Fisheries relevant to Buller's shearwater and red-billed gull prey availability in North Eastern North Island

Introduction

Commercial fishing may be driving changes in fish populations in the Hauraki Gulf area, leading to a reduction in suitable prey for Buller's shearwater and red-billed gulls in surface waters. As poor divers, Buller's shearwaters specialise in foraging in association with fish work-ups. This may be contributing to reduced breeding success of this species, which breeds only at the Poor Knight Islands. Recent tracking studies have shown that Buller's shearwaters now travel to the eastern South Island to gather food, and incubation shift lengths have increased markedly since the 1970's (from 4 days per shift to 14 days). Red-billed gull colonies in the Hauraki Gulf have declined substantially since the 1960s. For example, less than 100 pairs nested on the Mokohinau Island group in 2015 whereas this colony had >20,000 birds in the early 1960's. Red-billed gulls on the outer island colonies depend on krill and small fish brought to the sea surface by large schools of fish.

The objective of the CSP project INT2016-04 Indirect effects of commercial fishing on Buller's shearwater and red-billed gulls was to identify potential indirect effects of commercial fishing on red-billed gulls and Buller's shearwater. This paper is one of three components of this project and aims to characterise and describe the North Eastern North Island fisheries of most relevance to seabird prey availability.

Methods for characterising north-east North Island commercial fisheries

The importance of North Eastern North Island fisheries to seabird prey availability was assessed over three rounds. The first round consisted of collating a description of each commercial fish species found in Fisheries Management Area (FMA) 1 (n=97) using New Zealand Commercial Fisheries: The Atlas of Area Codes and TACCs as a guide. Information was collation on Total Allowable Commercial Catch (TACC), catch, type of fishery (target, non-target etc.), fishing gear used, as well as basic biology such as habitat use. A bibliography was produced for relevant biology and food web interactions and the information synthesised.

The second round involved an initial triage process to assess the importance of the species from the first round. Species believed to have a moderate to high importance (n=41) were separated from those of lower importance. Species that were believed to have higher importance were considered to be able to affect the seabird species in one or more ways, including: being prey species, competing species, surface feeders, predator species that cause the upwards movement of prey, species where fisheries catches had heavily fluctuated for the past years and species that are or have a high bycatch. Species believed to be of low importance (n=56) included deep water species, species with very low TACC, echinoderms, bottom feeders, etc.).

The third round consisted of further assessment of the fisheries in terms of catch and fluctuation in catch, biology, spatial distribution, potential importance to seabirds, and/or role in the food web, for the 41 'moderate to high importance' species. These species were further shortlisted; those with low catches in Hauraki gulf and species believed to have low importance to seabirds, were removed (n=19). The remaining 22 species are species with known effects on food webs in other ecosystems, such as top predators, large pelagic predators, surface feeding schooling species, pelagic prey species, and/or species with high historical or current catches. A summary of relevant information on these species, of greatest importance to seabird prey availability, is provided below.

Commercial fisheries of greatest relevance to Buller's shearwater and red-billed gull prey availability

The commercial fish species identified as of greatest importance to seabird prey availability in the North Eastern North Island region are listed in Table 1. A short description of the biology and commercial fishery for each of these 22 species follows. In addition, the TACC and recorded catch from 1978-79 (or the first year available) to 2015-16 were compiled for all the species in order to describe any fluctuations.

Table 1. The 22 commercial fish species identified as of greatest importance to seabird prey availability in the North Eastern North Island region.

Anchovy	Barracouta
Bigeye tuna	Blue (English) mackerel
Blue shark	Garfish (Piper)
Grey mullet	Jack mackerel
Kahawai	Kingfish
Mako shark	Pacific Bluefin tuna
Pilchard	School shark
Snapper	Southern Bluefin tuna
Swordfish	Trevally
Yellow-eyed mullet	Yellowfin tuna
Albacore tuna	Skipjack tuna

Anchovy

Fishery[1]

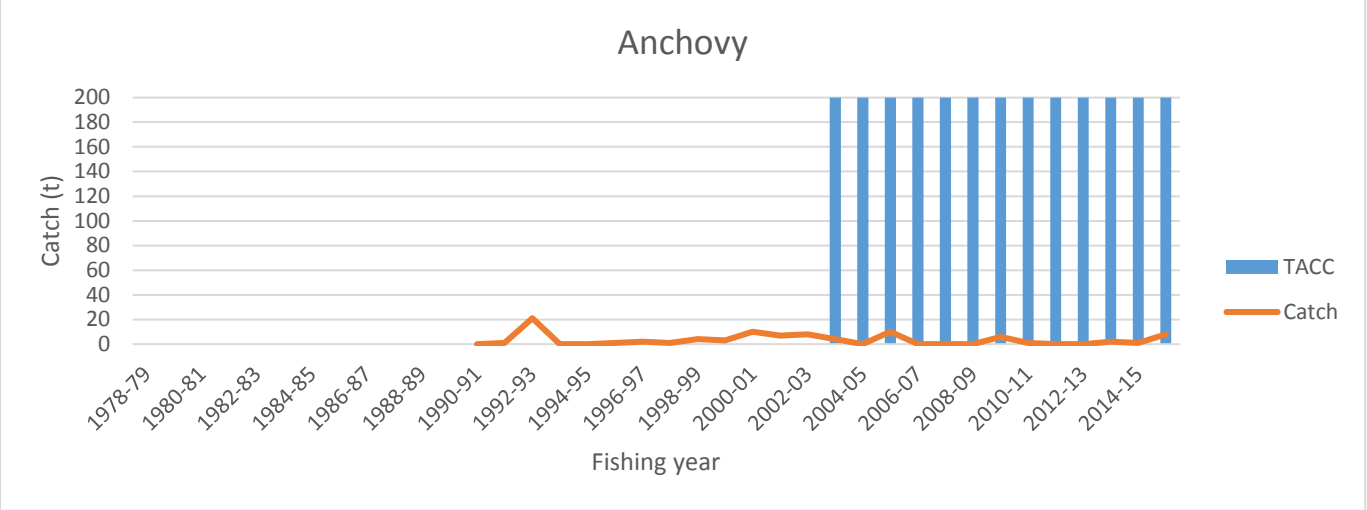
Reported annual landings have fluctuated from less than 1 t to 21 t since 1990-91. Under-reporting is likely to have occurred due to misidentification of anchovy in pilchard and other mixed catches and the low value of the species. Historically, most landings have been reported from north-eastern New Zealand, ANC 1 (FMA 1), with occasional small landings in ANC 3 and 8. The most consistent catches have been taken by purse seine, with very few catches reported as targeted; most anchovy appear to have been taken as non-target catch in the pilchard fishery. Up to four vessels have reported a catch or landing in any one year.

Biology[1]

The single anchovy species found in New Zealand, *Engraulis australis*, occurs around most of the coastline, but is absent between Banks Peninsula and Foveaux Strait. It is found mostly inshore, particularly in gulfs, bays, harbours, and some large estuaries. Anchovy are planktivorous, feeding mainly on copepods. They form compact schools, particularly during the warmer months. Although the generally form single-species schools, anchovies are closely associated with other small pelagic fish, particularly pilchards and sprats. The reproductive cycle is not well known. The main spawning season appears to be spring-summer, but in northern regions spawning may occur through much of the year. Spawning grounds extend from shallow water out to mid-shelf. The eggs are pelagic.

The anchovy is a significant food source for almost every predatory fish in its environment, including mackerel, kahawai and mullet. Seabirds, such as little penguin, and gannets, and marine mammals, such as dusky dolphins, also prey on anchovy. Excessive localised harvesting may disrupt ecosystems.

Figure 1: Reported total New Zealand within EEZ catch and TACC of anchovy in ANC 1.



Relevance to seabird prey availability in North Eastern North Island

Anchovies are at or near the bottom of the food chain. They feed on plankton and are an important prey for larger fish, seabirds and marine mammals, transferring energy from the oceans primary producers to the higher levels of the food web. They form compact schools and are often closely associated with other small pelagic fish such as pilchard and sprat. These mixed schools can cause a potential bycatch problem, where increased fishing effort on pilchard or sprat might cause a decline in the anchovy stock.

Some incidental captures of anchovy by vessels purse seining for other pelagic species may be discarded if no market is available. Thus, it is likely the total catch of anchovy is under-reported.

[1] MPI, 2014h, Fisheries Assessment Plenary, May 2014. Stock assessments and stock status of Anchovy (ANC). Ministry for Primary Industries. http://fs.fish.govt.nz/Doc/23543/03_ANC_2014%20FINAL.pdf.ashx

Barracouta

Fishery[2]

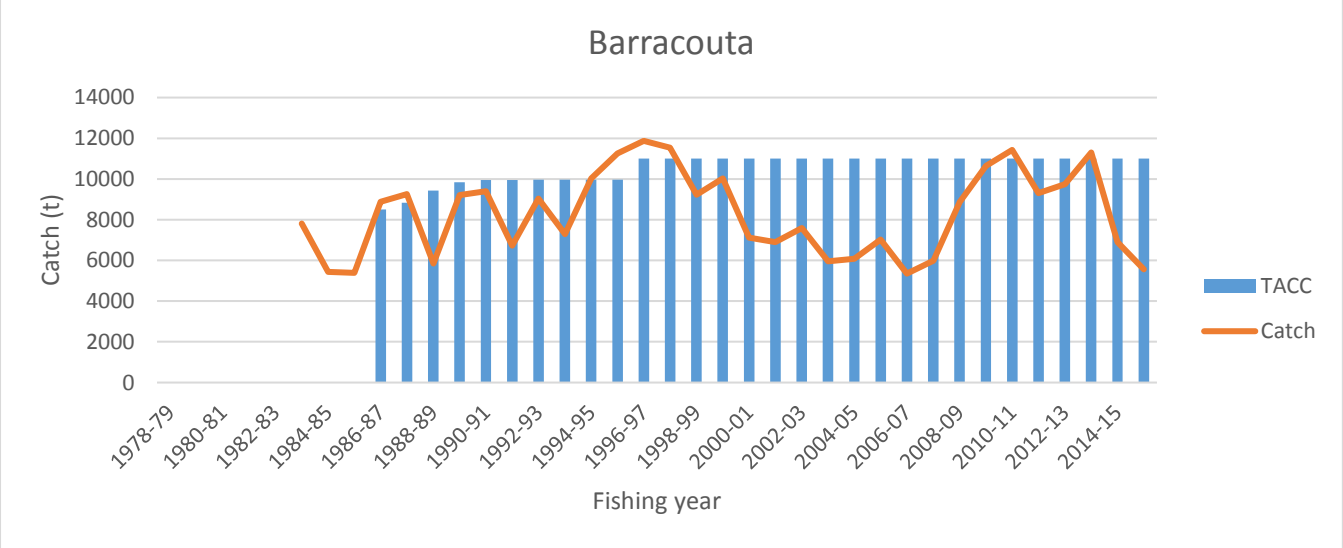
Barracouta are caught in coastal waters around mainland New Zealand, the Snares and Chatham Islands, down to about 400m. Catches increased significantly in the late 1960s and peaked at about 47,000 t in 1977. Between 1983-84 and 2004-05, catches fluctuated between 18,000 and 28,000 t annually. Landings have increased from the lower level of the early 2000's to 27,000 to 30,000 t in the last 4 years (2009).

Over 99% of the recorded catch is taken by trawlers. Major target fisheries have been developed on spring spawning aggregations (Chatham Islands, Stewart Island, west coast South Island and northern and central east coast South Island) as well as on summer feeding aggregations, particularly around the Snares and on the east coast of the South Island. Barracouta also comprise a significant proportion of the bycatch in the west coast North Island jack mackerel and The Snares squid fisheries.

Biology[3]

Barracouta forms large schools, which feed, migrate and spawn together. Barracouta are opportunistic feeders, and their diet varies in time and with location. In Bass Strait, they feed on small euphausiids, which they swallow in large numbers when the schools of the crustaceans are dense. Other important prey species include the anchovy, and smaller barracouta. In other regions, pilchards and jack mackerel make up the bulk of their diet. Due to the size of the schools and voracious feeding habits, barracouta are an important predator of many smaller commercially exploited species. Barracoutas usually swim actively in clear water searching for schools of plankton feeding fish and sometimes herd schools of fish into densely populated areas or chase them into shallow water.

Figure 2: Reported total New Zealand within EEZ catch and TACC of barracouta in BAR 1.



Relevance to seabird prey availability in North Eastern North Island

As surface feeding predator species, barracoutas likely cause the upward movement of prey species, making them more available for surface feeding birds such as Buller's shearwater and red-billed gulls. The catches of barracouta have been decreasing since 2013-14, which could potentially indicate that the stock in BAR1 is declining, causing less upwards movement of prey.

---

[2] MPI, 2014i, Fisheries Assessment Plenary, May 2014. Stock assessments and stock status of Barracouta (BAR). Ministry for Primary Industries. http://fs.fish.govt.nz/Doc/23545/05_BAR_%202014%20FINAL.pdf.ashx

[3] Schultz, S., *Thyrsites atun* in Fishes of Australia, accessed 23 Feb 2017, http://fishesofaustralia.net.au/home/species/711

Bigeye Tuna

Fishery[4]

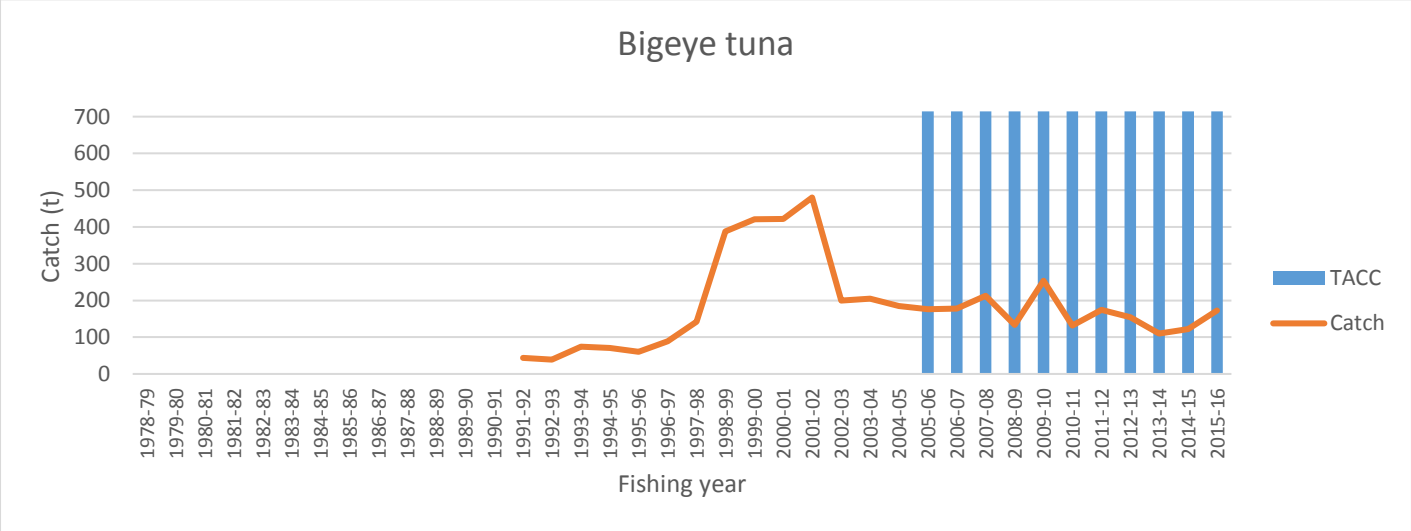
Bigeye tuna were introduced into the QMS on 1 October 2004 under a single QMA, BIG 1. Domestic tuna longline vessels began targeting bigeye tuna in 1990. There was an exponential increase in the number of hooks targeting bigeye which reached a high of approximately 6.6 million hooks in 2000-01 and declined thereafter.

The majority of bigeye tuna (88%) are caught in the bigeye tuna target surface longline fishery. While bigeye is the target it only comprises 11% of the total catch, with albacore making up the bulk of the catch at 34%. Longline effort is distributed along the east coast of the North Island and the south west coast of the South Island. The west coast South Island fishery predominantly targets southern bluefin tuna, whereas the east coast of the North Island targets a range of species including bigeye, swordfish, and southern bluefin tuna.

Biology[4]

Bigeye tuna are epi-pelagic opportunistic predators of fish, crustaceans and cephalopods generally found within the upper few hundred meters of the ocean. Because bigeye tuna are large pelagic predators, they are likely to have a "top down" effect on the fish, crustaceans, and squid they feed on. Juveniles and small adults school near the surface in tropical waters, while adults tend to live in deeper water. The individuals found in New Zealand waters are mostly adults.

Figure 3: Reported total New Zealand within EEZ catch and TACC of Bigeye tuna in BIG 1



Relevance to seabird prey availability in North Eastern North Island

Seabirds are often associated with tuna and other epi-pelagic predators near the surface. Bigeye tuna may drive prey up to the surface, making the prey more available to the birds. Many seabirds, including Buller's shearwaters and red-billed gulls, feed in the surface or within a half meter of the sea surface, and their feeding opportunities are often dependent on the presence of surface feeding predators such as bigeye tuna.

The bigeye tuna found in New Zealand waters are a part of a larger population from the Pacific. Even thought the total catch in New Zealand EEZ is not incredibly high, the fishing effort in the Pacific combined with the fishing effort in New Zealand might be. This could affect the number of adults that migrate into New Zealand waters.

[4] MPI, 2015a, Fisheries Assessment Plenary, November 2015. Stock assessments and stock status of Bigeye tuna (BIG). Ministry for Primary Industries. http://fs.fish.govt.nz/Doc/24011/02-BIG_2015_FINAL.pdf.ashx

Blue (English) Mackerel

Fishery[5]

Blue mackerel were introduced into the QMS on 1 October 2002, with the highest TACC in FMA 1 (EMA 1). Blue mackerel are taken by a variety of methods, however, the catch for most of the methods used is very low. The largest and most consistent catches have been from the target purse seine fishery in FMA 1,2 and 7, and as non-target catch in the jack mackerel mid-water trawl fishery in FMA 7. Since 1983-84, the catch of blue mackerel in New Zealand waters has grown substantially, primarily in the purse seine fishery in EMA 1.

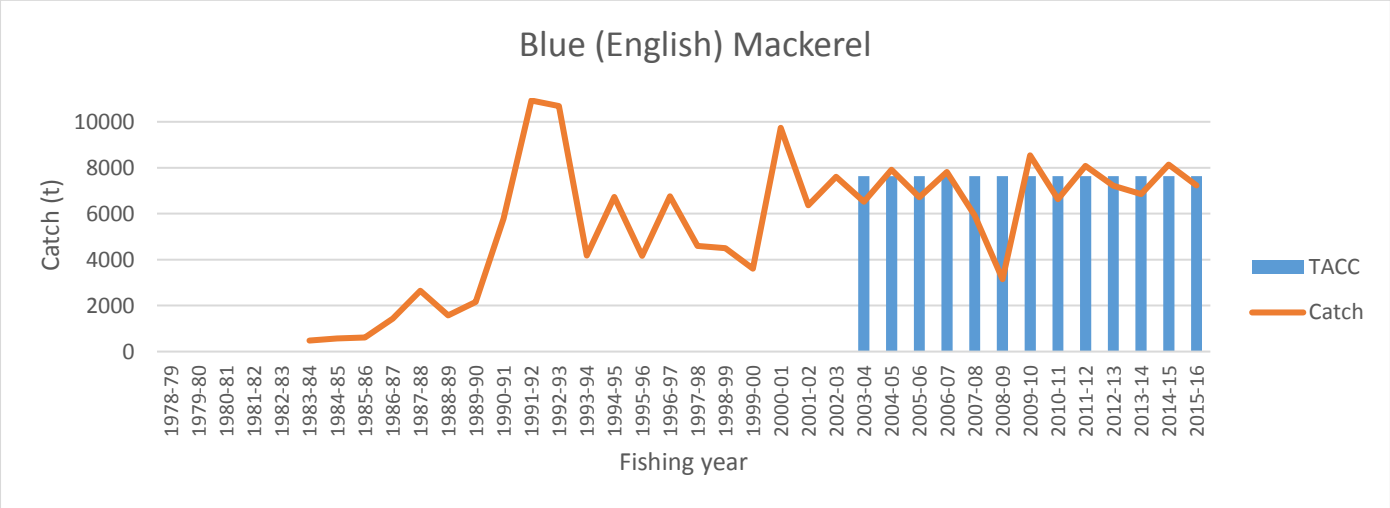
The fishing season usually begins around July-August, runs through the end-beginning of subsequent fishing years (the fishing year runs from 1st of October to 30th of September), and finishes in about November. A number of factors have been identified that can influence landings volumes in the blue mackerel fisheries. For example, in the purse seine fishery, blue mackerel has become the second most preferred species because of decreased TACCs on Kahawai. Skipjack tuna is the preferred species and blue mackerel will not be targeted once the skipjack season has begun in late-spring, early summer. Thus, early arrival of skipjack can result in reduced volumes of blue mackerel being landed.

Biology[5]

The distribution of blue mackerel at the surface is seasonal and differs from its known geographical range. During summer, surface schools are found in Northland, Bay of Plenty, South Taranaki Bight, and Kaikoura, but they disappear during winter, when only occasional individuals are found in Northland and the Bay of Plenty. Summaries from aerial sightings data show that blue mackerel can be found in mixed schools with jack mackerel, kahawai, skipjack tuna, and trevally, and that its appearance in mixed schools varies seasonally. Blue mackerel are serial spawners, releasing pelagic eggs in batches over several months and eggs have been documented throughout the Hauraki Gulf from November to the end of January.

In New Zealand, the diet of blue mackerel has been described as zooplankton, which consists mainly of copepods, but also includes larval crustaceans and molluscs, fish eggs and fish larvae. Feeding involves both filtering of the water and active pursuit of prey.

Figure 4: Reported total New Zealand within EEZ catch and TACC of blue mackerel in EMA 1.



[5] MPI, 2014a, Fisheries Assessment Plenary, May 2014. Stock assessments and stock status of Blue Mackerel (MAL). Ministry for Primary Industries. http://fs.fish.govt.nz/Doc/23549/09_EMA_2014%20FINAL.pdf.ashx

Relevance to seabird prey availability in North Eastern North Island

As surface feeding schooling species, blue mackerel is likely to cause the upward movement of prey species, making them more available for surface feeding birds such as Buller's shearwater and red-billed gulls. The catches of blue mackerel has been relatively high for the past years, after a drop in 2008-09.

Blue mackerel is a serial spawner, and their eggs are pelagic. It could be hypothesised that the eggs might be an important prey item for prey species of surface feeding birds and/or the seabirds themselves. Lowered abundance of mackerel might thus cause a lack of prey species that depend on their planktonic eggs.

Blue Shark

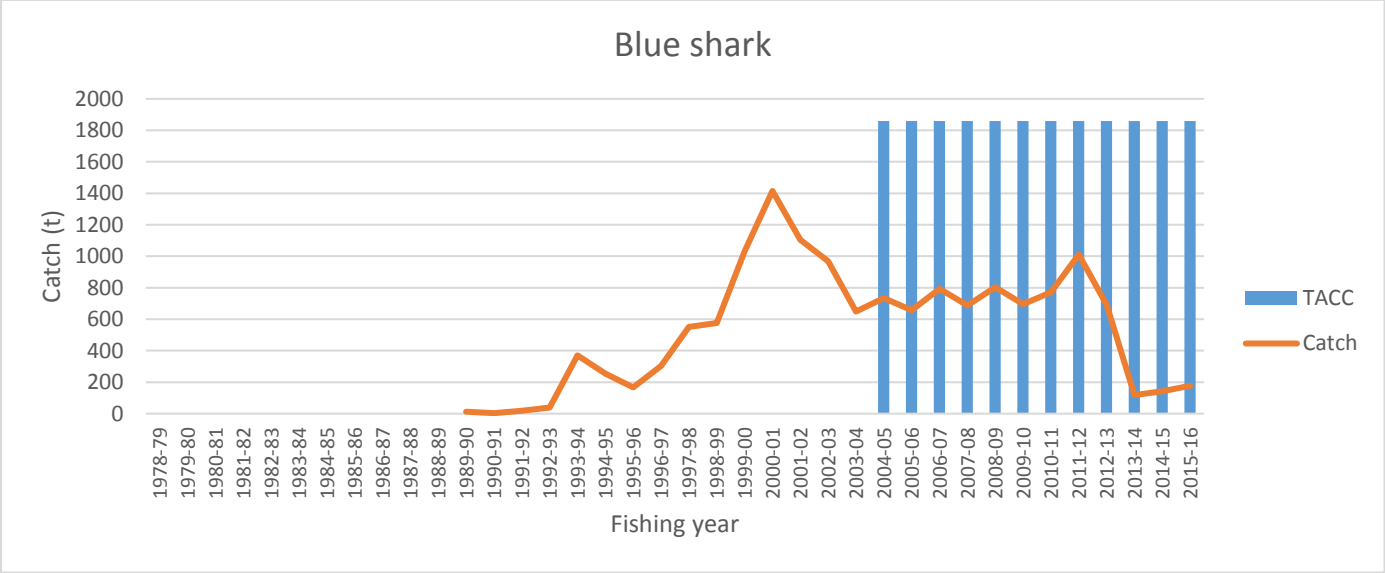
Fishery[6]

Between 2007-08 and 2010-11, blue shark catches were about 900-1100 t per year compared with landings of about 700-800 t and a TACC of 1860 t. The majority of the catch is taken by surface longline, mainly from FMA 1 and 2. Catches are strongly seasonal, with most being taken in April-August, peaking in May-July. Small amounts of blue shark are caught by bottom longline on the Chatham Rise and near the shelf edge around the mainland; by midwater trawl off the west coast of North and South Islands; and by setnet in inshore waters of both islands.

Biology[7]

This species prefers colder waters (7-16°C) but tolerates warmer water too (+21°C). Blue sharks normally swim very slow at the surface but can be found down to a depth of approximately 150m. Blue sharks feed primarily on pelagic fish and cephalopods, as well as invertebrates and carcasses. Blue sharks possess papillose gill rakers, a rare feature among requiem sharks. This may prevent small prey like squid, red crabs, or anchovies from slipping out the internal gill slits, or may also be used to feed on plankton.

Figure 5: Reported total New Zealand within EEZ catch and TACC of blue shark in BWS 1.



Relevance to seabird prey availability in North Eastern North Island[8]

The catch of blue sharks has dropped significantly in the past 5 years, although it has never reached the set TACC. However, even if there are no targeted blue shark fisheries, they form one of the three top catches by weight across all longline fisheries (17%). As top predators, blue sharks can strongly affect prey behaviours, such as foraging. Blue sharks could not only cause the upwards movement of prey to the surface, making prey more available to seabirds, but they could also drive fish into shallow surface waters as a flight response or avoidance mechanism.

---

[6] Francis, M.P. 2013. Commercial catch composition of highly migratory elasmobranchs. New Zealand Fisheries Assesment Report 2013/68. 79p. http://fs.fish.govt.nz/Doc/23489/FAR_2013_68_2725_HMS2010-03%20Obj1-3;%20MS7,%2017,%2027.pdf.ashx

[7] Nakano, H. and Stevens, J. D. (2008) The Biology and Ecology of the Blue Shark, *Prionace Glauca*, in Sharks of the Open Ocean: Biology, Fisheries and Conservation (eds M. D. Camhi, E. K. Pikitch and E. A. Babcock), Blackwell Publishing Ltd., Oxford, UK. doi: 10.1002/9781444302516.ch12 https://books.google.co.nz/books?id=lc9MyMaXHgEC&printsec=frontcover#v=onepage&q&f=false

[8] Heithaus, M. R., Frid, A., Wirsing, A. J., & Worm, B. (2008). Predicting ecological consequences of marine top predator declines. *Trends in Ecology & Evolution*, *23*(4), 202-210.http://ac.els-cdn.com/S0169534708000578/1-s2.0-S0169534708000578-main.pdf?_tid=8e27dbd6-f875-11e6-b3ec-00000aab0f02&acdnat=1487709626_f8f2a4524a472454904d895fc08bf849

Garfish (Piper)

Fishery[9]

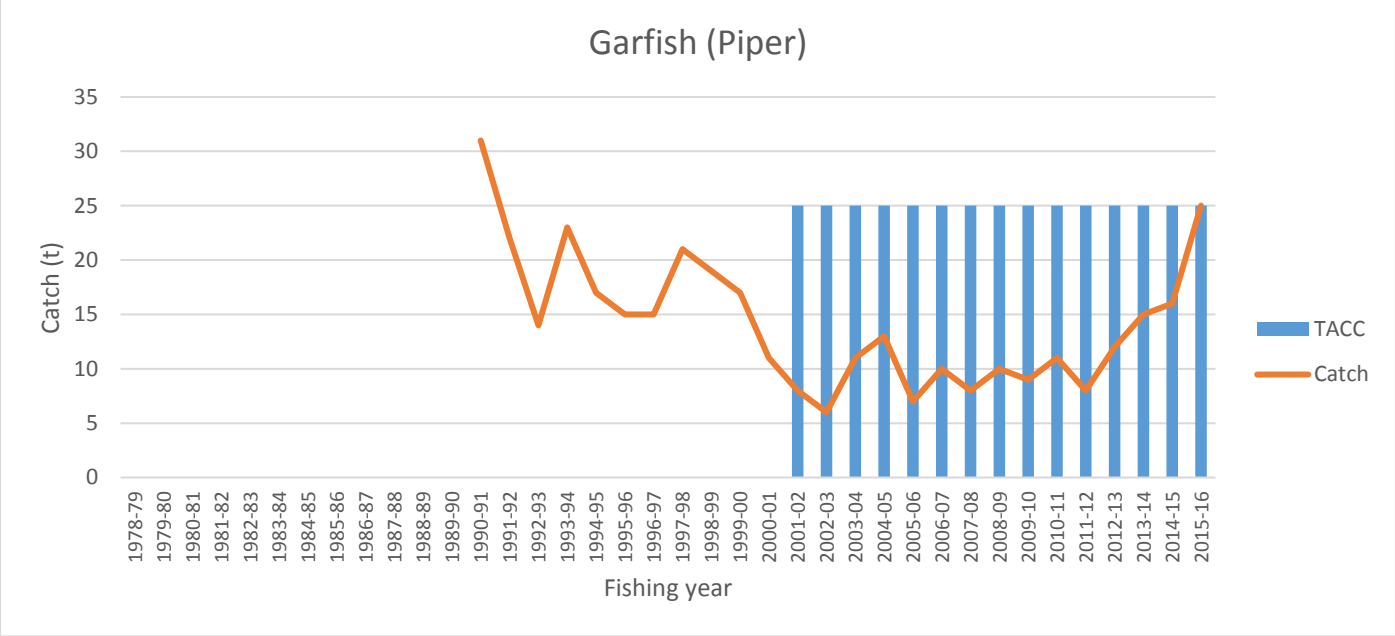
Garfish was introduced into the QMS from 1 October 2002, however, landings were first recorded in 1933, and a minor fishery must have existed before that. Reported catches and landings through the 1900s have been of a similar order of magnitude, although catches have declined since the 2000-01 fishing season. Largest catches and landings are made in FMA 1, and small quantities are taken in FMA 7. The most consistent catches are taken by beach seine, with some catches by lampara net. Most of the catch is reported as targeted.

Biology[9]

Garfish occur around most of New Zealand, and are present at the Chatham Islands. They are most abundant in sheltered gulfs, bays, and large estuaries, particularly near seagrass beds in shallow water, and over shallow reefs. Garfish feed on zooplankton. They form single-species schools, but occur in close proximity with other small pelagic fishes in shallow coastal waters, particularly yellow-eyed mullet.

The extent of natural variability in the size of garfish populations is not known, but from their very shallow inshore distribution, and demersal rather than pelagic eggs, it is suspected that they are less variable than other small pelagic species. However, these features also suggest localised populations, susceptible to local depletion.

Figure 6: Reported total New Zealand within EEZ catch and TACC of Garfish (piper) in GAR 1.



Relevance to seabird prey availability in North Eastern North Island

As a small pelagic schooling species, garfish might be an important prey item for surface feeding seabirds. The catches have been increasing rapidly since 2011-12, reaching the 25 t TACC in 2015-16. The very shallow inshore distribution of garfish and demersal eggs suggest that they have localised populations which can be susceptible to local depletion. This rapid increase in catch could cause a local depletion of the population found in GAR 1.

[9] MPI, 2014, Fisheries Assessment Plenary, May 2014. Stock assessments and stock status of Garfish (GAR). Ministry for Primary Industries. http://fs.fish.govt.nz/Doc/23563/23_GAR_2014%20FINAL.pdf.ashx

Grey mullet

Fishery[10]

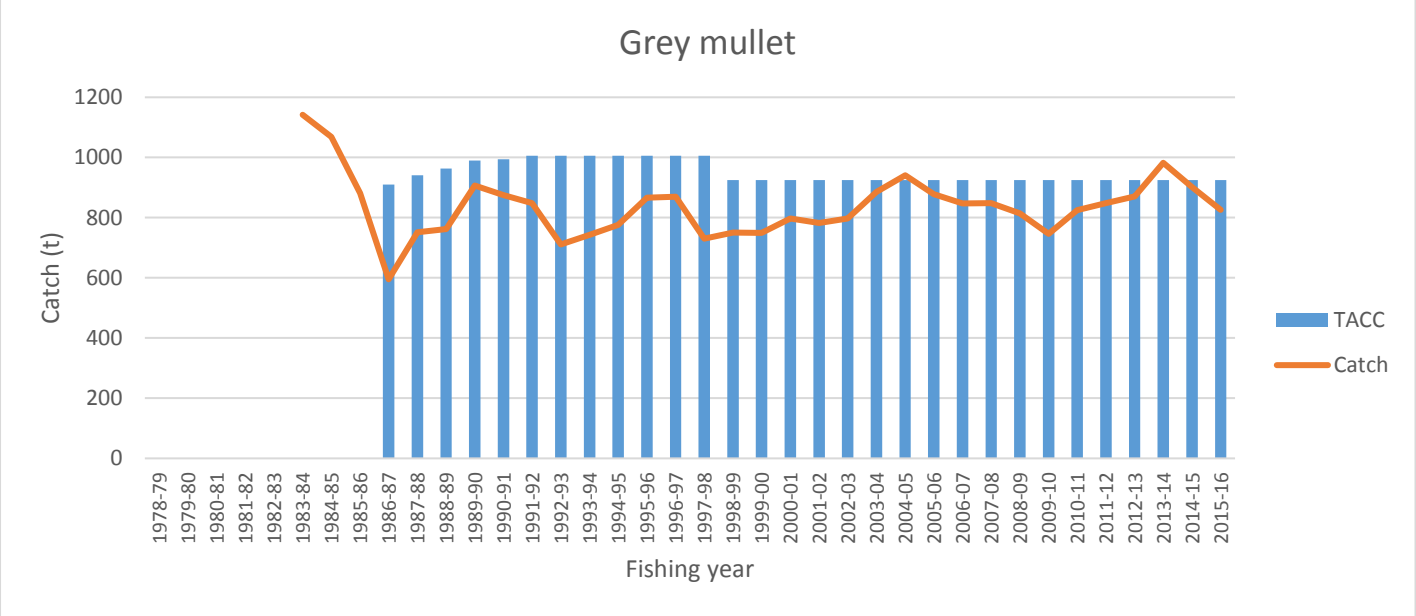
Commercial fishing for grey mullet occurs predominantly in GMU 1. Grey mullet was introduced to the QMS in 1987, with a TACC of 910 t, which was increased to 1006 t in 1992. The TACC was consistently under caught after GMU 1 was introduced into the QMS, and was therefore reduced to 925 t in 1998-99. The reduction in TACC had little effect on the annual catches, and it has only ever been reached in GMU 1 in 2004-05.

Grey mullet is a popular recreational species particularly in the Auckland FMA. It is likely that the annual level of recreational extraction from GMU 1 is in the order of 100-150 t.

Biology[10]

Grey mullet has a worldwide distribution, occurring commonly along coasts, in estuaries, and in lower river systems between latitudes of 42N and 42S. Grey mullet commonly occur in schools, which generally become larger and more prevalent in the spawning season (November to February). Adult grey mullet typically feed on diatom algae and small invertebrates which are gulped along with surface scum or with detrital ooze and sifted by fine teeth and gill-rakers.

Figure 7: Reported total New Zealand within EEZ catch and TACC of Grey mullet in GMU 1.



Relevance to seabird prey availability in North Eastern North Island

The catches of grey mullet in GMU 1 fluctuate from year to year. However, catches are usually close to the set TACC, and even above it in 2004-05 and 2013-14. As a small pelagic schooling species, grey mullet might be an important prey item for surface feeding seabirds. Small surface feeding schooling species are often vulnerable to localized depletion. Localized depletion of grey mullet may have great effects on predators that have limited ability to switch prey species or to find more distant patches of abundant prey.

[10] MPI, 2014, Fisheries Assessment Plenary, May 2014. Stock assessments and stock status of Grey mullet (GMU). Ministry for Primary Industries. http://fs.fish.govt.nz/Doc/23569/29_GMU_2014%20FINAL.pdf.ashx

Jack Mackerel

Fishery[11]

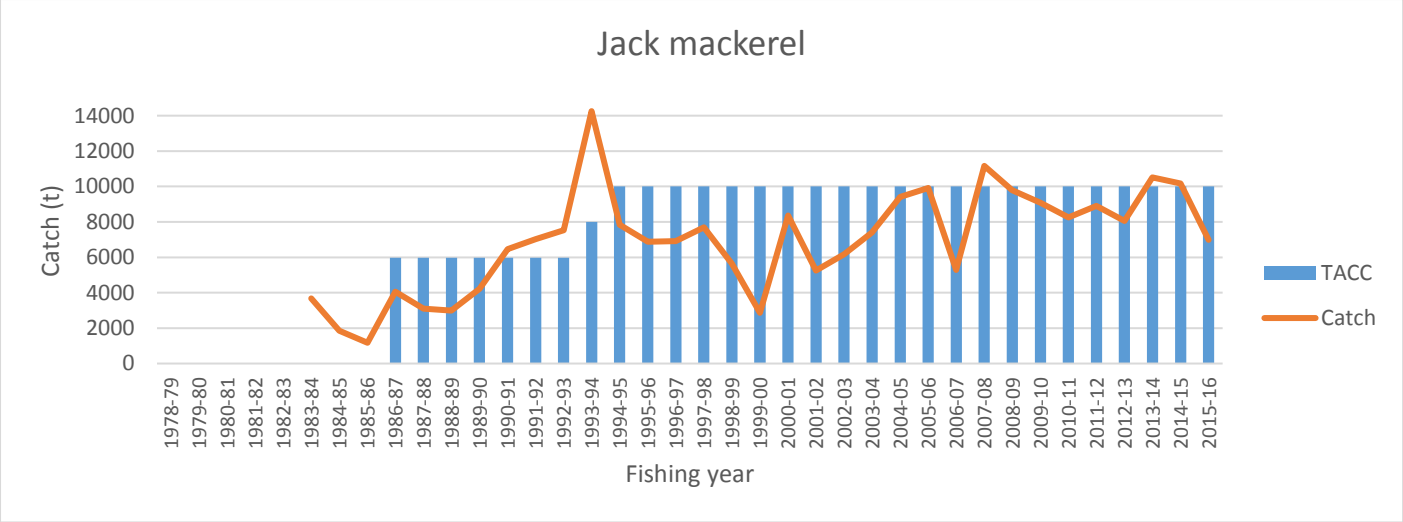
Jack mackerels have been included in the QMS since 1 October 1996, with four QMAs: JMA 1, JMA 3, JMA 7 & JMA 10. In JMA 1 (includes FMA 1), the jack mackerel catch is largely (about 96% of annual landings) taken by the purse seine fishery operating in the Bay of Plenty and on the east Northland coast. Some trawl bycatch of jack mackerel has been recorded In JMA 1.

Several factors have been identified that can influence landings volumes in the jack mackerel fisheries. In the purse seine fishery, jack mackerel is often mixed with kahawai. Fishing companies will avoid these mixed schools to conserve kahawai quota, particularly at the beginning of the fishing year. When mixing of the two species is prevalent, low kahawai TACC can result in the targeting of jack mackerel being inhibited. Both skipjack tuna and blue mackerel are fished in preference to jack mackerel in the purse seine fishery, and the length of the jack mackerel season is influenced by the availability of these species.

Biology[11]

The three species of jack mackerel in New Zealand have different geographical distributions, but their ranges partially overlap. All species can be caught by bottom trawl, mid-water trawl, or by purse seine targeting surface schools. The vertical and horizontal movement patterns are poorly understood. Jack mackerels are presumed to be generally off the bottom at night, and surface schools can be quite common during the day. Jack mackerels have a protracted spring-summer spawning season which occurs in the North and South Taranaki Bights and probably in other areas as well.

Figure 8: Reported total New Zealand within EEZ catch and TACC of jack mackerel in JMA 1.



Relevance to seabird prey availability in North Eastern North Island

As surface feeding schooling species, jack mackerels are likely to cause the upward movement of prey species, making them more available for surface feeding birds such as Buller's shearwater and red-billed gulls. The catches of jack mackerels fluctuate quite a lot between years, with catches in 2013-14 and 2014-15 exceeding the set TACC. However, the year after (2015-16) catches dropped down to around 7000 t.

Jack mackerels are serial spawners, and their eggs are pelagic, It could be hypothesised that the eggs might be an important prey item for prey species of surface feeding birds and/or the seabirds themselves. Lowered abundance of mackerels might thus cause a lack of prey species that depend on their planktonic eggs.

[11] MPI, 2014, Fisheries Assessment Plenary, May 2014. Stock assessments and stock status of Jack Mackerels (JMA). Ministry for Primary Industries. http://fs.fish.govt.nz/Doc/23574/34_JMA_2014%20FINAL.pdf.ashx

Kahawai

Fishery[12]

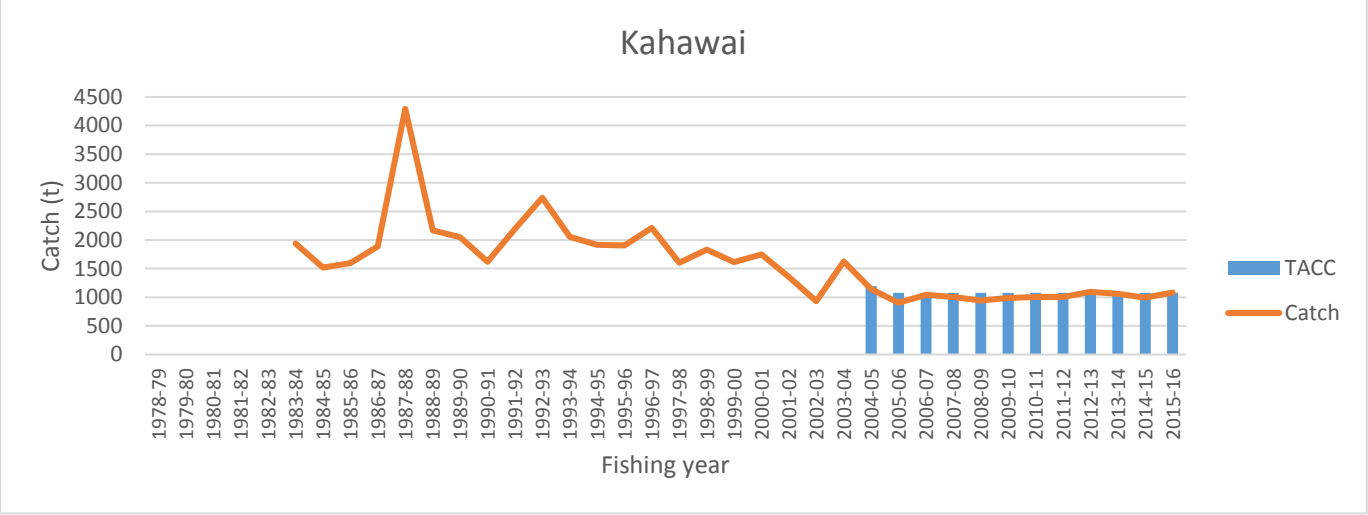
Kahawai was introduced into the QMS in 20014, with set TACs totalling 7612 t. Commercial fishers take kahawai by a variety of methods. Purse seine vessels take most of the catch; however, substantial quantities are also taken seasonally in set net fisheries and as a bycatch in longline and trawl fisheries. The kahawai purse seine fishery cannot be understood without taking into account the other species that the vessels target. The fleet, which is principally based in Tauranga, preferentially targets skipjack tuna between December and May, with very little bycatch. When skipjack are not available, usually June through November, the fleet fishes for a mix of species including kahawai, jack mackerels, trevally and blue mackerel. These are caught "on demand" as export orders are received. However, since the mackerels and kahawai school together there is often a bycatch of kahawai resulting from targeting of mackerels.

Kahawai is the second most important recreational species in FMA 1, after snapper. The only regulatory restrictions on recreational fishing for kahawai are a multi-species bag limit of 20 fish and a minimum set net mesh size of 90 mm. Kahawai is one of the fish species more frequently caught by recreational fishers, and recreational groups continue to express concern about the state of kahawai stocks.

Biology[12]

Kahawai are a schooling pelagic species found around the North Island, the South Island, the Kermadecs and the Chatham Islands. They occur mainly in coastal seas, harbours and estuaries, and will enter the brackish water sections of rivers. Kahawai feed mainly on fish but also on pelagic crustaceans, especially krill. Kahawai smaller than 100 mm mainly eat copepods. Although Kahawai are principally pelagic feeders, they will take food from the seabed.

Figure 9: Reported total New Zealand within EEZ catch and TACC of kahawai in KAH 1.



Relevance to seabird prey availability in North Eastern North Island

As surface feeding schooling species, kahawai are likely to cause the upward movement of prey species, making them more available for surface feeding seabirds. The catches of kahawai in KAH 1 have been relatively stable in the past 10 years, with the catch fluctuating slightly above or below the set TACC. Kahawai and mackerel often school together, which might cause a bycatch of kahawai when the vessels are targeting mackerel species.

[12] MPI, 2014c, Fisheries Assessment Plenary, May 2014. Stock assessments and stock status of Kahawai (KAH). Ministry for Primary Industries. http://fs.fish.govt.nz/Doc/23577/36_KAH_2014%20FINAL.pdf.ashx

Kingfish

Fishery[13]

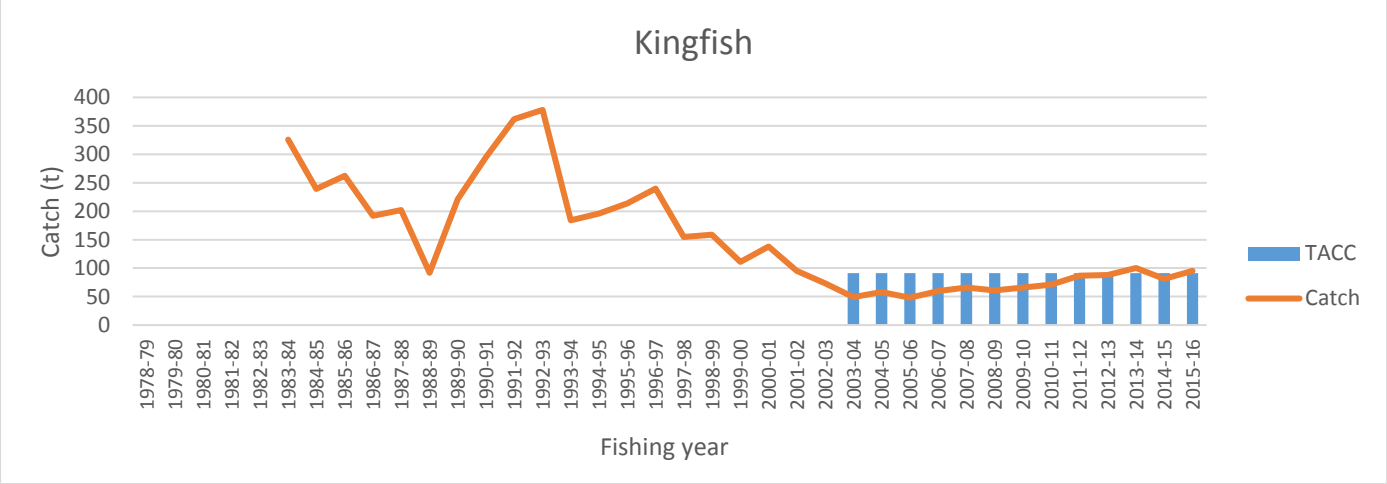
Kingfish commercial landings are reported largely as bycatch of inshore setnet, trawl and longline fisheries. From 1991 to late 2003, targeting of kingfish (as a non-QMS species) was prohibited unless the species was identified on a fisher's permit. A few permit holders were authorized to target kingfish and most of their catch was taken using setnets. The main fishing areas for kingfish are the east (KIN 1 & KIN 2) and west coast (KIN 8) of the North Island of New Zealand. The largest commercial catches generally come from KIN 1. The annual catch of kingfish from KIN 1 fluctuated between 100 and 250 t from 1993-94 through to 2000-01 and has remained below 100 t since 2001-02.

Kingfish is highly regarded by recreational fishers in New Zealand for its sporting attributes and large size. The main methods used to manage recreational harvests of kingfish are minimum legal size limits (MLS), method restrictions and daily bag limits. Recreational fishers have voiced concerns over a perceived marked decline in the size of kingfish available to them in recent years. Many clubs, competitions and charter boats have implemented a voluntary one kingfish per person per day limit in response. Results from a national panel survey for the 2011-12 fishing year indicated that the recreational catch is in the range of 500-700 t in KIN 1.

Biology[13]

In New Zealand, kingfish are predominantly found in the northern half of the North Island but also occur from 29S to 46S, Kermadec Islands to Foveaux Strait and to depths of 200m. Kingfish are large predatory fish with adults exceeding one and a half metres in length. They usually occur in schools ranging from a few fish to well over a hundred fish. Kingfish tend to occupy a semi-pelagic existence and occur mainly in open coastal waters, preferring areas of high current and or tidal flow adjacent to rocky outcrops, reefs and pinnacles. However, kingfish are not restricted to these habitats and are sometimes caught or observed in open sandy bottom areas and within shallow enclosed bays.

Figure 10: Reported total New Zealand within EEZ catch and TACC of Kingfish in KIN 1.



Relevance to seabird prey availability in North Eastern North Island

King fish are a typical pelagic schooling fish, often going into the shallows to hunt. Seabirds are often associated with kingfish and other epi-pelagic predators near the surface as the kingfish may drive up prey to the surface, making the prey more available to the birds. The catches of kingfish have stayed under or around 100 t since the TACC was set. However, before that, catches were much higher, reaching a peak of 378 t in 1992-93.

[13] MPI, 2014, Fisheries Assessment Plenary, May 2014. Stock assessments and stock status of Kingfish (KIN). Ministry for Primary Industries. http://fs.fish.govt.nz/Doc/23580/39_KIN_2014%20FINAL.pdf.ashx

Mako Shark

Fishery[14].

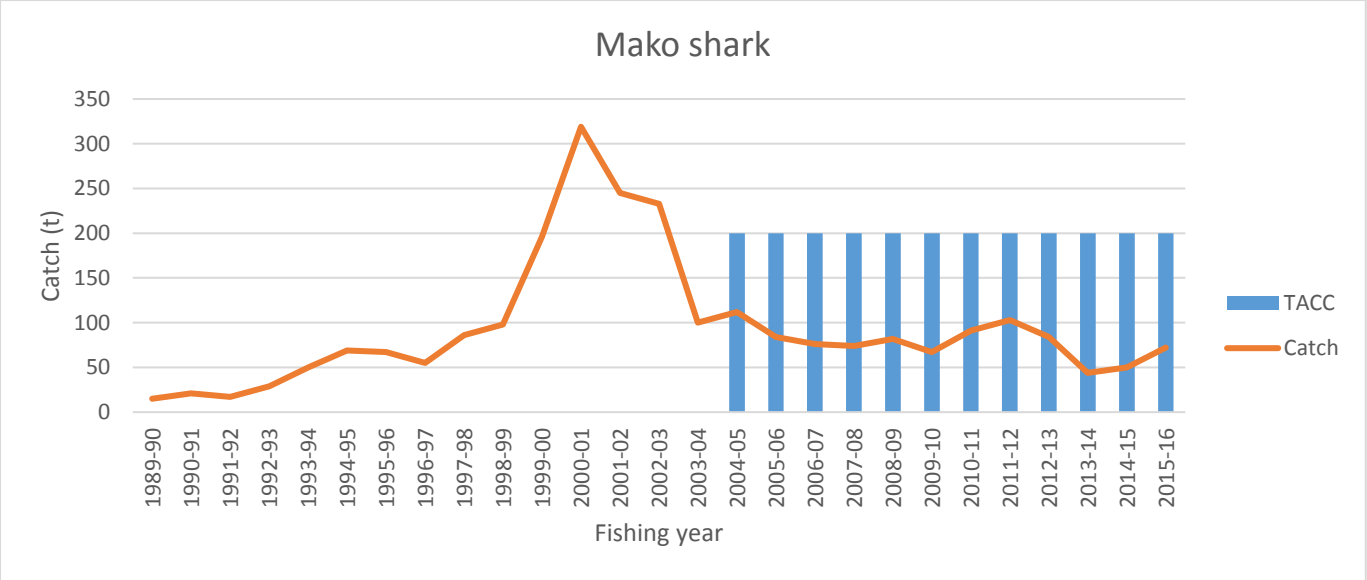
Most of the commercial catch of mako sharks is taken by tuna longliners and bottom longliners, they are also incidental bycatch of bottom and mid-water trawlers. Longline fishing effort is distributed along the east coast of the North Island and the south west coast of the South Island. The west coast South Island fishery predominantly targets southern Bluefin tuna, whereas the fishery off the east coast of the North Island targets a range of species, including bigeye, swordfish, and southern Bluefin tuna.

Before the introduction of a ban on shark finning that took effect on 1 October 2014, about 25% of mako sharks caught by tuna longliners were processed and the rest were discarded. The TACC was reduced from 400 t to 200 t for the 2012-13 fishing year.

Biology[14]

Mako sharks occur worldwide in tropical and warm temperate waters, mainly between latitudes 50N and 50S. Mako sharks are active pelagic predators of other sharks and bony fishes, and to a lesser extent squid. As top predator, mako sharks probably associate with their main prey, but little is known of their relationships with other species.

Figure 11: Reported total New Zealand within EEZ catch and TACC of mako shark in MAK 1.



Relevance to seabird prey availability in North Eastern North Island[15]

Mako shark catches in MAK 1 have been less than half of the set TACC since 2004-05, after reaching a peak of 319 t in 2000-01. As top predators, mako sharks can strongly affect prey behaviours, such as foraging. Like many other top predators, mako sharks could not only cause the upwards movement of prey to the surface, making prey more available to seabirds, but also, they could drive fish into shallow surface waters as a flight response or avoidance mechanism.

[14]MPI, 2014, Fisheries Assessment Plenary, May 2014. Stock assessments and stock status of Mako shark (MAK). Ministry for Primary Industries. http://fs.fish.govt.nz/Doc/24017/08-MAK_2014_FINAL.pdf.ashx

[15] Heithaus, M. R., Frid, A., Wirsing, A. J., & Worm, B. (2008). Predicting ecological consequences of marine top predator declines. *Trends in Ecology & Evolution*, *23*(4), 202-210.http://ac.els-cdn.com/S0169534708000578/1-s2.0-S0169534708000578-main.pdf?_tid=8e27dbd6-f875-11e6-b3ec-00000aab0f02&acdnat=1487709626_f8f2a4524a472454904d895fc08bf849

Pacific bluefin tuna

Fishery[16]

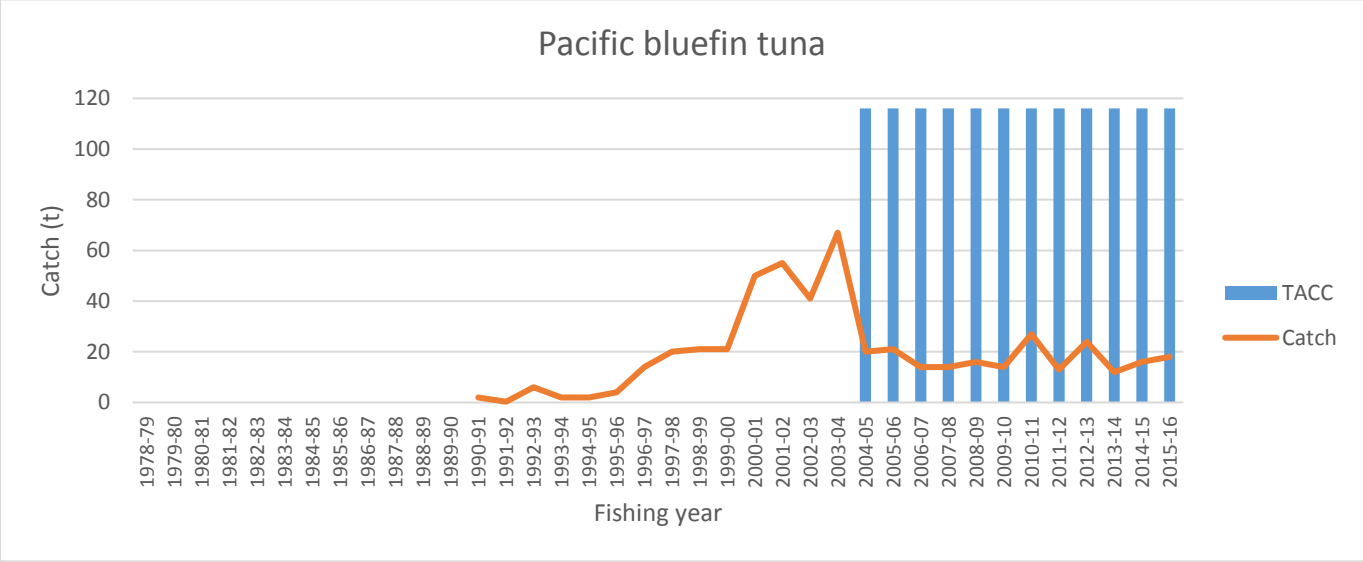
Pacific Bluefin tuna has been fished in the New Zealand EEZ since at least 1960, with some catch likely but undocumented prior to that time. New Zealand catches, are small compared to total stock removals. Pacific tuna is taken almost exclusively by longline in New Zealand.

Prior to the introduction to the QMS, the highest catches were made in FMA 1 and FMA 2. Catches are almost exclusively by tuna longlines, typically as a bycatch of sets targeting bigeye tuna. There is no targeted commercial fishery for Pacific bluefin tuna in New Zealand. Majority of Pacific bluefin tuna are caught in the bigeye tuna surface longline fishery (57%), with about 18% of the catch coming from the southern bluefin tuna surface longline fishery. The west coast South Island fishery predominantly targets southern bluefin tuna, whereas the east coast of the North Island targets a range of species including bigeye, swordfish, and southern bluefin tuna.

Biology[16]

Pacific bluefin tuna are epipelagic opportunistic predators of fish, crustaceans and cephalopods found within the upper few hundred meters of the water column. Pacific Bluefin tuna are large pelagic predators, so they are likely to have a 'top-down' effect on species they feed on. Individuals in New Zealand wasters are mostly adults.

Figure 12: Reported total New Zealand within EEZ catch and TACC of pacific bluefin tuna in TOR 1.



Relevance to seabird prey availability in North Eastern North Island

Seabirds are often associated with tunas and other epi-pelagic predators near the surface. Pacific bluefin tuna may drive prey up to the surface, making the prey more available to the birds. Many seabirds, including Buller's shearwaters and red-billed gulls, feed in the surface or within a half meter of the sea surface, and their feeding opportunities are often dependent on the presence of surface feeding predators such as bigeye tuna.

The Pacific bluefin tuna found in New Zealand waters are a part of a larger population from the Pacific, even thought the total catch in New Zealand EEZ is not incredibly high, the fishing effort in the Pacific combined with the fishing effort in New Zealand might be.

[16] MPI, 2015c, Fisheries Assessment Plenary, November 2015. Stock assessments and stock status of Pacific Bluefin tuna (TOR). Ministry for Primary Industries.http://fs.fish.govt.nz/Doc/24019/10-TOR_2015_FINAL.pdf.ashx

Pilchard

Fishery[17]

Pilchards are found around most of New Zealand; however, commercial fisheries have only developed in north-eastern waters, and in Tasman Bay and Marlborough Sounds at the north of the South Island. Almost all the pilchard catch is targeted and purse seine is the dominant method. A small catch has been recorded as a bycatch of jack mackerel. Landings have fluctuated between 660 t and 1320 t since 2000-01, generally directly linked to the amount of targeted effort in PIL 1.

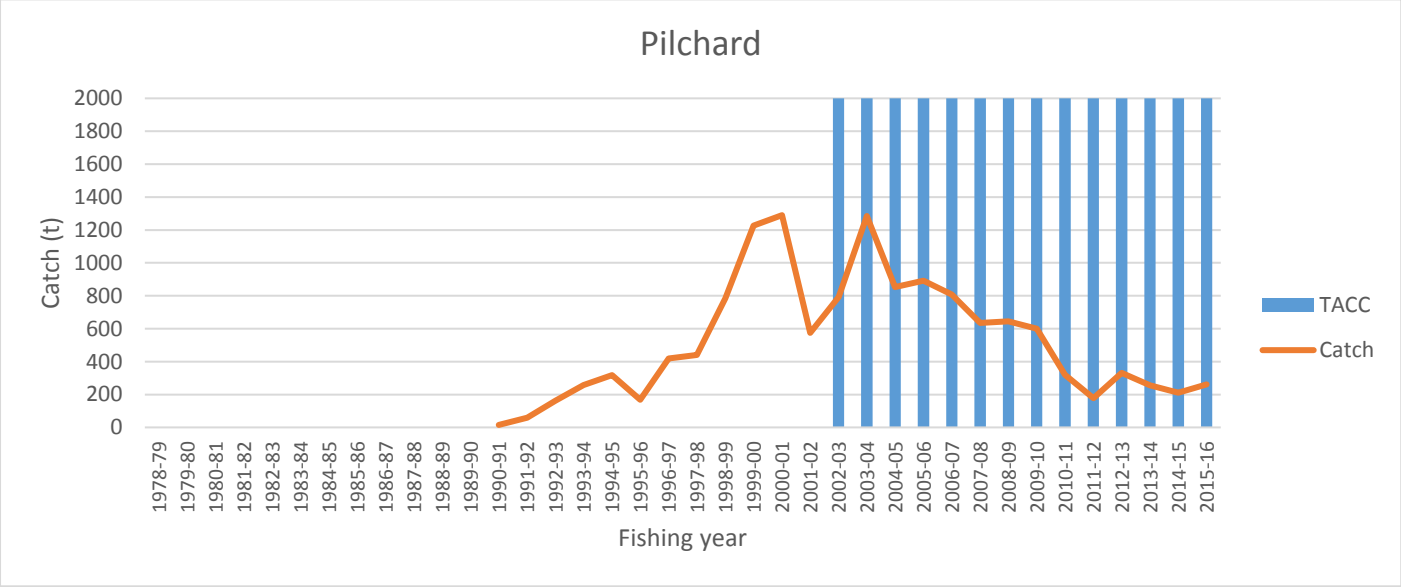
Some accidental captures by vessels purse seining for jack mackerel or kahawai may be discarded if no market is available. Pilchard mortality is known to be high in some places as a result of scale loss resulting from net contact.

Biology[17]

Pilchard are generally found inshore, particularly in gulfs, bays, and harbours. They display seasonal changes in abundance, reflecting schooling and dispersal behaviour, localised movement, and actual changes in population size. Pilchards form compact schools, particularly during summer, and these are heavily preyed upon by larger fishes, seabirds, and marine mammals and are thought to form an important part of the diet for many species.

A study on the feeding of Northland pilchards found that phytoplankton was probably the dominant food, with organic detritus and small zooplankton also being consumed.

Figure 13: Reported total New Zealand within EEZ catch and TACC of pilchard in PIL 1.



Relevance to seabird prey availability in North Eastern North Island

Pilchard are at or near the bottom of the food chain. They feed on plankton and are an important prey for larger fish, seabirds and marine mammals, transferring energy from the oceans' primary producers to the higher levels of the food web. They form compact schools and are often closely associated with other small pelagic fish such as anchovy and sprat. These mixed schools can cause a potential bycatch prolem, where increased fishing effort on one species might cause a decline in another non-target fish stock.

[17] MPI, 2014d, Fisheries Assessment Plenary, May 2014. Stock assessments and stock status of Pilchard (PIL). Ministry for Primary Industries. http://fs.fish.govt.nz/Doc/23607/66_PIL_2014%20DRAFT-MG.pdf.ashx

School Shark

Fishery[18]

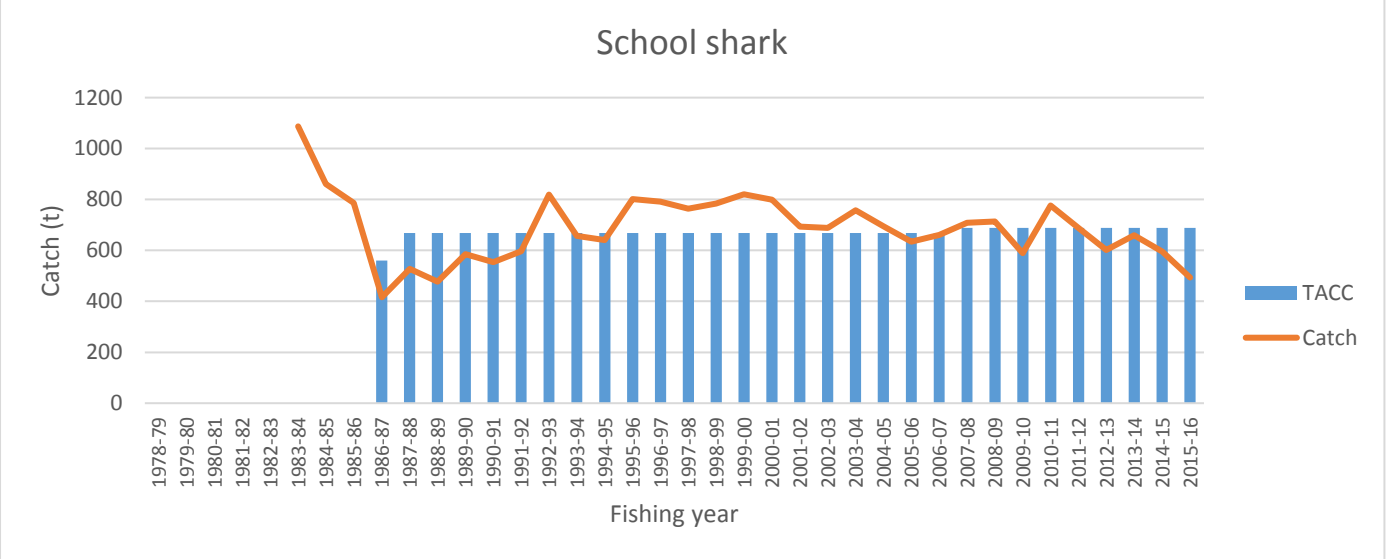
This moderate-size shark has supported a variety of fisheries around New Zealand from the early 1940s onwards. Landings rose steeply from the late 1970s until 1983, with the intensification of setnets targeting this and other shark species, and a general decline in availability of other, previously more desirable coastal species. However, because of earlier discarding and under-reporting, this recorded rise in landings did not reflect an equivalent rise in catches. Catches decreased by about 50% from 1986 onwards because quotas were set below previous catch levels when this species was introduced into the QMS.

About one third of the SCH 1 (FMA 1 & FMA 9) landings are taken by bottom trawl while targeting terakihi and snapper, with smaller catches when targeting trevally and red gurnard. The bottom longline SCH 1 fishery, taking about 30% of the total landings, is primarily directed at school shark, with hapuku and snapper being other important targets. The setnet fishery, which takes about ¼ of the landings, is mainly targeted at school shark, with some additional targeting of rig, trevally, gurnard and snapper.

Biology[18]

School sharks are distributed across the continental shelf, generally being inshore in summer and offshore in winter. They are found in smaller numbers near the seafloor and down the upper continental slope, to at least 600 m. School sharks feed predominantly on small fish and cephalopods (octopus and squid).

Figure 14: Reported total New Zealand within EEZ catch and TACC of school shark SCH 1.



Relevance to seabird prey availability in North Eastern North Island[19]

The catch of school sharks fluctuates year to year, but is mostly close to the TACC. However, for the past two years, catch has been declining, reaching a low of 494 t, the lowest catch recorded since 1986-87. As top predators, school sharks can strongly affect prey behaviours, such as foraging. Like many other top predators, school sharks could not only cause the upwards movement of prey to the surface, making prey more available to seabirds, but also, they could drive fish into shallow surface waters as a flight response or avoidance mechanism.

[18] MPI, 2014b, Fisheries Assessment Plenary, May 2014. Stock assessments and stock status of School shark (SCH). Ministry for Primary Industries. http://fs.fish.govt.nz/Doc/23621/81_SCH_2014%20FINAL.pdf.ashx

[19] Heithaus, M. R., Frid, A., Wirsing, A. J., & Worm, B. (2008). Predicting ecological consequences of marine top predator declines. *Trends in Ecology & Evolution*, *23*(4), 202-210.http://ac.els-cdn.com/S0169534708000578/1-s2.0-S0169534708000578-main.pdf?_tid=8e27dbd6-f875-11e6-b3ec-00000aab0f02&acdnat=1487709626_f8f2a4524a472454904d895fc08bf849

Snapper

Fishery[20]

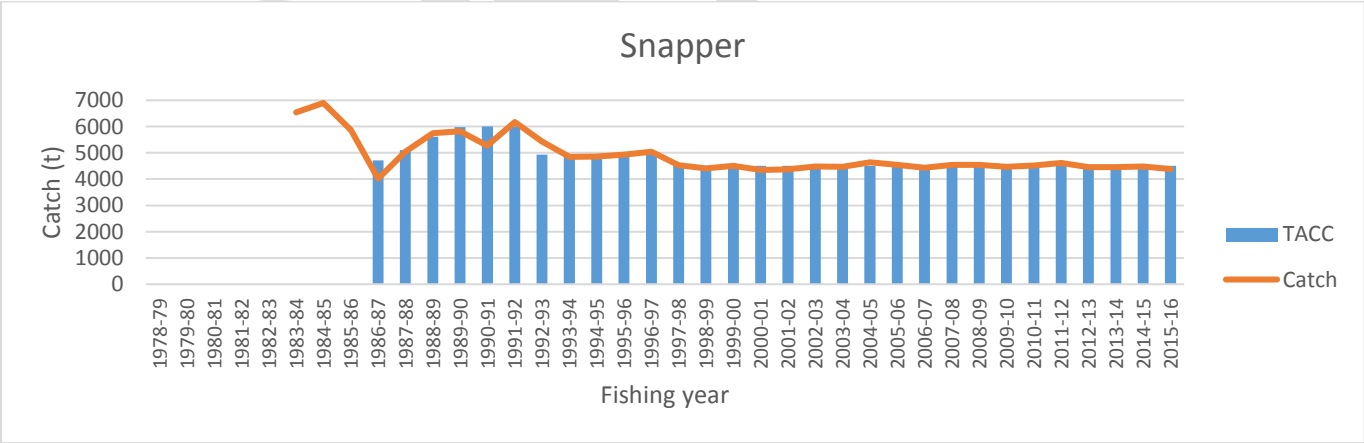
The snapper fishery is one of the largest and most valuable commercial coastal fisheries in New Zealand. The commercial fishery expanded in the 1970s with increased catches by trawl and Danish seine. With the introduction of the QMS in 1986, TACCs in all fish stocks were set at levels intended to allow for some stock rebuilding. Decisions by the Quota Appeal Authority saw TACCs increase to over 6000 t for SNA 1, and from 1330 to 1594 t for SNA 8. From 1 October 1997, the TACC for SNA 1 was reduced to 4500 t, within an overall TAC of 7550 t. Additional to the commercial fishery, a significant recreational fishery exists in the Hauraki gulf and neighbouring waters.

Biology[20]

Snapper are demersal fish found down to depths of about 200 m, but are most abundant in 15-60m. They are the dominant fish in northern inshore communities and occupy a wide range of habitats, including rocky reefs and areas of sand and mud bottom. They are widely distributed in the warmer waters of New Zealand, being most abundant in the Hauraki Gulf. The diet of snapper is diverse and opportunistic, largely feeding on crustaceans, polychaetes, echinoderms, molluscs and other fish. There is some evidence to suggest a seasonal component to snapper diet, with high proportions of pelagic items (salps and pelagic fish such as pilchard) observed during spring in one study. Snapper are one of the most abundant demersal generalist predators found in the inshore waters of New Zealand, and as such are likely to be an important part of the coastal marine ecosystem. Localised depletion of snapper probably occurs within the key parts of the fishery, and this has unknown consequences for ecosystem functioning in those areas.

A trawl survey conducted in the Hauraki Gulf showed decreasing trends in the proportion of species with low resilience and the proportion of demersal fish species in waters shallower than 50 m. Several indices of fish diversity showed significant declines in muddy waters shallower than 50m, especially in the Firth of Thames. There was some indication that the maximum size of fish has decreased in the Hauraki Gulf survey area, especially over sandy bottoms.

Figure 15: Reported total New Zealand within EEZ catch and TACC of snapper in SNA 1.



Relevance to seabird prey availability in North Eastern North Island

Due to the seasonal diet of pelagic prey, snapper might cause the upward movement of prey species, making them more available for surface feeding seabirds. The catches of snapper in SNA1 have been relatively stable in the past 10 years, with the catch fluctuating slightly above or below the set TACC. It has been suggested that a localised depletion of snapper occurs in key parts of the fishery, such as SNA 1, with unknown consequences for the ecosystems in those areas.

[20] MPI, 2014, Fisheries Assessment Plenary, May 2014. Stock assessments and stock status of Snapper (SNA). Ministry for Primary Industries. http://fs.fish.govt.nz/Doc/23627/87_SNA_2014%20FINAL.pdf.ashx

Southern bluefin tuna

Fishery[21]

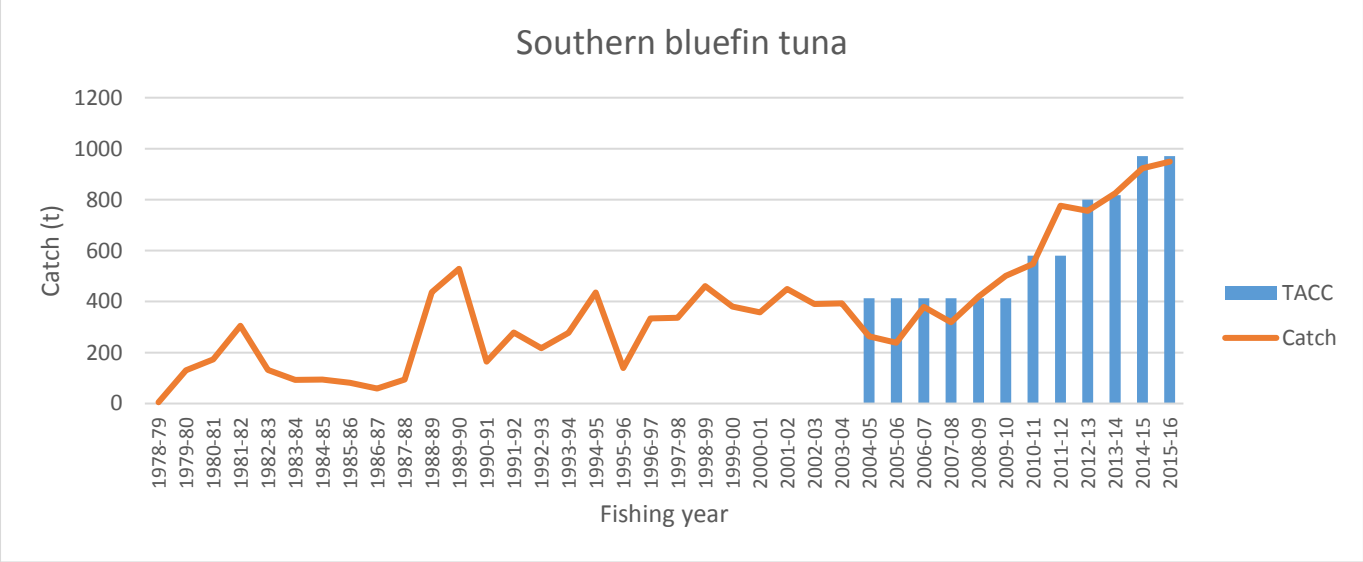
Since 1991, surface longlining has been the predominant method used to target southern bluefin tuna in the domestic fishery with 96% of all days fished using this method and only 4% using hand line (<1% used trolling). This represents a major change from the 1980s when most fishing was by hand line.

The majority of southern bluefin tuna (88%) are caught in the targeted southern bluefin tuna fishery. However, albacore comprise an equal proportion of the catch (29%) in this fishery. Longline fishing effort is distributed along the east coast of the North Island and the south west coast of the South Island. The east coast of the North Island targets a range of species, including bigeye, swordfish, and southern bluefin tuna.
Analysis of New Zealand catch data shows that most southern bluefin tuna are caught in FMA 1, FMA 2, FMA 5 and FMA 7. The northern FMAs that accounted for a small proportion of southern bluefin tuna before 1998 have in recent years accounted for about the same amount as the southern FMAs. This change in spatial distribution of catches can be attributed to the increase in domestic longline effort in the northern waters.

Biology[21]

Southern bluefin tuna are apex predators, feeding opportunistically on a mixture of fish, crustaceans and squid; juveniles feed on a variety of zooplankton and micronekton species. Southern bluefin tuna are large pelagic predators, so they are likely to have a 'top down' effect on the fish, crustaceans and fish they feed on.

Figure 16: Reported total New Zealand within EEZ catch and TACC of Southern bluefin tuna in STN 1.



Relevance to seabird prey availability in North Eastern North Island

Seabirds are often associated with tuna and other epi-pelagic predators near the surface. Southern bluefin tuna may drive prey up to the surface, making the prey more available to the birds. Many seabirds, including Buller's shearwaters and red-billed gulls, feed in the surface or within a half meter of the sea surface, and their feeding opportunities are often dependent on the presence of surface feeding predators such as bigeye tuna.

Catches of Southern bluefin tuna have been increasing over the past years, reaching a peak of 949 t in 2015-16, which is the highest catch recorded in almost two decades.

[21] MPI, 2015, Fisheries Assessment Plenary, November 2015. Stock assessments and stock status of Southern Bluefin tuna (STN). Ministry for Primary Industries. http://fs.fish.govt.nz/Doc/24024/15-STN_2015_FINAL.pdf.ashx

Swordfish

Fishery[22]

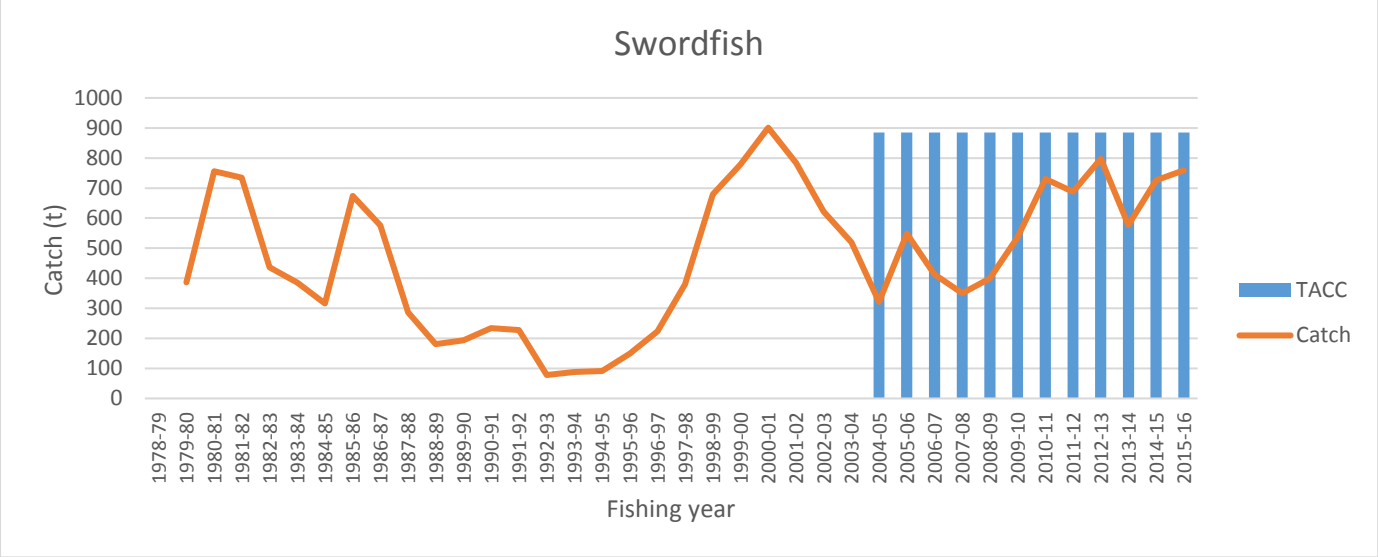
Annual swordfish catches throughout the Pacific have been increasing, with catches in the Western and Central Pacific increasing to 20,000 t in 2012. In New Zealand, swordfish are caught throughout the year in oceanic waters, primarily by pelagic longliners in areas where the bottom depths exceed 1000 m.

Swordfish are either targeted or caught in the tuna longline fishery as a bycatch when targeting bigeye and to a lesser extent when targeting southern bluefin tuna. Swordfish can be caught in most FMAs and adjacent high seas areas, although most catches are from waters north of 40S. Swordfish catches by domestic vessels increased rapidly from 1994-95 to a peak at 1100 t in 2000-01. Since 2000-01 catches declined in each year, coinciding with the decline in effort in the surface longline fishery, until 2005-06 when they increased again. Most of the catch is from FMA 1, FMA 2 and FMA 9.

Biology[22]

Swordfish are an epi- and mesopelagic highly migratory species found in all tropical and temperate oceans in large seas. Swordfish are large pelagic predators, so they are likely to have a 'top-down' effect on the species they feed on. Swordfish found in the New Zealand EEZ are part of a much larger stock that spawns in the tropical central to western Pacific Ocean. Stock structure is uncertain and recent genetic studies have indicated that there may be multiple Pacific Ocean stocks.

Figure 17: Reported total New Zealand within EEZ catch and TACC of swordfish in SWO 1.



Relevance to seabird prey availability in North Eastern North Island

Seabirds are often associated with swordfish and other epi-pelagic predators near the surface. Swordfish may drive prey up to the surface, making the prey more available to the birds. Many seabirds, including Buller's shearwaters and red-billed gulls, feed in the surface or within a half meter of the sea surface, and their feeding opportunities are often dependent on the presence of surface feeding predators such as bigeye tuna.

After a low in 2004-05, the catches of swordfish have increasing in the recent years. The swordfish found in New Zealand waters are a part of a much larger stock that spawns in the Pacific, but the stock structure is unknown. The increased catches in New Zealand waters, combined with catches in the Pacific, could be causing decreased abundance of swordfish in the New Zealand EEZ.

[22] MPI, 2015, Fisheries Assessment Plenary, November 2015. Stock assessments and stock status of Swordfish (SWO). Ministry for Primary Industries. http://fs.fish.govt.nz/Doc/24026/17-SWO_2015_FINAL.pdf.ashx

Trevally

Fishery[23]

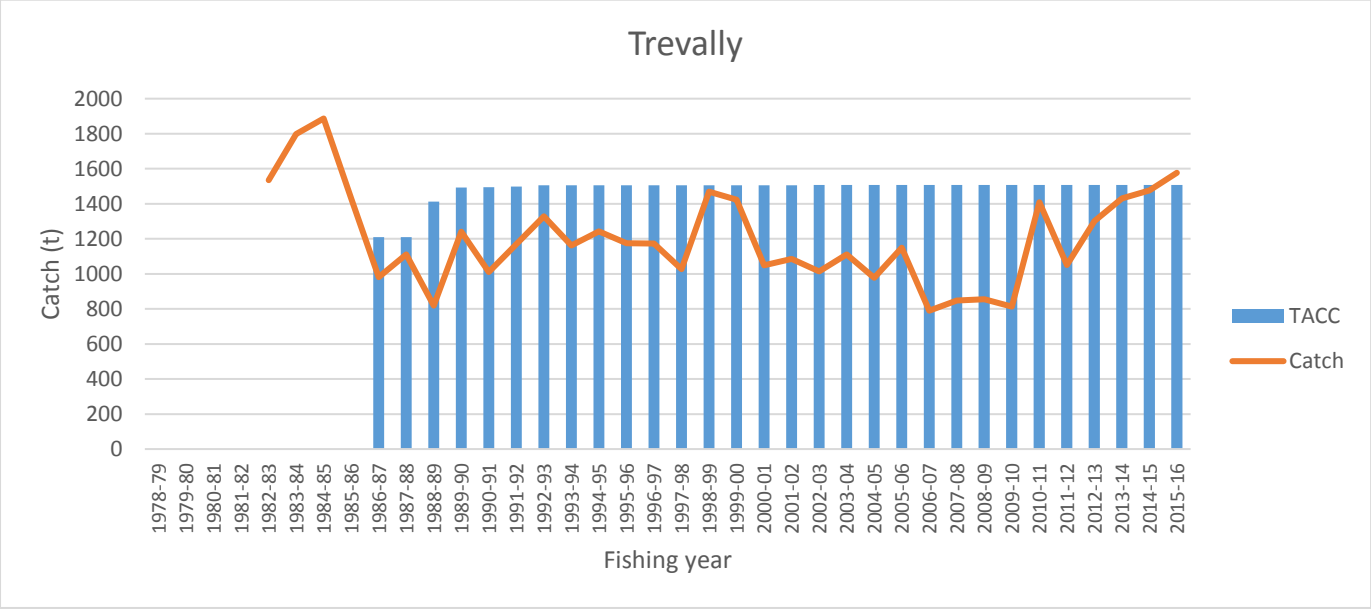
Trevally is caught around the North Island and the north of the South Island, with the main catches from the northern coasts of the North Island. Trevally is taken in the northern coastal mixed trawl fishery, mostly in conjunction with snapper. Since the mid-1970s trevally has been taken by purse seines, mainly in the Bay of Plenty, in variable but often substantial quantities. In 2010-11 and 2011-12, 86% of the total TACC were taken from TRE 1 (FMA 1).

Recent catches reported for TRE 1 are less than the estimated MCY levels and below the TACC. Reduced proportions of older age classes found in the single bottom trawl catch between 1999-00 and 2006-07 combined with the strong decreases in landings in 2006-07 and 2007-08 may indicate that the stock abundance is declining at current catch levels.

Biology[23]

Trevally are both pelagic and demersal in behaviour. Juvenile fish up to two years old are found in shallow inshore areas including estuaries and harbours. Young fish enter a demersal phase from about one year old until they reach sexual maturity. At this stage, adult fish move between demersal and pelagic phases. Schools occur at the surface, in mid-water and on the bottom, and are often associated with reefs and rough substrate. Schools are sometimes mixed with other species such as koheru and kahawai. Surface schooling trevally feed on planktonic organisms, particularly euphausiids. On the bottom, trevally feed on a wide range of invertebrates.

Figure 18: Reported total New Zealand within EEZ catch and TACC of trevally in TRE 1.



Relevance to seabird prey availability in North Eastern North Island

As surface feeding schooling species, trevally is likely to cause the upward movement of prey species, making them more available for surface feeding seabirds. Catches of trevally in TRE 1 have been increasing over the past five yeasrs, exceeding the TACC in 2015-16. This could be quite concerning after suggestions after the drop in landings in 2006-07 and 2007-08, that the stock abundance is declining at current catch levels.

[23] MPI, 2014, Fisheries Assessment Plenary, May 2014. Stock assessments and stock status of trevally (TRE). Ministry for Primary Industries. http://fs.fish.govt.nz/Doc/23641/101_TRE%202014%20FINAL.pdf.ashx

Yellow-eyed mullet

Fishery[24]

Yellow-eyed mullet was introduced into the QMS on 1 October 1998. From 1934 to 1972 information from catch records indicate that yellow-eyed mullet was taken by "other nets", meaning nets other than trawl or Danish seine. Catch by gear-type data from the Fisheries Statistics Unit (FSU) records between 1982-83 and 1988-89 show a predominant use of setnets and gillnets over beach seine and drag net. Highest recorded landings are in FMA 9 and FMA 1. High landings recorded since the mid-1980s most likely reflect increased fishing in the Auckland area in response to an increase in market demand for yellow-eyed mullet. Catches have fluctuated over time with a high of 68 t being recorded in 1986-87. The last five years have seen catches averaging 27 t, slightly below the long-term (30 year) average of 28 t.

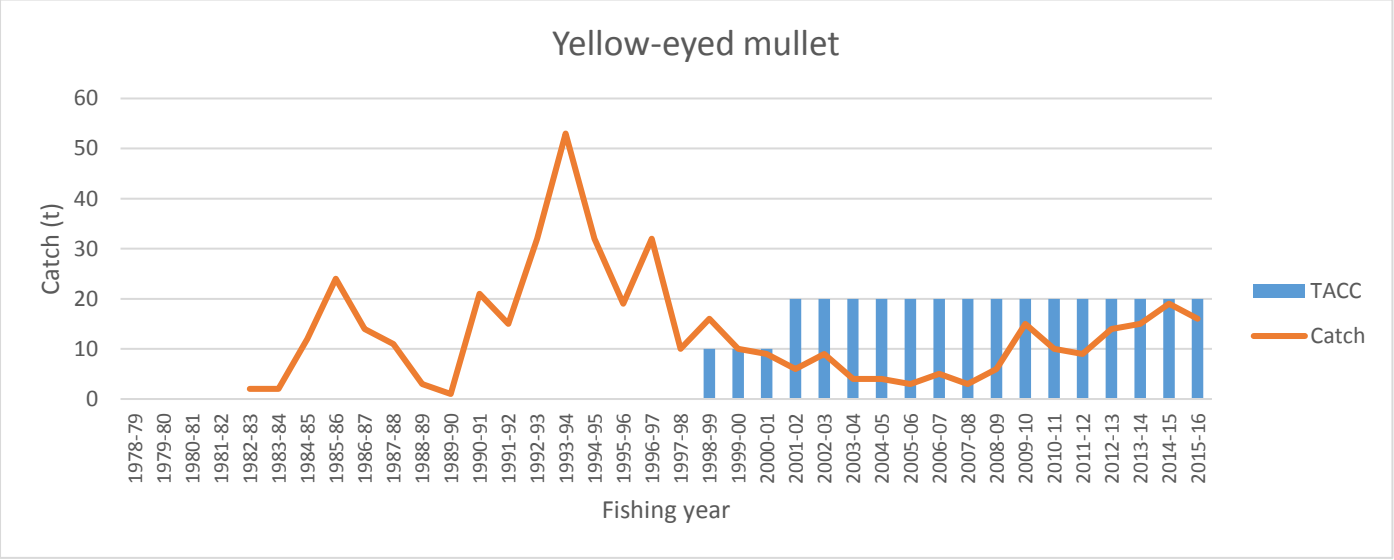
Yellow-eyed mullet are a popular recreational species throughout New Zealand, particularly in QMA 1. The estimated recreational harvest range is 12-20 t in YEM 1.

Biology[24]

Yellow-eyed mullet is typically a schooling species that occurs commonly along coasts, in estuaries and in lower river systems, with juveniles sometimes observed in freshwater where they have been observed feeding on algae. In New Zealand, the species is widely but erroneously known as herring.

Yellow-eyed mullet are omnivorous and feed on a wide range of food types, including algae, crustaceans, diatoms, molluscs, insect larvae, fish, polychaetes, coelenterates, fish eggs and detritus.

Figure 19: Reported total New Zealand within EEZ catch and TACC of yellow-eyed mullet in YEM 1.



Relevance to seabird prey availability in North Eastern North Island

As a small pelagic schooling species, yellow-eyed mullet might be an important prey item for surface feeding seabirds. The catches of yellow-eyed mullet in YEM 1 have been increasing for the past years, although the catch has not reached the same level as the set TACC since 1999-00. After a peak in catch in 1993-94, reported catch has dropped significantly, which might indicate a decresed abundance of yellow-eyed mullet.

[24] MPI, 2014, Fisheries Assessment Plenary, May 2014. Stock assessments and stock status of Yellow-eyed mullet (YEM). Ministry for Primary Industries. http://fs.fish.govt.nz/Doc/23645/105_YEM_2014%20FINAL.pdf.ashx

Yellowfin tuna

Fishery[25]

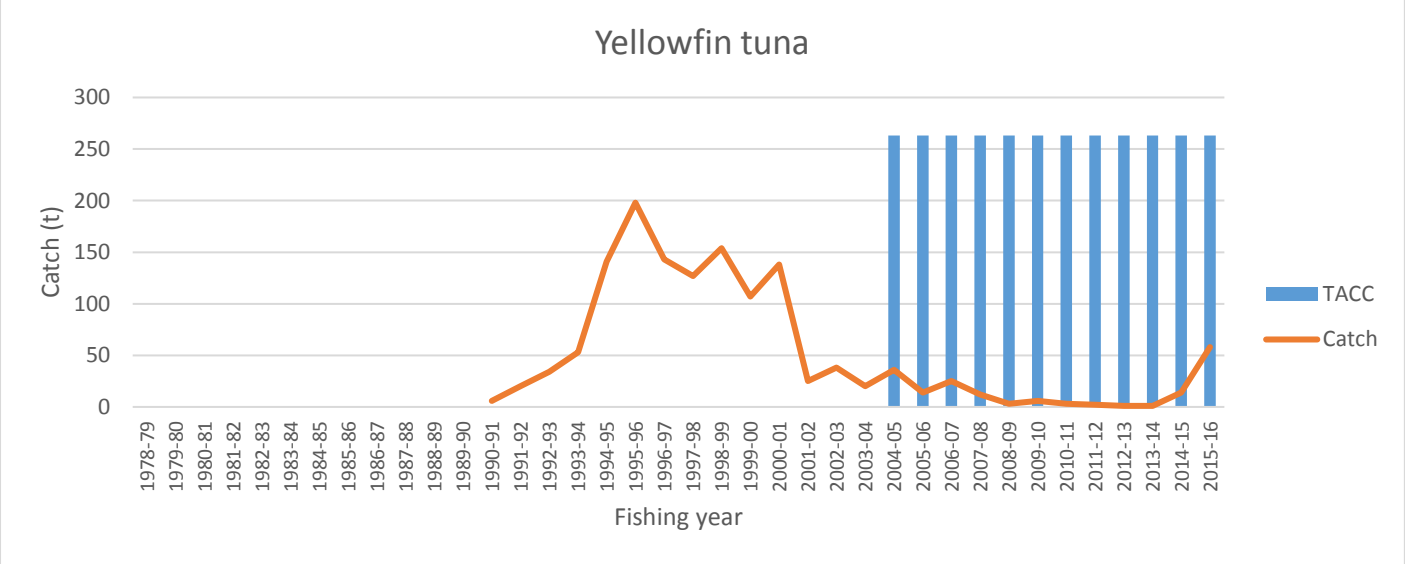
Domestic tuna longline vessels began targeting bigeye tuna in 1990-91 in northern waters of FMA 1, FMA 2 and FMA 9. Catches of yellowfin tuna have increased with increased longline effort, but as availability fluctuates dramatically between years, catches have been variable. In addition, small catches of yellowfin are made by pole-and-line fishing (about 4 t per year) and by trolling (about 14 t per year).

New Zealand landings were very high from 1995-2001, ranging from 138-198 t and then dropped significantly and have fluctuated between 1-38 t (2002-2014). The majority of yellowfin tuna are caught in the bigeye tuna surface longline fishery (68%), however, across all longline fisheries albacore make up the bulk of the catch (31%) and yellowfin tuna make up only 2% of the catch. Longline effort is distributed along the east coast of the North Island and the south west coast of the South Island. The west coast South Island fishery predominantly targets southern bluefin tuna, whereas the east coast of the North Island targets a range of species including bigeye, swordfish and southern bluefin tuna.

Biology[25]

Yellowfin tuna are epi-pelagic opportunistic predators of fish, crustaceans and cephalopods. They are found from the surface to depths where low oxygen levels are limiting. Due to their size and status, they are likely to have a "top-down" effect on the fish, crustaceans and squid they feed on.

Figure 20: Reported total New Zealand within EEZ catch and TACC of yellowfin tuna in YFN 1.



Relevance to seabird prey availability in North Eastern North Island

Seabirds are often associated with tunas and other epi-pelagic predators near the surface. Yellowfin tuna may drive prey up to the surface, making the prey more available to the birds. Many seabirds, including Buller's shearwaters and red-billed gulls, feed in the surface or within a half meter of the sea surface, and their feeding opportunities are often dependent on the presence of surface feeding predators such as yellowfin tuna.

The catches of yellowfin tuna dropped significantly after 2001, and have been under 15 t since 2007-08. However, in 2015-16 catches increased again, reaching 58 t.

[25] MPI, 2015, Fisheries Assessment Plenary, November 2015. Stock assessments and stock status of yellowfin tuna (YFN). Ministry for Primary Industries. http://fs.fish.govt.nz/Doc/24027/18-YFN_2015_FINAL.pdf.ashx

Albacore tuna – Non QMA

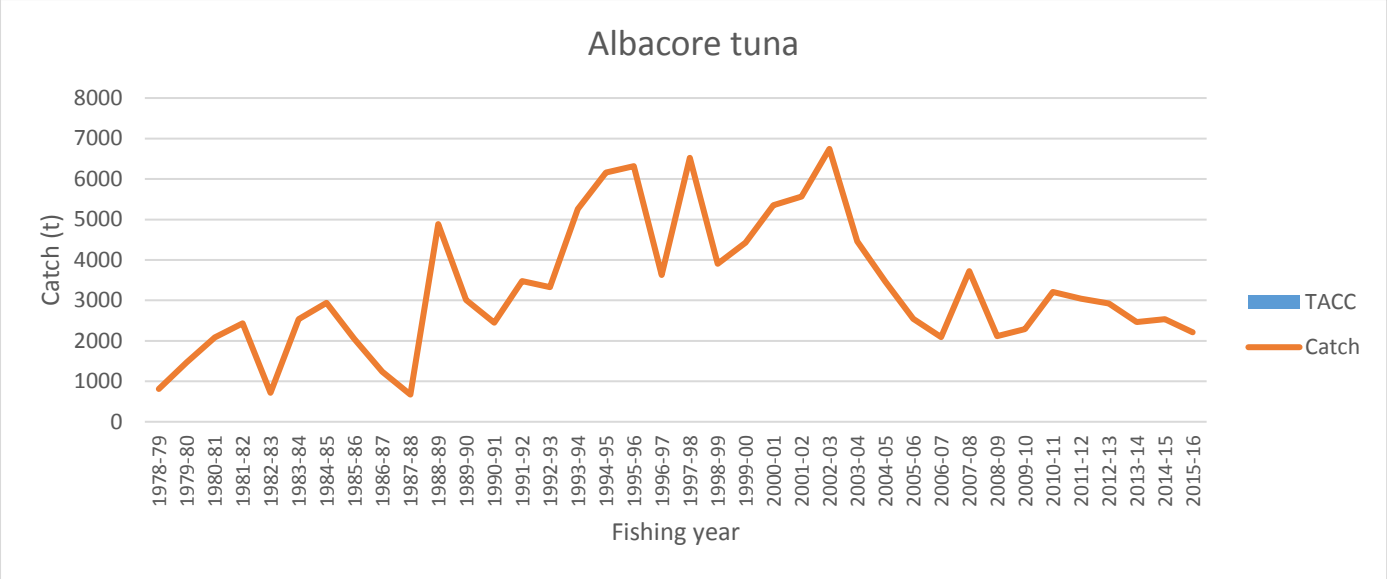
Fishery[26]

Albacore tuna caught in the New Zealand EEZ are part of a single South Pacific Ocean stock that ranges from the equator to about 45S. There had been a troll fishery for juvenile albacore in New Zealand coastal waters since the 1960s, in addition, the New Zealand longline fishery catches adult and sub-adult albacore. The fishery is operated by domestic vessels mostly in New Zealand coastal waters, primarily off the west coast of the North Island and South Island with Onehunga (Auckland), New Plymouth, Westport and Greymouth being major landing ports.
Total annual landings between 2000 and 2009 have averaged 4047 t (largest landing 6744 t in 2003).

Biology[26]

Albacore tuna are pelagic predators, i.e. open-sea hunters. Albacore tuna's main source of food is cephalopods. Albacore tuna is a schooling species, usually forming a single species school. Because of their size and status, they are likely to have a "top-down" effect on the fish, crustaceans and squid they feed on.

Figure 21: Reported total New Zealand within EEZ catch of albacore tuna



Relevance to seabird prey availability in North Eastern North Island

Seabirds are often associated with tunas and other epi-pelagic predators near the surface. Albacore tuna may drive prey up to the surface, making the prey more available to the birds.
The catches of Albacore tuna have been declining for the past years, with recorded landings of 2209 t in 2015-16, after hitting a high of 6744 in 2002-03.

[26] Griggs, L. & Large, L. 2016. Albacore catch sampling during 2013-14 and 2014-15. New Zealand Fisheries Assessment Report 2016/33. 319. http://fs.fish.govt.nz/Doc/24054/FAR-2016-33-Albacore-sampling.pdf.ashx

Skipjack tuna – Non QMA

Fishery[27]

The fishery in New Zealand waters has been almost exclusively a purse seine fishery, although minor catches (less than 1%) are taken by other gear types, especially troll. The purse seine fishery through 2000-01 was based on 5-7 medium sized vessels under 500 GRT operating on short fishing trips assisted by fixed wing aircraft, acting as spotter planes, in FMA 1, FMA 2 and occasionally FMA 9 during summer months.

Domestic landings within the EEZ between 2001 and 2014 ranged between 3555 and 13,312t.

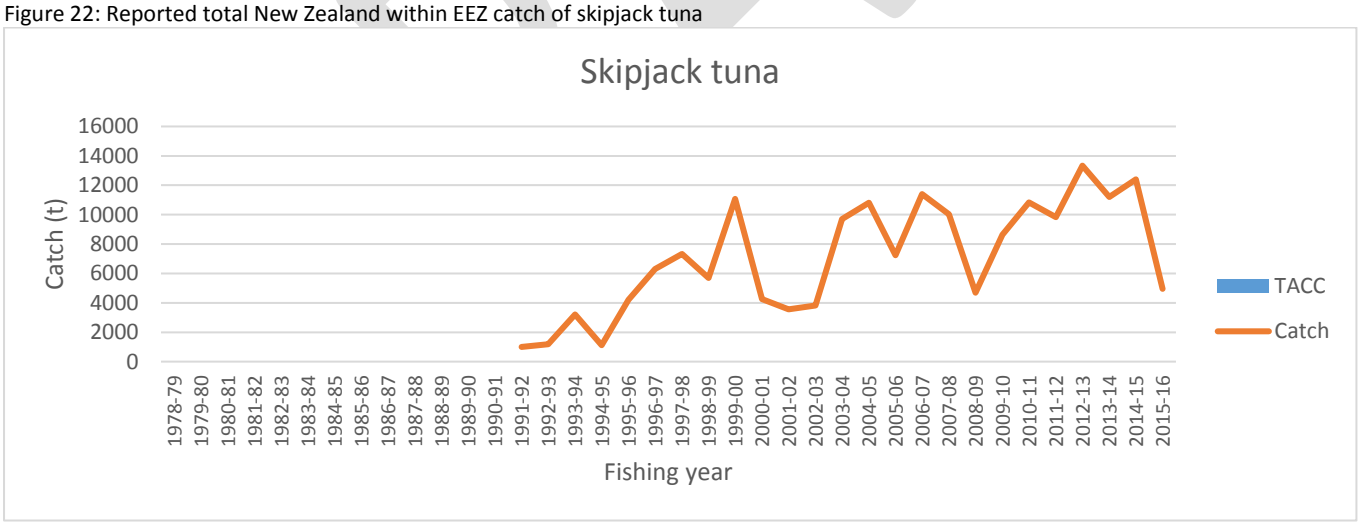
Recent catches are slightly above the estimated MSY of 1,532,000 t (overall, NZ and pacific). The assessment continues to show that the stock is currently only moderately exploited and fishing mortality levels are sustainable. However, the continuing increase in fishing mortality and decline in stock size are recognized. Fishing is having a significant impact on stock size, especially in the western equatorial region and can be expected to affect catch rates. The stock distribution is also influenced by changes in oceanographic conditions associated with El Nino and La Nina events, which impact on catch rates and stock size.

Biology[27]

Skipjack tuna are epi-pelagic opportunistic predators of fish, crustaceans and cephalopods found within the upper few hundred meters of the surface. Skipjack are typically a schooling species with juveniles and adults forming large schools at or near the surface in tropical and warm-temperate waters to at least 40S in New Zealand waters. Individuals found in New Zealand waters are mostly juveniles, which also occur more broadly across the Pacific Ocean, in both the northern and southern hemisphere.

Skipjack tuna average around 45-60 cm in length in New Zealand waters, reaching an upper maximum of around 70 cm. They are a prey of larger tuna, HMS sharks and billfish.

Figure 22: Reported total New Zealand within EEZ catch of skipjack tuna



Relevance to seabird prey availability in North Eastern North Island

Seabirds are often associated with tunas and other epi-pelagic predators near the surface. Skipjack tuna may drive prey up to the surface, making the prey more available to the birds.

The catches of skipjack tuna fluctuate heavily between years, going over 10,000 t in good years. There is a trend of continued increase in fishing mortality and decline in stock size, which could indicate that abundance of skipjack tuna in New Zealand waters is decreasing.

[27] MPI, 2015, Fisheries Assessment Plenary, November 2015. Stock assessments and stock status of Skipjack tuna (SKJ). Ministry for Primary Industries. http://fs.fish.govt.nz/Doc/24023/14-SKJ_2015_FINAL.pdf.ashx