Ministry for Primary Industries
Manatū Ahu Matua

# Jack Mackerel

## FISHERIES PLAN CHAPTER

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# Introduction

This chapter of the National Deepwater Plan sets the operational objectives and performance criteria for the jack mackerel fishery and key related fisheries. Specifically, it addresses the management of the following quota management species and stocks:

- Jack mackerel: JMA3 and JMA7 (target)
- Blue mackerel: EMA3 and EMA7 (bycatch)
- Redbait: RBT1, RBT3 and RBT7 (bycatch)

Note that not all stocks of jack mackerel and blue mackerel are managed as deepwater fisheries. JMA1, EMA1 and EMA2 are managed by the Inshore Fisheries Management Team as almost all catch of those species in those quota management areas is taken by the domestic purse seine fleet.

Throughout this chapter, unless specified, all references to jack mackerel fisheries refer only to those stocks covered under the National Deepwater Plan i.e. JMA3 and JMA7. This chapter also addresses the required management of any adverse environmental effects, and management of other impacts, where they exist, that are caused by jack mackerel fishing activity.

This chapter consists of the following sections:

1. Overview of the jack mackerel fisheries
2. Overview of non-target interactions
3. Operational objectives for the jack mackerel fisheries
4. Measuring performance

This chapter will direct the management of the jack mackerel fisheries for the next five years, starting in the 2013/14 year.

# 1. Overview of the jack mackerel fisheries

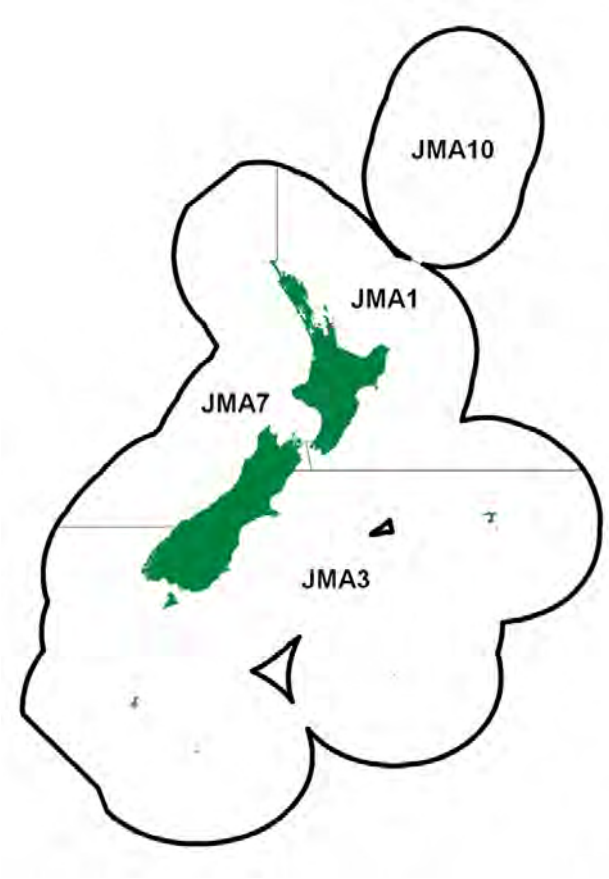


**Figure 1. Map of the jack mackerel quota management areas**

## Biology Overview

The jack mackerel fishery catches three species, each of which has a different geographical distribution although their ranges partially overlap. The three species are described individually below.

*Trachurus novaezelandiae* ("yellowtail horse mackerel") predominates in waters shallower than 150m and warmer than 13°C. It is uncommon south of 42°S (the latitude of the JMA1/JMA3 boundary in Figure 1 above). This species likely matures at an age of 3-4 years (26-30cm fork length). It grows to a maximum of 40-45cm.

*Trachurus declivis* ("greenback" or "greentail horse mackerel") generally occurs in deeper waters (up to 300m) less than 16°C, north of latitude 45°S (the latitude of the JMA3/JMA7 boundary in Figure 1 above). *T. declivis* matures at an age of 2-4 years (when about 26-30cm fork length) and grows to a maximum of 50-55cm.

*T. novaezelandiae* and *T. declivis* are both New Zealand species. While there is considerable overlap in their ranges, *T. novaezelandiae* follows a more northerly, nearshore distribution than *T. declivis. T.*

*declivis* tends to be slightly larger on average than *T. novaezelandiae.* Both species have moderate initial growth rates that slow after about 6 years. Both species reach a maximum age of 25+ years.

Both species are known to spawn in the north and south Taranaki Bights and probably in other areas as well. They have a protracted spring-summer spawning season.

The third species is *T. murphyi* ("Chilean" or "redtail" jack mackerel), which was first described in New Zealand waters in 1987. The range of this species extends along the west coast of South America, across the South Pacific, through much of New Zealand's EEZ, and into the waters off south-eastern Australia. Its distribution in New Zealand waters has changed over time and it is now rarely seen in areas where once it was common. In recent years it has been uncommon north of Cook Strait. It occurs to depths of at least 500m and is, on average, larger than the two native species.

The annual distributions of the three species are shown in Figures 2-4. The figures are generated from MPI's NABIS website.[1] The information upon which the figures are based comes largely from observer and trawl survey information combined with expert scientific knowledge. Note that the distribution of *T. murphyi* is based on over 20 years' worth of such information, which covers the period of increased abundance of this species. The distribution shown in Figure 4 is therefore unlikely to reflect current abundance, as the range of this species has contracted since the 1990s.

Initial growth of *T. murphyi* is rapid, slowing at 6-7 years. The species is moderately long-lived with a maximum reported age of 32 years. Its reproductive biology in New Zealand waters is not well understood. Pre- and post-spawning fish have been recorded from several locations, but it is unknown whether there has been any resulting recruitment in New Zealand waters.

All three species can be taken by bottom trawl, midwater trawl or purse seine.

*T. declivis* is believed to be highly mobile within New Zealand waters and because of this, a single biological stock has been assumed. While this has not been reliably established, the best available science suggests this is most likely.

The mobility of *T. novaezelandiae* is assumed to be lower, given that it is a smaller species with a more northerly and inshore distribution than *T. declivis*. The 2012 Plenary states that as a consequence, there is a higher probability of multiple independent breeding populations for *T. novaezelandiae*. However in contrast, McKenzie (2009)[2] considers that both native species are likely to form a single stock.

There are two possible hypotheses regarding the stock structure of *T. murphyi* in New Zealand waters. The first is that they constitute a separate stock originally established by fish migrating from South America but are now separate from South American stocks. The second is that the fish are part of a more extensive stock in the South Pacific. Current evidence favours the latter hypothesis; that *T. murphyi* in the New Zealand region are a small, and perhaps periodically separated, component of a larger South Pacific stock which undergoes periodic expansions or migrations.

For more detailed information on jack mackerel and the current status of the stocks see the latest Ministry for Primary Industries Stock Assessment Plenary report.

[1] National Aquatic Biodiversity Information System (NABIS).

[2] McKenzie, A. 2009. Preliminary stock assessments for *Trachurus declivis* and *T. novaezelandiae* in the JMA7 jack mackerel fishery to 2005-06. Fisheries Assessment Research Document 2009/28


**Figure 2. *Trachurus novaezelandiae* annual distribution**


**Figure 3. *T. declivis* annual distribution**


**Figure 4. *T. murphyi* annual distribution**

## Commercial fishery overview

The JMA3 and JMA7 stocks are mostly fished by large factory trawl vessels greater than 46m in total length. Since 2002/03, over 90% of the combined catch has been taken by Ukrainian[3] foreign charter vessels with the most commonly produced state being dressed.[4] A proportion of catch, usually smaller fish, is packed whole (green) and in the 2011/12 year just over 25% of jack mackerel taken was landed in this form.

Annual catches have averaged approximately 32,000 tonnes over the last 10 years. In the JMA7 fishery, catch is taken all year round although most catch is taken in two distinct periods. The first, and most important in terms of overall catch, is the October-January period while the second period is April-July. At peak times, the daily catch can be between 500-600 tonnes across the fleet.[5]

Fishing for jack mackerel does not appear to rely on spawning aggregations and fishing can probably be undertaken successfully all year round. However, activity tends to be based around vessel availability and the timing of other fisheries. In JMA7 the primary catch period of October-January occurs at the conclusion of the southern blue whiting fishery and before the start of the squid fishery. The secondary catch period of April-July occurs at the conclusion of the squid fishery and before the start of the West Coast South Island hoki fishery. Catches have been no lower than 80% of the JMA7 TACC every year since 2002/03 and have exceeded the TACC on two occasions (by 12% in 2004/05 and by 5% in 2007/08).

In the much smaller JMA3 fishery, catch can also be taken year-round but peaks in February-April. This is again due to vessel deployment in other fisheries rather than any seasonal change in availability. Fleet-wide catch per day rarely exceeds 100 tonnes. Since 2000/01 the most that has been taken in a year is 5,000 tonnes, which represents 28% of the 18,000 tonne TACC. The low catches in recent years reflect the decrease in abundance of *T. murphyi* since a peak in the 1990s.

Vessels generally target jack mackerel using mid-water trawl gear in relatively shallow water (75-150m) and the gear tends to be fished on or near the seabed. Table 1 shows the proportion of effort over the last five fishing years (2007/08 – 2011/12) made by bottom trawl vs. mid-water trawl. In addition, Figure 23 (page 44) shows the areas where target trawling for the jack mackerel fisheries occurs.

[3] Although referred to as Ukrainian, some vessels in this category may be flagged to other countries such as Dominica. One vessel reflagged to New Zealand in 2013.

[4] The processed state "Dressed" essentially means that the fish has had the head, gut and pectoral fins removed. A precise description is contained in the current Conversion Factors notice available on the MPI fisheries website (www.fish.govt.nz).

[5] Since 2010 the "fleet" has consisted primarily of six core vessels.

**Table 1. Proportion of targeted jack mackerel fishing effort, by method and depth from the seabed, between 2007/08 and 2011/12**

| Fishing Method | Distance of groundrope above seabed | Proportion of total effort |
|---|---|---|
| Mid-water trawl | On bottom | 73% |
| | 1-50m | 17% |
| | >50m | 7% |
| Bottom Trawl | 0m | 1% |

Overall, the majority of jack mackerel taken is targeted. In JMA7 only a small proportion (less than 2%) is taken while targeting other species however in JMA3 the proportions can vary considerably. During the last five years between 25% and 66% of JMA3 has been targeted. Tables 2 and 3 below show estimated catch of JMA7 and JMA3 by target species over the last five years.

**Table 2. Proportion of JMA7 catch by target species for the 2007/08 – 2011/12 fishing years (TCEPR data only)**

| Target species | 2007/08 | 2008/09 | 2009/10 | 2010/11 | 2011/12 | Five-year average |
|---|---|---|---|---|---|---|
| JMA | 98.7% | 98.2% | 99.5% | 99.6% | 99.3% | 99.1% |
| BAR | 0.7% | 1.3% | 0.3% | 0.2% | 0.3% | 0.6% |
| Others | 0.6% | 0.5% | 0.2% | 0.1% | 0.4% | 0.4% |

**Table 3. Proportion of JMA3 catch by target species for the 2007/08 – 2011/12 fishing years (TCEPR data only)**

| Target species | 2007/08 | 2008/09 | 2009/10 | 2010/11 | 2011/12 | Five-year average |
|---|---|---|---|---|---|---|
| JMA | 54.7% | 61.4% | 25.1% | 65.6% | 66.0% | 54.6% |
| BAR | 35.7% | 29.5% | 54.0% | 27.4% | 28.0% | 34.9% |
| SQU | 6.9% | 7.2% | 20.1% | 6.4% | 3.4% | 8.8% |
| Others | 2.7% | 1.9% | 0.7% | 0.7% | 2.5% | 1.7% |

## Fisheries management overview

Between 1987 and 1996 only the JMA7 stock was managed under the QMS proper. During this time JMA3 was, however, considered part of the QMS as quota was allocated annually by regulation. Since 1 October 1996 all jack mackerel stocks have been managed under the QMS. The quota management area (QMA) boundaries have not changed since QMS introduction in 1987. The jack mackerel fisheries are managed by October fishing year (1 October – 30 September).

The three jack mackerel species are managed collectively within each QMA. Fishers are not required to differentiate catch of the different species when completing catch returns and information collected by observers is often the only source of reliable information on species composition.

In JMA7 there are no species-specific catch limits. In JMA3 the TACC was increased from 2,700 tonnes to 9,000 tonnes and then to 18,000 tonnes in 1993/94 and 1994/95 respectively to reflect the sudden increase in abundance of *T. murphyi.* The increases to the TACC were made under the proviso that they be accounted for by catches of *T. murphyi* only. A TAC for this stock has never been set.

The TACC for JMA7 was initially set at 20,000 tonnes when the stock was introduced into the QMS on 1 October 1987. Between 1987 and 1993 the TACC was increased by approximately 12,500 tonnes as a result of decisions made by the Quota Appeal Authority (QAA).[6] Aside from QAA decisions, there have been no changes to the TACC since QMS introduction in 1987. As with JMA3, a TAC for this stock has never been set.

Only the JMA7 stock is managed as a Tier 1 fishery as it is a high volume fishery that is targeted. The relatively low catches in JMA3 over the last decade mean it is managed as a Tier 2 fishery.

As noted earlier, stock structure of the three jack mackerel species is uncertain and QMAs may not reflect discrete biological stocks. There may be a single stock for both the native species and *T. murphyi* is thought to be part of a wider South Pacific stock.

**Spatial management**

Most JMA is taken by large FCVs, which is a class of vessel that is subject to restrictions as to where they can operate. All FCVs, together with any trawl vessels over 46m in overall length (LOA), are prohibited from operating in the territorial sea (the area within 12nm of land). Additionally, trawlers greater than 46m LOA are restricted from operating in certain areas. The areas of relevance to the jack mackerel fisheries are detailed below.

In the larger JMA7 fishery trawlers greater than 46m LOA are prohibited from operating within:

- 20nm of the North Island west coast from the entrance to the Kaipara Harbour in the north to near Kapiti Island in the south
- the outer Tasman Bay/Golden Bay area
- 25nm of the South Island west coast from approximately Cape Foulwind in the north to Jackson Bay in the south

In the JMA3 fishery trawlers greater than 46m LOA are prohibited from operating in a large area off the South Island's east coast from approximately Clarence Point in the north to the Otago Peninsula in the south. The restricted areas in both fisheries are shown in Figure 5 and they mean that a proportion of jack mackerel biomass is inaccessible to the trawl fishery.

The restrictions, which have been in place since the late 1970s, were introduced primarily to protect the then small domestic fleet and the inshore fishing grounds from the greater power and capability of larger foreign-owned vessels.

[6] The Quota Appeal Authority (QAA) was the body set up under the Fisheries Act 1983 to hear appeals from fishers regarding the amount of quota they had been allocated. The QAA was able to award fishers additional quota, which was simply added to the existing TACC.

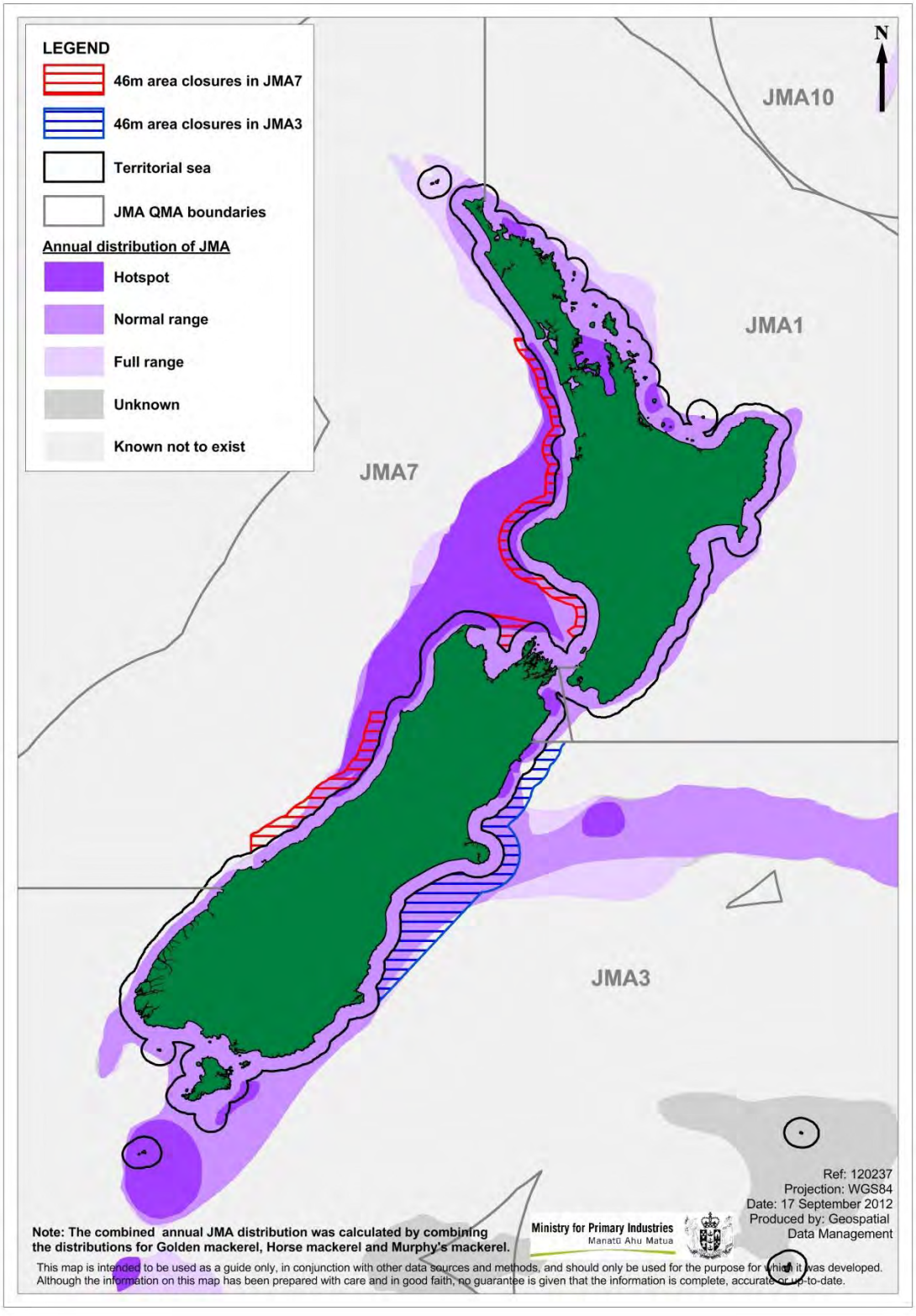


**Figure 5. Diagram showing relevant areas within JMA7 and JMA3 where trawling by vessels greater than 46m in overall length is prohibited. Combined annual distribution of the three species is also shown.**

Although this chapter does not include JMA1, it is worth noting that trawl vessels greater than 46m in length are prohibited from operating in the entire JMA1 QMA. There is no possibility of the current JMA3/JMA7 fleet entering the JMA1 fishery.

**Management approach**

***Reference points***

In the absence of species-specific measures, the default reference points set out by the Harvest Strategy Standard (HSS) apply. These are listed in Table 4 below.

**Table 4. Jack mackerel default reference points, and the associated management response**

| Reference point | Management response |
|---|---|
| Management target of 40% $B_0$ | Stock permitted to fluctuate around this management target. TAC changes will be employed to move stock toward or above target. |
| Soft limit of 20% $B_0$ | A formal time-constrained rebuilding plan will be implemented if this limit is reached. |
| Hard limit of 10% $B_0$ | The limit below which fisheries will be considered for closure. |
| Rebuild strategy | To be determined. |
| Harvest control rule | Management actions determined by the results of a series of forward projections under a range of catch assumptions, guided by the biological reference points |

***Status of stocks***

The current management approach for the JMA7 fishery is assessment-based. Assessments have been attempted for the two native species, although they are complicated by the reporting and management of all species under a single code.

Assessments to date have involved estimating the proportion of each species in the TCEPR data, deriving a standardised CPUE index and incorporating proportions-at-age. However, an agreed stock assessment methodology for JMA7 does not exist.

A preliminary stock assessment was undertaken for *T. declivis* and *T. novaezelandiae* in 2007 using data up until the end of 2005. The base model for *T. declivis* indicated biomass was 53% $B_0$.The assessment for *T. novaezelandiae* was not accepted by the working group due to convergence problems with the assessment model.

Another assessment was undertaken in 2011 using catch curve analysis. The results suggest that fishing mortality was well below M for *T. declivis* and about M for *T. novaezelandiae i.e.* it is unlikely that overfishing is occurring.[7] The Plenary states that no abundance indices are available and that the catch curves may not provide accurate values of average fishing mortality.

Assessments have not been undertaken for the JMA3 stock. The catch limit was raised by 15,300 tonnes from 2,700 tonnes to 18,000 tonnes in the early to mid-1990s based on the sudden increase

[7] M refers to the natural mortality rate, which is that part of the total mortality rate applying to a fish stock that is caused by predation and other natural events.

in abundance of *T. murphyi.* Despite the subsequent decrease in abundance of this species, the catch limit has not been decreased in response.

***Future research***

Under the 10 Year Research Programme JMA7 is due to undergo formal stock assessment every two years. The next assessment is scheduled to be presented to the Deepwater Working Group by February 2014.

A pilot acoustic/trawl survey was undertaken for JMA7 during January/February 2012; this method had not been applied to JMA previously. The intention was that the pilot survey will inform the stock assessment due to be completed in 2014. The survey did not detect large concentrations of fish such as those seen during hoki and southern blue whiting acoustic surveys and concluded that it would be difficult to do an 'aggregation-based' survey.

The 10 Year Research Programme does not currently include any JMA3 projects. This stock should undergo a characterisation as part of the JMA7 assessment and a variation to the research contract would be required to enable this to occur. The current trawl surveys that take place within the JMA3 QMA (the Chatham Rise and Sub-Antarctic trawl surveys) are not considered to be a suitable means to estimate biomass, primarily due to the slow towing speed (jack mackerel is not thought to be vulnerable to the trawl at such speeds).

Although JMA is currently managed under default HSS target and limits, management recognises that ideally, species-specific harvest strategies would be developed. However, the inherent difficulties associated with this mean that it may be more pragmatic to consider a strategy that combines the three species. Additional detail on the expected high-level approach to developing a harvest strategy for jack mackerel is provided in Operational Objective 2.1.

**Management needs:**
To determine the stock structure of the three jack mackerel species
To develop and agree a harvest strategy that encompasses species-specific aspects of the three jack mackerel species
To investigate the feasibility of management tools that would enable more species-specific information to be obtained
To develop a means of assessing abundance of each species or the three species combined

***Collaborative management***

The majority (92%) of jack mackerel quota is owned by shareholders of the Deepwater Group Ltd (DWG). DWG is the commercial stakeholder organisation representing the majority of deepwater and middle-depth fisheries, based on a mandate from the quota owners of the associated stocks.

The remaining 8% of quota is held by a range of quota holders including small companies, individuals and a number of different mandated iwi organisations (MIOs) who received quota allocations as part of their Treaty Settlement packages. The MIOs are generally represented through Te Ohu Kai Moana Trustee Ltd, whose role is to allocate fisheries assets to mandated iwi organisations and provide an advisory service to iwi constituents.

In 2010 the Ministry of Fisheries and DWG signed a Memorandum of Understanding (MOU) that established a structured partnership for the Ministry and the deepwater fishing industry to collaborate in managing New Zealand's deepwater fisheries. This MOU updated and replaced the 2008 MOU and recognises the maturing relationship between both parties that has evolved since the first MOU was signed in 2006.

Areas where this collaborative partnership operates include:

- Ensuring industry support and commitment to management approaches even when management interventions result in reduced catch allocations or fishing restrictions
- Developing innovative solutions to fisheries management issues, such as catch spreading arrangements within quota management areas and mitigating risks to protected species
- Enabling industry to bring commercial acumen and expertise to the procurement of research and other services that will lead to better value for money.
- Providing more effective opportunities to implement the informed and assisted compliance model

Both parties consider that acting in isolation is less effective and that ongoing benefits will be best achieved through continuing the partnership arrangement. The intention of the MOU is to capture those benefits in an explicit and transparent manner.

## Environmental overview

The jack mackerel trawl fisheries interact with a range of protected[8] species, including seabirds and some marine mammal species. Seabird and New Zealand fur seal interactions occur in low numbers, particularly in the JMA7 fishery where most effort occurs. New Zealand sea lion interactions have not been observed.

The JMA7 fishery is, however, responsible for the majority of observed common dolphin and pilot whale captures that occur across all New Zealand fisheries. Such captures probably occur while the animals feed in the same areas where the fleet targets JMA.

As noted in Table 1, around 75% of JMA target tows use mid-water trawl gear that is fished on the bottom, resulting in some benthic interaction. However, research indicates that the spatial extent of this impact is low. Between 1989 and 2009 the area swept by jack mackerel target tows where the ground rope depth was equal to the bottom depth represented 1.0% of New Zealand's EEZ (including the territorial sea), and 9% of the full habitat range of jack mackerel.

Where interactions with protected species and the marine environment are determined to be adverse, management intervention is required to avoid, remedy or mitigate these effects. A key focus of the National Deepwater Plan is to ensure that adverse effects are managed and impacts minimised and that the deepwater fisheries continue to improve performance in terms of interactions with protected species and the marine environment.[9] This is currently being achieved

[8] Protected under the Wildlife Act 1953.

[9] In terms of protected species the biological goal is that adverse effects on populations are managed. There is also the impact goal of reducing impacts on individuals of a particular species.

both through regulations and the range of non-regulatory measures that are implemented by industry and monitored and audited by the Ministry.

Section 2 provides more detailed information on the nature and extent of environmental interactions in the jack mackerel target trawl fishery.

**Management need:**
The environmental management needs are detailed in Section 2, with reference to each category of environmental interactions.

## Economic overview

In terms of quota, just over half of all JMA3 and JMA7 shares combined are held by two companies, while the top six companies hold approximately 80% of quota between them. Of the top six quota owners, two, either directly or through related entities, operate five of the six vessels involved in the jack mackerel target fishery. Another three operate other vessels that take small volumes as bycatch. In the 2011/12 year six vessels operated by only three companies were responsible for 98% of combined JMA3 and JMA7 landings.

Jack mackerels are relatively low value species. However, due to the volumes caught they support an important fishery in New Zealand and in 2012 jack mackerel ranked as one of the top five most valuable wild-caught fisheries species in terms of exports. As indicated in Table 5 below, export data indicates that the average unit value for dressed product appears to have more than doubled since 2003.

In the 2012 calendar year, around 32,000 tonnes (processed weight) of jack mackerel catch was exported, realising a value of $64m (note that these figures include JMA taken in the JMA1 fishery).[10] This equated to approximately 10.6% of total exports by volume and 4.1% by value.

Virtually all jack mackerel exports consist of frozen product, either whole or dressed. Destinations include Asian, African and eastern European countries. The unit value of jack mackerel appears to have increased in recent years, presumably in response to reduced production from other parts of the world.

[10] In the 2011/12 fishing year JMA1 landings made up 23% of all JMA landings. More than 99% of JMA1 was landed whole.

**Table 5. Total volume of JMA exports (tonnes), total value of JMA exports ($m) and estimate of average unit value of dressed JMA for the 2003 and 2007-2012 calendar years**

| Year | Volume of JMA exported (t) | Value of JMA exports ($m) | Average unit value of dressed product ($/kg) [11] |
|---|---|---|---|
| 2012 | 32,561 | $64.3 | $2.57 |
| 2011 | 23,084 | $41.8 | $2.02 |
| 2010 | 29,574 | $42.7 | $1.78 |
| 2009 | 27,652 | $45.9 | $2.07 |
| 2008 | 33,084 | $51.3 | $1.65 |
| 2007 | 25,174 | $32.5 | $1.42 |
| 2003 | 20,280 | $18.2 | $1.03 |

At the end of the 2008/09 fishing year, the value of jack mackerel quota (including JMA1) was $54 million and contributed 1.3% of the total asset value of New Zealand's commercial fisheries.[12]

**Management need:**
To enable quota holders to develop and implement a harvest regime that will maximise the economic benefits returned from the fishery

## Compliance overview

The jack mackerel fishery is subject to an extensive range of regulatory measures aimed at ensuring the fishery is managed to achieve long-term sustainability. Further work will be undertaken through the implementation of this Fisheries Plan chapter to identify and assess compliance risks in the fishery. However, the following compliance risks have already been identified as being of particular relevance to jack mackerel fisheries and these are described in more detail below.

*Discarding / misreporting of fish going to meal*

Discarding or misreporting of fish going to meal has been known to occur in the jack mackerel fisheries in the past and the issue relates to both jack mackerel and bycatch species. In this context the outcome is the same; accurate reporting of the quantities of fish taken does not occur.

The vessels currently responsible for around 99% of JMA catch all have meal plants and meal is a valuable product. Discarding is therefore not considered as high a risk as the misreporting of fish that is mealed.

In the JMA7 fishery, fishers may be motivated to illegally dump or misreport QMS species going to meal such as kingfish, snapper and frostfish to avoid utilising or acquiring annual catch entitlement (ACE) or paying deemed value charges if ACE cannot be obtained. They may also be motivated to

[11] Includes "frozen, headed and gutted" and "frozen, other form" data in export statistics.
[12] Statistics New Zealand (2010). Fish monetary stock account 1996-2009. Wellington: Statistics New Zealand.

misreport quantities of jack mackerel going to meal if, for example, a large bag of fish is outside the most desirable size range for processing.

Without independent verification of catches by observers, there is currently no accurate way of assessing the composition of fish meal. It is possible for a vessel to meal some quantities of jack mackerel catch that is not wanted for processing or QMS species for which it does not wish to acquire ACE and report that catch as being either a non-QMS species or a QMS species for which the vessel operator does have ACE.

*Area misreporting*

Area misreporting occurs when catch caught in one QMA is incorrectly reported as being caught in another. The primary motive behind this offence is to minimise the cost of acquiring ACE or paying deemed values.

Area misreporting of jack mackerel is unlikely to occur. However as the jack mackerel QMAs may extend over multiple QMAs of some of the most commonly-caught bycatch species, some of which are routinely overcaught (i.e. catch exceeds available ACE), the incentive to area misreport bycatch species does exist.

*Fishing in closed areas*

As noted earlier, some areas are closed by regulation to fishing by trawlers greater than 46m LOA. The risk of vessels fishing in these areas is considered low as all such vessels are required to use automatic location communicators (ALC) and position information is monitored by the Ministry. Additionally, there is no incentive to fish in the closed areas as the fishery can successfully operate in the areas not subject to regulations.

*Deployment of seabird mitigation devices*

Regulations require all deepwater trawl vessels operating in jack mackerel fisheries to deploy seabird mitigation devices to ensure that fishing activity does not pose an unnecessary risk to seabirds. Observers provide information to the Ministry on the level of compliance with these regulations. Additionally, the Ministry can arrange aerial surveillance or surface patrols targeting the vessels operating in the fishery.

The Ministry strives to minimise the opportunity for these and other types of offending to occur through careful risk analysis of the jack mackerel fishery with cooperative input from the industry. Information sharing with industry allows the Ministry to adapt compliance efforts to current risks.

*Risk profile*

A desktop-based risk profile of the JMA7 fishery was undertaken in 2011. Although the results are yet to be released, it is expected that they will drive future compliance monitoring of this fishery.

*Observer coverage*

The jack mackerel fishery, JMA7 in particular, has had a relatively high level of observer coverage in recent years. This is summarised in Table 6 below.

**Table 6. Summary of observer coverage in the JMA3 and JMA7 fisheries between the 2006/07 and 2011/12 fishing years**

| | JMA3 | | | JMA7 | | |
|---|---|---|---|---|---|---|
| Year | No. of target tows | No. observed target tows | % of tows observed | No. of target tows | No. observed target tows | % of tows observed |
| 2011/12 | 231 | 137 | 59% | 1,645 | 1,354 | 82% |
| 2010/11 | 169 | 76 | 45% | 1,636 | 506 | 31% |
| 2009/10 | 101 | 56 | 55% | 2,183 | 733 | 34% |
| 2008/09 | 120 | 27 | 23% | 1,880 | 730 | 39% |
| 2007/08 | 160 | 28 | 18% | 2,323 | 775 | 33% |
| 2006/07 | 103 | 16 | 16% | 2,405 | 765 | 32% |

As noted earlier, the JMA3 and JMA7 fisheries are dominated by Ukrainian foreign charter vessels (FCVs). Since 2002/03 such vessels have taken between 94% and 99% of the combined annual catch. In March 2012 the Government decided that Ministry observers would be placed on all FCVs from 1 October 2012. The rate of observer coverage of the jack mackerel fishery is therefore expected to rise and some of the compliance risks associated with FCVs would be expected to be mitigated because of this.

**Management need:**
To ensure compliance with the range of regulatory and non-regulatory management measures in the jack mackerel fisheries is satisfactory and to minimise the opportunities for offending to occur.

## Social and cultural overview

The Fisheries Act (1996) (The Act) requires that, prior to setting management measures for jack mackerel stocks, the Minister of Fisheries shall consult with persons having an interest in the stock or the effects of fishing on the aquatic environment in the area in which the fishery takes place, including Maori, environmental, commercial and recreational interests. In addition the Act requires that in setting a total allowable catch (TAC) under section 13, the Minister shall have regard to such social, cultural and economic factors (s)he considers relevant.

Social and cultural factors include those related to the harvesting of jack mackerel by all parties; commercial, recreational and customary. Currently, only a TACC is set for the JMA3 and JMA7 stocks; no TAC or other allowances have been set. The reason for this is that current catch limits were set under the Fisheries Act 1983, which, at the time the catch limits were set, did not require such allowances to be made.

There is a very small jack mackerel take by recreational fishers and it is likely allowances for this sector, as well as customary, would be set in the future if the TACC was reviewed. Future Maori

interest in the jack mackerel fisheries could emerge through the development of Iwi and Forum Fisheries Plans. If future interests do emerge, the associated management objective(s) will be addressed and prioritised through the Deepwater Annual Operational Plan.

Social and cultural factors also include the non-extractive value of healthy jack mackerel stocks and the values associated with an aquatic environment that is not adversely impacted on by jack mackerel fishing activity. These inherent values must also be considered when determining the appropriate management measures for a fishery.

The generic management objectives described in the National Deepwater Plan and the fishery-specific objectives described in this chapter ensure that these social and cultural requirements also guide the management of the jack mackerel fishery.

## Overview by fishery

The following sections provide a description of the JMA3 and JMA7 fisheries and an outline of their current status, as at 1 October 2012. Graphs of catch over time are also included for each fishery.

*Historical fishery information*

Catch limits were first introduced for the jack mackerel fisheries in 1986-87, the year prior to JMA7 being introduced into the QMS. At that time a total catch limit of 22,200 tonnes was set across the JMA3 and JMA7 stocks. Between 1987/88 and 1992/93 the initial 20,000 tonne catch limit for JMA7 increased by approximately 12,500 tonnes as a result of QAA decisions.

The initial 2,200 tonne catch limit for JMA3 was increased to 2,700 tonnes in 1988/89. It was then subject to increases of 6,300 and 9,000 tonnes in the 1993/94 and 1994/95 years respectively, bringing it up to the current 18,000 tonne TACC. The current combined catch limit of approximately 50,500 tonnes has been in place since 1994/95.

## *JMA3*

From the mid 1980s until 1988/89 catch was less than the catch limit. Catches started increasing from 1989/90 and were almost six times the TACC during 1992/93, reflecting the sudden increase in abundance of *T. murphyi.* Landings were in the 10-20,000 tonne range between 1992/93 and 1999/00, with catch peaking at just under 20,000 tonnes during 1995/96 (see Figure 6).

When landings peaked during the 1990s, most catch of JMA3 was taken in two main areas; the north-east coast of the South Island (primarily statistical areas 18, 21 and 22) and Southland (primarily statistical areas 27 and 28). These statistical areas are shown in Figure 7. Only a small proportion of the catch was taken on the Chatham Rise. Between 1992/93 – 1994/95 most JMA3 was taken in the north-east coast South Island area. However between 1995/96 – 1999/00 most catch was taken in Southland around the Stewart/Snares shelf (see Figure 8).

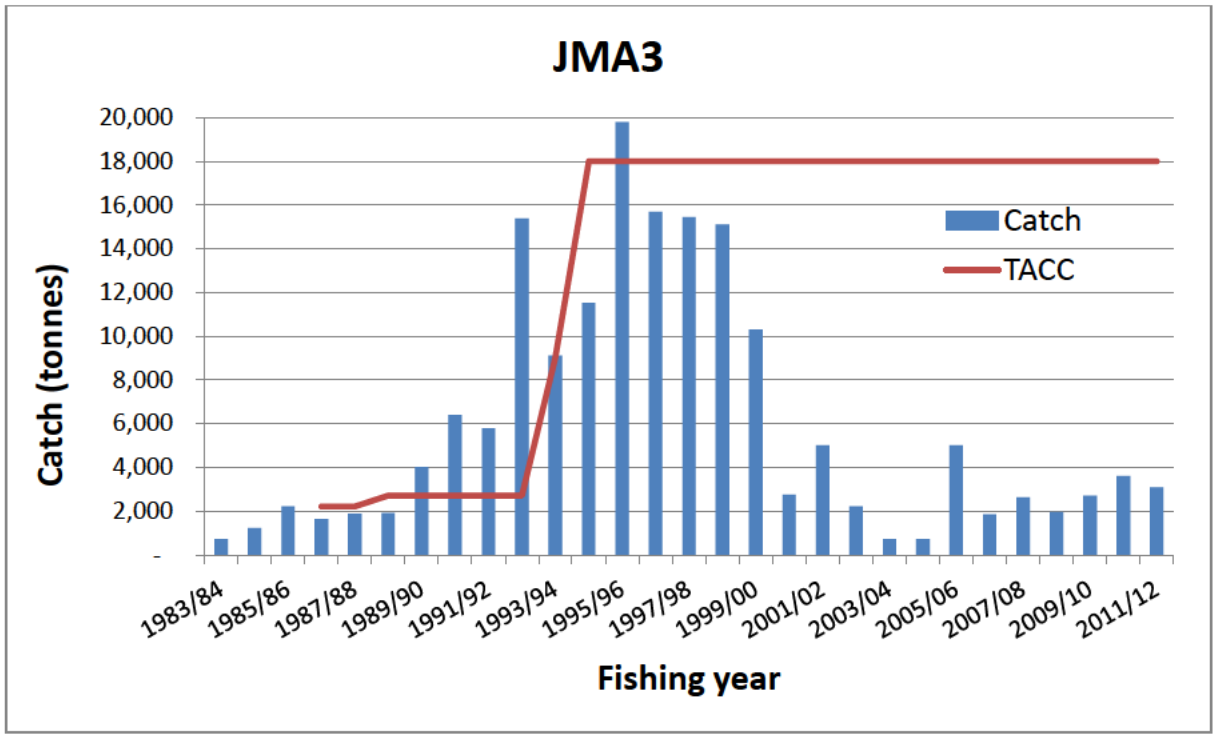


**Figure 6: Catch vs TACC for JMA3 since 1983/84**

Most catch was taken by trawlers although there was a purse seine fishery, which peaked at around 3,500 tonnes (23% of landed catch) in 1992/93. The purse seine fishery involved a small number of domestic vessels and took place almost entirely in statistical area 18. Estimated catch by method for the period 1990/91 – 1999/00 is summarised in Figure 9.

Within the trawl fleet, the majority of the catch during the 1990s was taken by large foreign charter trawl vessels from Soviet Bloc countries.

Since 2000, catch of JMA3 has not exceeded 5,000 tonnes and was as low as 705 tonnes during 2003/04. Purse seine catch has become negligible and there has been no targeting of jack mackerel by purse seiners in JMA3 since May 2003. Since 2005/06 over 98% of JMA3 has been landed by FCVs.

Since 2000/01 most catch has continued to be taken from either the east coast of the South Island or the Southland / Sub-Antarctic areas (see Figure 10). The proportion of catch taken on the Chatham Rise was higher during this period than during the 1990s although the overall amount of catch from this area was similar.

The decrease in catch since the 1990s is attributed to the corresponding decrease in abundance of *T. murphyi*.

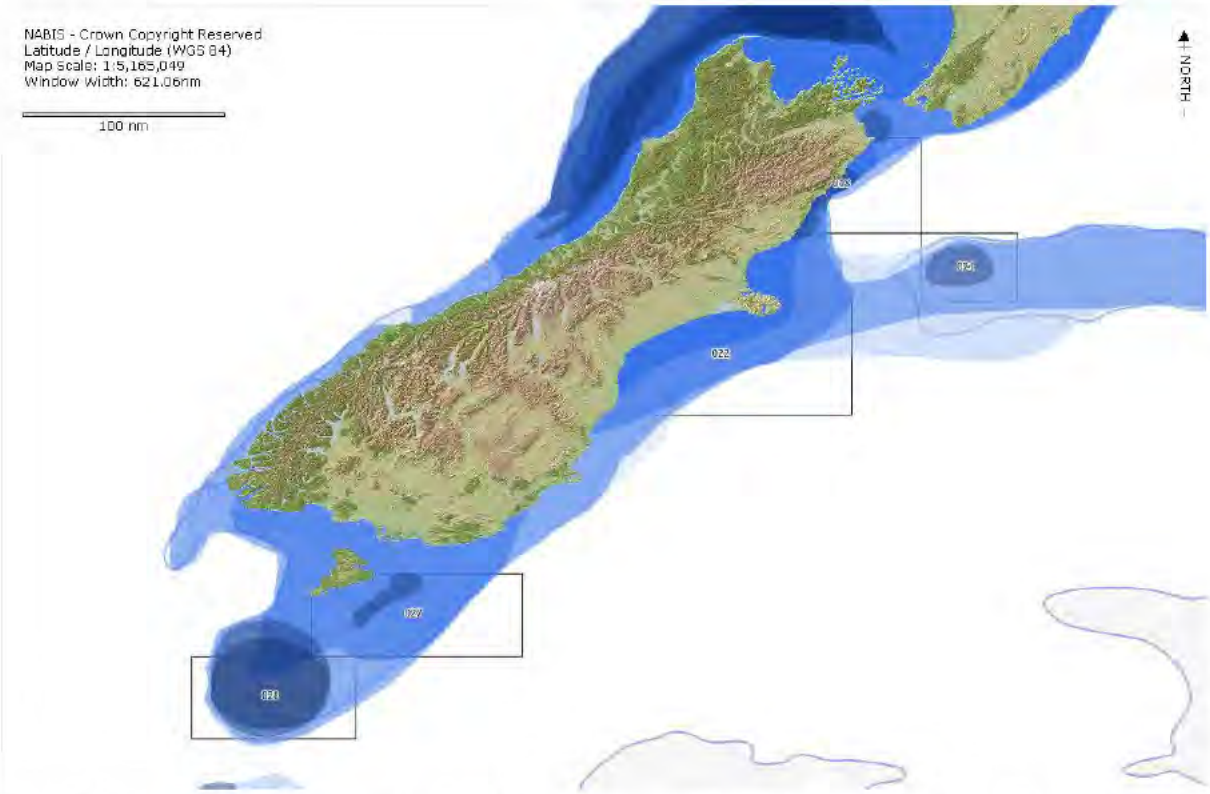


**Figure 7. Diagram showing the main statistical areas where most JMA3 is taken together with annual distribution of the three jack mackerel species**

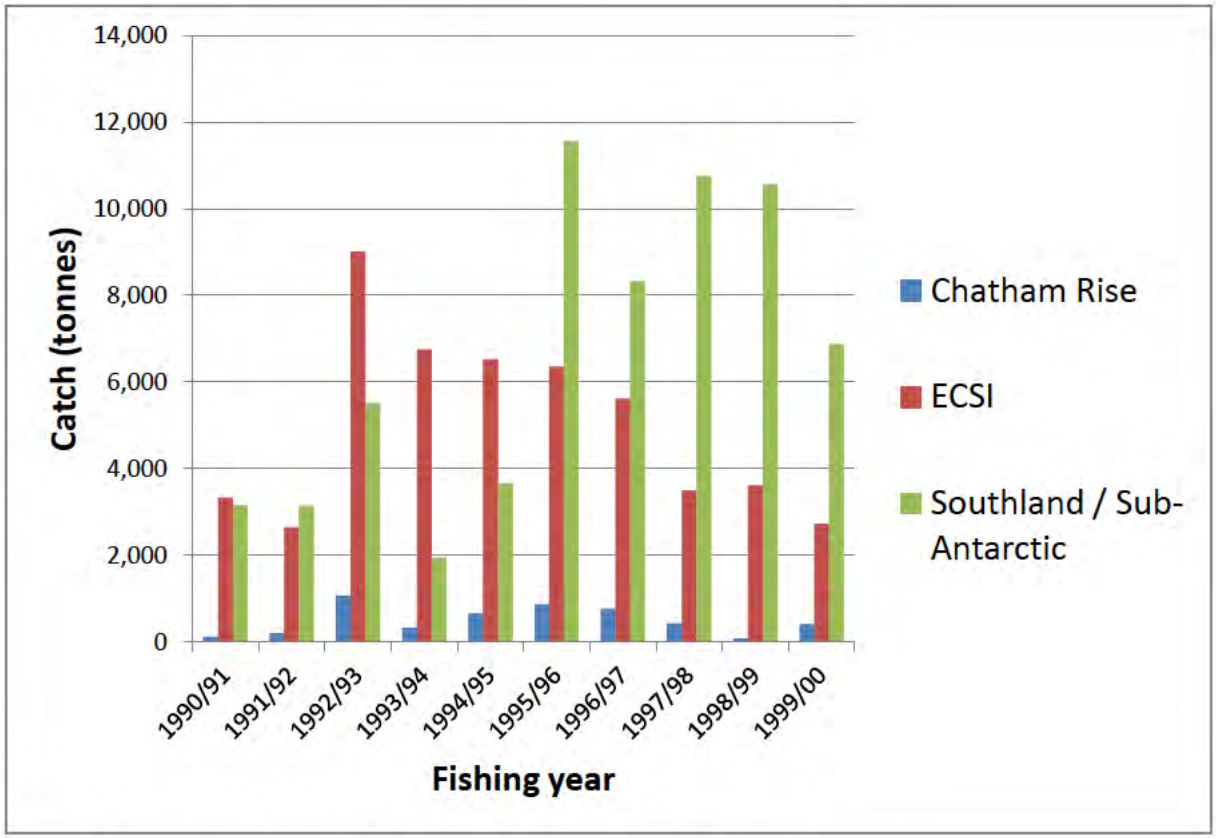


**Figure 8. Estimated catch of JMA3 by region for the period 1990/91 – 1999/00**

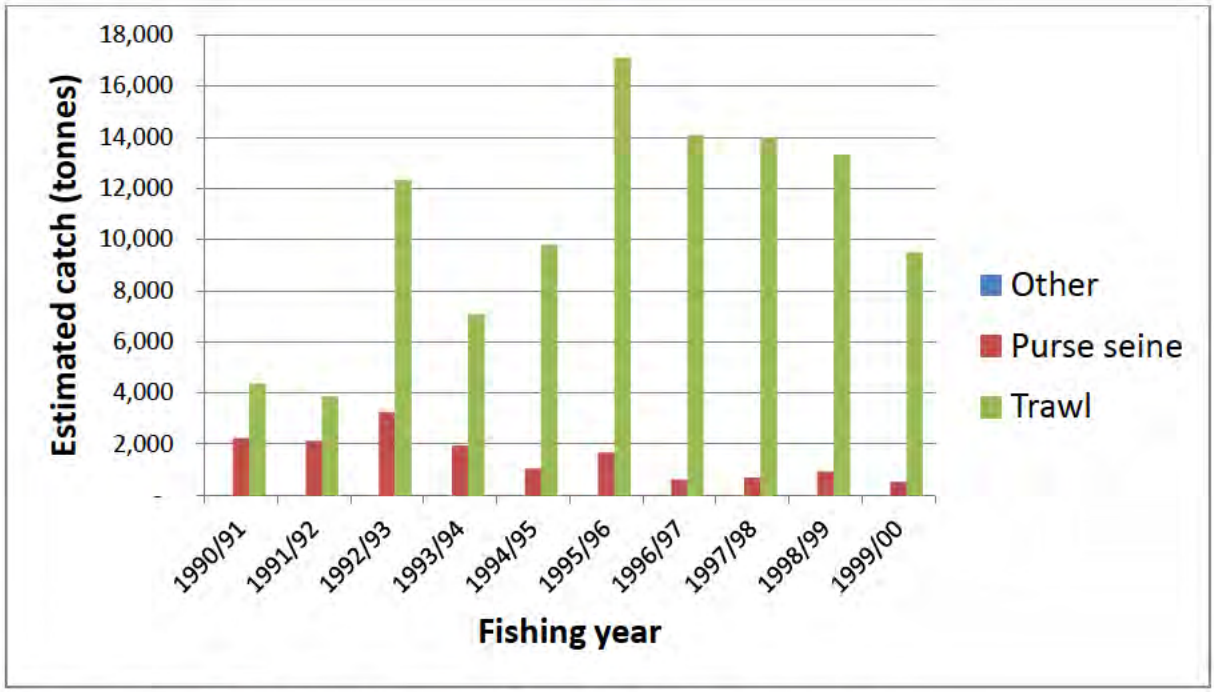


**Figure 9. Estimated catch of JMA3 by method for the period 1990/91 – 1999/00**

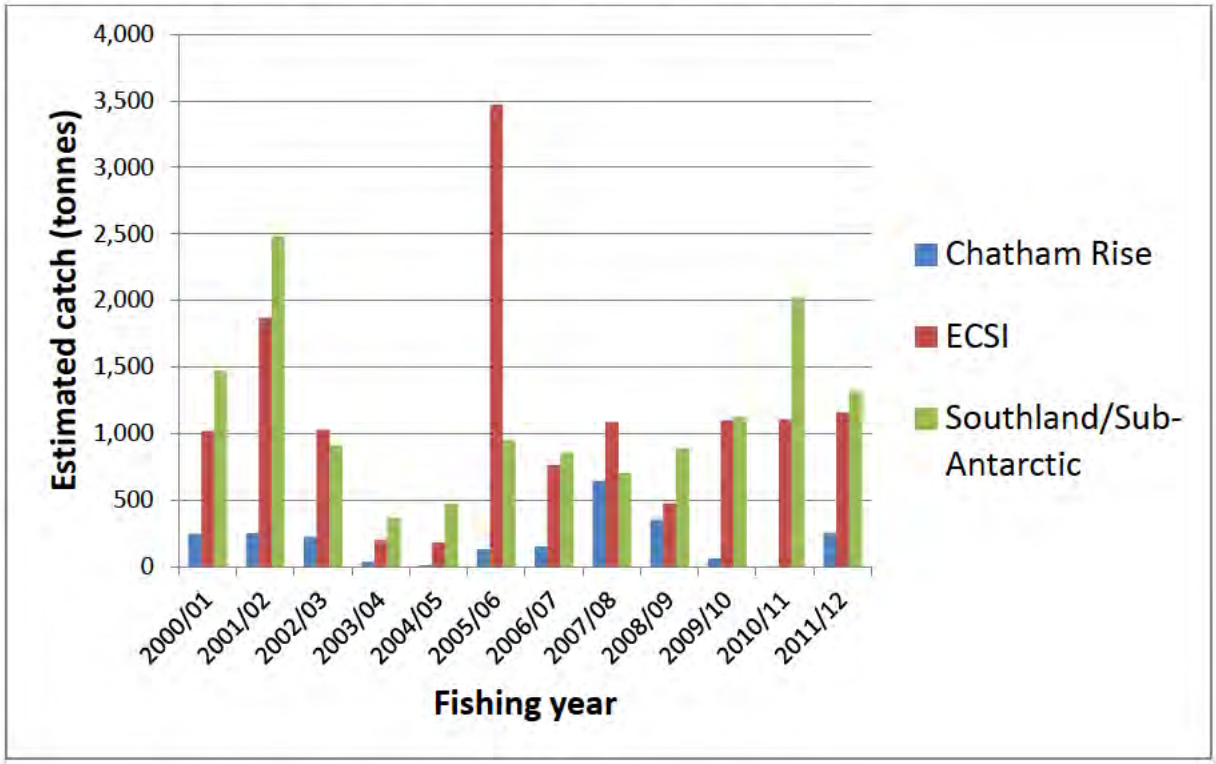


**Figure 10. Estimated catch of JMA3 by region for the period 2000/01 – 2011/12**

## *JMA7*

The JMA7 fishery is, by volume, the larger of the two fisheries included in this chapter. A plot of catch against the TACC is shown in Figure 11 below.

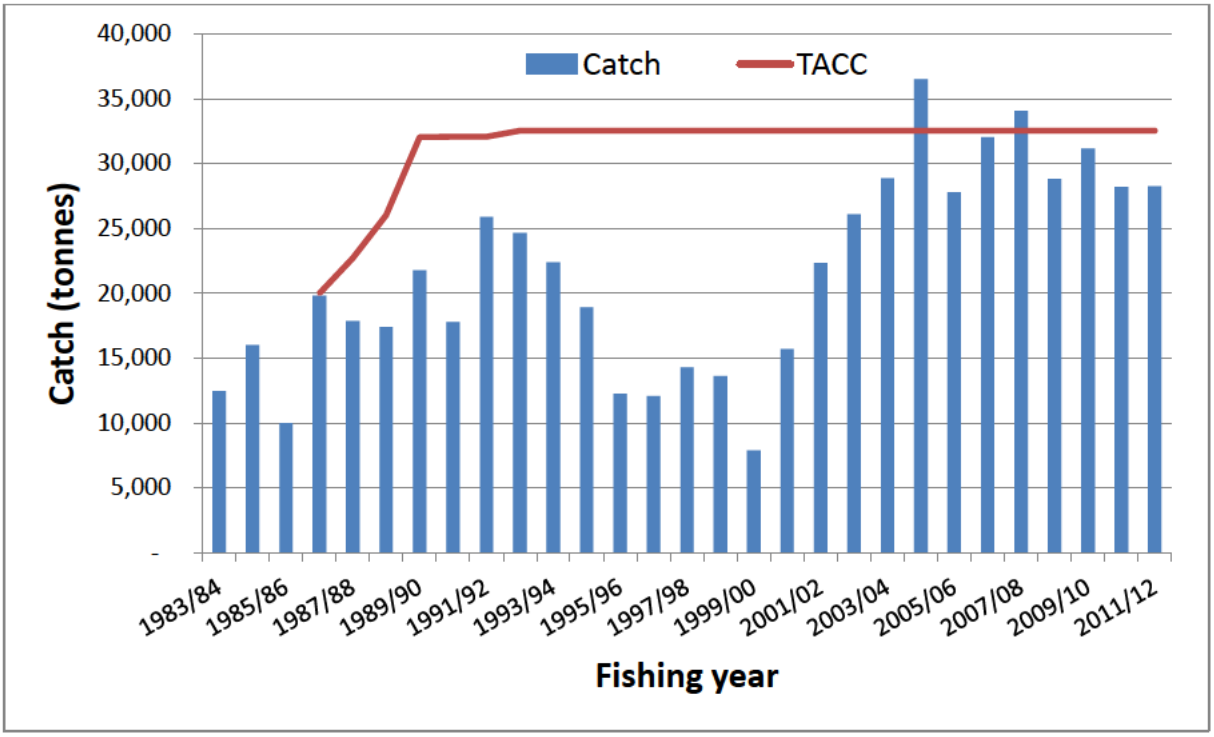


**Figure 11. Catch vs TACC for JMA7 since 1983/84**

A fishery has existed since the late 1960s when Japanese trawlers started fishing in the area now encompassed by JMA7. In the period between 1986/87 and 1994/95, catches ranged between 17-26,000 tonnes. After this, there was a period of reduced catches between 1995/96 and 1999/00 when catch dropped to between 8-14,000 tonnes.

During the period between 1989/90 and 1994/95 there were typically 3-6 vessels responsible for 50% of more of the JMA7 catch, with the remainder spread across a larger number of vessels. Of the dominant vessels, there were up to six large Japanese trawlers and two domestic purse seine vessels. During the late 1980s/early 1990s, purse seine vessels were responsible for 10-20% of JMA7 catch.

Most of the Japanese vessels had left the fishery after the 1994/95 year although one remained until 1999/00. The departure of these vessels is likely to be one of the main contributors to the decline in catch during the mid to late 1990s. One of the domestic purse seine vessels left the fishery after the 1995/96 year. The other is still active and has continued to report some catch in most years, albeit at a much reduced rate than during the peak of the late 1980s/early 1990s.

After the 1998/99 year, and continuing to the present day, JMA7 catch has been dominated by 6-7 Ukrainian FCVs, which, until the end of the 2011/12 year, were responsible for over 98% of during this period. Some purse seine catch is reported from JMA7 every year, but less than 1% of catch is taken by this method.

Within JMA7 around 80% of catch is, on average, taken off the lower west coast of the North Island (North and South Taranaki Bight – statistical areas 37, 40, 41 and 42). These areas are shown in Figure 12. Around 10% of catch is taken off the north-west coast of the South Island with the rest of the catch taken in the offshore statistical areas bordering the EEZ boundary, off Northland and in the west coast harbours, and in the western approaches to Cook Strait or Tasman Bay areas.

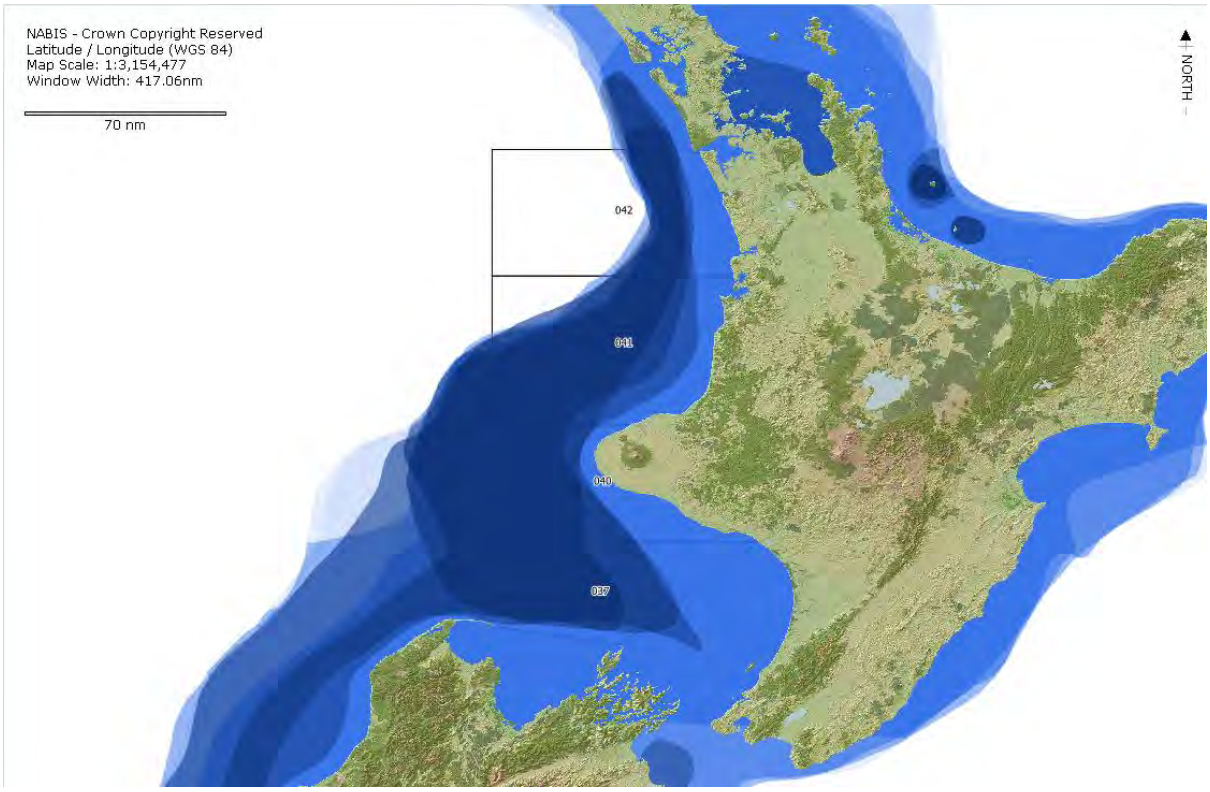


**Figure 12. Diagram showing the main statistical areas where around 80% of JMA7 is taken together with annual distribution of the three jack mackerel species**

When the purse seine fishery was responsible for 10-20% of JMA7 catch in the late 1980s/early 1990s, most catch was taken off the Marlborough coast and the fishery was a continuation of the JMA3/KAH3 purse seine fishery that operated off the Marlborough/Kaikoura Coast. In most years some JMA7 is taken off the upper west coast of the North Island by the purse seine vessels that target skipjack there during the summer months.

A 2011 Fisheries Assessment Research Report provides estimates of the annual proportion of each species both nationally and for each QMA.[13] The data for JMA3 and JMA7 is summarised in Tables 7-8 and Figure 13-14 below.

[13] Penney, A.J., Loveridge, C.J., Moriarty, J.A., and George, K. 2011. Estimation of New Zealand monthly purse-seine and midwater trawl catches of *Trachurus novaezelandiae, T. declivis*, and *T. murphyi* by fisheries management area from October 1985 to December 2010. New Zealand Fisheries Assessment Report 2011/41.

**Table 7. Monthly catch-weighted calendar year average proportions of *T. novaezelandiae* (JMN), *T. declivis* (JMD) and *T. murphyi* (JMM) in catches of JMA3 from 1985 to 2010.**

| Calendar year | JMN | JMD | JMM |
|---|---|---|---|
| 1985 | 0.00 | 0.00 | 1.00 |
| 1986 | 0.00 | 0.00 | 1.00 |
| 1987 | 0.00 | 0.21 | 0.00 |
| 1988 | 0.02 | 0.19 | 0.79 |
| 1989 | 0.00 | 0.12 | 0.88 |
| 1990 | 0.00 | 0.00 | 1.00 |
| 1991 | 0.00 | 0.00 | 1.00 |
| 1992 | 0.00 | 0.00 | 1.00 |
| 1993 | 0.00 | 0.30 | 0.70 |
| 1994 | 0.00 | 0.31 | 0.69 |
| 1995 | 0.00 | 0.03 | 0.97 |
| 1996 | 0.00 | 0.01 | 0.99 |
| 1997 | 0.00 | 0.00 | 1.00 |
| 1998 | 0.00 | 0.02 | 0.98 |
| 1999 | 0.00 | 0.16 | 0.84 |
| 2000 | 0.01 | 0.53 | 0.46 |
| 2001 | 0.00 | 0.14 | 0.86 |
| 2002 | 0.01 | 0.18 | 0.81 |
| 2003 | 0.00 | 0.70 | 0.30 |
| 2004 | 0.00 | 0.06 | 0.94 |
| 2005 | 0.00 | 0.05 | 0.95 |
| 2006 | 0.12 | 0.50 | 0.38 |
| 2007 | 0.00 | 0.12 | 0.88 |
| 2008 | 0.00 | 0.13 | 0.87 |
| 2009 | 0.00 | 0.20 | 0.80 |
| 2010 | 0.01 | 0.50 | 0.49 |

**Table 8. Monthly catch-weighted calendar year average proportions of *T. novaezelandiae* (JMN), *T. declivis* (JMD) and *T. murphyi* (JMM) in catches of JMA7 from 1985 to 2010.**

| Calendar year | JMN | JMD | JMM |
|---|---|---|---|
| 1985 | 0.32 | 0.68 | 0.00 |
| 1986 | 0.41 | 0.59 | 0.00 |
| 1987 | 0.55 | 0.45 | 0.00 |
| 1988 | 0.41 | 0.59 | 0.00 |
| 1989 | 0.40 | 0.50 | 0.10 |
| 1990 | 0.76 | 0.24 | 0.00 |
| 1991 | 0.41 | 0.45 | 0.14 |
| 1992 | 0.16 | 0.48 | 0.36 |
| 1993 | 0.24 | 0.44 | 0.32 |
| 1994 | 0.18 | 0.28 | 0.54 |
| 1995 | 0.11 | 0.13 | 0.76 |
| 1996 | 0.19 | 0.34 | 0.47 |
| 1997 | 0.15 | 0.31 | 0.54 |
| 1998 | 0.34 | 0.45 | 0.21 |
| 1999 | 0.11 | 0.70 | 0.19 |
| 2000 | 0.13 | 0.48 | 0.39 |
| 2001 | 0.12 | 0.86 | 0.02 |
| 2002 | 0.07 | 0.84 | 0.09 |
| 2003 | 0.55 | 0.44 | 0.01 |
| 2004 | 0.35 | 0.59 | 0.06 |
| 2005 | 0.15 | 0.80 | 0.05 |
| 2006 | 0.25 | 0.72 | 0.03 |
| 2007 | 0.23 | 0.70 | 0.07 |
| 2008 | 0.23 | 0.70 | 0.07 |
| 2009 | 0.26 | 0.69 | 0.05 |
| 2010 | 0.18 | 0.75 | 0.07 |

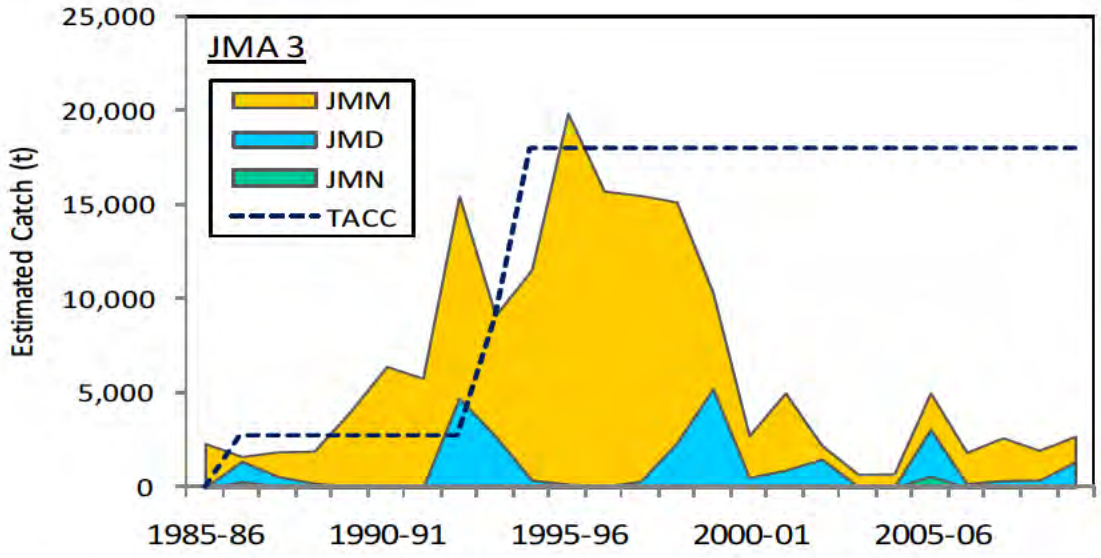


**Figure 13. Catch composition in the JMA3 fishery by fishing year from 1985/86 to 2009/10**

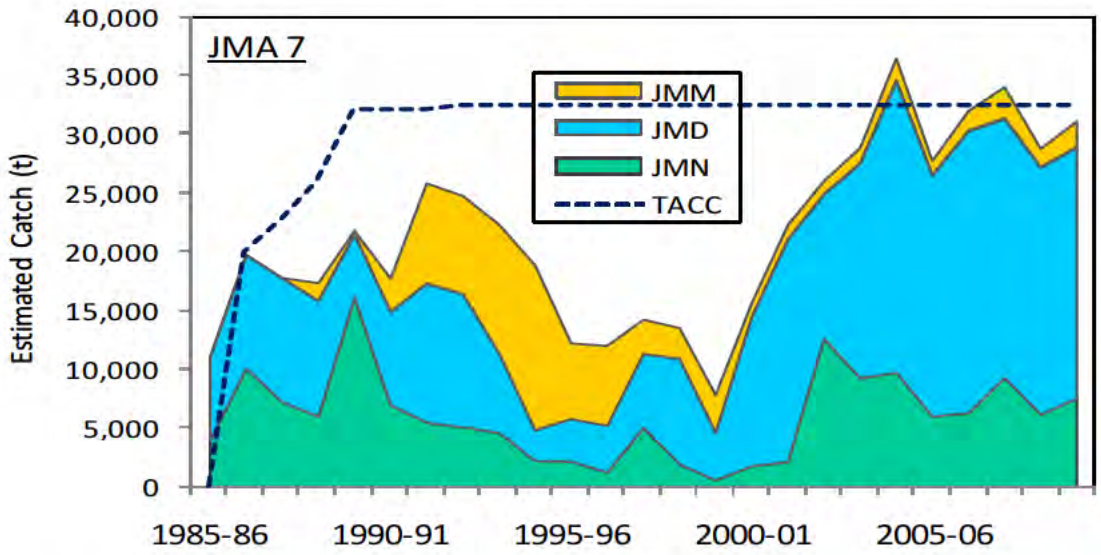


**Figure 14. Catch composition in the JMA7 fishery by fishing year from 1985/86 to 2009/10**

Figure 13 clearly indicates that the period of increased catch of JMA3 in the 1990s was comprised largely of *T. murphyi*. Table 7 indicates that *T. murphyi* still comprises a significant proportion of JMA3 catch despite the much reduced overall catch. Anecdotal information from observers indicates that the proportion of *T. murphyi* is often higher in catch taken from the Stewart/Snares shelf than from the east coast South Island. *T. novaezelandiae* is only present occasionally in this fishery.

Figure 14 shows that *T. murphyi* only contributed significantly to catches over the peak in availability of this species from about 1991/92 to 1996/97. The dominant species in the JMA7 fishery in recent years has been *T. declivis* with *T. novaezelandiae* being the second most common species.

# 2. Overview of non-target interactions

The purpose of the Act describes sustainability in part as avoiding, remedying or mitigating any adverse effects of fishing on the aquatic environment. This section describes in more detail the relevant non-target bycatch and incidental interactions and captures that occur in the jack mackerel fisheries and also describes these effects in the context of the Act.

Bycatch and incidental captures that occur in the jack mackerel fisheries have been categorised as follows:

1. **Associated species:** These are species that are caught in sufficient quantities to be of economic value. Some are often targeted during the same trips where jack mackerel are targeted. As they are QMS species, they will therefore be managed through either the jack mackerel fisheries plan chapter or another fisheries plan chapter.

   In general, species that account for at least 1% of the total catch weight are managed as an associated species.

2. **Incidental bycatch species:** These are species caught in small quantities. Some (typically non-QMS species) have little or no commercial value and are usually rendered to fishmeal. Others are QMS species that are commercially valuable in their respective fisheries, but are not caught in sufficient quantities in the jack mackerel target fishery to be of significant value. They are usually processed but may be mealed.

3. **Incidental interactions of endangered, threatened and protected (ETP) species:** This category relates to the accidental capture, interaction and mortality of protected species such as seabirds, marine mammals, protected corals and protected shark species.

4. **Benthic interactions:** This category includes benthic invertebrate species that are captured by trawl gear, the damage to or mortality of bottom-dwelling animals not captured in nets, and overall damage to benthic habitats. This information is based on Ministry observer reports and the assessment of the trawl footprint from this fishery.[14]

Fish and invertebrate species taken as bycatch or incidental catch in the jack mackerel fisheries during the 2009/10– 2011/12 fishing years are shown in Tables 9 and 10 below. This information is based on observer data.

The tables are coded as follows:

- Those species highlighted in blue are species managed through this jack mackerel chapter
- Those species highlighted in orange, and labelled “D”, are species that will be managed through another chapter in the National Deepwater Plan

[14] The information in this report comes from: Black, J., & Wood, R., 2010. Analysis of New Zealand’s Trawl Grounds for key Middle Depths and Deepwater Tier 1 Fisheries. GNS Science Consultancy Report 2010/67. However, regular assessments of this kind will be delivered through the 10 Year Research Programme for Deepwater Fisheries.

- Those species highlighted in yellow, and labelled "I" are species managed through an Inshore fisheries plan
- Those species highlighted in green and labelled "H" are species managed through the Highly Migratory Species fisheries plan
- Remaining species are incidental bycatch species that will be monitored annually as part of the jack mackerel chapter

**Table 9: Catch of the top 20 species caught in jack mackerel target trawls in JMA3. Information is derived from Observer data for the period 1 October 2009 to 30 September 2012. Fifty-four percent of target JMA tows were observed during this time period.**

| Species | Common name | Sum of observed greenweight (kg) | Percentage of catch (%) | Code |
|---|---|---|---|---|
| **JMA**[15] | **Jack mackerel** | **2,235,791** | **45.6** | **JMA** |
| BAR | Barracouta | 1,966,237 | 40.1 | D, I^ |
| RBT | Redbait | 404,659 | 8.3 | JMA |
| SWA | Silver warehou | 159,881 | 3.3 | D |
| SQU | Arrow squid | 54,737 | 1.1 | D |
| STU | Slender tuna | 20,822 | 0.4 | |
| SPD | Spiny dogfish | 19,307 | 0.4 | D, I^ |
| WAR | Common warehou | 8,866 | 0.1 | I |
| RCO | Red cod | 6,551 | 0.1 | I |
| EMA | Blue mackerel | 5,963 | 0.1 | JMA |
| RBY | Rubyfish | 3,967 | 0.1 | D |
| RBM | Ray's bream | 2,070 | <0.1 | H |
| OPE | Orange perch | 1,697 | <0.1 | |
| HAP | Hapuku | 1,447 | <0.1 | I |
| SCH | School shark | 1,313 | <0.1 | I |
| SDO | Silver dory | 1,095 | <0.1 | |
| THR | Thresher shark | 1,020 | <0.1 | |
| HOK | Hoki | 812 | <0.1 | D |
| GUR | Gurnard | 774 | <0.1 | I |
| SSI | Silverside | 710 | <0.1 | |

**^** - note that for both barracouta and spiny dogfish, some stocks within the area encompassed by the JMA3 QMA are managed as deepwater stocks while others are managed as inshore stocks

[15] For the purposes of this table, catch of the three jack mackerel species has been combined.

**Table 10: Catch weight by species name for the top 20 species caught in jack mackerel target trawls in JMA7. Information is derived from Observer data for the period 1 October 2009 to 30 September 2012. Forty-seven percent of target JMA tows were observed during this time period.**

| Species | Common name | Sum of observed greenweight (kg) | Percentage of catch (%) | Code |
|---|---|---|---|---|
| **JMA**[16] | **Jack mackerel** | 38,053,364 | **78.5** | **JMA** |
| BAR | Barracouta | 5,088,845 | 10.5 | D |
| EMA | Blue mackerel | 2,072,801 | 4.3 | JMA |
| FRO | Frostfish | 1,991,392 | 4.1 | D |
| RBT | Redbait | 461,275 | 1.0 | JMA |
| SPD | Spiny dogfish | 127,037 | 0.3 | I |
| SNA | Snapper | 120,572 | 0.2 | I |
| KIN | Kingfish | 81,072 | 0.2 | I |
| SQU | Arrow squid | 53,170 | 0.1 | D |
| POP | Porcupine fish | 50,959 | 0.1 | |
| JDO | John dory | 48,321 | 0.1 | I |
| PIL | Pilchard | 46,303 | 0.1 | I |
| SDO | Silver dory | 34,711 | 0.1 | |
| TAR | Tarakihi | 26,493 | 0.1 | I |
| GUR | Gurnard | 25,179 | 0.1 | I |
| KAH | Kahawai | 20,614 | <0.1 | I |
| WAR | Common warehou | 19,101 | <0.1 | I |
| SUN | Sunfish | 18,028 | <0.1 | |
| THR | Thresher shark | 16,713 | <0.1 | |
| SCH | School shark | 13,165 | <0.1 | I |

[16] For the purposes of this table, catch of the three jack mackerel species has been combined.

## Category 1: Associated species

The jack mackerel fisheries, particularly JMA7, are reasonably species specific; however, significant volumes of a small number of other species are also taken. Table 9 indicates that 46% of the catch in JMA3 target tows over the three-year period was jack mackerel with barracouta comprising 40% of the catch. Aside from redbait, which formed 8% of the observed catch, silver warehou (3%) and squid (1%) were the only other species that comprised more than 1% of catch.

In JMA7, jack mackerel comprised 79% of all catch. The other species that contributed over 1% of total catch were barracouta (11%), blue mackerel (4%), frostfish (4%) and redbait (1%).

Blue mackerel and redbait are included in the jack mackerel fisheries chapter for the following reasons:

- Between 2002/03 and 2011/12 around 70% of EMA7 catch was taken as bycatch to the JMA7 fishery
- Between 2002/03 and 2011/12 just under 80% of EMA3 catch was taken as bycatch to the JMA3 fishery
- Since 2004/05 over 80% of RBT7 has been taken while targeting JMA
- Since 2004/05 around 35% of RBT3 has been taken while targeting JMA
- More than 90% of catch of the blue mackerel and redbait stocks included in this chapter is taken by the same 6-7 vessels responsible for most of the jack mackerel catch

## BLUE MACKEREL (EMA)

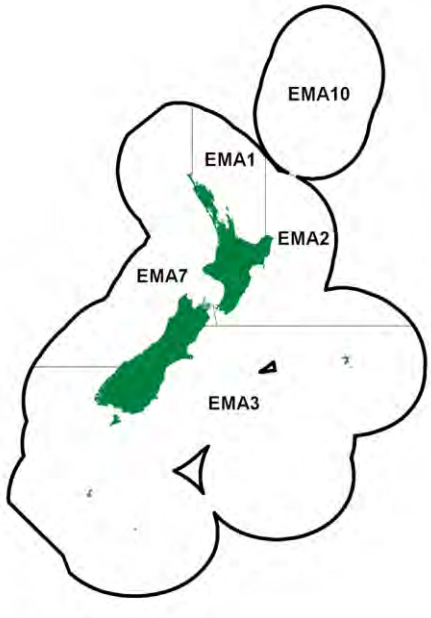


**Figure 15. Blue mackerel quota management areas**

## Biological overview

Blue mackerel (*Scomber australasicus*) is a small to medium-sized fish that inhabits epipelagic and mesopelagic waters throughout the Indo-Pacific. Adult blue mackerel have been recorded around both the North and South Islands to Stewart Island and across the Chatham Rise to almost the Chatham Islands. However there is almost no commercial catch recorded south of latitude 43°S (Kaikoura) and blue mackerel's New Zealand distribution is largely restricted to the northern half of New Zealand fisheries waters.

During summer, surface schools are found in Northland, Bay of Plenty, the South Taranaki Bight and Kaikoura but they disappear during winter. Blue mackerel grow to just over 50cm and are considered to reach sexual maturity at about two years old.

Research indicates there are at least three EMA stocks in New Zealand fisheries waters: EMA1, EMA2 and EMA7.[17]

## Commercial fishery overview

The most important blue mackerel fishery is the EMA1 fishery, which, along with EMA2, is managed under an inshore fisheries plan. In those two stocks, most catch is taken by purse seiners. The EMA QMAs are shown in Figure 15.

In EMA7, and the much smaller EMA3 fishery, most catch is currently taken by the Ukrainian FCV fleet using mid-water trawl gear. In most years however, 5-15% of EMA7 is taken by purse seiners that have headed to the west coast of the North Island either in search of skipjack tuna or to avoid bad weather on the east coast.

As indicated in Figure 16, EMA3 catch during the late 1980s/early 1990s was significantly higher than recent years; catch reached a maximum of 1,141 tonnes in 1988-89 and was no lower than 424 tonnes between 1986/87 and 1990/91. During this time, most EMA3 catch was taken by the Nelson-based purse seine fleet that was developed to take advantage of the sudden increase in abundance of *T. murphyi.* There has been no purse seine catch in this fishery since at least 2002.

EMA3 has a TACC of only 390 tonnes, reflecting the predominantly northerly distribution of this species. Catch has reached a maximum of 133 tonnes since 1996/97 and in 2004/05 only 85 kg of EMA3 was reported.

EMA7 has a TACC of 3,350 tonnes and, as indicated in Figure 17, catch has been around the level of the TACC in most years since 1998/99. Catch peaked at 8,756 tonnes during 1998/99. During this season the Tauranga-based purse seine fleet spent more time than usual on the west coast due to persistent bad weather on the east coast. The extra fishing effort resulted in an atypical catch of EMA.

[17] P.J. Smith, B. Diggles and S. Kim. Stock structure of blue mackerel, *Scomber australasicus.* FAR 2005/43.

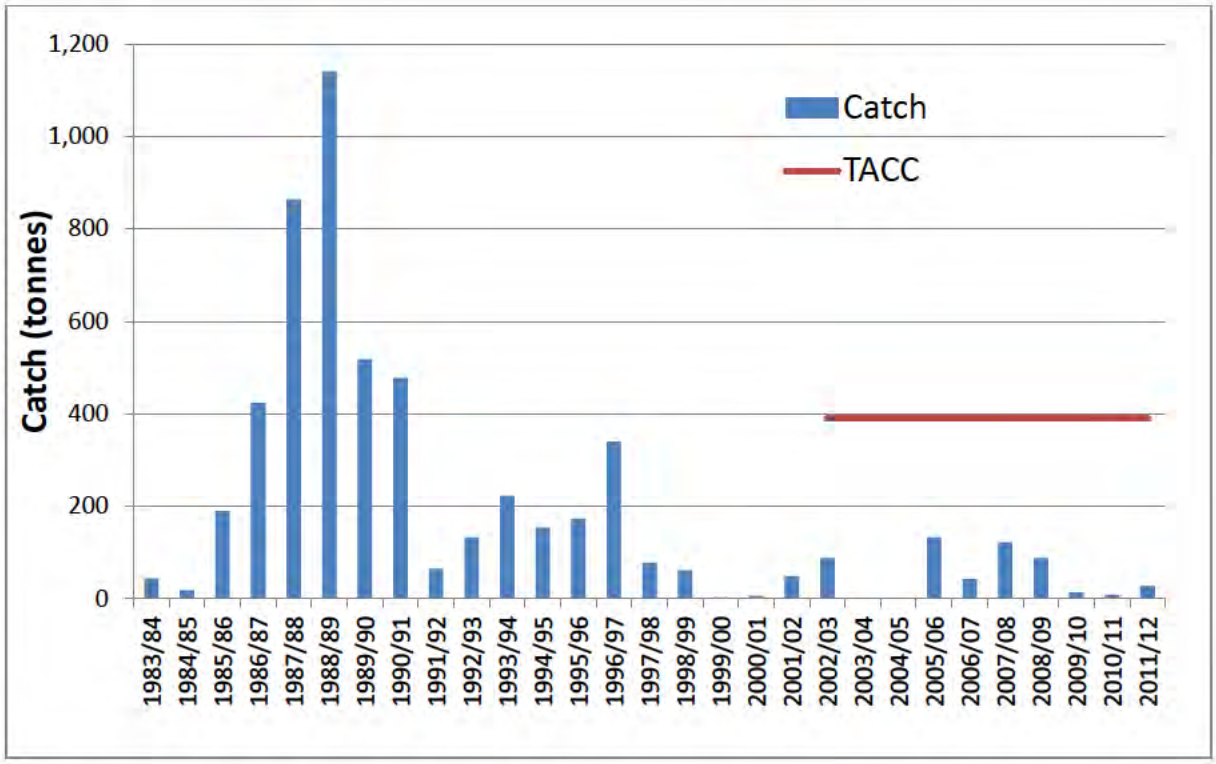


**Figure 16. Catch vs TACC for EMA3 since 1983/84**

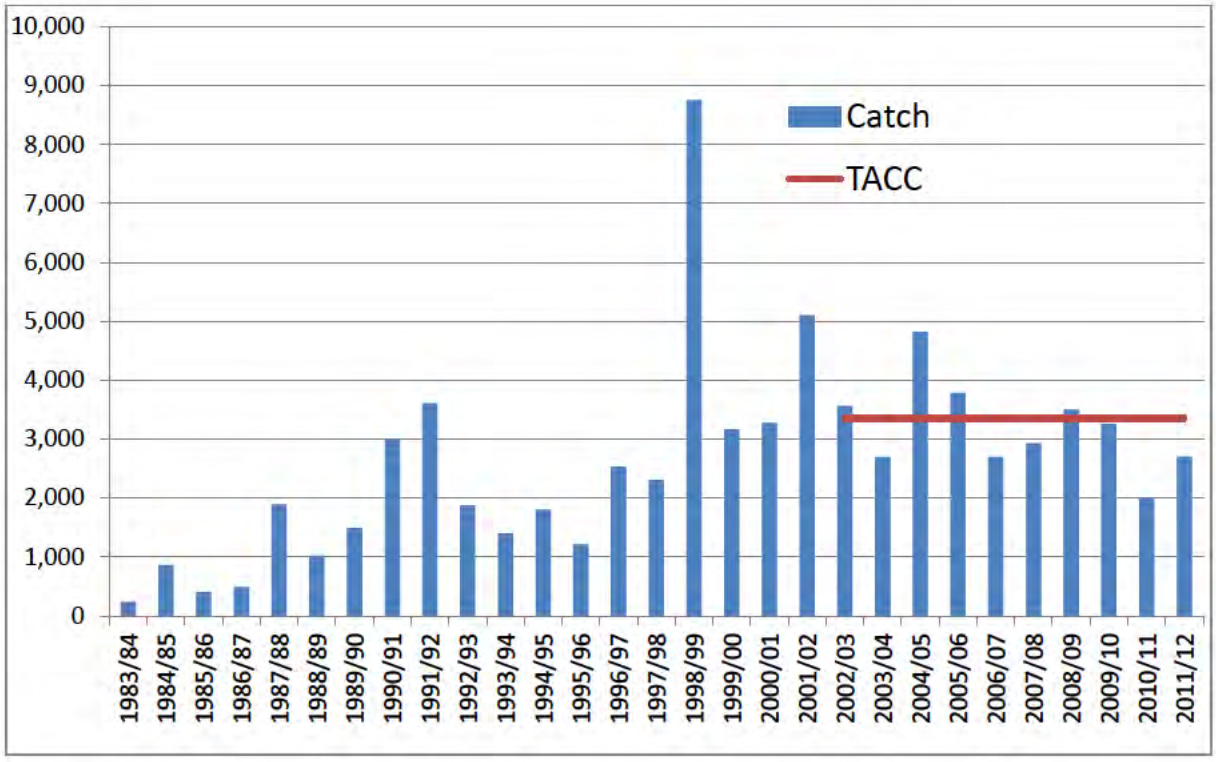


**Figure 17. Catch vs TACC for EMA7 since 1983/84**

## Fisheries management overview

Blue mackerel was introduced into the QMS on 1 October 2002 and catch limits have not changed since then. The TACC for EMA7 was set based on average catch for the five years between 1996/97 and 2000/01, with the large purse seine component of the 1998/99 catch removed due to it being atypical. The TACC for EMA3 was largely based on the average catch between 1985-86 and 1996-97.

Little is known about the status of blue mackerel stocks and no estimates of current and reference biomass, or yield, are available for any blue mackerel area. It is not known if recent catch levels are sustainable or at levels that will allow the stocks to move towards a size that will support the MSY.

Under the 10 Year Research Programme, EMA is one of the Tier 2 species that is scheduled to undergo regular characterisations. The first was presented to the mid-water working group in June 2012. The working group noted that CPUE could be used to monitor the EMA7 fishery and that the west coast North Island fishery should be considered separately from the west coast South Island fishery. The second characterisation is due to be completed in 2015.

**Management need:**

To develop a management strategy to ensure effective management of blue mackerel stocks

## Economic overview

Two companies hold 78% of EMA3 quota between them and two MIOs each hold 10%. In EMA7, the top three companies hold 67% of quota and TOKM holds 11%, although this percentage would be expected to decline as quota is divested to MIOs. The remaining 21% of quota is spread between 34 other entities.

In the 2012 calendar year total exports of EMA were worth $17.8m, with 10,000 tonnes (product weight) being exported. Of this, 1,700 tonnes consisted of processed EMA, with an export value of $5.0m. The processed component of EMA exports is likely to represent the majority of fish from EMA7 and EMA3, around 90% of which is processed at sea to a dressed state. All EMA1 is landed green and is exported frozen whole.

EMA quota value was estimated to be $13.2m in 2009.

## REDBAIT

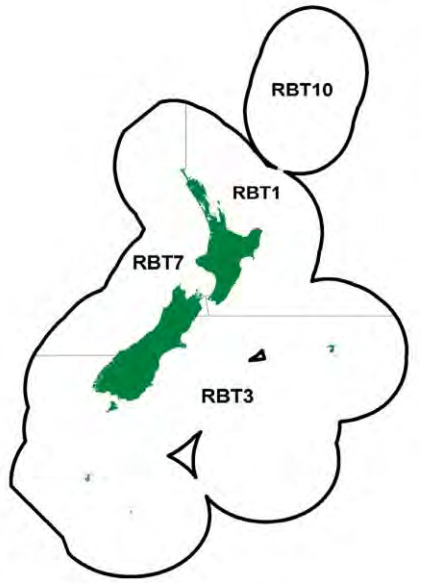


**Figure 18. Redbait quota management areas**

## Biological overview

Redbait (*Emmelichthys nitidus*) is a schooling, bathypelagic species that is closely related to rubyfish. It is widely distributed around New Zealand in depths from 85 to 500m. It is also widely distributed throughout the southern hemisphere.

Juveniles are found at the surface and adults near the bottom in deeper waters, including seamounts. Redbait reaches a maximum length of around 50cm and a maximum age of 10 years. Spawning is thought to last 2-3 months during spring, with 50% mature at 2-3 years of age (24cm). Nothing is known about possible stock structure in New Zealand.

## Commercial fishery overview

Combined landings from all areas between 1993/94 and 2011/12 ranged between approximately 1,000 and 4,600 tonnes.[18] Most catch was taken from the RBT7 and RBT3 fisheries (see Figure 19) with a negligible proportion of catch, typically less than 1%, being taken in RBT1.

After QMS introduction in 2009, catches dropped considerably with a combined nationwide catch of only around 1,000 tonnes being taken in both the 2009/10 and 2010/11 years and 1,400 tonnes during 2011/12. This represents the three lowest reported annual catches since 1991/92.

Since QMS entry in 2009, 69% of catch has been landed green, 16% was mealed and 15% was dressed. Processing of RBT has changed over time with the amount mealed decreasing (from 100% in 2002/03) and the amount dressed or packed green increasing.

[18] There is uncertainty regarding the validity of some of the historical catch reported in this fishery. It is thought that some vessels would, from time to time, report redbait that they didn't actually catch in order to account for the volume of meal they were producing.

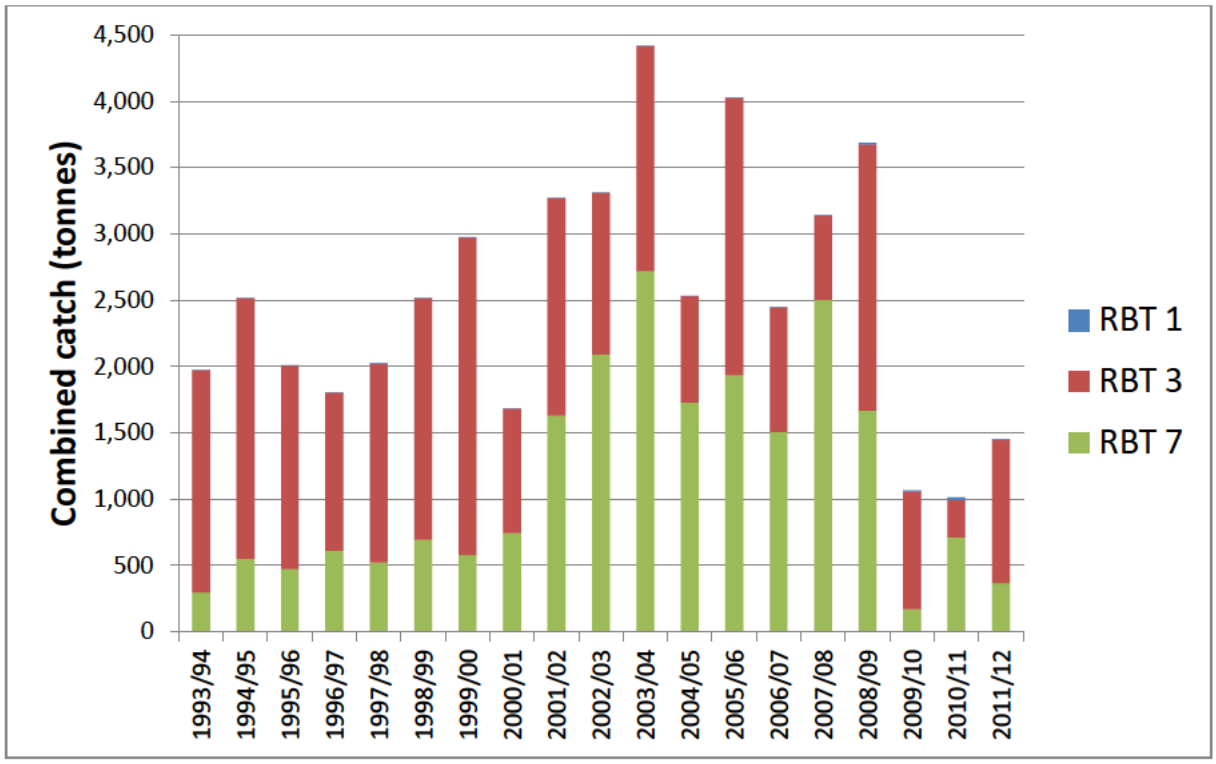


**Figure 19. Reported redbait catch between 1993/94 and 2011/12 (tonnes). Catch has been broken down into the quota management areas used since this species entered the QMS in 2009.**

Prior to 2004/05 almost all RBT7 was taken while targeting JMA, while most RBT3 was taken in the SQU fishery. The moratorium on targeting RBT was lifted on 1 October 2004 and since that date there has been some targeting, particularly in the RBT3 fishery around Mernoo Bank. However, most RBT continues to be taken as bycatch, primarily in the jack mackerel fishery in the case of RBT7 and in the jack mackerel, barracouta and squid fisheries for RBT3. RBT1 is still taken only in very small quantities as a bycatch in fisheries such as rubyfish. Currently, over 95% of RBT is taken by the Ukrainian FCV trawl fleet.

Annual catches from the two main redbait stocks are shown in Figures 20 and 21.

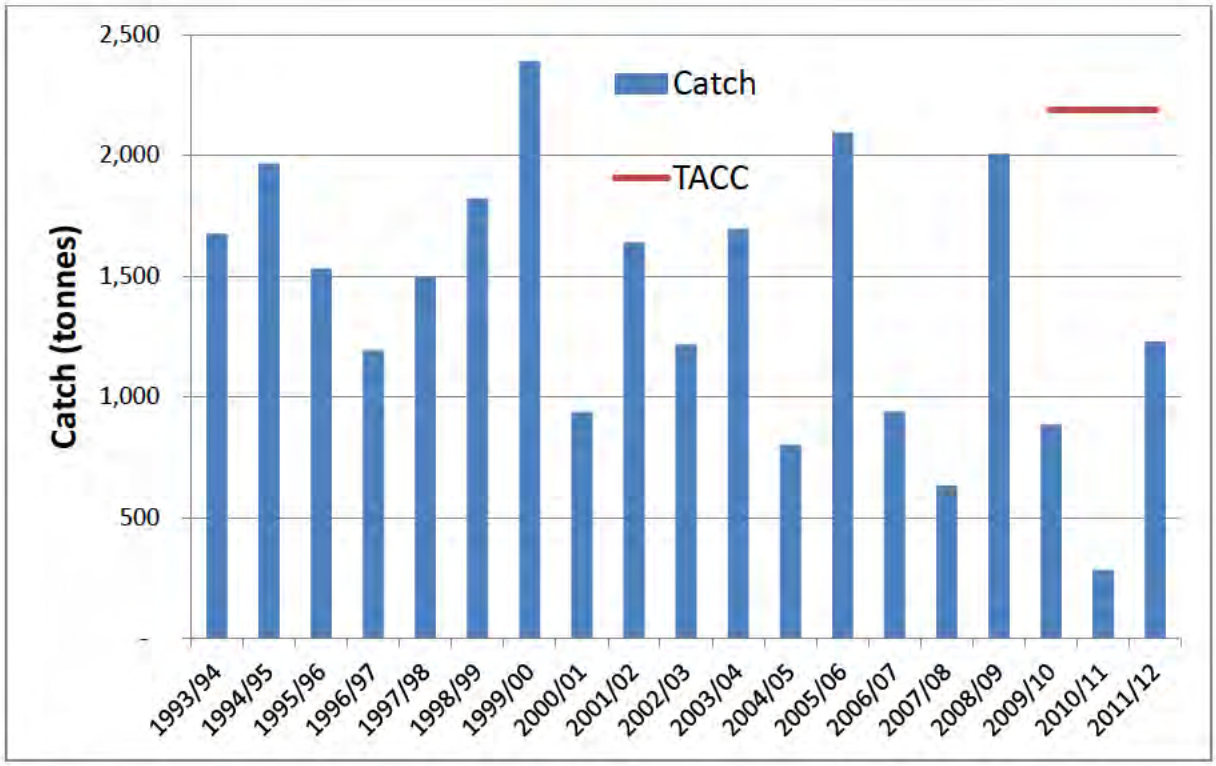


**Figure 20. Catch vs TACC for RBT3 since 1993/94**

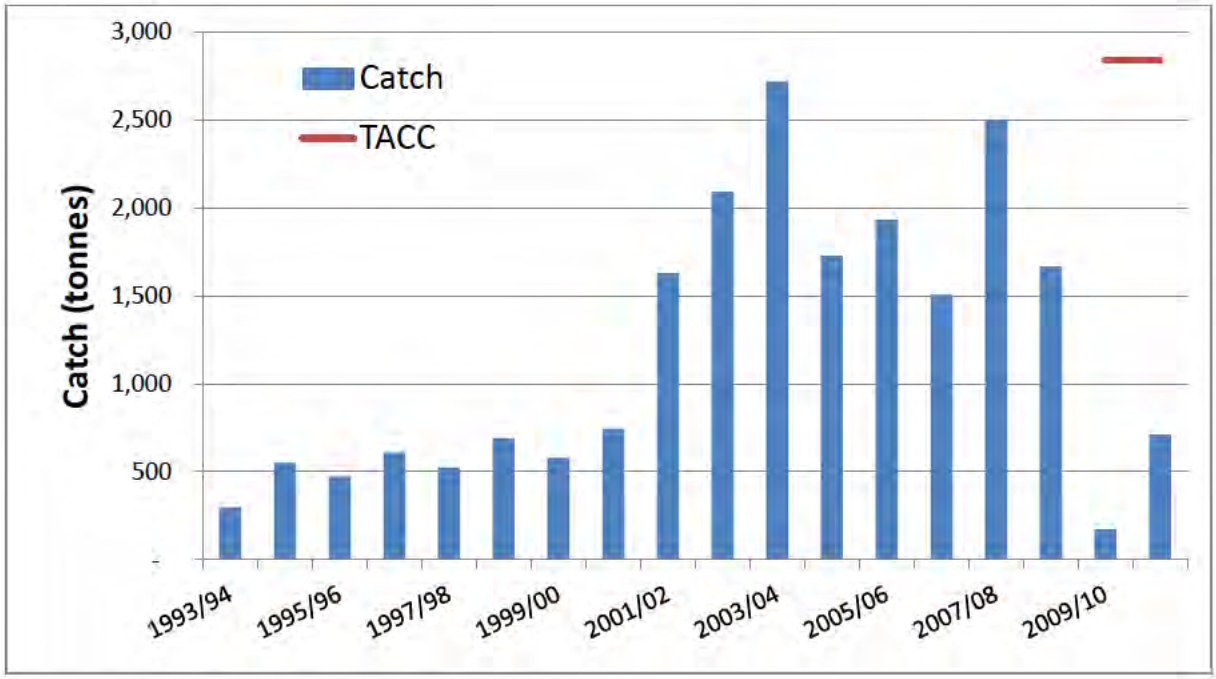


**Figure 21. Catch vs TACC for RBT7 since 1993/94**

There are no estimates of fishery parameters or abundance for any RBT stock. It is not known whether any RBT stocks are at, above, or below a level that can produce MSY.

Under the 10 Year Research Programme, RBT is one of the Tier 2 species that is scheduled to undergo regular characterisations. The first is due in 2013.

**Management need:**

To develop a management strategy to ensure effective management of redbait stocks

## Economic overview

Around 86% of the quota for the two main stocks (RBT3 AND RBT7) is held by six companies. The remainder is mostly held by TOKM or MIOs. One company owns 78% of RBT1 quota.

Redbait is not included as a separate species in export statistics and there is no quota value information.

## Category 2: Incidental bycatch species

These include a limited number of QMS species that have value in their respective fisheries but are taken in small to very small quantities in the JMA fisheries. Alternatively they may be non-QMS species that have little or no commercial value. In either case they are not the focus of fishing effort and may be processed, rendered to fishmeal or, where applicable, released under the provisions of the Sixth Schedule of the Fisheries Act 1996. As most JMA fishing is undertaken by Ukrainian FCVs, all of which have meal plants, there is almost no discarding of incidental bycatch unless it is under the provisions of the Sixth Schedule of the Fisheries Act 1996 or a limited number of species that cannot be mealed such as sharks, sunfish or porcupine fish.

The total quantity of incidental bycatch in the jack mackerel fisheries is considered unlikely to adversely affect any of the species that are taken. The Ministry considers it unlikely that there are additional sustainability concerns with any of the incidental bycatch species listed in Tables 9 or 10 (or species taken in even lower volumes that are not included in the tables) that it is not already aware of.

**Management need:**

To ensure accurate reporting of the species caught as incidental bycatch species.

To ensure that catch levels of the species that are caught as incidental bycatch are monitored annually by Observers.

To intervene if there are concerns that harvest levels are thought to be impacting on the sustainability of the species or if there are utilisation concerns. For non-QMS species this could include section 11 measures or the species being assessed for possible QMS introduction, via the QMS introduction standard.

## Category 3: Incidental captures of ETP species

As described previously, the jack mackerel trawl fisheries interact with a range of seabird species and some marine mammal species. The Fisheries Act requires that when an environmental impact is adverse this effect should be avoided, remedied or mitigated.

Table 11 below describes the extent of interactions with seabirds and marine mammals reported by Ministry observers over the period 1 October 2002 – 30 September 2012.

**Table 11. Observed interactions with seabirds and marine mammals in the jack mackerel trawl fisheries. Data from 2002/03 to 2008/09 from Abraham & Thompson (2011), data from 2009/10 to 2011/12 from the observer database.[19]**

| Year | % of tows observed | Seabirds | Common dolphin | Dusky dolphin | Pilot whale | Fur seal |
|---|---|---|---|---|---|---|
| 2011/12 | 79.5% | 2 | 5 | | | 4 |
| 2010/11 | 32.1% | 7 | 7 | | | |
| 2009/10 | 34.4% | 9 | 4 | | | 2 |
| 2008/09 | 37.5% | 6 | 11 | | 2 | 8 |
| 2007/08 | 30.9% | 1 | 20 | | | 7 |
| 2006/07 | 29.6% | 1 | 11 | | | 2 |
| 2005/06 | 25.2% | | 2 | 1 | | 6 |
| 2004/05 | 22.2% | 8 | 21 | | 6 | 5 |
| 2003/04 | 6.4% | | 17 | | | 2 |
| 2002/03 | 11.3% | 4 | 21 | | | 1 |

## Seabirds

Seabirds are infrequently caught during trawling for jack mackerel. Table 11 above details observed interactions while Table 12 below details observed interactions together with the estimate of total captures. Thirteen species or species groups have been reported as being taken by the JMA trawl fishery, with two species (sooty shearwater and white-capped albatross) making up over half the captures. Most interactions with seabirds occur in the Southland region in JMA3.

[19] Abraham, E.R. and Thompson, F.N. 2011. Summary of the capture of seabirds, marine mammals, and turtles in New Zealand commercial fisheries, 1998-99 to 2008-09. New Zealand Aquatic Environment and Biodiversity Report No. 80 2011.

**Table 12. Seabird interactions in the jack mackerel trawl fisheries 2002/03-2010/11. Observed and estimated seabird captures shown, with 95% confidence intervals in parentheses. Data from www.dragonfly.co.nz. In some instances the number of observed captures differs from that in Table 11. Differences may be due to Table 12 data only including dead birds whereas Table 11 includes all interactions.**

| Year | Observed captures | % tows observed | Strike rate based on observer data | Estimated captures |
|---|---|---|---|---|
| 2010/11 | 7 | 31.6% | 1.18 | 22 (10-49) |
| 2009/10 | 3 | 32.6% | 0.38 | 10 (4-21) |
| 2008/09 | 6 | 37.5% | 0.74 | 14 (7-28) |
| 2007/08 | 1 | 30.9% | 0.12 | 8 (2-19) |
| 2006/07 | 1 | 29.5% | 0.12 | 8 (2-19) |
| 2005/06* | | 25.3% | 0.00 | 34 (12-78) |
| 2004/05 | 8 | 22.2% | 1.25 | 17 (9-30) |
| 2003/04 | | 6.4% | 0.00 | 7 (1-16) |
| 2002/03 | 4 | 11.3% | 1.16 | 26 (12-49) |

* the use of seabird scaring devices by trawl vessels greater than 28m LOA became mandatory in April 2006

The low level of interactions, particularly in the larger JMA7 fishery, is likely to be related to seabird distribution. A recent report looked at risk of commercial surface longline, bottom longline and trawl fisheries to 17 seabird taxa. The report concluded that few taxa were at risk in FMAs 8 and 9.[20]

A level 2 risk assessment for incidental seabird mortality associated with New Zealand fisheries in the EEZ was recently undertaken and the report completed in 2011.[21] For each species, the risk was assessed by comparing the total number of birds potentially killed while fishing against the Potential Biological Removal (PBR) index. This index represents the amount of human-induced mortality a species can sustain without compromising its persistence. The PBR was calculated from the best available information on the species' demography.

The risk assessment looked at risk for some fisheries, including the jack mackerel trawl fishery. It calculated that there were nine seabird species for which jack mackerel trawls had a level of annual potential fatalities that are between 1 and 50% of the PBR. The total number of annual potential fatalities in the jack mackerel trawl fishery across all seabird species (119) represented 0.5% of the annual potential fatalities across all trawl fisheries. The jack mackerel fisheries are considered to present a relatively low risk to seabirds.

Seabirds that are injured or killed by trawl gear either collide with the trawl warps or are caught in the net when the fishing gear is on the surface for shooting and hauling. Typically, it is the larger seabirds, such as albatrosses, which are struck by warps, and the smaller birds, such as petrels and shearwaters, which become caught in the net. As noted above, sooty shearwater and white-capped

[20] Baird, S.J.; Gilbert, D.J. (2010). Initial assessment of risk posed by trawl and longline fisheries to selected seabird taxa breeding in New Zealand waters. New Zealand Aquatic Environment and Biodiversity Report No. 50 2010

[21] Yvan Richard, Edward R. Abraham & Dominique Filippi (2011). Assessment to the risk to seabird populations from New Zealand commercial fisheries. Final Research Report for Ministry of Fisheries projects IPA2009/19 and IPA2009/20.

albatross are the two species that have made up over 50% of captures in the jack mackerel fisheries.[22]

Regulations were passed in 2005 that required all trawl vessels over 28 metres in length to deploy paired streamer lines as seabird mitigation devices in order to scare birds away from the danger zone around the stern of the vessel. The initial regulations were revoked and replaced in 2006 with regulations requiring the use of one of three types of seabird mitigation devices, paired streamer lines, bird bafflers or warp deflector.

These mitigation measures have proved successful in reducing the number of warp interactions across the deepwater and middle-depth fleet generally. However, there is still the outstanding issue of incidental seabird mortalities through net captures and achieving a better understanding of the level of cryptic seabird mortalities[23] that occur in these fisheries.

In addition to these mandatory mitigation measures, industry and the Ministry work collaboratively to ensure all trawlers over 28 metres in length have, and follow, a Vessel Management Plan (VMP). VMPs specify measures that must be followed onboard the vessel to reduce the risk to seabirds of interacting with the fishing gear or the fishing vessel. These measures include storing offal while shooting and hauling the gear, and making sure all fish are removed from the net before it is redeployed. The Ministry monitors vessel performance against its VMP and if a vessel is not complying with the guidelines within its VMP the Director General of the Ministry has the option of putting vessel-specific regulations in place to better control offal management practices. The Ministry can also use incentives such as the increased placement of observers to encourage operators to adhere to the guidelines in the VMPs.

**Management need:**
Given the low level of interactions that occur in these fisheries, the Ministry considers the current management measures to be sufficient but will continue regular monitoring to ensure this remains the case.

## Marine Mammals:

Common dolphins (*Delphinus delphis*) and New Zealand fur seals (*Arctocephalus forsteri)* are the marine mammal species most likely to interact with the jack mackerel fisheries (see Table 11). Interactions with pilot whales (*Globicephala melas*) and other dolphin species (e.g. dusky dolphin, *Lagenorhynchus obscures*) are also known to occur but with less frequency.[24] Interactions with Maui's (*Cephalorynchus hectori*) or Hector's dolphins (*Cephalorynchus hectori maui)* are not known to occur. Almost all captures occur in the JMA7 fishery.

[22] Abraham, E.R. and Thompson, F.N. 2011. Summary of the capture of seabirds, marine mammals, and turtles in New Zealand commercial fisheries, 1998-99 to 2008-09. New Zealand Aquatic Environment and Biodiversity Report No. 80 2011.
[23] Cryptic seabird mortalities refer to the unrecorded, unobserved, or unknown deaths that may have occurred to a seabird due to an interaction with a fishing vessel.
[24] In the 2012/13 year capture of a Risso's dolphin (*Grampus griseus*) was observed.

The jack mackerel trawl fisheries are responsible for the majority of observed whale and dolphin captures across all New Zealand fisheries (see Table 13 below). Most captures consist of common dolphins. It is assumed that the rate of captures is not having an impact on common dolphin populations but as there is no information on the abundance of this species, this cannot be confirmed. Observed total dolphin and whale captures (all species combined) in the jack mackerel trawl fisheries between 2002/03 and 2011/12, together with captures in all other fisheries, are shown in Table 13.

**Table 13. Summary of observed dolphin and whale captures (all species) in JMA and other fisheries between 2002/03 and 2011/12**

| Year | Observed dolphin and whale captures (all species) in JMA trawl fishery | Observed dolphin and whale captures (all species) in all other fisheries |
|---|---|---|
| 2011/12 | 5 | 0 |
| 2010/11 | 7 | 4 |
| 2009/10 | 4 | 4 |
| 2008/09 | 13 | 9 |
| 2007/08 | 20 | 4 |
| 2006/07 | 11 | 2 |
| 2005/06 | 3 | 3 |
| 2004/05 | 27 | 1 |
| 2003/04 | 17 | 0 |
| 2002/03 | 21 | 2 |

**Table 14: Common dolphin interactions in the west coast North Island jack mackerel trawl fisheries 2002/03-2010/11. Observed and estimated common dolphin captures shown, with 95% confidence intervals in parentheses. Data from Thompson et al 2013.[25]**

| Year | Observed captures | % tows observed | Strike rate based on observer data | Estimate of total captures[26] |
|---|---|---|---|---|
| 2010/11 | 7 | 29.9% | 1.51 | 64 (26-116) |
| 2009/10 | 4 | 30.1% | 0.61 | 30 (7-68) |
| 2008/09 | 13 | 38.1% | 1.59 | 28 (13-52) |
| 2007/08 | 20 | 34.0% | 2.72 | 44 (25-74) |
| 2006/07 | 11 | 28.7% | 1.77 | 55 (23-103) |
| 2005/06 | 3 | 30.6% | 0.31 | 13 (2-34) |
| 2004/05 | 27 | 23.1% | 3.74 | 82 (45-132) |
| 2003/04 | 17 | 7.1% | 10.37 | 108 (47-204) |
| 2002/03 | 20 | 9.9% | 9.42 | 141 (56-276) |

[25] Thompson, F.N. Berkenbusch, K. And Abraham, E.R. 2013. Marine mammal bycatch in New Zealand trawl fisheries 1995-96 to 2010-11. New Zealand Aquatic Environment and Biodiversity Report No. 105.
[26] Estimated captures were calculated using both modelling and ratio-based estimates.

Fur seal captures do occur (see Table 11) but not often. As with common dolphins, it is assumed that the rate of captures is not having an impact on populations but without information on fur seal abundance this cannot be confirmed. Fur seals are, however, increasing in number and expanding to recolonise much of their former range.[27]

Overall, the rate of marine mammal interactions is low and the effects of jack mackerel fishing activity on these species are unlikely to be adverse.

The industry-developed Marine Mammal Operating Procedure (MMOP) is the tool currently used to encourage good fishing practices that mitigate risk to marine mammals across all deepwater and middle-depth fisheries. The MMOP is generic across all trawlers over 28m in length and describes a range of procedures that a vessel and crew should follow to reduce the risk of marine mammal captures. These measures include managing offal discharge and avoiding shooting and hauling the gear when marine mammals are congregating around the vessel. DWG attempts to visit vessel operators and crews annually to reinforce the key aspects of the MMOP as well as a vessel's VMP.

There is also a measure in the MMOP that was developed in 2008 specifically for the JMA7 fishery. Research indicated that the risk of dolphin captures increased during the early hours of the morning and that capture events were also more likely to occur while the net was close to the surface (see Figure 22 below). As a result DWG developed the following procedures:

- When visibility permits, the officer on watch will search the immediate area around the vessel for dolphin activity before shooting the gear. If dolphin sightings are confirmed, the vessel will move from that immediate fishing area. Before re-setting the gear, the officer on watch must confirm that the new area is also visibly clear of dolphins. When the vessel moves for this reason it should be recorded in the ship's log.
- If vessel turns are made during trawling, the doors must be hauled to (or above) the surface of the water so the trawl wing ends are closed before undertaking the turn.
- Shooting and hauling of fishing gear must be completed as quickly as possible. Turns at speed should be avoided when about to haul or during hauling.
- Between the hours of 2:30 and 4:30am vessels will not shoot or haul the net if operating above latitude 40°30'S (the latitude of Farewell Spit)

In the event of a dolphin capture the vessel must alert the other JMA vessels in the vicinity and report the capture to DWG.

[27] Boren, L. 2010. Diet of New Zealand fur seals (*Arctocephalus forsteri*): a summary. *DOC Research and Development Series* 319. Department of Conservation, Wellington.

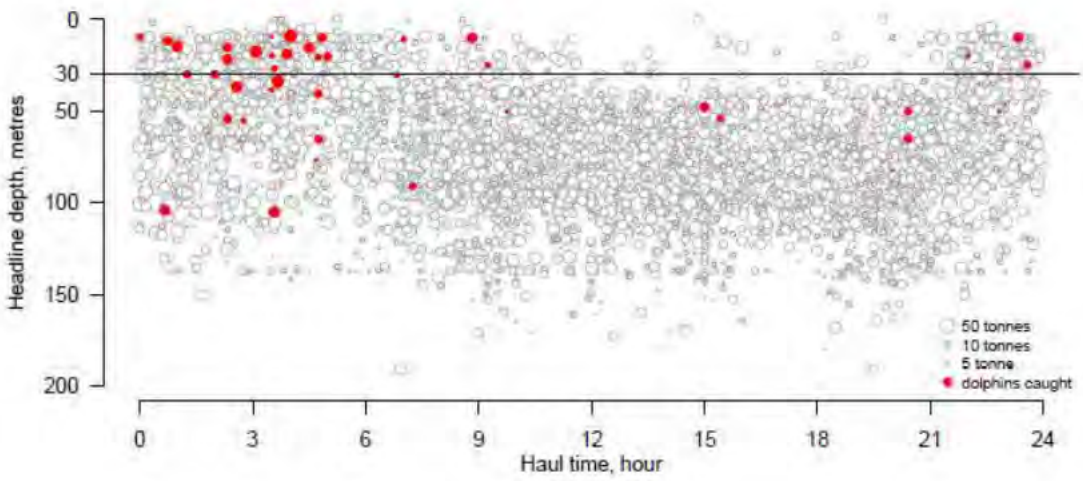


**Figure 22. Plot of headline depth vs haul time for observed trawls in the large-vessel mackerel fishery. The catch weight is indicated by the size of the circles. Tows where an observed common dolphin capture event occurred are filled. From Thompson *et al* 2010.[28]**

The Ministry and DWG monitor and audit vessel performance against the MMOP via the Observer Programme. The Ministry has reported the results of these audits annually from 2011-12, via the Deepwater Annual Review Report (ARR).

**Management need:**
An assessment of whether the current management measures for dolphins are adequate.

Given the low level of interactions that occur with marine mammal species other than dolphins, the Ministry considers the current management measures to be sufficient. However, it will continue regular monitoring to ensure this remains the case.

[28] Thompson, F.N., Abraham, E.R., and Berkenbusch, K. 2010. Common dolphin (*Delphinus delphis*) bycatch in New Zealand mackerel trawl fisheries, 1995-96 to 2008-09. New Zealand Aquatic Environment and Biodiversity Report No. 63.

## Protected shark species:

There are no known interactions with protected shark species.

## Protected coral species:

The majority of hard coral species found in New Zealand are now protected under the Wildlife Act 1953.

Observer records from the 2006/07 to 2011/12 fishing years indicate that only around 10kg in total of protected coral has been incidentally taken by vessels targeting jack mackerel (refer to Table 15).

**Management need:**
Given the lack or low level of interactions with protected shark and coral species in the jack mackerel fisheries, the Ministry considers the current management measures to be sufficient but will continue regular monitoring to ensure this remains the case.

## Category 4: Benthic interactions

The majority of jack mackerel target fishing over the last five years (approximately 98% of target tows) utilised mid-water trawl gear (see Table 1). Although this gear is fished close to or on the seafloor in over 70% of trawl tows, mid-water gear is lighter and is not rigged to be fished hard against the seafloor. This has the effect of limiting the impacts of this fishery on the benthic environment. Table 15 indicates relatively little benthic bycatch over this period.

**Table 15. Benthic bycatch from jack mackerel target tows, from Observer records for the 2007-08 to 2011-12 fishing years.**

| Category | Common name | Protected species (corals only) | Total amount recorded (kg) |
|---|---|---|---|
| Corals | Black corals | Yes | 1 |
| | Coral rubble – dead | No | 5 |
| | Encrusting polyps | No | 13 |
| | Feathery hydroids | No | 21 |
| | Gorgonian coral | Yes | 5 |
| | Hydroids | No | 4 |
| | Sea pens | No | 71 |
| | Soft coral | No | 0.1 |
| | Warty deepsea anemones | No | 0.2 |
| Echinoderms | Starfish (various species) | | 19 |
| | Sea cucumbers (other than *Stichopus mollis*) | | 2 |
| Sponges | Airy finger sponge | | 34 |
| | Floppy tubular sponge | | 7 |
| | Glass sponges | | 1 |
| | Rubber sponge | | 0.1 |
| | Sponges | | 17 |

Across the jack mackerel fisheries, the total trawl footprint has been calculated as 41,092km$^2$ between 1989-90 and 2008-09.[29] This figure includes the swept area of all target jack mackerel bottom trawls and mid-water trawls that were fished on the seafloor, and is shown in Figure 23. In comparison, the trawl footprint from the 2008/09 year was 4,199km$^2$ (shown in Figure 24). Figure 24 clearly indicates the low level of target trawling in the JMA3 QMA during 2008/09.

In recent years the management measures to address the effects of deepwater trawl activity have focused on 'avoiding' these effects rather than remedying or mitigating them. This has been achieved by closing large areas to bottom trawling; first with seamounts and then with Benthic Protection Areas (BPAs). The prohibition through the implementation of BPAs in 2007 effectively closed by law over 30% of the New Zealand EEZ to trawling where the gear would contact the

[29] Black, J., & Wood, R., 2010. Analysis of New Zealand's Trawl Grounds for the Tier 1 species. GNS Science Consultancy Report 2010/67.

seabed. The Ministry also implemented a monitoring regime to ensure these closures were adhered to. The BPA closures were based on the best available marine classification and over 10% of each environment class was closed.[30]

Figures 23 and 24 also show the location of the BPAs and seamount closures, together with the combined distribution of the three jack mackerel species. The three JMA quota management areas all contain BPAs and seamount closures. However, it is clear that there is little overlap between BPAs/seamount closures and the distribution of the JMA species/JMA trawl footprint.

As noted in the fishery management overview section, the key spatial management measures that affect benthic interactions are the areas where trawling by vessels >46m is prohibited. These restrictions were put in place in the 1970s to resolve access issues however, rather than to limit benthic interactions.

**Management need:**
To continue to monitor the extent of the trawl footprint each year to ensure the bottom trawl footprint is not having an adverse impact on the benthic habitat.

[30] The exception was environmental class 55, where only 3% was closed, because a third of this area is included in the Territorial Sea and most bottom trawling in that area is for coastal rather than deepwater species.

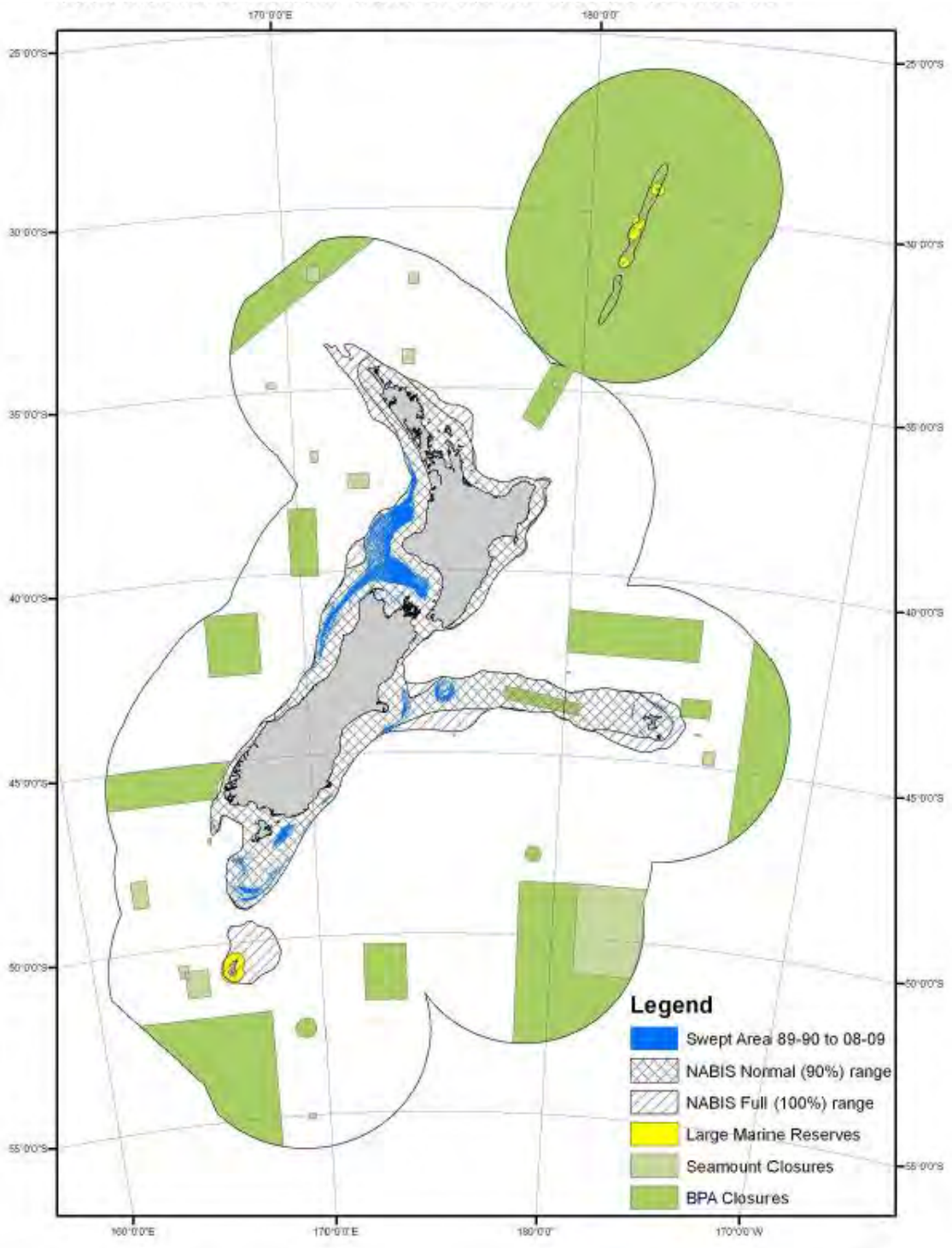


**Figure 23. Jack mackerel trawl footprint 1989-90 to 2008-09 (note trawl tracks are not to scale)**

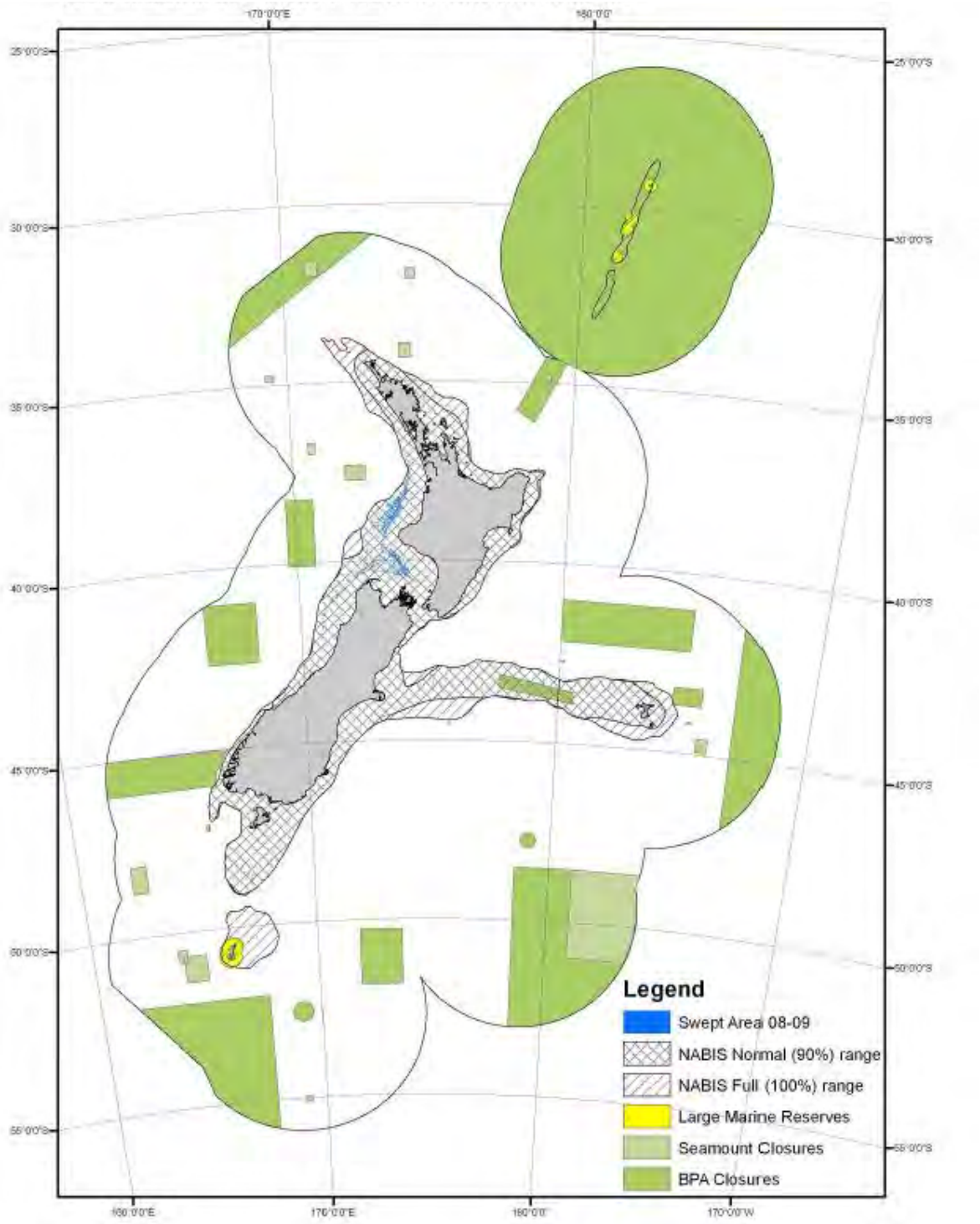


**Figure 24. Jack mackerel trawl footprint for 2008-09 (note trawl tracks are not to scale)**

# 3. Operational Objectives for the jack mackerel fisheries

This part of the plan describes the operational objectives that will drive the management of the jack mackerel fisheries through the five year timeframe of the National Deepwater Plan. Each operational objective is described in terms of the high level management approach that will be taken to addressing these key issues (see Appendix 1 for overview).

This section also shows the expected timeframe for delivery of the work that will contribute to achievement of the stated Performance Indicators. Timeframes are presented by financial year (1 July – 30 June), and to enable readers to interpret these timeframes correctly, the following guidelines are included below:

1. Where the timeframe is "**by** 20xx/xx", it is expected that work will be **completed** by the **end** of the stated financial year.
2. Where the timeframe is "**from** 20xx/xx", it is expected that work will **commence** during the stated financial year, and will likely be ongoing across one or more financial years.
3. Where the timeframe is "**during** 20xx/xx", it is expected that work will be **completed** during the stated financial year.
4. "Annual delivery" requires work to be reported annually through the duration of this Plan.

## Utilisation Operational Objectives

**OO1.1 Enable quota owners to develop and implement a harvest regime that will maximise the value obtained from the jack mackerel fisheries, in line with the harvest strategy**

Jack mackerel has traditionally been a low unit value product. Despite this, it was the in the top five most valuable wild-caught species exported during 2012 and its value is understood to be increasing. Operational Objective 1.1 recognises that, although ensuring biological sustainability is paramount to fisheries management decisions, economic decisions can also influence the value quota holders are able to realise each year.

Objective 1.1 aims to assist quota owners in developing a list of principles or guidelines that can inform fisheries management decisions provided stock sustainability is assured. These guidelines will help give effect to the economic considerations of quota holders when TAC reviews occur. Principles will likely address factors such as:

- Indicators of change in collective abundance or relative abundance of each species
- Consideration of the rate of change to the TAC

| Contributing to Management Objectives: | Performance Indicators: | Timeframe |
|---|---|---|
| MO 1.1, MO 1.2 MO 1.3, MO 1.5, and MO 2.1 | 1. Guidelines that maximise the value obtained from the jack mackerel fisheries are agreed by quota owners<br>2. Such guidelines are an integral component of jack mackerel management decisions, provided no sustainability concerns have been raised | 1. By 2014/15<br>2. From 2015/16 |

**OO1.2 Ensure satisfactory levels of compliance are achieved in jack mackerel and associated fisheries**

Compliance indicators have been developed for the deepwater fisheries generally to support the concept of "informed and assisted" compliance, but fishery-specific compliance information is not readily available for jack mackerel.[31] The Ministry has partially completed a risk profile for the fishery and this is expected to be completed before the end of the 2013/14 year. It will be used to identify any areas that may need focussed compliance monitoring. The Ministry will use it to develop a range of performance indicators that will assist in managing the identified risks.

Levels of compliance will then be assessed annually against the agreed performance indicators and reported to stakeholders and tangata whenua through the Annual Review Report.

| Contributing to Management Objectives: | Performance Indicators: | Timeframe |
|---|---|---|
| MO 1.2, MO 1.3, MO 1.5 | 1. Risk profile completed<br>2. The performance of the jack mackerel fisheries are assessed against the specified performance indicators<br>3. The results of each annual assessment demonstrate high levels of compliance in the jack mackerel fisheries | 1. During 2013/14<br>2. From 2013/14<br>3. From 2013/14 |

**OO1.3 Develop and implement stock monitoring and management regimes for blue mackerel and redbait to enable development of appropriate management settings and harvest strategy**

Little is known about the status of blue mackerel or redbait stocks and no estimates of current and reference biomass, or yield, are available for any blue mackerel or redbait area. Regular characterisations are scheduled in the 10 Year Research Programme for Deepwater Fisheries. The characterisations may provide the basis for delivering on this objective.

| Contributing to Management Objectives | Performance Indicators | Timeframe |
|---|---|---|
| MO1.1, MO1.2. MO1.3, MO1.4. MO1.5, MO2.1 | 1. Monitoring and management approaches for blue mackerel and redbait are developed, including a harvest strategy. | 1. From 2013/14 |

[31] The agreed compliance indicators are specified on the Compliance Information Sheet titled "Compliance Benchmarking", which can be found at the following link: Fact sheet

**OO1.4 Collaboratively assess potential options for obtaining better information on the three jack mackerel species**

Jack mackerel stocks comprise three separate species managed collectively and it would be desirable for management to be at the species level. However, the nature of the fishery, where skippers target "mackerel', not one of the three species, and each tow typically comprises varying proportions of the three species, means this is unlikely over the term of this fish plan chapter.

Despite this, the Ministry considers there are some unique aspects to this fishery which should be viewed as opportunities to obtain better information. These aspects include:

- Around 99% of catch is taken by only six vessels, which are almost identical to each other in operation and which operate cooperatively
- From 1 October 2012, each of the six vessels has been required to carry at least one Ministry observer at all times

| Contributing to Management Objectives | Performance Indicators | Timeframe |
|---|---|---|
| MO1.2<br>MO1.1<br>MO1.3<br>MO1.4<br>MO1.5<br>MO1.6<br>MO2.1 | 1. Potential approaches to obtain better information on the individual jack mackerel species have been assessed<br>2. Potential mechanisms for monitoring and to allow management based on individual species have been considered | 1. During 2013/14<br>2. From 2014/15 |

**OO1.5 Ensure all research planned under the 10 Year Research Programme and used to inform the management of the jack mackerel fisheries continues to be peer reviewed, meets the requirements of the research standard and is delivered in time to inform management decisions before the start of each fishing year**

The 10 Year Research Programme for Deepwater Fisheries sets out the research and monitoring approach for jack mackerel over the next 10 years. A pilot survey to assess the feasibility of acoustic surveys to measure relative abundance of jack mackerel in JMA7 was carried out in January/February 2012. Preliminary results suggested that it was feasible to survey JMA using acoustics. However, mark identification, particularly discrimination between JMA species, was problematic because individual schools could not be targeted with a trawl. It would also be difficult to do any kind of aggregation-based acoustic survey because there are no concentrations of fish such as those seen for southern blue whiting and hoki.

Aside from the pilot survey, other research and monitoring for JMA set out detailed in the 10 Year Research Programme consists of a JMA7 stock assessment scheduled for 2013/14. Nothing is scheduled for JMA3 although it would be logical if this fishery underwent a characterisation concurrently with the JMA7 stock assessment.

To ensure the robustness of the science research used in management decisions, all jack mackerel research must be peer reviewed through the relevant Ministry process. This will determine whether the requirements of the Ministry's Research and Science Information Standard are satisfied and will determine how research will be used to inform management. [32]

The 10 Year Research Programme sets out the long term research schedule for all deepwater fisheries but also recognises that additional research may be required. As yet no additional research related to jack mackerel is planned.

| **Contributing to Management Objectives:** | **Performance Indicators:** | **Timeframe** |
|---|---|---|
| MO 1.3, MO 1.4, MO 1.5 (MO 1.6) | 1. All research projects scheduled through the 10 Year Research Programme are delivered in time to inform the annual management process for the start of the fishing year.<br>2. All research delivered through the 10 Year Research Programme meets the agreed Ministry research standard and is independently peer reviewed through the Ministry Working Group process.<br>3. Any additional research requirements are contracted and delivered in a timely manner through the Additional Research component of the 10 Year Research Programme. | 1. Annual delivery<br>2. Annual delivery<br>3. Annual delivery |

[32] http://www.fish.govt.nz/en-nz/Publications/Research+and+Science+Information+Standard.htm

## Environmental Operational Objectives

**OO2.1 Develop an agreed harvest strategy for jack mackerel including a stock rebuild strategy that is consistent with the Harvest Strategy Standard**

The jack mackerel fisheries are currently managed using generic reference points specified in the Harvest Strategy Standard. As part of the development of a harvest strategy, appropriate biological reference points for the jack mackerel species will be considered. Reference points will then be used to underpin the management of jack mackerel.

The jack mackerel harvest strategy will incorporate all components detailed in the Harvest Strategy Standard, but will tailor the components specifically to the biological characteristics and productivity of the jack mackerel species. The following components will therefore be developed and agreed: 1) a management target, 2) soft and hard limit reference points, 3) a formal, time-constrained rebuilding strategy, and 4) a harvest control rule component that will guide management action.

| Contributing to Management Objectives: | Performance Indicators: | Timeframe |
|---|---|---|
| MO 1.2, MO 1.3 MO 1.5 MO 2.1, MO 2.2 | 1. An agreed harvest strategy for the jack mackerel species is in place<br>2. Details of the harvest strategy, including a rebuild strategy, are publically available<br>3. The agreed harvest strategy has underpinned management responses | 1. By 2013/14<br>2. By 2013/14<br>3. From 2013/14 |

**OO2.2 Ensure that incidental marine mammal captures, particularly common dolphins, do not impact the long term viability of the populations and captures are minimised through good operational practices**

As discussed previously, the JMA fishery (primarily JMA7) has the highest known rate of interactions with common dolphins of any New Zealand fishery. At the current level, interactions are not thought to adversely affect the common dolphin population, although there is no information on dolphin abundance in the New Zealand region.

Through the course of this National Deepwater Plan, the Ministry will continue to monitor the level of interactions between common dolphins and vessels operating in the jack mackerel fisheries. Observer coverage in these fisheries has been relatively high in the past (typically 30-40% in recent years).

In March 2012 the report of the Ministerial Inquiry into the use and operation of Foreign Charter Vessels (FCVs) was released. One of the recommendations was that an observer be placed on all FCVs. The Government accepted this recommendation and was implemented from 1 October 2012. As over 95% of JMA is taken by Ukrainian FCVs, coverage of this fishery will almost certainly increase from current levels.

The Ministry will also continue to work with industry to ensure the JMA fleet remains aware of the factors thought to influence the risk of common dolphin interactions. This will instil the importance of adhering to non-regulatory codes of practice, particularly the MMOP. The Ministry will also continue to monitor overall adherence to the MMOP, and ensure that vessels are taking all reasonable operational precautions to minimise future captures.

However if any changes become apparent that are likely to alter the risk to marine mammals, either in terms of an increase in the level of common dolphin interactions or an observed decline in the dolphin population, additional management measures will be considered and the appropriate management action will be taken. The high level of monitoring in this fishery will ensure that any changes in the level of interactions will be identified early, and the strong links between the Ministry and DWG will allow prompt identification of the possible causes for such change. If specific risks are identified, management measures will be agreed and implemented as appropriate.

| **Contributing to Management Objectives:** | **Performance Indicators:** | **Timeframe** |
|---|---|---|
| MO 1.3, MO 2.5, MO2.6 | 1. The comprehensive Observer monitoring programme provides high quality information on the nature and extent of common dolphin interactions in the JMA fisheries. | 1. Ongoing |
| | 2. All practicable operational steps have been taken to minimise the number of common dolphin captures, and where appropriate the operational guidelines have been updated in the MMOP. | 2. Ongoing |
| | 3. Good fishing practices are proven through adherence with the MMOP being achieved by all vessels, and performance is transparently reported annually to all stakeholders. | 3. Annual delivery |
| | 4. Any observed changes from the current level of interactions are addressed promptly, and the appropriate management action is taken. | 4. As required |

**OO2.3 Implement appropriate spatial management measures to address any adverse effects of jack mackerel trawl fishing on benthic habitats**

The management approach that the Ministry has taken to address benthic interactions with deepwater fisheries focuses on avoiding the effects of bottom trawling by closing representative areas of the benthic habitat to this fishing method.

The management of benthic interactions across the jack mackerel fisheries will focus on monitoring the extent of the bottom trawl component of the jack mackerel fishery each year.[33] Ongoing monitoring of the jack mackerel trawl footprint is scheduled under the 10 Year Research Programme, through project DAE 1010/04 “Monitoring the trawl footprint for deepwater fisheries”.

[33] This analysis will include mid-water trawl effort that takes place on the seabed.

This project will update the trawl footprint annually, enabling the Ministry to assess any changes to the impacted area. The footprint will also be assessed against the best available marine habitat classification, which is currently the Benthic Optimised Marine Ecosystem Classification (BOMEC).

If significant changes in the patterns of fishing effort are observed, and these changes are considered to have an adverse impact on the benthic habitat, a transparent process will be implemented to develop and consider additional management measures.

| Contributing to Management Objectives: | Performance Indicators: | Timeframe |
|---|---|---|
| MO 1.2, MO 1.3, MO 2.3, MO 2.4, MO 2.7 (MO 2.6) | 1. Maps of the jack mackerel bottom trawl footprint produced annually.<br>2. The extent of the bottom trawl footprint is formally assessed against the BOMEC each year, to assess whether benthic interactions are considered to have an adverse impact.<br>3. Should the jack mackerel bottom trawl footprint be considered to have an adverse impact on the benthic habitat, a transparent process will be implemented to develop additional management measures as appropriate. | 1. Annual delivery<br>2. Annual delivery<br>3. As required |

**OO2.4 Monitor incidental bycatch in jack mackerel fisheries**

As described earlier, jack mackerel fisheries take some non-target species during fishing activity. One of the annual projects scheduled in the 10 Year Research Programme is "Bycatch monitoring and quantification of deepwater stocks". In the 2014/15 year the project will examine JMA. The specific objectives include:

- To estimate the quantity of non-target species caught, and the target and non-target fish species discarded in the specified fishery, for the fishing years since the last review, using data from Ministry Observers and commercial fishing returns
- To compare estimated rates and amounts of bycatch and discards from this study with previous projects on bycatch in the specified fishery
- To compare any trends apparent in bycatch rates in the specified fishery with relevant fishery independent research surveys

One of the research projects scheduled for the 2013/14 financial year is a level 1 risk assessment for Tier 3 (non-QMS) species. The intention is that a level one risk assessment will be completed which will identify Tier 3 species which may be at risk from fishing activity across all fisheries, not just the jack mackerel fisheries. Any species deemed to be at risk from fishing activity will then be assessed against the QMS introduction standard.

| Contributing to Management Objectives | Performance Indicators | Timeframe |
|---|---|---|
| MO2.4<br>MO1.6<br>MO2.2<br>MO2.6 | 1. Research project "Bycatch monitoring and quantification of deepwater stocks" undertaken for jack mackerel.<br>2. Any bycatch species deemed to be at risk from jack mackerel fishing is assessed against the QMS introduction standard and the outcome reported in the Annual Review Report. | 1. 2014/15<br>2. Annually |

# 4. Measuring performance

Monitoring and measuring performance is critical to ensure operational objectives are achieving the management objectives, the Fisheries 2030 supporting outcomes and, in turn, the overall strategic vision for the fisheries sector.

## Management Objectives: Review Criteria

Review criteria will enable the measurement of where we are in five years time, i.e. how the management of the jack mackerel fisheries has improved over the five year duration of the National Deepwater Plan.

The nature of some of these management objectives means it may not be feasible to fully meet the targeted outcome within the five-year duration of this chapter of the National Deepwater Plan.

Each of the high level management objectives for the deepwater fisheries is assessed below in terms of its current status in the jack mackerel fisheries and the target status after this chapter has been in place for five years.

## Management Objectives – Utilisation

<table>
<tr><td>MO1.1</td><td colspan="8">Enable an economically viable jack mackerel fishery in NZ over the long term</td></tr>
<tr><td colspan="4">Status at start of chapter</td><td colspan="5">Target status at five year review</td></tr>
<tr><td colspan="4">• Current jack mackerel (all stocks including JMA1) quota value of $54 million (2009)<br>• Current jack mackerel export earnings are $64 million (2012)</td><td colspan="5">• The real value of jack mackerel quota is increased<br>• Management decisions are assessed in terms of their impacts on the economic yield from the jack mackerel fisheries<br>• Information necessary to manage fisheries is transparently obtained on a cost effective basis</td></tr>
<tr><td colspan="9">Supporting Operational Objectives:</td></tr>
<tr><td>1.1</td><td>1.2</td><td>1.3</td><td>1.4</td><td>1.5</td><td>2.1</td><td>2.2</td><td>2.3</td><td>2.4</td></tr>
</table>

| MO1.2 | Ensure there is consistency and certainty of management measures and processes in the jack mackerel fisheries |
|---|---|

| Status at the start of chapter | Target status at 5 year review |
|---|---|
| • The jack mackerel fisheries are managed through the collaborative partnership between the Ministry for Primary Industries and the DeepWater Group Ltd (DWG)<br>• A fisheries plan is developed that sets out the management objectives for the jack mackerel fisheries<br>• Key management decisions are consulted on widely across all stakeholder groups with an interest in the fishery<br>• Catch is monitored annually against the TACC set for each stock<br>• Compliance information specific to the jack mackerel fisheries is limited<br>• Ministry Observers achieve 30-40% coverage in the JMA fisheries | • Collaborative management relationship continues, with greater benefits realised<br>• The transparent objectives within this chapter have driven the management of the jack mackerel fisheries throughout its 5 year duration<br>• Evidence of high levels of compliance in the jack mackerel fisheries is available<br>• There is wide support of, and high levels of adherence with, the non-regulatory management measures in place in the jack mackerel fisheries<br>• With a high level of observer coverage, the information collected by observers is optimised |

| Supporting Operational Objectives: | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **1.1** | **1.2** | 1.3 | **1.4** | 1.5 | 2.1 | 2.2 | 2.3 | 2.4 |

| MO1.3 | Ensure the jack mackerel fisheries resources are managed so as to provide for the reasonably foreseeable needs of future generations |
|---|---|

| Status at the start of chapter | Target status at 5 year review |
|---|---|
| • The foreseeable needs of future generations, including intrinsic and bequest values, have not specifically been identified in relation to jack mackerel<br>• Current management focuses on retaining catch within the allocated catch limit, and avoiding, remedying or mitigating the adverse effects of fishing on the aquatic environment<br>• The Harvest Strategy Standard provides a generic management target of 40%$B_0$, although this target has not been assessed in terms of its appropriateness for the long term viability of jack mackerel | • Awareness and understanding of how the jack mackerel fisheries are managed has improved through delivery of this chapter<br>• Harvest strategies ensure that the jack mackerel stocks are managed at a level that ensures their long term sustainability<br>• Greater awareness of Maori and environmental needs is achieved |

| Supporting Operational Objectives | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **1.1** | 1.2 | 1.3 | **1.4** | **1.5** | **2.1** | **2.2** | **2.3** | 2.4 |

| MO1.4 | Ensure effective management of the jack mackerel fishery is achieved through the availability of appropriate, accurate and robust information |
|---|---|

| Status at the start of chapter | Target status at 5 year review |
|---|---|
| • Management of jack mackerel to date has been supported by regular stock assessments for JMA7. The most recent assessment (2011) indicated F is likely to be about M for *T. novaezelandiae* and well below M for *T. declivis.* There is no stock assessment information for JMA3 or *T. murphyi*.<br>• A schedule, including the pilot acoustic survey, stock assessments and characterisations, is planned through the 10 Year Research Programme for Deepwater Fisheries<br>• Further work is required to develop stock assessment models for *T. novaezelandiae* and *T. declivis*<br>• Very little information to support the management of blue mackerel and redbait | • All surveys, stock assessments and characterisations scheduled between 2011-12 and 2014-15 in the 10 Year Research Programme have been completed within the required timeframes<br>• All research delivered through the 10 Year Research Programme and used to inform management meets the Research and Science Information Standard for New Zealand Fisheries<br>• Outcomes of the observer optimisation project have been implemented to maximise benefits gained from observer coverage<br>• Robust stock assessment models are available for *T. novaezelandiae* and *T. declivis* in JMA7 and there is some way of assessing abundance of *T. murphyi*.<br>• Consideration given to undertaking Management Procedure Evaluation (MPE) for jack mackerel fishery<br>• Information available to better support management of blue mackerel and redbait |

| Supporting Operational Objectives | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1.1 | 1.2 | **1.3** | **1.4** | **1.5** | 2.1 | 2.2 | 2.3 | 2.4 |

| MO1.5 | Ensure that the management of NZ jack mackerel is recognised as being consistent with or exceeding domestic and international best practice |
|---|---|

| Status at the start of chapter | Target status at 5 year review |
|---|---|
| • The JMA7 stock is monitored regularly but has not had a TAC review since it was introduced into the QMS in 1987<br>• The Harvest Strategy Standard provides generic target and limit reference points that are consistent with international best practice but no stock specific harvest strategies for the jack mackerel species are available | • Available evidence shows that levels of compliance in the jack mackerel fisheries are high<br>• The jack mackerel fisheries are generally accepted as having minimal impacts on the marine environment<br>• Harvest strategies have been developed that are consistent with the Harvest Strategy Standard, and therefore with international best practice |

| Supporting Operational Objectives | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **1.1** | 1.2 | 1.3 | **1.4** | **1.5** | **2.1** | 2.2 | 2.3 | 2.4 |

| MO1.6 | Ensure New Zealand's jack mackerel fisheries are transparently managed |
|---|---|

| Status at the start of chapter | Target status at 5 year review |
|---|---|
| • The majority of information currently available on jack mackerel consists of scientific technical reports and advice papers that are accessible to a small number of people<br>• There is no primary information source that can be accessed by all people with an interest in the management of the jack mackerel fisheries | • The Ministry's fisheries website is acknowledged as a comprehensive source of information (both technical and "plain English") on the management of the jack mackerel fisheries<br>• The Deepwater Annual Operational Plan describes the Management Actions and Services relating to jack mackerel that will be delivered each year through the duration of this chapter<br>• The Deepwater Annual Review Reports details the progress made in the previous year to deliver the Management Actions and Services specified in each AOP<br>• Clear processes have been established to enable engagement between the Ministry and key stakeholders and Treaty partners |

| Supporting Operational Objectives | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **1.1** | 1.2 | 1.3 | **1.4** | **1.5** | 2.1 | 2.2 | 2.3 | **2.4** |

In addition, completion of Operational Objective 1.7 from the hoki chapter will support delivery of MO1.6

| MO1.7 | Ensure the management of New Zealand's jack mackerel fishery fully meets the Crown's obligations to Maori under the fisheries settlement Acts |
|---|---|
| Status at the start of chapter | Target status at 5 year review |
| • 12 iwi are currently members of the DeepWater Group Ltd<br>• All iwi that hold jack mackerel quota are engaged on key management decisions through Te Ohu Kai Moana Trustee Ltd<br>• Non-commercial iwi interests are not represented in JMA management | • A clear process has been established that provides tangata whenua the opportunity to engage on jack mackerel management decisions<br>• All iwi with jack mackerel quota have the opportunity to engage through the Deepwater Group Ltd and/or Te Ohu Kai Moana Trustee Ltd<br>• The wider commercial and non-commercial interests of tangata whenua that relate to jack mackerel are taken into account through the relevant Iwi/Forum Fisheries Plans |
| **Supporting Operational Objectives** | |
| Operational Objectives 1.11 and 1.12 from the hoki chapter, and 1.9 and 1.10 from the orange roughy chapter of the National Deepwater Plan relate to facilitating increased iwi involvement with fisheries management decisions. The Ministry will use this work to ensure that obligations to Maori are met with regards to all the deepwater fisheries, including jack mackerel. | |

## Management Objectives - Environment

| MO2.1 | Ensure jack mackerel is managed within an agreed harvest strategy |
|---|---|
| Status at the start of chapter | Target status at 5 year review |
| • Jack mackerel, blue mackerel and redbait are managed using the generic target and limit reference points from the Ministry's Harvest Strategy Standard<br>• Data and information to assess the status of jack mackerel, blue mackerel and redbait in relation to reference points is not available | • Harvest strategies for the jack mackerel species have been developed and agreed with JMA quota holders and in consultation with other stakeholders<br>• The necessary information is available to assess the status of the stocks against the harvest strategies<br>• Harvest strategies underpin the management of JMA stocks and guide the sustainability advice for these stocks<br>• A harvest strategy has been developed for blue mackerel and redbait |
| **Supporting Operational Objectives** | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **1.1** | 1.2 | **1.3** | **1.4** | 1.5 | **2.1** | 2.2 | 2.3 | 2.4 |

| MO2.2 | Maintain the genetic diversity of deepwater and middle-depth target and bycatch species |
|---|---|

| Status at the start of chapter | Target status at 5 year review |
|---|---|
| • The harvest strategy standard provides generic reference points, but no analysis has been undertaken to determine whether these target and limit reference points are appropriate for jack mackerel and associated species | • Harvest strategies ensure that the JMA and associated stocks are maintained at biomass levels that maintain genetic diversity |

**Supporting Operational Objectives**

| 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | **2.1** | 2.2 | 2.3 | 2.4 |
|---|---|---|---|---|---|---|---|---|

| MO2.3 | Protect habitats of particular significance for fisheries management |
|---|---|

| Status at the start of chapter | Target status at 5 year review |
|---|---|
| • There is no comprehensive definition of what constitutes a habitat of particular significance for the management of jack mackerel<br>• Little information is available on any habitats that are of particular significance for jack mackerel | • Agreed policy definition available describing what is meant by 'habitats of particular significance for fisheries management'<br>• Jack mackerel habitats of significance to fisheries management have been identified<br>• Where necessary, management measures to further protect these habitats have been developed and implemented |

**Supporting Operational Objectives**

| 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 2.1 | 2.2 | **2.3** | 2.4 |
|---|---|---|---|---|---|---|---|---|

| MO2.4 | Identify and avoid or minimise adverse effects of jack mackerel fishing activity on incidental bycatch species |
|---|---|

| Status at the start of chapter | Target status at 5 year review |
|---|---|
| • Incidental bycatch information, collected by Ministry Observers, shows that the level of incidental bycatch is low in the jack mackerel fisheries | • Incidental bycatch is monitored annually in the jack mackerel fisheries and reported through the Deepwater Annual Review Reports<br>• The jack mackerel fisheries continue to have a minimal impact on incidental bycatch species<br>• If a species is identified as being at risk from jack mackerel fishing activity, it is assessed against the QMS introduction standard |

**Supporting Operational Objectives**

| 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 2.1 | 2.2 | 2.3 | **2.4** |
|---|---|---|---|---|---|---|---|---|

| MO2.5 | Manage the jack mackerel fisheries so as to avoid or minimise adverse effects on the long-term viability of endangered, threatened and protected species |
|---|---|
| Status at the start of chapter | Target status at 5 year review |
| • The jack mackerel fisheries are known to have the highest observed rate of interactions with common dolphins of any New Zealand fishery<br>• Interactions of the jack mackerel fisheries with other ETP species are monitored and are not thought to be having an adverse effect on any populations | • Reliable information is available on the nature and extent of ETP species interactions and impacts on populations across the jack mackerel fisheries<br>• Incidental captures are reported annually<br>• All practicable steps have been taken to minimise the number of individual marine mammal and seabird captures that occur in the jack mackerel fisheries |

| Supporting Operational Objectives | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 2.1 | **2.2** | 2.3 | 2.4 |

| MO2.6 | Manage the jack mackerel fisheries to avoid or minimise adverse effects on biological diversity |
|---|---|
| Status at the start of chapter | Target status at 5 year review |
| • Research and information on the full extent of the impacts of jack mackerel fishing on biological diversity is limited | • A biodiversity index is developed and monitored based on available information from jack mackerel fisheries |

| Supporting Operational Objectives | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1.1 | 1.2 | **1.3** | 1.4 | 1.5 | 2.1 | **2.2** | **2.3** | **2.4** |

| MO2.7 | Manage effects from the impact of jack mackerel fishing activity on the benthic habitat using a spatial management approach |
|---|---|
| Status at the start of chapter | Target status at 5 year review |
| • The Benthic Protection Areas and Seamount Closures currently in place cover around 2% of the normal range of jack mackerel<br>• The jack mackerel trawl footprint covers 11% of the normal range of jack mackerel | • The bottom trawl component of the jack mackerel trawl footprint has been assessed annually against the BOMEC<br>• A transparent programme is available to develop and implement additional management measures, should the impacts on benthic habitats become adverse |

| Supporting Operational Objectives | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 2.1 | 2.2 | **2.3** | 2.4 |

# Appendix 1:

**Details of the operational objectives (OO) for the jack mackerel fishery and link with management objectives (MO)**

●● Denotes the primary management objective that each operational objective contributes to achieving

● Denotes additional management objectives that each operational objective contributes to achieving

| Utilisation focused Operational Objectives | MO 1.1 | MO 1.2 | MO 1.3 | MO 1.4 | MO 1.5 | MO 1.6 | MO 1.7 | MO 2.1 | MO 2.2 | MO 2.3 | MO 2.4 | MO 2.5 | MO 2.6 | MO 2.7 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **OO1.1** Enable quota owners to develop and implement a harvest regime that will maximise the value obtained from the jack mackerel fisheries, in line with the harvest strategy | ●● | ● | ● | | ● | | | ● | | | | | | |
| **OO1.2** Ensure satisfactory levels of compliance are achieved in the jack mackerel and associated fisheries | | ●● | ● | | ● | | | | | | | | | |
| **OO1.3** Develop and implement stock monitoring and management regimes for blue mackerel and redbait to enable development of appropriate management settings and harvest strategy | ● | ● | ● | ● | ● | | | ●● | | | | | | |
| **OO1.4** Collaboratively assess potential options for obtaining better information on the three jack mackerel species | ● | ● | ● | ●● | ● | ● | ● | ● | | | | | | |
| **OO1.5** Ensure all research planned under the 10 Year Research Programme and used to inform the management of the jack mackerel fisheries continues to be peer reviewed, meets the requirements of the research standard and is delivered in time to inform management decisions before the start of each fishing | | | ● | ●● | ● | ● | | | | | | | | |

| Utilisation focused Operational Objectives | MO 1.1 | MO 1.2 | MO 1.3 | MO 1.4 | MO 1.5 | MO 1.6 | MO 1.7 | MO 2.1 | MO 2.2 | MO 2.3 | MO 2.4 | MO 2.5 | MO 2.6 | MO 2.7 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| year. | | | | | | | | | | | | | | |

| Environmental focused Operational Objectives | MO 1.1 | MO 1.2 | MO 1.3 | MO 1.4 | MO 1.5 | MO 1.6 | MO 1.7 | MO 2.1 | MO 2.2 | MO 2.3 | MO 2.4 | MO 2.5 | MO 2.6 | MO 2.7 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **OO2.1** Develop an agreed harvest strategy for jack mackerel including a stock rebuild strategy that is consistent with the Harvest Strategy Standard | | ● | ● | | ● | | | ●● | ● | | | | | |
| **OO2.2** Ensure that incidental marine mammal captures, particularly common dolphins, do not impact the long term viability of the population and captures are minimised through good operational practices | | | ● | | | | | | | | | ●● | ● | |
| **OO2.3** Implement appropriate spatial management measures to address any adverse effects of jack mackerel trawl fishing on benthic habitats. | | ● | ● | | | | | | | ● | ● | | ● | ●● |
| **OO2.4** Monitor incidental bycatch in jack mackerel fisheries | | | | | | ● | | | ● | | ●● | | ● | |