



Historical evidence for the state and exploitation of the marine fish and invertebrate resources in the Hauraki Gulf and along the Otago-Catlins shelf 1769–1950

New Zealand Aquatic Environment and Biodiversity Report No. 194

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ISSN 1179-6480 (online)
ISBN 978-1-77665-763-6 (online)

January 2018



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EXECUTIVE SUMMARY

MacDiarmid, A.B.; Cleaver, P.; Stirling, B. (2018). Historical evidence for the state and exploitation of marine fish and invertebrate resources in the Hauraki Gulf and along the Otago-Catlins shelf 1769–1950.

New Zealand Aquatic Environment and Biodiversity Report No. 194. 69 p.

The objective of this research was to assess and collate existing historical data on relevant components of New Zealand's marine ecosystem in order to provide a detailed description of change in the shelf marine ecosystem in two areas of contrasting human settlement over the period 1769 to 1950. The two areas chosen were the greater Hauraki Gulf and the Otago-Catlins shelf. The focus for this study was primarily on marine fish and invertebrates as reviews of the historic exploitation of other components of the ecosystem had recently been undertaken.

The study found that marine environments in the Greater Hauraki Gulf and Otago-Catlins areas underwent a profound change over the period 1769–1950. The abundance of fish, invertebrates, and marine mammals was remarkable to the earliest European visitors and explorers. This was despite a high reliance by Māori, in both regions, around the time of early European contact, on marine fish and invertebrates. An increasing range of fish and invertebrates were exploited once commercial fisheries were established in the 1860s to supply a growing European settler population and, later, rapidly developing export markets. Laws and regulations attempting to control fishing practices were introduced as early as 1866 and continued to be modified throughout the period.

For many of the principal exploited species in both study regions, noticeable declines in abundance occurred in the late 19th century and early 20th century prior to the organised collection of fishery statistics. The historical narratives indicate that the declines were first evident in species such as oysters, grey mullet and flat fishes in sheltered, shallow, easily accessible areas, but later progressed to species with a wider inshore distribution such as snapper and blue cod, or with a deep-water refuge such as groper.

The realisation that exploitation could significantly affect fish stocks was acknowledged at different times for different species by different sectors of the community but action to conserve fisheries was greatly impeded by a lack of consistently collected landings data for most species. Finally, in January 1935, a scheme for obtaining monthly returns of fish landed from every licensed fishing-boat was commenced.

It is clear from the historical records examined in this study that New Zealand has a rich history of marine exploitation in the period before detailed fisheries catch records began, although the information is largely in a form of observations and anecdotes. This study has dealt with only two regions in any detail. Other regions would benefit from an examination of historical source material and collation of the information along the lines undertaken for this study.

In New Zealand, marine species assessment and environmental management it is rare to have information available from before the modern data era (starting in the early 1930s with the nationwide collation of fisheries catch data). Hopefully the historical information contained in this report will start to help remedy the situation.

1. INTRODUCTION

1.1 Background

New Zealand was the last major land mass to be settled by humans, occurring sometime in the period AD 1230–1280 (Wilmshurst et al. 2010). Consequently, New Zealand has a short and reasonably complete archaeological, historical and contemporary record of human exploitation of marine resources compared to most other places, where the earliest evidence of human impacts on marine ecosystems is difficult to discern because of climate fluctuations and changes in sea level over periods of tens of millennia (MacDiarmid et al. 2016). The collaborative multi-disciplinary Taking Stock project (ZBD200505), has the overall objective of determining the effects of climate variation and human impact on the structure and functioning of New Zealand shelf ecosystems over the timescale of human occupation.

To achieve this overall objective the project addresses five specific objectives. Specific Objective 2 is relevant to this report. Its aim is to assess and collate existing archaeological, historical, and systematically collected data (including catch records and stock assessments) on relevant components of the marine ecosystem to provide a detailed description of change in the shelf marine ecosystem in two areas of contrasting human occupation over the last 1000 years. In all, 11 separate reports contribute to addressing this specific objective, each focusing on either a different time period and associated method of inquiry (e.g., pre-European Māori period using archaeological approaches, and the historical period using marine environmental history approaches – see Holm et al. (2010)) or different faunal groups in one or more regions, or New Zealand wide. This report focuses specifically on the historical evidence available from written records for the state and exploitation of the marine fish and invertebrate resources in the Hauraki Gulf and along the Otago-Catlins shelf from 1769 to 1950. We have not summarised historical information on the New Zealand or regional exploitation of marine mammals as this has recently been undertaken by others (e.g., Lalas & Bradshaw 2001, Carroll et al. 2014, Lalas & MacDiarmid 2014, Ling 2002, Richards 2003, Smith 2005, 2011, 2013, Smith et al. 2012, Jackson et al. 2016; Pinkerton 2015).

The Hauraki Gulf and the Otago-Catlins shelf (Figures 1 – 3) were chosen as case studies of the broader New Zealand wide changes as they were both settled by Māori at about the same time, but have since experienced contrasting trajectories in human population size and marine resource use (Smith 2011 and 2013, MacDiarmid et al. 2016). While Māori rapidly explored and settled all the main islands, the Chatham Islands to the east, and as far south as the sub-Antarctic Auckland Islands, the main center of settlement and growth was the northern half of the North Island, including the Hauraki Gulf region, where a more benign climate allowed the cultivation of a greater range of tropically derived crops (King 2003). In 1769 only about 6000 Māori are thought to have lived in the whole of South Island, including the Otago-Catlins region (Pool 1991). European settlement followed a similar pattern (King 2003). Importantly, both the Hauraki Gulf and the Otago-Catlins regions have sufficient archaeological evidence, historic written records, and modern data about marine resource use to reliably indicate the pattern and magnitude of human impacts on the marine environment.

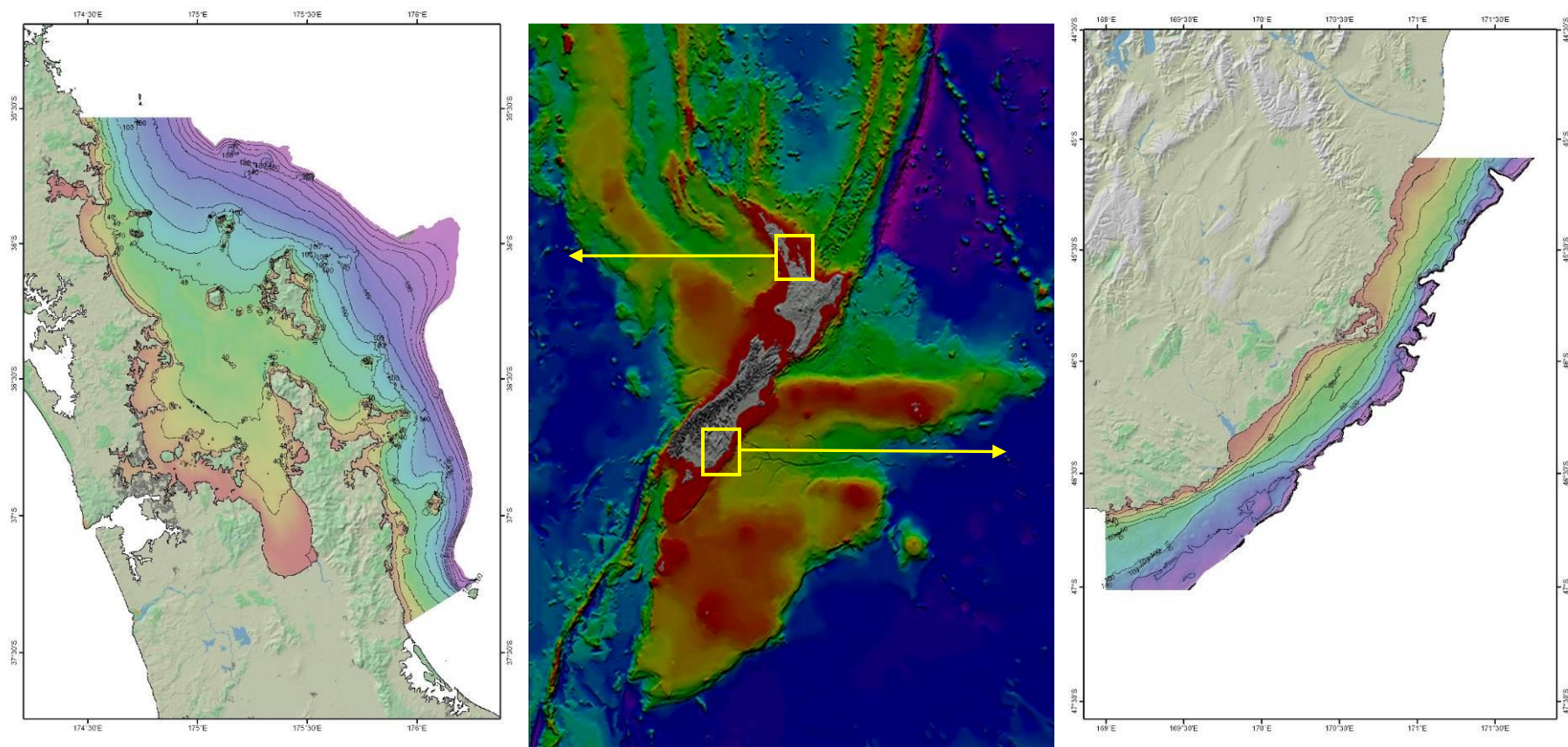


Figure 1: Map of New Zealand (middle panel) indicating the location of the Hauraki Gulf (left panel) and Otago-Catkins (right panel) study regions (coloured bathymetry).

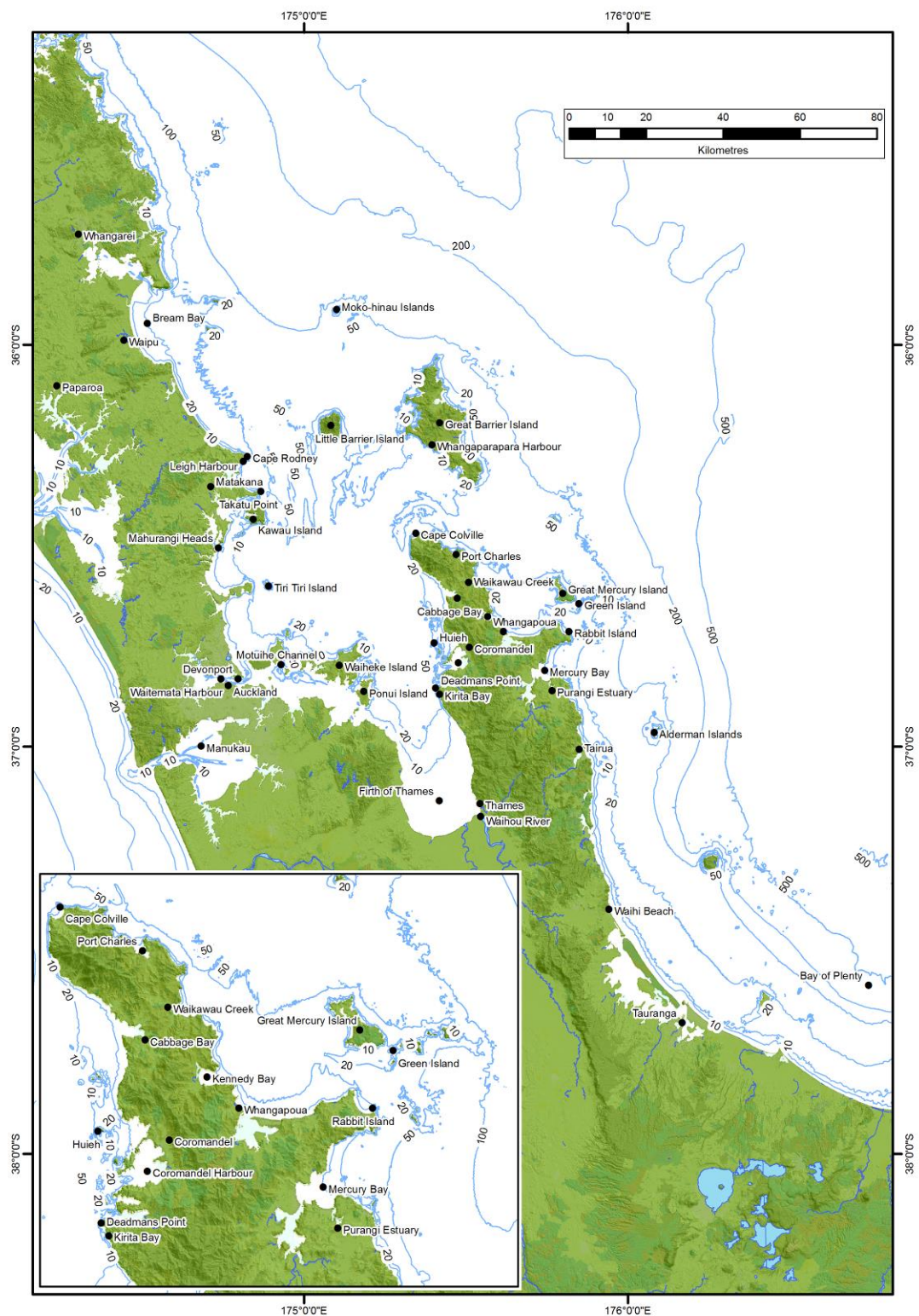


Figure 2: Locations in the Hauraki Gulf study region mentioned in the text.

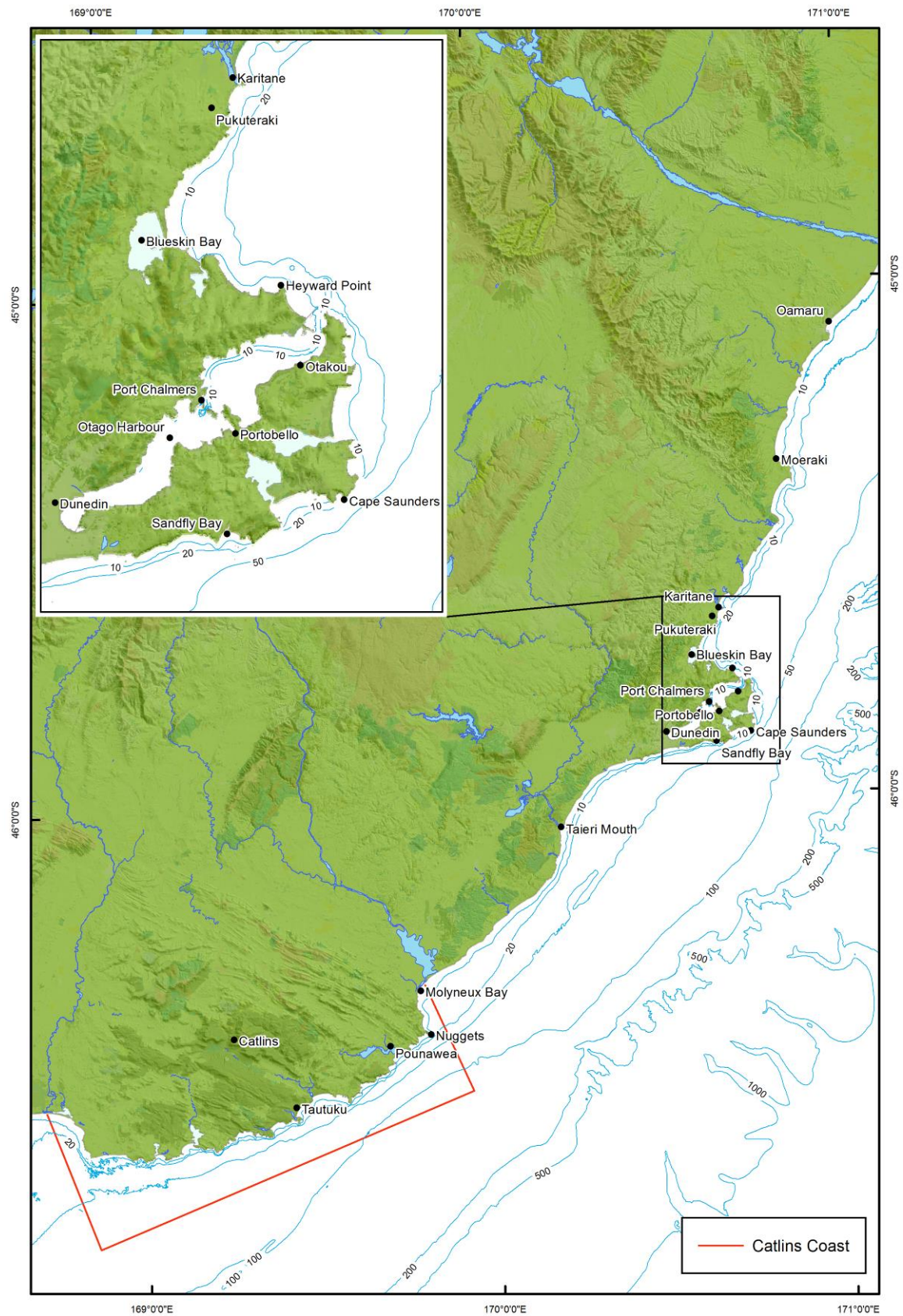


Figure 3: Locations in the Otago-Catlins study region mentioned in the text.

1.2 Overview

Until recently the focus for marine ecological research, stock modeling and fisheries management has been exclusively on the present and the recent past accessible via organized sampling and experimentation, surveys using standardised equipment and protocols, and official catch records (Holm et al. 2010). Historical information not complying with modern data standards has been almost completely inaccessible and unknown to the disciplines for which it might provide an extended temporal context or historical perspective of environmental and species-specific change. Unfortunately, if history and trajectories of change are ignored or unknown then an ecosystem or population is likely to be falsely perceived as being stable and pristine (Hughes et al. 2005). This is the problem of sliding baseline syndrome where the current status of an ecosystem, species or fish stock is assumed to be “normal” by contemporary observers ignorant of its previous states (Pauly 1995, Dayton et al. 1998). This can limit the range of options considered for future management or rebuilding targets.

However, over the last 20 years what is knowable and acceptable as information that can usefully complement quantitative catch or survey data has expanded globally as the new disciplines of historical marine ecology and marine environmental history have emerged (Holm et al. 2001, 2010, Bolster 2006, Gertwagen 2010, Poulsen 2010). It has expanded to include the oral histories of people who participated in marine resource exploitation (e.g., Saenz-Arroyo et al. 2005, Maxwell & MacDiarmid 2016), and it has extended back in time to include notes and journals of earlier explorers and observers. For example, Saenz-Arroyo et al. (2006) used reports by 16th to 19th century travellers to describe the past abundance of marine fauna in the Gulf of California. Similarly, Fortibuoni et al. (2010) coded early naturalists’ accounts, as well as modern landing statistics, into long-term fish community changes in the Adriatic Sea over the period 1800–2000. Recently, Schwerdtner-Manez & Ferse (2010) used extensive analysis of historical documents, many searchable on line, as well as empirical field findings to trace the development of sea cucumber fishing and trading from its beginning 300 years ago in Makassar, Indonesia, until the industrialization of the fishery and worldwide depletion of sea cucumbers in the 20th century. Likewise, Thurstan & Roberts (2010) used government landings data, alongside qualitative and anecdotal information from a variety of historical sources to describe changes in fisheries and the environment of the Firth of Clyde from the second half of the 19th century to the present day. Moreover, Smith (2011) has demonstrated that archaeological data can also be used to extend estimates of catches of particular species into the pre-historical period.

As pointed out by Tull & Polacheck (2001), New Zealand has a useful number of historical sources to draw upon with regard to the state and exploitation of marine resources in the years prior to the establishment of reliable catch histories in about 1931 (McKenzie & MacDiarmid 2012). The journals of Captain James Cook and Sir Joseph Banks from the voyage of the *Endeavour* in 1769 (Beaglehole 1955, 1963) are the first in a series of accounts by early European explorers and settlers which provide observations and anecdotes about Māori use of the marine environment, the abundance and availability of marine species, and the development of commercial and recreational fisheries. Some 78 early New Zealand books published between 1807 and 1932 have been digitized and are searchable on line (Table 1). In addition there are archival and published sources including Waitangi Tribunal Reports and Evidence, Appendices to the Journals of the House of Representatives, and national archives of the Ministry of Transport, Department of Customs, Department of Trade and Industries, Department of Agriculture and Fisheries, Department of Industries and Commerce, Ministry of Works and Development, but especially the Marine Department.

Table 1: Early New Zealand books, by year of publication, available in digital form at www.enzb.auckland.ac.nz.

Year	Author	Title
1807	Savage, J.	Some Account Of New Zealand
1817	Nicholas, J. L.	Narrative of a Voyage to New Zealand
1817	Nicholas, J. L.	Narrative of a Voyage to New Zealand [Vol.II].
1824	Cruise, R.	Journal of a Ten Months' Residence in New Zealand [2nd ed.]
1829	Dillon, P.	Narrative and Successful Result of a Voyage... Vol. I. [Selected chs.]
1829	Dillon, P.	Narrative and Successful Result of a Voyage... Vol. II
1831	Tyerman, D	Journal of Voyages and Travels... Vol. II. [One chapter]
1832	Earle, A.	A Narrative of a Nine Months' Residence in New Zealand, in 1827
1830	Craik, G. L.	The New Zealanders
1834	MacDonell, T.	Extracts from Mr. M'Donnell's MS Journal
1835	Yate, W.	An Account Of New Zealand [2nd ed.]
1836	Marshall, W. B	A Personal Narrative of Two Visits to New Zealand
1838	Polack, J. S.	New Zealand [Vol.I]
1838	Polack, J. S.	New Zealand [Vol.II]
1840	Polack, J. S	Manners and Customs of the New Zealanders [Vol. I.]
1840	Polack, J. S.	Manners and Customs of the New Zealanders [Vol. II]
1840	Ward J.	Supplementary Information Relative to New Zealand
1841	Bidwill, J.	Rambles in New Zealand
1841	Hodgskin, R	A Narrative of Eight Months' Sojourn in New Zealand
1842	Petre, H. W.	An Account of the Settlements of the New Zealand Company [5th ed.]
1842	Wade, W.	A Journey in the Northern Island of New Zealand
1842	Anon.	Latest Information from the Settlement of New Plymouth
1842	Heaphy, C.	Narrative of a Residence in Various Parts of New Zealand
1842	Ward, J.	Nelson, the Latest Settlement of the New Zealand Company
1842	Terry, C.	New Zealand: its Advantages and Prospects as a British Colony
1843	Anon.	Letters from Settlers and Labouring Emigrants
1843	Dieffenbach, E.	Travels in New Zealand [Vol.I]
1843	Dieffenbach, E.	Travels in New Zealand [Vol.II]
1844	Burns, Barnet	A Brief Narrative of a New Zealand Chief
1845	Brodie, W.	Remarks on the Past and Present State of New Zealand
1845	Martin, S. M	New Zealand: in a Series of Letters
1845	Wakefield, E.J	Adventure in New Zealand [Vol.I.]
1845	Wakefield, E. J.	Adventure in New Zealand [Vol.II.]
1845	Wilkes, C.	Narrative of the United States Exploring Expedition Vol. II
1846	Fitzroy, R.	Remarks on New Zealand: in February 1846
1846	Marjoribanks, A.	Travels in New Zealand
1847	Angas, G. F.	Savage Life and Scenes in Australia and New Zealand [Vol I.]
1847	Angas, G. F.	Savage Life and Scenes in Australia and New Zealand Vol.II.
1847-1851	Selwyn, G. A.	New Zealand
1848	Chamerovzow, L. A.	The New Zealand Question
1849	Hursthouse, C.	An Account of the Settlement of New Plymouth
1851	Cooper, G. S	Journal of an Expedition Overland from Auckland to Taranaki
1851	Brown, W.	New Zealand and its Aborigines [2nd ed.]
1851	Fox, W.	The Six Colonies of New Zealand
1852	Barrett, A.	The Life of the Rev. John Hewgill Bumby
1853	Swainson, W.	Auckland, the Capital of New Zealand
1855	Taylor, R.	Te Ika a Maui
1856	Fitton, E.	New Zealand: its Present Condition, Prospects and Resources
1856	Shortland, E.	Traditions and Superstitions of the New Zealanders

1857	Cooper, I. R.	The New Zealand Settler's Guide
1857	Hursthouse, C.	New Zealand, or Zealandia, the Britain of the South [Vol.I.]
1857	Hursthouse, C.	New Zealand, or Zealandia, the Britain of the South [Vol.II.]
1859	Swainson, W.	New Zealand and its Colonization
1859	Thomson, A. S.	The Story of New Zealand [Vol.I]
1859	Thomson, A. S.	The Story of New Zealand [Vol.II]
1863	Maning, F.	Old New Zealand
1863	Scherzer, K.	Narrative of the Circumnavigation... by the Austrian Frigate, Novara [Ch. XIX]
1865	Davis, R.	A Memoir of the Rev. Richard Davis
1867	Williams, W.	Christianity among the New Zealanders
1867	von Hochstetter, F.	New Zealand
1870	Strachan, A.	The Life of the Rev Samuel Leigh
1874	Carleton, H	The Life of Henry Williams, [Vol. I.]
1876	Davis, C. O.	The Life and Times of Patuone
1877	Carleton, H	The Life of Henry Williams [Vol. II.]
1877	Pratt, W. T.	Colonial Experiences
1878	Buller, James	Forty years in New Zealand
1878	Wells, B.	The History of Taranaki
1881	Campbell, J. L.	Poenamo
1883	Rusden, G. W.	History of New Zealand Vol.I
1884	Lady Martin	Our Māoris
1888	Pompallier, J.	Early History of the Catholic Church in Oceania
1888	Barlow, P. W.	Kaipara
1889	Wilson, J. A	Missionary Life and Work in New Zealand
1890	Colenso, W.	The Authentic and Genuine History of the Signing of the Treaty of Waitangi
1895	Wohlers, J. F. H.	Memories of the Life of J.F.H. Wohlers
1907	Wilson, J. A.	The Story of Te Waharoa...Sketches of Ancient Māori Life and History
1908	Webster, J.	Reminiscences of an Old Settler in Australia and New Zealand
1932	Elder, J. (Ed.)	The Letters and Journals of Samuel Marsden

2. METHODS

We searched for historical information relevant to the state and exploitation of marine resources in the Hauraki Gulf and along the Otago-Catlins shelf from a wide variety of sources.

2.1 Waitangi Tribunal Reports

An enormous volume of material by Māori about their use of kaimoana for the period 1840 onwards is available from Waitangi Tribunal Reports (e.g., Bathgate 1992). Some of this material has been summarised and published, notably in the Tribunal's *Muriwhenua Fishing Claim* report (Waitangi Tribunal 1988) and the *Ngai Tahu Fisheries Report* (Waitangi Tribunal 1992) (Appendix 1a).

2.2 Historical books, journals, and memoirs

Other historical sources by early European explorers, visitors, sealers, whalers, fishers and settlers from 1769 onwards also contained material regarding the state and exploitation of marine resources (Table 1, Appendices 1b and 1c). We searched these sources for information on Māori fish catches, fishing techniques, and (predominantly) qualitative impressions of the distribution and abundance of key marine species. Some of this information has been reviewed and interpreted and is available in the contemporary literature. For example, the history of commercial fishing in New Zealand from the colonial period to the present day has recently

been reviewed and summarised by Johnson (2004). Older books summarised information pertinent to particular regions and there is a wide range of observations about mid-to-late 19th century fishing practices in early settler accounts of New Zealand. Graham's (1957) *A Treasury of New Zealand Fishes* includes some excellent descriptions of early colonial fishing in the Otago region. An earlier work by Sherrin (1886), *A Handbook of New Zealand Fishes*, includes similarly useful accounts of early fishing practices in the Auckland region.

Manuscripts held at major repositories (such as Alexander Turnbull Library, Auckland War Memorial Museum Library, and Auckland Public Library) included relevant primary material such as Elsdon Best's notebooks on Māori fishing (Best 1929), as well as early settler and colonial-era accounts of Māori and Pakeha fishing. These institutions also held other relevant material, such as recent analyses of historical fisheries (e.g., Bathgate 1989).

2.3 Official records

Parallel research concentrated on a search of published Marine Department records in the *Appendices to the Journals of the House of Representatives* (AJHR) (from 1869 to 1938) (Appendix 1d). These provided an overview of official views and regulation of the developing fishing industry, as well as some useful aggregated catch data by port of landing for 1930 and preceding years (Supplementary Information S35–45). After 1930, this source provided more useful and accurate data, broken down by species and these data were passed to colleagues preparing separate reports on fisheries catch histories (Parsons et al. 2009, McKenzie & MacDiarmid 2012, Paul 2012, 2014).

Late 19th and early 20th century official records relating to the administration and regulation of fisheries proved a largely untapped but rich source, particularly the voluminous files of the Customs and Marine Departments held at Archives New Zealand in Auckland, Wellington and Dunedin (Appendix 1e). Research focused on the unpublished reports filed with the Marine Department by the District Fisheries Inspectors for the Hauraki Gulf and Otago regions. These reports form the basis of the summary data published in the Marine Department's annual reports in the AJHR. The District Inspectors' original reports, filed with Marine Department archives in Archives New Zealand, contained a great deal more information on fisheries, qualitative reports on seasonal catches, changes in gear, general qualitative data, and species-specific catch records. There was some difficulty in matching data to regions, as the records are drawn from port of landing, rather than district of catch. However, the District Inspectors refer to the fishing grounds being used, and how far out boats have to work to obtain their catches, so in many cases it proved feasible to match a large proportion of the catches to the district being studied. In addition, minutes of evidence relating to early 20th century official inquiries into fisheries, and the records of select committee inquiries into fisheries-related petitions (particularly from Māori), were other valuable and untapped archival sources.

Beyond the District Inspectors' reports, the Marine Department and other record groups at Archives New Zealand in Auckland, Wellington and Dunedin contained a great deal of detailed but highly variable data. Some of the information covered fisheries issues broadly, giving only an overview. Other files contained great detail but only about a very limited topic. Rock oysters in the Hauraki Gulf were, for instance, covered in quite exhaustive detail, because they were a species subject to high early extraction, prompt and relatively strict regulation, and active maintenance and management. There were also a small number of files dealing with a specific species (e.g., crayfish) over a long period. Sometimes the detailed data was very restricted temporally; only covering a single event or a short period. Such files

include records of early inquiries into the fishing industry, and early official reviews of fisheries resources, which were of varying quality and utility. The files also detailed changes in fishing practices and shifts in fishing grounds. This included material relating to the introduction of restrictions such as closed seasons and closed areas.

2.4 Collation of information

We first organised the observations, anecdotes and reported information by area and decade (Supplementary Information S1–17). For each of the most important species or species groups occurring in each of the study areas (Table 2), we further organised the observations chronologically by year (Supplementary Information S18–34). In the results section, we then summarised this information to produce a historical narrative of exploitation for most species groups. As often as possible we used direct quotes from primary sources to convey their impressions as observed. Detailed historical summaries of the exploitation of grey mullet (*Mugil cephalus*), snapper (*Pagrus auratus*), and mussels (*Perna canaliculus*) in the Hauraki Gulf have recently been compiled elsewhere (Paulin & Paul 2006, Parsons et al. 2009, Paul 2012, MacDiarmid et al. 2016) and are not repeated here.

2.5 Interpretation

Historical information must be viewed, judged and interpreted within the context of its time and purpose (White 1973). The diaries, letters and memoirs of those who directly observed or took part in the events of the past provide us with a direct connection with those events but are influenced by the subjective nature of their conclusions. For example, during the early part of the 20th century, seine and line fishermen were bitterly opposed to the expansion of trawling which they blamed for the decline in fish stocks. For this reason, statements from this fishing sector about the ease of fishing prior to the introduction of trawling and its decline afterwards, and opposing views by trawlermen, must be viewed taking into account possible bias. Thus, as often as practical, we have directly quoted the various primary sources, especially when they contained credible factual information. We have attempted to provide information from various primary sources so as to ascertain the degree of conflict and consistency. We gave more regard to events or observations that could be corroborated by a number of sources or were from sources, whom by virtue of their role or job, were required to have a balanced view (e.g., Fisheries Inspectors). Whenever possible we have tried to establish the historical context within which a document was produced or a statement was made. Ultimately, however, we have placed our own, hopefully balanced, interpretation on the available historical information.

Table 2: The most important species or species groups occurring in each of the study areas for which summaries by year were prepared and are available as separately published Supplementary Information.

Study area	Common name	Species	Supplementary Information
Hauraki Gulf	Crayfish		S19
	Red	<i>Jasus edwardsii</i>	
	Packhorse	<i>Sagmariasus verreauxi</i>	
	Flatfish		S20
	Yellowbelly	<i>Rhombosolea leporina</i>	
	flounder	<i>Rhombosolea plebeia</i>	
	Sand flounder	<i>Pelotretis flavilatus</i>	
	Lemon sole	<i>Peltorhamphus</i>	
	New Zealand sole	<i>novaezeelandiae</i>	
	Groper		S21
	Hapuku or hapuka	<i>Polyprion oxygeneios</i>	
	Bass	<i>Polyprion americanus</i>	
	Grey mullet	<i>Mugil cephalus</i>	S22
	Mussels	<i>Perna canaliculus</i>	S23
	Rock oysters	<i>Saccostrea commercialis</i>	S24
	Snapper	<i>Pagrus auratus</i>	S25
	Tarakihi	<i>Nemadactylus macropterus</i>	S26
Otago-Catlins	Barracouta	<i>Thyrsites atun</i>	S28
	Blue cod	<i>Parapercis colias</i>	S29
	Crayfish	<i>Jasus edwardsii</i>	S30
	Flatfish		S31
	Yellowbelly	<i>Rhombosolea leporina</i>	
	flounder	<i>Rhombosolea plebeia</i>	
	Sand flounder	<i>Rhombosolea tapirina</i>	
	Greenback flounder	<i>Colistium nudipinnis</i>	
	Turbot	<i>Peltorhamphus</i>	
	New Zealand sole	<i>novaezeelandiae</i>	
	Groper		S32
	Hapuku or hapuka	<i>Polyprion oxygeneios</i>	
	Bass or Moeone	<i>Polyprion americanus</i>	
	Red cod	<i>Pseudophycis bachus</i>	S33
	Tarakihi	<i>Nemadactylus macropterus</i>	S34

3. RESULTS

3.1 General historical accounts of fish and fishing in the Hauraki Gulf

The following summary is compiled from the information compiled in Supplementary Information S1–8 and S18. Key events are compiled as a timeline in Table 3 on page 20.

Early European accounts of fish abundance

The earliest European explorers gave accounts of a great abundance of marine fish and invertebrates almost everywhere they visited. For example, Sir Joseph Banks, a notable participant in Captain James Cook's first voyage to New Zealand, in 1770 remarked that '*For this scarcity of animals on the land the Sea however makes abundant recompense. Every creek and corner produces abundance of fish not only wholesome but at least as well tasted*

as our fish in Europe: the ship seldom anchor'd in or indeed pass'd over (in light winds) any place whose bottom was such as fish resort to in general but as many were caught with hook and line as the people could eat, especially to the Southward, where when we lay at an anchor the boats by fishing with hook and line very near the rocks could take any quantity of fish; besides that the Seine seldom fail'd of success, insomuch that both the times that we anchor'd to the Southward of Cooks streights every Mess in the ship that had prudence enough salted as much fish as lasted them many weeks after they went to sea' (Beaglehole 1963).

On 15th November 1769 Captain James Cook travelled up the Purangi Estuary behind Cook's Beach on the eastern shores of the Coromandel Peninsular where he observed, *'The best anchorage is in a sandy bay which lies just within the south head . . . here it is very convenient Wooding and watering, and in the River are an immense quantity of Oysters and other small shell fish, and this is the only thing it is remarkable for and hath occasioned my giving it the name of Oyster River'*. Later that month he sailed north up the coast where, *'At half past 7 PM we Anchor'd in a bay in 14 fathom water a Sandy bottom. We had no sooner come to an anchor then we caught between 90 and a hundred Breems, (a fish so called) this occasioned me giving this place the name of Bream Bay'* (Beaglehole 1955).

Joseph Banks also remarked upon the fishing at Bream Bay. *'At night we came to an anchor in a small open bay; our fishing lines were tried and we soon caught a large number of fish which were call'd by the seamen Sea bream, as many as I believe the ships company could eat in 2 days'* (Beaglehole 1963).

Nicholas (1817), in his *Narrative of a Voyage to New Zealand* [Vol.II], in 1814 and 1815 includes general observations on the great abundance of fish around New Zealand. On page 257 he writes, *'During the short stay which I made in this interesting island, I had repeated occasions to observe the great abundance of fish that everywhere visited the coast; and, indeed, so immense a supply is here provided for the use of man, as must inspire him with admiration and gratitude for the liberality of nature. Nor is the profusion more remarkable than the variety; and there is no part of the world where the epicure who understands the qualities of this species of food, could more readily select a treat for his discriminating palate, than on the shores of New Zealand.'* Sailing round the whole extent of coast, he found as he proceeded, [page 258] *'shoals of the most excellent fish; and I must observe, that while we remained here, our table was not only plentifully but luxuriously supplied'*.

Cruise, in his 1824 book *Journal of a Ten Months' Residence in New Zealand*, sailed the northeast coast of the North Island. He noted on page 222, *'At nine, having cleared all the islands, and being in the great channel between Point [Cape] Rodney and Cape Colville, altered course to N. W. and by N. At ten the wind became very light, and at twelve it fell calm. We now threw out our fishing lines, and in a short time caught as much snapper (many of which weighed from twelve to fourteen pounds) as we could possibly make use of in several days.'*

The missionary Henry Williams, in November 1831 sailed down the eastern shore of Great Barrier Island. Here he observed, *'No appearance of natives on the Island – all killed or dispersed. . . . There are numbers of small rivers and bays, and timber in every part of the Island, and fish in the greatest abundance.'* His party then headed west towards modern Leigh. *'At five we rounded the north head of the Thames [Cape Rodney], and entered a small deep cove [Leigh Harbour], which was as quiet as a fishpond, with trees on either side growing down to the water's edge; anchored in three fathoms water, which was beautifully*

clear, with sandy bottom, shewing the fish in great numbers, while the birds were singing most delightfully in the bushes. We went on shore to stretch our legs, which was a great relief. All soon at work cutting wood, gathering oysters, and shooting bird' (Carleton 1874).

Two years later, on Christmas day 1833, another missionary, J.A. Wilson, left Whangarei for Omaha Cove (Leigh). He wrote, *'The weather perfect. Standing before a fresh sea breeze, we passed at times through shoals of kahawai, in places covering the whole surface of the water. In these immense gatherings the fish appear in millions. They are finely formed, a model of symmetry, and are something like the mackerel. In the evening entered the more than pretty little cove of Omaha, which is well sheltered except from the east. The rocks here were covered with oysters, and so also the branches of the trees which dip in the water'* (Wilson 1889).

William Yate, in his 1835 book *Account of New Zealand*, made some general remarks on the abundance of fish and shellfish in harbours between the Bay of Islands and Auckland. He noted that, *'With the exception of the Bay of Islands, none of these ports are generally known, as no charts or descriptions of them have hitherto been published. A few Europeans, expressly trading to some of them, are the only civilized people perfectly acquainted with them. All the ports abound in fish and oysters.'* Similarly, Polack (1838) commented, *'The rivers [harbours] are abundantly supplied with shoals of fish, including small sharks: oysters and other shell-fish are also to be found in abundance'*.

Bidwell (1841) describes visiting Coromandel Harbour. *'There are not many anchorages in the Thames, and but three places which can be considered harbours: the one called Coromandel harbour The shores are all very rocky and covered with trees, but the cliffs are not in general high, and are always very rugged; those at the water's edge are covered with oysters in a most extraordinary manner; generally they are more than a foot thick, and very good; other shell-fish are also abundant, particularly Cockles--of these I have seen more than a man could carry collected by one woman during the space of a tide; Scallops are also tolerably abundant, and are most delicious eating. There are no Lobsters nor Crabs, but a great abundance of fish of all kinds; one, the Salmon of the English, or Carwai (Carwhy) [kahawai], is a most excellent fish, the best I have tasted in the southern hemisphere; it is about the size of a salmon, and so like it in figure, fins, &c., that I should think it must belong to an allied family. Flat-fish are also more abundant than they usually are on these coasts, but I have never tasted any equal even to a Plaice.'*

Similarly, Angas (1847) visited Kawau Island. *'The coast is rocky, and indented with many picturesque and sheltered bays, that terminate in sandy beaches. Nothing can exceed the loveliness of some of these fairy-like bays: the water, sheltered on all sides by the steep hills, is clear and blue, and so transparent that the fish may be seen sporting in thousands through the cool element . . .'*

Earp (1853) observed that, *'... the harbours abound in fish – abound is a poor word for it: they are literally alive with fish. M—— and myself now live almost entirely on them at every meal; they are delicious, and in great variety. We have a fish here exactly like the salmon, and of as good flavour. On a sunny morning the surface of the harbour is a complete mass of fishy life.'*

Early European observations of Māori fishing

The early explorers and visitors frequently observed Māori fishing techniques and use of seafood and sometimes traded with Māori for seafood. For example, Captain James Cook, at Mercury Bay 6 November 1769 noted, *‘I went to another part of the Bay to haule the sene but met with as little success as before and the Master did not get above half a Bucket full of shells with the dridges. The Natives brought to the Ship and sold to our people, small Cockles, Clams and Mussels enough for all hands, these are found in great plenty upon the Sand Banks of the River. In the Morning I sent the Long-boat to Trawl in the Bay, and an officer with the Marines and a party of men to cut wood and hale the sene, but neither the sene nor the Trawl met with any success, but the natives in some measure made up for this by bringing several baskets of dry’d or ready dress’d fish’* (Beaglehole 1955). A few days later Cook again noted in his journal, *‘As soon as it was day light the Natives began to bring off Mackarel and more then we well know’d what to do with’*. On 24 November 1769, while exploring the Waihou River, Cook observed a method of catching fish, *‘We saw poles stuck up in many places in this River to set nets for catching of fish, but of what sort we know not for we saw more’*.

Sir Joseph Banks made several journal entries about the large seines Māori used to fish for various species. In 1770 he remarked that *‘For the Sorts, there are Macarel of several kinds, one precisely the same as our English ones and another much like our horse macarel, besides several more; these come in immense shoals and are taken by the natives in large Seines from whom we bought them at very easy rates’* (Beaglehole 1963). Similarly, on 4 December 1769 in the Bay of Islands, *‘...and after having a little laught at our seine, which was a common kings seine, shewd us one of theirs which was 5 fathom deep and its length we could only guess, as it was not stretchd out, but it could not from its bulk be less than 4 or 500 fathom [730-914 m]. Fishing seems to be the cheif business of this part of the countrey; about all their towns are abundance of netts laid upon small heaps like hay cocks and thatched over and almost every house you go into has netts in it making’* (Beaglehole 1963). Thomson, in his 1859 *Story of New Zealand*, tells that some of the seines used by Māori were 1000 yards long and required 500 people to draw them properly.

Nicholas, in 1817, described Māori use of seafood. *‘The fish, however, which are in common use among the natives, are snappers, bream, the beneecootoo, the parrot-fish, cray-fish, the herring, the flounder, and a fish resembling the salmon, but much inferior to it in flavour. In some of the coves were large flats, which, at low water, had beds of cockles, muscles and other shellfish. The muscles were of immense size, and the natives relished them exceedingly’*.

In 1819 the missionaries Samuel Marsden and John Butler, Butler’s family and two Māori chiefs, Tuhi and Titore, were on route to the Bay of Islands from Sydney on board the American brig, the *General Gates*. Close inshore off North Cape they sighted and passed close by a fleet of canoes with the occupants fishing with short lines. Tuhi spoke with the Māori anglers who explained that they were fishing for swordfish, which they would dry and keep for winter use. Drying platforms could be seen on the adjacent shore (Sharp 1958).

In 1833 the missionary J.A. Wilson on a sailing trip south to the Thames area was forced to take shelter in Paroa Bay, in the Bay Islands. *‘Here we found natives fishing for kahawai, and preserving large quantities for winter use. They were nearly all heathens, but they received us kindly and gave us a liberal supply of fresh and dried fish’* (Wilson 1889). Further south, between Whangarei and Cape Rodney, he and his party sailed through great schools of

kahawai. He wrote, *'In going through these shoals the natives row quickly, and throwing a cleverly made artificial bait overboard, generally catch some'*.

In 1840 J.S. Polack wrote of Māori fishing practices generally. *'Fishing consumes much of the time of these people, who undertake the art in large parties, the entire inhabitants of several villages joining forces to engage in this piscatory warfare; for this purpose, they repair to the sea-girt shores, or to the sides of the numerous bays that imbricate the coast and harbours of this favoured country. Fishing for young sharks is confined to the southward, principally on the east coast, and especially in the Firth of Thames.'* Polack (1838) added, *'In the river Thames, during the season for catching sharks, the banks are occupied by numerous fishers'*. Other observers provided more detail of the actual process. For instance, during an eight month visit to New Zealand, Hodgskin (1841) observed Māori fishing and preserving fish on the western side of the entrance to the 'Firth of Thames'¹ (probably Kawau Bay). *'This part of the country was but thinly inhabited; but numerous natives, from the neighbouring tribes, resort here in the fishing seasons [Hodgskin visited in January] for the purpose of catching and drying fish, and procuring oil from the livers of the fish. The skin of the sting ray serves the purpose of a bladder for containing the oil. I purchased several gallons for the use of our ship's company, and found it burn remarkably well.'* Hodgskin also observed fish drying techniques. *'Large quantities of the horse mackerel are annually caught, and dried by the natives in a peculiar manner, without the use of salt; they keep good a long time, and are an agreeable relish for breakfast; but I did not see any of the real mackerel, although the coasts and harbours are full of excellent flavoured fish, and wherever we anchored we generally caught as many as we could make use of with hook and line; when we hauled the net we caught abundance of fine mullet, soles, and other flat fish, for the use of our men working in the forests; but we could purchase them so cheap from the natives that they were hardly worth the trouble of catching.'*

Ferdinand von Hochstetter (1867) visited the North Shore of the Waitemata Harbour (Auckland) in 1859. *'Our object was, to visit and to examine the most easterly of the three cones, called Takapuna [North Head] by the natives.'* ...*'In passing along the beach, we came to a kind of scaffold about 30 feet long. Our organs of smell betrayed to us at a considerable distance its object. A long row of fish, sharks and other kinds, were suspended from it to dry, tossed to and fro by the wind and promising the natives a favourite dish for the winter with a great deal of "haut gout." Fat pigs and lean dogs were running about; and farther on, there were some Māori huts...'*

Beginnings of a commercial fishery

After the signing of the Treaty of Waitangi in 1840 Māori supplied a growing European settler community with fresh fish. Hursthouse (1857) reports this burgeoning trade. *'In three months, in 1853, there visited Auckland alone (but Auckland is the chief seat of the native trade) 442 canoes, navigated by 1592 men and 590 women, bringing produce to the value of nearly £4000.'* This trade included 5 ½ tons of fish and 18 kits of oysters. The settlements in Auckland, Thames and Whangarei grew rapidly from about 1850 and commercial fisheries soon established to supply the local market.

¹ It appears that for a period during the first half of the 19th century the Firth of Thames was used to generally describe the body of open water between Cape Colville, at the northern tip of the Coromandel and Cape Rodney, south to the Hauraki plains.

In 1885 J. McKenzie provided details of a brief assessment of New Zealand's fish stocks and the potential for commercial exploitation to Julius Vogel, Premier (Martin 1969). *'I carefully fished the Firth of Thames, round Cape Colville to Port Charles, Kennedy Bay, and Mercury Bay; found plenty of firm, delicate fish, the snapper being the only large fish that could be got in anything like large quantities. Examined the coast northwards as far as Whangarei Bay; found snapper, mullet, kahawai, and bream of fine quality; but as the weather was so bad I did not devote much attention to this locality, further than to satisfy myself that fish of countless millions frequent the neighbourhood of Great and Little Barrier Isles, and the Firth of Thames'* (Martin 1969). In the same year Dr Hector wrote to Julius Vogel commenting that that knowledge of fishes round New Zealand is imperfect, particularly in respect of deep-sea fish. His letter provides details of the fish species mentioned in the regulations issued under the Conservation of Fisheries Act 1884; including: hapuku, kahawai, snapper, tarakihi, trumpeter, moki, barracouta, horse mackerel, trevally, kingfish, warehou, mackerel, rock cod (blue cod), gurnard, grey mullet, butterfish, red cod, flounder, soles, garfish, and yellow eyed mullet.

In 1888 regulations under the Fisheries Conservation Act 1884 and the Fisheries Conservation Amendment Act 1887 were passed prescribing the minimum size or weight at which fish may be taken for 21 species. The weights appear very low but this may indicate the extent to which very small fish were being captured. For instance the minimum weight of snapper that could be caught was 1 lb (about 0.45 kg) and tarakihi only 4 oz (113 g). Further regulations in 1893 and 1894 adjusted the minimum landed weights for kahawai, blue cod, rock cod and red cod.

In 1901, experimental trawling was undertaken by the government using the steam trawler *Doto*. L.F. Ayson, Chief Inspector of Fisheries (AJHR 1900 and 1901) reported that, *'in and around Hauraki gulf good hauls of marketable fish were made on every occasion....- hauls were especially good in the Firth of Thames, where fish appear to be particularly plentiful and of good quality....exhaustive tests were made in all parts of the Gulf with suitable bottoms to Great Barrier Island on one side and along the coast to Whangarei on the other...the hauls sufficiently encouraging except in Motuihi Channel, Whangaparapara Harbour, and the vicinity of Whangarei.'*

In 1902, the Chief Inspector of Fisheries went to Auckland to consider the question of whether trawling should be allowed in the Hauraki Gulf and Firth of Thames. He decided that for a time trawling should be prohibited in the Firth of Thames and a portion of the Hauraki Gulf.

The 1907 Marine Department Annual Report (AJHR 1907) noted that *'Manufacture of fertilisers from fish is now carried on at three places in the colony, including Matakana [at Sandspit on the mainland opposite Kawau Island] and deserves encouraging. It also leads to the destruction of large numbers of sharks, dog-fish, etc., which now infest some of the fishing grounds, and which, up to recently, have been allowed to increase unmolested to the great destruction of market fish.'*

On 24 April 1907, the Governor in Council fixed trawling limits in the Hauraki Gulf. The prohibited area was bound on the north by a line extending from the north head of Cabbage Bay (Coromandel Peninsular) to the southernmost point of Tiri Tiri Island, and thence to the mouth of the Matakana River.

Fisheries Commissions and Inquiries

In 1919 a Royal Fisheries Commission sat at Auckland, Thames, and Helensville to hear evidence concerning trawling restrictions in the Gulf and other matters relating to fish and fisheries. At that time trawling was prohibited from a line starting at Matakana in Kawau Bay and extending from there to the southernmost point of Tiritiri Island, and from that point to Cabbage Bay on the western side of the Coromandel Peninsular.

The evidence presented to the Commission about the effects of fishing on fish stocks and the environment in the Hauraki Gulf varied considerably (AJHR 1919). At one extreme was Gilbert Sanford, of Sanford Fisheries, who presented his company's point of view on 10 March 1919. *'We consider that man or his methods cannot fish out the sea, nor make any impression on what nature has provided in our vast extent of waters throughout the world.'*...*'We do not want Thames schnapper on account of their quality. The Thames gulf is overstocked, and it would be a good thing to allow the trawlers to thin the fish out. If a number of Thames men say that the quantity of fish is being reduced, and attribute it to the trawlers, I say the Thames men would swear to anything. . . . I do not agree that the fish can be depleted or decreased in numbers. I consider that fish breed too fast, and ought to be caught to keep th number down. I do not think 100 trawlers in this gulf would make any difference. Starvation would keep them down if they were not caught. I do not think the trawlers make food for the fish, but by stirring up the mussels they allow the young mussels to grow. . . . If the trawlers are sent further I think the fish in the inner waters will starve, just as they do in Cabbage Bay, by depletion of the food supply. It has not been proved that trawlers can deplete fish supplies in any other part of the world.'*

Another with a similar point of view was Axel Nilesen, Master of the trawler *Countess*, who had had 20 years of experience of trawling in New Zealand. *'An increase in the number of trawlers would improve the fishing in the gulf. We create more food for fish by clearing the ground for them. The continuous trawling over a given area does not, in our experience, seem to have reduced the food supply for the fish. I have seen as many as half a basket of horse mussels brought up at times when the trawl was not working properly. I have seen as many as three baskets. We now get one occasionally. If we pulled the horse mussels off the bottom we should have the net full of them, but we only skim the bottom. When we used to get them we had the trawl fixed for smooth bottom. Now we have the trawl fairly high, and do not get the mussels.....Bad weather and the desire of the fish to get away from disturbed water may account for the fish disappearing from places where they have been found in quantity.'*

Similarly, Richard Nixon, an Auckland based fisherman and owner of the steam fishing boat *Whakapara*, stated to the Commission that he *'doesn't believe that the fishing destroys the feed, if anything improves it by clearing the bottom....I do not think any importance can be attached to the alleged destruction of mussels by the trawlers. There are hundreds of thousands of tons of mussels in the gulf.'*

A different perspective was provided to the Fisheries Commission by Hammond & Cracknell acting for settlers and others residing on the shores of the Hauraki Gulf between Mahurangi Heads and Takatu Point. *'Previously to the advent of trawlers in the waters between the Mainland and Kawau, fish abounded and the settlers could rely upon catching whatever they required. The Trawlers have worked here at intervals, even as far as possible into the smaller bays, and now it is impossible to get a reasonable catch. Not only have the fish*

almost disappeared but what remain are small and the feeding grounds are apparently seriously disturbed.'

James Moir, Auckland City Health Officer and recreational fisher with a great interest in fishing, presented his opinion to the Commissioners. *'I have no doubt the supply in the Gulf has been reduced in the last 20 years. The decrease has been gradual. . . . I attribute the decrease to the trawler. I am sure it is the cause.'*

Line and net fishermen also put the view to the Fisheries Commission that it was trawling that had caused the decline in fish stocks in the Gulf. Hugh Farcelly, fisherman at Thames and owner of the *Ila*, stated that *'Five years ago we could rely on getting quantities of fish at Cabbage Bay [western shore of Coromandel Peninsular]. That was before the trawlers began. You could not get a fish there now.'* Similarly, William Payne, a fisherman at Thames for 40 years, observed, *'Fish are not as plentiful in the gulf as formerly. More nets are now needed than formerly to catch a given amount of fish. The number of nets per boat has increased from two to about sixteen....I cannot say when it was that the supply of fish in the gulf began to decline, but I know that when the trawler came in it was difficult to get 3 or four dozen fish, hooking, per day.'* William Jones, a line fisherman at Auckland, owner of *Petrol* and President of the Northern Fishermen's Union, recalled that, *'The school fish used to come into the gulf every year until the advent of the trawler. From about the 1st November till the end of January you could take great quantities of fish with hand lines, and most of them would be bursting with roe. You cannot catch the fish in such quantities now.... They [trawlers] catch a great quantity of small fish, so that they have no chance to grow. That is an important element in the depletion.'*

Jones was concerned not only by the volume of catches by the trawlers but also by the damage to the seabed. *'I went on them [trawlers] to learn trawling. I understood it was the very latest way of catching fish. I find that it is the latest way of destroying them. The trawler destroys an important proportion of small fish. . . . I say the trawlers have seriously destroyed the feed wherever they have trawled... Disturbing the ground provides at the time more food for the large fish, but it destroys the small fish. The weight of the trawl must destroy the small fish sheltering on the bottom. . . . When I was on the *Simplon* [a large steam trawler] we brought up about ten to 12 baskets of mussels and other sea growths to the haul of the trawl. We got most mussels close to the limit line.'*

L.H. Gresham also presented evidence as to the effects of trawling on the seafloor. *'Formerly large quantities of mussels were taken in the net, now very few mussels but principally mussel shells. The boards of the Trawl bury themselves deeply when trawling (I measured six inches of mud on the board) and with the heavy foot rope measuring 80 feet in length stretched taut from board to board plow up the bottom to such an extent that the food the fish are looking for is destroyed and has no chance to grow. // The writing is on the wall and is easy to read. If the Trawlers keep on scouring this ground as they have been doing for the past 3 years there will soon be no fish but only empty mussel shells.'*

Gresham also noted another threat to fish stocks and the environment. *'Constant reports are being received that fish are being dynamited. Under the present law it is very difficult to obtain a conviction of any person thus transgressing. A man may bring in a boat full of dynamited fish but nothing could be done to him unless he was caught in the act.'*

To enable some independent view of the state of fish stocks in the Gulf, the Fisheries Commissioners spent a day trawling in various parts of the Gulf on board the trawler *Baroona*. James Bennett, Inspector of Fisheries for the Auckland District and with 50 years of experience of the Gulf stated, *'I was quite satisfied by the single day's trawling in the Baroona that there had been a tremendous depletion in the supply of fish..... Fish are very scarce in the whole Gulf from the line man's point of view.... As to parts of the gulf that I consider well stocked with fish, just now, I cannot point to any that I would so class. I am speaking now of my own experience.'* He did not ascribe the whole of the problem to trawling however. *'I have found that the Thames [net] fishermen destroy a large quantity of small flounder. Generally he works on till the tide is too low for his dinghy – practically until the nets are stranded. . . . The fish are not as a rule bundled up till the tide has gone. Then the boat is taken alongside the launch for the purpose. The small fish are then thrown overboard. If they are alive they get away. . . . The small fish brought up in a trawler are returned, I should say, much more quickly than those taken in the net. . . . Another cause of destruction of fish in the gulf is the use of dynamite. Previous to trawling being started the line fishermen did a lot dynamiting. The proportion of fish recovered to those destroyed and lost through dynamite is small. A vast number sink.'*

Similarly, Francis Flinn, Inspector of Fisheries for the North Auckland District, stated to the Fisheries Commission, *'I do not say that the trawlers have depleted the fish – they have gone down gradually. If there has been a gradual depletion since 1896 there is no reason to ascribe the depletion wholly to the trawlers, but the depletion has been more rapid in their time.'* This point of view was largely supported by L.F. Ayson, Chief Inspector of Fisheries. *'There has been a gradual diminution for many years, but whether it has been greater since the trawlers started I am not in a position to say. If the fish were there I should expect the line men to catch them..... If the trawlers came inside the present limits, I consider that they will destroy the young fish...'* *'I consider that it is inadvisable that, taking everything into consideration, trawling should be allowed inside the present limits.'*

The Royal Commission on Fisheries concluded that *'The evidence shows fairly conclusively that fish cannot now be caught in the Gulf by the line and net fishermen with the same ease with which they were caught many years ago; but the evidence also shows that this great difficulty in catching the fish was noticeable even before the advent of the trawler, and the evidence that the trawlers have had any great part in producing the state of affairs is far from conclusive. Undoubtedly, however, the trawlers have had some part in bringing it about, and if in trawling well up into the Gulf the greater part of their catches consists of moderate sized fish, it follows that more fish will be destroyed than if the same weight of larger fish were taken. If, as seems quite clear, the shallower waters of the bays and inlets are inhabited by small fish, it is to be expected that trawling waters anywhere in their vicinity will lead to the catches containing a considerable proportion of smaller, even if not undersized, fish.'* The commission recommended that the line banning trawling in the inner Gulf be fixed from Mahurangi Heads to Shearer Rock, off the north-east point of Tiritiri, and thence to Cabbage Bay on the western side of the Coromandel Peninsula.

Table 3: Time line of key observations or events affecting the Hauraki Gulf and/or the Otago-Catlins coast during the historical period 1769-1950. Compiled from material compiled in Supplementary Information S1-S18 and S46, and from Appendices 1 and 2 in Paul (2014).

Year	Hauraki Gulf	Otago-Catlins coast
1769	Captain James Cook, Sir Joseph Banks and crew explore NZ	
1817	John Nicholas publishes his two-volume account of a voyage to NZ in 1814–15	
1824	Richard Cruise publishes his account of a cruise to NZ in 1817	
1840	Treaty of Waitangi is signed	
1840	Auckland city is founded	
1841	Māori supply European settler community with fresh fish	
1848		Dunedin city is founded
1850	Commercial fisheries established to supply a rapidly growing population in both regions	
1868		First trawling in New Zealand undertaken in Otago Harbour by the <i>Redcliffe</i> . Lasts less than a year
1869		Report by the Commissioners for Otago into state of fisheries
Early 1870s	Export of fresh rock oysters to Sydney and canning of grey mullet commence	
1877	Fish Protection Act establishes the principles for regulating New Zealand's fisheries, such as closed areas and seasons, gear restrictions, the imposition of penalties for infringements. Marine Department established.	
1878	Fisheries Dynamite Act 1878, prohibits dynamiting fish in the sea and fresh water	
1882		New Zealand Deep Sea Fishing Company, operating out of Port Chalmers, briefly trawled with a steamer before winding up
1884	Fisheries Conservation Act 1884. Consolidates previous legislation and introduces more specific regulations on minimum sizes, closed seasons, and fishing methods.	
1885	Fisheries Encouragement Act 1885. Provides for the establishment of fishing towns and villages, and promotes (via a financial bonus) the export of canned and cured fish.	
1888	Regulations define mesh size for general seine nets, garfish nets and herring [yellow-eyed mullet] nets. Defines minimum weight or size (length) for 21 fish species.	
1897	J. Hector report on the protection of grey mullet published	
1899	<i>Minnie Casey</i> begins trawling in the Hauraki Gulf	Otago Trawling Company begins bottom trawling using the chartered <i>Napier</i> .
1900	Government trawler <i>Doto</i> begins exploratory bottom trawling around NZ	
1902	Trawling prohibited in the inner and much of the central Hauraki Gulf	Report of Inspector of Fisheries on Trawling at Port Chalmers
1903	Regulations under the Sea-fisheries Act 1894 revises size limit for sand flounder, and closes season (Oct–May) for this species in Auckland waters. Trawl net mesh size defined.	
1904	Owners of <i>Minnie Casey</i> prosecuted for trawling in closed area and trawling in the Gulf ceases until 1915.	Portobello Marine Hatchery established to boost local production of flounder and sole
1906	Regulations under the Sea-fisheries Act 1894 defines an area of the inner and central Hauraki Gulf closed to trawling.	
1907	Regulations under the Sea-fisheries Act 1894 revise the area of Hauraki Gulf closed to trawling	
1907	Government trawler <i>Nora Niven</i> surveys fishing grounds from Stewart Island to Bay of Plenty and Chatham Islands	

- 1907 New Zealand Governmental takes control of the rock oyster beds in the entire country
- 1908 Fisheries Act 1908 consolidates previous legislation, establishes administrative framework that survives in broad form until 1983, and more formally claims jurisdiction over a Territorial Sea to 3 miles offshore.
- 1912 Blue Cod Commission sits to decide on regulations for this fishery
- 1915 Trawling in Hauraki Gulf recommences
- 1919 Royal Fisheries Commission focussed on fisheries in the Auckland region, especially on restricted areas for trawlers, trawl mesh size, industry-imposed limits on fish landings, and the price of fish to the public.
- 1929 Report on the fisheries of the Hauraki Gulf by AE Hefford, with special reference to the snapper fishery and to the effects of trawling and Danish seining
- 1930 Catch log books issued to the skippers of fishing boats working the Hauraki Gulf.
- 1932 Export fishery for crayfish to London starts in both regions
- 1934 Export fishery in Hauraki Gulf ceases
- 1935 Monthly returns of fish landed from every licensed fishing-boat becomes mandatory for New Zealand
- 1937 Report by the Sea Fisheries Investigation Commission inquired generally into New Zealand's fisheries, but with specific reference to the Hauraki Gulf.
- 1937 Export fishery for crayfish along Otago coast collapses
- 1939– Trawling in Hauraki Gulf ceases during
- 1944 WWII as trawlers were seconded to the Navy
- 1945 Trawling resumed in Hauraki Gulf

3.2 Hauraki Gulf: species summaries

Crayfish

The following summary is compiled from the information collated in Supplementary Information S19. For a timeline of key events see Table 3 on page 20.

Māori fishery

The earliest accounts by Europeans indicate the ease at which Māori fished for crayfish. Elsdon Best (1929) in his report *'Fishing Methods and Devices of the Māori'* recounts Captain Cook's description from 1769. *'These [crayfish] we also brought everywhere to the northward in great quantities of the natives, who catch them by diving near the shore and finding out where they lie with their feet.'* Almost 100 years later at Great Mercury Island, Cameron Buchanan, aged 14, observed Māori catching crayfish *'of which there are quite a lot in the seaweed that fringes the beaches and reefs around the Island'* (Anon 1977) in an identical manner. *'The Māori felt for the crayfish with their feet, then reached down and caught them by their feelers and threw them onto the beach. In about 20 minutes, they caught about 12-15 crayfish.'*

Trawl fishery

Today we usually associate crayfish with rocky reefs but the earliest steam trawlers commonly caught crayfish on open trawlable ground. For example, the steam trawler *Doto* undertook exploratory fishing around the North Island in 1901. In 29 hauls off the coast from Whangapoua on the east coast of the Coromandel Peninsula and in the Hauraki Gulf, including the Firth of Thames, crayfish is listed among the catch in the report by L.F Ayson, Inspector of Fisheries. Similarly, in December 1915, from beyond the closed waters of the immediate Hauraki Gulf, one of Sanford's three trawlers landed a six-ton catch that included crayfish. In 1951 a Marine Department report indicated that the methods of fishing for crayfish had changed with trawlers more actively hunting for crayfish.

Inshore fishery

In 1916, Marine Department records indicate that most of the crayfish landed into Auckland for the domestic market originated from Great Barrier Island. In 1928, 30 Auckland based vessels were engaged in crayfishing, while at Mercury Bay on the east coast of the Coromandel Peninsular several boats fished only for crays. By 1933 an export trade to London was established with 2146 cwt (109.4 t) of frozen crayfish and 168 920 cwt (8615 t) of tinned crayfish exported in the 11 months to November of that year. But by 1934 the export trade had languished.

In 1937 crayfishing was part of the remit of the Sea Fisheries Investigation Committee. Experienced fishermen from Mercury Bay and Waihi Beach on the eastern side of the Coromandel Peninsular reported that supplies were not being diminished by the existing fishing levels, and indeed, had stood up fairly well to the heavy extractions of up to 25 tons per week during the short time the export trade had flourished. But in the opinion of one of the more experienced men such a rate of extraction could not have been continued for long, there being unmistakable signs that the supplies were starting to decline. Auckland based fishermen complained to the committee about the practice of taking undersized and egg-bearing crayfish and argued that in the interests of conservation it was desirable that this practice should stop. The committee duly recommended that the legal size of crayfish be fixed at 9 in. in length and that it be made illegal to take any female crayfish carrying external ova or to remove the ova (berries) prior to sale. Regulations to this effect were put in place in

1938 but relaxed in 1940 at the outbreak of WWII in the interests of fuel economy. At the end of the war the New Zealand Wholesale Fish Merchants Association made submissions to the Minister of Marine requesting that earlier regulations regarding crayfish size and taking of egg-bearing females be re-enacted, otherwise *‘the waters of the Dominion will, within a nominal period be depleted of this type of fish’*. Eventually, in 1947, a size limit of 8 inches total body length was imposed for both the North and South Islands.

Exports of frozen crayfish tails to the USA boomed in the early 1950s with about 180 tons being landed through Auckland and Whitianga in 1950. A Marine Department report in 1951 noted the recent growth in crayfish catch and cautioned that *‘Such a rapid increase in the catch of a single species is from past experience a danger signal. Experience has shown that a rapid increase in the catch of a species is followed by a rapid drop when the stocks are unable to withstand the impact of increased fishing intensity. Already in a number of places the catch is beginning to drop.’*

Flatfish

The following summary is compiled from the information collated in Supplementary Information S20. For a timeline of key events see Table 3 on page 20.

In the early part of the 20th century, flatfish were among the most common fish landed by commercial fisheries in the Hauraki Gulf. The steam trawler *Doto* undertook exploratory fishing around the North Island in 1901. In 32 hauls in the Hauraki Gulf, including the Firth of Thames, and in Bream Bay, flatfish of various species are listed among the catch. The Marine Department Annual Report for 1906 noted that *‘during the summer the fishermen on several occasions caught more flounders than there was a demand for, and had to give them away to the Māoris.’* A similar situation was apparent in 1908 when *‘during last summer flounders were taken in such large quantities that the demand was exceeded.’* Marine Departments Annual Reports for 1909 through to 1916 report plentiful supplies of flounder with most of these taken by hand-hauled nets in the Firth of Thames.

Conflict between line fishing and trawling

Marine Department Annual Reports from 1919 indicate that the Department was frequently urged to reduce the area within which trawling was prohibited in the Hauraki Gulf, but line fishermen have always opposed any increase in trawling, claiming it would interfere with their fishing and fish breeding grounds. Reports note *‘The Thames fishing industry [for snapper and flounder] is developing of late and will in very few years become one of Auckland’s greatest industries and will necessitate all trawling being prohibited with the Hauraki Gulf and reserve the Gulf solely for line and net fishermen only.’* In 1923 Mr G.A. Pollock, Chairman of the Thames Fishermen Union, wrote to the Minister of Marine stating *‘That purse-seining, if permitted within the Hauraki Gulf, will eventually destroy the supply of flounder in the Gulf.’* He argued that the Gulf was a breeding ground for flounder, and that hauling the bottom has been proved to disturb the bottom, destroy spawn, and cause loss of small fish. Later that same year the Dominion newspaper reported that *‘Great catches of flounders have been made by the new seine net carried on by one of the privately-owned trawlers operating in Hauraki Gulf. “We are getting them by the ton”, declared an employee of the trawling company to an “Auckland Star” reporter. The new seine net has revolutionised fishing in these waters. Flounder will soon be cheaper than schnapper.’* The following year, 1924, was a remarkably good year for fishing in the Hauraki Gulf with very big hauls of flatfish being made by the seiners. The Firth of Thames was then closed to this method of fishing. In 1925 the seine boats were no longer getting the record catches of the

previous year and six vessels converted from Danish seining back to trawling. The 1930 flatfish season was good, particularly on the ‘Dab patch’ at the entrance to The Firth of Thames but Mr Hefford, the Chief Inspector of Fisheries, warned that *‘This fishery is prosecuted at the expense of spawning aggregations of flounders and dabs, and therefore requires careful watching both from the economic and the biological aspect.’* In his 1934 annual report he commented *‘The fact is that the fish on the grounds were fewer and catches were less. A significant and perhaps ominous feature of the fishing is that the best catches were made in the month of August, which is the height of the spawning-season for dabs and flounders.’* Hefford added, *“There seems no doubt but that the intensive catching of dabs and flounders at this time is a very considerable factor in their depletion.”* The winter spawning aggregations in the so called ‘Dab patch’ between Ponui Island and Deadman Point were finally closed to fishing in May 1947. In 1959 the Secretary of the Marine Department noted that *‘This ground was closed in an attempt to arrest the decline in flounder stocks in Hauraki Gulf when Danish seining was the principal method of fishing. The research vessel “Ikateri” has worked the ground experimentally to check any recovery of flounder stocks but as yet no significant recovery is apparent.’*

Groper

The following summary is compiled from the information collated in Supplementary Information S21. For a timeline of key events see Table 3 on page 20.

The earliest historical reference to groper fishing in the Hauraki Gulf study region is from the memoirs of Cameron Buchanan who lived as a child on Great Mercury Island from 1859 to 1873. He recalled that *‘In November the Māoris used to come across from the Mainland nine miles, and catch a lot of Hapuku. Some were eighty pounds in weight. These they dried and smoked for winter food.’* Titchener (1981) reported that in the 1890s Māori were successful fishermen, especially Tenetahi of Ngati-Wai, using the scow *Ida*. *‘Every summer Tenetahi and his crew would sail Ida to the Moko-hinau Islands to fish for hapuku. They would sail back to the Auckland markets with the huge fish cut up and hanging in the rigging to dry.’*

Through the early part of the 20th century groper was reported as ‘plentiful’ and in ‘good supply.’ In 1918 the Whangarei Fisheries Inspector reported that hapuku was one of the species caught by a small fleet of line fishing vessels in Whangarei Harbour or outside the harbour entrance. The 1918 Marine Department Annual Report noted that, *‘The extensive fishing grounds in the Bay of Plenty are capable of great development, as very large supplies of schnapper, terakihi, trevalli, and hapuku can be taken either by trawling or lining.’* By 1919 the Auckland Fisheries Inspector noted in his annual report that groper was *‘more plentiful in former years owing to the fishermen [now] going further afield for their catches of line fish.’* He noted that the catch was mostly taken at the northern side of Great and Little Barrier Islands, Moko Hinau Islands, Mercury Islands, Alderman Islands, and the Bay of Plenty with the boats carrying a supply of ice and staying out until they caught sufficient fish to take to market. In 1928 a decline in the availability of hapuku was noted by Hefford in his report on the fisheries of the Hauraki Gulf. He further commented that *‘It is the amount of fish that are extracted, not the method of fishing, which is the important factor.’*

Rock Oysters

The following summary is compiled from the information collated in Supplementary Information S24. For a timeline of key events see Table 3 on page 20.

Early observations

Early European explorers consistently remarked on the very great abundance of native rock oysters (*Saccostrea commercialis*) on sheltered rocky coastlines in northern New Zealand. Captain James Cook wrote of the sheltered reaches of Mercury Bay in 1769, ‘...in the River are an immense quantity of oysters and other small shell fish, and this is the only thing it is remarkable for and hath occasioned my giving it the name of Oyster River [Purangi River].’ Similarly, visitors to Omaha Cove (Leigh Harbour) near Cape Rodney in 1831 and 1833 remarked, ‘The rocks here were covered with oysters, and so also the branches of the trees which dip in the water,’ and William Yate reported in 1835 that ‘All the [north-eastern] ports abound in fish and oysters.’ Likewise, James Bidwell wrote of Coromandel Harbour in 1841 that ‘The shores are all very rocky and covered with trees, but the cliffs are not in general high, and are always very rugged; those at the water’s edge are covered with oysters in a most extraordinary manner; generally they are more than a foot thick, and very good.’

Writing in the Marine Department Centennial History Martin (1969) noted that departmental records indicated that “One hundred years ago the rock oyster beds extended from the Bay of Plenty to North Cape on the east coast. All the sheltered rocky foreshore along this coastline was covered with oysters. On the west coast, there were oysters in all the estuaries from Cape Maria van Diemen to Kawhia”.

Oyster fishery begins

In 1850 when the city of Auckland was beginning to rapidly grow, Māori from the Hauraki Gulf landed their canoes in Auckland to trade, their cargo including fish and oysters. Hursthouse writing in 1857 remarked that, ‘In three months, in 1853, there visited Auckland alone (but Auckland is the chief seat of the native trade) 442 canoes, navigated by 1592 men and 590 women, bringing produce to the value of nearly £4000’. This trade included 5 ½ tons of fish and 18 kits of oysters. The local demand for oysters grew rapidly so that in the 1850s, ‘Oysters were picked from the islands of the Hauraki Gulf to the Coromandel Peninsular, from the bays on the western side of Coromandel, and from rocky shores nearer Auckland. It required little capital; all that was needed was a small boat . . . and a spade to strip the oysters from the rocks. Many oyster pickers were Māori.’ By the September quarter of 1856, 579 baskets of oysters were landed at Auckland, mostly brought by Ngati Paoa. In the early 1870s an ‘immense number’ of kits of oysters were landed on the Auckland wharf. Some of these were destined for export live to eastern Australia in sacks kept wet on deck of low seaboard scows. During the year to 31 December 1885, 1 057 760 dozen rock oysters were exported.

Warnings about the consequences of widespread picking of oysters emerged by 1883 when Alfred Cadman, wrote to the Colonial Secretary, stating that oysters in the Coromandel were ‘being destroyed in a wholesale manner’. The following year the Fisheries Conservation Act 1884 ‘enabled some urgently-needed regulations to be made for the protection of the local fisheries.’ An Order in Council issued on 27 March 1885 provided for closed seasons for oysters and established the minimum size to be taken. In 1886, under regulations issued under the Fisheries Conservation Act 1884, the oyster beds at Whangarei, the Hauraki Gulf, and the coastline between Bream Head and north of the Bay of Islands were closed for three years. The use of spades for stripping rocks was banned, with a 2 inch blade being the largest tool allowed. The Order in Council also prohibited the export of rock oysters. Johnson (2004) noted that from the 1880s to 1907, the management of the rock oyster beds was difficult, even after the ban on export. The Marine Department Annual Report for 1893 noted ‘when a bed is opened, if it is at all accessible, it is at once rushed, and oysters almost completely

destroyed.’ Despite the ‘ban’ on exports, in 1895 1 164 540 dozen oysters were exported from Auckland (including Devonport, Manukau, Waiheke Island, Waipu, Whangarei, Thames, Coromandel, Tairua and Mercury Bay). In 1898 James Bennett, Fisheries Inspector, wrote to the Collector of Customs, ‘*During the last week I have been around the oyster beds of the Hauraki Gulf and after the most careful examination, I find the beds on the eastern side of the gulf, in a most deplorable condition, so much so that I would not think of picking any oysters from any of them. From the Waikawau Creek as far north as Paparoa which includes Manaia, Te Kuna, Coromandel, and the adjacent Islands, the oyster beds have been utterly ruined by pickers opening the oysters and leaving the bottom shell still adhering [sic] to the rocks. Almost all the inhabitants of Coromandel or their friends are owners of small boats, and those who are not owners, mostly hire a watermans boat of a Sunday and go pleasuring and destroying oysters. // If this is not checked, by the end of the present season there will be scarcely a live oyster to be found in or near Coromandel Harbour, or upon the beds near it.*’

Government control of oyster beds

By 1907 the Marine Department Annual Report noted that ‘*Some beds opened last year have been so denuded of oysters that it will take many years to recover. It seems impossible under the present system to prevent overpicking of beds.*’ The report concluded, the ‘*only option appears to be for the Department to take over the picking.*’ Later that year the Sea Fisheries Amendment Act 1907 saw the Marine Department take control of the North Island oyster beds – the operation of picking and selling to retailers. In 1908 the Marine Department Annual Report noted that ‘*Under the new system the picking will be so carried out that the beds can be worked every season, which will give a regular supply of oysters....All beds in the North Island presently closed, except beds on Waiheke Island and Great Barrier Island, and at Kerikeri in the Bay of Islands*’. The following year the Department noted, ‘*Where the old system led to the complete stripping of oysters, it is advisable that the Department should plant oysters in these places.*’ During the period 1910–1911 the Marine Department replanted rock oysters on the Coromandel coast at Huieh, Kepuki, Rabbit, Green Islands, Kirita Bay, south shore of Coromandel Harbour, and from Coromandel South Head to Manaia Head. In 1923 the Marine Department warned of the threat from a burgeoning human population in the Auckland region. ‘*During the last five years there has been a very great increase in the number and size of pleasure launches in Auckland, in the number of public picnics, summer boardinghouses, and summer residences, and this all means a tremendous increase in the number of people who roam about the gulf and live in the vicinity of the oyster-beds, and consequently a yearly increase in the quantity of oysters which are poached every year. At Ostend and some other parts of Waiheke Island, where summer and weekend villages have come into existence during the last few years, the beds are fast being depleted.*’

For over 50 years the Marine Department was active in what it termed ‘oyster cultivation’ in that rock wall settlement surfaces were provided or augmented, different areas rotationally harvested and predatory gastropods were removed. The usefulness of this work was questioned in the 1935 Marine Department Annual Report which noted that ‘*of the oyster marketed annually, only a small proportion have been derived from “cultivation work” that has consisted of creating new oyster-beds on ground that did not previously contain oysters.*’ Nonetheless, state control of the rock oyster fishery continued into the 1960s when in 1964 legislation was passed providing for the leasing of tidal lands and the harbour bed by persons prepared to undertake the commercial production of rock oysters.

Statistics on Hauraki Gulf landings of rock oysters are available each year from 1908, when the state took control of oyster harvesting, and for most years back to 1885 (Figure 4). In

some years all the beds in the Hauraki Gulf were closed due to prior over-harvesting and landings are recoded as zero in these years. Beds were open for harvesting from 1905–1907 but no landings data have been located.

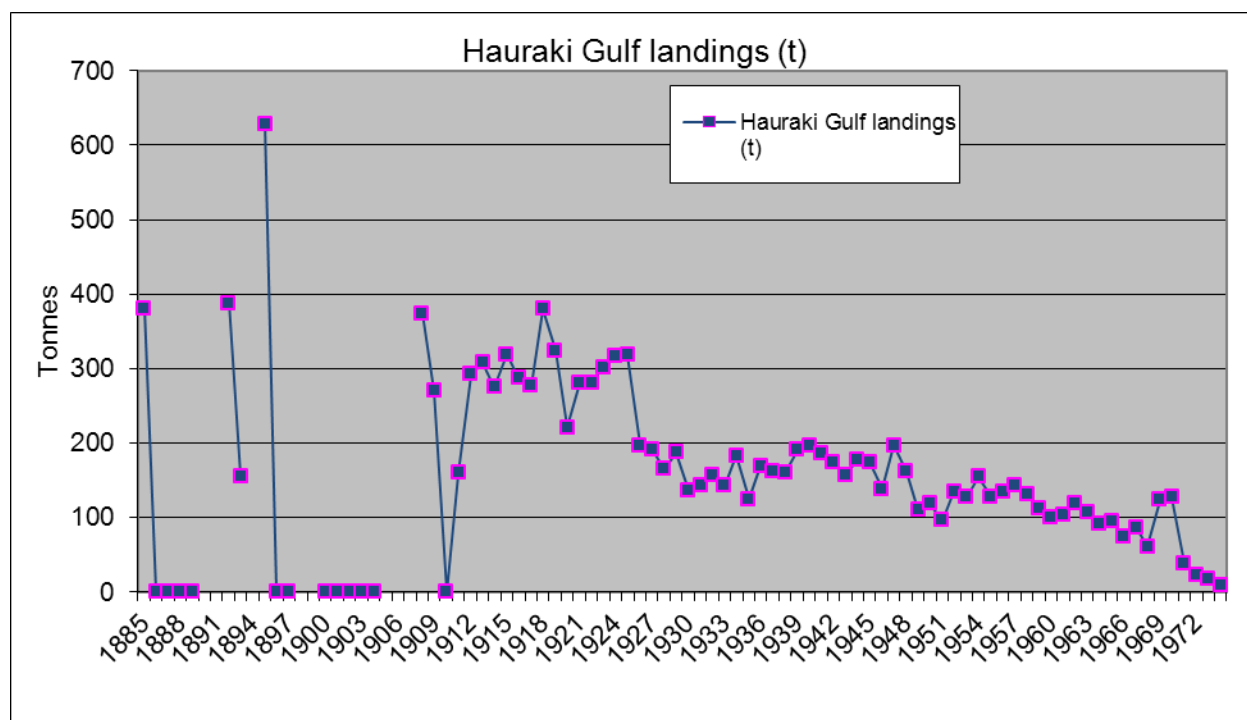


Figure 4: Hauraki Gulf landings (t) of New Zealand rock oysters (*Saccostrea commercialis*). Zero values are provided for years in which the beds were closed to picking. Data are provided in Supplementary Information S34.

Tarakihi

The following summary is compiled from the information collated in Supplementary Information S26. For a timeline of key events see Table 3 on page 20.

Tarakihi was one of a suite of fish commonly caught in the Hauraki Gulf, though more commonly in its deeper waters. The historical information available for this species is not extensive, with no mention in the records available from the 19th century and only passing mention in records from the first half of the 20th century. The 1915 Marine Department Annual Report notes tarakihi as being plentiful on the fishing grounds of the Hauraki Gulf and on the outside grounds. The 1918 report commented that tarakihi was not so plentiful as the previous year. The Chief Inspector of Fisheries, Mr A.E. Hefford, in the 1929 Annual Report noted that there were generally diminished landings for Auckland, particularly a deficit in the landings from steam trawlers, with tarakihi being noticeably less abundant on the market. In 1931 a report prepared by the Sanfords fishing company stated “*As a result of the above restrictions our trawlers were then forced out to areas where fishing operations are quite unproductive. . . . The only other Fishing Ground left us is the Bay of Plenty, yielding chiefly Tarakihi, and even this area has proved unremunerative for some time back. // Most of our trawlers now work the Bay of Plenty grounds, proceeding right round East Cape as far South as Tokomaru Bay.*” The 1935 Marine Department Annual Report comments that ‘*The trawling grounds most visited were those of Bay of Plenty and those off East Cape. Landings consisted of fewer snapper and rather more terakihi than in the*

preceding year. ‘ In 1940 the Marine department Annual report noted that the tarakihi catch was the lowest since 1935–36. During the war years, landings generally suffered from the requisition of trawlers for war service with the tarakihi landings into Auckland decreasing from 11 490 t in 1938–39 to 657 t in 1941–42. The return of trawlers after the war substantially lifted tarakihi catch with 12 045 t landed into Auckland in 1946. The early 1950s saw Auckland based trawlers going further afield with many working the East Cape tarakihi grounds (Paul 1977). In 1954, Mr E.G. Gilliver, District Inspector of Fisheries, commented in a report to the Secretary to the Marine Department that *‘Those skippers of Auckland trawlers working on tarakihi from Bay of Plenty to Gable End Foreland are quite ready to admit that the tarakihi fishing is now not what it used to be in the waters they fished so successfully in previous years.’*

3.3 General accounts of fish and fishing along the Otago-Catlins coast

The following summary is compiled from the information collated in Supplementary Information S27. Key events are compiled as a timeline in Table 3 on page 20.

Early European observations

The Otago-Catlins coast became a centre for whaling in the mid-1830s and it is from these activities that came the first direct comments on fish or fisheries in the region by early European explorers. On the 14th February 1835 the *Joseph Weller* sailed from the southern part of New Zealand [almost certainly from Otago Harbour where the Weller brothers had established a whaling station at Otakou near the heads] with 1.5 tons of whalebone, 31 casks of saltfish, 65 seal skins, 4000 dried fish, and a cask of sundries. Apparently the dried and salted fish caused quite a stir in Sydney and 2 tons was immediately dispatched to Hobart with some of the remainder sent to London where it caused a tax dispute.

The next observations come from the voyage of the *Astrolabe* in 1840 on leaving Otago Harbour. *‘Once we were on the open sea again, our men threw lines into the water and caught an enormous quantity of fish.’* Upon sailing north, *‘Every day the crew caught such a lot of fish on their lines, that very soon the men themselves were tired of them’.*

Immense seasonal schools of sprats made a strong impression on early observers. According to a Mr Stoddart of Moeraki, in the years prior to 1875: *‘The sprat visited the reefs regularly from March till May in incredible numbers, disappearing with the approach of cold weather.’* Stoddart said that, *‘the red cod caught on the reefs were stuffed full of sprats.’* Another Moeraki fisherman stated *‘every year sprats were in any quantities around the reefs a mile from the shore, appearing about January, but most plentiful in March and April, on two occasions coming ashore in dense masses.’* A letter from a Mr Cosgrove, stated that *‘a shoal of sprats makes its appearance on the east coast of Otago in November, remaining until the end of March. When first seen, the shoal is usually travelling southward. Muttonbirds follow the shoal in vast numbers. Cosgrove observed several acres of water black with them, and stated that ‘Mr W. Robertson, landowner at Sandfly Bay, observed shoals passing the bay every year since he settled there in 1860’. Cosgrove described a scene when shoals were preyed upon by larger fish, birds, and seals as – ‘baffles description’. He stated that he ‘is uncertain how sprats could be caught offshore, but inshore they could be caught in great quantities with hand nets, or even lifted out of the shoal with a shovel.’*

J. McKenzie, in papers to Julius Vogel relating to the potential for the development of colonial fisheries, provide details of a brief 1885 assessment of New Zealand's fish stocks and the potential for commercial exploitation. McKenzie stated that from Martins Bay (South Westland) he '*commenced to meet with fish in such numerous shoals that from there to off Oamaru, inshore and offshore, I believe millions of tons of fish could be caught yearly..... off Cape Saunders and Otago Heads seems to be a central gathering ground for countless millions of these fish for several months in the year. . . . Two men fishing, and one man rowing the boat, will often catch from thirty to forty dozen fish in two or three hours... Otago Harbour commands most extensive and valuable barracouta, groper, ling, rock-cod, and crayfish fishing, and with proper fishing-smacks Otago Harbour could also command the blue-cod fishing.*'

Establishment of commercial fisheries

With the settlement of Dunedin in 1848 (McLintock 1949), there was a growing demand for fresh fish and shellfish. Johnson (2004) reported that in 1862 Māori landed 'an enormous quantity' of crayfish on the Dunedin jetty, from the heads beyond Otakou, later collecting more. In the 1860s, dredge oysters were also being harvested from Blueskin Bay and sold in the Dunedin. Around this time there were calls to protect the bed. By 1865, the shallow oyster beds in Otago Harbour were soon depleted, and, in 1868, a tsunami from an earthquake in South America shifted so much sand in Blueskin Bay that the beds were nearly covered. Church et al. (2007) reported that the '*wanton destruction*' of oysters by some residents at Blueskin Bay was brought to public attention again in January 1880. Horse drawn dredges were being used, backed into 'the creek', crushing many oysters in the process. The offenders subsequently appeared in the Port Chalmers court. In September 1882, it was claimed that over 20 tons of oysters had been taken that season. By 1884, Otago Harbour oyster beds had run out and silt from the upper harbour channel had buried the beds.

In the 1860s, small scale commercial fishing operations sprung up in various localities along the coast. According to McLean (1986), from the early 1860s Moeraki fishermen using small rowboats and sail-assisted dinghies began fishing for the wider North Otago market. Dried and smoked fish were sent as far afield as Oamaru. An example of an Otago fisherman in 1860s was Richard Lewis. He had his fishing ketch delivered from Victoria to Otago in 1862. He began by catching hapuku and blue cod between Moeraki and Cape Saunders. Around 1870 he switched to seine fishing for flounder and red cod in Otago Harbour. In 1869 a report by the Commissioners for the Province of Otago estimated that about 70 men were employed in the fisheries; about 60 at Otago Heads, about 8 to 10 at Moeraki, and about 2 to 4 at Molyneux. The report further noted that fishing inside the harbour was carried on all year, each boat working about six tides a week. In contrast fishing outside the harbour entrance was carried on as weather permitted all through the year, but the season when fish were most numerous extended from about October to March. The fishing methods employed were principally set and hand lines for outside fishing, and seine nets for the fishing inside the Otago Harbour.

The report by the Commissioners for the Province of Otago also listed the principal species caught in 1869 by the '*outside fishery as hapuku, groper, ling, red and blue cod, moki, trumpeter, barracouta, and skate. Inside the harbour the fish principally caught are flounder, red cod, [yellow eyed] mullet or herring, guard-fish, trevally, whiting, and occasionally Colonial salmon [kahawai]....crayfish are also caught in large numbers.*'

Johnson (2004) reports that in 1868, the first trawling in New Zealand was undertaken in Otago Harbour by the *Redcliffe*, which began by towing between Port Chalmers and Otago Heads, catching a variety of fish including trumpeter, flounder, crayfish, skate, and sharks. In two later expeditions, the trawl catch also included hapuku, sole, ling, and cod. The *Redcliffe* experiment did not last owing to wear and tear on gear. Trawling did not occur again in the Otago region until 1899 when the Otago Trawling Company chartered the *Napier*, equipped with an otter trawl. This trial was closely followed by an official survey by the Marine Department's Chief Inspector of Fisheries, L.F. Ayson, who in 1900 took the trawler *Doto* around parts of New Zealand to find suitable trawling grounds for commercial fishing. Fourteen hauls were located off the coast between Moeraki and Cape Saunders with ling, barracouta, and red cod the principal species caught. In 1907, Ayson led another trawling expedition on the *Nora Niven* with the objectives '*to test the ocean-floor off the east coast from Stewart Island to the Bay of Plenty and around the Chatham Islands; ascertain what trawling grounds exist outside those already known and worked; ascertain what fish-life exists out to 100 fathoms; to look for offshore banks.*' In all, 106 hauls were made, ranging from 4 to 120 fathoms (8–215 m).

Conflict between line and seine net fishermen and trawlermen

Resistance by Otago line and seine net fishermen started almost immediately trawling became established. They pushed for a ban on trawling within three miles of land and an inquiry duly took place at Port Chalmers on 14–15 November 1902. The outside line fishermen claimed that fishing had only declined since trawling started a few years before. Formerly, they were able to get plenty of fish near Otago Heads, but now they had to go much further to make a catch. The fishermen seining inside Otago Harbour also claimed that trawling had decreased the availability of sole and flounder. Unsurprisingly, the trawlermen counterclaimed that they caught species of fish, especially moki, tarakihi and sole, not frequently caught by the liners that mostly caught groper and barracouta. The trawlermen also argued that they had been able to catch fish in all weathers, when other fishermen could not venture out. This was verified by the fish-mongers who observed that '*there has been a poor supply of fish over the last few years*'.... '*We should have had nothing at all if it had not been for the trawlers..... which continue to work in rough weather.*' The inquiry concluded that the line and seine net fisherman had not brought any proof to substantiate their claims that trawling was destroying fish-feed on the bottom and driving fish away. The report also pointed out that there had also been a scarcity of fish at other places, where no trawlers were operating.

Almost 20 years later in October 1919, the Otago Fisherman's Society (representing mostly line and seine fishermen) presented a petition to the Minister of Marine urging him, 'to introduce a three mile limit [on trawling] from point to point Moeraki to Cape Saunders, similar to that appertaining to the British Isles, Auckland and other ports of the Dominion.' The petition was turned down.

By the mid-1930s line fishing was changing. In 1937 the Sea Fisheries Investigation Commission looked into '*the condition and prospect of the sea-fishing industry of New Zealand, including . . . any matter relating to the exploitation and conservation of our sea fisheries.*' The report noted that the line '*method of fishing is used throughout the Otago and South Canterbury districts, but the fisheries have declined to such an extent that it is becoming practically impossible for the men to make a fair living by the use of hand-lines only, and they are used mainly as an auxiliary method of fishing either while waiting for the*

set gear to be picked up or when weather conditions make it unadvisable to use set or dan lines.'

Trawlermen were also finding it more difficult to find sufficient fish to meet demand. A.E. Hefford, in his Report on Fisheries for the year ended 31 March 1937, concluded *'The general impression obtainable from various reports is that the local trawling-grounds off Canterbury and Otago are not as productive as formerly'*.

In 1947 a letter to the Minister of Marine from fishermen based on the Catlins coast wrote, *'We the fishermen operating boats at Nugget Bay are much concerned about the depletion of fish in Nugget Bay by outside trawlers, and are desirous of getting an area set aside on which Nugget boats only are allowed to operate.'* McIvor, District Inspector of Fisheries, commenting to the Secretary of Marine on the above letter noted, *'The depletion, I am afraid is a known fact, as all who know the area concede that the grounds are slowly becoming poorer. All along the coast the position is the same, but this is in a large measure offset by higher prices.'* McIvor suggested that trawling be totally prohibited from the area if the depletion was not to become an urgent problem. In 1948 a claim was made in the Otago Daily Times by a man who had been fishing at Taieri Mouth for many years *'that the livelihood of fishermen at Taieri Mouth was being affected by the inroads of Port Chalmers boats, which had destroyed 10 years' work on the part of the Taieri Mouth fishermen, and the operations of a "large steam trawler" between Otago and Oamaru had depleted the fishing grounds of groper and had a harmful effect on private boats operating from Oamaru, Moeraki and Karitane.'* Trawling was not banned.

The need for reliable catch statistics

The need for reliable catch statistics and scientific information about fish and fisheries was recognized early in the development of the commercial fisheries but resources were poor and the fishermen were not enthusiastic about divulging any information. A report by the Commissioners for Otago in 1869 pointed to the difficulty of getting firm numbers from anybody in the fishing industry. The evidence *'is vague and in some instances unsatisfactory; many of the men engaged in fishing, as well as those trading in fish, seeming to be unable to give any definite information.'* At the time of the 1937 report by the Sea Fisheries Investigation Commission, the Marine Department had been gathering statistics of fish landings for nearly 20 years. Initially the summaries by the Chief Inspector of Fisheries were based on annual reports from his inspectors. A new inspector (Hefford) had introduced logbooks to skippers, but skippers were still notoriously unreliable. Logbooks were not completed, often the wrong species was entered, and there was a thriving cash economy. In 1946 Hefford retired and was replaced by M.W. Young as Chief Inspector of Fisheries. But the Marine Department had limited resources and still had no means of measuring what it should be controlling other than by analysis of incomplete statistics grudgingly supplied by fishermen.

David Graham, a marine biologist at the Marine Fisheries Investigation Station, Portobello, noted in 1953 *'It is . . . of paramount importance that the harvesting of the sea should receive the attention of both scientific and commercial men before an irreparable injury is done to such a valuable asset. I do not wish to spread the impression that our fishing industry is being exploited, but I do suggest that commercial fishing should be more methodically and scientifically controlled than at present. We have had enormous quantities of edible fishes from our inshore waters but in some instances certain species are being demanded by the public to the detriment of the future of those particular fishes, which may in time become less*

common than at present. This was evident to me in 1930–1934’. Graham noted that there was a ‘certain amount of fisheries research carried out in the first half of the 20th century. However, this research was of a limited nature.’ Graham compared fisheries research unfavourably with the amount of research undertaken for the agricultural sector, and added, ‘The foundations of a proper harvesting of the sea lie at the door of both the scientist and the commercial man, one being of little use without the other’.

3.4 Otago-Catlins species summaries

Barracouta

The following summary is compiled from the information collated in Supplementary Information S28. For a timeline of key events see Table 3 on page 20.

Graham (1957) stated that *‘Barracouta were to be found up and down the coastline of Otago and in the Otago Harbour in large or small shoals, sometimes singly and sometimes densely occupying many acres at the surface up to 12 miles off shore.’* Usually they fed on shoals of pilchards and sprats but when whale feed (the pelagic phase of the squat lobster *Munida gregaria*) was particularly abundant barracouta was frequently sighted in large schools near the entrance to Otago harbour gorging on the bright red crustaceans.

Māori fishing

Barracouta or manga were very commonly caught by pre-European Māori, accounting for up to 50% of the catch weight of marine fish in the Otago-Catlins region (Smith 2011). In the early years of the Otago European settlement, when the colonists depended solely on Māori for the supply of fish, it was extensively used. According to Leach (2006) the most common lure used by pre-European Māori was known as *pohau mangā* and consisted of a piece of wood with a single bone point, often made from the jaw-bone of a dog, set into the end. Leach considered these lures to be simple, but perfectly effective. He noted that when metal came to New Zealand in the 18th and 19th centuries, the bone point was replaced with a bent nail. Graham (1957) observed Māori fishermen capturing barracouta with almost identical lures in the 1930s. *‘These fish usually caught on a slightly curved stick, about 4 feet in length. Fastened to this stick was a piece of stout fishing line, about 3-4 feet in length, carrying a piece of red wood about 5-6 inches in length. A bent nail was secured to this piece of wood in the form of a hook but no bait was used. ‘When a school of Barracouta was found the Couta stick, or paw, was brought out ready for fishing. From the cockpit of the launch the piece of wood with the nail was violently swirled with a circular motion in and out of the water, causing a disturbance of the water in a good imitation of a number of Sprats, Pilchards or other small fish jumping in and out of the sea. The Barracouta would swim for such a place. Seeing the piece of red wood moving rapidly through the water they would take it for a fish, snap at it or even jump out of the water for the lure and were caught by the crude iron hook. As the fish was hooked during the time the paw was being drawn through the water the fisherman would swing the fish over his head above the boat or launch and when the caught fish was midway in the air, more or less above the cockpit, would expertly give the stick a dexterous smart twist. As there was no barb on the hook the fish was released and fell into the cockpit. So rapid are expert fishermen at this game that I have a reliable record of one man catching ninety-six dozen Barracouta in one day.’* Hutton & Hector (1872) noted that *‘It [barracouta] dries well, and is thus preserved in large quantities by the natives.’*

Commercial fishing

In the 1860s a fish-curing factory was established at Port Chalmers, processing a wide range of species including barracouta which was predominately caught by ‘line-men’ working just outside the harbour entrance. Although Marine Department surveys of Dunedin fish markets indicate they were mainly landed from October through to May, barracouta was not popular with the European public and often was not saleable. Very often in the early 20th century monthly Marine Department reports for Otago fisheries, barracouta was reported to be very plentiful, but as there was little demand only small quantities were landed. Demand for barracouta slowly grew. In 1941–42, 5599 cwt (284 t) was landed for export through Port Chalmers, mainly from line-fishing vessels. By 1947 landings had more than doubled to 683 t.

Blue cod

The following summary is compiled from the information collated in Supplementary Information S29. For a timeline of key events see Table 3 on page 20.

Distribution

Sherrin (1886) in his ‘Handbook of New Zealand Fishes’ described blue cod as ‘*Abundant all around New Zealand; not found elsewhere. . . . In the neighbourhood of rocks, in from 10 to 15 fathoms of water, is the best fishing-ground for the rock-cod, but they are also caught inside harbours, and even far up the Sounds of the West Coast Around portions of Stewart Island they are found in very large numbers The sea, looking through its clear pellucid water, appears quite literally to swarm with them.*’

Māori fishery

Despite their apparent abundance, at the time of European contact blue cod was of minor importance for Māori in the Otago-Catlins region, comprising less than 1% of the catch weight of marine fish (Smith 2011).

Commercial fishery

Blue cod was highly sought by the European settlers, however, and a fledgling commercial fishery lining for blue cod from small rowboats, sail assisted dinghies, and at least one fishing ketch started in the early 1860s. A fish-curing factory was established at Port Chalmers, processing a wide range of species including blue cod, and fishermen from Moeraki began fishing for blue cod and other species for the wider North Otago market, with dried and smoked fish sent as far afield as Oamaru. Although blue cod occurred in the Otago Harbour and the other smaller inlets on the Otago-Catlins coast it was mainly caught by line fishing on or near reefs on the open coast, especially around Moeraki, the Otago Peninsula, and Molyneux Bay.

Concern over availability

In the late 1860s, a sharp decline in the fishery around Molyneux was attributed to mud from gold diggings discharged from the Molyneux River. As early as 1877 complaints were made about the small size of blue cod landed into the Otago market. These concerns increased over the next 20 years and in 1908 James H. Pomery, an Invercargill fish dealer, wrote to the Marine Minister, concerned about blue cod stocks. He suggested that the minimum landed weight should be doubled to one pound. At the time blue cod as small as four ounces were being taken for market and large numbers were being used for bait. The Marine Department Annual Report for 1911–12 recorded complaints from Moeraki fishermen regarding the

scarcity of blue cod. Some of the oldest fishermen stated that there had been a steady decrease for a good many years. One man made the statement that, *'Fifteen years ago one of the old sailing-boats would bring in as many blue-cod in a day as all the boats could do now.'* The Collector of Customs at Oamaru reported: *'Blue-cod are now very scarce.'* In March 1912, the minimum landed green weight was raised by government regulation to one pound. However, as Mr Sullivan, Otago Inspector of Fisheries, noted in a letter to the Secretary of the Marine Department, *'The fishermen are adverse to any alteration in the regulations as to the weight of this particular class of fish, being a hook and line fish when once taken they are not fit to be returned to the water again.'* Continuing protests from cod fishermen culminated in the 1912 Blue Cod Commission. In their evidence to the Commission, the fishermen made three main claims; that the blue-cod grounds off Halfmoon Bay and in Foveaux Strait were not depleted; that a closed season was not required as the taking of blue cod practically ceased about the end of August, when the fish evidently disappear for the purpose of spawning; and that a size limit was necessary to protect the small fish, but that this should be based on length, not weight. In October 1912 the Commission noted that, *'there had been frequent complaints for some years past about the supply of blue cod and the size of the fish brought to market'* and that *'this shows the necessity of protecting these fisheries.'* The Commission recommend that the regulation gazetted on 14 March 1912, fixing the size limit to 16 oz, be revoked, and an amending regulation be brought into force fixing the size limit to 10.5 inches in length when in green state or 9 inches when headed properly.

The new regulations had little immediate effect. The Marine Department Annual Report in 1913 noted that *'from information gathered from fishermen along the coast, the quantity of fish landed about the same as last year'*. The 1914 Marine Department Annual Report noted that the catches of blue cod were generally poor in Oamaru, Moeraki, and the Nuggets, and that in some case the fishermen had to lay up their boats. In a 1914 letter to Dunedin MP G.M. Thomson, Rev. Dr S.T. Nevill noted that *'blue cod was no longer plentiful in the area.'* In 1915 good catches of blue cod were made at several localities and Mr W. Adam, the Otago Inspector of Fisheries, noted that *'Blue cod are now more plentiful than for some years passed.'* In 1919, a survey of all the fishing ports in the Otago-Catlins region by the Fisheries Inspectors suggested that it was the worst fishing season on record. By 1921 a new fishing ground off Tautuku was exploited and large quantities of blue cod were taken, but near established fishing grounds catches remained depressed. From 1924 to 1927 the blue cod stocks appeared to recover somewhat with fair catches taken at most Otago-Catlins localities. In 1929 the situation worsened again with fishermen working as far as 16 miles offshore to maintain catches or giving up fishing altogether. According to McLean (1986), during the 1930s fishermen at Moeraki experienced difficulties – rising costs, static incomes, a scarcity of fish, and competition from boats from other Otago ports. Annual reports by Fisheries Inspectors indicated a similar situation at other Otago and Catlins ports during the 1930s.

Graham (1957) reflected on the situation of blue cod in Otago Harbour up until 1934. He wrote, *'At one time blue cod were plentiful in Otago Harbour and provided sport for fishermen around Goat and Quarantine Islands. About 1915–16 they became scarce in the summer months, then returned in 1926. Since then, however, Blue Cod once more became less frequent visitors to the harbour, this time probably on account of the extensive dredging and road making which tend to cause cloudiness in the water'*.

In 1947, Mr McIvor, Otago Inspector of Fisheries, in a letter to the Secretary of the Marine Department, summed up the situation of declining stocks of blue cod and most other fishes

succinctly. *‘The depletion, I am afraid is a known fact, as all who know the area concede that the grounds are slowly becoming poorer. All along the coast the position is the same, but this is in a large measure offset by higher prices.’* These comments were echoed and elaborated in David Graham’s 1957 *‘A Treasury of New Zealand Fishes’* where he wrote, *‘Even though the sea is teeming with life, it is quite possible to fish out a certain fish. This may seem incredible to some people, but during 1930–34 one of the most popular fish on the market, the Groper, was slowly and surely being depleted by nothing more or less than overfishing. Unless some restriction is placed either on the number caught, or on their being caught during the spawning season, they will gradually become less abundant. The same can be said for Blue Cod. This is not a scientific theory but is recognised by line fishermen who live by their catches’.*

Crayfish

The following summary is compiled from the information collated in Supplementary Information S30. For a timeline of key events see Table 3 on page 20.

Māori fishery

Elsdon Best, in his 1929 article *Fishing Methods and Devices of the Māori*, noted that along the Otago coastline *‘Crayfish are numerous on many parts of the rocky coast-line, and so furnished quite an important food-supply to the natives. They were taken largely by means of a lobster-pot, termed a taruke, and also often by hand’.*

Trawl fishery

Today we usually associate crayfish with rocky reefs but the earliest trawlers commonly caught crayfish on open trawlable ground. For example, the first trawling undertaken in New Zealand took place in Otago Harbour onboard the *Redcliffe* in 1868, which began by towing in Otago Harbour between Port Chalmers and Otago Heads, catching a variety of fish including crayfish. In 1900, the steam trawler *Doto* undertook further experimental trawling around New Zealand including Otago. Four trawls were located off the coast between Cape Saunders and Nugget Point where crayfish figured prominently among the catch. In 1906, Mr T. Anderton in his article *‘Observations on New Zealand Fishes’* noted that, *‘Large hauls of them [crayfish] are occasionally taken in the trawl some distance from shore, and on a sandy bottom. The fishermen say they are then on the move, and it would appear that at certain periods a great migratory movement takes place from one part of the coast to another’.* In 1913 and again in 1916 the Otago Inspector of Fisheries noted in his monthly reports to the Secretary of the Marine Department that on several occasions crayfish were taken in large numbers by steam trawlers with catches of 6–7 tons landed at Port Chalmers or Dunedin.

Inshore commercial fishery

Crayfish are normally caught in close association with rocky reefs, and, as early as 1869, the rocky headlands around Blueskin Bay was identified as a good source of crayfish, which were caught in baited hoop nets that had to be continuously attended. The catch was sent north to Oamaru or south to Dunedin. The hoop nets were soon replaced by traps constructed of supplejack vine that could be baited and left unattended. By 1914 fishermen from Pukuteraki (located 2 km south of Karitane) were sending about 100 50 kg sacks of crayfish a day to the canning factory in Dunedin. In the 1920s, fishermen from Moeraki, 50 km to the north, first began taking crayfish in notable quantities, but received only six shillings per hundredweight (about 50 kg). In 1923 crayfish were made subject to the provisions of the Fisheries Act 1908 that already controlled fishing for wetfish and oysters. In the 1928 Annual Return on Crayfishing, Moeraki fishermen were reported as agreeing *‘that supplies have been*

diminishing for some years past, variously ascribed to rocky bottom becoming sanded over, too constant working of grounds, too much rain increasing proportion of fresh water’.

In 1932 an export fishery for crayfish developed. The October Monthly Report on Otago Fisheries noted that three Dunedin merchants were exporting large quantities of large sized crayfish to London that were almost unsaleable on the local market due to the depressed economic conditions. In 1933 a fourth exporter joined the trade to London with 1100–1200 cases of crayfish tails exported from Port Chalmers during the year. The main crayfishing centres in the region were (from north to south) Moeraki, Karitane, and the Taieri River mouth. One crayfishing vessel brought in a ton a day on two successive days. Another took three tons over a weekend. Fisheries inspectors noted that some females caught for export had eggs attached and warned that regulations against landing these crayfish would be enforced. Consequently, the fishery ceased operations until the egg brooding season was over. However, such was the depressed state of fin-fisheries that trawl gear was discarded from fishing vessels and converted to crayfishing. The export market collapsed owing to the application of a quota on foreign lobster exports entering France and crayfish exporters had difficulty selling their product.

In 1935, A.E. Hefford, Chief Inspector of Fisheries, in his Annual Report noted a comparative shortage of large crayfish on the usual grounds. In its 1937 report the Sea Fisheries Investigation Committee noted that, *‘After one year of intensive fishing to supply the heavy demand [of the export trade], the grounds showed marked signs of depletion. This was not so noticeable in the quantity of fish coming forward, but in the alarming decrease in size. The Moeraki grounds suffered worst and have not recovered. Taieri Mouth, which was not exploited so much, suffered least, and these grounds are now coming back to normal. The state of the Karitane grounds is rather doubtful as, although it was noticed that when the question of conservation was being discussed the fishermen would agree to the prohibition of taking of “berried” females, they would not agree to even a mild restriction on the size. From this it would appear that there is still a large proportion of [small] crayfish in the landings. The cannery at Dunedin provides a market for crayfish, but the fishermen complain that the low prices offered and the intermittent market due to its dependence on overseas orders, make their livelihood precarious.’*

Regulations

Regulations to control the size of crayfish that could be caught and landed were mooted as early as 1933 but strongly resisted by local fishermen. In a petition to the Minister of Marine, Karitane fishermen argued that crayfish *“have been caught off Karitane for 35 years in our season without diminution of supplies.”* They added that the proposed size regulations and consequent loss of sales *‘would be a serious loss to our community’*. In 1937 the Sea Fisheries Investigation Committee recommended that the legal size of crayfish be fixed at 9 inches in length and that it be made illegal to take any female crayfish carrying external ova or to remove the ova (berries) prior to sale. Regulations to this effect were put in place in 1938 but relaxed in 1940 at the outbreak of WWII in the interests of fuel economy. At the end of the war the New Zealand Wholesale Fish Merchants Association made submissions to the Minister of Marine requesting that earlier regulations regarding crayfish size and taking of egg-bearing females be re-enacted, otherwise *‘the waters of the Dominion will, within a nominal period be depleted of this type of fish’*. Eventually, in 1947 a size limit of 8 inches total body length was imposed for both the North and South Islands. In 1948 the regulations were altered again with a new size limit of 9 inches, except in Otago where smaller crayfish could be taken, but not sold outside Otago.

Exports to the USA

The Otago-Catlins region was strongly involved in the export of frozen crayfish tails to the USA that developed soon after the end of WWII. According to Johnson (2004), in 1950 the Otago coast produced nearly 850 tons, but as many of the vessels fishing Fiordland were from Port Chalmers the figures could include tails from elsewhere.

Flatfish

The following summary is compiled from the information collated in Supplementary Information S31. For a timeline of key events see Table 3 on page 20.

Commercial fishery begins

Seining for flatfish and other species in Otago Harbour started in the 1860s. In an 1869 Report of the Commissioners for the Province of Otago the authors note that fishing inside the harbour was carried on all year round by about 60 fishermen, each boat working about six tides a week. These fishermen also fished outside the harbour heads, as weather permitted, all through the year, but especially over spring and summer. A writer in the *Otago Witness* (13 March 1875) reported that Blueskin Bay ‘*swarms with fish, principally flounders, of a flavour and size not to be excelled on any part of the coast.*’ In 1876, P. Thomson, in his journal article ‘Fish and their seasons’ (Thompson 1876), observed that flounders ‘*are netted in the Lower [Otago] Harbour and the various inlets up and down the coast, as well as speared in the shallows.* Interestingly he commented that, ‘*Founders are rather over-fished, and are neither so large nor so plentiful as they used to be.*’ He also noted that, ‘*Complaints have been made during the past few months about the size of the fish brought to market – most apparent in the case of flat fish, particularly flounders and soles.*’ Thomson (1876) commented that it was surprising that fishermen were not more conscious of this problem, and claimed that if fishing at the current rates continued much longer the flounder will become rare.

In 1877 the Marine Department first became interested in fisheries administration with the passage of the Fish Protection Act. The Act was introduced after J. Macandrew (Dunedin MP) complained to Parliament about the destruction caused by drag-net fishing and requested legislation to provide protection of seine fisheries throughout the various harbours of New Zealand. He argued that ground fish, such as flounders and soles, were being rapidly exterminated, and that there ought to be at least three months in the year during which no such fish should be caught, and no fish below a given size should be allowed to be exploited for sale.’ Regulations under the act set the minimum mesh size of seine and set nets to 1¾ inches and the minimum size of flounders and soles to 9 inches from snout to root of tail, except in July.

In 1882 the New Zealand Deep Sea Fishing Company, operating out of Port Chalmers, briefly trawled with a steamer before winding up. In November 1882, the ship landed its first major catch including 300–400 sole. In 1900 the steam trawler *Doto* was chartered for experimental trawling around New Zealand and fitted with an otter trawl. Twenty-eight hauls were undertaken off the Otago-Catlins coast with common flounder, yellow-bellied flounder, brill (or turbot), sole, and lemon-sole included in the catch.

Most flounders at this time were taken by small seine. Typical of the period was George King who worked from his shed at Doctors Point in Blueskin Bay. Church et al. (2007) noted that, ‘*Seine fishing involved one man holding the end of a net on the bank while his mate rode around [in a rowboat] in a semi-circle sweeping up flounders and soles.*’

1902 inquiry

Apparent competition between trawling, hand-lining, and seining led to a 1902 inquiry by the Inspector of Fisheries. Edward Nelson, a fisherman who had seined in Otago Harbour for 18 years stated that since trawling started inside [the harbour] fishermen rarely got sole, whereas they used to get 6 or 8 dozen, and that there had also been a decline in flounder over the last 10 years. Nelson noted that the number of seine fishermen in the harbour was the same as 15 years ago and believed that a greater mesh size of trawl net would limit the destruction of small fish. W. Stewart, a fishmonger from Princes Street in Dunedin, commented to the inquiry that flounders '*seem to be going out of existence altogether.*' Francis Hewitt, mate of the trawler *Napier* had formerly worked as a small boat fisherman and fish curer. He stated to the inquiry that in winter the flounder always 'go off' and that the only thing the seine men have to live on is red cod. '*Five years ago we were catching nothing but red-cod, and it was owing to that that Mr Sullivan took up the trawling business.*'

Establishment of Portobello Marine Hatchery

Concern about the state of the flatfish in Otago harbour in part led to the establishment in 1904 of the Portobello Marine Hatchery, midway down the Otago Harbour. In 1906 a large number of flounder-fry were liberated into the harbour. The following year the Marine Department Annual Report noted that, '*Several millions of ova of New Zealand food fishes, principally soles and flounders, have been fertilised and hatched out at the station and liberated in Otago Harbour.*' The Chairman of the Fish Hatchery reported in 1909 that over the previous 5 years it had released millions of larvae of sole, lemon-sole, and flounder.

Conflict between seiners and trawlers

Interestingly, in 1910, the Marine Department Annual Report noted that soles, flounder, and flatfish have generally been plentiful. Similarly, in 1913, W. Adam, the Otago Inspector of Fisheries, reported to the Secretary of the Marine Department that '*Supply of flat fish from the local grounds has been good.*' Good supplies of flatfish continued through to the early 1920s apart from in 1917 when poor weather conditions made trawling for flatfish difficult. However, in 1919 the Otago Fisherman's Society petitioned the Minister of Marine to ban trawling inside a three mile limit from Moeraki to Cape Saunders. The petitioners claimed that '*Prior to the trawlers commencing operations, flat fish (flounders and soles) used to go outside the heads into deeper water to spawn and return again unmolested to the harbours, where seine fishermen caught them in large quantities.*' The petitioners added that, '*Since the trawlers started without a limit, the flat fish which usually go outside the heads into the bays to spawn are caught, while full of spawn, and as time has elapsed the want of a limit has caused the fish to grow scarcer and still scarcer.*' No trawl limit was imposed.

In 1924 catches of flatfish by trawlers were very poor and by the end of the year the largest of the Port Chalmers steam trawlers was laid up indefinitely. In 1925 G.M. Thomson, Chairman of the Portobello Marine Fish-Hatchery Biological Station, reported that flatfish were more scarce than for some years past. During the spawning season, the flatfish were only being caught in small numbers on the grounds four miles north and north-east of Otago Heads. The grounds closer inshore were foul with loose weed throughout the greater part of the winter, and as a result were almost bare of flounder and sole. Thompson added that brill were exceptionally scarce – none were caught during the spawning season. In 1926, Mr Adams, the curator of the Portobello Marine Fish-Hatchery Biological Station, reported that there has been an exceptional scarcity of flatfish on the local grounds. '*All the trawlers able to have been travelling as far south as The Nuggets, where large hauls of sole have been made over the previous seven years. Only two small trawlers have worked the local Otago grounds*

where catches have been the poorest on record.' The Otago Inspector of Fisheries noted that the seine fishermen working inside Otago Harbour reported a scarcity of flounder which continued into 1927.

Various reasons for the scarcity of flatfish in Otago Harbour were put forward. The opinion of S. Broadley, the Otago Inspector of Fisheries, was that *'this has been brought about by the amount of silt on the bottom caused by dredging and other operations being carried on in the Harbour.'* A few months later he ventured that the lack of small fish *'has been caused by the amount of oil which has been allowed to escape on several occasions from oil burning steamers at Port Chalmers'*.

Fluctuating availability

Despite these problems, in 1928 the catches of flatfish began to pick up, especially on the trawl grounds off Otago and the Nuggets with good catches carrying through to 1933. Catches by seiners inside Otago Harbour remained depressed, however, and in 1935 A.E. Hefford, the Chief Inspector of Fisheries, noted that Otago catch of flounder on the outside grounds and in the harbour was markedly deficient. The following year he commented that *'Generally speaking, flatfish as well as groper supplies have been below requirements. As might be expected, the small-boat and inshore fishermen have been most seriously affected and some of the Otago men have abandoned the fishing.'* In 1937, the Otago Inspector of Fisheries, S. Broadley, noted that the supply of flatfish from the Otago grounds *'is decreasing each year, especially since diesel engines have been installed in the majority of boats'* and that, *'Seine fishermen are having a very lean time, flounders are scarce and the harbour is full of floating weed. Added to this they have to contend with many weekenders who fish the Harbour from Friday night to Monday morning with a result the grounds never have time to settle'*.

By 1940 good catches of flatfish were being taken by trawling off Pounawea, the Nuggets, and the mouth of the Taieri River. The average catch was 5–14 cases of flatfish, each averaging 70 lbs, for one day's fishing. Catches in Blueskin Bay were not as good, averaging just 1 to 4 cases of soles and flounders per day. Meanwhile catches of flounder in Otago Harbour continued to be poor. In August 1941, S. Broadley, Otago Inspector of Fisheries, remarked that, *'The few remaining seine fishermen in Otago Harbour are experiencing a very lean time, often finishing a full tide without catching enough fish of any kind to send to the market'*. In December that same year Broadley added, *'All fishing in the Otago Harbour is practically at a standstill and the majority of fishermen have found other employment as for the past two years they have been unable to make wages.'* In 1942, seining in the harbour seems to have improved a little with Broadley noting in his February report that there were *'some good hauls of flounders.'* Through the 1940s the catch of sole and flounder landed through Port Chalmers fluctuated 35–40% around the decadal annual average of 55 t from year to year. The Port Chalmers trawlers often traveled south to operate at the Nuggets, much to the chagrin of the local fishermen. In 1947 they wrote a letter of protest to the Minister of Marine stating that, *'We the fishermen operating boats at Nugget Bay are much concerned about the depletion of fish in Nugget Bay by outside trawlers, and are desirous of getting an area set aside on which Nugget boats only are allowed to operate.'* The Otago District Inspector of Fisheries, Mr McIvor, provide written comment on the fishermen's letter to the Secretary of Marine. McIvor noted, *'The depletion, I am afraid is a known fact, as all who know the area concede that the grounds are slowly becoming poorer. All along the coast the position is the same, but this is in a large measure offset by higher prices.'* McIvor further suggested that trawling be totally prohibited from the area if the depletion was to become an

urgent problem. In 1948 a modern steam trawler commenced fishing out of Port Chalmers. Almost immediately there were strong protests from smaller scale fishermen who fished out of the Taieri River mouth. One fisherman complained that, *'It took 10 years for us to build up the grounds and in the past two years, when the fish have been better than ever, the Port Chalmers boats have begun to visit the grounds again. All through the summer they worked round the clock, and catches of up 100 cases have been known to go back to Port Chalmers.'* He argued that the Port Chalmers boats had worked their ground continuously until the fish became seriously depleted.

An article in the Otago Daily Times on 18 May 1957 offered a sad post-script to the state of fishing off the Otago coast. The article stated, *'Trawler and line fishermen operating off the Otago coast are not "striking it rich" just now.....No one seems to know why the flounders and sole have disappeared.'*

Groper

The following summary is compiled from the information collated in Supplementary Information S32. For a timeline of key events see Table 3 on page 20.

Māori fishing for hapuku

Elsdon Best (1929) described the fishing practices of Ngai-Tahu and Ngati-Mamoe for groper. *'Fishing-canoes began to go out to the hapuku fishing-grounds in the sixth month (November or December). The larger canoes would contain thirty men, more or less, and the small canoes a lesser number. The large and small canoes would go out together to the fishing [grounds]; the larger vessels proceeded to the more distant fishing-grounds . . . The hapuku fishing ceased in the Maruaroa season [about June], the month when Orion appeared well above the horizon; at that time the tail of the hapuku becomes red, so in the latter days of June the fishing ceases.'*

Early commercial fishing for groper

Commercial fishing for groper on the Otago-Catlins coast began sometime in the 1860s. Richard Lewis had a fishing ketch delivered from Victoria, Australia, to Otago in 1862 and began by hand-lining for hapuku and blue cod between Moeraki and Cape Saunders (Johnson 2004). In the same decade a fish curing factory was established at Port Chalmers and processed several species including groper. A few gropers were caught in 1868 during exploratory trawling off the Otago coast using the vessel *Redcliffe* but the trials soon ceased because of extensive wear and tear on the cotton nets.

The earliest reports indicate that large groper were commonly available nearshore. In 1869 the Commissioners for the Province of Otago reported that about 30 fishing vessels were working the coast year round as weather permitted but especially from October to March. Set and hand lines were used to capture groper within a short distance of Otago Heads. Hutton & Hector in their 1872 publication *'Fishes of New Zealand'* note (p. 102) that groper can be *'Obtained from November to May on all parts of New Zealand coast where rocky capes and islands prevail – appears to be favourite feeding and spawning ground. During winter season they are seldom caught – probably leave the coast for deeper water.'* They indicated that the average weight of groper was about 45 lbs, with occasional specimens up to 130 lbs. Thompson (1876) noted that groper was caught off the rocky points of the coast, in five fathoms [about 10 m] or more of water, just outside the kelp. In an 1877 report on the Dunedin fish supply, Thompson indicated that a few very large individual gropers were brought to town, weighing as much as 50–60 lbs, with 20–30 lbs being the average size.

Sherrin, in his 1886 publication *A Handbook of New Zealand Fishes*, stated that groper feed around exposed rocky capes and islands in waters of 20 to 50 fathoms, with patches of sandy bottom and that groper can be obtained between November and May on nearly every part of the New Zealand coast where these conditions prevail. The size and style of craft used to fish for groper also indicates how close inshore they occurred. For instance, the fishing industry at the Nuggets was established in 1879 by a Mr Arthur who began fishing to feed his family. His first boat was a 14 foot row boat; he carted his groper catch to Kaitangata, where they were sold for two pence per pound. Graham (1957) quoted Mr Broadley, Otago Inspector of Fisheries who stated that *'the dropping of a line and hook in shallow water off Purakuranui, Tyrone, Blueskin and other parts in 1910, or even later, would result in catching up to five or six dozen groper. The dropping of a line anywhere outside the Otago Heads at one time would result in catching Groper.'* Graham (1957) added, *'At one time in the summer months Groper were plentiful anywhere inshore from five to twenty fathoms in such places as Heyward Point, Drivers Rock, Cape Saunders, and similar places up and down the coastline. From 1922 up to 1927 it was possible to fish off Drivers Rock, off Otago Heads, and load a boat with groper. In the years mentioned, during the summer months a few could be caught inside Otago Heads. It was possible at that time to go off-shore to Two Lights, which is about twelve miles off land, and two men in one day could catch from five to fifteen dozen large Groper. When I use the term large I am alluding to fish weighing eighty pound, now so seldom seen.'*

The preference of groper for areas of foul or rocky ground was underscored by the experimental trawling carried out by the steam trawler *Doto* during the autumn and winter of 1900. No groper was taken in any of the hauls off the Otago coast. Similarly, in the 1937–38 Marine Department Annual Report A.E. Hefford, Chief Inspector of Fisheries, presented a table showing the quantities of different kinds of fish caught by different methods. Groper is listed as being caught only by line (set and hand).

There was considerable enthusiasm for the development of Otago fisheries. In *Papers Relating to the Development of Colonial Industries* a Mr J. McKenzie (1885) provided a brief assessment of New Zealand fish stocks and the potential for commercial exploitation. He stated that from Martins Bay (south Westland) he *'commenced to meet with fish in such numerous shoals that from there to off Oamaru, inshore and offshore, I believe millions of tons of fish could be caught yearly. . . . 'Ling and groper in great quantities I found from off Chaslands Mistake to off Timaru.'* Exploitation of offshore stocks of groper was enabled by new technologies. The introduction of small reliable benzene powered 'oil' engines to the fishing fleet occurred around 1900. These enabled discovery and exploitation of various reefs up and down the coast, where groper and other species congregated. According to Munro & Munro (1984) many of these grounds were named after their finders such as McDonald's (North Reef), Tonnage's patch, McIntosh's reef, Jim Dow's patch (Little South reef), Jim Dow's reef, Middendorf, and Thomson patches. The boats were usually crewed by two men, setting long lines with hooks off each side, with setting and retrieval by hand. Later, to increase efficiency and profitability, the 'long-line' was introduced, with 100 to 300 hooks, buoyed with floats at each end, and the 'dahn' line – 7 to 20 hooks, with a grapnel at bottom and buoy at top, left in place for 1 to 3 hours. In 1906 the Marine Department Annual Report noted that there had been a considerable improvement in the boats and gear used in the industry and that despite unseasonable weather much larger catches were taken than during previous years from the Otago coast.

Decline in inshore groper

This increase in fishing power and areas and depths fished enabled catches of groper to be maintained or increased. The 1910 Marine Department Annual Report noted that, *‘owing to new class of boats and gear, many parts of the coast formally untouched have been visited, and, as a consequence, a better variety of fish has been taken..... - groper, trevally, terakihi, snapper, moki, and barracouta have been taken, but cautioned ‘though some of them have disappeared from their old haunts’.* Graham (1957) noted that *‘As soon as the North Reef was discovered [around 1900], it was not uncommon to see 20 or more boats fishing there – fishermen coming not only from Port Chalmers, but also Moeraki and Puketeraki. The result was that the place was overfished even during the spawning season and consequently much smaller hauls were evidenced – the decrease was notable not only at North Reef, but also at Two Lights, anywhere north and south of Otago Heads.’*

In 1913 the decline of inshore stocks of groper was further noted in the Marine Department annual report for 1912–1913. *‘At Moeraki some exceptional hauls of hapuku made well off-shore in 50 to 90 fathoms....At Nugget Point the fishermen report that fishing in the inshore grounds has been rather poor, but further off in the deeper water the catches [of hapuku] were equal to other years.’* Later in 1913 the October Monthly Report on Otago Fisheries noted that, *‘Some very large hauls of groper have been caught about 8 miles SE of Otago Heads. One boat is credited with having taken 16 dozen in one day.’* In 1914 the Nuggets based groper boats had a poor season and the boats have had to go farther away to make catches. In 1915 the March and July Monthly Report on Otago Fisheries noted that fair and good numbers of groper and ling were caught by the line men some 16 miles NE of Otago Heads. In 1924 to catch groper off Oamaru boats had to run some 20 miles or more from the coast. In 1926 Otago line fishermen were compelled to go well off the land to secure any quantity of groper with some of these boats steaming up to 25 miles to get on the fishing grounds. In 1929, Mr Brewer, Inspector of Fisheries, commented in his Annual Report for Oamaru and Moeraki that *‘Most fishermen at Oamaru and Moeraki have recently adopted the fixed line method of fishing, some lines having up to 500 hooks. ‘This system will no doubt be the means of more quickly exhausting the groper fishing grounds.’* Brewer also stated *‘that it is the opinion of the experienced fishermen in this district that the Department should consider a closed season for groper during spawning.’* In the early 1940s catches of groper were poor. In 1940 the Otago Inspector of Fisheries noted in his May report that, *‘Line fish scarce for this time of the year.’* In his May 1941 report he noted that *‘Early in the month the line boats working out of Port Chalmers brought in very small catches of groper.’* In his October 1941 report he noted that *‘The few line boats working out of Port Chalmers report a decided scarcity of groper; often the catches were too small to send to market.’* Mr A.E. Hefford in the 1942 Marine Department annual report noted that fewer groper were landed at Port Chalmers than in previous years.

Debate about the decline

The decline in nearshore stocks of groper was blamed on various factors. In 1919 a petition by the Otago Fisherman’s Association to the Minister of Marine requested that bottom trawling be banned inside 3 miles of shore from Moeraki to Cape Saunders. The Association argued that the trawl gear, *‘which are dragged for hours also kill millions of small fish and spawn, and drive groper, kingfish etc. miles off into deeper water, which prior to trawling let it again be mentioned were caught close in shore.’* In 1947 and 1948 further claims were made in a letter to the Minister of Marine and in the Otago Daily Times newspaper by small boat fishermen from the Nuggets and Tairei River mouth of the destructive effects of bottom trawling by large trawlers on fish stocks including groper. Mr McIvor, District Inspector of

Fisheries for Otago, responded to the Secretary of the Marine Department regarding the letter to the Minister. *'The depletion, I am afraid is a known fact, as all who know the area concede that the grounds are slowly becoming poorer. All along the coast the position is the same, but this is in a large measure offset by higher prices.'* McIvor suggested that trawling should be totally prohibited from the area if the depletion was to become an urgent problem. In 1923 the Collector of Customs for Oamaru noted that the *'Past year shows a marked decrease in the quantity of fish landed'* and that *'Some of the fishermen strongly recommend a closed season for groper from the end of June to October. They state that during these months the fish go out to spawn and by catching them during this time millions of fish are lost annually, and in a few years groper will be exceedingly scarce.'*

The Collector of Customs noted that some fishermen hold a counter view that *'when the groper go to spawn they remove themselves so far from the coast that the fishing boats seldom get near them.'* In 1931, R. Brewer, Oamaru Fisheries Inspector, in a letter to the Secretary of the Marine Department noted that Moeraki fishermen were *'concerned that about the future supply of groper ('the mainstay of fishing in this district'), which they claim are becoming more difficult to obtain owing to the long-line method of catching.'* The fishermen believed that the hooked groper frighten off others.' In the same year A.E. Hefford, in the Marine Department Annual Report noted that *'Some fishermen believe that present scarcity [of groper] may be the result of dead fish on lost long-lines polluting the grounds. I disagree that there is any chance of appreciable pollution occurring. 'The effect of long-lines, in my opinion, is to bring about an increase in the number of fish abstracted from an already depleted stock.'* In the 1934 Marine Department Annual Report, Hefford elaborated further on the state of the groper stocks in Otago and elsewhere. *'This kind of fish is becoming more and more difficult of catch. Formerly the market requirements could be supplied by hand-line fishing, but nowadays the majority of groper are taken by long lines. Each line carries several hooks, usually on wire snoods, a sinker being attached to the further end of the line and a buoy to the nearer end. Several of these lines may be fished by a single boat, and in fishing they are allowed to drift with the tide. Experience has shown that groper grounds which are shed in this way do not maintain their original productiveness for very long.....In my opinion the local depletion is largely a matter of the abstraction of larger numbers of the fish population by the intensified efficiency of the fishing operations. Even hand-line fishing, if carried on continuously, can have a marked effect in reducing the stock of fish.'* Hefford also suggested that variation in reproduction may be a relevant factor. *'The occurrence of good spawning years and bad spawning years is well known, and the elucidation of the factors effecting such variation in the ultimate results of the natural reproduction of fishes have been clearly demonstrated by fishery investigations in other parts of the world. There remain matters of obscurity with regard to New Zealand fishes, though statistical records of the fisheries, even without biological investigations, would have thrown a great deal of light on these questions.'*

That fishing itself may be the main culprit for the decline in groper stocks was clearly voiced by David Graham in his 1957 book 'A Treasury of New Zealand Fishes'. Graham wrote, *'Even though the sea is teeming with life, it is quite possible to fish out a certain fish. This may seem incredible to some people, but during 1930-34 one of the most popular fish on the market, the Groper, was slowly and surely being depleted by nothing more or less than overfishing. Unless some restriction is placed either on the number caught, or on their being caught during the spawning season, they will gradually become less abundant. The same can be said for Blue Cod. This is not a scientific theory but is recognised by line fishermen who live by their catches'*. Graham (1957) concluded, *'It is surprising that a thinking community*

would permit this [depletion] to go on and on without some attempt being made to formulate some scheme whereby the Groper would be allowed to maintain even its comparative abundance.’

Red cod

The following summary is compiled from the information collated in Supplementary Information S33. For a timeline of key events see Table 3 on page 20.

Commercial fishery begins

The earliest records of commercial fishing for red cod are from 1869 when the Commissioners for the Province of Otago noted red cod among the fish species caught by fishermen on the Otago coast and in the waters of Otago Harbour. These fish were taken by line and small seines. A survey by P. Thompson in 1876 of the fish for sale in Dunedin indicated that red cod was caught year round. Thompson also added that red cod were, ‘very common, occurring in the Harbour in large shoals, and a favourite object of sport from all the jetties and piers as well as from boats in the channels’. In a similar survey in 1878 Thompson noted that ‘This fish is always to be had, in finest condition during the winter months, when pretty large takes of good-sized specimens are got from the outside fishery, those caught by the seine-net in the harbour being as a rule much smaller.’ Trawling operations by the steam trawler *Doto* in 1900 established that red cod could also be taken in good numbers on open ground everywhere along the Otago-Catlins coast. Similar trawling trials using the government chartered steam trawler the *Nora Niven* indicated good catches of red cod in Molyneaux Bay, off Cape Saunders, and north of the Otago Peninsula.

Fluctuating abundance

The historical record indicates greatly fluctuating abundances of red cod off the Otago-Catlins coast. The abundance of red cod in Otago Harbour was indicated by Graham (1957). ‘About 1910 they were so numerous on many occasions in the harbour, Mr Broadley [Fisherman and Inspector of Fisheries] said, that a person in a rowing boat could take a stick with a nail at the end and spear a boatload in an hour and a half. They seemed so numerous in the water as to give one the impression that a person could walk on top of them without sinking. The visitation of this unusual number of Red Cod was due to enormous numbers of Whalefeed being in the harbour.’

In 1910 the Marine Department Annual Report reported a depression in the Otago fishery caused mainly by a scarcity of fish. Presumably this also applied to red cod. In spring of 1913 red cod were reported to have been taken by trawlers but few by the line fishery. Later in summer reports noted that, ‘Red cod are now very plentiful inside the [Otago] harbour, and some good catches have been taken by the line men when it has been too rough too venture outside the Heads.’ In 1914 fair catches of red cod were initially made by vessels operating out of Oamaru, but later on all fish became scarce and many of the fishermen had to lay up their boats. Off the Otago coast good hauls of red cod were made by trawlers, but very few were taken by line fishermen.

In 1915 the abundance of red cod appeared to greatly increase. In the March monthly report by the Otago Inspector of Fisheries it was noted that red cod were now plentiful inside and outside the harbour with large quantities taken by the trawlers and seine boat men. The report for the following month noted that ‘Red Cod can be caught in quantity in almost any part of the harbour.’ By the end of the year the Otago Inspector noted that, ‘Large numbers of red cod of large size, but in very poor condition, have been taken by the trawlers. On several

occasions, owing to their enormous numbers, they have greatly interfered with trawling, and it has been necessary at times, to cut away the meshes before hoisting the trawl on board.' This abundance continued through 1916 with the Otago Inspector of Fisheries noting in his April report that, *'Both inside and outside the harbour the water is practically alive with red-cod, but on account of the poor demand, very few of these fish were taken.'*

By 1918 red cod were still fairly plentiful off Moeraki but further north off Oamaru they had declined. By 1919 Oamaru fishermen were reporting that they *'catch barely enough for bait.'* In June 1920 the Otago Inspector of Fisheries reported that, *'Red cod have again made their appearance off Cape Saunders from which place they have been absent for about four years'* and in the following year he noted that *'red cod have appeared again in large shoals,'* with boats working close inshore taking large numbers. The increase extended north to Oamaru with the Collector of Customs noted that, *'This year shows an increase in the total quantity of fish – most noticeably red cod.'* In 1922 the Otago Inspector of Fisheries noted that at times red cod were unsaleable. The good availability of red cod continued through 1923 and 1924 but by the winter of 1925 red cod were again reported to be scarce. Their availability increased through 1928 when G.M. Thomson, Chairman, Marine Fisheries Investigation Station at Portobello reported that, *'Red cod, no doubt following the whale feed, have been seen in the Harbour in larger quantities than for some time past.'* Line fishermen working about Cape Saunders were also reported to have taken fair catches of red cod. Large catches of red cod were also taken off Otago by steam trawlers. In 1930, seine fishermen secured large hauls of red cod off the banks near Port Chalmers in Otago Harbour. The good catches of red cod continued throughout the 1930s and it was not till 1941 when a number of reports all commented that red cod had become very scarce. However catches of red cod rebounded in 1942–43 before falling by 60% in 1944, building again in 1945, before decreasing to low levels in 1946 and 1947.

Catches of red cod were rarely a good indication of abundance. Only in years when other species were scarce would all the red cod caught be landed. Often they were returned to the sea, dead from nets.

Tarakihi

The following summary is compiled from the information collated in Supplementary Information S34. For a timeline of key events see Table 3 on page 20.

In the earliest days of commercial fishing off the Otago-Catlins coast by hand seining and line fishing, tarakihi was not regularly landed. Small tarakihi occurred in Otago Harbour, particularly in summers when shoals of whale krill were abundant, and were sometimes caught by the seiners working harbour waters. It was not until the arrival of steam trawlers on the coast at the start of the 20th century that tarakihi were caught in any quantities, principally in 20 to 120 m of water over muddy, sandy or gravel bottoms. The historical sources report fair to large catches of tarakihi taken by trawlers through to about 1934, but then tarakihi began to be reported as scarce inside Otago Harbour adjacent to the marine research station at Portobello. However, large steam trawlers working well off Otago Heads continued to bring in large catches of tarakihi. For example in the June 1937 report on Otago Fisheries, S. Broadley, Inspector of Fisheries, reported that, *'The large steam trawler has secured several large hauls of round fish of all kinds, the principal being tarakihi. For one catch of two days fishing she brought in 14,000 lbs of tarakihi'* [73% of the catch]. These large offshore catches continued until 1944 when the largest trawler was wrecked and catches of tarakihi declined by 95%. In 1947 catches of tarakihi again increased when a replacement vessel was

purchased. However, by 1957 Otago catches had greatly decreased and a newspaper article described how *‘Trawler and line fishermen operating off the Otago coast are not “striking it rich” just now. For reasons that only research officers will be able to explain comparatively few fish are being taken from the recognised grounds. In previous years the poundage each day rose into four figures. Now only about 300lb are being taken in a day that lasts as long as 15 hours...’*

3.5 Pre-1930s Hauraki and Otago catch data

Catch data

These data are provided in Supplementary Information S33–43. The only pre-1930s data that are useful for regional estimates of catch by species are the Hauraki data for 1927 and 1929. The data for these years are species specific and cover all of the relevant Hauraki ports except Whangarei. Species specific data for Whangarei are available for 1928 and provide an estimation of the 1927 and 1929 Whangarei catch, which would have been relatively small. The 1927 and 1929 Hauraki data includes a portion of catch (about 10%) that is ‘undefined’. However, an examination of the records shows that the principal catch species were generally accounted for, and that the undefined catch probably related to species caught in relatively small numbers, which the fishing companies did not record individually.

Species specific data are available for some Otago-Catlins ports in some years (particularly Moeraki and Oamaru), but are not be useful as the data for the remaining ports in the study area are not species specific.

The best catch data from the period prior to 1930 are for the landings of rock oysters, as by 1908 the Marine Department had taken over sole responsibility for picking the oysters and maintaining the beds.

Interpretation

For both the Hauraki and Otago study areas, an assessment needs to be made of the proportion of the fish recorded as landed at ports in the region that was actually caught within the study area boundaries.

(1) Hauraki

In the Hauraki area, a significant proportion of the landings recorded at ports within the region were caught outside the study area, primarily in the waters of the Bay of Plenty. An important reason for this was that regulations introduced from around the turn of the 20th century placed increasing restriction on fishing within the Hauraki Gulf (figures 8 and 19 in Paul (2014) illustrate these changes). In his annual report for the year ending 31 March 1917, the Inspector of Fisheries at Tauranga noted that a Sanford’s trawler had made an experimental voyage to the Bay of Plenty. By 1921, the Auckland Inspector of Fisheries was reporting that several trawlers were working the Bay of Plenty and, when the weather was good, were taking good catches of snapper, tarakihi, and gurnard. In 1925, the Tauranga Inspector of Fisheries noted that all the fish caught by the Auckland steam trawlers was taken straight to Auckland.

Auckland trawlers also worked other grounds. In 1926, the Auckland Inspector of Fisheries noted that, as well as the Bay of Plenty, Auckland trawlers were working the north coast, with one believed to be working about North Cape and Three Kings Islands. In 1928, a

steam trawler was reported to be operating from Manukau Harbour, working the west coast. In 1931, Hefford noted that Auckland steam trawlers were dividing their operations between the lower Hauraki Gulf, off Great Barrier, the Bay of Plenty, and the west coast.

By the mid-1930s, Danish seining vessels were also working in the Bay of Plenty. In his annual report for the year ending 31 March 1936, Hefford commented that: 'The restricted areas available for Danish-seine fishing in the Hauraki Gulf and the increased numbers and power of the vessels using this method of fishing have led to an augmented exploitation of the fishing-grounds in the Bay of Plenty, from where substantial catches have been brought to the Auckland markets.'

A few sources shed light on the proportion of fish recorded as landed in Auckland that was caught in the Bay of Plenty:

1. In 1935, the Auckland Inspector of Fisheries provided the following figures of the quantity of fish landed annually in Auckland from the Bay of Plenty: snapper – 420 tons; tarakihi – 220 tons; flatfish (mostly dabs) – 50 tons.
2. Reporting on the year ending 31 March 1940, Hefford noted that Auckland trawler voyages were divided between the Hauraki Gulf grounds, Bay of Plenty, and East Cape in a ratio of 1:2:7. He noted that, of the total Auckland landings, trawl-caught fish represented 13.8%, Danish-seine 82.4%, line-fishing 2.7%, net-fishing 1.1%.
3. Writing in November 1942, Hefford stated that: *'The statistical data are unfortunately not available in such a form that we can sort out from the fish landed in Auckland what proportion has been derived from the Bay of Plenty. Taking snapper alone, the total quantity of this fish brought to the Auckland markets in the last five years amounted to 23,000 tons. We shall not be far out if we conclude at least one third of this was caught in the Bay of Plenty: that is, over 7,600 tons or an average of 1,500 tons or more yearly, or about 125 tons monthly.'*

Another matter that is relevant to the interpretation of these data is that small or undersized fish were sometimes killed during the fishing process, but not recorded in the landing returns. There is little evidence relating to this. In 1954, a District Inspector of Fisheries working in the Hauraki Gulf commented that for several years commercial fishing vessels – both Danish seiners and trawlers – had been dumping a growing proportion of their catch at sea because it was small (though not necessarily undersized). He stated that the proportion of dumped fish had grown to a percentage *'which causes concern'*. He noted that many Danish seiners had changed to trawling, and that the escapement of undersized fish and those not wanted by the trade was nil *'as at least 90% of the catch when lifted aboard is already dead, when caught by the trawl method.'* The District Inspector further commented that: *'The amounts of small fish (undersized) vary from time to time. Often 20% of the catch is rejected, not because it is undersized but because of the lack of demand for fish between 10-11- to 12 inches. The trade does not want it because of the handling of it, cleaning and gutting etc.'*

(2) Otago

Some fish landed in the Otago ports may also have been caught from outside the Otago study area. In the annual report for Oamaru and Moeraki for the year ending 31 March 1925, it was noted that *'groper is the mainstay of the fleet, but must be sought 20 miles off the coast in fine weather'*. The Otago Inspector of Fisheries stated in November 1926 that: *'For this time of year the line fishermen are compelled to go well off the land to secure any quantity of groper. Some of these boats are steaming up to 25 miles to get on the fishing grounds.'* In April 1928

he reported that line fishermen were securing moderate catches of groper and ‘a fair amount of kingfish’ (actually most probably warehou), most caught at a distance of from 15 to 18 miles off Otago Heads at a depth of 70 to 100 fathoms. In May 1937, he reported that: ‘*The large steam trawler working the grounds North East of Otago Heads at a depth of 40 to 60 fathoms brought in some very large catches of tarakihi, moki, barracouta, red cod, dogfish, elephant fish and a few cases of flatfish.*’

The issue of fish being returned to the sea (possibly dead), but not recorded as catch, is also relevant to Otago. In the Marine Department annual report for 1916–1917, it was noted that there was some wastage from oversupply, with 10 tons returned to sea and thrown overboard. In December 1933, the Otago Inspector of Fisheries reported that, on account of lack of demand, steam trawlers had thrown back large quantities of red cod.

4. DISCUSSION

4.1 A change from Māori to European dominated society

The historical period examined in this report was a time of profound societal transformation in New Zealand from the late Māori period when European visitors were few and Māori kawaanatanga, culture, values, and trade dominated life, to 1950 when European governance, culture, values, law and commerce were preeminent (see King 2003). The prevailing societal perceptions of the marine environment, use of its resources, and the laws that governed this use reflected this change from a Māori (Anon 1993, Walter et al. 2006, Leach 2006, Smith 2011 and 2013) to a European (Arnold 2004, Hughey et al. 2010, McKenzie & MacDiarmid 2012, Supplementary Information S46) dominated society. At the same time the historical information indicates a decline in the state of the coastal marine environment. It changed from one where the abundance of fish and invertebrates was remarkable to the earliest European visitors and explorers, to a situation, about 100 years later, when the rapid development of commercial fisheries prompted the introduction of laws restricting the most destructive practices.

4.2 Early European Impressions

The earliest European visitors to New Zealand noted an extraordinary abundance of fish and invertebrates everywhere around the coasts. For example, Sir Joseph Banks, a notable participant in Captain James Cook’s first voyage to New Zealand, in 1770 remarked that ‘*For this scarcity of animals on the land the Sea however makes abundant recompense. Every creek and corner produces abundance of fish not only wholesome but at least as well tasted as our fish in Europe...*’ (Beaglehole 1963). Likewise, Nicholas in his 1817 book ‘*Narrative of a Voyage to New Zealand [Vol.II]*’ observed, ‘*During the short stay which I made in this interesting island, I had repeated occasions to observe the great abundance of fish that everywhere visited the coast.*’; As late as 1853 Earp observed, ‘*..the harbours abound in fish – abound is a poor word for it: they are literally alive with fish.*’ Captain James Cook remarked on the great abundance of shellfish in the harbours and estuaries he explored (Beaglehole 1955), and later explorers made reference to the extent and thickness of oyster beds lining sheltered rocky shores in northern New Zealand (Yate 1835, Polack 1838, Bidwill 1841).

These Europeans were remarking on the abundance of fish and invertebrates from the perspective of their mostly British experience and observations of marine productivity and fisheries, as well as experiences gained on the long trip from Europe to New Zealand. In

British seas at this time, despite seven centuries of exploitation through mainly hook and line, hand-seine and set-net fisheries, coastal fish were still relatively common (Barrett et al. 2004, Thurstan & Roberts 2010), so fish and invertebrates around New Zealand must have been very abundant to be worthy of mention in official journals and letters.

This abundance was despite a high reliance by Māori, in both the Greater Hauraki and Otago-Catclins regions around the time of early European contact, on marine fish and invertebrates (Leach 2006). Sir Joseph Banks and later European explorers and visitors were struck by the great size of the beach seines properly drawn by up to 500 Māori, as well as the numerous types of hooks, lures, and traps that were used to catch fish (Leach 2006). Smith (2011) estimated that in the Greater Hauraki region around 1769 AD, 12 150 Māori were, each year, extracting approximately 2600 t (range 1464–3644 t) of fish (mainly comprising snapper 38%, and small sharks 37%), and 2295 t (range 1289–3207 t) of shellfish (comprised mainly of cockles 59%, and pipi 26%). In the Otago-Catclins region 1800 Māori were extracting approximately 725 t (range 540 – 939 t) of fish (mainly comprising barracouta 50%, and hapuku 31%), and 51 t (range 38–66 t) of shellfish (comprised mainly of paua 69%) annually at the time of Cook's first voyage (Smith 2011). In both regions this equated to about 400 kg of fish and shellfish per person per year and it is useful to put into perspective the annual total catch of the fish species most heavily exploited by Māori around the time of Cook's first voyage. For the Greater Hauraki region, it was about 4.5% of the unfished biomass of snapper and about 11% of the unfished biomass of small sharks (McKenzie & MacDiarmid 2012). In the Otago-Catclins region, Māori annual catches around 1769 AD were about 1% of the unexploited biomass of barracouta and 0.5% of the unfished biomass of hapuku (McKenzie & MacDiarmid 2012). At these levels of exploitation Māori in the Greater Hauraki Gulf were probably having modest impacts on small sharks, which because of a combination of late maturity, slow growth, and low fecundity overall have a low productivity (Ministry for Primary Industries 2014), and minor impacts on snapper, while impacts by Māori on barracouta and hapuku stocks in the Otago-Catclins region were probably negligible. Thus, Cook and other early European explorers and visitors probably did experience almost pristine fish and shellfish populations, especially towards the sparsely settled southern parts of New Zealand.

4.3 Late 19th and early 20th century exploitation of some species

The historical information indicates that catches of some fish species were significant in the period prior to the establishment of regular and reliable catch and landings time series in 1931. In the Hauraki Gulf study region substantial fisheries for rock oysters, dredge mussels, crayfish, grey mullet, flatfish, groper, and particularly snapper had developed in the second half of the 19th century to supply the local domestic market, especially Auckland city (see Sections 3.1 and 3.2, Parsons et al. 2009, Paul 2012). Along the Otago-Catclins coast substantial fisheries for blue cod, crayfish, flatfish, and groper had developed to supply the growing cities of Dunedin and Oamaru in the period 1860–1930 (see Sections 3.3 and 3.4). Concern over the state of fisheries and of destructive fishing practices emerged quickly and as early as 1877 the Fish Protection Act was enacted. The following year the Fisheries (Dynamite) Act of 1878 was introduced to curb the very destructive practice of dynamiting of fish in the sea, lakes, and rivers. The historical decline in fish stocks in New Zealand and the imposition of state regulations and controls was in two cases, rock oysters and grey mullet, rapid once a commercial fishery started.

Rock oysters

The earliest visitors, from Cook onwards, remarked on the astonishing abundance of rock oysters in sheltered localities in the Hauraki Gulf (see Section 3.2.4 and Supplementary Information S 24). As late as 1841 James Bidwell wrote of Coromandel Harbour, *'The shores are all very rocky and covered with trees, but the cliffs are not in general high, and are always very rugged; those at the water's edge are covered with oysters in a most extraordinary manner; generally they are more than a foot thick, and very good.'* A commercial fishery hand-picking for rock oysters started in the 1850s when the city of Auckland was beginning to rapidly grow and by the early 1870s oysters were being exported live to eastern Australia in sacks kept wet on deck of low freeboard scows. The impact on oyster stocks was evident by 1866 when the Oyster Fisheries Act was passed only about 15 years after this fishery started, but levels of exploitation remained very high. Warnings about the consequences of widespread picking of oysters emerged again in 1883 when Alfred Cadman, wrote to the Colonial Secretary, stating that oysters in the Coromandel were *'being destroyed in a wholesale manner'*. The following year the Fisheries Conservation Act 1884 *'enabled some urgently-needed regulations to be made for the protection of the local fisheries.'* These included closed seasons and minimum sizes. However, the destructive practices continued. The Marine Department Annual Report for 1893 noted *'when a bed is opened, if it is at all accessible, it is at one rushed, and oysters almost completely destroyed.'* In 1907 the Marine Department Annual Report noted that *'Some beds opened last year have been so denuded of oysters that it will take many years to recover. It seems impossible under the present system to prevent overpicking of beds.* The report concluded, the *'only option appears to be for the Department to take over the picking.* Later that year the Sea Fisheries Amendment Act 1907 saw the Marine Department take control of the North Island oyster beds – the operation of picking and selling to retailers, periodic closure and opening of beds, building stonewalls in the intertidal zone for oyster settlement and removal of whelk predators. This state control was to last almost 60 years until in 1964 legislation was passed providing for the leasing of tidal lands and the harbour bed by persons prepared to undertake the commercial production of rock oysters.

Grey mullet

The commercial fishery for grey mullet in the harbours and estuaries of the Hauraki Gulf study region, as well the Kaipara and Manukau Harbours on the west coast grew out of a long established subsistence fishery by Māori. Mullet were netted in the harbours and smoked or dried for use during winter (Paulin & Paul 2006). Yate (1835) described this Māori fishing activity, ... *'tribes go together to the little creeks where these fish frequent, and always succeed in capturing some hundreds of thousands before they return; the greater part of which they preserve for winter stock. They always catch them in the darkest nights ... with their nets which are several hundred yards long, and drag them in vast numbers to the shore.'* As early as 1841 Māori were trading mullet and other fish species to Europeans cutting masts and spars from the forests fringing the northern harbours (Hodgskin 1841). A market for freshly smoked mullet greatly expanded with the growth of Auckland city and the first mullet canning factory in New Zealand was established at Whangarei in the early 1870s. The number of canneries grew, especially with the support of an export bonus under the Fisheries Encouragement Act of 1885 (Martin 1969). Grey mullet was highly favoured for canning because, as noted by Sherrin (1886), *'there is no New Zealand fish which can be put up in tins fresh so well as the mullet. Its oily and rich nature makes it a general favourite with the public, and many epicures pronounce the fish quite as good as the salmon, and superior to any other smoked or put in tins.'* Māori fishers supplied the early market but soon a specialised European commercial fishery developed with specially designed wide-berth

shallow-draught fishing yachts, the mullet boat, that could easily navigate the shallow harbours and then race under full sail to Auckland markets (Paulin & Paul 2006). However, the concentration of the fishery in shallow easily accessible harbours and tidal estuaries made it susceptible to intense competition and over-exploitation. In 1884 the Fisheries Conservation Act was passed because commercial fishing practices were said to be recklessly destroying small fish. Regulations were put in place that stipulated a minimum landed weight for mullet of 4 oz (Martin 1969), though this seems very small and ineffectual from a modern stock conservation perspective. Greatly fluctuating landings and spoilage of fish caught over the summer season prompted the introduction of a closed season in 1886, but by 1888 this had been lifted for the whole of the eastern North Island (Paulin & Paul 2006). Continuing concerns about the state of the mullet fishery prompted a government sponsored inquiry in 1895–96 led by one of New Zealand’s leading scientists of the time, Sir James Hector. Although Hector’s inquiry was comprehensive, his conclusions were limited by the lack of information about the biology of mullet (Paulin & Paul 2006). A minimum mesh size for mullet nets was introduced in 1905 but Marine Department reports for 1906 and 1907 noted the continuing scarcity of mullet (Supplementary Information S22). In 1907 the Department announced, *‘Owing to the scarcity of mullet on the East Coast of the North Island, a close season will be held during the spawning months of December, January, and February in the waters of that coast.’* In 1910 the Marine Department Annual Report noted that, *‘..mullet appear to be increasing in numbers [Auckland region] since the close season, but most are small.’* However, by 1914 Fisheries Inspector J.P. Bennett, in his Annual Report on Fishing Industry at Auckland, noted with some alarm that, *‘Mullet are doomed to extinction if something is not done in the near future to conserve them, I would suggest a close season extending over a term of years.’* The following year he again wrote of his concerns, *‘Mullet are becoming more scarce each year and it is my opinion only a matter of a year or two when this beautiful fish will become extinct in the Hauraki Gulf if not given strict protection by declaring a close season extending over a number of years.’* Though grey mullet did not become extinct the fishery remained very small with an average of only about 25 tonnes landed each year from the greater Hauraki study area through till 1950 (Paul 2014).

Flatfish

Other species were more resilient than rock oysters and grey mullet, having some parts of their populations inaccessible to the technology of the time, and problems only began to emerge after decades of commercial fishing. For instance, by the early part of the 20th century flatfish were among the most common fish landed by commercial fishermen in the Hauraki Gulf. By 1930 Mr Hefford, the Chief Inspector of Fisheries, warned that *‘This fishery is prosecuted at the expense of spawning aggregations of flounders and dabs, and therefore requires careful watching both from the economic and the biological aspect.’* In his 1934 annual report he commented *‘The fact is that the fish on the grounds were fewer and catches were less. A significant and perhaps ominous feature of the fishing is that the best catches were made in the month of August, which is the height of the spawning-season for dabs and flounders.’* Hefford added, *‘There seems no doubt but that the intensive catching of dabs and flounders at this time is a very considerable factor in their depletion.’* Notably this depletion was underway by the start of the modern time series of flatfish landings.

Flatfish stocks along the Otago-Catlins coast also came under early pressure, especially populations in Otago Harbour and other coastal inlets where small hand seines could be safely deployed in most weather. In Otago Harbour up to 60 commercial seine-net fishermen were operating year round by 1869. However, as early as 1876 P. Thomson, in his journal article ‘Fish and their seasons’, observed that, *‘Flounders are rather over-fished, and are*

neither so large nor so plentiful as they used to be.’ By 1877 the Fish Protection Act was introduced with associated regulations setting minimum mesh sizes for seine and set-nets and introducing a minimum landed size of 9 inches. Continuing concern about flatfish and other stocks, in part, led to the establishment in 1904 of the Portobello Marine Hatchery midway down the Otago Harbour. While flatfish populations on the open coast appeared to wax and wane, those in Otago Harbour never fully recovered and various reasons for this were put forward. In 1927 the opinion of S. Broadley, the Otago Inspector of Fisheries, was *‘this has been brought about by the amount of silt on the bottom caused by dredging and other operations being carried on in the Harbour.’* A few months later he ventured that the lack of small fish *‘has been caused by the amount of oil which has been allowed to escape on several occasions from oil burning steamers at Port Chalmers.’* A decade later in 1937, Broadley noted that the supply of flatfish from the Otago grounds *‘is decreasing each year, especially since diesel engines have been installed in the majority of boats’* and that, *‘Seine fishermen are having a very lean time, flounders are scarce and the harbour is full of floating weed. Added to this they have to contend with many weekenders who fish the Harbour from Friday night to Monday morning with a result the grounds never have time to settle.’*

Snapper

Even a resilient species such as snapper showed early effects of fishing. In the Hauraki Gulf study region, snapper was the principal target fish species by Māori during the prehistoric period, by the commercial fishery since the 1860s, and by a growing recreational fishery since European settlement (Supplementary Information S25, Parsons et al. 2009, Smith 2011, Paul 2014). Despite its continuing dominance in the modern Hauraki Gulf ecosystem where it comprises about 42% of the biomass of all commercially fished species (McKenzie & MacDiarmid 2012), Parson et al. (2009) were surprised how early the effects of exploitation were noted in historical sources. They concluded that localised depletion of snapper in the inshore protected waters of the Gulf had begun before the end of the 19th century, and accelerated in the early decades of the 20th century after the introduction of steam trawlers and purse seiners. In 1914, Jas Bennett, Auckland Inspector of Fisheries, reported that *‘Schnapper in the inland waters of the Hauraki Gulf is decreasing in quantity which can only be expected considering the large number of long line fishermen, and the large number of private yachts and launches which continuously fish there.’* At the same time he noted snapper *‘in abundance’* in the outer Gulf *‘in some cases enormous catches have been made’* by net boats. The report by the Royal Fisheries Commission in 1919 concluded that *‘The evidence shows fairly conclusively that fish cannot now be caught in the gulf by the line and net fishermen with the same ease with which they were caught many years ago; but the evidence also shows that this great difficulty in catching the fish was noticeable even before the advent of the trawler.’* The success of trawling led to trawlers being banned from parts of the Gulf, not so much to preserve the species but to protect the livelihood of long-liners and recreational fishers.

Groper

For other species the decline was quite gradual, especially for those species which had a deeper water refuge that was only exploited following changes in technology. A good example is the groper fishery. In 1919 the Auckland Fisheries Inspector noted in his annual report that groper was *‘more plentiful in former years owing to the fishermen [now] going further afield for their catches of line fish.’* In 1928 a decline in the availability of groper was noted by the Chief Inspector of Fisheries Hefford in his report on the fisheries of the Hauraki Gulf. He further commented that *‘It is the amount of fish that are extracted, not the method of fishing, which is the important factor.’* Along the Otago-Catlins coast, groper was the second

most important fish species after barracouta for Māori (Smith 2011) and a commercial fishery for groper began in the 1860s. The historical evidence clearly indicates that groper were seasonally available close inshore in about 10 m of water around rocky headlands (Section 3.4.5). This was the initial target of the commercial hand-lining fishery from small oar powered dories. Set and hand lines were used to capture groper within a short distance of Otago Heads. According to Graham (1957) up until 1927 it was possible to fish at Drivers Rock, off Otago Heads, and load a boat with groper. As inshore stocks of groper dwindled, exploitation of offshore stocks was enabled by new technologies. Small reliable benzene powered ‘oil’ engines were introduced to the fishing fleet around 1900, and these enabled discovery and exploitation of various reefs up and down the coast, where groper and other species congregated. The boats were usually crewed by two men, setting long lines with hooks off each side of the boat that were set and retrieved by hand. Later, to increase efficiency and profitability, the ‘long-line’ was introduced, with 100 to 300 hooks, buoyed with floats at each end, and the ‘dahn’ line – 7 to 20 hooks, with a grapnel at bottom and buoy at top, left in place for 1 to 3 hours. This increase in fishing power and areas and depths fished enabled catches of groper to be maintained or increased. Graham (1957) noted that ‘*As soon as the North Reef was discovered [around 1900], it was not uncommon to see 20 or more boats fishing there – fishermen coming not only from Port Chalmers, but also Moeraki and Puketeraki. The result was that the place was overfished even during the spawning season and consequently much smaller hauls were evidenced – the decrease was notable not only at North Reef, but also at Two Lights, anywhere north and south of Otago Heads.*’ By the late 1920s Otago line fishermen were compelled to go well off the land to secure any quantity of groper with some of these boats steaming up to 25 miles to get on the fishing grounds. Regular commercial catches of groper near the coast was no longer possible. The decline in nearshore stocks of groper was blamed on various factors including bottom trawling, and pollution from fish rotting on long-lines. Hefford, the chief inspector of fisheries, put the blame squarely on the intensity of fishing, *In my opinion.... the local depletion is largely a matter of the abstraction of larger numbers of the fish population by the intensified efficiency of the fishing operations. Even hand-line fishing, if carried on continuously, can have a marked effect in reducing the stock of fish.*’ That fishing itself may be the main culprit for the decline in groper stocks was clearly voiced by David Graham in his 1957 ‘A Treasury of New Zealand Fishes’. Graham wrote, ‘*Even though the sea is teeming with life, it is quite possible to fish out a certain fish. This may seem incredible to some people, but during 1930-34 one of the most popular fish on the market, the Groper, was slowly and surely being depleted by nothing more or less than overfishing.*’

4.4 Debate about the impacts of fishing

Through the later part of the 19th century a scientific debate had raged about the ability of fishing to affect marine stocks. Because of the high egg production of most fish species, their apparently enormous stocks and the great size of the world’s oceans, Prof. Thomas Huxley concluded in his opening address to the London Fisheries Exhibition in 1883 that ‘*probably all the great fisheries are inexhaustible; that is to say that nothing we do seriously affects the number of fish*’ and that everyone should be free to fish ‘*where you like, when you like, and as you like*’ (Huxley 1883). More caution was apparent 12 years later in an address by G.M. Thompson to the Otago Institute, later included as an appendix in Hector’s 1897 report on ‘Protection of Mullet’. Here Thompson concedes that on the balance of evidence from Britain, Europe and North America that ‘*It is possible to exhaust all fisheries which are purely local, such as (a) beds of oysters and other mollusca, and (b) flat-fish fisheries in inland waters or in more or less enclosed areas. Fisheries confined to a limited zone, such as those of crayfish on the coast, are also capable of depletion, especially near centres of*

population. On the other hand fisheries in the open sea cannot easily be affected, except within range of fishing fleets of densely populated countries.’ Thompson was clearly implying that such things may occur in other countries but not in New Zealand and concluded that *‘there is very little need for fisheries legislation at the present time in this colony.’*

The view that fishing could not possibly impact on fish stocks and may actually improve them was a belief widely held and long-lasting within commercial fishing communities. Countering this view was greatly impeded by a lack of fisheries statistics. L.F. Ayson, Chief Inspector of Fisheries, considered in 1919 that, *‘There has been a gradual diminution [of fish stocks in the Hauraki Gulf] for many years, but whether it has been greater since the trawlers started I am not in a position to say.* His replacement, A.E. Hefford, noted in 1931 that, *‘There remain matters of obscurity with regard to New Zealand fishes, though statistical records of the fisheries, even without biological investigations, would have thrown a great deal of light on these questions.’* The information on fishery catches in the Marine Department files grew in accuracy, specificity, and utility over time but the accuracy of much of the pre-1930s catch data is questionable. The early inspectors had some initial difficulty in obtaining catch data from fishing boats because there was no power to compel fishers to provide them with returns. Consequently, the figures provided in their reports appear to have often been based on loose estimations. In his annual report for Auckland for 1925 (the year ending 31 March 1926), Inspector of Fisheries Charles Daniel stated: *‘In collecting figures for these returns it is very hard to set anything like accurate figures even from merchants wholesale keeping books, and I am afraid that some very wild guessing is done.’* In order to improve this situation, log books were soon after issued to the skippers of fishing boats working the Hauraki Gulf. By 1930, the collection of data for Auckland, at least, appears to have improved. In the Marine Department annual report for 1929-1930, Chief Inspector of Fisheries Hefford commented that the Auckland data *‘may be taken as very closely approximating to accuracy’*. Unfortunately, this was still not the case with the data collected in many other places. In 1930, for example, the Inspector of Fisheries at Oamaru stated that *‘In some instances I have reason to believe that the figures are very inaccurate, thereby reducing the value of the return.’* The Whangarei Inspector also commented on the difficulty of collecting statistics.

In January 1935, a scheme for obtaining monthly returns of fish landed from every licensed fishing-boat was commenced. In his annual report for the year ending 1937, Chief Inspector Hefford stated: *‘For the first time in the history of the Department we have obtained data that may properly be called statistical. . . . The statistical tables that it has been customary to present with this report are for this year based on monthly returns of the landings on individual fishing-vessels and not, as hitherto, on an estimate made for a whole year by local Inspectors who sometimes had limited opportunities for obtaining comprehensive data for such an estimate.’*

4.5 Conclusions

If the history of changes to a population or an ecosystem is ignored, unknown, or unknowable then that population or ecosystem is likely to be perceived as stable or not greatly impacted (Hughes et al. 2005). New Zealand has not been immune to this sliding baseline syndrome, where the current status of marine ecosystems, species or fish stocks are assumed to be “normal” by each generation of observers ignorant of its previous states (Pauly 1995, Dayton et al. 1998). Use of information from before the modern data era (starting in the mid-1930s with the nationwide collation of fisheries catch data) has been rare in marine species assessment and environmental management in New Zealand. Largely this has been because other data types and

sources have been unknown or inaccessible to those trained in marine biology, ecology, population dynamics or resource management.

It is interesting to compare from this sliding baseline syndrome perspective the views of recreational fishers recorded via oral histories in the 1990s and in 2008 (Maxwell & MacDiarmid 2016), to historical attitudes collated here. For instance, older people interviewed in the 1990s and in 2008 recalled recreational fishing in the 1930s, 1940s, and 1950s as easy and productive compared with the modern era (Maxwell & MacDiarmid 2016). However, it is clear that for some people engaged in recreational fishing in much earlier periods they perceived that serious localised declines in some species had already occurred by 1920. For example, in the 1890s, James Moir joined the Auckland Fishing Club, consisting of almost 20 members. The club chartered a steamer every Saturday afternoon. *‘Results were good from some time, averaging from 106 to 1109 snapper. By and by the catches dwindled until [certainly before 1918] both our club and the Newmarket Club gave it up as useless, not being able to get any fish.’*

The historical records collated, reviewed, and interpreted in this report indicate that over the period from Cook’s 1769 voyage to New Zealand to 1950, marine environments in the Greater Hauraki Gulf and Otago-Catlins study sites underwent a profound change. European visitors to New Zealand noted an extraordinary abundance of fish and invertebrates everywhere around its coasts until at least 1850. Thereafter, an increasing range of fish and invertebrates were exploited once commercial fisheries were established in the 1860s to supply a growing European settler population and later rapidly developing export markets. Laws and regulations to control fishing practices were introduced as early as 1866 and continued to be modified throughout the period. For many of the principal exploited species in both study regions noticeable declines in abundance occurred in the late 19th century and early 20th century prior to the organised collection of fishery statistics. The declines were first evident in species such as oysters, grey mullet, and flat fishes in sheltered, shallow, easily accessible areas, but later progressed to species with a wider distribution such as snapper and blue cod, or a deep-water refuge such as groper.

The realisation that exploitation could significantly affect fish stocks was acknowledged at different times for different species by different sectors of the community but action to conserve fisheries was greatly impeded by a lack of consistently collected landings data for most species. Finally, in January 1935, a scheme for obtaining monthly returns of fish landed from every licensed fishing-boat was commenced and it is from this point that a time series of increasingly detailed catch data supports our modern fisheries stock assessments.

5. MANAGEMENT IMPLICATIONS

New Zealand has a rich history of marine exploitation in the period before detailed fisheries catch records began, although the information is largely in the form of observations and anecdotes. This study has dealt with only two regions in any detail. Other regions would benefit from an examination of historical source material and collation of the information along the lines undertaken for this study.

The historical information indicates that for some species there were significant declines in abundance before the time series of fisheries catch information began in the early 1930s.

Stock assessments of these species (blue cod, flatfish, grey mullet, groper, rock oysters, and snapper) should attempt to take this information into account.

6. ACKNOWLEDGMENTS

This research was funded by Ministry of Fisheries project ZBD200505. Ben Sharp's (MPI) enthusiasm for this project was critical to its eventual funding and we are grateful to Mary Livingston and Martin Cryer (MPI) for project stewardship. Thanks to Peter Geering of NIWA for drafting Figures 2 and 3. Particular thanks go to Peter Horn (NIWA) and Mary Livingston (MPI) for reviewing earlier drafts of the manuscript and suggesting numerous useful changes.

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- M 1 2/7/190 part 1, Oysters – picking and sale during 1930 season, 1930-1932.
- M 1 2/7/191 part 1, Oysters – Foveaux Strait – application to use suction dredge apparatus, 1930-1930.
- M 1 2/7/192 part 1, Oysters – Foveaux Strait – opening and closing season, 1911-1950.
- M 1 2/7/196 part 1, Oysters – picking and sale during 1931 season, 1931-1932.
- M 1 2/7/200 part 1, Oysters – picking and sale during 1932 season, 1932-1933.
- M 1 2/7/201 part 1, Oysters – Bluff – royalty, 1932-1932.
- M 1 2/7/203 part 1, Oysters – mangrove, mud or drift, 1932-1948.
- M 1 2/7/205 part 1, Oysters – picking and sale during 1933 season, 1933-1934.

- M 1 2/7/206 part 1, Oysters – rock, etc (Northern Beds) – defining boundaries of areas of beds, 1927-1933.
- M 1 2/7/207 part 1, Oysters – picking and sale during 1934 season, 1934-1935.
- M 1 2/7/210 part 1, Oysters – Auckland rock oyster season 1935, 1935-1936.
- M 1 2/7/211 parts 1-5, Oysters – Foveaux Strait general file, 1886-1963.
- M 1 2/7/212 part 1, Oysters – Coromandel Peninsula general file, 1936-1936.
- M 1 2/7/213 part 1, Oysters – picking and sale Auckland rock oyster season 1936, 1936-1937.
- M 1 2/7/216 part 1, Oysters – picking and sale Auckland rock oyster season 1937, 1937-1939.
- M 1 2/7/218 part 1, Oysters – picking and sale Auckland rock oyster season 1938, 1937-1939.
- M 1 2/7/220 part 1, Oysters – picking and sale Auckland rock oyster season 1939, 1939-1939.
- M 1 2/7/223 part 1, Oysters – picking and sale Auckland rock oyster season 1940, 1940-1941.
- M 1 2/7/225 part 1, Oysters – picking and sale Auckland rock oyster season 1941, 1941-1942.
- M 1 2/7/228 part 1, Oysters – picking and sale Auckland rock oyster season 1942, 1942-1952.
- M 1 2/7/229 part 1, Oysters – picking and sale Auckland rock oyster season 1943, 1942-1943.
- M 1 2/7/230 part 1, Oysters – picking and sale Auckland rock oyster season 1944, 1944-1945.
- M 1 2/7/231 part 1, Oysters – picking and sale Auckland rock oyster season 1945, 1943-1945.
- M 1 2/7/233 part 1, Oysters – picking and sale Auckland rock oyster season 1946, 1946-47.
- M 1 2/7/235 part 1, Oysters – picking and sale Auckland rock oyster season 1947, 1947-1948.
- M 1 2/7/237 part 1, Oysters – picking and sale Auckland rock oyster season 1948, 1947-1949.
- M 1 2/7/238 part 1, Oysters – picking and sale Auckland rock oyster season 1949, 1949-1950.
- M 1 2/7/239 part 1, Oysters – picking and sale Auckland rock oyster season 1950, 1950-1951.
- M 1 2/7/240 parts 1-3, Oysters – picking and sale general file, 1951-1958.
- M 1 2/12/2 part 1, Otago fisheries reports, 1913-1928.
- M 1 2/12/2 part 2, Otago fisheries reports of S Broadley, 1928-1944.
- M 1 2/12/14 part 1, Mullet - regulations, 1913-1928.
- M 1 2/12/35 part 1, Dominion fisheries – annual inspection by the inspectors, 1914-1914.
- M 1 2/12/49 part 1, Undersized mesh in trawl nets, 1898-1914.
- M 1 2/12/55 parts 1-2, Fisheries general – Hauraki Gulf, 1906-1919.
- M 1 2/12/55 part 2a, Hauraki Gulf trawling prosecutions, 1916-1916.
- M 1 2/12/55 part 3, Fishing Commission – examination of witnesses 1919, 1919-1919.
- M 1 2/12/55 part 4-6, Hauraki Gulf – general, purse seine fishing, regulations, fishing commission, 1919-1928.
- M 1 2/12/55 part 7, Hauraki Gulf – restrictions, 1928-1931.
- M 1 2/12/55 part 8, Hauraki Gulf – restrictions, 1932-1939.
- M 1 2/12/55 part 9, Auckland Fish Commission – report and evidence, 1919-1928.
- M 1 2/12/62 part 1, Port Pegasus fishery – establishment, 1914-1915.
- M 1 2/12/64 part 1, New Zealand Fisheries, report by Professor Prince, 1914-1933.
- M 1 2/12/65 parts 1-2, New Zealand sea fisheries – supply and price, 1948-1965. Notes: Nothing relevant – mostly concerns pricing; also at margins of the time period.
- M 1 2/12/73 part 1, Annual reports of Fisheries Inspectors for the year ending 31 March 1915, 1915-1915.
- M 1 2/12/75 parts 1-5, Portobello Marine Fish Hatchery, 1904-1962. Notes: Nothing relevant – concerns administrative and funding matters, staffing and correspondence relating to the introduction of foreign species.
- M 1 2/12/77 part 1, Fishing reserve – Mercury Island, 1915-1929. Notes: Nothing relevant – concerns fish landing reserve.
- M 1 2/12/93 parts 1-2, Report on South Island fisheries – drawing attention to need for insulated wagon for conveyance of fish, 1915-1928 and 1948-1962. Notes: Nothing relevant – as title suggests, concerns the transport of fish.
- M 1 2/12/115 part 1, Annual reports of Fisheries Inspectors for the year ending 31 March 1916, 1916-1916.
- M 1 2/12/116 parts 1-3, Trawling – Bay of Plenty, 1906-1950.
- M 1 2/12/137 part 1, Annual reports of Fisheries Inspectors for the year ending 31 March 1917, 1917-1917.
- M 1 2/12/146 part 1, Trawling and netting restrictions – Whangarei and vicinity, 1917-1954.

- M 1 2/12/155 part 1, Turtles, 1927-1964.
- M 1 2/12/163 part 1, Annual reports of Fisheries Inspectors for the year ending 31 March 1918, 1918-1918.
- M 1 2/12/164 part 1, Trawling – Sanfords working inside of prohibited area of Hauraki Gulf, 1914-1918.
- M 1 2/12/182 part 1, Annual reports of Fisheries Inspectors for the year ending 31 March 1919, 1919-1919.
- M 1 2/12/190 part 1, Fishing reserve – Fiat Island near Great Barrier, 1919-1934.
- M 1 2/12/191 parts 1-3, Otago – trawling and seining restrictions, 1899-1961.
- M 1 2/12/195 part 1, Protest against formation of Otago Deep Sea Fishing Company, 1919-1920.
- M 1 2/12/207 part 1, Annual reports of Fisheries Inspectors for the year ending 31 March 1920, 1920-1920.
- M 1 2/12/224 part 1, Annual reports of Fisheries Inspectors for the year ending 31 March 1921, 1921-1921.
- M 1 2/12/234 part 1, Establishment of a fishing station at Otago Head, 1921-1921.
- M 1 2/12/245 part 1, Annual reports of Fisheries Inspectors for the year ending 31 March 1922, 1922-1922.
- M 1 2/12/246 parts 1-6, Fisheries regulations, consolidation, and revision, 1904-1965.
- M 1 2/12/269 part 1, Annual reports of Fisheries Inspectors for the year ending 31 March 1923, 1923-1923.
- M 1 2/12/295 part 1, Groper, 1914-1938.
- M 1 2/12/298 part 1, Annual reports of Fisheries Inspectors for the year ending 31 March 1924, 1924-1924.
- M 1 2/12/308 parts 1-2, Dunedin – marketing of fish, 1924-1960. Notes: Nothing relevant – mostly concerns sale and marketing by wholesaler and retailers; no catch details, except for a couple of instances where details are provided by individual wholesalers.
- M 1 2/12/324 parts 1-2, Cod, 1908-1945.
- M 1 2/12/330 part 1, Annual reports of Fisheries Inspectors for the year ending 31 March 1925, 1924-1925.
- M 1 2/12/339 part 1, Tours of inspection – general file, 1925-1933.
- M 1 2/12/350 parts 1-2, Mussels – Coromandel and Hauraki Gulf – leasing of areas, 1924-1949.
- M 1 2/12/356 part 1, Annual reports of Fisheries Inspectors for the year ending 31 March 1926, 1926-1926.
- M 1 2/12/361 parts 1-2, Big game fishing – general file, 1926-1960.
- M 1 2/12/388 part 1, Annual reports of Fisheries Inspectors for the year ending 31 March 1927, 1927-1927.
- M 1 2/12/413 part 1, Annual reports of Fisheries Inspectors for the year ending 31 March 1928, 1927-1928.
- M 1 2/12/415 part 1, East Coast, Coromandel – trawling, netting – restrictions, 1928-1945.
- M 1 2/12/422 part 1, Territorial limit of three miles – power of Marine Department to prevent use of driven nets in Hauraki Gulf, 1928-1937.
- M 1 2/12/425 part 1, Paua, 1912-1945. Notes: Nothing relevant – largely concerns relatively small scale export of shell (not sourced from paua in Hauraki or Otago.) First attempts at commercial paua fishing appear to have been from Wellington in the mid 1930s.
- M 1 2/12/425 part 2, Paua, 1946-1949.
- M 1 2/12/425 part 3, Paua, 1950-1961.
- M 1 2/12/448 part 1, Firth of Thames – siltation data – effect on the fisheries therein, 1929-1929.
- M 1 2/12/451 parts 1-10, Export trade, 1924-1963. Notes: Nothing relevant – grading and condition of fish, some details of quantities and types of fish exported by different companies, etc.
- M 1 2/12/452 part 1, Annual reports of Fisheries Inspectors for the year ending 31 March 1929, 1929-1930.
- M 1 2/12/454, Mussels – Tauranga Harbour – restrictions, 1929-1959.
- M 1 2/12/464 part 1, Report on condition of New Zealand sea fisheries, 1927-1936. Note: Missing from archives.

M 1 2/12/477 part 1, Annual reports of Fisheries Inspectors for the year ending 31 March 1930, 1930-1931.

M 1 2/12/500 part 1, Annual reports of Fisheries Inspectors for the year ending 31 March 1931, 1931-1931.

M 1 2/12/503 parts 1-2, Nets – size of mesh, 1902-1963.

M 1 2/12/510 part 1, Annual reports of Fisheries Inspectors for the year ending 31 March 1932, 1932-1932.

M 1 2/12/514 part 1, Trawling and netting – Great Barrier Island – restrictions, 1917-1936.

M 1 2/12/533 part 1, Annual reports of Fisheries Inspectors for the year ending 31 March 1934, 1933-1934.

M 1 2/12/559 parts 1-3, Tuna – fishing industry establishment in New Zealand, 1916-1962.

M 1 2/12/561 part 1, Bureau of Industry – Fisheries Committee, 1932-1954.

M 1 2/12/565 part 1, Annual reports of Fisheries Inspectors for the year ending 31 March 1937, 1937-1937.

M 1 2/12/567 part 1, Otago District – inspections and reports, 1937-1946.

M 1 2/12/575 part 1, Annual reports of Fisheries Inspectors – general file, 1938-1947.

M 1 2/12/579 part 1, Bluff fish trade, 1938-1965.

M 1 2/12/594 part 1, Fish smoking and canning industry, 1940-1947.

M 1 2/12/604 part 1, Export trade, 1937-1938.

M 1 2/12/604 part 2-5, Auckland Fisheries Advisory Committee – weekly reports, 1938-1948. Notes: Unclear who made up the AFAC. The weekly reports cover a range of matters and include details of the quantity of fish landed at each of the wholesale companies. From 1940, figures are given for individual species. It is assumed these annual statistics are also provided in the Marine Department reports.

M 1 2/12/606 parts 1-9, Licensing of fishing industry, 1945-1962.

M 1 2/12/619 part 1, Annual conference of District Inspectors of Fisheries, 1946-1961.

M 1 2/12/641 part 1, Danish Deep Sea Investigation Expedition, 1949-1955.

M 1 2/12/650 part 1, Sea Fisheries – pollution – Interdepartmental Committee, 1949-1956.

Notes: Nothing relevant.

M 1 2/12/650a part 1, Sea Fisheries – pollution – proceedings of Interdepartmental Committee, 1949-1954.

M 1 2/12/664 part 1, Coromandel cockle beds, 1952-1954.

M 1 2/12/674 part 1, Underwater fishing general, 1953-1962. Notes: Nothing relevant – concerns the activities of amateur fishermen; no Hauraki or Otago details.

M 1 2/12/675 part 1, Underwater fishing general, 1953-1962. Note: Missing from archives

M 1 2/12/690/5 part 1, Butterfish – research and investigation, 1960-1960.

M 1 2/12/691 part 1, Inspector of Fisheries, Bluff – general file, 1957-1962.

ADOE 16627 M24/1 – various files on individual licensed fishing boats.

Ministry of Works and Development Residual Management Unit, Head Office
AATE 10884 A956/83a 10/31, Miscellaneous – Thames fisheries, 1947-1950.