



Fishing activity in the Waikato and Waipa rivers



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Prepared for the Ministry for Primary Industries by
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EXECUTIVE SUMMARY

The purpose of this research project is to collate information regarding the recent use of fisheries resources in the Waikato River and Waipa River catchment areas. In particular, the project sought to summarise the commercial, customary, and recreational fishing activity in the catchments of the Waikato and Waipa rivers in the spatial context of recently introduced co-governance areas. These fisheries include, but are not exclusive to, the broad range of aquatic life managed under the Fisheries Act 1996. Such information is required to support management which includes a co-management framework. The research describes the commercial, customary and recreational fisheries including species and quantities taken, fishing methods, and seasonal influences.

Commercial fishing: The collation and analysis of commercial fishing information for this report was derived from statutory catch returns made by commercial fishers, industry collected information for other Ministry for Primary Industries (MPI) commissioned research projects, fisher and processor interviews, and knowledge held by the research providers. Commercial fishing is undertaken throughout the Waikato catchment, but the extent of this activity declines significantly between the marine and estuarine waters of the lower Waikato River at the delta, and the increasingly freshwater environment beyond that point. Accordingly, much of the commercial fishing activity occurs in the Waikato-Tainui co-governance area. The main species of interest in the estuarine delta is grey mullet, whereas shortfin and longfin eels are predominantly taken, in smaller quantities, from the freshwater environment. There is some use of brown bullhead catfish and koi fisheries in freshwater, particularly downstream of Ngaruawahia.

The level of commercial fishing activity for the main fisheries resources (particularly eels, following the introduction of catch constraints) has generally declined over recent years, although some intensive fishing in the case of grey mullet is still possible within the current commercial catch limit for the GMU 1 stock. The commercial catch limit of 925 tonnes is 20% lower than historically high levels of commercial catch experienced in the early 1980s (average of 1116 tonnes). The number of commercial fishers for both eel fisheries and non-eel fisheries shows a slightly declining trend over the fishing years 2004–05 and 2008–09 in all areas. Several commercial eel fishers retired when shortfin and longfin eel stocks were introduced into the quota management system (QMS) in October 2004, or at October 2007 when catch limits were further reduced to ensure sustainable use.

Customary fishing: The primary method of characterising customary fishing use involved engagement with iwi through hui using a consent and information form and a standard questionnaire. Based on the questionnaire, semi-structured focus groups were held, and supplemented by electronic and hard copy survey questionnaires that respondents completed. Eel, both shortfin and longfin, are the predominant species for customary fishing, reinforcing the significance of these species for Māori. Feedback during the research hui indicated that the most important reason for customary fishing was harvest, primarily for hui and tangi. Other reasons given for customary harvest of eel included poukai, whānau, research, enhancement, birthdays and fishing for older people who are no longer able to fish for themselves. Eel is increasingly seen as a delicacy rather than as a food regularly fished for customary purposes.

Though overfishing has reduced eel size and abundance in the past, the stocking programme in the hydro reservoirs has increased the fishing opportunities in the upper Waikato River catchment, given the inability of aquatic life to safely migrate past dams. Customary fishers are likely to have been fishing for a long time; across all iwi the average length of experience in customary fishing was 22 years. Across respondents from Raukawa and Waikato-Tainui, there was generally an even spread across age groups, however, there was a notable absence of young customary fishers in Maniapoto.

About one third of customary fishing was by hīnaki, whereas one quarter used fyke net. Respondents also indicate that rod and line, gill net and “other” (including hand, gaff, ripi, spear and bracken) are important fishing methods.

Customary fishers largely fish all year round. This probably reflects the observation that customary fishing generally happens according to need. Survey data also indicates that there was a small decrease of absolute numbers of people engaged in customary fishing over winter. Feedback from hui showed that customary fishers often fished according to tikanga or to other factors that affected fishing, such as moon phase, season, and weather conditions.

Puhi (shortfin male migrant eels) are still actively fished in the Huntly area, with up to 400 taken annually to sustain the functions of marae. This type of customary fishing has occurred for many generations, and historically puhi were even more intensely harvested with many paa tuna weirs constructed on the outlet of most lakes and in tributaries of the Waipa and Waikato Rivers.

Piharau (lamprey) were captured and harvested historically in the upper Waikato and Waipa Rivers. This no longer occurs, and both Raukawa and Maniapoto would like to see this species enhanced in future. The black flounder was noted by Maniapoto as a species that used to be prevalent in the upper Waipa River, but which appears to no longer be present.

Decreasing frequency of customary fishing has meant that there are fewer fishers engaged in *hī tuna* (eel fishing) as a customary activity, and with fewer people aware of or taught tikanga relating to *hī tuna*, leading to a loss of connection between youth and elders who possessed such knowledge.

Recreational fishing: Recreational fishing in the Waikato and Waipa river catchments fell broadly into three categories; fisheries for introduced coarse fish (e.g., rudd, koi carp, goldfish, and brown bullhead catfish), fisheries for native species (e.g., whitebait, eels, and grey mullet), and trout fishing. Surveys were conducted by a combination of online electronic questionnaire participation, visits to fishing club meetings, field visits to locations generally popular with coarse anglers, and data from compliance patrols of recreational fishers from the Ministry for Primary Industries.

Respondents to the recreational fishing questionnaire indicated a spread of target species when fishing for recreational purposes with distinct patterns relating to club membership and reasons for fishing. Coarse fishing is restricted to the lower Waikato catchment below Taupiri, whilst trout fishing occurs in all three co-governance areas, but generally occurs in the Waikato catchment above Taupiri and in the Waipa catchment above Te Awamutu. Longfin and shortfin eel, and grey and yellow-eyed mullet, are the targets of fishing in the Waikato-Tainui iwi co-governance area of the lower Waikato River.

Twenty-nine respondents indicated koi carp as a target species. Koi carp, a target species for bow hunters, were largely fished in the lower Waikato shallow lakes (Lakes Hakanoa, Waikare and Whangape) and around the Whangamarino wetlands (Whangamarino and Maramarua Rivers and Pungarehu Canal). Trout was the most popular species; a total of 32 respondents indicating that they target trout. Key areas included the Waikato River hydro-lakes (Lakes Karapiro, Arapuni, Waipapa, Maraetai, Whakamaru, Atiamuri, and Ohakuri).

Goldfish, grey mullet, and rudd were targeted by 18, 17 and 12 respondents respectively, with lower numbers of respondents targeting longfin and shortfin eel, yellow-eyed mullet, perch, tench and catfish. No recreational fishers exclusively targeted longfin or shortfin eel, or adult galaxiids, i.e., they fished for both eel species, and if they caught adult galaxiids it was only as a bycatch. Koi carp had the highest average take by recreational fishers with respondents (10.8 fish per trip), and bow hunters had a high number of koi carp taken (average 17.9 per trip, maximum of 60). Longfin and shortfin eel both had an average take of 2.5 per trip. Fishing rod or handline were the most commonly used fishing methods by recreational fishers, and were used for all species except adult galaxiids and yellow-eyed mullet. Perhaps surprisingly, recreational fishers also used rods and handlines for eels.

Most of the 801 recreational fishers questioned in compliance inspections between summer 2006-07 and summer 2011-12 were close to Port Waikato or accessed Waikato River fisheries via Kariotahi Beach north of the Waikato River mouth, and most were fishing for grey mullet.

1 INTRODUCTION

The purpose of this research project is to collate information regarding the recent use of fisheries resources in the Waikato River and Waipa River catchment areas. These include, but are not exclusive to, the broad range of aquatic life managed under the Fisheries Act 1996. Such information is required to support management which includes a co-management framework. The research describes the commercial, customary and recreational fisheries including species and quantities taken, fishing methods, and seasonal influences.

1.1 Research objectives

This project entails a number of objectives to obtain broad coverage of recent fishing activity in the Waikato and Waipa catchments, including:

- Engagement with Waikato and Waipa river iwi.
- Collation and analysis of existing data on fisheries activity in the Waikato and Waipa river Co-governance areas, including information reported by commercial fishers to the Ministry of Fisheries (MPI).
- Collection of additional information in a manner sensitive and appropriate to the interests involved in order to present (in relation to the broad range of aquatic life subject to the Fisheries Act 1996):
 - A detailed characterisation of the commercial fishery including species taken, quantities taken, location of fishing (including differences between lake and river fisheries), fishing methods, and “target” species.
 - A characterisation of the Māori customary fishery including species taken, indicative quantities taken, location of fishing, fishing methods.
 - A characterisation of the amateur or recreational fishery, including species taken, indicative quantities taken, location of fishing, and fishing methods.
- Identification of current commercial fishers who may have fished one or more sites of the Waikato-Tainui Whenua Raahui Reserve.

1.2 Background to fisheries co-management in the Waikato River catchment

The Crown has recently signed agreements with five iwi regarding the Waikato and Waipa rivers. In 2009, Waikato-Tainui signed a revised Deed of Settlement with the Crown committing to co-governance of the Waikato River recognising the importance of the Waikato River to Waikato-Tainui and their role in the continued management of its environment, particularly for the restoration and protection of the river’s health and wellbeing. Also in 2009, Raukawa and the Crown signed a Deed of Settlement regarding the co-governance of the Waikato River, as did Te Arawa and Ngāti Tuwharetoa in separate agreements in 2010. These settlements also address the co-management of the Waikato River, focusing on the restoration and maintenance of the Waikato River environment. Maniapoto and the Crown signed a Deed of Settlement regarding co-governance of the Waipa River in relation to restoring and maintaining the Waipa River environment. As part of wider co-management agreements, the Crown has agreed to provide for fisheries regulations for managing fishing of species covered by the Fisheries Act 1996 in the three co-governance areas.

The Waikato-Tainui Raupatu Claims (Waikato River) Settlement Act 2010 (herein after referred to as “the Waikato-Tainui 2010 Act”) gave effect to the 2009 deed with provision for the creation of jointly developed fisheries regulations in the Waikato-Tainui fisheries area, which extends from Lake Karapiro on the Waikato River and the Puniu River junction on the Waipa River to the mouth of the Waikato River (Figure 1.1, Area A), including:

- Provision for Waikato-Tainui to manage customary fishing on the Waikato River through the issuing of customary fishing authorisations.
- Provision for Waikato-Tainui to recommend to the Minister of Fisheries the making of bylaws restricting or prohibiting fishing on the Waikato River.
- Provision that the Minister of Fisheries will make the bylaws recommended by Waikato-Tainui, unless the Minister of Fisheries considers that an undue adverse effect on fishing would result if the proposed bylaws were made.

The Crown has committed to developing similar jointly developed regulations in the Upper Waikato (Huka Falls below Lake Taupo to Lake Karapiro, Figure 1.1, Area B) and the Waipa River catchment above the Puniu River junction (Figure 1.1, Area C). In addition to existing frameworks for management of fisheries resources there are three pieces of legislation that all give effect to co-management agreements by requiring the making of fisheries regulations; one set have been made (Waikato-Tainui Raupatu Claims (Waikato River) Settlement Act 2010, Waikato-Tainui (Waikato River Fisheries) Regulations 2011), and the other two fisheries regulations are to be made in the short term (Ngati Tuwharetoa, Raukawa, and Te Arawa River Iwi Waikato River Act 2010, Nga Wai o Maniapoto (Waipa River) Act 2012).

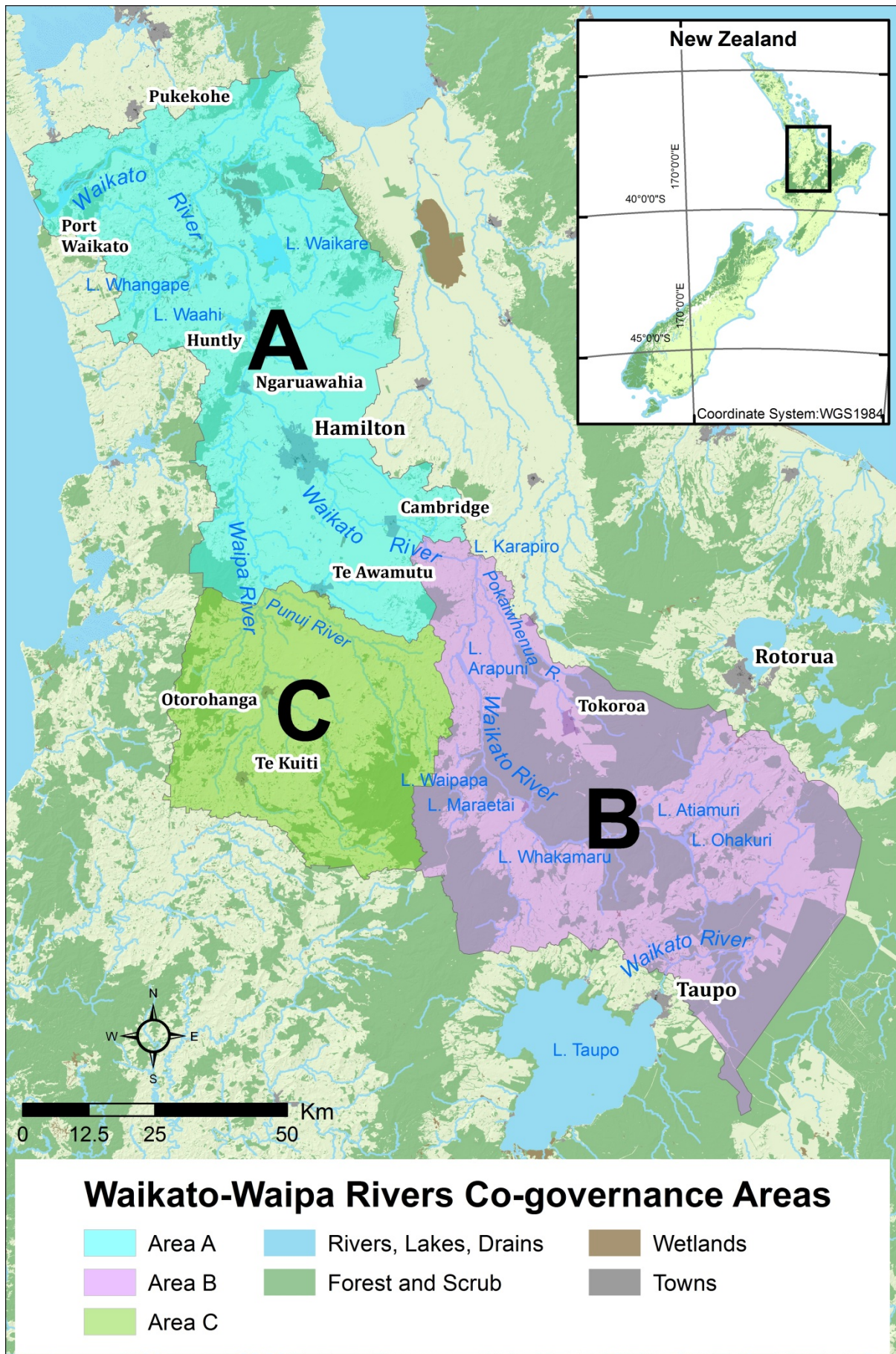


Figure 1.1: Waikato River and Waipa River catchments co-governance areas.

1.3 Sites of significance

The Waikato-Tainui 2010 Act also makes provision for the vesting of specified sites of cultural significance to Waikato-Tainui to the Waikato Raupatu River Trust. These sites are collectively declared a single reserve and classified as a local purpose reserve called the Waikato-Tainui Whenua Raahui Reserve (Figure 1.2).

The purpose of the reserve is to:

- Protect and preserve in perpetuity the intrinsic worth and cultural value to Waikato-Tainui of the Waikato River.
- Preserve and enable public access to and along the river.
- Contribute to the maintenance of the natural functioning of the Waikato River by protecting the habitats of the species that typify the lower Waikato River, associated archaeological and historic values, and maintain the value of the reserve as a soil conservation and river control area (the Waikato-Tainui 2010 Act, Part2, s 66, p. 58).

Geographical information system (GIS) layers for the co-governance areas were sourced from the Waikato Regional Council. Fisheries statistical layers were sourced from the MPI. Through communication with Land Information New Zealand (LINZ) and Office of Treaty Settlements we have established that the Sites of Significance that are to be included in the Waikato-Tainui Whenua Raahui Reserve have been modified from those listed in the reserves sites. We have identified all of the relevant reserves as stated in the Waikato-Tainui 2010 Act and listed in the Part 8, Subpart A, Sites of Significance, in the Waikato-Tainui Deed of Settlement (2009). The revised list is set out in Appendix 1.1 and we combined the downloaded cadastral GIS shape files from LINZ into a single GIS layer.

The land titles for the various discrete sites making up the Waikato-Tainui Whenua Raahui Reserve were gazetted in December 2011. The sites are found from the upstream area of Huntly to one site about 2.5 kilometres downstream of the Tuakau Bridge. Most of the sites are relatively small sections of river bank (e.g., Waahi Waka Tauranga, Rangiriri-Meremere Takinga Wairua) or islands (e.g., Tarakokomako Islands, Maurea Islands), or drain areas (Hukanui-a-muri Marae Lands), that may be covered by water in flood events. Two sites are of relatively significant size (Lake Waikare lake bed, and Lake Kopuera Wildlife Refuge). With the titles issued by LINZ, more detailed maps were then produced in ArcGIS for use in discussions with commercial fishers (Figure 1.3, Figure 1.4, and Figure 1.5).

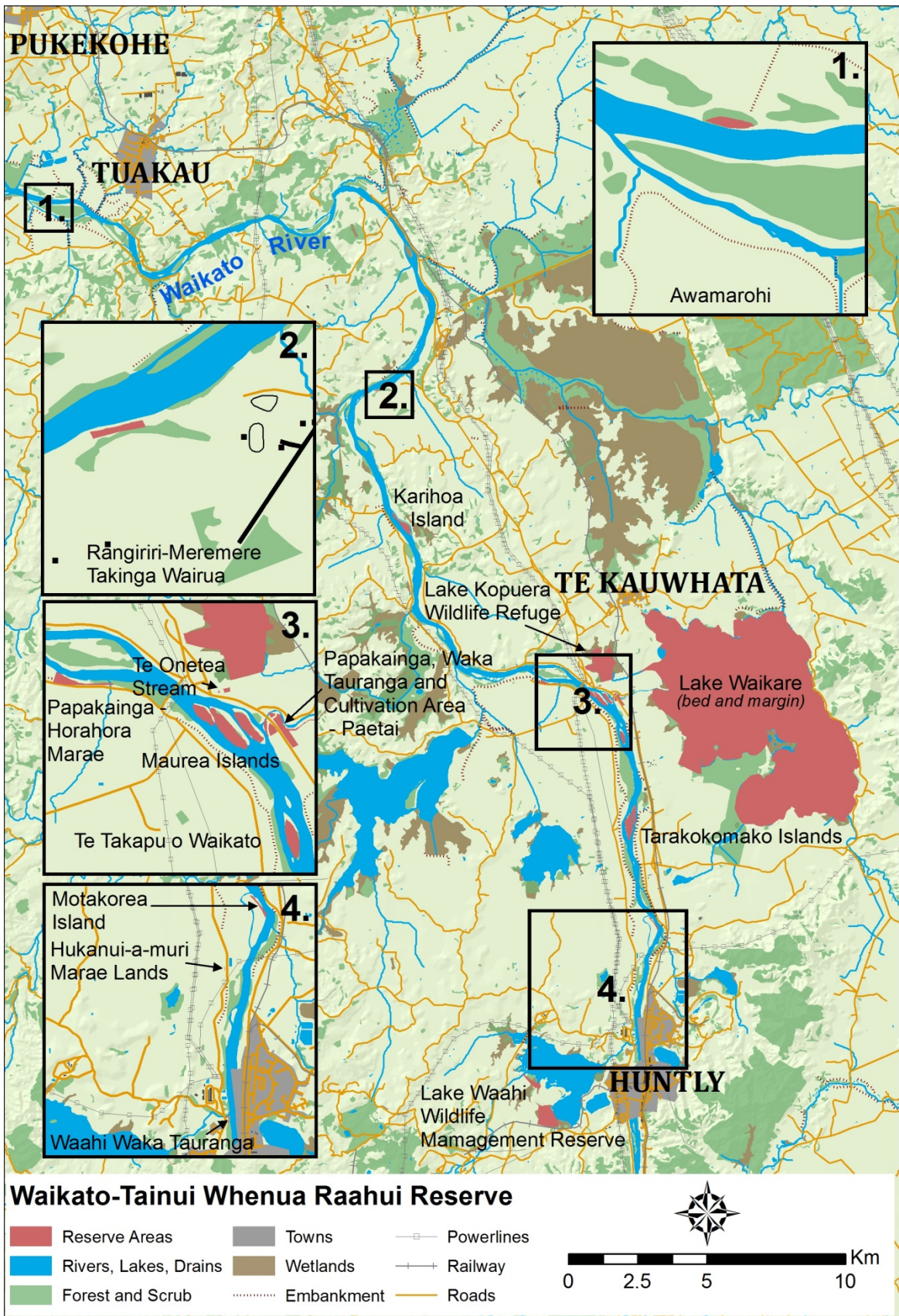


Figure 1.2: Sites of significance making up the Waikato-Tainui Whenua Raahui Reserve.

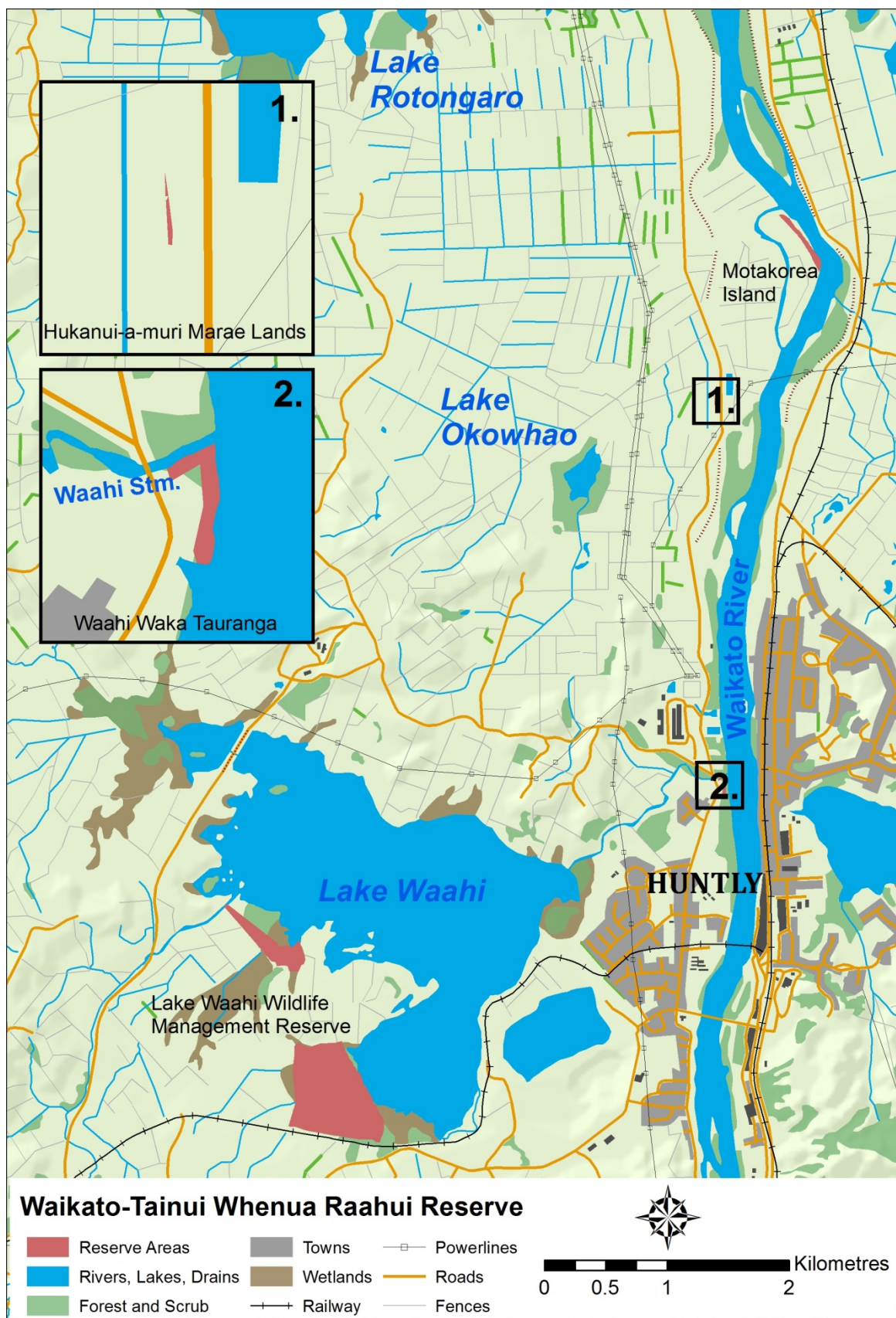


Figure 1.3: Waikato-Tainui Whenua Raahui Reserve sites in the vicinity of Huntly.

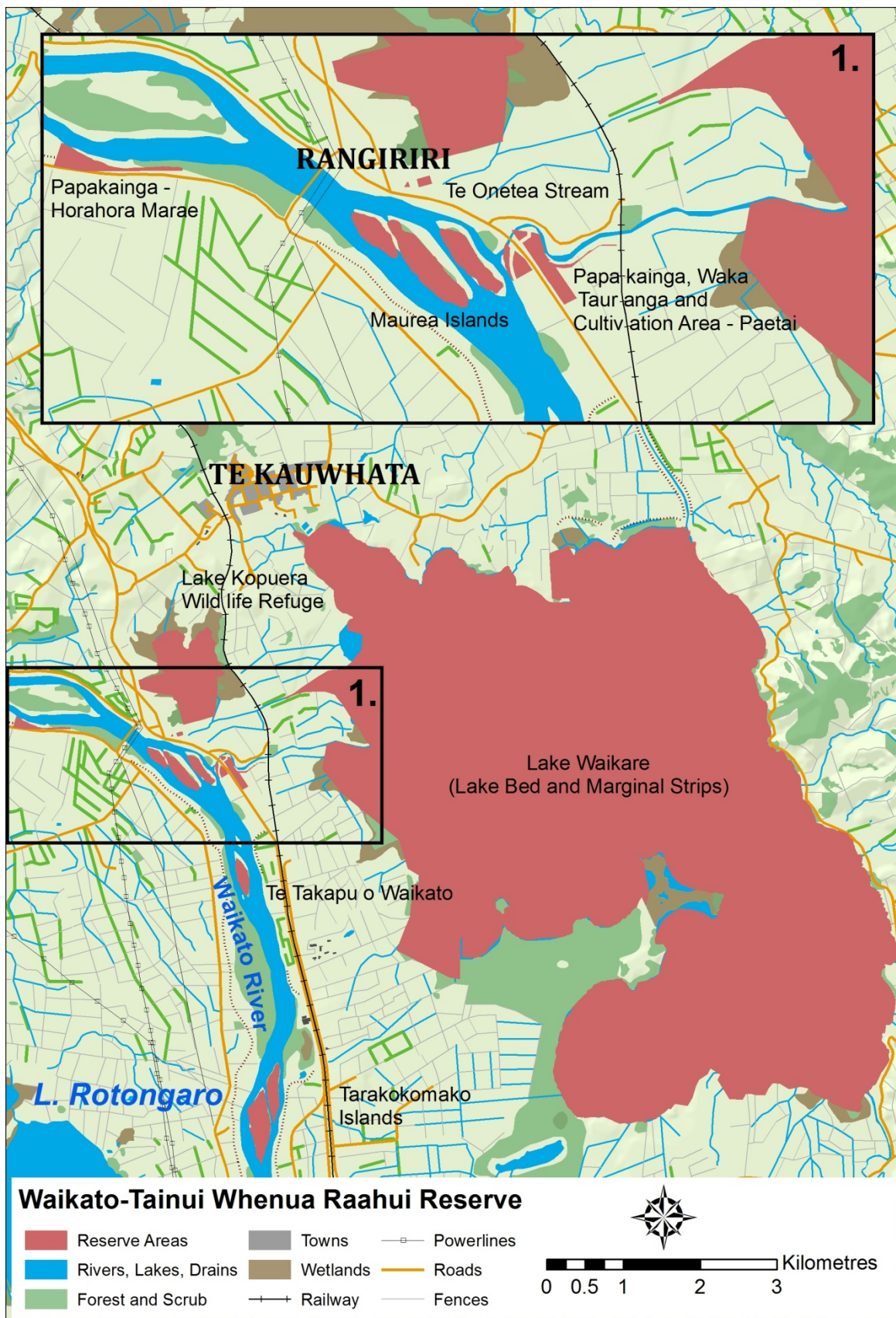


Figure 1.4: Waikato-Tainui Whenua Raahui Reserve sites in the vicinity of Te Kauwhata.



Figure 1.5: Waikato-Tainui Whenua Raahui Reserve sites in the vicinity of Tuakau to Meremere.

2 COMMERCIAL FISHERIES

2.1 Introduction

Commercial fishing is the taking of aquatic life for the broad range of commercial purposes encompassed by the Fisheries Act 1996. The taking of koi, which may be disposed of by sale, can be authorised under the Fisheries Act 1996 as a means to remove this ‘unwanted aquatic life’, in parallel with other authorities required to take and use this species under other legislation.

The nature and extent of commercial fisheries resource use from the 2004–05 fishing year through to the 2008–09 fishing year is analysed in this report. For all the species mentioned in this report, where they are treated as a unit for the purposes of fisheries management under the Fisheries Act 1996, a fishing year starts in October and continues through to the end of the following September.

The species that commercial fishers take in greatest quantities within the Waikato and Waipa catchments are managed under the quota management system (QMS), in quota management areas (QMAs) that extend beyond the Waikato and Waipa river catchments. Analysis of the longfin and shortfin eel fisheries in the context of their respective QMAs (Figure 2.1) has also been undertaken.

Fisheries resources within the Waikato catchment have been used commercially for more than a century, but some have only been used in the last few decades and others only experimentally from time to time. Historically, the extent of commercial use of a range of fisheries resources from the Waikato catchment has been relatively modest, and focused on the lower part of the catchment. However, the fisheries resources of significant historic commercial usage include the grey mullet fishery, and the shortfin and longfin eel fishery. The nature and extent of their commercial use increased in the latter half of the 20th century to levels where concerns were widely held about the sustainable use of such resources (Todd 1981, Anonymous 1989, Ministry of Agriculture and Fisheries 1984a, 1984b, Ministry of Fisheries 2005).

Catch limits to ensure sustainable use, at the scale of a management unit or stock, are applied on a stock’s entry into the QMS. In October 1986 the first fisheries were introduced into the QMS. The grey mullet fishery was introduced at that time (along with many other inshore fisheries). While proposed, the longfin and shortfin eel fisheries were not introduced at that time. From the mid-1980s through to the early 2000s, permitting access controls were applied to most non-QMS commercial fisheries, to prevent further risks to sustainable use.

North Island eel stocks were introduced into the QMS in October 2004 (Figure 2.1). This followed a similar initiative for South Island and Chatham Island eel stocks in 2000 and 2003 respectively.

A further reduction in the North Island eel stock catch limits were applied in October 2007. This was done to provide greater assurance that these stocks would improve by 2014 (Ministry of Fisheries 2007). The level of national commercial eel use has been reduced from historic levels (e.g., the 1990s average commercial catch of 1346 tonnes per annum) to about a national average of 740 tonnes per annum in the 2000s (Ministry for Primary Industries 2012). This represents an approximate 45 % national reduction on a decade by decade comparison as a result of targeted management action. The reduction is proportionately more for those eel stocks of the North Island. Subsequent trends in the fishery are being monitored over time using a range of techniques (e.g., Beentjes & Dunn 2010).

The grey mullet stock for the upper North Island (GMU 1), while introduced into the QMS in October 1986, and having its Total Allowable Commercial Catch (TACC) slightly reduced to 925 tonnes from October 1998, is still utilised at relatively high historic levels. Much of the grey mullet fishery within the GMU 1 stock has been taken from west coast harbour and estuarine environments (i.e., Kaipara and Manukau), including the delta area of the lower Waikato River.

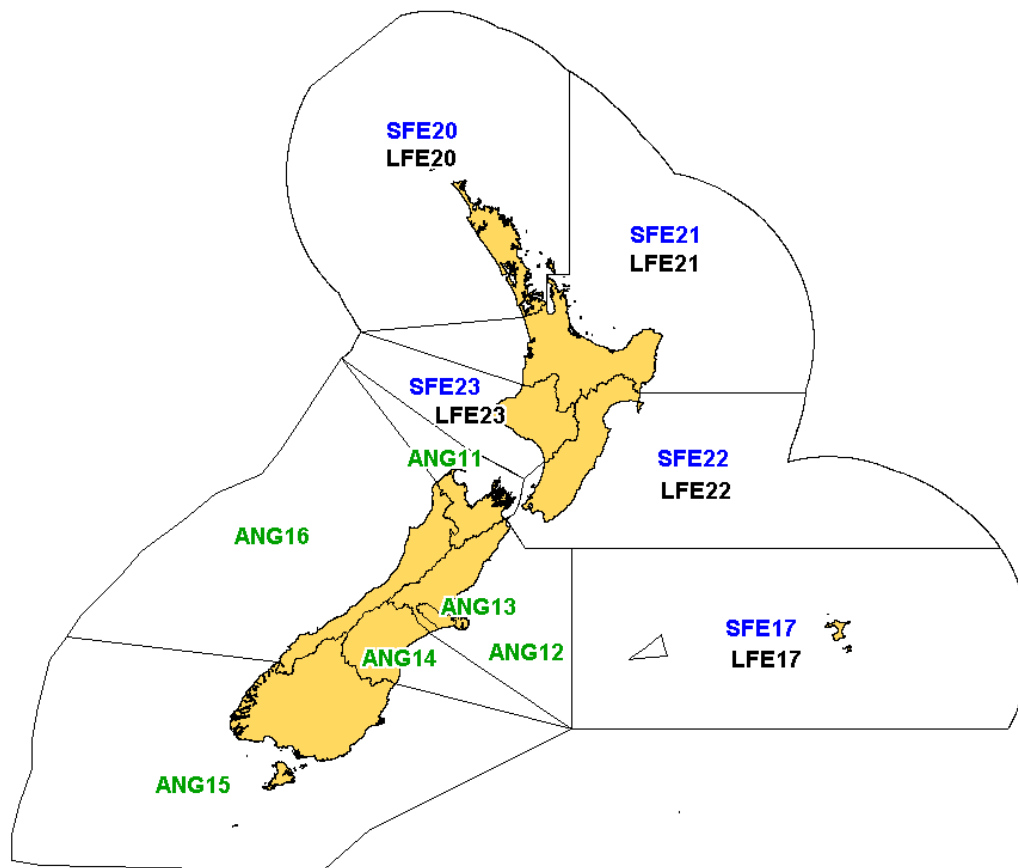


Figure 2.1: Quota Management Areas for the New Zealand eel fishery. Shortfin eel stocks are denoted by the prefix SFE, and longfin eel stocks by LFE. The ANG eel stocks of the South Island include both shortfin and longfin eel species.

Other species encountered within the Waikato and Waipa river catchments, which are managed in the QMS, include yellow-eyed mullet, flatfish, kahawai and parore. However, the majority of fisheries resources found predominantly in freshwater have not been prioritised for inclusion in the QMS, reflecting the relatively low level of resource use.

Today, many non-QMS fisheries can be fished commercially with a fishing permit (s 91, Fisheries Act 1996), but little development of these resources has occurred. This could include the commercial use of species by aquarium enthusiasts (e.g., freshwater mussel), in aquaculture (e.g., galaxiids), a food product (e.g., watercress), or as incorporated in fishing bait products (e.g., brown bullhead catfish).

The commercial removal (for subsequent sale, rather than just being discarded) of some introduced species considered to be undesirable (e.g., koi, brown bullhead catfish) started experimentally in the late 1980s. In theory, the removal of such species could derive ecological benefits, where fishing activities are undertaken with some intensity, and the market demand allows for the appropriate disposal of such products to defer costs. The range of both ‘native’ and introduced species residing in the Waikato catchment is reasonably well documented (McDowall 1994, David & Bruno 2010, Hicks, Ling & Wilson 2010). Various interests recognise that there is potential for introduced species to be more effectively used, consistent with the outcomes envisaged with the environmental principles of the Fisheries Act 1996, and in ensuring the sustainability of other desirable species (Speirs *et al.* 2010).

2.2 Methods used for commercial fisheries analysis

In undertaking the commercial fishery assessment of the Waikato catchment, principally for the fishing years 2004-05 through to 2008-09, the primary information sources were:

- a) statistical catch and landing information provided by commercial fishers on statutory returns required to be furnished in accordance with the Fisheries Act 1996 (i.e., Eel Catch Effort Return (ECER), Eel Catch Landing Return (ECLR), Catch Effort and Landing Return (CELR); records from Net Catch Effort Landing Return forms (NCELR) were evaluated, but discounted, as these related to offshore fishing outside the catchment;
- b) voluntarily supplied eel processor information on shortfin and longfin size grade information and sub-Eel Statistical Area (sub-ESA) shortfin and longfin catch distribution by commercial fisher, already collected under a research programme commissioned by the Ministry for Primary Industries (MPI), and its predecessor, the Ministry of Fisheries (see Beentjes 2008a, 2008b, 2011);
- c) public register extracts of quota share and Annual Catch Entitlement (ACE) holders as at 24 September 2010 (kept in accordance with the Fisheries Act 1996), for five fishstocks whose natural distribution would extend into the Waikato River between Tuakau and Huntly, coinciding with the discretely distributed sites of the Waikato-Tainui Whenua Raahui Reserve;
- d) coupled with information derived from the preceding information source, phone interviews of commercial fishers and an eel processor as it related to localised fisheries use (e.g., including non-quota species) of the Waikato-Tainui Whenua Raahui Reserve prior to 24 September 2010.

2.2.1 Commercial eel fishing distribution, number of fishers, and landed catch size grades

2.2.1.1 Data collation

The primary data source for the characterisation of the Waikato catchment commercial shortfin and longfin eel fishery is the previously collected and largely groomed information held by the MPI, arising from the previous 'Monitoring of commercial eel fisheries' research projects, as reported in Beentjes (2008a, 2008b, 2011). This data contained each commercial fisher's landed catch by date, eel stock (i.e., shortfin (SFE) or longfin (LFE)), the relevant Eel Statistical Area (ESA) (i.e., AD: Waikato), and the constituent sub-ESAs sub-setted within the ESA code (Table 2.1; Figure 2.2), and size grade (weight) (Appendix 2.1).

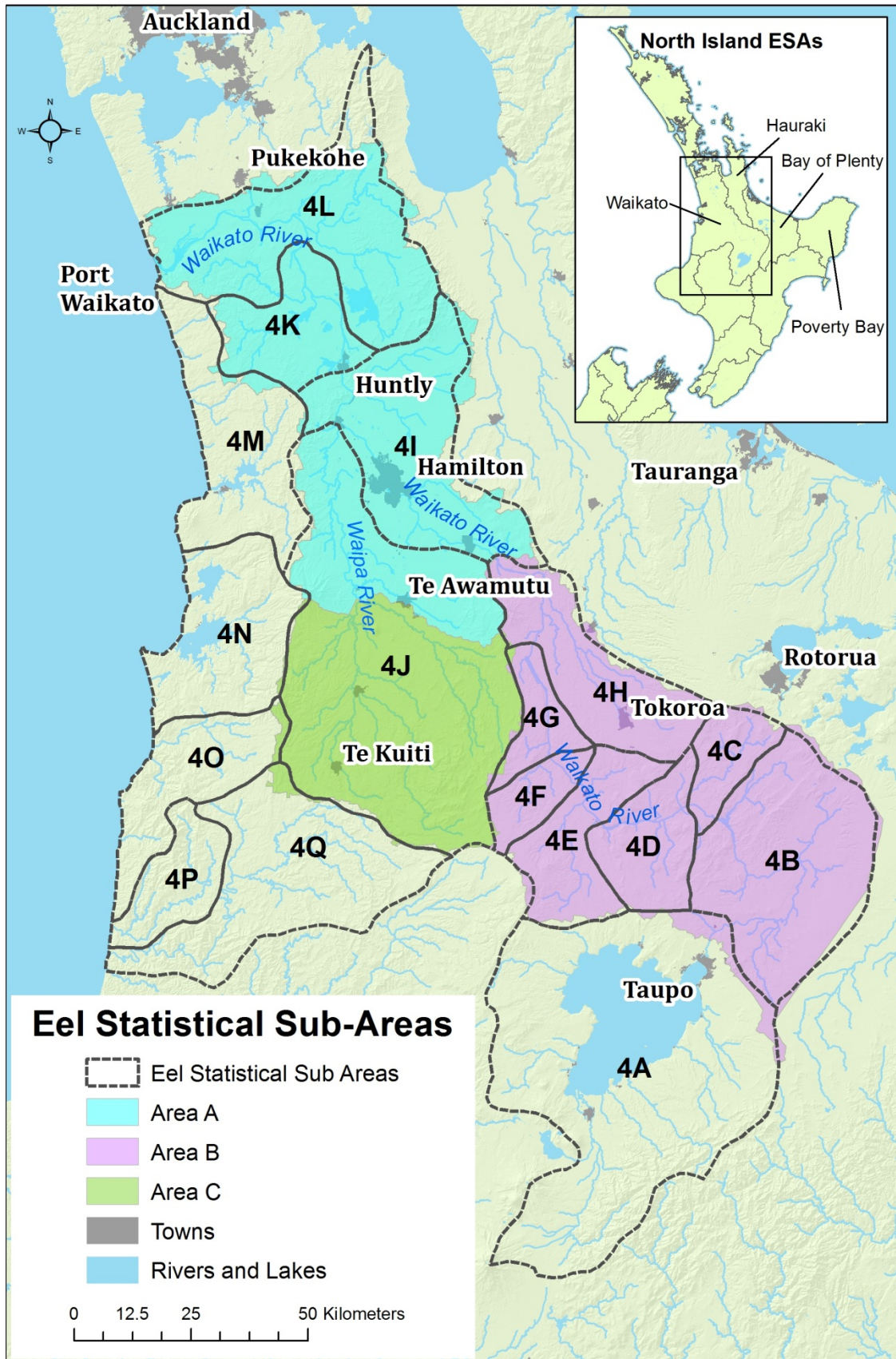


Figure 2.2: Map of Eel Statistical Area AD (Waikato) with the sub-ESAs 4A–4Q within its boundaries (taken from Beentjes 2011), with a coloured overlay of three co-governance areas within the Waikato River catchment, being Area A in turquoise (Waikato-Tainui), Area B in purple (Raukawa, Te Arawa & Ngāti Tuwharetoa), and Area C in green (Maniapoto).

The primary sub-ESAs of interest, which coincide with the three co-governance areas, are 4B through to 4L (Figure 2.2). While sub-ESA 4A is not a part of the Raukawa, Te Arawa and Ngāti Tuwharetoa co-governance area, it is part of the wider area encompassed by the common QMA boundary for the SFE 21 and LFE 21 eel stocks. There is no commercial eel fishing within the Lake Taupo locality, so the 4A sub-ESA did not materially contribute to the subsequent analysis steps. The sub-ESAs 4M to 4Q form a ‘west coast Waikato’ pool of data. This was retained for comparative purposes in analyses that compared shortfin and longfin eel catch from each of the co-governance areas, relative to the catch in other parts of the QMA for the SFE 21 and LFE 21 stocks.

The ESA code AD encompasses the Waikato catchment. Finer scale sub-ESA codes are used voluntarily and separately by the fishing industry at present, to provide greater scale of resolution of commercial eel fishing activity within the ESA in question. Commercial eel catch data was also retained and grouped together for the eastern side of the QMA, being the Hauraki (ESA AC), Bay of Plenty (ESA AE) and Poverty Bay (ESA AF) statistical areas (see inset of Figure 2.2 for relative position of these ESAs to others within the SFE 21 and LFE 21 stock boundaries).

Table 2.1: Fisheries reporting codes used for the eel fishery. Eel Statistical Areas (ESAs) are used by commercial fishers in furnishing Eel Catch Effort Returns (ECERs) and Eel Catch Landing Returns (ECLR).

Eel Statistical Area (ESA), code for statutory reporting of Waikato provincial area	Sub-ESA, voluntarily applied at sub-catchment level	Sub-ESA Locality name (from Beentjes 2011)
AD	4A	Lake Taupo
AD	4B	Lake Ohakuri
AD	4C	Lake Atiamuri
AD	4D	Lake Whakamaru
AD	4E	Lake Maraetai
AD	4F	Lake Waipapa
AD	4G	Lake Arapuni
AD	4H	Lake Karapiro
AD	4I	Hamilton
AD	4J	Pirongia Forest Park
AD	4K	Lake Whangape
AD	4L	Lake Waikare/Port Waikato
AD	4M*	Raglan Harbour
AD	4N*	Kawhia Harbour
AD	4O*	Marakopa River
AD	4P*	Awakino River
AD	4Q*	Mokau River

* = sub-ESAs that do not coincide with the Waikato catchment, but are part of the old sub-ESA ‘4’ coding series.

Beentjes (2011) describes the size grades used by the two main North Island processors (New Zealand Eel Processing Co. Ltd (NZ Eel); and AFL-Levin Eel Trading Co. Ltd (AFL-Levin)), and this is reproduced in Appendix 2.1 for reference. Basically, there have been three size classes for shortfin, and three size classes for longfin eel, although each processor had slightly different weights they would each use to demarcate the three different size classes and these were adjusted slightly from the 2008-09 fishing year. AFL-Levin increased the lower weight for ‘medium’ sized shortfin eels from 500 to 650 grams, and NZ Eel reduced their lower bound for ‘large’ longfin eels from 1200 to 1000 grams.

For ease of reference in the current analysis, the differences between size grade classes used by the two processors, and the modest size grade changes in 2008-09, are not represented in this report. Generic data from both processors have been combined. In assessing the data available for use, there did not appear to be a discernible change in the ratio of the number of landings made to respective processors over the five fishing years in question. Size classes are simply referred to as ‘small’, ‘medium’ and ‘large’, as this simplifies the trends in size classes being landed in the Waikato catchment fishery.

Other potential factors affecting the trends in the quantity of shortfin or longfin eels in size grades, from the 2008–09 fishing year in particular, are noted in Beentjes (2011). The extension of the 4 kg maximum size limit for shortfin and longfin eels to all New Zealand fisheries waters from 1 April 2007 (previously just the South Island fisheries waters from 1995) was probably of modest consequence to landings of ‘large’ size grade eels for the time period through to the end of the 2008–09 fishing year. Anecdotally, commercial eel fishers advise (April 2012) that the proportion of large longfin eels over 4 kg in individual weight has increased in several areas of the Waikato catchment since that time. This may in part be a result of the reductions in TACCs for North Island longfin eel stocks implemented on 1 October 2007.

2.2.1.2 Data analysis

In order to characterise the commercial catch of shortfin and longfin eels within each of the co-governance areas, it was necessary to determine the spatial alignment of each sub-ESA with each co-governance area. With one exception, this was relatively straightforward given:

- the relatively small size of the sub-ESAs in comparison to the co-governance areas;
- the use of some common and logical boundary lines, although used for different purposes;
- the outer common boundary of the co-governance areas and the most part of the Waikato ESA (other than in the west), both generally conform to the natural catchment boundary for the Waikato catchment.

Sub-ESA 4J spanned both the Maniapoto and Waikato-Tainui co-governance areas, and this required a particular approach to apportion catch into either the Maniapoto or Waikato-Tainui co-governance areas. Sub-ESA 4J encompasses the entire Waipa catchment, whereas the Waikato-Tainui and Maniapoto co-governance areas align in a spatial sense, respectively, to the lower and upper half of the Waipa River catchment, in about equal proportion.

More generally, the sub-ESA spatial alignment to the following co-governance areas, and adjacent parts of the common QMA for the SFE 21 and LFE 21 stocks, are as follows:

- Raukawa, Te Arawa and Ngāti Tuwharetoa: sub-ESAs 4B, 4C, 4D, 4E, 4F, 4G, 4H;
- Maniapoto: the upper part of sub-ESA 4J above the junction of the Punui River with the Waipa River (pro-rated, based on discussions with affected commercial fishers – see following explanation);
- Waikato-Tainui: sub-ESAs 4I, 4J (lower part), 4K, 4L;
- West coast Waikato: sub-ESAs 4M, 4N, 4O, 4P, 4Q (in recognition of tribal affiliations with Waikato-Tainui and Maniapoto iwi, rather than being grouped in with all other non-co-governance area ESAs within the common QMA boundary for SFE 21 and LFE 21 stocks);
- Hauraki, Bay of Plenty, Poverty Bay (ESAs AC, AE and AF, in inset of Figure 2.2), being the rest of the common QMA for SFE 21 and LFE 21 stocks.

There were ten commercial fishers that had recorded eel catch from sub-ESA 4J at some point over the five fishing years (201 landings in total). Three of the ten commercial fishers only reported fishing one time in sub-ESA 4J, and one commercial had fished in this sub-ESA on four occasions over the five year period. One of the three commercial fishers did not wish to provide information on his past fishing activities, but his activities were known to be predominantly based in the lower Waikato and

Hauraki sub-ESAs. Given the past distribution of fishing activities of the other three commercial fishers in adjacent sub-ESAs, and one of the author's general knowledge of their historical fishing activity, their catch landings were assigned to the lower Waipa (below the Puniu River junction).

The other six commercial fishers were asked in April 2012 to estimate what approximate (to the nearest 5-10%) proportion of their eel catch on average, over the five fishing years in question, was taken above or below the Waipa/Puniu Rivers junction (Appendix 2.2). Their annual shortfin and longfin eel catch, by size grade, for each of the five years was subsequently pro-rated between the two co-governance areas (Waikato-Tainui (lower Waipa), and Maniapoto (upper Waipa)).

A small discrepancy was noted in the landed catch data supplied by eel processors for several sub-ESAs, in the 2005–06 and 2006–07 fishing years. The commercial eel fishing data used from the previously submitted electronic records (from NIWA to MPI at end of research contract) and the published records (e.g., in Appendix 3 of both Beentjes (2008b), and Beentjes (2011)) do not align. Perhaps some of the electronic records for 2005–06 and 2006–07 have been updated since 2008, and the old records continue to be used in the Appendix 3 of Beentjes (2011).

The 5194 kg discrepancy (6.8%) in the 2006-07 fishing year may have slightly impacted the analysis of size grade information, although the discrepancies are evenly spread over most sub-ESAs, and therefore each co-governance area. The quantitative difference in the 2005-06 fishing year is only 116 kg (0.1%), and therefore is of negligible consequence. The differences at the level of each sub-ESA, and as totals for both the entire '4' ESA series, and just those ESAs within the Waikato catchment, are set out in Appendix 2.3. There were insufficient resources available to further investigate, and in any case, the industry processing staff familiar with these issues may no longer be involved in the fishery.

A consistent colour scheme is used to identify graphs associated with the different co-governance areas, the west coast Waikato, and the eastern part of the QMA for LFE 21 and SFE 21 stocks, as follows:

- | | |
|--|-----------|
| • Waikato-Tainui: | Turquoise |
| • Raukawa, Te Arawa, Ngāti Tuwharetoa: | Lavender |
| • Maniapoto: | Green |
| • West coast Waikato: | Orange |
| • Eastern QMA (Hauraki, Bay of Plenty, Poverty Bay ESAs combined): | Pale blue |

2.2.2 Commercial use of fisheries resources other than eels

2.2.2.1 Data extraction and grooming steps

The statutory fishing returns that were evaluated for relevant catch landed records of non-eel catch within the Waikato catchment for the 2004–05 through to the 2008–09 fishing year included:

- Catch, Effort and Landing Returns (CELR);
- Net Catch Effort and Landing Returns (NCELR);
- Eel Catch Landing Return (ECLR) and the associated Eel Catch Effort Return (ECER).

Initial grooming was undertaken to remove data records from the data set that were clearly not associated with the Waikato River catchment.

Commercial fishers fishing in the Waikato catchment do not report using latitude and longitude coordinates, and instead use standardised statistical reporting areas. The General Statistical Area (GSA) code that commercial fishers are obliged to use to identify fishing activity (other than eels) within the Waikato catchment and adjacent coast is 042 (Figure 2.3). In addition to extracting fishing records using this GSA code, data extracts were also requested on other GSA codes that are known to be mistakenly used by commercial fishers fishing in the Waikato catchment. These mistakes largely arise

as a result of commercial fishers confusing statistical area reporting with the codes they also use for fishstock reporting.

The other GSA codes checked for Waikato catchment records included GSAs:

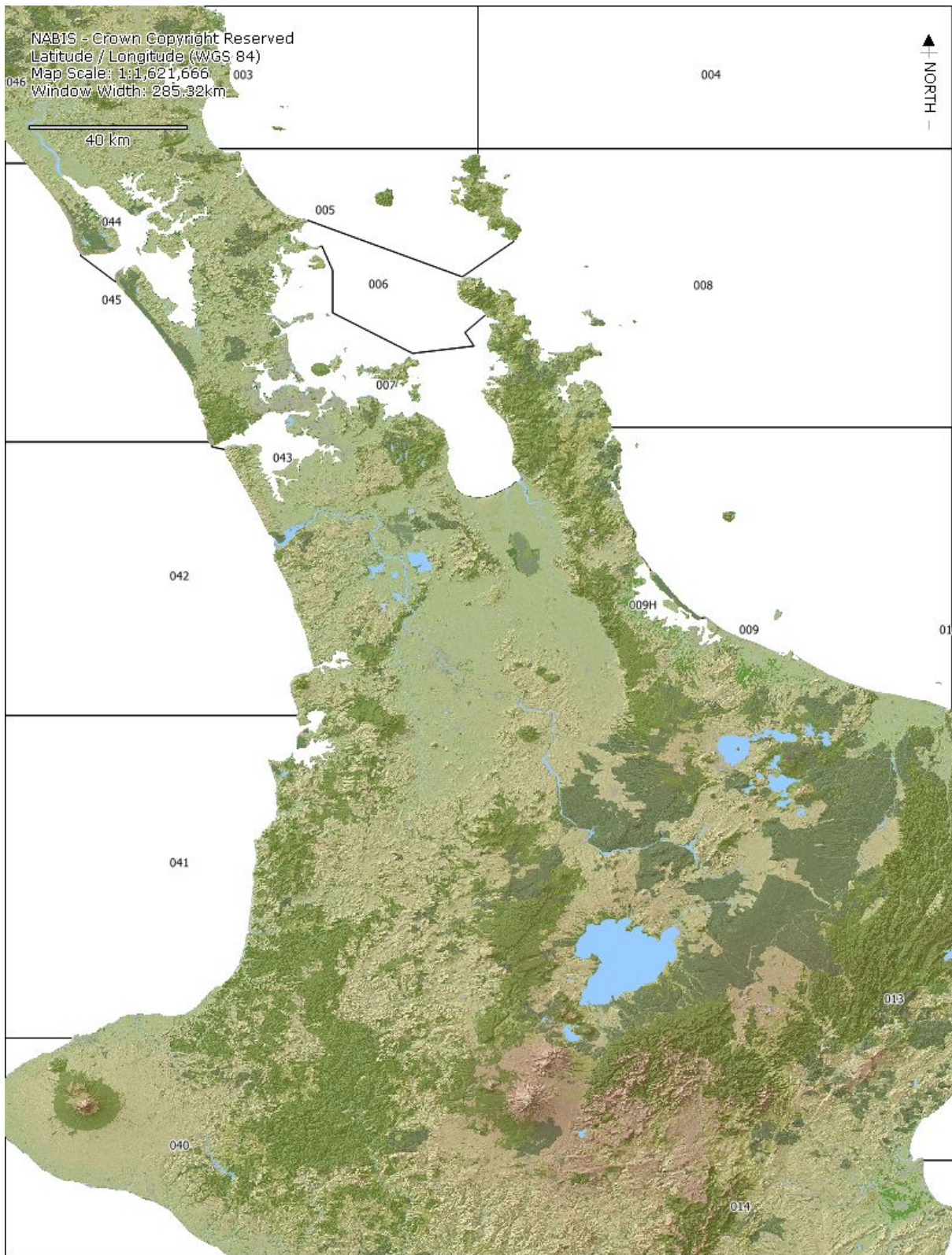
- 004 – as it may have been data entered as such when a commercial fisher had submitted ‘4’, being an old eel fishing statistical area code for the Waikato catchment;
- 009 – as it may have been used incorrectly by a commercial fisher, when its proper use is as a Fishery or Quota Management Area code (i.e. Area 9) for the west coast from North Cape to Tirua Point, south of Kawhia;
- 043 – code associated with the Manukau Harbour;
- 044 – code associated with the Kaipara Harbour.

Catch landing CELR records from the GSAs evaluated were retained in the initial groomed data set, having removed records that were associated with one or more of the following factors:

- fishing methods not able to be used in the catchment;
- species not naturally found in the catchment;
- fishing vessels of a size that would not typically operate in shallow water, or were known as vessels used in other non-Waikato fisheries;
- commercial fishers known not to typically fish in the Waikato catchment, based on point of landing information and general knowledge of their fishing activities or for some commercial fishers based in and around Port Waikato, a phone call was made to ascertain whether fishing occurred outside the River entrance, with the point of landing being inside the River delta area.

The CELR catch landing records were further confined to those using landing destination codes L (landed to Licenced Fish Receiver), or W (wharf sale), which accounted for most of the records. Commercial fishers using the CELR form do not typically report catch they discard (destination code D), although obliged in law to do so. CELR records were assigned to co-governance areas based on the data entries that a commercial fisher makes for the ‘point of landing’ on the form. In addition, almost all of the catch recorded on the CELR form type came from fisheries operating in the delta area of the river where species were known to naturally occur in fishable numbers. Similarly, commercial fishers confirmed that the market was reluctant to receive grey mullet, the main target species, from the freshwater environment.

A review of the NCELR records confirmed that the nature of the net fishing activities, requiring the use of this form type, would have occurred offshore. This was evident by the species being taken in significant quantities (e.g., rig), by recognised commercial fishers with an interest in this fishery, and the length of net used which, under fisheries regulation, would not be legally allowed within a river environment. Some of the vessels were also reasonably large, and unlikely to be used on the Waikato River. Accordingly, none of the NCELR records were relevant to the Waikato River fishery characterisation.



This map is intended to be used as a guide only, in conjunction with other data sources and methods, and should only be used for the purpose for which it was developed. Although the information on this map has been prepared with care and in good faith, no guarantee is given that the information is complete, accurate or up-to-date.

Date: 13 July 2012

Figure 2.3: General Statistical Areas (GSA) used by commercial fishers when completing statutory fishing returns, principally the Catch, Effort and Landing Return (CELR). GSA 042 encompasses the west coast area between the Manukau Harbour entrance in the north, to a point just north of Aotea Harbour, and is used for reporting non-eel commercial catch in the Raglan Harbour and Waikato River catchments.

Relevant non-eel data associated with ECLRs were identified by retaining those records having landed fishstock codes associated with the upper North Island Fishery Management Areas (e.g., CAT 1, CAT 9, or CAU 1, rather than say BUL 3, or GLX 7). Fishstock codes for non-QMS species are made up of both a species codes (see Table 2.2) and a unique number ascribed to the relevant Fishery Management Area (i.e., either a 1 or a 9 for the east or west coasts of the upper North Island respectively).

Upper North Island landed catch records were then linked with Eel Statistical Area (ESA) AD used in the corresponding ECER form, to further refine those upper North Island landings derived from the Waikato catchment, in contrast to other North Island ESAs. Given one of the author's knowledge of the commercial fishers involved in the Waikato fishery, a further visual check on remaining records identified any commercial fishers who were not known to fish in the Waikato catchment. As bycatch species are more commonly taken in the Waikato catchment, given their relative abundance, there were relatively few records from non-Waikato commercial fishers retained in the dataset.

In order to assign the non-eel catch (recorded on ECLR forms at the scale of Waikato catchment only (i.e., ESA AD)), to the different co-governance areas, the fishing trip date was matched with the eel landing date that each commercial fisher had been assigning a sub-ESA code. The sub-ESA code signified the area where eel fishing had taken place, and in all likelihood was the same place of capture of non-eel by-catch. For any non-eel by-catch recorded as being taken from sub-ESA 4J, which overlaps both the Waikato-Tainui and Maniapoto co-governance area, knowledge of the commercial fishers area of operation was used to assign catch. This was either already known from involvement with these fisheries, and/or confirmed following a phone call to the commercial fisher concerned.

In the case of ECLRs, some commercial eel fishers more readily report the landing and discarding of some species commonly taken in their operations. In addition to destination codes L and W, destination code D records were also retained for analysis, as the catch of these species (e.g., koi, catfish, and goldfish) is of interest in better characterising the nature of the fishery in the freshwater environment.

Table 2.2: Selected species codes and associated common names used for statutory reporting under the Fisheries Act 1996, as used in Figures for commercial fishing.

Common name	Species code
Brown trout	BTR
Brown bullhead catfish	CAT
Flatfish	FLA
Galaxiids (adult)	GLX
Goldfish	CAU
Grey mullet	GMU
Kahawai	KAH
Koi	KOI
Kōura (freshwater crayfish)	KOU
Longfin eel	LFE
Parore	PAR
Perch	FLU
Rainbow trout	RTR
Rig	SPO
Rudd	RDD
Shortfin eel	SFE
Trevally	TRE
Yellow-eyed mullet	YEM

2.2.2.2 Secondary grooming and data analysis

During the initial data grooming it became evident that the preliminary assessment of grey mullet catch was lower than expected over the five fishing years being analysed. The follow-up extracts of CELR catch landing information for GSAs 043 (Manukau Harbour) and 044 (Kaipara Harbour) was evaluated with a view that commercial fishers had incorrectly reported Waikato River fishing effort against these codes, predominantly the adjacent GSA 043. Given concerns about the significance of the miscoding error, four commercial fishers using the delta area of the River were visited in person to discuss their reporting patterns.

Following discussions with three related commercial fishers with significant grey mullet catch, it became evident that they had regularly conducted two fishing trips on one day, one in the Manukau, and one in the Waikato. They had recorded both trips on one CELR form (instead of separately) with a mixed point of landing noted (e.g., 'Waiau Pa / Elbow'), and typically reported the statistical area as GSA 043 (Manukau). Fortunately, this significant pattern of incorrect reporting behaviour was isolated to these individuals. Catch landing information from a CELR form was re-assigned between the two adjacent areas using the following approach:

- Grey mullet was principally targeted in the Waikato, whereas flatfish were targeted in the Manukau, as advised by commercial fishers;
- Catch landings of flatfish of no more than 10 kilograms were taken on occasion in the Waikato as a by-catch, noting that no more than a few hundred kilograms were taken from the Waikato in any one fishing year (mainly a winter fishery);
- Catches of smooth skate (SSK), eagle ray (EGR), rig (SPO), school shark (SCH), bronze whaler shark (BWS) were highly likely to have been taken in the Manukau Harbour, with only the occasional rig being confirmed by commercial fishers as being taken at the Waikato River entrance;
- Associated catch effort information advising of koi (KOI) catch supported assignment to the Waikato rather than the Manukau;
- Catches of trevally were removed when above 10 kilograms in any landing, or where associated with rig target effort, as commercial fishers advise that rig is rarely taken in the Waikato River delta, and trevally is not typically targeted in the Waikato River entrance waters;
- Catch landing mixes were compared with other commercial fishers in the Waikato for any catch taken in unusual ratios over the fishing year (e.g., all other commercial fishers typically had 85 % of their catch landings. For example, no other commercial fisher in the Waikato had reported school shark catch.

The fourth commercial fisher was unaware that he should be recording commercial catch in the Waikato delta under the GSA 042 code. He had been using GSA 043 as this is how he had interpreted the map that came with the CELR book. He was under the impression that the GSA 043 code applied to the harbour and estuarine areas inland from the Manukau coast, which is not the case. Consequently, greater reliance was placed on the recorded 'point of landing' information to assign his catch to either the Manukau or Waikato catchments.

Overall, about 2,520 lines of catch landing information, from 40,927 lines (i.e., 6%) reportedly taken from Manukau Harbour, has been re-assigned from the Manukau Harbour GSA to the Waikato catchment. This represented about 436 tonnes of fish over the five fishing years, comparable with 412 tonnes of catch landings correctly made from that part of GSA 042 being the Waikato catchment. It is possible that a small amount of grey mullet catch was actually taken in the Manukau, but re-assigned to the Waikato, despite contact with the commercial fishers concerned, and establishing some rules to re-assign catch. A check of GSA 044 (Kaipara Harbour) identified a further 15 lines of catch landing information (from a total of 45,188 lines) that had Waikato catchment point of landing information

(e.g., Hoods landing). This represented about three tonnes of fish over the five year period, which is not significant when compared to overall catch of fish taken from the Waikato delta area.

After the completion of grooming steps, the CELR records were grouped with the ECLR records of non-eel catch for the purpose of summarising catch information, mostly as Figures.

The assignment of catch landing data between various co-governance areas was based on the point of landing information, knowledge of commercial fisher activity, discussions with commercial fishers, and knowledge of natural distribution of some species.

2.2.3 Assessing commercial use of Waikato-Tainui Whenua Raahui Reserve

2.2.3.1 Contact with commercial fishers

An initial round of individual discussions and distribution of reserve maps (Figures 1.3 to 1.5) was sent to 22 commercial fishers predominantly fishing for longfin and shortfin eels, grey mullet (generally no further upstream than near the Rangiriri Bridge), and some limited activity for brown bullhead catfish and koi. The intent in the initial discussion was to ensure that commercial fishers were aware of the reserve's existence, and to generally indicate that access rights to these areas were now defined by section 73 of the Waikato-Tainui 2010 Act. Commercial fishers were asked to also identify others with a potential interest.

The analysis provided here does not seek to identify all types of persons who may hold on-going access rights to the reserve, as that was beyond the project's scope. The outcome of this evaluation was to simply identify the most likely current commercial fishers who may have on-going qualified access to the reserve, for as long as it remains lawful.

The follow-up round of discussions with the identified commercial fishers established whether they either:

- i) held a fishing permit on the legislation settlement date (24 September 2010), and had fished in any one site of the Waikato-Tainui Whenua Raahui Reserve; or,
- ii) whether the identified commercial fishers held quota shares or current ACE in stocks (whose QMA incorporated the reserve) at the settlement date.

2.2.3.2 Extract of quota share holders and current ACE holders for relevant stocks

Section 73 of the Waikato-Tainui 2010 Act, sets out the basis on which commercial use and access rights may continue in the Waikato-Tainui Whenua Raahui Reserve. Other than actually fishing any one of the sites historically, as discussed in the preceding section, access may also be provided to persons holding quota shares or current ACE for those stocks that encompass the reserve sites within their respective QMAs.

Technically, the stock boundaries of almost all quota stocks adjoining the Waikato coast line extend inland from the offshore 200 nautical mile Exclusive Economic Zone (EEZ) boundary through the internal waters to the top of all catchments within a particular QMA. However, in a practical sense, one is unlikely to naturally find most quota stocks in the Waikato River.

To aid with the identification of people who may have a fishing interest in the reserve areas, an extract of quota shareholders and ACE holders as at 24 September 2010 was sought for relevant quota species and stocks:

- GMU 1 grey mullet
- YEM 1 yellow-eyed mullet
- FLA 1 flatfish
- SFE 21 shortfin eel
- LFE 21 longfin eel

Summary information on the number of quota share holders and ACE holders for each of these stocks, and respectively, a summary of unique quota shareholder and ACE holders between these five fishstocks, was produced. The summarised information shows the number of people who have a theoretical right to access the reserve sites for the purpose for which the person holds the quota shares or ACE. In reality, many of the people identified may utilise their applicable quota shares and ACE well outside the immediate sites making up the reserve (e.g., Coromandel or Bay of Plenty), while still being in the broadly applying QMA for the relevant stock.

The summary list was further refined to those likely to be more interested in the status of the reserve area, and access to it. This task was based on the proximity of the quota shareholders and ACE holders to the Waikato catchment, compared to other parts of the various QMAs of interest, and in some cases, knowledge of their likely fishing interests, regardless of their residential proximity to the Waikato catchment.

2.3 Commercial fishing results

2.3.1 Distribution of commercial eel fishing

The catch landing distribution of longfin and shortfin eel, by co-governance areas and adjacent parts of the common QMA for LFE 21 and SFE 21 stocks, for the 2004–05 to 2008–09 fishing years, is presented in Figure 2.4. A dashed line representing the overall TACC for each stock is included.

The two most important areas for commercial eel fishing continue to be the Waikato-Tainui co-governance area, and the broad eastern part of the QMA, comprising the Hauraki, Bay of Plenty and Poverty Bay ESAs. Commercial eel fishing in the Maniapoto co-governance area, the Raukawa, Te Arawa and Ngāti Tuwharetoa co-governance area, and the west coast Waikato area have remained relatively modest, and have either declined or remained static through to the 2008-09 fishing year. There are a variety of reasons why commercial eel catch has reduced in these areas, principally in response to declining fishing effort. The slight increase in shortfin commercial catch in the Raukawa, Te Arawa and Ngāti Tuwharetoa co-governance area may relate to use of the enhanced fishery, as a result of authorised translocations of small eels into the hydro-electric lakes since late 1992.

The relative importance of each of the areas within the common QMA for LFE 21 and SFE 21 stocks is also represented in pie charts (Figure 2.5). The average tonnage of longfin and shortfin eel over the five year period is plotted. The significant contribution in eel catch from the Waikato-Tainui co-governance area, and the combined Hauraki, Bay of Plenty and Poverty Bay ESAs is evident. In comparison to other areas for the five year time period, there is a greater proportion of longfin eel catch in the Maniapoto co-governance area, and the west coast Waikato area. This is not an unexpected result given the habitat characteristics in these areas.

The number of commercial eel fishers reported to have fished in the five areas identified (i.e., three co-governance areas, western coast Waikato, and the eastern part of the QMA) show a slight decline over the five year period (Figure 2.6). There are fewer commercial fishers and major processors participating in the commercial eel fishery in recent years than historically.

Several commercial fishers with an interest in the Waikato catchment retired at the time of QMS introduction (October 2004), and others have either left the industry or reduced their commitment given prevailing market conditions at the time, and/or the effect of further TACC reductions from October 2007. A major Auckland based processing shed belonging to Aotearoa Fisheries Ltd (AFL) closed in 2008. Catch previously processed at that facility was either landed at a competitor's plant (NZ Eel), or trucked to Levin Eel Trading Co. Ltd in the Manawatu. Some commercial fishers would have elected not to continue with either alternative at the time, and retired.

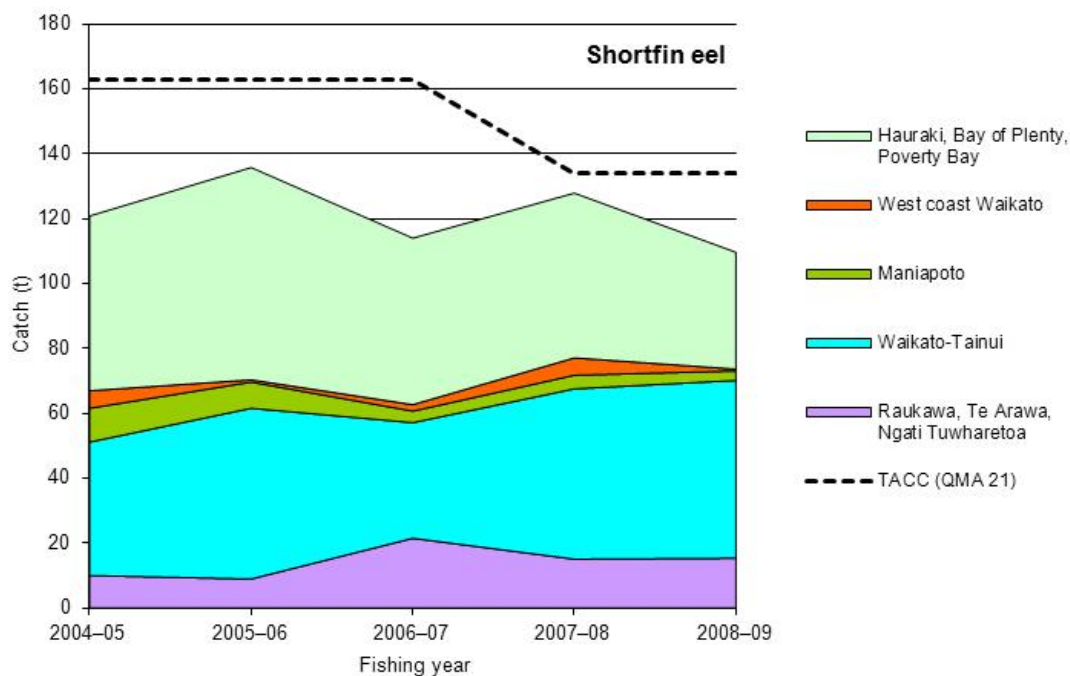
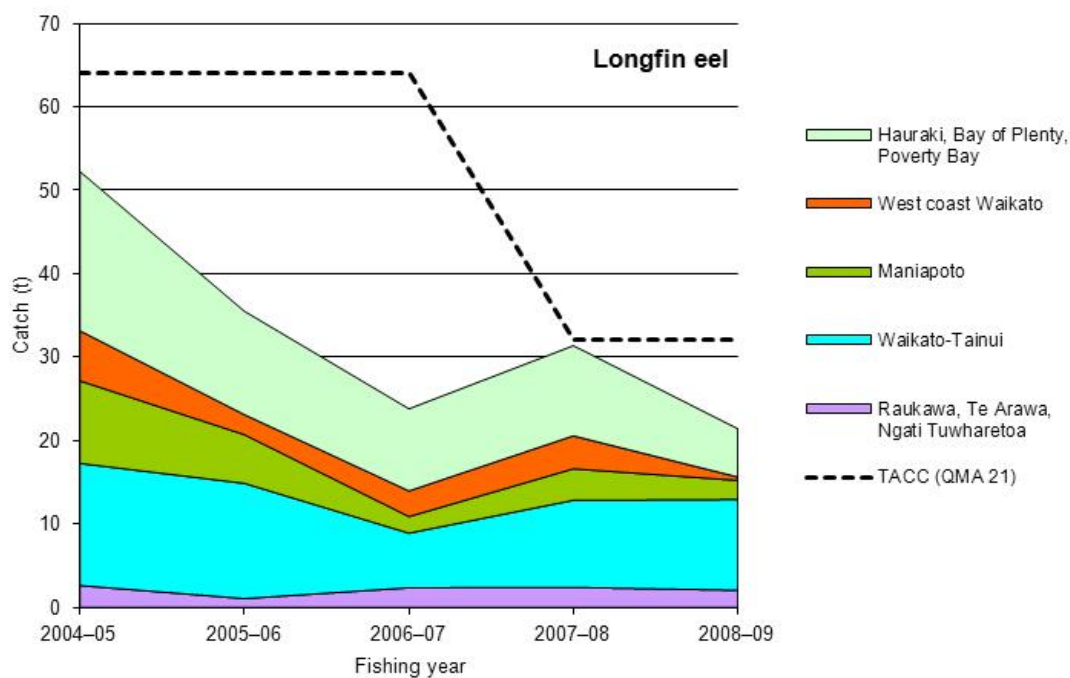


Figure 2.4: The landed commercial catch (t) of longfin (top) and shortfin (bottom) eels by each co-governance area in the Waikato catchment, and other adjacent areas within the Quota Management Area for LFE 21 and SFE 21 stocks for the fishing years 2004-05 to 2008-09.

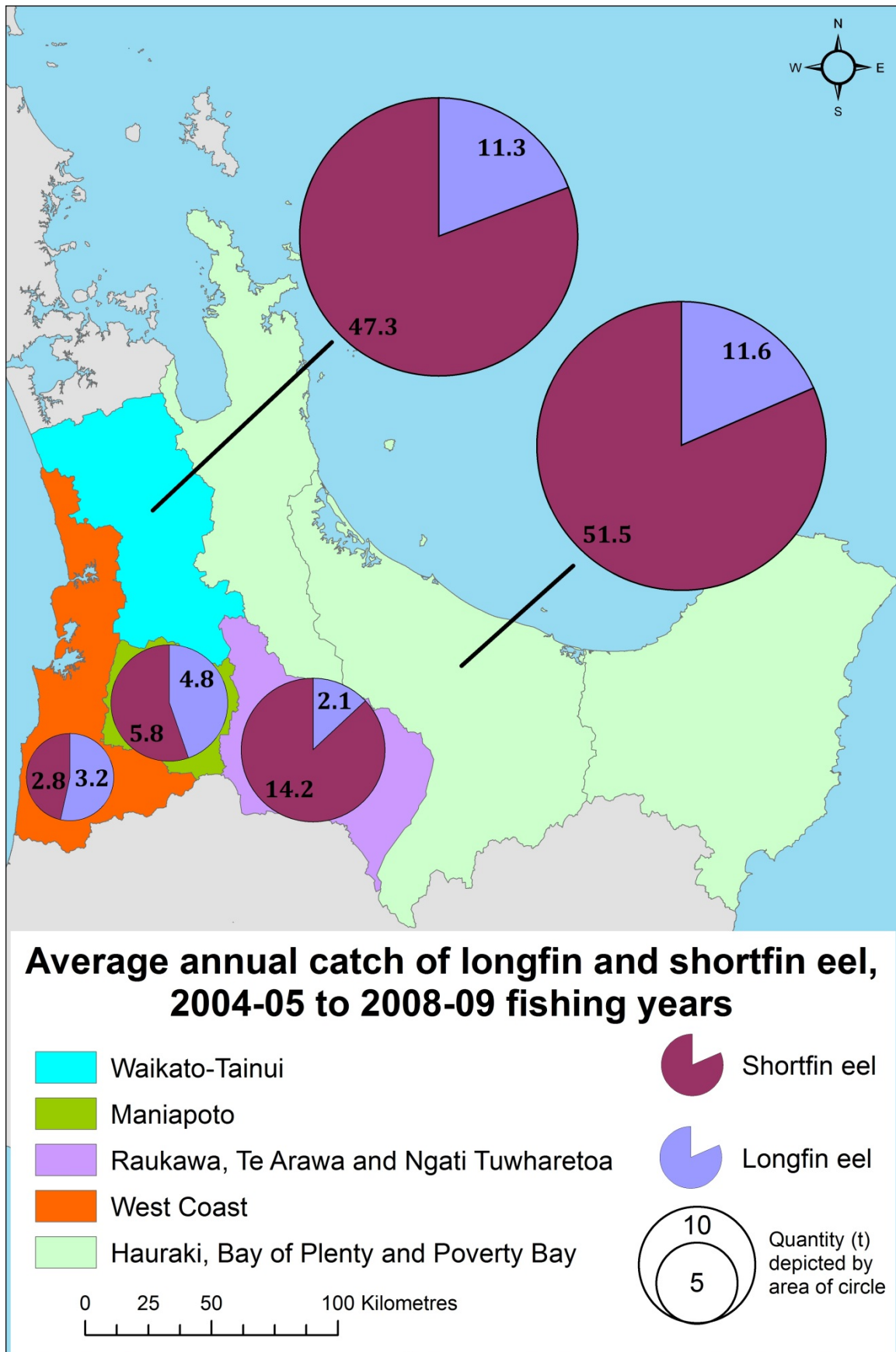


Figure 2.5: Relative average annual commercial catch (t) of longfin (blue) and shortfin (purple) eels from each Waikato catchment co-governance area and other adjacent areas within the common Quota Management Area boundary for LFE 21 and SFE 21 stocks for the fishing years 2004–05 to 2008–09.

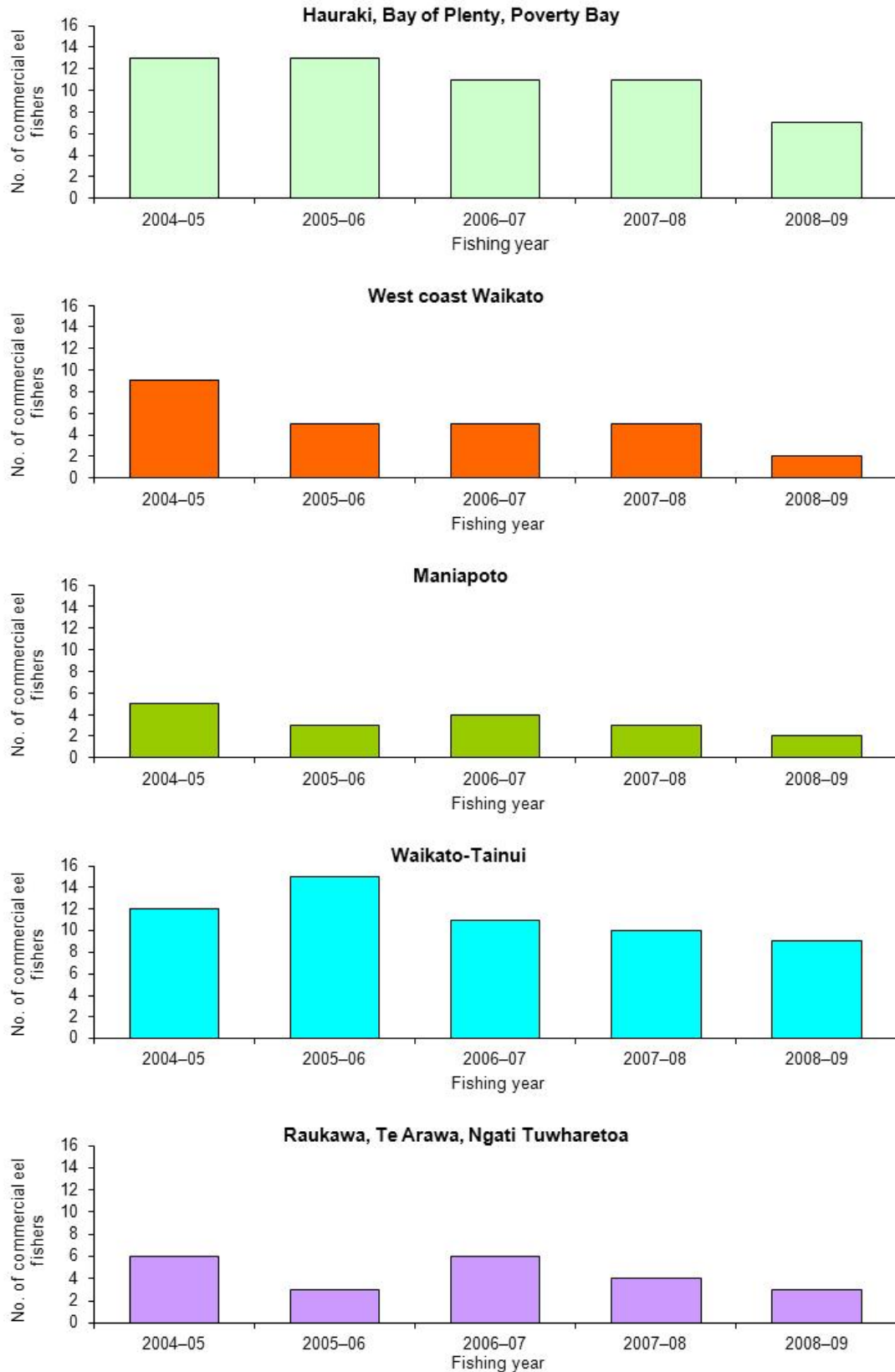


Figure 2.6: Number of commercial fishers that land eels from each Waikato catchment co-governance area and other adjacent areas within the Quota Management Area for LFE 21 and SFE 21 stocks, for the fishing years 2004-05 to 2008-09.

2.3.2 Existing information on the size of eels taken commercially

Absolute landed catch tonnages for the three weight size grades for both longfin (left hand column, Figure 2.7) and shortfin eels (right hand column) shows the large quantity of small sized shortfins in the Waikato-Tainui co-governance area, relative to the medium and large size grades from that area. Similarly, there is a large proportion of small sized shortfin taken from the Waikato-Tainui co-governance area, in comparison to the quantities taken from the two other co-governance areas. There were a slightly greater proportion of small sized longfin eels in the Waikato-Tainui co-governance area than the upstream co-governance areas.

Figure 2.8 provides the same information, but landed catch is expressed as a percentage, so the proportions of different size grades are more easily compared between the three co-governance areas. This is consistent with the presentation of size grade information provided at the ESA and sub-ESA level by Beentjes (2008a; 2008b; 2011). The proportion of landed catch of shortfin eels in the Waikato-Tainui co-governance area is consistently about 70%, whereas this reduces to about 60% of the landed catch in the two other co-governance areas. The proportional representation of the three shortfin size grades over the five year period, in each of the three co-governance areas, shows no significant change.

The longfin size grade information is more difficult to interpret. Given the reduced TACC from October 2007, commercial fishers may not always be able to obtain ACE to cover any expected catch, and commercial fishers may avoid areas where longfin catch is likely to be found in a higher proportion. In addition, the harvesting costs of fishing in some co-governance areas may be slightly higher than others. This includes, since April 2007, the time associated with removing individual eels of over 4 kilograms in weight at the point of capture.

In the Maniapoto co-governance area, the increase in large sized longfin eels is consistent with some anecdotal information from commercial fishers using this area. These fishers advise that longfin have always been a significant proportion of the catch, and that larger longfins are not uncommon in the upper Waipa catchment. In addition, the available resource is being fished by a declining number of commercial fishers resident in the area.

There are sufficient longfin catch landings made in the Waikato-Tainui co-governance area to say that the proportion of the three size grades has remained relatively consistent over the five year period. The reduced amount of small sized longfin eels in the 2006–07 fishing year, in all co-governance areas (to varying degrees), is likely to reflect a reduced market demand for this size grade (Beentjes 2011).

In the case of the Raukawa, Te Arawa, and Ngāti Tuwharetoa co-governance area, much of the fisheries resource is found behind hydro-electric dams. The historic river habitat has been significantly modified (Chapman 1996, Phillips 2008a, 2008b), and the nature and extent of aquatic life found in the lakes today would be quite different to historic times. Before the hydro development scheme, eels were not considered to have been naturally present, at least upstream of Mangakino (Bioresarches 1993). Without natural upstream or downstream passage of consequence at the Karapiro Dam since its completion in 1947, the resident population of both shortfin and longfin above that point in the river has declined over time (Allen 2010).

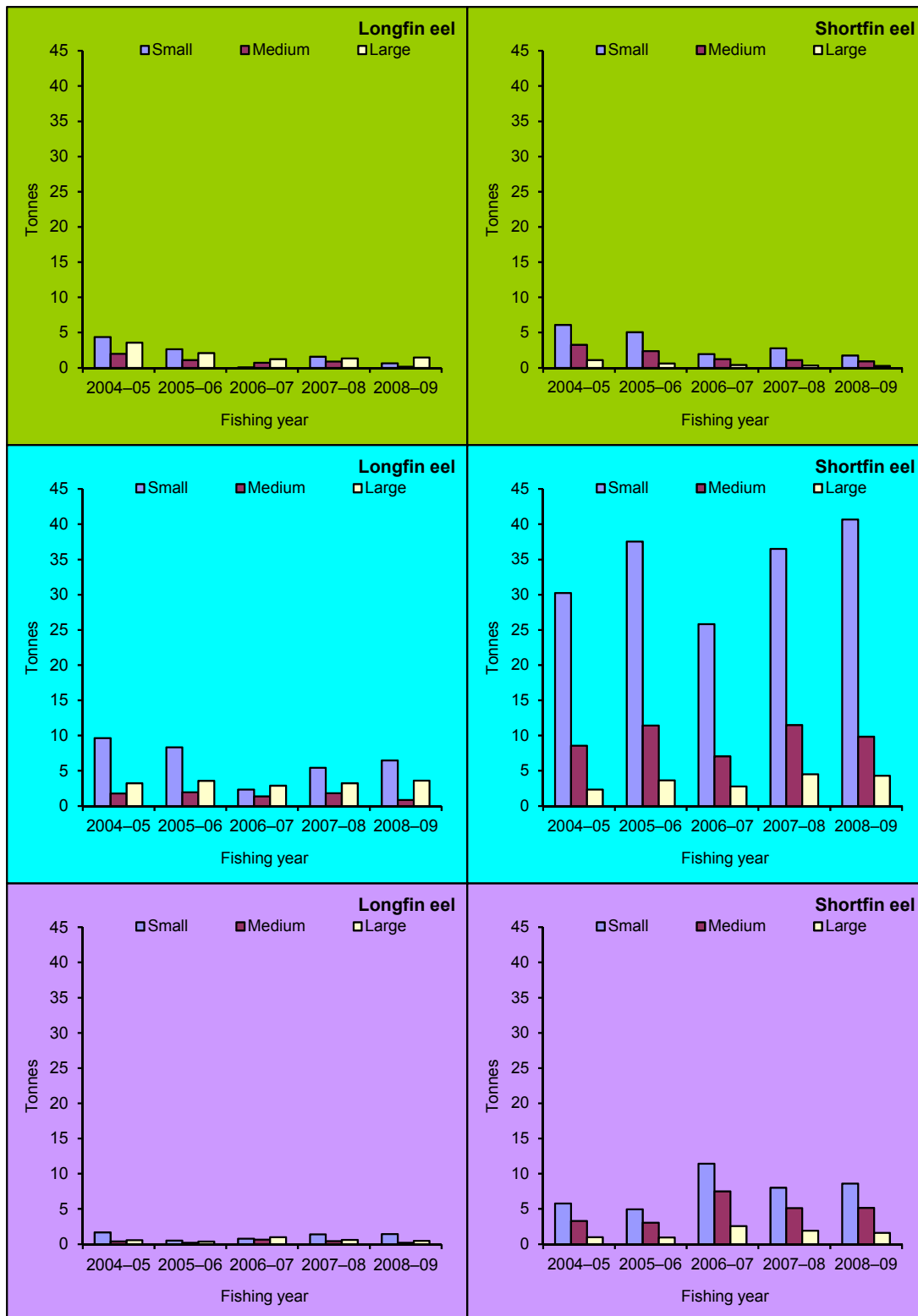


Figure 2.7: The landed commercial catch (t) of longfin (left) and shortfin (right) eels by Maniapoto (green), Waikato-Tainui (turquoise), and Raukawa, Te Arawa, and Ngāti Tuwharetoa (lavender) co-governance areas in the Waikato catchment for the fishing years 2004-05 to 2008-09. Note: longfin eel size grades - small (300-500 g), medium (500-1200 g), large (>1200 g); shortfin eel size grades - small (220-500 g), medium (500-1000 g), large (>1000 g); see text for size grade changes and processor differences.

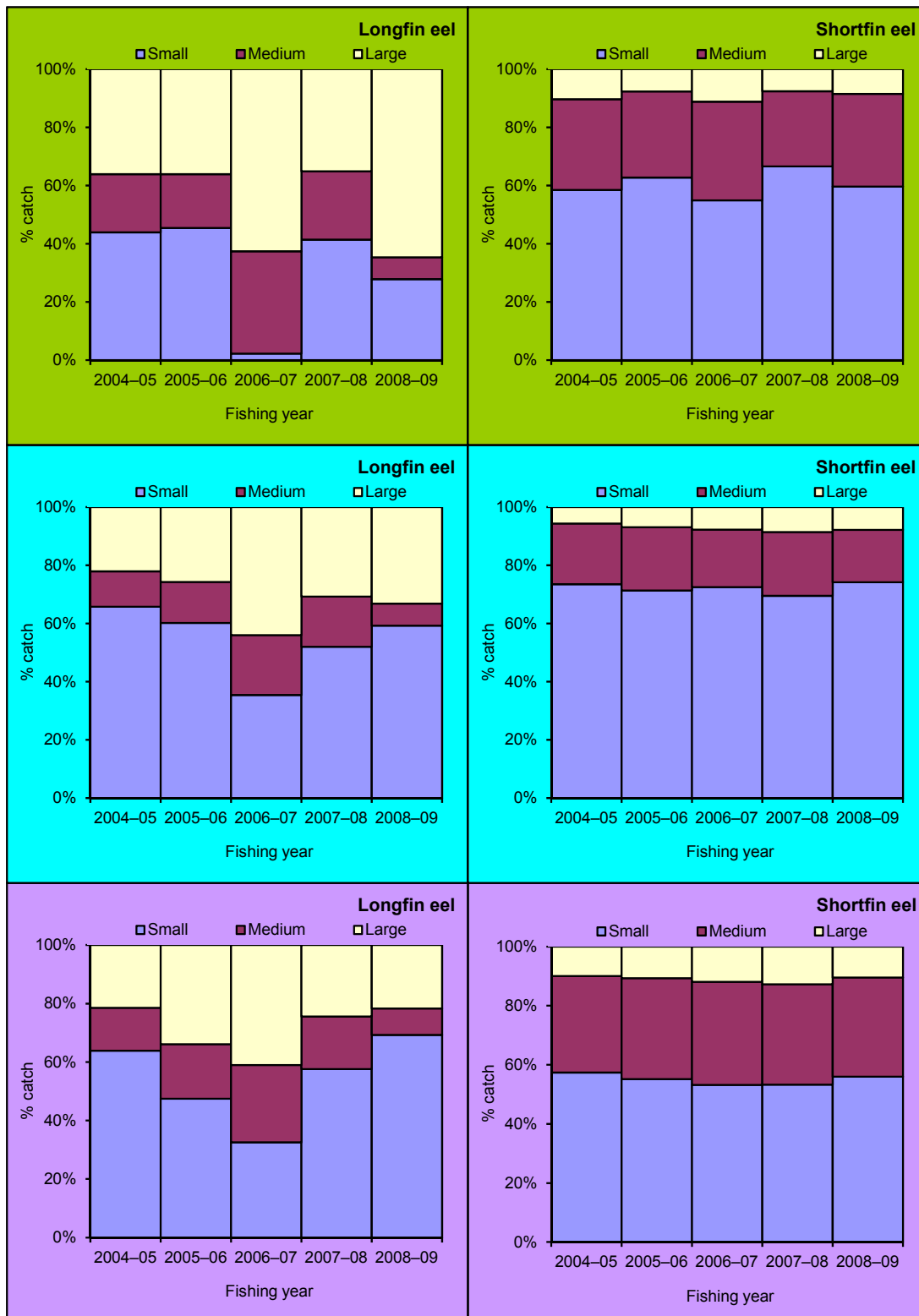


Figure 2.8: The percentage landed commercial catch of longfin (left) and shortfin (right) eels by Maniapoto (green), Waikato-Tainui (turquoise), and Raukawa, Te Arawa, and Ngāti Tuwharetoa (lavender) co-governance areas in the Waikato catchment for the fishing years 2004-05 to 2008-09. Note: longfin eel size grades - small (300-500 g), medium (500-1200 g), large (>1200 g); shortfin eel size grades - small (220-500 g), medium (500-1000 g), large (>1000 g); see text for size grade changes and processor differences.

The elver enhancement programme commenced from late 1992, and eel populations have been established in the Waikato hydro lakes through to the Huka Falls (Allen 2010). Commercial fishers have been actively involved in transfers on an annual basis, with the aim of increasing eel populations in these waters for the benefit of all users. The longfin size grade information for this co-governance area is relatively consistent over time, having taken into account the reduced demand for small sized longfins in the 2006–07 fishing year (Beentjes 2011). Despite the co-governance area being dependent on eel enhancement activities, the size grade information is not that different from non-enhanced areas in other co-governance areas.

2.3.3 Commercial use of fisheries resources other than eels

2.3.3.1 Distribution of commercial catch, and inter-relationships with other species

The commercial use of fisheries resources other than eels is most evident in the lower Waikato River, and in general, there is negligible reported commercial use of such resources upstream beyond the Waikato-Tainui co-governance area. Of the 1003.5 tonnes of non-eel catch, which was either landed or discarded from all co-governance areas over the five year period, only 228 kilograms was reported as being caught in the Raukawa, Te Arawa and Ngāti Tuwharetoa co-governance area (10 kg landed, 217 kg discarded), and 171 kilograms of non-eel catch was reported as being taken and discarded in the Maniapoto co-governance area. Figures were therefore not produced for each co-governance area.

Figure 2.9 presents (other than a few eel by-catch records) the reported commercial catch from the Waikato-Tainui co-governance area, as a function of the species being targeted.

The most significant fishery in the Waikato catchment (easily more than eels), and specifically in the Waikato-Tainui co-governance area, by tonnage, is the grey mullet fishery, followed by brown bullhead catfish, koi, kahawai and yellow-eyed mullet. Most of the species landed are target specific fisheries, although catfish and koi are associated mainly with eel fisheries. Small quantities of grey mullet, kahawai and yellow-eyed mullet are taken together, when one of these species is targeted.

The distribution of reported commercial catch largely reflects the natural distribution of species that have been traditionally used as a food source. In the past, grey mullet was commercially fished up river to at least Hamilton. However, with an increasing preference for salt water fished grey mullet, and the retirement of commercial fishers who typically fished further up river, most of the grey mullet taken for fish market supply comes from the delta area.

The commercial use of some fisheries resources is not purely as a food product for humans, with the use of brown bullhead catfish and koi being taken and landed for other purposes since the late 1980s (e.g., fish bait, removal as undesirable species). Further, the commercial use of some fisheries resources were affected by the implementation of a statutory moratorium on permitting access to non-QMS species between the late 1980s through to 2001. This moratorium prevented ‘new entrants’ from targeting such species under the authority of a fishing permit. The commercial fishers who took these other fisheries resources did so as a bycatch to their existing operations, principally eels, with several initiatives undertaken in or around existing fisheries and areas fished (eg, Lake Waikare). Since the lifting of the permitting moratorium for all but a few species, the lack of commercial use of other fisheries resources simply reflects a lack of development interest.

The access requirements for koi were not affected by the moratorium on the issue of fishing permits under fisheries legislation, as authorisation to target this species was able to be provided through special permits (s 97, Fisheries Act 1996), and additional authorisations under legislation administered by other government departments. However, the reporting of catch (if any) under these authorisations is not reported here. Commercial fishers holding such authorisations were exempted from reporting under the standard fisheries framework. The koi records in the following figures are simply that catch taken as a by-catch of other targeted fishing for other species, principally shortfin and longfin eels, where such catch is captured by the standard reporting framework.

2.3.3.2 Trends in species catch over time, and whether landed, or discarded

Over the five fishing years of interest, the grey mullet fishery remains the most significant commercial fishery in the Waikato catchment (Figure 2.10, and Figure 2.12), principally taken from the delta area of the lower reaches of the Waikato River. Around 150 tonnes of grey mullet is caught and landed each fishing year. Similarly, reported catches of kahawai, yellow-eyed mullet, flatfish, and parore are all landed, but in significantly less quantities. Commercial fishers advise that much of the landed catch for all species makes it way to the Auckland fish market.

There are small reported catches of goldfish, and most of these are landed, rather than being reported as discarded. A reasonably consistent catch of brown bullhead catfish is landed, perhaps reflecting the available market (sold in a dead state), whereas a more variable amount is reported as discarded by a larger number of commercial fishers. About the same amount of koi is reported landed as is discarded. Of the 64 tonnes of various species reported on ECLR as being discarded over the five year period (Table 2.3), about 74 % of the catch weight was comprised of brown bullhead catfish and 25 % was koi. By comparison, for CELR forms, only 17 kilograms of fish was reportedly discarded from the grey mullet target fishery over the five year period.

Table 2.3: Summary of discarded commercial catch (destination code D), as reported on Eel Catch Landing Returns (ECLRs), and associated with each co-governance area over the 2004–2005 to 2008–09 fishing years. A ‘—’ signifies that no returns were furnished by commercial fishers during the time period.

Co-governance area	Brown Trout (BTR)	Brown Bullhead catfish (CAT)	Goldfish (CAU)	Perch (FLU)	Galaxiids, adult (GLX)	Koi (KOI)	Kōura (KOU)	Rudd (RDD)	Rainbow trout (RTR)
Maniapoto	0.045	0.001	0.004	—	0.004	—	0.066	0.005	0.046
Waikato-Tainui	—	47.905	0.090	0.040	—	15.596	—	0.260	—
Raukawa, Te Arawa, Ngāti Tuwharetoa	—	0.197	0.015	—	—	—	0.001	—	0.005

It is evident that not all non-QMS by-catch species caught are being reported. For example, commercial eel fishers catch other non-QMS species in their fyke nets which are generally discarded as either they are of no commercial value, or they are not allowed to retain the species in question.

2.3.3.3 Number of commercial fishers landing non-eel species

The number of commercial fishers that land species other than eels has generally declined over the 2004–2005 to 2008–09 fishing years (Figure 2.11).

The overall decline in the numbers of commercial fishers landing non-eel catch could have been affected by the reduction in the TACCs for shortfin and longfin eel stocks in October 2007, if those resources were part of a commercial fishers overall fishing operation fishing a range of species. However, a further and immediate reduction in the number of commercial fishers landing non-eel catch in the 2007–08 fishing year is not obvious. The very few commercial fishers involved in both eel and grey mullet fisheries may have simply adjusted their fishing activity to suit the adjusted harvesting rights held for the various stocks from that fishing year.

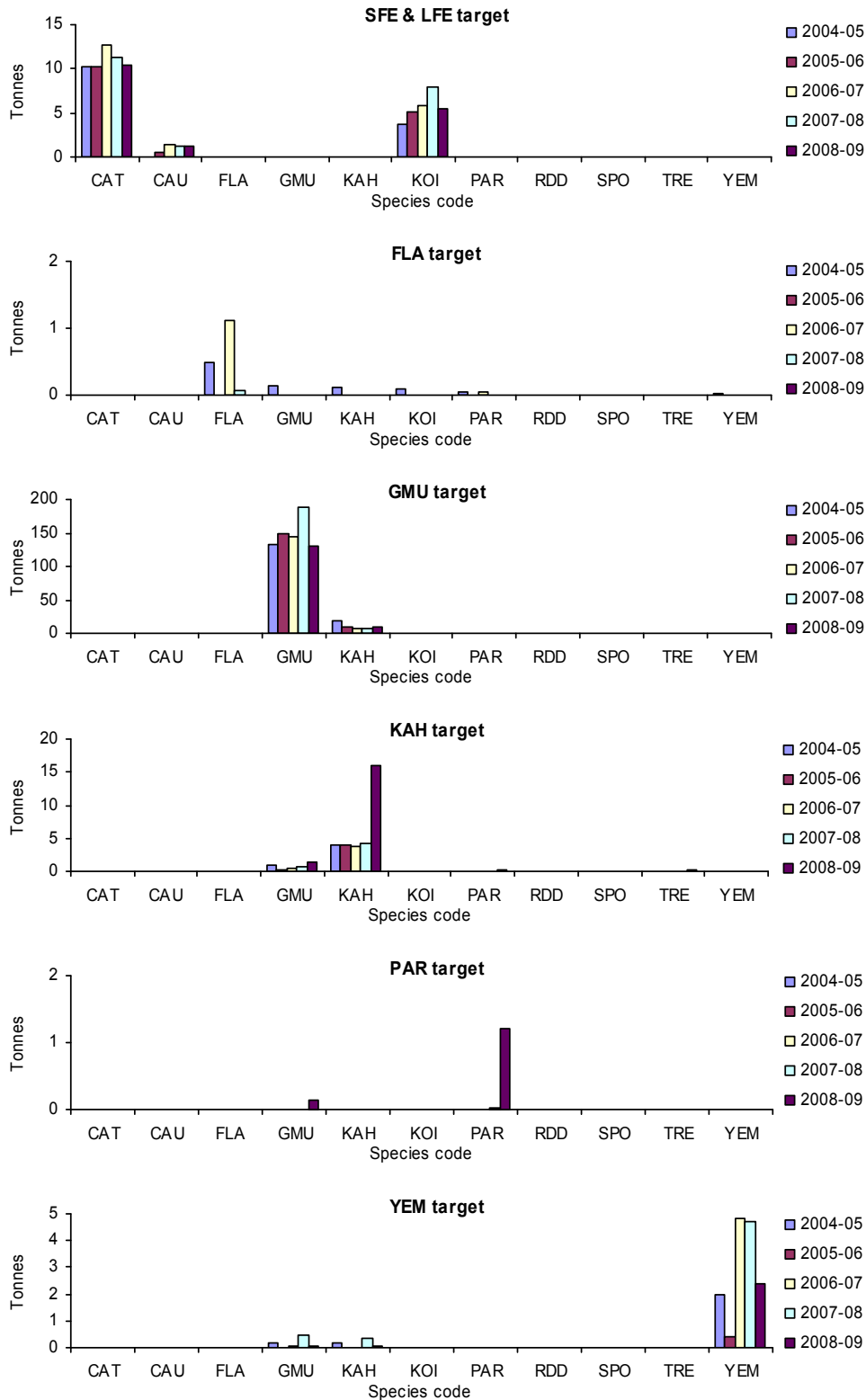


Figure 2.9: Landed commercial catch (t) by target species in the Waikato catchment co-governance areas across the 2004–05 and 2008–09 fishing years. SFE & LFE = shortfin and longfin eels; FLA = flatfish; GMU = grey mullet; KAH = Kahawai; PAR = parore; YEM = yellow-eyed mullet. Other species codes in Table 2.2.

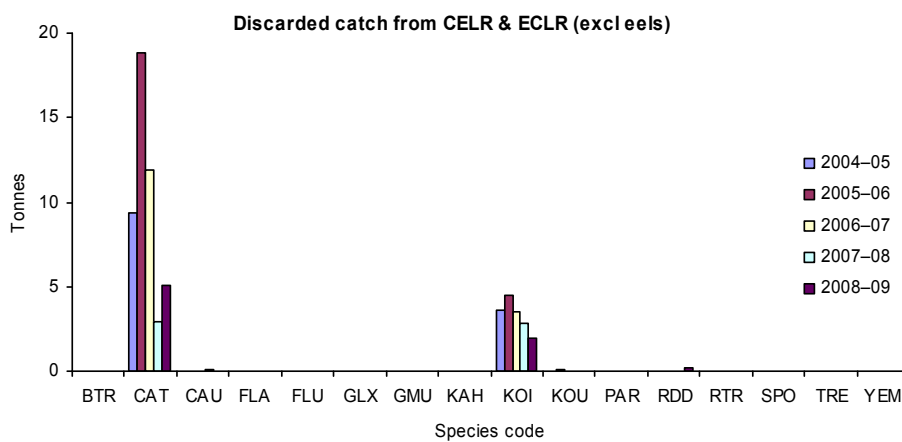
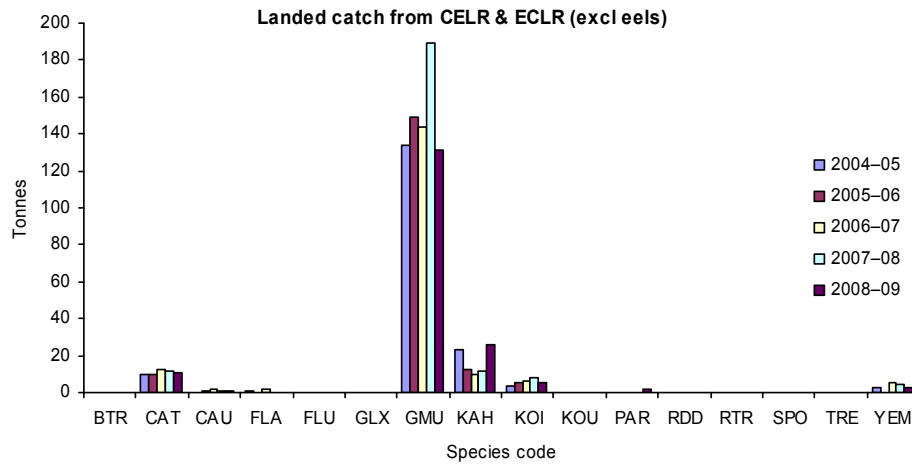


Figure 2.10: The landed (top) or discarded (bottom) commercial catch (t) of species (other than eels) in the Waikato catchment co-governance areas across the 2004-05 to 2008-09 fishing years. Species codes are listed in Table 2.2. CELR = Catch, Effort and Landing Return; ECLR = Eel Catch Landing Return.

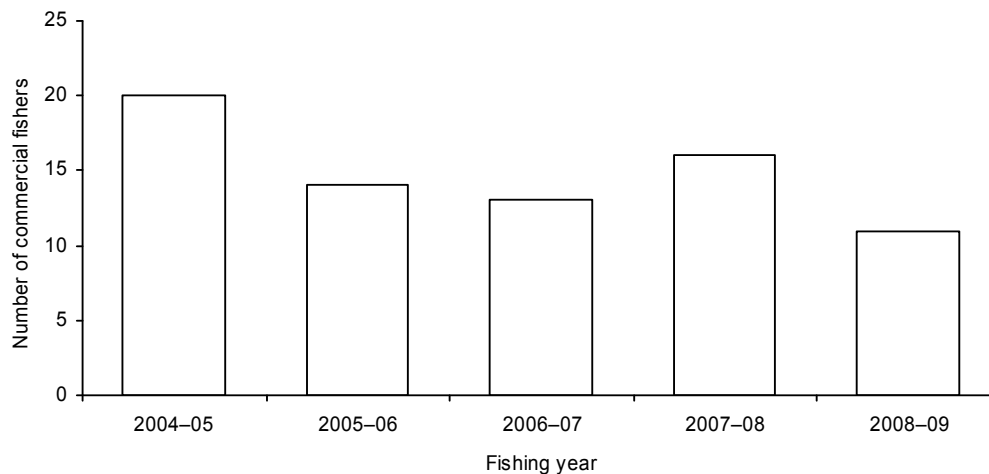


Figure 2.11: Number of commercial fishers that land species other than eels from all Waikato catchment co-governance areas for the 2004-05 to 2008-09 fishing years.

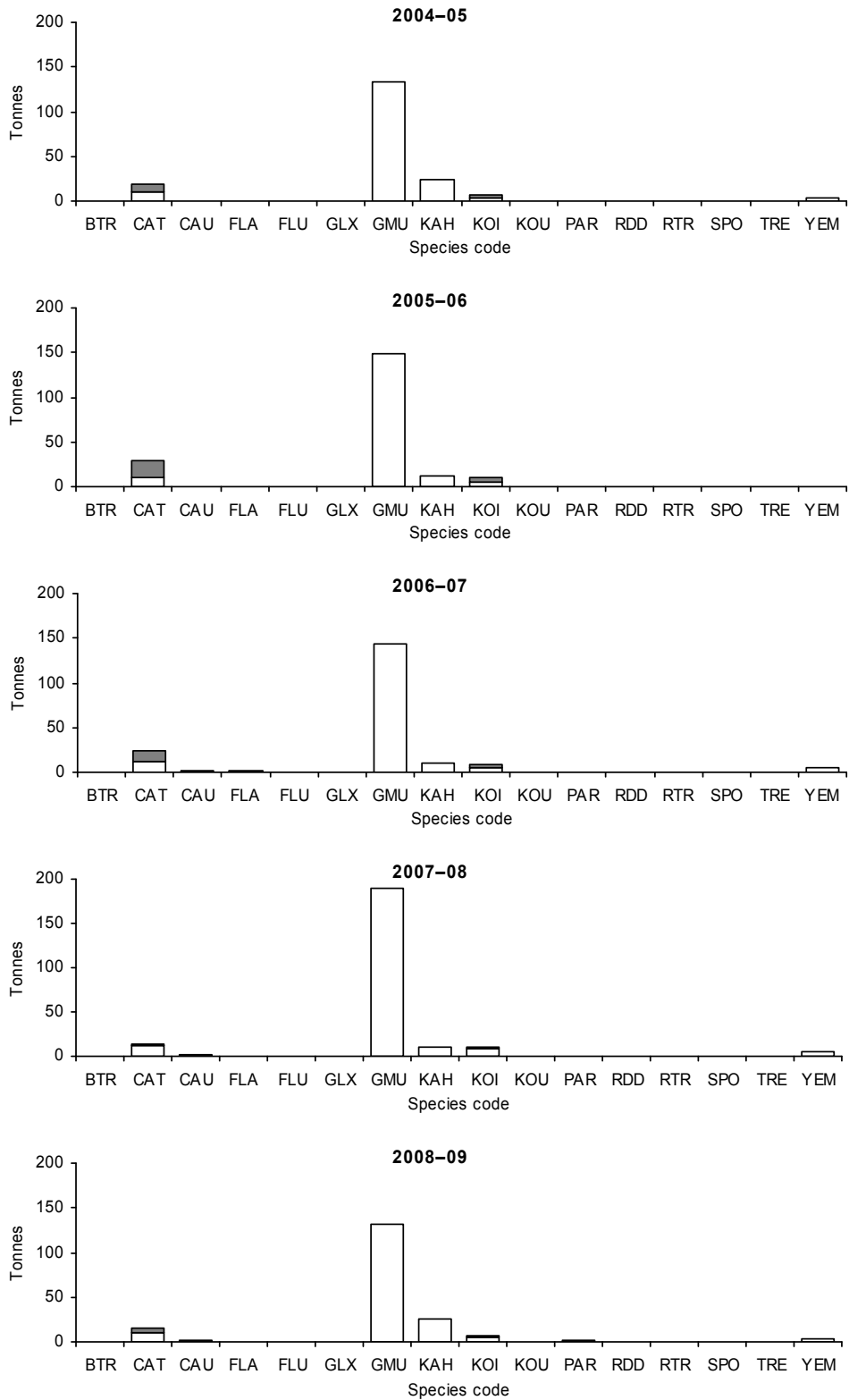


Figure 2.12: The combined landed (white) and discarded (shaded) commercial catch (t) (other than eels) from all Waikato catchment co-governance areas combined for the 2004-05 to 2008-09 fishing years. Species codes are listed in Table 2.2.

2.3.4 Commercial use and access to the Waikato-Tainui Whenua Raahui Reserve

2.3.4.1 Discussions with commercial fishers

Discussions were held with known commercial fishers having identified them through furnished statutory returns, referral from existing commercial fishers, or knowledge of these individuals held by the researcher.

Twelve commercial fishers were identified as having previously fished in the reserve sites. Further, there may be additional fishers that may be eligible for on-going qualified access by virtue of being a quota shareholder or ACE holder as at 24 September 2010, or eligible under any other relevant provisions of settlement legislation. One commercial fisher did not wish to discuss his past fishing activities with the researcher, but that individual would appear to qualify for access to the reserve as a result of being an ACE holder on 24 September 2010.

The initial scoping of quota shareholders and ACE holders as at the settlement date are canvassed for the most likely quota stocks in the vicinity of the reserve area in the next section. Accessing the extent of commercial interests under other statutory tests provided by s 73 of the settlement legislation is beyond the scope of this project.

2.3.4.2 Analysis of quota shareholder and ACE holder extracts

The number of quota shareholders and ACE holders for the five most likely quota stocks to be found in the vicinity of the Waikato-Tainui Whenua Raahui Reserve is presented in Figure 2.13.

Given that the QMA for flatfish and grey mullet stocks encompasses the entire upper North Island, and these fisheries are used by a number of small vessel operators, there are a reasonable number of commercial fishers who are likely to be eligible for access into the reserve. However, it is a reasonable assumption that commercial fishers from outside of the Waikato catchment and adjacent areas would not have an interest in fishing the reserve areas.

After pooling all quota shareholders from five separate fishstock extracts together, a list of 165 unique shareholders is created. Of these, it is estimated that about 28 of these quota shareholders would have an interest in fishing in the Waikato catchment, for the purpose for which they hold quota shares. This more focused list of shareholders was simply identified based on the researcher's knowledge of their past fishing interests, and/or their proximity to the catchment from their place of residence.

Using the same approach for ACE holders, a list of 294 unique ACE holders is created. Of these, it is estimated that about 45 of these ACE holders would have an interest in fishing in the Waikato catchment for the purpose for which they hold ACE.

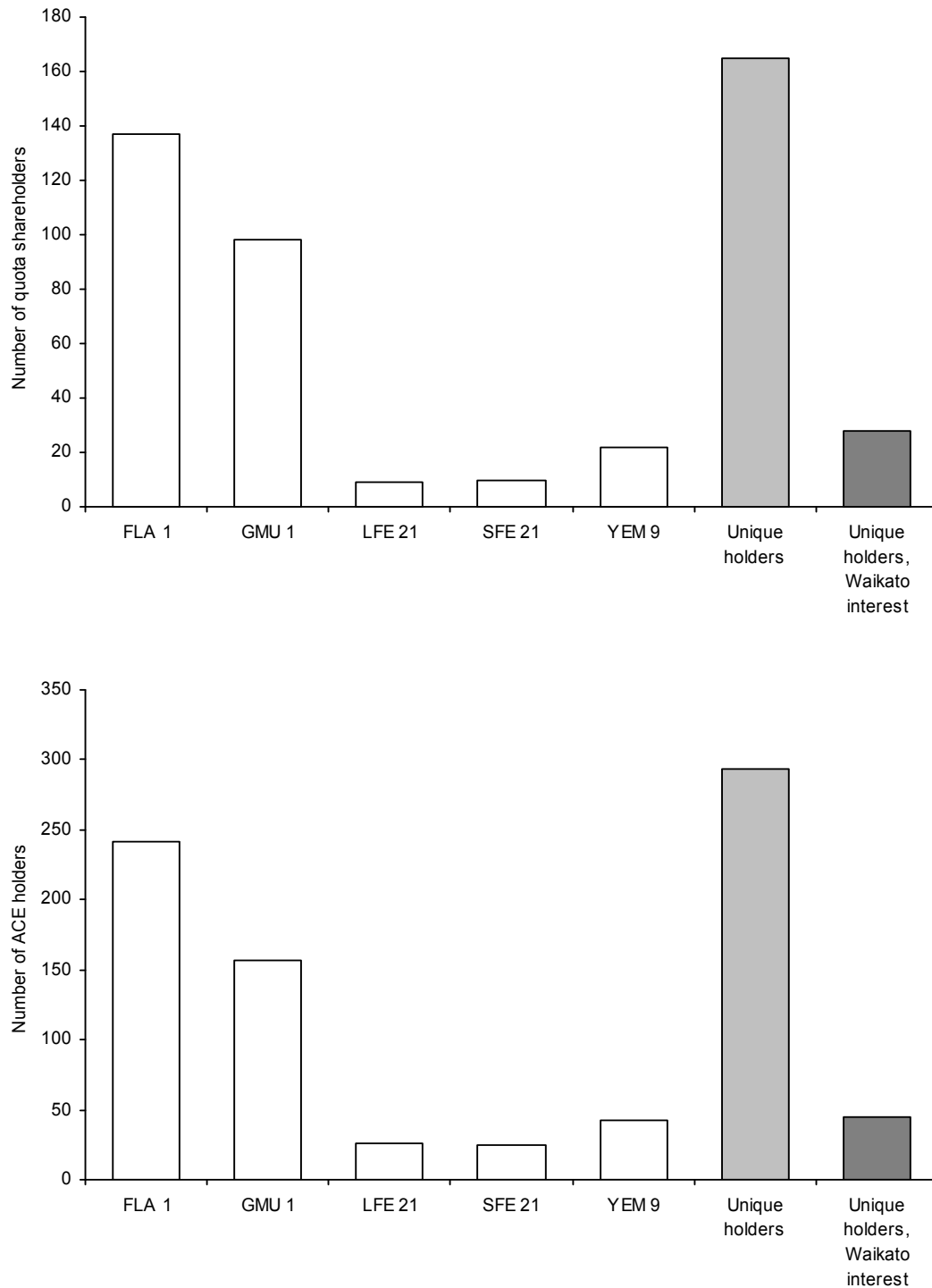


Figure 2.13: Number of quota shareholders (top) and Annual Catch Entitlement (ACE) holders (bottom) for five quota stocks which both encompass the Waikato-Tainui Whenua Raahui Reserve, and are likely to be present within one or more of the reserve sites. FLA = flatfish; GMU = grey mullet; LFE = longfin eel; SFE = shortfin eel; YEM = yellow-eyed mullet. The number of ‘unique holders’ (light grey) of either quota shares (top) or ACE (bottom) is drawn from those entities that respectively hold quota shares or ACE in one or more of the five quota stocks depicted. The number of ‘unique holders, Waikato interest’ (dark grey) represent those quota shareholders or ACE holders who are likely to have some association with fishing activity in the Waikato catchment, based on their postal address, and knowledge of their fishing activities.

2.4 Commercial fishing discussion

2.4.1 Overall findings

2.4.1.1 Eel fishery

The longfin and shortfin eel fishery of the North Island underwent a significant change in its management during the 2004–05 to 2008–09 fishing years. From October 2004, catch limits were applied. Catch limits for both longfin and shortfin stocks were reduced from October 2007. This provided greater assurance that the sustainability and utilisation outcomes sought in 2004, at the time of QMS introduction, would be significantly progressed by 2014. A number of existing commercial participants retired or wound up their eel processing businesses through this five year period. Consistent with this broader trend, there is a gradual decline in the number of commercial fishers taking eels in each co-governance area, and other parts of the LFE 21 and SFE 21 stocks over the five year period.

Despite reduced processing capacity in recent years, and other non-fishing impacts on the river (Chapman 1996, Beentjes *et al.* 2005), about half of the commercial catch able to be taken within the QMA 21 area (Figure 2.1), was fished from the Waikato catchment during the five year period of interest.

Within the Waikato catchment, commercial eel fishing is predominantly undertaken in the Waikato-Tainui co-governance area. Fishing activities in the Raukawa, Te Arawa and Ngāti Tuwharetoa co-governance area are dependent on on-going enhancement of the resource above the Karapiro Dam. The reduced activity in the Maniapoto co-governance area is likely to reflect a limited number of resident commercial fishers in this area. In more recent years, there is a greater proportion of longfin eel taken in the Maniapoto and west coast Waikato areas, whereas the lower Waikato River is dominated by shortfin eel catch.

2.4.1.2 Non-eel fisheries

In terms of tonnage, the most significant commercial fishery in the Waikato catchment is the grey mullet fishery (even more so than eels), at about 150 tonnes per fishing year. This occurs in the delta area of the lower Waikato, with occasional activity up the river towards Tuakau and beyond. Grey mullet is not readily taken from the freshwater environment in recent times given the non-acceptance of such fish at market, although it is sold as bait.

The grey mullet resource has been fished at high levels throughout the GMU 1 stock over recent decades, peaking in the early 1980s at an average annual catch of 1162 tonnes (Anonymous 1989). The grey mullet resource, particularly in the main fishing areas of the lower Waikato, Manukau and Kaipara Harbours, were considered overfished at these prior commercial catch levels (Anonymous 1989). A formal review of catch limits applying to the GMU 1 stock was last undertaken in 2005, given concerns held by both fishery interests and the Ministry of Fisheries. These concerns centred on the question of whether sustainability and utilisation objectives were being adequately met under the current commercial catch limit of 925 tonnes (Ministry of Fisheries 2005). The Minister of Fisheries at the time elected to retain the existing catch limits for the GMU 1 stock.

Other fisheries resources taken in smaller quantities in the Waikato delta area include the kahawai and yellow-eyed mullet fisheries, and the occasional catch of flatfish.

Within the middle section of the Waikato-Tainui co-governance area, the main fishery resource taken in some quantities (other than eels) is brown bullhead catfish and koi. These resources are taken either as a by-catch of eel fishing, or are targeted collectively by some commercial eel fishers. Their distribution extends over a broader area, but commercial fishers may not always record their capture, particularly in the delta, where the focus is on other species.

Other than eels, no commercial fishery of any consequence takes place within the Raukawa, Te Arawa, and Ngāti Tuwharetoa co-governance area, or the Maniapoto co-governance area. Fisheries resources taken in these areas are the by-catch of the eel fishery, which are mostly discarded, although not typically reported in these areas.

There is a slight declining trend in the numbers of commercial fishers in the catchment over the 2004–05 to 2008–09 fishing years, and this probably reflects the retirement of some commercial fishers, possibly by those also involved in the eel fishery, and few new entrants in either eel or non-eel fisheries. Despite this, the catch of the main target species have been maintained over the five year period.

2.4.1.3 Use of the Waikato-Tainui Whenua Raahui Reserve

There are at least twelve current commercial fishers who have utilised one or more sites of the Waikato-Tainui Whenua Raahui Reserve prior to 24 September 2010. This initial listing is not necessarily definitive or conclusive, despite reasonable attempts to contact interested parties.

Some of the fishing activities at or near these sites are seasonal, whereas others fish regularly throughout the year. Some commercial fishers who set net for grey mullet advised that they did not get close to the islands or river banks of the main river, while others did with shorter nets. Some commercial fishers indicated they did not fish grey mullet in these areas anymore given a lack of market acceptance of freshwater caught fish, while others still did. Others advised that in flood conditions (e.g., eel fishing), it was possible that their fishing activities extended up the sides of river banks and islands, which may have included the reserve sites. Lake Waikare remains an important area for commercial eel fishing, and is also utilised to take brown bullhead catfish and koi.

A greater number of commercial interests are likely to have access to the reserve sites than those contacted based on fishing activity undertaken before 24 September 2010. This is demonstrated in this report through the tabulation of shareholders and ACE holders for the five quota stocks more likely than others to be present in the reserve sites (i.e., flatfish, grey mullet, longfin eel, shortfin eel, and yellow-eyed mullet). However, it is very likely that only a small proportion of the 165 quota shareholders and the 294 ACE holders have any interest in actively fishing in the discrete reserve sites within the Waikato catchment. Many of these commercial interests are based elsewhere, mostly across the upper North Island. Similarly, one would be more likely to catch some quota species in economic numbers in a different environment. For example, flatfish and yellow-eyed mullet interests are more likely to catch their species of commercial interest in an estuary or harbour environment.

3 CUSTOMARY FISHING

3.1 Customary fishing introduction

The research aims to characterise the customary fishery in the Waikato and Waipa catchments including species taken, indicative quantities taken, location of fishing, fishing methods. MPI commissioned a survey and a series of hui with the five river iwi (Waikato-Tainui; Raukawa; Maniapoto; Te Arawa; Ngāti Tuwharetoa) in the co-governance areas to collect data to provide an indicative snapshot of the customary fishery from 2007 to the present day.

3.2 Methods used to gauge customary fishing

Three methods were used to gather information to characterise the customary fishery; however, customary fishers may also fish under the amateur regulations (see Section 3.3.1). The primary method involved engagement with iwi through hui using a consent and information form (Appendix 3.1) and a standard questionnaire (Appendix 3.2) to conduct semi-structured focus groups based on the questionnaire, and supplemented by electronic and hard copy survey questionnaires that respondents completed. These are explained further below.

3.2.1 Iwi engagement

Prior to carrying out the research, we engaged iwi representatives for the river authorities of each of the five river iwi (Table 3.1). This was an important part of engagement with iwi to establish formal lines of communication and avoid overlapping requests for information. Initial engagement with iwi representatives began in October 2011. Deliberate care was taken to ensure that the appropriate authorities were engaged and informed about the research scope and process. Iwi representatives utilised their networks to contact and recruit customary fishers who would be able to participate in the research.

Six customary fishing hui were conducted within the Waikato and Waipa River catchment between February and April 2012 (Table 3.2). We also identified a critical component of interaction with river iwi was to report the results of the survey back to the respondents, both by face-to-face follow-up meetings and by access to the final report. We did this because iwi identified re-engagement after the original data gathering as a critical element to the success of the survey

Table 3.1: Iwi engagement in customary fishing in the Waikato River catchment.

Iwi	Authorities engaged
Te Arawa	Te Arawa Lakes Trust, Te Arawa River Iwi Trust
Ngāti Tuwharetoa	Tuwharetoa Māori Trust Board
Raukawa	Raukawa Settlement Trust
Maniapoto	Maniapoto Māori Trust Board
Waikato-Tainui	Waahi Whaanui Trust, Huakina Development Trust, Ngāti Koroki-Kahura

Table 3.2: Hui conducted between February and April 2012 to establish the nature and extent of customary fishing in the Waikato River catchment, and to report survey results back to iwi.

Iwi	Date	Location	Report back
Waikato-Tainui	7-Feb	Waahi Whaanui Trust	17-Jul
Raukawa	22-Feb	Pikitu Marae	26-Jul
Maniapoto	22-Feb	Te Keeti Marae	20-Jul
Te Arawa	23-Feb	Te Arawa Fisheries	5-Jul
Waikato-Tainui	21-Mar	Huakina	28 Jul
Waikato-Tainui	4-Apr	Karapiro	28 Jul

Ngāti Tuwharetoa Trust Board advised that there were no known customary fishers in their rohe in the Upper Waikato River catchment and therefore there was no need to convene a research hui for their iwi members. Despite nominating to not hold a hui, the Ngāti Tuwharetoa representative has been contacted to discuss the results of the customary fishing research as a matter of courtesy.

The general reception within Te Arawa was positive but no survey data were provided. One customary fisher attended the Te Arawa hui but did not fit the research criteria of having fished in the last five years. However, he was able to provide important contextual information about the fishery in the Te Arawa rohe. The Te Arawa representative indicated that hapū members were available and willing to participate in the hui and to complete the survey, but despite conducting hui, passing out hard copy questionnaires and directing prospective respondents to online questionnaires, no responses were provided besides the one fisher mentioned above. Therefore there is no quantitative data is available for the Te Arawa rohe.

Graphs in this report do not show Te Arawa or Ngāti Tuwharetoa because no data is available for either of these iwi as outlined above.

3.2.2 Data collection

The research employed three methods of collecting standard data on customary fishing experiences since 2007 (for the past five years). The primary method was hui across the five river iwi (Figure 3.1). During hui we provided information sheets, consent forms, and a standard questionnaire. Once the questionnaires were complete we conducted semi-structured focus groups that followed the general format of the questionnaires and sought complementary qualitative information from attendees.

We provided hard copies of questionnaires to attendees at the hui to pass on to others who could not attend, and we requested that iwi officials circulate hard copies of the questionnaires to known customary fishers in their rohe. To supplement this approach an online questionnaire tool was developed on Survey Monkey (2012).

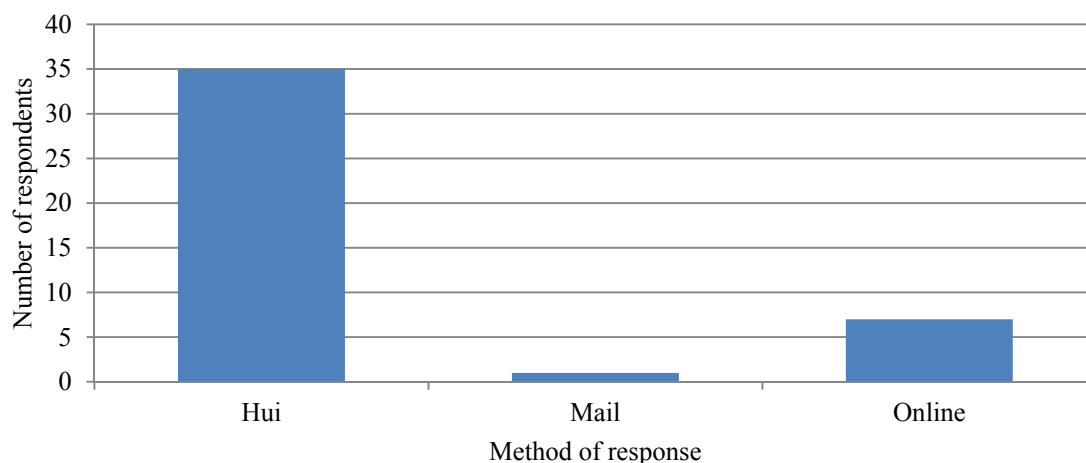


Figure 3.1: Method of response to questions on customary fishing activity in the Waikato River catchment.

3.2.3 Customary fishing survey responses

Responses to questions on customary fishing were both quantitative and qualitative because of the nature of discussions with iwi in structured interviews and completion of survey questionnaires by individual respondents. In addition, some respondents reported multiple iwi associations, which necessitated a flexible approach in reporting data. To accommodate this, the data are presented qualitatively based on individual iwi and semi-quantitatively based on responses to questionnaires.

3.2.3.1 Iwi and co-management areas

Six “iwi” classifications were identified for the purposes of this report:

- Te Arawa;
- Ngāti Tuwharetoa;
- Raukawa;
- Maniapoto;
- Waikato-Tainui; and
- iwi not identified.

The whakapapa origins of Koroki-Kahukura and their rangatiratanga are acknowledged. For the purposes of this report, we have grouped Koroki-Kahukura according to the co-management framework, and as such, information relating to customary fishing relevant to their area has been included within the Waikato-Tainui co-governance area.

Four responses did not identify an iwi. We have not provided data according to the co-governance areas as Raukawa data could not be divided between co-governance areas B and C.

3.2.3.2 Single and total responses

Some respondents indicated that they were affiliated to more than one iwi. To ensure that the data was comparable across the report, ‘single responses’ have been used based on (1) the first iwi indicated in the questionnaire and (2) the hui which the respondent attended, if relevant. Total response was defined as the combination of all iwi responses together, and thus includes a very small amount of double counting where a fisher fished in more than one rohe. The differences were small whether we used total response or single response method, but we preferred the single response method because affiliation may not have a bearing on where people fished. For example, fishers were identified who

were part of one iwi but who identified fishing locations in other subtribal areas. The incidence of this issue was no more than three respondents.

For the purposes of this report ‘total responses’ are not counted for data stratified by iwi. Statistics New Zealand regularly reports ethnicity and iwi affiliation counts by total response as this acknowledges that one person can affiliate with more than one ethnicity or iwi. While this is philosophically a preferred approach, some sets of data within this research are unable to be calculated using a total response method. However, the difference between single and total response was minimal (the difference being between one and three responses across all responses). Using a single response approach in this report does not impact on the findings of the research, but we acknowledge that there were multiple iwi affiliations in some cases.

This report focuses on the quantitative data from the questionnaires, with the aim of providing comparable information across the commercial, customary, and recreational fisheries. Qualitative data from the hui provide an important context to the discussion about the well-being of the fishery and about the cultural wellbeing of the river iwi.

3.2.3.3 Traditional ecological knowledge

This research has been mindful of the mātauranga Māori that is vested within the river iwi and hapū who have participated in this research. The majority of traditional ecological knowledge that was provided in hui was at a high level and assists the contextualisation of the survey data provided in this report. To that extent we have endeavoured to provide sufficient context in light of the hui feedback and the brief to provide information on customary fisheries use and values in the Waikato catchment.

3.3 Customary fishing results

The research results are discussed below according to the *purpose* for customary fishing, *species* and *methods* employed for customary fishing. Customary fishing locations were widely scattered throughout co-governance areas A and C, but were concentrated in the lower part of co-governance area B (Figure 3.2).

3.3.1 Purpose of fishing

Survey data showed that twelve people (27%) of all respondents (n=45) conducted both customary and recreational fishing, but customary fishing was usually the sole purpose of their fishing trip (Figure 3.3). Of those who conducted both customary and recreational fishing in the same trip, nearly two thirds of respondents indicated that they fished for both customary and recreational purposes at the same time in less than half of their fishing trips. Some people had responded to a second question about frequency of dual customary and recreational fishing, but did not indicate that they were recreational fishers. We did not impute a positive response to the recreational question and therefore only counted responses that answered both questions.

From the data provided, respondents in the Raukawa (60%) and Maniapoto (30%) catchment areas are more likely to fish for both customary and recreational purposes.

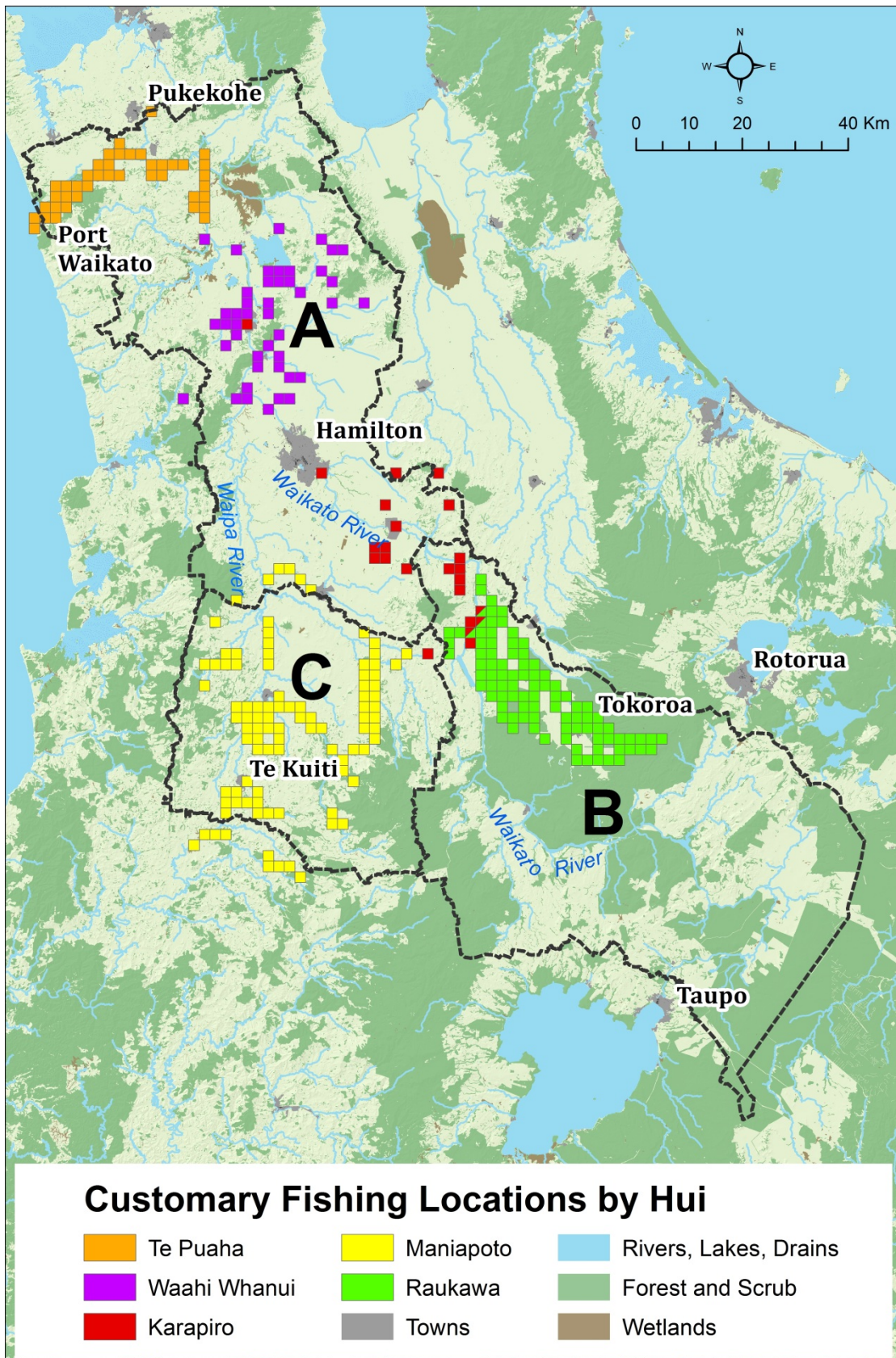


Figure 3.2: Customary fishing locations in the Waikato catchment identified by participants at the five hui (see Table 3.1). Note that Te Puaha, Waahi Whaanui and Karapiro hui contribute to the Waikato-Tainui findings, and that three Karapiro hui fishing locations in area B clustered within Raukawa hui fishing locations were identified as customary fishing locations at both the Karapiro and Raukawa hui.

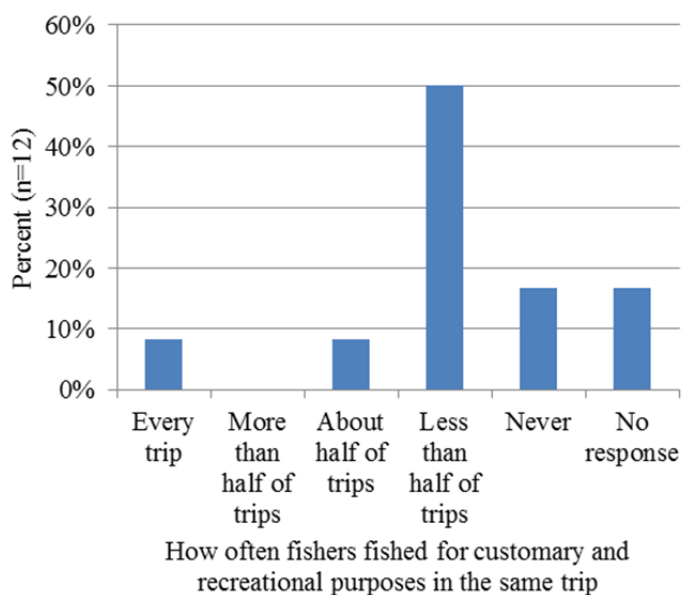


Figure 3.3: Frequency of dual customary and recreational fishing trips in the Waikato catchment.

In general, customary fishers were likely to have been fishing for a long time; across all iwi, the average length of experience in customary fishing was 22 years. Among respondents from Raukawa and Waikato-Tainui, there was a generally even spread across the age groups provided, but there was a notable absence of young people in Maniapoto.

Interpretation of this data requires caution given the low sample size. However, Maniapoto and Te Arawa provided a strong message about the impacts of a perception of low stocks of traditional food sources (eel and kōura) within the catchment areas. Feedback indicated that low stocks meant less cultural and fishing engagement with the river, resulting in cultural disconnection and a negative impact of tikanga relating to the river not being passed on to younger generations.

While this feedback was strongest within Maniapoto, this trend is likely to continue across other iwi, particularly where fish stocks, eel migrations, and habitats for fishing and on-growing are most challenged.

Table 3.3: Years spent customary fishing by iwi in the Waikato catchment.

Iwi	Years				
	Less than 10	11 to 20	21 or more	No response	Average
Te Arawa	0	0	0	0	0
Ngāti Tuwharetoa	0	0	0	0	0
Ngāti Raukawa	3	2	4	3	14.8
Ngāti Maniapoto	0	1	5	2	29.8
Waikato-Tainui	3	4	11	1	34.7
Iwi not identified	1	0	1	2	22.0
Total	7	7	21	8	26.5

Customary fishing is carried out primarily for hui and tangi. Feedback during the research hui indicated that the most important reason for customary fishing was harvest for food, i.e., their customary fishing happened because there was a reason to do so, such as birthdays or fishing for older people who were no longer able to fish for themselves. Other customary purposes included research, enhancement and pest fish removal. An example of pest fish removal was noted in the hui at Waahi Whaanui Trust where one of the participants caught koi carp, not for food but to remove them from Lake Waahi, as he thought they had a negative effect on the water quality. Another fisher from the Waahi Whaanui Trust hui was involved in an enhancement/research project where he was relocating tuna from streams that were going to be adversely affected during the construction of the Waikato Expressway.

Feedback also centred on a mātauranga Māori perspective that customary fishing is for the holistic well-being of iwi. Further, the health and well-being of the river encompasses both the fish stocks in the river *and* the well-being of the iwi. Where iwi was identified, 60-90% of respondents fished for hui and tangi (Figure 3.4). Total responses are shown as most fishers fish for multiple purposes. Only four fishers did not indicate any purpose. When responses to “other” purpose for customary fishing were decomposed, a wide variety of purposes were identified (Table 3.4); all responses were considered valid. The most common responses are indicated in bold (whānau and birthdays).

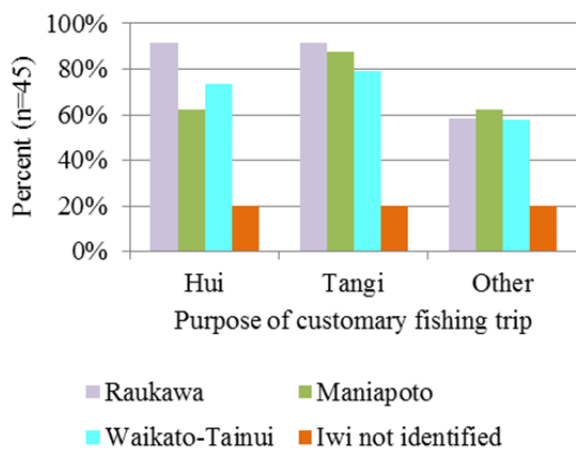


Figure 3.4: Purpose of customary fishing by iwi in the Waikato catchment.

Table 3.4: Purposes for customary fishing other than hui and tangi.

Kiingitanga	Whānau , i.e., to feed the family	Christmas
Poukai	For the old people	Gatherings
Iwi, hapū, marae	Birthdays (including 21 st birthdays)	Weddings
Kai - take generally for food	Kāinga	Manuhiri
Unveillings	Enhancement	Koroneihana
Research		Pest fish eradication/removal

Hui attendees strongly stressed concern about the health and well-being of the river and its effect on fish stocks within the river. Respondents indicated that low fish stocks have caused a decrease in the frequency of customary fishing. Eel, the key target species, as discussed later, is seen less as a food for sustenance but more as a delicacy that is fished mainly for special occasions. Some respondents went further to say that due to the low abundance of eel, they had to purchase eel from the New Zealand Eel Processing Co. Ltd in Te Kauwhata for important cultural events such as poukai. Respondents agreed that ideally the fishery would be healthy enough for regular fishing rather than mainly just for special occasions. These themes were echoed across all hui.

The decreasing frequency of customary fishing has meant that there are fewer fishers engaged in *hī tuna* (eel fishing) as a customary activity, and therefore fewer people are aware of or taught tikanga relating to *hī tuna*. Kaumatua expressed concern that mātauranga Māori was not being passed down the generations as a result of the decreasing connection to the rivers.

3.3.2 Species

Eel are the key species targeted by customary fishers across the whole Waikato River catchment. Just over four-fifths of respondents indicated eel (82% for longfin and 86% for shortfin) as the main target species. For the purposes of customary fishing, responses about the actual species (longfin or shortfin) were largely an artefact of coding required for the survey data analysis, whereas fishers generally had no intention of targeting one species over another. An exception was fishing for puhi (shortfin male migrant eels).

In Waikato-Tainui rohe, eel catches averaged nine longfin and eight shortfin per trip. One Waikato-Tainui fisher reported large catches of up to 400 shortfin eels per year, which he used to sustain the function of his marae. Puhi are targeted as they exit the lower Waikato lakes during their annual downstream migration. This type of fishing has occurred for generations, and his marae is renowned for eel. Fishers from Karapiro reported catching predominantly female longfin eels from upper tributaries on Maungatautari that fed into Lake Karapiro. The view from the Karapiro hui was that “there are still fish available, not as many as in previous times, but enough to get a feed to support their whānau”. Fishers from Te Puaha mainly fished for shortfin eel, although smelt were harvested during the white baiting season. Grey mullet, smelt, yellow-eyed mullet, goldfish and koi carp were also targeted by Waikato-Tainui as these species are also readily available.

In the upper river catchment eel and trout were the main target species, with an average of six eels per trip recorded in Raukawa and Maniapoto catchment areas, though this is tempered by hui feedback where respondents said that they catch “as much as they need”. This was also true for Koroki Kahukura and Huakina. For example, if there are hui, they will stay out longer to catch as much as needed. The upper river iwi expressed a strong interest in piharau (lamprey) and kōura. These species were targeted historically, but are now rarely caught. The black flounder was noted as a species of interest in Maniapoto rohe, and historically was observed as far upstream in the Waipa River as Te Kuiti.

Qualitative feedback from hui indicated that the eel size is generally smaller than expected across all iwi. Respondents across all iwi indicated that there were both fewer numbers and smaller eel than expected.

Customary fishers largely fish all year round (Table 3.5). This reflects that customary fishing generally happens according to need. Survey data also indicates that there was a small decrease of absolute numbers of people engaged in customary fishing over winter.

Feedback from hui showed that customary fishers often fished according to tikanga or to other factors that affected fishing. For example some fished during a new moon, some during a full moon. Others

said that fishing for eel was better during flooding. Some fished only between the months of February and April (downstream migration of eels) where they captured enough eels to last for the whole year. This feedback did not fit within the questionnaire but is helpful in characterising the customary fishery.

Table 3.5: Frequency of customary fishing in the Waikato catchment (n=45).

Frequency	Number of fishers			
	Summer	Autumn	Winter	Spring
More than once a week	4	0	0	3
Weekly	3	3	1	5
Fortnightly	5	4	3	3
Monthly	5	9	4	3
New or full moons	5	6	5	5
Other	7	6	7	6
No response	16	17	25	20

The bycatch from customary fishing was predominantly eels, catfish, goldfish, and sometimes trout (Figure 3.5) Respondents were not prevented from entering a targeted species as a by-catch, and for this reason eel was coded as both a target species and bycatch within the survey results. Only four respondents did not identify either longfin or shortfin eel as a target species, and of those four, none identified eel as bycatch.

Each method generally caught most other species of fish classified in the survey, and there was a bigger bycatch in the lower catchment (Waikato-Tainui) than in the upper catchment (Raukawa and Maniapoto) where only grey mullet and trout were identified as by-catch. Koroki-Kahukura identified the same in addition to yellow-eyed mullet.

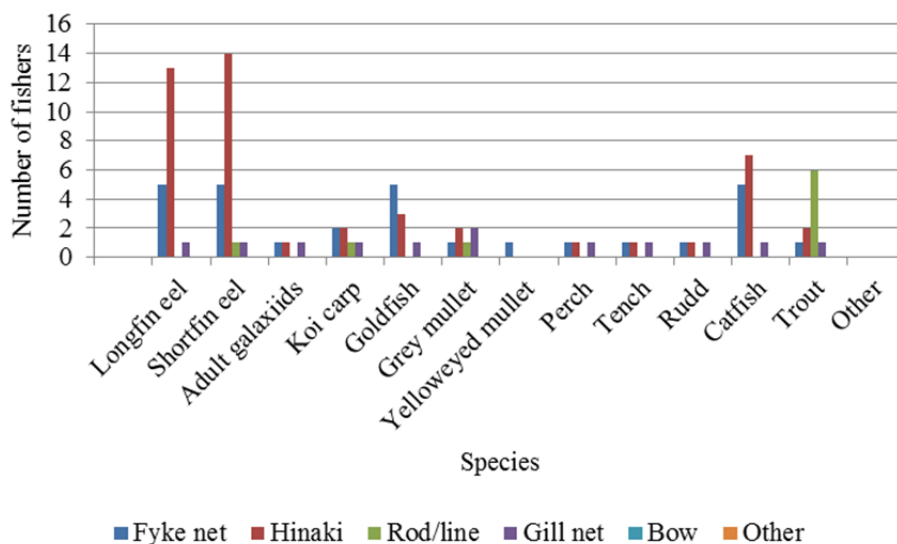


Figure 3.5: By-catch during customary fishing in the Waikato catchment.

3.3.3 Fishing method used

The primary method for customary fishing was by hīnaki (Figure 3.6). About a third of customary fishers used hīnaki, whereas one quarter used fyke net. Respondents who used fyke nets commented how they were similar to hīnaki but were easier to transport and were less likely to break.

Respondents also indicated that rod and line, gill net and “other” were important methods. “Other” included fishing by hand, gaff, ripi, spear or using bracken.

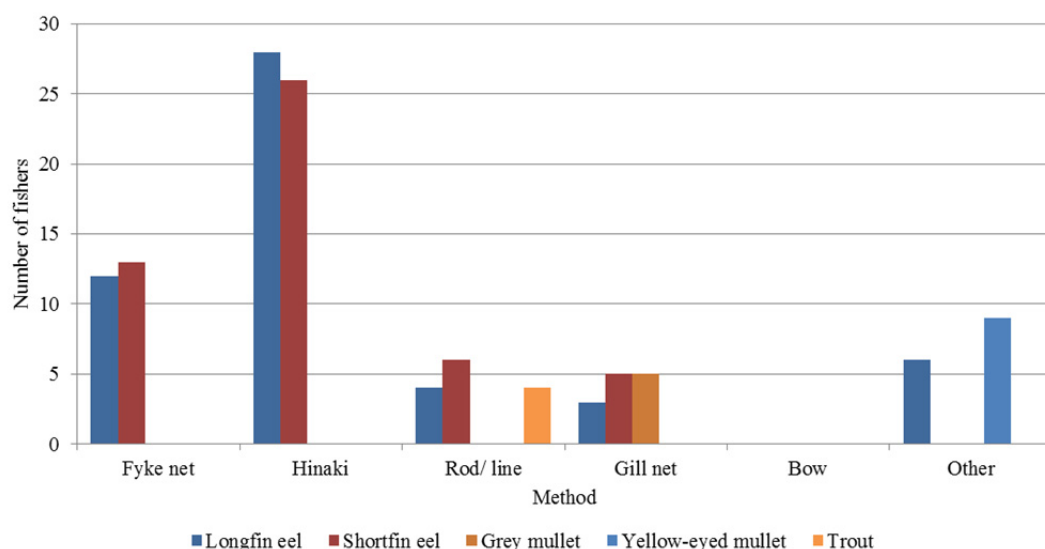


Figure 3.6: Methods use for customary fishing in the Waikato catchment.

3.4 Customary fishing discussion

Eel, both shortfin and longfin, are the predominant species for customary fishing. Eels were highly valued by Māori in pre-European times, they were abundant, easily caught and highly nutritious (Downes 1918, Best 1929, McDowall 1990). Eels provided an essential source of fat and protein (McDowall 1990), and in many cases they were essential for survival.

Eel are mostly caught by hīnaki and fyke net. Though overfishing has reduced eel size and abundance in the past, the stocking programme in the hydro reservoirs has increased the fishing opportunities in the upper Waikato River catchment. The elver enhancement programme has played an integral role in re-establishing eel populations in the upper hydro lakes from Karapiro through to the Huka Falls, enabling greater access to eel across all three fishing sectors (customary, commercial and recreational).

Eel are now taken for a range of customary purposes, particularly hui, tangi, poukai, whānau, research, enhancement and birthdays. Respondents emphasised that customary fishing is based on take, namely fishing for a purpose; but that eel was increasingly seen as a delicacy rather than as a food regularly fished for customary purposes. Maniapoto (1998) reported exchange, koha (including whānau and hapū use) and trade as the main customary uses during his Maniapoto customary eel research project.

Puhi (shortfin male migrants) are still actively fished in the Huntly area, with up to 400 taken annually to sustain the functions of marae. This type of customary fishing has occurred for many generations, and historically puhi were even more intensely harvested with many paa tuna (eel weirs) constructed on the outlet of most lakes and in tributaries of the Waipa and Waikato Rivers (NIWA, 2010). These fishing sites once provided an important and reliable source of food and the base of many alliances, feuds and battles (e.g., Ashwell 1878).

Piharau were captured and harvested historically in the upper Waikato and Waipa Rivers. This no longer occurs and both Raukawa and Maniapoto would like to see this species enhanced in future. The

black flounder was noted by Maniapoto as a species that used to be prevalent in the upper Waipa River, but which is also no longer present.

The customary fishing season decreased slightly in winter, but generally occurs throughout the whole year. This is likely to be due to customary fishing occurring on need, rather than a particular time of year. Though there was some overlap with recreational fishing, most respondents undertook fishing trips for the sole purpose of customary fishing. Approximately a quarter of customary fishers identified that they fished for both customary and recreational fishing purposes, with varied responses about how often they fished for both purposes on the same fishing trip. These messages support the findings of earlier research (Maniapoto 1998).

Feedback from hui indicated that there was an overall perception that low fish stocks have reduced customary fishing activity in the Waikato catchment, which again supports previous research (Maniapoto 1998). This is important because the decreasing frequency of customary fishing has meant that there are fewer fishers engaged in *hī tuna* (eel fishing) as a customary activity, fewer people aware of or taught tikanga relating to *hī tuna*. Te Aho (2009) discussed the loss of vocabulary caused by lack of transmission of knowledge about species and fishing practices which have not been passed down, leading to a loss of connection between youth and elders who possessed such knowledge. This loss of mātauranga Māori means knowledge is not being passed down the generations, and is resulting in decreasing connection to the rivers. The significance of this loss is exemplified in the sophisticated fishing techniques documented by McDowall (2011) that are no longer being practised (Hicks and Watene-Rawiri 2012).

Feedback from hui indicated an aspiration to one day having enough eel stocks in the catchment to be able to fish on a regular basis, rather than to treat customary catch as a delicacy, but that the current state of the fishery does not permit this to happen. Consistent with this desired outcome, eels were introduced into the QMS in 2004 to ensure sustainability. The Minister of Fisheries, in introducing eels into QMS in 2004, set a management strategy that would enable the rebuild of the fishery over a 10 year period, and addressing the desire for a greater average size of eel from a non-commercial use perspective. The management strategy was re-confirmed in 2007 when commercial catch limits were again reduced (Ministry of Fisheries 2007).

Feedback from the hui indicated that rebuilding of the fishery may not yet have been successful. Respondents felt that, given the long lifecycle of eel, even more stringent management measures for commercial fishing interests may need to be adopted to ensure that greater quantities of eel become available for customary use. Management objectives identified by iwi include placing a rāhui over fish stocks, until they have recovered to a state that satisfies customary requirements; reducing the upper size limit for eels from 4 kg down to 2.5 kg; increasing the regulated minimum size from 0.220 kg to 1 kg, removing longfin from the QMS; and increasing the size of eel escapement tubes. There was also vocal concern that commercial fishing activity affects the eel fishery within both the Waikato and Waipa catchments; this sentiment was consistent across all of the iwi.

4 RECREATIONAL FISHING

4.1 Recreational fishing introduction

The aim of the recreational fishing survey was to gather information on fishing and fishery resources in the co-governance areas in the Waikato and Waipa catchments that are managed under the Fisheries Act 1996. Further, the aim was to collate, supplement and present those data in a format that will assist fisheries management decision-making and implementation of any new fisheries regulations arising from the Waikato settlement legislation. Specifically, the data and analysis was required to characterise the amateur fishery including species taken, indicative quantities taken, location of fishing, and fishing methods.

Recreational fishing in the Waikato and Waipa river catchments falls broadly into three categories; trout fisheries, fisheries for introduced coarse fish (e.g., rudd, koi carp, goldfish, and catfish), and fisheries for native species (e.g., whitebait, eels, and grey mullet). As it was likely that recreational fishers might target a range of species, we included questions on sport fisheries such as trout even though they are not the specific target of study, i.e., they are designated as sports fish under the Conservation Law Reform Act 1990. Inclusion of sports fish species gives context to fisheries for other species, and simplifies by-catch considerations. The fishery for juvenile whitebait species, collectively known as galaxiids, is quite restricted by season and space and since 1991, has been administered by the Department of Conservation under the Conservation Act 1987, and so these fish were excluded from the current survey. Adults of whitebait species are managed under the Fisheries Act 1996, so were included.

Surveys were conducted of recreational fishers using prepared questions on target species, locations, numbers of fish caught, seasonality of fishing, and by catch for their fishing experience in the previous five year period. The data were given spatial context so that they could be later grouped into the co-governance areas. Surveys were conducted by web-based methods and as interviews of individual respondents at fishing locations.

4.2 Recreational fishing method

Initial contact with recreational fishing clubs was attempted via telephone. A list of 65 fishing and boating clubs primarily in the Waikato and Auckland regions was collated from internet sources and telephone books. We attempted to make telephone contact with each club that had a listed number. Initial contact with fishing clubs indicated general support for electronic contact with club members via email mailing lists so an online questionnaire was developed to gather information from recreational fishers. Both contacted and un-contacted clubs were emailed introductory information about the research project. Clubs were then emailed information and a web link to the electronic questionnaire to pass on to club members via email. Before answering the questionnaire, respondents were encouraged to read and complete a consent form for participants that explained their rights and defined commercial, customary, and recreational fishing and fishing methods (Appendix 3.1).

4.2.1 Recreational fishing questionnaire

Survey Monkey (2012) was used to create and manage the questionnaires. Texts such as Bryman (2004) and Tolich and Davidson (1999) were used to develop the questionnaire. The complete questionnaire totalled 17 questions (Appendix 4.1). The majority of the questions were multiple choice to make the data easier to quantify, to simplify responses, to assist respondents' recall of their fishing activity over the past five years, and to support analysis. Participants were asked:

1. if there was any cross over between recreational fishing and customary or commercial fishing and if so, how often they undertook multiple uses of the fisheries simultaneously;
2. to give an approximate number of years that they have been recreationally fishing;
3. to characterise their recreational fishing activity over the past five years;
4. to give reasons why they recreationally fish (e.g., leisure, competitions or consumption);

5. what species they target and approximately how many they took on an average fishing trip;
6. approximately how long they fished for on an average fishing trip;
7. what species they would target in each season and how often they would fish in each season;
8. to provide information on what method they employed when targeting different species as well as what by-catch they encountered when using those methods;
9. to provide coordinates of 2-km by 2-km grid locations of the study area where they usually fish;
10. to provide demographic data including home town or city, age, gender and ethnicity.

As well as 'other' responses, when asked for fish species in questions the options were: longfin eel, shortfin eel, adult galaxiids, koi carp, goldfish, grey mullet, yellow-eyed mullet, perch, tench, rudd, brown bullhead catfish and trout. Fishing method options were fyke net, hīnaki, rod or hand line, gillnet, or bow. Prior to deployment, the questionnaire and ancillary information were approved by the University of Waikato's Human Ethics Committee.

A series of nine, 2 km x 2 km gridded maps were used for participants to list the grid locations of their usual fishing locations in point 9. Figure 4.1 illustrates the extent of the nine maps and 2 km x 2 km reference grid.

Additional supporting information was produced to aid participants completing the questionnaire (Appendix 3.1). Participants were required to read a participant information sheet prior to participating in the questionnaire. This gave participants an overview of what the research was, how their information would be used and their rights regarding their participation. Having read the participant information, participants were then required to sign a consent form. To aid answering the questions in point one above, definitions of commercial, customary and recreational fishing were supplied. To aid in the fishing method questions in point seven, images of the different fishing methods listed in the questionnaire were supplied. Additional information was placed on a website and linked to the electronic questionnaire. For participants filling out paper questionnaires, this additional information was supplied in paper format.

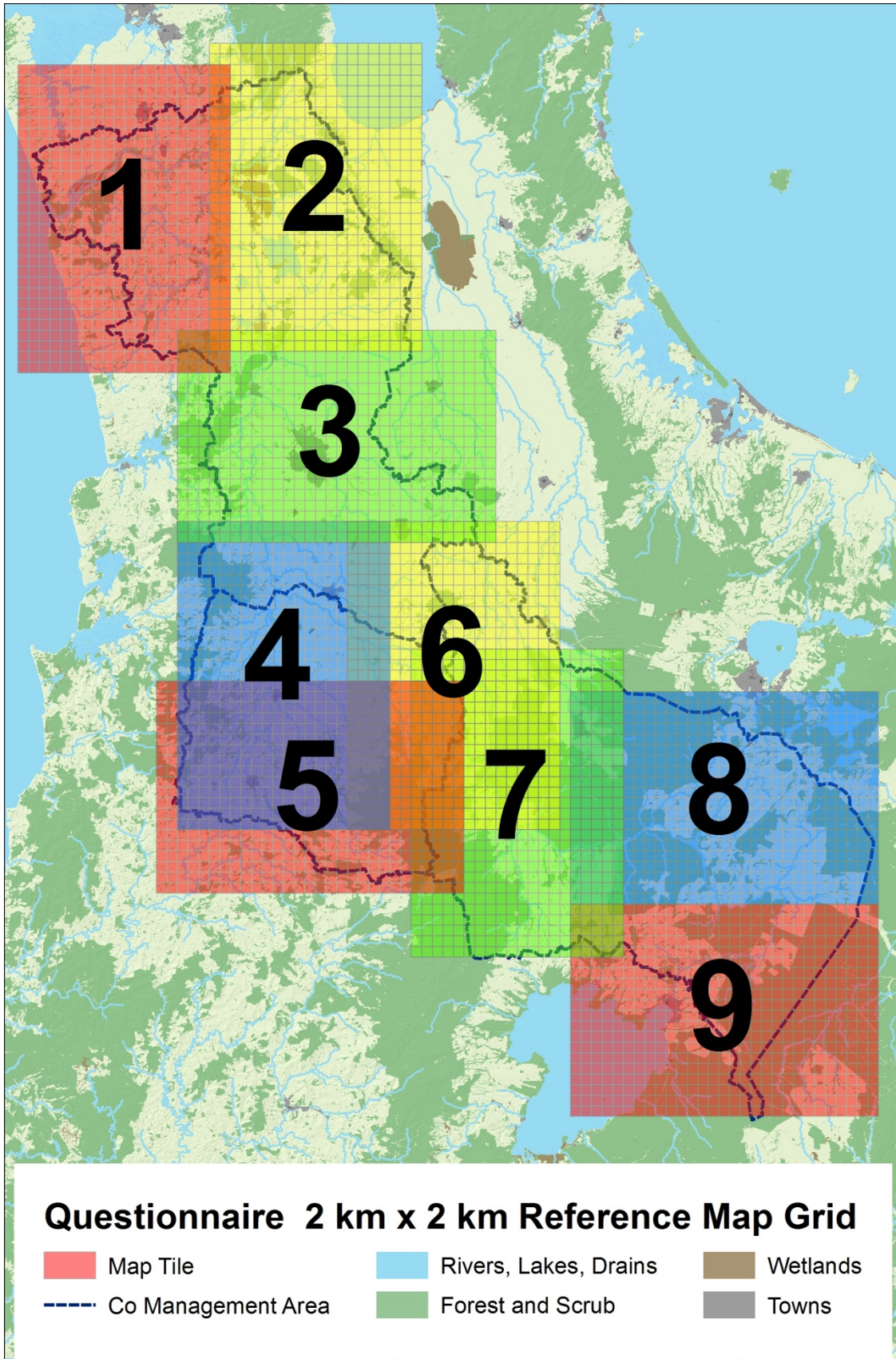


Figure 4.1: Recreational questionnaires 2 km x 2 km reference map grid, showing co-governance area in dashed outline.

4.2.2 Recreational fishing clubs and field visits

A number of club meetings were visited to present further information on the research and recruit more participants (Table 4.1). Whilst participation at meetings was generally high (12-25 attendees at each meeting), the focus of these clubs fishing activity was mostly trout. Seven field visits to locations generally popular with coarse anglers were conducted between mid-March and early May 2012. These visits were generally quite productive, yielding a number of valuable responses from communities of fishers who did not respond to the online survey. Asian fishers were well represented in these field surveys.

Table 4.1: Recreational fishing meetings and field visits.

Club or location	Date	N fishers
Fishing club meetings		
Te Awamutu Angling Club	13-Mar-12	6
Hamilton Anglers Club	26-Mar-12	21
Auckland Freshwater Anglers Club	10-Apr-12	25
Tokoroa Sports Fishing Assoc. Inc.	3-May-12	12
Visits to fishing locations		
Lake Arapuni, Te Awamutu Angling Club competition	17-Mar-12	13
Lake Waikare	1-Apr-12	7
Lake Hakanoa	1-Apr-12	9
Whangamarino River, Island Block Rd	8-Apr-12	9
Pungarehu Canal, Lake Waikare	8-Apr-12	16
Whangamarino River, Falls Rd	15-Apr-12	0
Lake Ngaroto	22-Apr-12	4
Total		122

4.2.3 Recreational fishing compliance patrol data

Data from the MPI's Auckland compliance office was obtained to supplement that collected using the recreational fishing questionnaire. The data were captured via interviews conducted by fisheries officers and honorary fisheries officers regarding non-commercial fishing activity in the lower Waikato catchment. The locations specified by fisheries officers in regard to these data is shown in Figure 4.2, and all fall within co-governance area A. The data were collected over the past five years (summer 2006-07 to summer 2011-12), and were groomed to correct or remove erroneous data (e.g., data given incorrect spatial references). The data includes interview/fishing location, species caught, fishing method, size of group and main ethnicity of group.

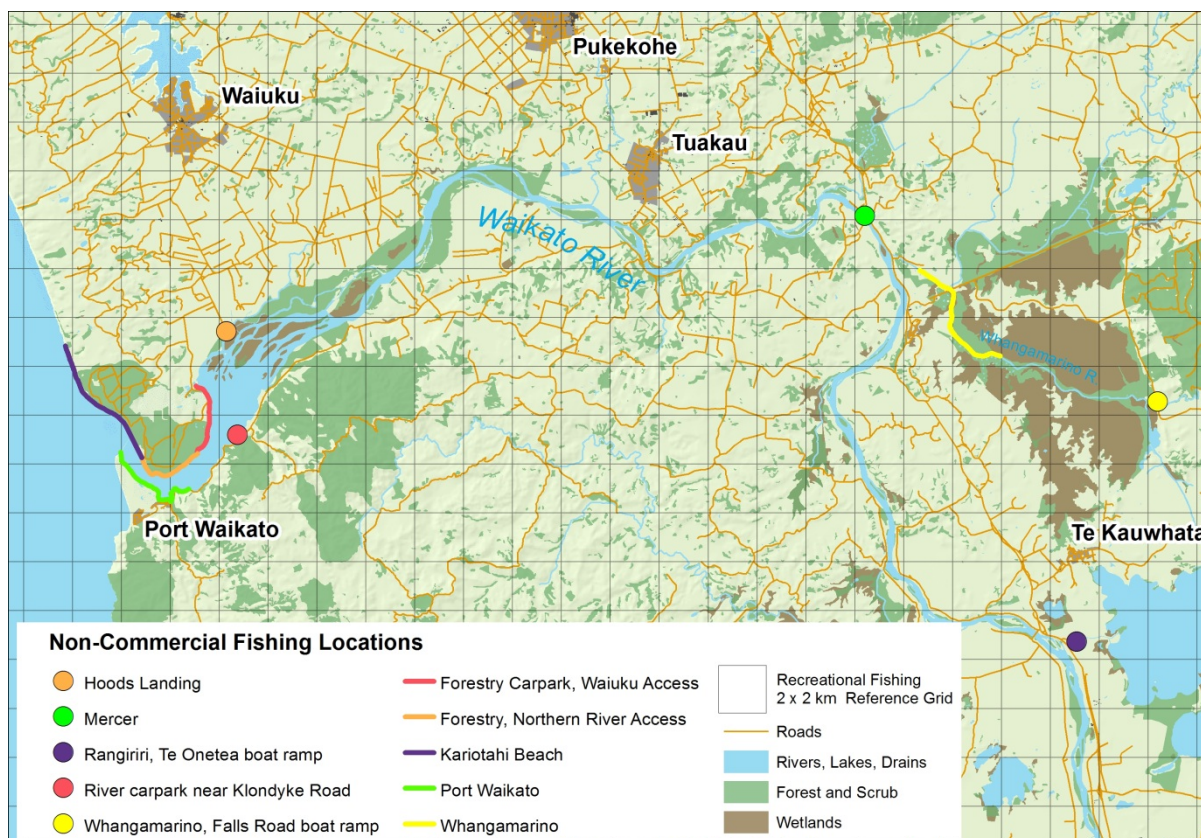


Figure 4.2: Non-commercial fisheries compliance patrol data locations shown as colour-coded points and lines in the lower Waikato catchment. Grid squares are 2 km x 2 km.

4.3 Recreational fishing results

4.3.1 Questionnaire results

A total of 70 recreational fishers participated directly in the recreational fishing questionnaire. Of the 70 respondents, there were 62 valid responses. A total of 40 recreational fishers participated in the online questionnaire. A further 16 respondents were recruited at fishing club meetings and 14 by field visits. Language was often a problem, preventing interviews in some instances, so in many groups of two to five fishers only one person in the party had sufficient English to respond on behalf of the group. The data received from the spokesperson can be taken as indicative of the fishing behaviour across the entire group. Most responses were obtained from Survey Monkey online questionnaires, with field interviews second in importance once group size was considered (Figure 4.3). Respondents to the questionnaire fished throughout the three co-governance areas, although co-governance areas A and B comprised much larger proportions of fishers than co-governance area C (Figure 4.4).



Figure 4.3: Number of responses to the recreational fishing questionnaire by recruitment method for individual respondents and groups where one respondent spoke for several fishers.

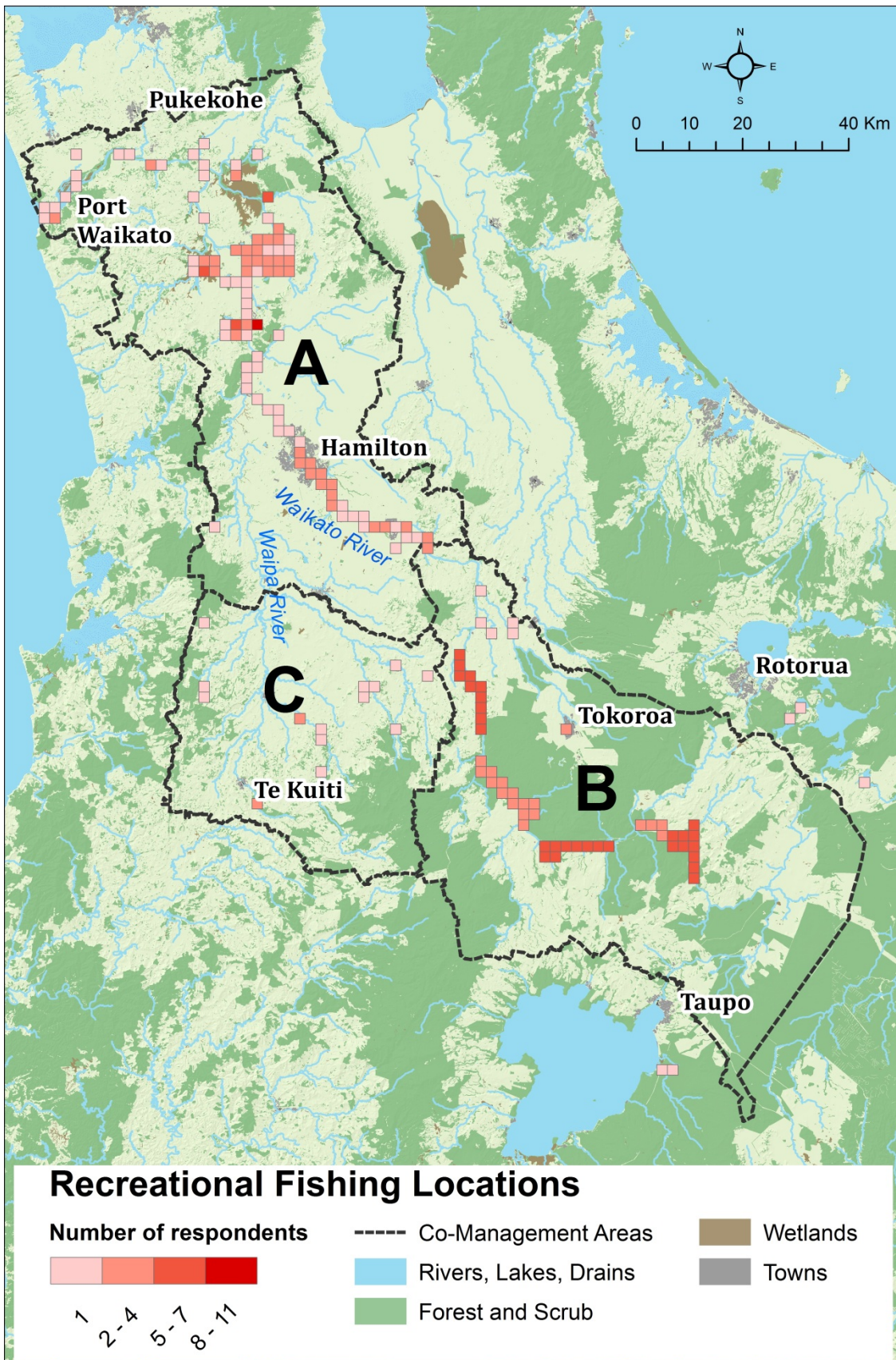


Figure 4.4: Locations fished by recreational fishing questionnaire respondents, showing co-governance areas A, B, and C in black outline.

4.3.1.1 Demographics

Of the 62 respondents to the reasons for fishing question, 61 indicated fishing for sport and leisure; a single exception fished for the purposes of tagging trout. Thirty respondents also indicated fishing for consumption and 27 indicating fishing for competitions (Figure 4.5). Three respondents also indicated fishing for bait as a reason for recreational fishing in the study area, the common target species between the three being grey mullet.

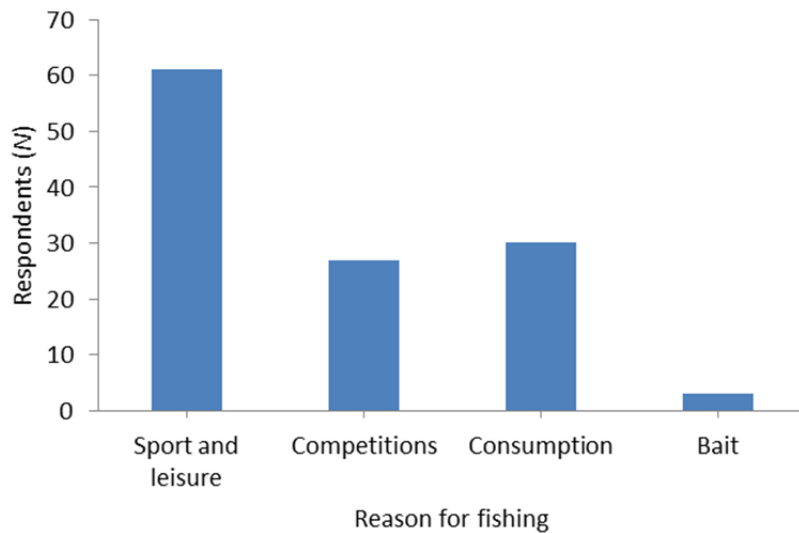


Figure 4.5: Number of respondents by reasons for recreational fishing.

A variety of responses were given for length of time respondents have been recreationally fishing. Whilst respondents were asked to indicate a number in years, responses ranged from new recreational fishers who have been fishing for less than a year to fishers who have been fishing for over 61 years (Figure 4.6). When grouped into five year brackets, the largest group of respondents have been recreationally fishing for five or less years. The median number of years recreationally fishing is 20 and the average number of years is 25.

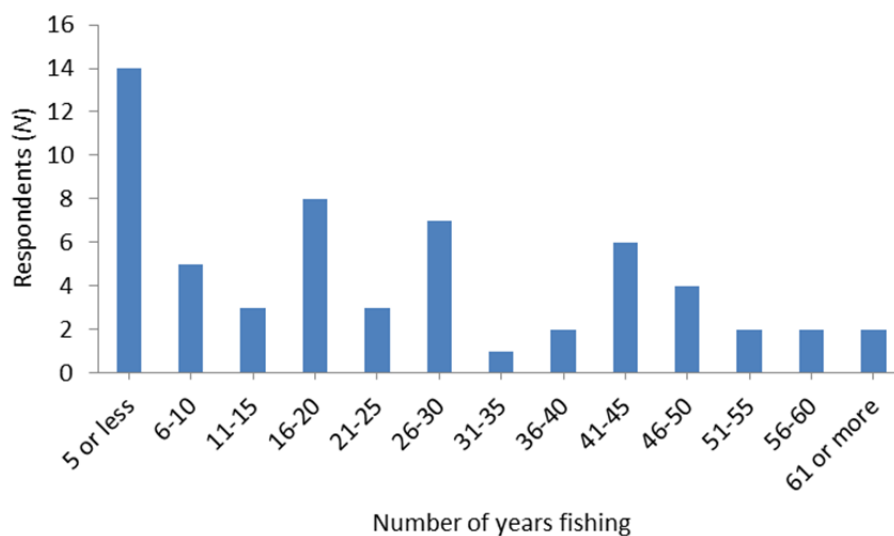


Figure 4.6: Number of respondents by years spent recreationally fishing.

A range of clubs participated in the recreational survey (Table 4.2). A total of 37 respondents are members of a recreational fishing club, with the highest representation from Hamilton Anglers Club (13) and New Zealand Bow Hunters Society (NZBHS - 10). 31 respondents to the questionnaire did not specify a club affiliation. Of the 32 recreational fishers who target trout, 27 indicated membership with a fishing club. 14 koi carp fishers and 14 grey mullet fishers also indicated club membership, with a high representation of the NZBHS targeting these species in the lower Waikato catchment (co-governance area A).

Table 4.2: Number of responses from recreational fishing clubs in the Waikato catchment.

Fishing club	Number of respondents
No affiliation	31
Auckland Freshwater Anglers Club	1
Carp Anglers Group	1
Counties Sport Fishing Club	1
Fish and Game Auckland\Waikato	1
Hamilton Anglers Club	13
Mercury Bay Game Fishing Club Inc.	1
NZ Bow hunters Society	10
Tokoroa Sports Fishing Assoc. Inc.	8
Unspecified club	1
Total	68

Respondents to the recreational fishing questionnaire come from a variety of towns both inside and outside the study area (Figure 4.7), and often from outside the co-governance areas. Auckland had the highest representation with 13, followed by Hamilton with 11 and Tokoroa with 9. Twelve respondents did not specify the town they live in. Nine Auckland fishers targeted koi carp, as did four both from Hamilton and Huntly and three from Pukekohe. Ten respondents from Hamilton and eight from Tokoroa targeted trout.

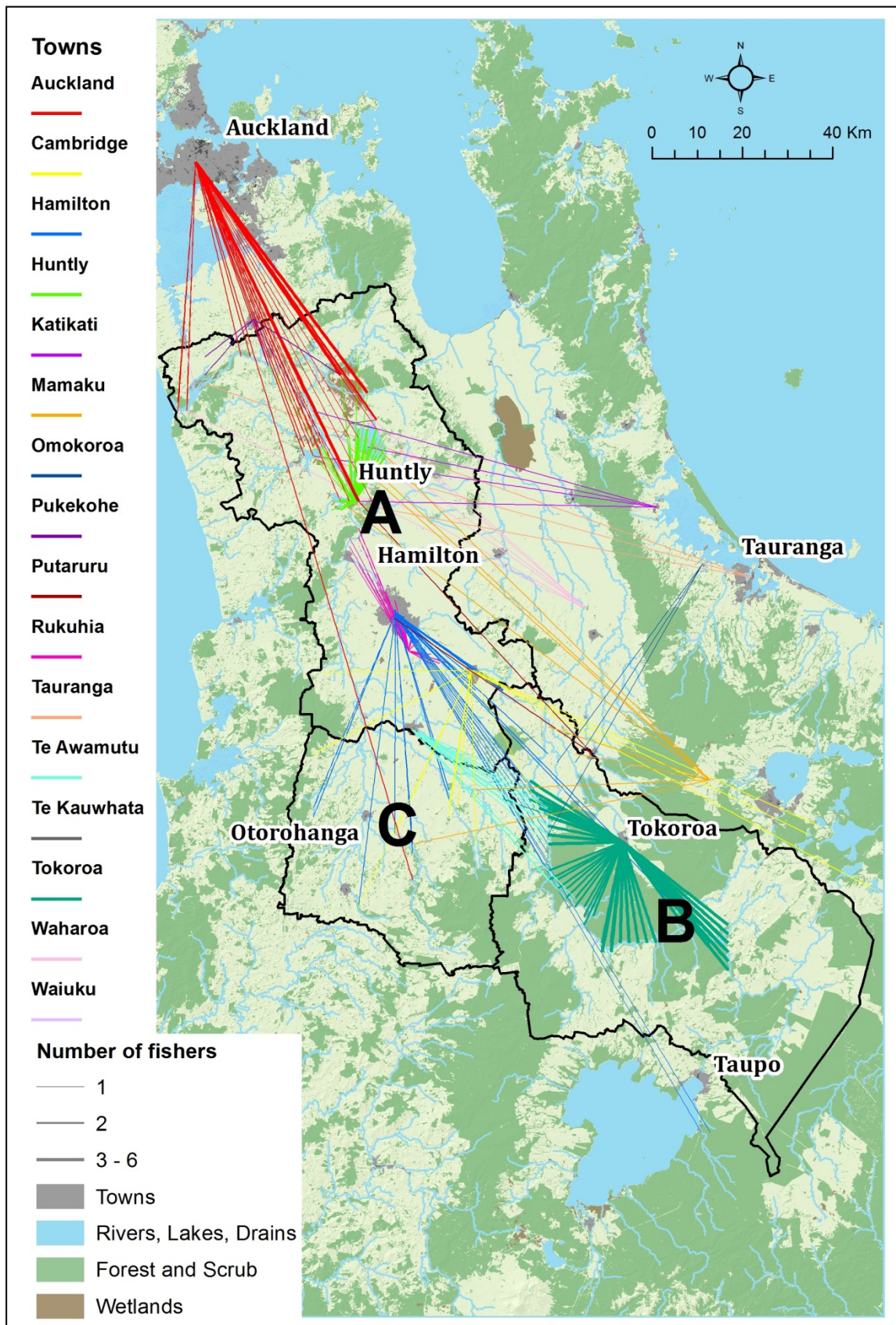


Figure 4.7: Spider diagram connecting town of origin of recreational fishers to their fishing locations, showing co-governance areas A, B, and C in black outline.

Of the respondents to the recreational fishing questionnaire, all 10 year age groups between 20 and 79 were represented. The largest age group was 50-59 years (12), while both 30-39 and 40-49 had 11 respondents. Nine respondents were between 20-29, seven between 60-69, five between 70-79 and 13 unspecified (Table 4.3). Two respondents identified as female, 52 as male and 14 did not specify gender. The largest ethnic group represented in the recreational fishing questionnaire is New Zealand European with 33 respondents. Three respondents identified as New Zealand Māori, seven as Asian, six as Other European and seven as individual other responses (Table 4.4). Notably no respondents to the recreational fishing questionnaire identified as Pacific Islander.

Table 4.3: Number of respondents by age group for recreational fishing in the Waikato catchment.

Age Group	Respondents (N)
20-29 years	9
30-39 years	11
40-49 years	11
50-59 years	12
60-69 years	7
70-79 years	5
Unspecified	13

Table 4.4: Number of respondents by ethnicity for recreational fishing in the Waikato catchment.

Ethnicity	Respondents (N)
New Zealand European	33
New Zealand Māori	3
Asian	7
Pacific Islander	0
Other European	6
Other	7

4.3.1.2 Target species

Respondents to the recreational fishing questionnaire indicated a spread of target species when fishing for recreational purposes with distinct patterns relating to club membership and reasons for fishing. Trout was the most popular species targeted by recreational fishers with a total of 32 respondents indicating that they target trout, and club members tended to focus on trout. Trout in the Waikato River were generally targeted upstream of Taupiri, particularly in the Waikato River hydro-lakes (lakes Karapiro, Arapuni, Waipapa, Maraetai, Whakamaru, Atiamuri, and Ohakuri). A small number of respondents also indicated other areas of the Waikato and Waipa catchments. Recreational trout fishing occurred in all co-governance areas. Locations indicated by fishers exclusively targeting trout are shown in Figure 4.8. A similarly high number of respondents indicated koi carp as a target species with a total of 29. Koi carp, a target species for bow hunters, were largely fished in the lower Waikato shallow lakes (lakes Hakanoa, Waikare and Whangape) and around the Whangamarino wetlands (Whangamarino and Maramarua rivers and Pungarehu Canal).

Goldfish, grey mullet, and rudd were targeted by 18, 17 and 12 respondents respectively, with lower numbers of respondents targeting longfin and shortfin eel, yellow-eyed mullet, perch, tench and

catfish. Locations indicated by fishers targeting these species exclusively are shown in Figure 4.9. No respondents to the questionnaire indicated exclusively targeting longfin or shortfin eel. Locations indicated by fisher who target eel as well as other species (including trout, koi carp, grey mullet and goldfish) is shown in Figure 4.10. Notably, no recreational fishers who participated in the questionnaire indicated that they target adult galaxiids. Total respondent numbers for each species is shown in Table 4.5. All species indicated by respondents as target species, including longfin and shortfin eel, grey and yellow-eyed mullet, koi carp, goldfish, perch, tench, rudd, catfish and trout were targeted in co-governance area A. Results of respondents who indicated exclusive targeting of either coarse fish or trout show that coarse fishing is restricted to the lower Waikato catchment below Taupiri whilst trout fishing occurs in the Waikato and Waipa catchments above Taupiri (Figure 4.8 and Figure 4.9).

Table 4.5: Number of respondents targeting each species in the recreational questionnaire for fishing in the Waikato catchment.

Species	Respondents (N)
Longfin eel	5
Shortfin eel	9
Adult galaxiids	0
Koi carp	29
Goldfish	18
Grey mullet	17
Yellow-eyed mullet	2
Perch	6
Tench	7
Rudd	12
Catfish	6
Trout	32

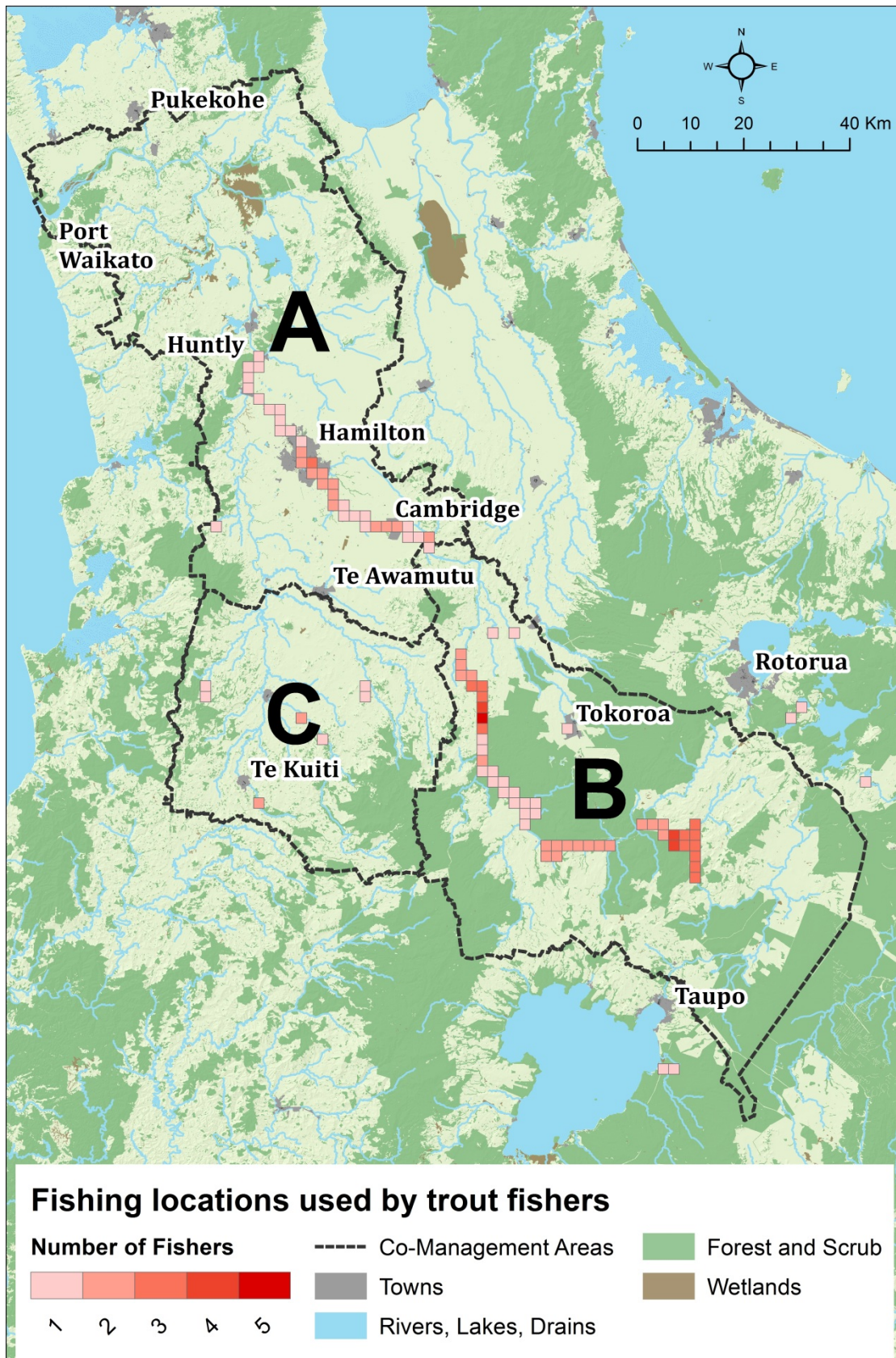


Figure 4.8: Locations used to target trout indicated by recreational fishers, showing co-governance area A, B, and C in black outline. *N* respondents = 18.

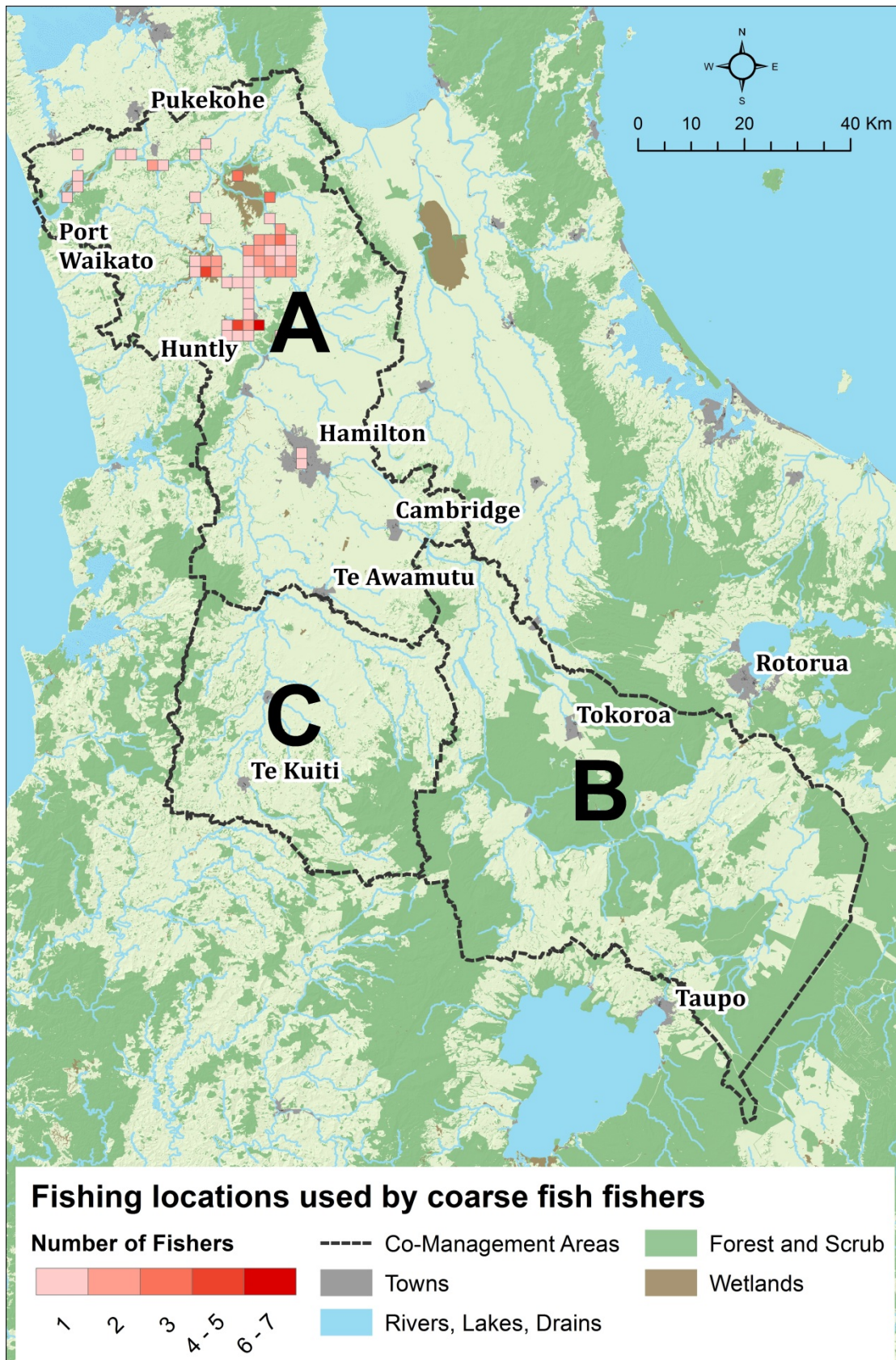


Figure 4.9: Locations used to target coarse fish (koi carp, goldfish, perch, tench, rudd), grey mullet, and catfish indicated by recreational fishers, showing co-governance areas A, B, and C in black outline. *N* respondents = 18.

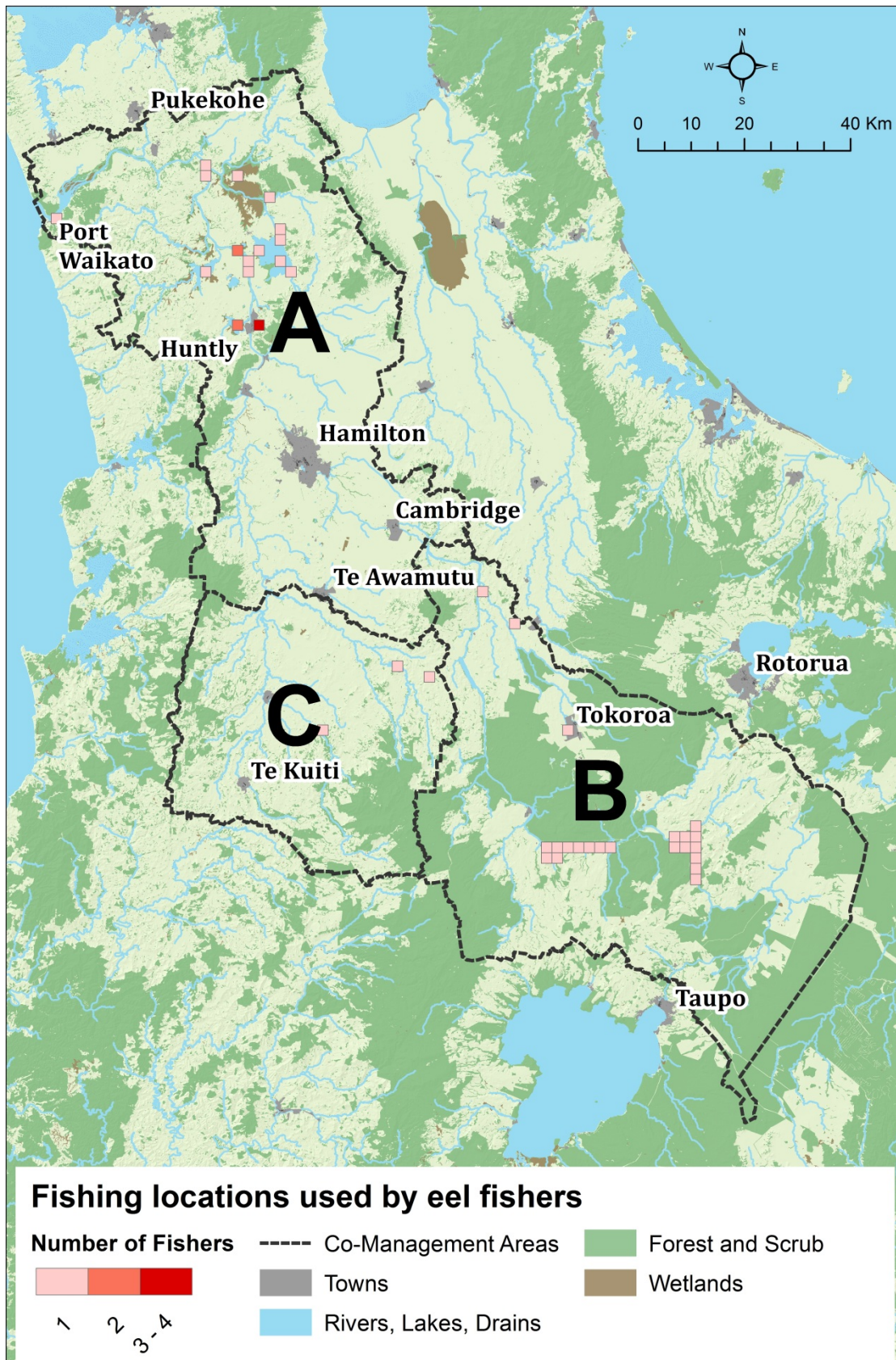


Figure 4.10: Locations used to target longfin and shortfin eel indicated by recreational fishers, showing co-governance areas A, B, and C in black outline. (Locations indicated by fishers also targeting coarse fish and trout). *N* respondents = 11.

Koi carp had the highest average take by recreational fishers; respondents averaged 10.8 fish per trip (Table 4.6). Bow hunters in particular caught a large number of koi carp, averaging 17.9 per trip with a maximum of 60. Such catches are likely to be associated with the World Koi Carp Classic Bowfishing Tournament, held in early November near Huntly (e.g., <http://www.nzbowhunters.co.nz/koicarpclassicrosults2011.html>). The median catch for koi carp was 5 per trip. Trout, the most commonly fished target species, had an average take of 2.1 per trip, the third lowest of target species taken. Longfin and shortfin eel both had an average take of 2.5 per trip, whilst all other species ranged in average take between 7.5 and 1.0 per trip (Table 4.6).

Table 4.6: Mean and median number of fish per trip taken by recreational fishing in the Waikato catchment.

Species	Mean	Median
Longfin eel	2.5	2.5
Shortfin eel	2.5	2
Adult galaxiids	0.0	0
Koi carp	10.8	5
Goldfish	5.7	2.5
Grey mullet	4.2	3
Yellow-eyed mullet	1.5	1.5
Perch	1.0	1
Tench	4.0	4
Rudd	7.5	5.5
Catfish	4.4	3
Trout	2.1	1.5

4.3.1.3 Fishing methods

Fishing rod or handline are the most commonly used fishing methods by recreational fishers. These were used by respondents to target all species listed in the questionnaire except adult galaxiids (no respondents target this species) and yellow-eyed mullet (Table 4.7). Trout was the most popular species targeted using a rod (31), with koi carp (16), goldfish (15), rudd (13) and catfish (12) being popular rod or handline targets in the lower Waikato catchment. Bow hunting was the second most popular method, particularly targeting koi (13) and grey mullet (12). Only two respondents indicated the use of hīnaki to target longfin eel and three respondents indicated the use of gill nets to target grey mullet. No respondents use fyke nets whilst there were single respondents who identified the use of spears and cast nets.

Table 4.7: Number of respondents targeting fish species by method for recreational fishing in the Waikato catchment.

Method	Number of respondents					
	Fyke net	Hīnaki	Rod/ Line	Gill net	Bow	Other
Longfin eel	—	2	2	—	1	—
Shortfin eel	—	—	9	—	2	1
Adult galaxiids	—	—	—	—	—	—
Koi carp	—	—	16	—	13	1
Goldfish	—	—	15	—	6	—
Grey mullet	—	—	1	3	12	1
Yellow-eyed mullet	—	—	—	—	3	—
Perch	—	—	7	—	—	—
Tench	—	—	5	—	—	—
Rudd	—	—	13	—	1	—
Catfish	—	—	12	—	1	—
Trout	—	—	31	—	—	1

4.3.1.4 By-catch

The most numerous indication of bycatch by respondents was rudd caught on a rod or handline with 13 respondents (Table 4.8). Rod fishers indicated a wide range of by-catch, with all questionnaire species apart from adult galaxiids and yellow-eyed mullet encountered as by-catch. Bow hunters indicated less by-catch due to being able to better target species, whilst users of hīnaki have only experienced catfish and trout as by-catch and gill net users indicated koi carp as by-catch. Trout fishers recorded a high number of rudd as by-catch, whilst catfish and perch were also commonly encountered by-catch across most of the target species (Table 4.9).

Table 4.8: Species by-catch by fishing method for recreational fishing in the Waikato catchment.

Species	Number of respondents					
	Fyke net	Hinaki	Rod/ Line	Gill net	Bow	Other
Longfin eel	—	—	1	—	—	1
Shortfin eel	—	—	5	—	1	1
Adult galaxiids	—	—	—	—	—	—
Koi carp	—	—	6	1	4	—
Goldfish	—	—	4	—	1	—
Grey mullet	—	—	1	—	5	—
Yellow-eyed mullet	—	—	—	—	2	—
Perch	—	—	5	—	1	—
Tench	—	—	2	—	1	—
Rudd	—	—	13	—	2	—
Catfish	—	1	9	—	1	—
Trout	—	1	6	—	—	—

Table 4.9: Bycatch species by target species for recreational fishing in the Waikato catchment.

Target Species	By-catch by number of respondents											
	Longfin eel	Shortfin eel	Adult galaxiids	Koi carp	Goldfish	Grey mullet	Yellow-eyed mullet	Perch	Tench	Rudd	Catfish	Trout
Longfin eel	—	—	—	1	1	1	1	—	—	—	—	1
Shortfin eel	—	—	—	1	1	2	1	—	—	1	2	1
Adult galaxiids	—	—	—	—	—	—	—	—	—	—	—	—
Koi carp	—	4	—	—	2	5	2	3	2	4	5	1
Goldfish	1	4	—	2	—	—	—	2	2	3	8	1
Grey mullet	—	1	—	5	—	—	1	2	1	3	1	1
Yellow-eyed mullet	—	—	—	—	—	—	—	1	1	—	—	—
Perch	1	2	—	2	2	—	—	—	2	2	4	1
Tench	1	3	—	2	2	—	—	3	—	3	5	1
Rudd	1	3	—	2	2	—	—	3	3	—	6	3
Catfish	—	1	—	—	—	—	—	—	—	—	—	—
Trout	2	3	—	5	4	2	2	4	1	12	3	—

4.3.1.5 Seasonality and effort

Seasons were broken into four groups of three months, i.e., summer (December – February), autumn (March – May), winter (June – August), and spring (September – November). Recreational fishers indicated an overall decline in activity from a summer peak to a winter low before climbing again in spring. This is illustrated in both target species numbers (Table 4.10) and frequency of fishing trips (Figure 4.11). Only one respondent indicated moon phase as a determinant of frequency of recreational fishing trips. We acknowledge there could be a recall bias. Trout fishers had the most stable number of recreational fishers throughout the year with a winter low that was 61% of the summer maximum.

Table 4.10: Seasonal change in numbers of recreational fishers by species in the Waikato catchment.

Species	Number of respondents			
	Summer	Autumn	Winter	Spring
Longfin eel	3	1	1	1
Shortfin eel	9	5	2	2
Adult galaxiids	—	—	—	—
Koi carp	27	16	11	18
Goldfish	17	12	6	8
Grey mullet	15	6	4	9
Yellow-eyed mullet	1	0	0	1
Perch	6	2	2	2
Tench	5	1	0	3
Rudd	13	7	1	7
Catfish	8	5	2	2
Trout	28	27	17	23

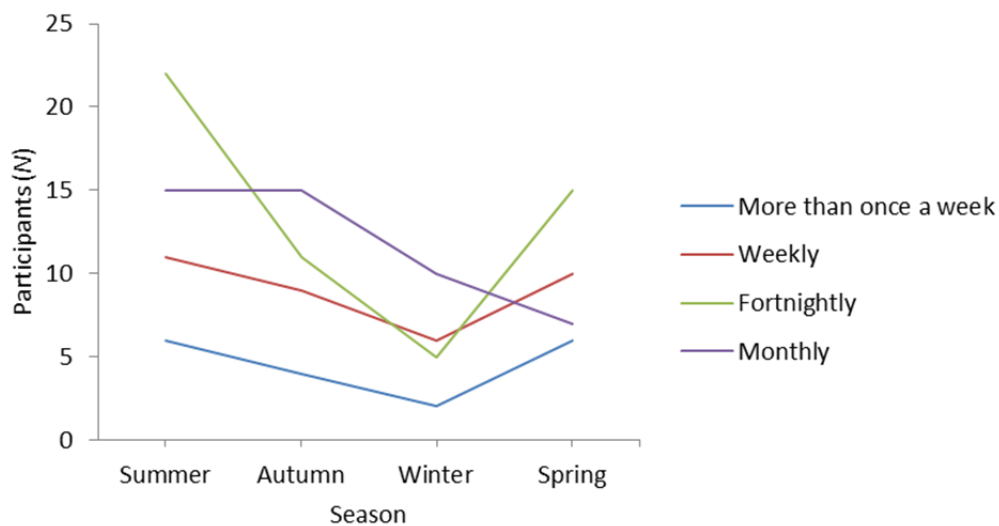


Figure 4.11: Seasonal change in frequency of fishing trips by recreational fishers.

In response to usual fishing trip length (time spent fishing), respondents gave trip lengths ranging from 1 to 10 hours. Occasionally respondents indicated a range in number of hours. In such cases medians were used or the lower of two consecutive hours. The average length of a recreational fishing trip was influenced by the reason for fishing (Figure 4.12). A common theme was that fishing trip length would increase when fishing in competitions. Other comments included a dependence on the weather, species, and enjoyment.

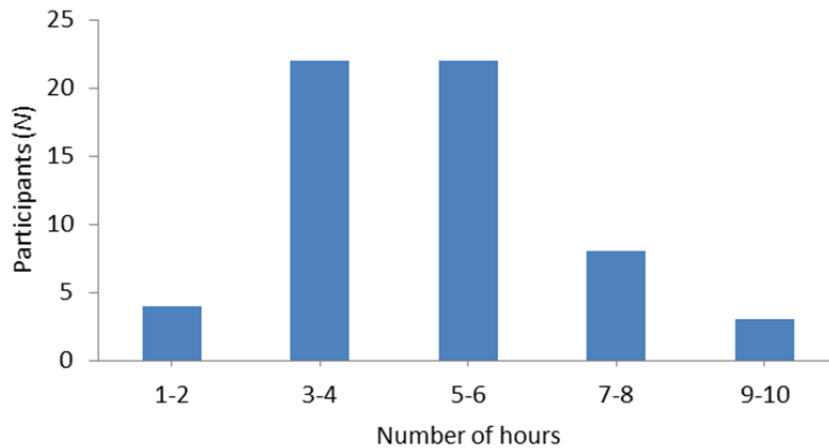


Figure 4.12: Average recreational fishing trip length in the Waikato catchment.

4.3.2 Recreational fishing - compliance patrol results

4.3.2.1 Species taken

The species with the highest number caught by non-commercial fishers interviewed during compliance control inspections over the past five years was grey mullet with 1760 caught, 1092 in the Port Waikato area (Table 4.11). Relatively large numbers of yellow-eyed mullet and pipi were also caught over this period (1399 and 1397 respectively). The lowest numbers reported were for brown bullhead catfish (1), parore and rig (2 each). Koi carp, the species with the highest number taken in the recreational fishing questionnaire, has a five-year total of 50, most of which are caught near Mercer (20) or Whangamarino (12 in Whangamarino River, 7 from reports at the Falls Road boat ramp).

Table 4.11: Total number of fish caught by non-commercial fishers in the lower Waikato catchment. Data from MPI fisheries officers on routine compliance patrols.

Location	Brown bullhead catfish	Cockle	Flatfish	Flounder (Unspecified)	Grey mullet	Kahawai	Koi carp	Pacific oyster	Parore	Pipi	Red cod	Rig	Snapper	Trevally	Yellowbelly flounder	Yellow-eyed mullet	Grand total
Forestry carpark, Waiuku access			34	12	4	3											53
Forestry, northern River entrance			11														11
Hoods Landing					408	18			1							6	433
Kariotahi Beach			7		192	323							25	1		1	549
Maraetai Park, Waikato River															10		10
Mercer							20										20
Port Waikato		525	163		1092	363	5	331	1	1397	27	2	256	19		1392	5573
Rangiriri, Te Onetea boat ramp							1										1
River Carpark near Klondyke Road, Port Waikato Road					1		5										6
Waikato River			1		63	1											65
Whangamarino	1						12										13
Whangamarino, Falls Road boat ramp							7										7
Total	1	525	216	12	1760	708	50	331	2	1397	27	2	281	20	10	1399	6741

4.3.2.2 Demographics of recreational fishers interviewed from compliance patrols

Between summer 2006-07 and summer 2011-12, 801 active fishers were inspected in 342 inspections (Table 4.12). Of these, the most active fishers were recorded in the vicinity of Port Waikato (492), with another large group recorded as accessing the Waikato River fisheries via Kariotahi Beach north of the Waikato River mouth. Smaller numbers of fishers were recorded at Hoods Landing (44), with the remainder of locations having less than 20 active fishers inspected over the five year time period. Table 4.13 describes the number of groups by group size, with fishers working in pairs the most frequent group size (119). Group sizes of 3 and 4 are also common (59 and 36 groups respectively) as well as 88 inspected solo fishers. Other group sizes range from 6 to 25. Of the specified ethnicities inspected, Māori was the greatest number of active fishers (40), with 35 identified as Asian, 28 as Caucasian, 24 as Polynesian as well as one Indian (Table 4.14).

Table 4.12: Number of non-commercial inspections and fishers inspected by location. Data from MPI fisheries officers on routine compliance patrols.

Location	Inspections (N)	Active fishers (N)
Forestry carpark, Waiuku access	2	6
Forestry, northern River entrance	2	7
Hoods Landing	24	44
Kariotahi Beach	86	208
Mercer	1	1
Port Waikato	212	492
Rangiriri, Te Onetea Boat Ramp	1	6
River Carpark near Klondyke Road, Port Waikato Road	1	4
Waikato River	4	11
Whangamarino	7	17
Whangamarino, Falls Road Boat Ramp	2	5
Grand Total	342	801

Table 4.13: Group sizes of non-commercial fishers inspected. Data from MPI fisheries officers on routine compliance patrols.

Group size	Count of group size
25	1
12	1
9	2
8	3
7	2
6	9
5	16
4	36
3	59
2	119
1	88

Table 4.14: Non-commercial groups and active fishers by ethnicity. Data from MPI fisheries officers on routine compliance patrols.

Ethnic group	Groups (N)	Active fishers (N)
Asian	18	35
Caucasian	18	28
Indian	1	1
Māori	8	40
Polynesian	9	24
Unspecified	288	673

4.4 Recreational fishing discussion

The purpose of this research project was to collate information regarding the current use of fisheries resources in the Waikato River and Waipa River catchment areas and specifically to address a gap in knowledge about recreational fishing activity in the Waikato region, with a particular focus on the three co-governance areas. The online survey and angling club visits were largely successful to evaluate the fishing effort for most species, and field visits were the most successful for identifying Asian fishers of goldfish and koi carp, despite language difficulties encountered. Use of a Mandarin speaker would have improved the field survey. The non-commercial compliance patrol data was especially useful for quantifying fishing effort in the lower catchment over a number of years for grey mullet, flounder, kahawai, and yellow-eyed mullet. As far as we are aware, this is the first time the non-commercial compliance patrol data has been summarised to inform fisheries management.

One shortcoming of the recreational survey resulted from our requirement to have respondents recall their fishing experience for the previous five years and for multiple species where applicable. This reduced our ability to gather location and species-specific information because of the complexity of data. The format of the questionnaire was decided upon to make data gathered as detailed and descriptive as possible whilst encouraging and retaining participation as well as making the data as quantifiable as possible. However, we lost the ability to resolve cross-tabulated spatial information for data with multiple responses in other

questions, such as target species. Where multiple target species were given, data was not captured regarding possible separation of fishing location by target species. The detailed capture of such data was unfeasible in this study for a number of reasons. A 2 km x 2 km grid for fishing location identification was used primarily to encourage response to what many fishers would regard a highly sensitive question. Asking participants to pinpoint locations would likely result in far fewer responses to the question. If respondents were required to identify locations by species, an additional set of at least 12 questions, involving the use of the maps to look up the locations 12 times, would be required to capture the data, all but ensuring higher occurrence of nil or incomplete responses. Also, due to budgetary constraints, the development of a method to electronically capture pinpoint or by species data was unfeasible. The 2 km x 2 km grid did, however, provide adequate accuracy for spatially locating fishing activity given both the size of the study area and possible movement around certain landmarks, particularly by fishers using boats.

The focus of most fishers in clubs was trout, although some also fished for coarse fish or caught species such as rudd as a by-catch of fishing. The bow hunters, however, were an exception, and targeted mainly koi carp. There was a relative lack of engagement of coarse anglers in clubs despite repeated contact. Pacific Islanders, who anecdotally fish for mullet by netting, were also difficult to engage. Asian fishers from Auckland formed a distinctive group, targeting primarily coarse fish such as goldfish and koi carp, though one group focussed on eels. In general, Asian fished in groups of two-five, and generally had one English speaker who could be interviewed as a respondent. Some Asian fishers could not be interviewed because they did not speak English; a Chinese speaker would be a useful addition for future surveys at fishing spots. Field interviews were a very effective method of reaching Asian fishers, few of whom responded to the web survey.

5 CONCLUSIONS

This report illustrates the nature and extent of the fisheries resource use in recent years, and should enable a basis on which further comparative studies can be done in the future.

There are a variety of fisheries uses of the Waikato and Waipa catchment. Fisheries are well regarded by commercial, customary, and recreational fishers, and all participants share a desire to see an improved fishery. There has been improved management measures applied to managing some fisheries resources to ensure sustainable use over the longer term, although these fisheries management actions are likely to be dependent on underlying improvements in habitat management, and on-going monitoring of fishery performance. Improvements in either habitat or fishery performance may take some time to show through.

Commercial fishing is largely undertaken in the Waikato-Tainui co-governance area, principally in the delta area for grey mullet, and smaller catches of kahawai, yellow-eyed mullet and trevally closer to the river mouth. Further up-river, the predominant fishery has been for shortfin and longfin eel. As a result of eel management initiatives over the last decade, the extent of this commercial fishery has been significantly reduced. Catch limits under the QMS constrain commercial catch, and there has been a decline in commercial participants between the 2004-05 and 2008-09 fishing years. Māori have secured commercial harvesting rights as stocks are included into the QMS, as a key part of Treaty settlement legislation of 1992.

The introduction of the North Island eel fishery into the QMS in 2004 has enabled sustainability outcomes to be more effectively achieved for both shortfin and longfin eel species. With the reduced catch limits in place since 2007, it is expected that the eel fishery will rebuild over the medium term. In addition, fishing industry members across the North

Island have voluntarily increased the size of the two escape tubes used in their fyke nets. This voluntary measure has subsequently been proposed for regulatory implementation in 2013.

Other non-QMS fisheries are only lightly fished on a commercial basis, with brown bullhead catfish and koi being taken mainly in the Waikato-Tainui co-governance area. Commercial fishing activity in the Maniapoto co-governance area and the Raukawa, Te Arawa and Ngati Tuwharetoa co-governance area is based on eels, and there is only a limited by-catch reported from this fishery. The eel fishery for all participants in the Raukawa, Te Arawa and Ngati Tuwharetoa co-governance area is dependent on eel enhancement activities, where industry members transfer elvers upstream from the Karapiro Dam under an authorised programme.

The results of the customary survey indicated that eel were the key species targeted across the whole Waikato River catchment. Just over four fifths of respondents indicated eel (82% for longfin and 86% for shortfin) as the main target species. This demonstrates the continued importance of eels to Māori despite an aging population of active fishers, barriers to natural migration, and perceived overfishing. Goldfish, catfish, and trout were the main by-catch, reflecting their widespread abundance and susceptibility to the same harvest methods as eels.

In the upper river catchment, eel and trout were the main target species, whereas in the lower catchment (the Waikato-Tainui rohe), eel was the main target species, with catches averaging nine longfin and eight shortfin per trip. Customary fishers from Karapiro reported catching predominantly female longfin eels from upper tributaries on Maungatautari that fed into Lake Karapiro. The view from the Karapiro hui was that there are still fish available, not as many as in previous times, but enough to get a feed to support their whānau. Fishers from Te Puaha mainly fished for shortfin eel, although smelt were harvested during the whitebaiting season. Grey mullet, smelt, yellow-eyed mullet, goldfish and koi carp were also targeted by Waikato-Tainui as these species are also readily available.

The pattern of recreational fishing was consistent with that for customary fishing, with trout caught in the upper Waikato catchment (co-governance area A) and in the main channel between Karapiro and Huntly (co-governance area B), with scattered fishing in the tributaries of the Waipa River (co-governance area C). Coarse fish (koi carp, goldfish, perch, tench, rudd), grey mullet, and catfish were targeted downstream of Huntly in co-governance area A.

Non-commercial fishers in the lower Waikato catchment surveyed by MPI fisheries officers on routine patrols caught grey mullet, yellow-eyed mullet, and kahawai, principally near Port Waikato. In contrast to customary fishers, recreational fishers came from outside the Waikato and Waipa catchments to fish, principally from Auckland. This was especially so for Asians targeting koi carp and goldfish.

Our findings show an aging population of customary fishers who have major concerns about the current state of their fish stocks. Conversely, some commercial fishers are of the view that fisheries resources such as eels are now improving in parts of the Waikato catchment. The challenge will be to further refine management measures to ensure that all aspirations can be met over time. Habitat loss, historical overfishing, and barriers to fish migration for principally diadromous species (David et al. 2010, Hicks et al. 2010) remain issues of importance. Over 90% of the 19 fish species in the lower Waikato require access to and from the sea at some point in their life history. Invasive fish species have contributed to habitat decline and compete with native fish species (Hicks et al. 2010).

The management measures introduced in recent decades for commercial fishing activities have gone some way to stabilising the situation since that observed in the early 1980s (Ministry of Fisheries 1984a, 1984b, Anonymous 1989), particularly where these measures are effectively applied at the level of the stock or nationwide. Such broadly based measures will have an important bearing on the improvement of each catchment's fisheries.

6 ACKNOWLEDGMENTS

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We thank the respondents for both the customary and recreational fishing activity surveys for their time and willingness to participate. Without their help the surveys would not have been possible. Similarly, we thank commercial fishers for identifying their prior and current use of sites forming the Waikato-Tainui Whenua Raahui Reserve.

Waikato Regional Council and Land Information New Zealand provided GIS data, and the Office of Treaty Settlements helped with definition of the Waikato-Tainui Whenua Raahui Reserve sites that allowed identification of Waikato-Tainui Whenua Raahui Reserve.

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7 GLOSSARY OF MĀORI WORDS

The Māori words, shown in bold, are accompanied by their English translation as used in the context of this report.

hapū	sub-tribal grouping
hī tuna	eel fishing
hīnaki	eel net, usually a woven basket-like trap
hui	meeting
iwi	tribal grouping of Māori from a direct common ancestor
kāinga	dwelling
kīngitanga, kiingitanga*	king movement
kai	food
kaumātua	elder
koha	gift, present, offering, donation, or contribution
koroneihana	coronation
kōura	freshwater crayfish
manuhiri	guest, visitor
marae	communal Māori meeting place
mātauranga	knowledge
mātauranga Māori	Māori knowledge
pā tuna, paa tuna*	weir for catching eels
piharau	lamprey
poukai	gathering of the king movement
puhi	shortfin migrant male eel
rāhui, raahui*	temporary ritual prohibition
rangatiratanga	right to exercise authority
raupatu	the confiscation or seizure of land
ripi	metal or bone blade used to hunt eels with a slashing motion
rohe	area
tangi	funeral
tikanga	custom
tuna	eel
whakapapa	genealogies, lineage
whānau	family group
whenua	land

*In Tainui dialect, the ā (a macron) is replaced with **aa**, and ī (i macron) with **ii**.

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APPENDICES

Appendix 1.1: Revised list of reserves that comprise the Waikato-Tainui Whenua Raahui Reserve as stated in Waikato-Tainui Raupatu Claims (Waikato River) Settlement Act 2010 and listed in the Part 8, Subpart A, Sites of Significance, in the Waikato-Tainui Deed of Settlement (2009).

Original description	New description
1.07ha Parcel 4280676: Allot 815 Town of Rangiriri.	0.7738 hectares, more or less, being Section 5 SO 412601. Part Computer Interest Register 478144.
1.07ha Parcel 4506647: Allot 2 Town of Rangiriri.	
1.07ha Parcel 4356176: Allot 816 Town of Rangiriri.	
0.07 ha Parcel 4515502: Pt Lot 2 DPS 6972.	0.0684 hectares, more or less, being Section 1 SO 48135. Balance Computer Interest Register 478144.
1.81 ha Parcel 4336757: Pt Allotment 11 Whangape Parish.	2.5300 hectares, more or less, being Section 1 SO 49492.
0.72 ha Parcel 4493882: Pt Allotment 11 Whangape Parish.	
0.43 ha Parcel 4563067: Pt Lot 2 DP 35569.	0.4300 hectares, more or less, being Section 1 SO 51592. All Gazette Notice H445553.
0.01 ha Parcel 4391762: Pt Allot 171A1B Pepepe Parish.	0.0057 hectares, more or less, being Section 2 SO 47389. Part Gazette Notice H409241.
3.53 ha Parcel 4330723: Pt Allot 24B Whangape Parish.	3.5300 hectares, more or less, being Section 1 SO 47528. All Gazette Notice H235159.
0.04 ha Parcel 4481995: Pt Allot 171A1B Pepepe Parish.	0.0369 hectares, more or less, being Section 1 SO 47389. Part Gazette Notice H409241.
0.32 ha Parcel 4416590: Pt Allot 222 Whangamarino Parish.	7.3589 hectares, more or less, being Sections 1 – 7 SO 448945.
0.42 ha Parcel 4256715: Pt Allot 222 Whangamarino Parish.	
1.08 ha Parcel 4338169: Pt Allot 222 Whangamarino Parish.	
2.44 ha Parcel 4257992: Pt Allot 222 Whangamarino Parish.	
0.34 ha Parcel 6716652: Pt Allot 222 Whangamarino Parish.	
0 ha Parcel 4460651: Pt Allot 550 Whangamarino Parish.	
0.34 ha Parcel 4490184: Pt Allot 222 Whangamarino Parish.	
2.88 ha Parcel 4548760: Pt Allot 223 Whangamarino Parish.	

Appendix 1.1. (continued)

Original description continued	New description continued
R 12004, LIPS 10354 (Awamarohi)	1.1862 hectares, more or less, being Awamarohi Block.
1.32 ha Parcel 4513106: Pt Allot 306 Whangamarino Parish.	1.3253 hectares, more or less, being Section 1 SO 44801. Part Gazette 1970 page 1958.
LIPS 17555, Lake Waikare lake bed	3642.3939 hectares, more or less, being Sections 1 and 2 SO 436760.
62.88 ha S13039: Allots 728 and 729 Whangamarino Parish.	
Lake Waikare Marginal Strips	
15.06 ha S13036: Pt 687 Parish of Whangamarino	
3 ha. S13037: Crown Land (accreted lake bed) adjoining Allot 234D Whangamarino Parish.	
0.0 ha S13038: Pt Lake Waikare. Lake Waikare Wildlife Refuge	
1.04 ha S13043: Lot 1 DPS 26990	
83.45 ha S13028: Allot 721 Whangamarino Parish	83.4500 hectares, more or less, being Allotment 721 Whangamarino Parish. All Gazette 1981 page 1132.
53.49 ha S 13021: Lot 1 DPS 37484 and Lot 1 DPS 37485.	53.4900 hectares, more or less, being Lot 1 DPS 37484 and Lot 1 DPS 37485. All Gazette Notice H750475.
5.5 ha S13014 (pt): Allot 749 Whangamarino Parish	5.9475 hectares, more or less, being Section 2 SO 436761. Part Gazette 1984 page 104.
16.9 ha S13014 (pt): Allots 745 – 747 Whangamarino Parish	15.4029 hectares, more or less, being Sections 31, 32 and 33 SO 436762. Part Gazette 1984 page 104.
11 ha S13014 (pt): Allot 739 Whangamarino Parish	11.1003 hectares, more or less, being Section 4 SO 436763. Part Gazette 1984 page 104.
26.1 ha S13014 (pt) Allots 844 – 845 Taupiri Parish	24.7002 hectares, more or less, being Sections 51 and 52 SO 436764. Part Gazette 1984 page 104.

Appendix 2.1: Chronology of size grade changes used for shortfin (SFE) and longfin (LFE) eels at processing facilities in the North Island (from Beentjes 2011).

Date	Species	Processor	Size grade (g)
2003–04	LFE	NZ Eel	220–500, 500–1200, over 1200
July 2006	LFE	NZ Eel	300–500, 500–1200, over 1200
Dec 2008	LFE	NZ Eel	300–500, 500–1000, over 1000
2003–04	SFE	NZ Eel	220–500, 500–1000, over 1000
2009–10	SFE	NZ Eel	300–500, 500–1000, over 1000
2003–04	LFE	AFL	220–500, 500–1000, over 1000
2003–04	SFE	AFL	220–500, 500–1000, over 1000
2008–09	SFE	AFL-Levin	220–650, 650–1000, over 1000

Appendix 2.2: Commercial fishers' estimate of the approximate proportion of eel catch landed from the upper or lower Waipa catchment, as separated at the Waipa/Puniu River junction, as part of voluntarily recorded catch landings made against sub-ESA 4J at any time between the 2004–05 and 2008–09 fishing years. Number of landings for each commercial fisher provided to indicate overall level of use of sub-ESA 4J over the five fishing year period.

Commercial fisher	Number of voluntarily reported landings of eels from sub-ESA 4J	Commercial fisher's estimate of approximate proportion of eel catch voluntarily reported from the two component areas making up sub-ESA 4J (%)	
		Upper Waipa	Lower Waipa
		A	11
B	10	75	25
C	12	20	80
D	100	50	50
E	23	0	100
F	38	80	20
G	1	0	100
H	1	0	100
I	4	0	100
J	1	0	100

Appendix 2.3: Quantitative differences (kg) between Waikato catchment commercial shortfin and longfin eel catch summary data (combined) by sub-ESA for two fishing years in the published Appendix 3 of Beentjes 2011, and the tabulated data submitted by that author to the Ministry for Primary Industries on completion of NIWA’s research contract. Green shaded cells in italics denote differences in quantities. * = sub-ESAs that do not coincide with the Waikato catchment, but are part of the old sub-ESA ‘4’ coding series.

Sub-ESA	2005–06 fishing year, quantities in kg		2006–07 fishing year, quantities in kg	
	Appendix 3, Beentjes 2011	Beentjes submitted data to MAF (now MPI)	Appendix 3, Beentjes 2011	Beentjes submitted data to MAF (now MPI)
4B	873	838	8180	7984
4C	1433	1395	1081	1081
4D	2490	2490	1252	1192
4E	0	0	926	898
4F	0	0	402	402
4G	2843	2791	4969	4426
4H	2555	2531	8405	8038
4I	2053	2053	2064	1806
4J	21922	21777	11940	10021
4K	8774	8627	8149	7524
4L	47517	47842	29162	28219
4M*	636	636	353	350
4N*	1328	1328	503	484
4O*	313	313	0	0
4P*	470	470	0	0
4Q*	368	368	4479	4244
Total (4 series)	93575	93459 (116 kg or 0.1% difference for all 4 series sub-ESAs)	81863	76669 (5194 kg or 6.8% difference for all 4 series sub-ESAs)
Total (Waikato catchment)	90460	90344 (116 kg or 0.1% difference for just Waikato catchment sub-ESAs)	76528	71591 (4937 kg or 6.9% difference for just Waikato catchment sub-ESAs)

Appendix 3.1. Fishing activity in the Waikato/Waipā Rivers and their catchments: consent form for participants used for both customary and recreational fishers.

I have read the **Participant Information Sheet** for this study and have had the details of the study explained to me. My questions about the study have been answered to my satisfaction, and I understand that I may ask further questions at any time.

I also understand that I am free to withdraw from the study before 31 March 2012, or to decline to answer any particular questions in the study. I understand I can withdraw any information I have provided up until the researcher has commenced analysis on my data. I agree to provide information to the researchers under the conditions of confidentiality set out on the **Participant Information Sheet**.

I agree to participate in this study under the conditions set out in the **Participant Information Sheet**.

Signed: _____

Name: _____

Contact phone/email (*optional*): _____

Date: _____

ID number (*Office use only*): _____

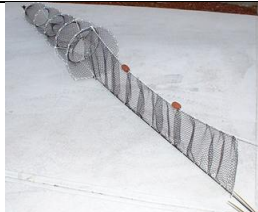

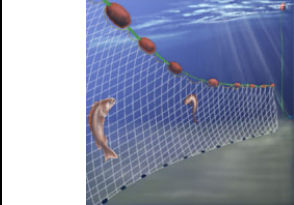

Fishing activity in the Waikato/Waipā Rivers and their catchments

Definitions Sheet

Commercial fishing is the taking of fish, aquatic life, or seaweed in a way that provides some form of valuable consideration beyond personal use where a fishing permit is required by section 89 of the Fisheries Act 1996.

Fishing for customary use is the taking of fish, aquatic life, or seaweed or managing of fisheries resources, for a purpose authorised by Tangata Kaitiaki/Tiaki, including koha, to the extent that such purpose is consistent with Tikanga Māori and is neither commercial in any way nor for financial gain or trade, pursuant to the traditional rights confirmed by the Treaty of Waitangi and the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992.

Recreational fishing (or amateur fishing) is persons taking or possessing any fish or aquatic life for non-commercial purposes, i.e., not for sale. This does not include commercial fishers taking or possessing the fish or aquatic life under a permit, licence, catch entitlement, or other authorisation issued or granted under the Fisheries Act 1996 or any regulations made pursuant to the Act.

	Fyke net
	Hīnaki
	Gill net
	Bow

Appendix 3.2. Fishing activity in the Waikato/Waipā Rivers and their catchments: Customary use fishing questionnaire.

Please ensure that prior to participating in this questionnaire that you have read and understood the **Participant Information Sheet** and have signed the **Consent Form for Participants**.

INSTRUCTIONS FOR ANSWERING QUESTIONS ARE WRITTEN IN ITALICISED CAPITAL LETTERS.

Question 1 Under which of the following categories do you currently fish or have fished in the last five years?
<i>TICK AS MANY AS APPLICABLE. SEE DEFINITIONS ON DEFINITION SHEET.</i>
<input type="checkbox"/> Recreational <input type="checkbox"/> Customary <input type="checkbox"/> Commercial

Question 2 If you ticked more than one category in Question 1, how often do you fish for multiple categories on a single fishing trip? i.e. fishing for customary use and recreational use on the same trip.
<i>TICK ONE ONLY.</i>
<input type="checkbox"/> Every trip <input type="checkbox"/> More than half of trips <input type="checkbox"/> About half of trips <input type="checkbox"/> Less than half of trips <input type="checkbox"/> Never

Question 3 How many years have you been fishing for customary use?
<i>WRITE NUMBER OF YEARS.</i>
_____ years <i>Comments:</i> _____ _____

Question 4 For what reason(s) do you usually fish for customary use (consider the last five years)?
<i>TICK AS MANY AS APPLICABLE.</i>
<input type="checkbox"/> Hui <input type="checkbox"/> Tangi <input type="checkbox"/> Other (<i>please specify</i>): _____

Question 5

What species do you target when fishing for customary use?

TICK AS MANY AS APPLICABLE.

- Longfin eel
- Shortfin eel
- Adult galaxiids
- Koi carp
- Goldfish
- Grey mullet
- Yelloweye mullet
- Other (*please specify*): _____
- Other (*please specify*): _____

Question 6

How many fish of each of the following species would you take on an average customary use fishing trip?

WRITE NUMBER NEXT TO APPLICABLE SPECIES.

- _____ Longfin eel
- _____ Shortfin eel
- _____ Adult galaxiids
- _____ Koi carp
- _____ Goldfish
- _____ Grey mullet
- _____ Yelloweye mullet
- _____ Other (*please specify*): _____
- _____ Other (*please specify*): _____

Question 7**What season(s) do you fish for customary use for the following species?***TICK AS MANY AS APPLICABLE.*

Species	Summer	Autumn	Winter	Spring
Longfin eel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Shortfin eel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Adult galaxiids	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Koi carp	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Goldfish	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Grey mullet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Yelloweye mullet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify): _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify): _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Question 8**How often do you fishing for customary use during the following seasons?***TICK ONCE ONLY PER COLUMN WHERE APPLICABLE.*

	Summer	Autumn	Winter	Spring
More than once a week	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Weekly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fortnightly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Monthly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
New or full moons	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify): _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Question 9**On each occasion, how long (in hours) do you usually fish for customary use?***WRITE NUMBER OF HOURS.*

_____ hours.

Question 10

TARGET SPECIES: What fishing method(s) do you use and for what species when fishing for customary use?

TICK AS MANY AS APPLICABLE AND WRITE SPECIES TARGETED WITH EACH METHOD (IF EELS, PLEASE SPECIFY SHORTFIN OR LONGFIN. MULTIPLE SPECIES MAY APPLY. IF UNSURE, PLEASE SEE IMAGES ON DEFINITIONS SHEET.

<input type="checkbox"/>	Fyke net	Species: _____
<input type="checkbox"/>	Hīnaki	Species: _____
<input type="checkbox"/>	Rod	Species: _____
<input type="checkbox"/>	Gill net	Species: _____
<input type="checkbox"/>	Other (<i>please specify</i>): _____	Species: _____

Question 11

BY CATCH: Which of the following species do you often encounter as by-catch for each of the following fishing methods?

TICK AS MANY AS APPLICABLE.

Species	Fyke net	Hīnaki	Rod	Gill net
Longfin eel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Shortfin eel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Adult galaxiids	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Koi carp	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Goldfish	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Grey mullet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Yelloweye mullet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Trout	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rudd	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Perch	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tench	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (<i>please specify</i>): _____ catfish _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (<i>please specify</i>): _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Question 12**Are you a member of a fishing or boating club?**

TICK ONE ONLY.

- No
- Yes (*please specify*): _____
- Does the club keep catch records? Yes No

Question 13**Are you male or female?**

TICK ONE ONLY.

- Male
- Female

Question 14**What age category are you in?**

TICK ONE ONLY.

- Up to 19 years
- 20 – 29 years
- 30 – 39 years
- 40 – 49 years
- 50 – 59 years
- 60 – 69 years
- 70 – 79 years
- 80 years or over

Question 15**What is your ethnicity?**

TICK AS MANY AS APPLICABLE.

- New Zealand Maori
(*please specify your iwi*): _____
- New Zealand European
- Other European
- Pacific Islander
- Asian
- Other (*please specify*): _____

Appendix 4.1. Fishing activity in the Waikato/Waipā Rivers and their catchments: Recreational use fishing questionnaire.

Please ensure that prior to participating in this questionnaire that you have read and understood the **Participant Information Sheet** and have signed the **Consent Form for Participants**.

INSTRUCTIONS FOR ANSWERING QUESTIONS ARE WRITTEN IN ITALICISED CAPITAL LETTERS.

Question 1

In addition to recreational fishing, do you currently fish or have in the last five years fished in the following categories in the Waikato or Waipā catchments?

TICK AS MANY AS APPLICABLE. SEE DEFINITIONS ON DEFINITION SHEET.

- Customary
- Commercial

Question 2

If you ticked an additional category in Question 1, how often do you fish for multiple categories on a single fishing trip?

i.e. fishing for recreational use and customary use on the same trip.

TICK ONE ONLY.

- Every trip
- More than half of trips
- About half of trips
- Less than half of trips
- Never

Question 3

About how many years have you been recreationally fishing?

WRITE NUMBER OF YEARS.

_____ years *Comments:* _____

Question 4

For what reason(s) do you usually fish for recreational use in the last five years?

TICK AS MANY AS APPLICABLE.

- Sport and leisure
- Competitions
- Consumption
- Other (*please specify*): _____

Question 5

What species do you target when recreationally fishing?

TICK AS MANY AS APPLICABLE.

- Longfin eel
- Shortfin eel
- Adult galaxiids (e.g. Kokopu)
- Koi carp
- Goldfish
- Grey mullet
- Yelloweye mullet
- Perch
- Tench
- Rudd
- Catfish
- Trout
- Other (*please specify*): _____
- Other (*please specify*): _____

Question 6

How many fish of each of the following species would you take on an average recreational fishing trip?

WRITE NUMBER NEXT TO APPLICABLE SPECIES.

- _____ Longfin eel
- _____ Shortfin eel
- _____ Adult galaxiids (e.g. Kokopu)
- _____ Koi carp
- _____ Goldfish
- _____ Grey mullet
- _____ Yelloweye mullet
- _____ Perch
- _____ Tench
- _____ Rudd
- _____ Catfish
- _____ Trout
- _____ Other (*please specify*): _____
- _____ Other (*please specify*): _____

Question 7**What season(s) do you fish for recreational use for the following species?***TICK AS MANY AS APPLICABLE.*

Species	Summer	Autumn	Winter	Spring
Longfin eel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Shortfin eel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Adult galaxiids (e.g. Kokopu)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Koi carp	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Goldfish	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Grey mullet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Yelloweye mullet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Perch	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tench	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rudd	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Catfish	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Trout	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify): _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Question 8**How often do you fish for recreational use during the following seasons?***TICK ONCE ONLY PER COLUMN WHERE APPLICABLE.*

	Summer	Autumn	Winter	Spring
More than once a week	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Weekly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fortnightly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Monthly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
New or full moons	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify): _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Question 9**On each occasion, how long (in hours) do you usually fish for recreational use?**

WRITE NUMBER OF HOURS.

_____ hours.

Comments (optional): _____

Question 10

TARGET SPECIES: What fishing method(s) do you use and for what species when fishing for recreational use?

TICK AS MANY AS APPLICABLE.

Species	Fyke net	Hīnaki	Rod	Gill net	Bow	Other
Longfin eel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Shortfin eel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Adult galaxiids (e.g. Kokopu)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Koi carp	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Goldfish	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Grey mullet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Yelloweye mullet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Perch	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tench	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rudd	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Catfish	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Trout	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other Species (please specify): _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

(please specify

other method): _____

Question 11

BY CATCH: Which of the following species do you often encounter as by-catch for each of the following fishing methods?

TICK AS MANY AS APPLICABLE.

Species	Fyke net	Hīnaki	Rod	Gill net	Bow	Other
Longfin eel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Shortfin eel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Adult galaxiids (e.g. Kokopu)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Koi carp	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Goldfish	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Grey mullet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Yelloweye mullet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Perch	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tench	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rudd	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Catfish	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Trout	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other Species (please specify): _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

(please specify other method): _____

Question 12

Using the maps provided, what index location(s) do you usually fish at over the past five years when recreationally fishing?

MULTIPLE LOCATIONS CAN BE GIVEN, e.g. BA39, BD40

Question 13

Are you a member of a fishing or boating club?

TICK ONE ONLY.

- No
- Yes (*please specify*): _____
Does the club keep catch records? Yes No

Question 14

Are you male or female?

TICK ONE ONLY.

- Male
- Female

Question 15

What age category are you in?

TICK ONE ONLY.

- Up to 19 years
- 20 – 29 years
- 30 – 39 years
- 40 – 49 years
- 50 – 59 years
- 60 – 69 years
- 70 – 79 years
- 80 years or over

Question 16

What is your ethnicity?

TICK AS MANY AS APPLICABLE.

- New Zealand Maori
(*please specify your iwi*): _____
- New Zealand European
- Other European
- Pacific Islander
- Asian
- Other (*please specify*): _____

Question 17

What town or city do you live in?

WRITE TOWN OR CITY.
