +64 (0) 9 373-7599 extn. 83711.

APPROVED BY THE UNIVERSITY OF AUCKLAND HUMAN PARTICIPANTS ETHICS COMMITTEE ON
…… for (3) years, Reference Number …../

CONSENT FORM (Recreational Fisher-Interview)

THIS FORM WILL BE HELD FOR A PERIOD OF 6 YEARS

Project title: How can enhancing awareness of recreational fishing activities lead to better policy making decisions in the future?

Ahmad Shendi
Candidate for Master of Science (Environmental Management)
School of Environment
Faculty of Science
University of Auckland

- I have read the Participant Information Sheet, have understood the nature of the research and why have been approached by the researcher. I have had the opportunity to ask questions and have them answered to my satisfaction.
- I agree to take part in the research.
- I understand the interview will take 1 hour to complete.
- I understand that I am free to withdraw my participation at any time and for any reason, and to withdraw any data traceable within a period of one month after the interview.
- I agree / not agree to be audio-taped.
- I understand that if the information provided in the interview is reported or published, it will be done in a way that does not identify me as its source. However, I am aware that other members of the fishing community might be able to identify me as a source due to my position within the community.

I understand that the data obtained will be used by the researcher to complete his Master's thesis and may also be used in others publications and presentations.

I understand that all data will be stored securely for 6 years, after which time it will be destroyed.

Name_____Signature _____Date

_____

APPROVED BY THE UNIVERSITY OF AUCKLAND HUMAN PARTICIPANTS ETHICS COMMITTEE ON

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Participant Information Sheet (Recreational Fisher)

Project title: How can enhancing awareness of recreational fishing activities lead to better policy making decisions in the future?

Ahmad Shendi

Candidate for Master of Science (Environmental Management)
School of Environment
Faculty of Science
University of Auckland

My name is Ahmad Shendi and I am post-graduate student currently enrolled in a Master of Science degree at the School of Environment at the University of Auckland, New Zealand. As part of my degree, I am carrying out a research project leading to a master's thesis. The field research component of this project will take place in Hauraki Gulf Region, between 3rd June 2013 and 31st July 2013.

I would like to invite you to participate in this project to share your experiences and expertise in marine fisheries management in the Hauraki Gulf Region. I also invite you to share your thoughts on what you perceive to be the barriers and opportunities to managing recreational fisheries.

THE RESEARCH PROJECT

Using Hauraki Gulf as the case study, this research will consider the significance of recreational fisheries in the Gulf. In addition to determining the effects of fishing and other activities in the Gulf through scientific data, the research will investigate the perceived role of recreational fishing and its impacts on targeted fish stocks as well as the ecosystem as a whole. An evaluation of the perceived effectiveness of current approaches used to manage recreational fishers, and how these may affect future efforts to achieve broader ecosystem management goals will also be explored. Finally, with the Hauraki Gulf Forum's goal of integrating Ecosystem Based Management with the Marine Park Act by 2030, this research will examine the complexities affecting this process.

INTERVIEW REQUEST

I would like to interview you about recreational fishing activities and the influence it is having on fish stocks as well as the marine ecosystem as a whole. I am interested in learning about the current approaches used to manage recreational fishers, and how these may affect future management efforts. Quota Management System clearly allocates quotas for commercial and customary fisheries but it lacks clear management strategy for recreational fishing. This research will provide insight into recreational fishing practices and the effectiveness of Quota Management System in managing these activities. This research will also try to answer the question of whether the Quota Management System will need to be reviewed to address those gaps. Finally, I am interested in hearing your thoughts on the challenges and opportunities facing the Hauraki Gulf Forum in achieving its goal of integrating eEosystem Based Management with the Marine Park Act by 2030.

The interview will take approximately 1 hour. It will follow a semi-structured format. The exact time, date and location for the interview will be decided based on what is convenient for you. I will take notes during the interview and, if you agree I will also audio- record the interview. If agree to be audio-recorded, you may ask for the recorder to be stopped at any time for any reason. Audio-recorded interviews will be transcribed by the researcher; no third parties will be involved in the process.

THE OUTCOME

The data collected during this research project will be used to complete master's thesis research and for the production of the thesis. Data and information will be used in seminar presentations undertaken as part of or related to the MSc program of study. Data may also be used in publications or presentations arising from this thesis.

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The data collected during this research project will be kept in storage in a locked cabinet at the University of Auckland for six years and will then be destroyed. In the case of electronic data such as digital video, digital audio, digital photographs, and emails, data will initially be safeguarded by passwords and the deleted from all computerised storage spaces and hard drives after six years. Transcripts and other hard copies of data will be shredded after six years. Consent forms will be kept separate from data in a locked cabinet on University premises and kept for six years before being destroyed.

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You have the right to withdraw from the research at any time. Furthermore, you have the right to withdraw your data from the research within a one month period after the interview.

If you have any questions or concerns about this study, please feel free to contact me (the researcher) or my supervisor at any time. Important contact details are provided below.

Thank you

Contact details

Researcher Ahmad Shendi ashe054@aucklanduni.ac.nz	**Main Supervisor** Dr Karen Fisher Human Science Building 10 Symonds Street Auckland, New Zealand Phone +64 9 373 7599 ext 88410 k.fisher@auckland.ac.nz	**Head of Department** Professor Paul Kench Human Science Building 10 Symonds Street Auckland, New Zealand Phone: +64 9 373 7599 ext 88440 p.kench@auckland.ac.nz

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Participant Information Sheet (Recreational Fisher-Questionnaire)

Project title: How can enhancing awareness of recreational fishing activities lead to better policy making decisions in the future?

Ahmad Shendi

Candidate for Master of Science (Environmental Management)
School of Environment
Faculty of Science
University of Auckland

My name is Ahmad Shendi and I am post-graduate student currently enrolled in a Master of Science degree at the School of Environment at the University of Auckland, New Zealand. As part of my degree, I am carrying out a research project leading to a master's thesis. The field research component of this project will take place in Hauraki Gulf Region, between 3rd June 2013 and 31st July 2013.

I would like to invite you to participate in this project to share your experiences of recreational fishing in the Hauraki Gulf Region, and to share your thoughts on what you perceive to be the barriers and opportunities to managing recreational fisheries.

THE RESEARCH PROJECT

Using Hauraki Gulf as the case study, this research will analyse a wide range of issues concerning the collective impacts caused by recreational fishing activities. An investigation of the current effects of recreational fishing on the marine environment in the Gulf will be carried out to help understand the effects of recreational fishing on the fish populations well as the environment as a whole. An assessment of the current approaches used to manage recreational fishers, and how it affects future efforts to achieve better management of fishing activities will also be explored. Finally, with the Hauraki Gulf Forum's goal of implementing Ecosystem Based Management (EBM) as a method to enhance the marine environment and allow for better fishing opportunities, this research will investigate the difficulties and limitations delaying this process from being achieved.

QUESTIONNAIRE REQUEST

I would like to invite you to complete a questionnaire about recreational fishing activities and the influence it is having on fish stocks as well as the marine ecosystem as a whole. I am interested in learning about the recreational fishing sector in the Hauraki Gulf. With your participation I will be able to learn more about your experiences as a recreational fisher, the methods you employ to improve the chances of landing catch, the fish type you are most interested, as well as other general information regarding your hobby.. This research will enable me to gain an understanding of recreational fishing activities within the Hauraki Gulf. Ways to improve the fishing experience through better management approaches that will better protect the Hauraki Gulf environment and and allow for better fishing opportunities to protect the Hauraki Gulf Environment.

The questionnaire will take approximately 10-15 minutes to complete. It includes both short answer and tick box questions.
Completion of the questionnaire will be regarded as consent to participate in this research study. Please also note that once completed and submitted, you will not be able to withdraw the questionnaire as it is anonymous and therefore not identifiable.

THE OUTCOME

The data collected during this research project will be used to complete master's thesis research and for the production of the thesis. Data and information will be used in seminar presentations undertaken as part of or related to the Master of Science program of study. Data may also be used in publications or presentations arising from this thesis.

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This Participant Information Sheet provides you with information that enables you to make an informed decision about whether or not you wish to participate in this research. It is recommended that you keep a copy of this document for future reference. If you have any questions or concerns about this study, please feel free to contact me (the researcher) or my supervisor at any time. Important contact details are provided below.

FOLLOW-UP INTERVIEW REQUEST

As part of the research, I am also interested in conducting interviews with recreational fishers to gain more in depth information. If you are interested in being interviewed, please contact me (see below).

Thank you

Contact details

Researcher Ahmad Shendi +64 021 292 9688 ashe054@aucklanduni.ac.nz	**Main Supervisor** Dr Karen Fisher Human Science Building 10 Symonds Street Auckland, New Zealand Phone +64 9 373 7599 ext 88410 k.fisher@auckland.ac.nz	**Head of Department** Professor Paul Kench Human Science Building 10 Symonds Street Auckland, New Zealand Phone: +64 9 373 7599 ext 88440 p.kench@auckland.ac.nz

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Appendix C – Questionnaire and Interview Questions

Recreational Fishers Questionnaire

Please note: Completing and submitting the survey is implied as consent. Withdrawal is not possible after submitting the survey due to the anonymous nature of the questionnaire.

1. How long have you been fishing?
2. How often do you fish?
   No of times:
   .....A week?
   .....A month?
   .....A year?

3. How many hours do you spend fishing during each trip?

   ☐ < 1hr ☐ 1-2hr ☐ 2-3hr ☐ 3-4hr ☐ 4-5hr ☐ 5-10hr ☐ >10hr Rough Estimate .....

4. Do you own a boat? Yes ☐ No ☐

5. What was the motivational factor that got you in to fishing?

   1. Hobby ☐
   2. Source of food ☐
   3. Cultural reasons ☐
   4. Other ☐

   If other (Please explain) .....

---

6. How many people accompany you in each fishing trip in the Hauraki Gulf?

   ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ -------

   0 (alone) 1 2 3 4 5 6 Varies Rough Estimate

7. How many fish do you usually catch on each fishing trip?

---

8. How many fish do you keep on each fishing trip? ----------
---

9. Has the amount you catch changed over time? Yes ☐ No ☐ (If **No proceed to Question 9)**

   - 8.a) If Yes, has the amount of Catch: Increased ☐ ☐ Decreased
     (If Increased proceed to Question 9)

   - 8.b) What activities in your opinion are effecting you to catch fish? (Using the table below please rank the activities from 1 to ----- with 1 = most influential and 10= least influential)

Activity	**Rank**
Commercial Fishing	
Customary Fishing	
Ministry of Primary Industries	
Tourism Fishing	
Land based activities	
Climatic change	
Commercial shipping	
Oceanic Non- renewable resource exploration (oil and gas)	

9. What type of species do you mainly target?

   ----

10. What are the main species you catch?

    ----

11. What time of the year do you predominantly fish?

    ----

12. During the last 12 Months how many times have you used the fishing methods mentioned below in the Hauraki Gulf Region? Please put a number next to the applicable options used.

------ Longline fish with a handline or rod

..... Dredging

..... Set netting

------ Beach seining

..... Spearing

..... Potting

------ Diving from the shore

------ Diving from a private boat

------ Shore fishing with a handline or rod

..... Shore fishing with a longline

..... Rod or handline from a private boat (jigs, bait, poppers, trolling)

..... Rod or handline or longline fishing from a charter boat

..... Longline fishing from a private boat

Other (please Describe) .....

13. Please approximately mark with an (X) on the map (next page) the top three areas you use for fishing.

Are there any further comments regarding location, and type of methods used at different locations?


Bream Head
Bream Bay
MAROTERE IS.
HEN AND CHICKENS IS.
TARANGA I.
MOKOHINAU IS.
Ruakaka
Waiotira
Waipu
Waipu Cove
Taipuha
Out-of-service
Brynderwyn
Mangawhai Heads
Mangawhai
Maungaturoto
Kaiwaka
Kauri Museum
Tinopai
Port Albert
Te Hana
Tomatara
Pakiri
C. Rodney
Leigh
Omaha
Wellsford
Matakana
Sheepworld
Warkworth
Sandspit
Snells Beach
KAWAU ISLAND
Jellicoe Channel
Cradock Channel
LITTLE BARRIER ISLAND
Bird Sanctuary
AIGUILLES I.
Kawa
Okiwi
RAKITU I.
Port Fitzroy
621
Mt. Hobson
GREAT BARRIER ISLAND
Whangaparapara
Okupu
Tryphena
Tryphena Harbour
C. Barrier
Colville Channel
Fletcher Bay
C. Colville
Port Jackson
Coromandel Track
Stony Bay
Port Charles
Moehau
892
Waikawan
Colville
GREAT MERCURY ISLAND
Pouto
Tapora
Harbour
Ahuroa
Hot Springs
Puhoi
Waiwera
Out-of-service
Shelly Beach
Orewa
Red Beach
Kaukapakapa
Silverdale
TIRITIRI MATANGA I.
Hauraki
Gulf
Hauraki Gulf
Maritime Park
Aquatic Park
Parakai
Helensville
Dairy Flat
Whangaparaoa
AUCKLAND
N.S.-EAST COAST BAYS
Coatesville
Paremoremo
Albany
NORTH SHORE
MOTUTAPU I.
Omaru Bay
Needle Rock
Te Rerenga
Huapai
Kumeu
Waimauku
Palm Beach
WAIHEKE ISLAND
Coromandel
Castle Rock
521
School of Mines Mus.
Whitianga
N.S.-TAKAPUNA
A.-BIRKENHEAD
RANGITOTO I.
A.-DEVONPORT
Oneroa
Onetangi
Ostend
Muriwai Beach
Gannet Colony
WAITAKERE
Swanson
Panuiu
AUCKLAND
A.-MT. EDEN
PONUI ISLAND
Maraetai
Beachlands
A.-MT. ROSKILL
Howick
A.-ONEHUNGA
A.-OTAHUHU
Papatoetoe
Clevedon
Kawakawa Bay
Orere Point
Coroglen
Piha
Titirangi
A.-MANGERE
Huia
Manukau
MANUKAU (MANUREWA)
Papakura
HUNUA RANGE
Firth of Thames
Tapu
Te Puru
Forest Park
Whatipu
Manukau Heads
Ahwitu
Clarks Beach
Kingseat
Runciman
Drury
Hunua
Kaiaua
Matakawau
THAMES
Mineralogical Museum
Thames

I

INTERVIEW QUESTIONS

Recreational Fisher

1. During the period you have been fishing, have you noticed any changes in consistency or difficulty in terms of catching your fish?
2. What are the factors that can influence the marine habitat and the fish resources?
3. What industry or activity in your opinion is the most responsible for the impacts on marine habitat?
4. In your opinion, how well does Ministry of Primary Industries manage the interests of recreational fishers?
5. Do you think current policy supports recreational fisheries?
6. What do you think of the output controls in place to limit catch numbers such as TAC and size based restrictions?
7. In your opinion do you think more needs to be done to reduce impacts of fishing? If yes what measures do you suggest
8. What is your opinion on licencing recreational fishers, as a measure to reduce fishing impacts?
9. Do you think it is possible for recreational fishers and the commercial sector to work cooperatively to manage fish resources?
    - If yes, why? What would this involve?
    - If no, why not? What would need to be done to make this work?
10. Do you think the definition of recreational fishing rights needs to be more clearly defined in the QMS?
11. Fishin Future search brought different stakeholders together and they found common ground, what do you envision fishinfuture search achieving in the near future,
12. Are you aware of Legasea?
    - If yes: What is your opinion on Legasea as a replacement for option4.
    - If no: explain who they are and what they are trying to do then ask their opinion of whether it's good or not.

NIWA Scientist

1. In your opinion what impact do recreational fishers have on the depletion of fish stocks and marine ecosystems as a whole?
2. Are there any recent scientific data to prove that recreational fishers are having a significant impact on the marine ecosystem?

3. What methods are used to track the stock numbers of fish? Target and non-Target species? And in your opinion are those methods successful?
4. Do you think that it is necessary to reduce recreational fishers' impacts on marine resources? If yes, what further actions do you recommend?

5. What methods are used to identify if the impacts are generated from commercial or recreational fishers?
6. Does scientific data collected regarding fish resources and marine ecosystem health take into account other Land based impacts such as industrial activity and farming runoff?
7. What are the barriers of coordinating scientific information into management plans and actions?
8. How is scientific information generated and then incorporated into management decisions.
9. What are the barriers of communicating the scientific information to the general public and fishers?
10. Do you think it is possible for recreational fishers and the commercial sector to work cooperatively to manage fish resources?
    - If yes, why? What would this involve?
    - If no, why not? What would need to be done to make this work?

Ministry of Primary Industries (Fisheries)

1. In your opinion what impact do recreational fishers have on the depletion of fish stocks and marine ecosystems as a whole?

2. Do you think that it is necessary to reduce recreational fishers' impacts on marine resources? If yes, what further actions do you recommend?

3. What enforcement or monitoring procedures are currently used to control the activities of Recreational fishers?

4. Is there any current data highlighting the effectiveness of QMS in enforcing the regulations regarding recreational fishers?

5. How effective in your opinion is the QMS in regards to addressing the impacts of Recreational Fishers?

6. Does the QMS need reviewing in order to incorporate the effects of recreational fishers more?

7. What types of indicators are used to measure the effectiveness of QMS in regards to recreational fishers?

8. Can recreational fisheries be fully integrated into the Quota Management system?

9. Is there any current data highlighting the impacts of recreational fishers on the marine ecosystem within the Hauraki Gulf?

10. In your opinion, how likely is it that the Hauraki Gulf Forum's goal of integrating EBM with the Marine Park Act by 2030 will be achieved?

11. What are the barriers hindering the implementation of EBM in the Hauraki Gulf? (funding, Values, conflict)

12. What are the opportunities for implementing efficient EBM approach in the Hauraki Gulf?

13. What are your thoughts on licencing the recreational sector?

14. Do you think recreational fishing rights need to be more clearly defined?

15. What are the barriers of communicating the scientific information to the general public and fishers?

16. Do you think it is possible for recreational fishers and the commercial sector to work cooperatively to manage fish resources?
    - If yes, why? What would this involve?
    - If no, why not? What would need to be done to make this work?

Hauraki Gulf Forum

1. In your opinion what impact do recreational fishers have on the depletion of fish stocks and marine ecosystems as a whole?
2. How effective in your opinion is the QMS in regards to addressing the impacts of Recreational Fishers?
3. Does the QMS need reviewing in order to incorporate the effects of recreational fishers more?
4. In your opinion, how likely is it that the Hauraki Gulf Forum's goal of integrating EBM with the Marine Park Act by 2030 will be achieved?
5. What are the barriers hindering the implementation of EBM in the Hauraki Gulf? (funding, Values, conflict)
6. What are the opportunities for implementing efficient EBM approach in the Hauraki Gulf?
7. Do you think it is possible for recreational fishers and the commercial sector to work cooperatively to manage fish resources?
    - If yes, why? What would this involve?
    - If no, why not? What would need to be done to make this work?

8. Are you aware of Legasea?
    - If yes: What is your opinion on Legasea as a replacement for option4.
    - If no: explain who they are and what they are trying to do then ask their opinion of whether it's good or not.

9. Do you think that it is necessary to reduce recreational fishers' impacts on marine resources? If yes, what further actions do you recommend?

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