Ministry for Primary Industries
Manatū Ahu Matua

Review of the Maui's dolphin Threat Management Plan

Final Advice Paper – Fishing-Related Measures

June 2013

Contents

1 EXECUTIVE SUMMARY

Background

The Maui's dolphin[1] has a very small population off the west coast of the North Island (WCNI) that has likely declined from higher levels of abundance. Biological factors and low abundance make the Maui's dolphin extremely susceptible to the effects of human-induced mortality.

Potential Biological Removal (PBR) analysis provides an indication of the vulnerability of Maui's dolphins to human-induced impacts. The PBR analysis estimates the maximum number of human-induced dolphin mortalities, which may occur while allowing the stock to reach or maintain its optimum sustainable population size with high probability. The PBR analysis for Maui's dolphins suggests that a rebuild of the population is put at risk if more than one human-induced death occurs in the next 10 to 23 years. However, information suggests the population can recover in the absence of human-induced mortality.

On 2 January 2012 an accidental mortality of a Maui's or Hector's dolphin occurred in a commercial set net off Cape Egmont, Taranaki. In addition to this mortality, new research estimates the Maui's dolphin population over one year of age to be 55 individuals, with 95 percent confidence that the number of individuals over one year of age is between 48 and 69 individuals.

In response to this information, your predecessor and the former Minister for Conservation directed officials to bring forward the review of the Maui's dolphin portion of the Hector's and Maui's dolphin Threat Management Plan for completion in 2012. Your predecessor also put in place interim measures along the Taranaki coast (from Pariokariwa Point south to Hawera) to protect the Maui's dolphin from fishing-related threats while this review was undertaken.

This paper outlines the Ministry for Primary Industries' (MPI) final advice on the outcome of the review. MPI's final advice considers whether additional measures under the Fisheries Act 1996 (the Act) are necessary to avoid, remedy, or mitigate any adverse effects of fishing on the Maui's dolphin population. In light of the status of the population you should consider whether current management measures reduce the likelihood of entanglement in fishing gear to an acceptable level. The Department of Conservation is responsible for advice on managing non-fishing related human induced risks.

Risk Assessment Workshop

To inform the review of the TMP, MPI and the Department of Conservation (DOC) hosted a risk assessment workshop in June 2012 with the purpose of identifying, analysing and evaluating all threats to Maui's dolphins off the WCNI. The risk assessment scoring was conducted by an expert panel of domestic and international specialists in marine mammal science and ecological risk assessment.

The panel considered all of the known actual or potential threats to the population and provided estimates of associated impacts (e.g. dolphin deaths) based on the estimated spatial overlap between the dolphin distribution and the distribution of each threat, and the expected level of vulnerability of the dolphins to each threat. For each threat, each panel member estimated the number of associated dolphin mortalities arising from the threat, *and* the level of uncertainty around that estimate. The combined results of all panel members' estimates suggest that at current threat levels, from 1 to 8 Maui's dolphin mortalities (a

[1] To provide context to the information discussed in this paper:
'Maui's dolphin(s)' refers to the North Island subspecies (*Cephalorhynchus hectori maui*). 'Hector's dolphin(s)' refers to the South Island subspecies (*Cephalorhynchus hectori hectori*). The use of 'Maui's and Hector's dolphins' refers to the species collectively (*Cephalorhynchus hectori*). 'Maui's and/or Hector's dolphins' refers to both subspecies, and is used where the identification of the subspecies cannot be confirmed.

median of 5) will likely occur each year from all threats over the next five years. Fishing-related activities account for about 95 percent of total estimated human-induced mortalities; the remaining 5 percent are attributed to non-fishing-related threats.

The estimates represented a subjective but informed judgement by the panel members, given available information and taking into account input from stakeholders and other informed workshop attendees. The broad confidence limits for this estimate reflect an acknowledged high level of uncertainty in the number of dolphin mortalities as estimated by individual panellists, as well as variable estimates between panellists.

MPI considers the risk assessment a guide to target where mitigation may best be placed to reduce the risk to Maui's dolphins. Despite the uncertainty in the estimates, the panel's scores suggest with high confidence that total human-induced mortality, and within that fishing-related mortality, is higher than the Maui's population can sustain. Population projections based on the panel's estimated total mortalities indicate a 96 percent likelihood that the population will decline if threats remain at current levels. MPI notes the risk assessment occurred prior to your predecessor's decision to put in place interim measures in the Taranaki region, and therefore did not take those measures into account. For more discussion of the risk assessment refer to section 7 of this paper.

Context

Existing set net prohibitions remove most of the threat from set nets and reduce the likelihood of a Maui's dolphin entanglement to a low level. However, the likelihood of an interaction with set net is influenced by the intensity of set net activity and the likelihood of an interaction in locations where Maui's dolphins are rarely or infrequently observed. Existing trawl prohibitions remove most of the threat from trawl activity and reduce the likelihood of a Maui's dolphin entanglement. However, there is still overlap between trawl activity and dolphin distribution, as well as insufficient information to quantify the level of risk that this overlap poses.

The risk assessment used information on dolphin distribution and fishing activity to identify areas where Maui's dolphins are exposed to the greatest level of residual risk from set net and trawl fisheries off the WCNI. MPI notes that this assessment occurred *prior* to your predecessor putting in place the interim measures around the Taranaki coast. The risk assessment concluded the greatest residual risk to Maui's dolphins was found in three key fishery areas:

1. Set net fisheries off the northern Taranaki coastline out to seven nautical miles from shore
2. Set net fisheries close to the entrance of the Manukau Harbour (inner harbour side)
3. Inshore trawl fisheries between the boundaries of the trawl fishery closures areas (that extend two or four nautical miles offshore) and seven nautical miles offshore, particularly towards the centre of dolphin distribution (from Raglan Harbour entrance to the Kaipara Harbour).

In response to this information, MPI developed and consulted on a number of options to address the key areas of residual risk. The options for each fishing threat can be categorised by their ability to:

- reduce the uncertainty in the information (the level of interactions between fishing-related threats and the Maui's dolphin population), and/or
- reduce or remove the residual risk of fishing-related mortality.

Consultation

There was considerable interest from stakeholders and the general public on the consultation paper and the options proposed to address the residual risk posed by fishing-related activities.

Most fishing interests (commercial and non-commercial) consider there is insufficient information about the Maui's dolphin and threats to the dolphin to take further threat management action. Fishing interests argue that more research should be undertaken on population size, distribution, non-fishing-related threats before further action is taken. Fishing interests stress that any action taken will offer negligible benefit to dolphins but impact greatly on fishers. They propose in some instances a relaxation of existing fishing restrictions to allow for what they define as low risk fishing activities to provide additional utilisation opportunities for fishers.

The majority of submissions received (ENGOs, general public, local councils, and Conservation Boards) consider the management measures proposed in consultation are greatly inadequate to protect the long-term viability of the Maui's dolphin from fishing-induced mortality. They argue that you should take a precautionary approach to remove all fishing-related threats given they are the greatest known threats to the population. They propose measures to ban set net and trawl activity out to the 100 m depth contour or accepted proxy, and in the harbours.

Management Options

You are being asked to make decisions relating to three areas where the greatest levels of residual risks from fishing have been identified:

1. Commercial and amateur set net fishery along the Taranaki coast,
2. Commercial and amateur set net fishery in the west coast North Island harbours, and in particular, the Manukau Harbour, and
3. Commercial trawling off the west coast of the North Island.

MPI and DOC developed a continuum of options below for your consideration. This table summarises those options proposed in the consultation paper and what was proposed in submissions received during the consultation process. The options are presented from the least conservative to the most conservative.

	Least conservative option	Improve information (reduce uncertainty in level of risk)	Intermediate option (reduction in residual risk)	Conservative option (removal of greater level of residual risk	Most conservative option (removal almost all residual risk)
IMPACT ON UTILISATION/ LEVEL OF RISK MITIGATION LOWER → HIGHER					
Commercial and Amateur Set Netting (off the WCNI)	Amend the interim measures to allow for a seasonal winter fishery between zero and two nautical miles offshore from Pariokariwa Point to Hawera with observers on board and specific other controls such as net height and length. Prohibit the use of commercial set nets between 2 and 7 nautical miles offshore without an observer on board from Pariokariwa Point to Hawera.	Keep existing management, including the interim measures: - set net prohibition between 0 and 2 nautical miles offshore from Pariokariwa Point to Hawera; - prohibit the use of commercial set nets between 2 and 7 nautical miles offshore from Pariokariwa Point to Hawera without an observer onboard.	Extend the set net prohibition between 0 and 4 nautical miles offshore from Pariokariwa Point to Hawera. Prohibit the use of commercial set nets between 4 and 7 nautical miles offshore from Pariokariwa Point to Hawera without an observer onboard.	Prohibit all set net activity from Maunganui Bluff south to Hawera and out to 7 nautical miles.	Prohibit all set net activity from Maunganui Bluff south to Whanganui and out to the 100 m depth contour (or some proxy).
Commercial and Amateur Set Netting (WCNI Harbours)	*Status quo:* Keep existing management.	Keep existing management for set netting. Allow ring netting in the harbour where set net prohibition applies. Improve information on Maui's dolphin distribution and set net activity in the west coast North Island harbours, with a focus in the Manukau Harbour.	Extend the existing set net prohibition in the entrance of the Manukau Harbour further into the harbour. Improve information on Maui's dolphin distribution and set net activity in the west coast North Island harbours, with a focus in the Manukau Harbour.		Prohibit all set net activity in the WCNI harbours
Commercial Trawling	*Status quo:* Keep existing management.	Put in place extensive monitoring coverage in the commercial trawl fishery between 2 and 7 nautical miles offshore from Maunganui Bluff to Pariokariwa Point.	Extend the trawl prohibition from 2 to 4 nautical miles offshore from Kaipara Harbour to Kawhia Harbour. Put in place extensive monitoring coverage in the commercial trawl fishery between 2 and 7 nautical miles offshore from Maunganui Bluff to Pariokariwa Point.	Prohibit all trawl activity from Maunganui Bluff south to Hawera and out to 7 nautical miles.	Prohibit all trawl activity from Maunganui Bluff south to Whanganui and out to the 100 m depth contour (or some proxy).

MPI's Preferred Options

Taking into account a range of factors that inform the likelihood and consequence of any Maui's dolphin mortality from set net fishing in the defined areas, MPI recommends the following management measures (noting estimated economic costs).

Commercial and Amateur Set Netting (off the WCNI - Taranaki)		Economic cost
Option 1	*Status quo*: Keep existing management, including the interim measures to: • retain the set net prohibition between 0 and 2 nautical miles offshore from Pariokariwa Point to Hawera; • retain the prohibition on the use of commercial set nets between 2 and 7 nautical miles offshore from Pariokariwa Point to Hawera without an observer onboard, and; The interim measures would be reviewed in 2015 (or prior in the case of a dolphin capture) to inform management going forward.	Annual Revenue: $339 280 Annual Value Add: $569 991 Capitalised future value: $1 911 267 Observer coverage (Crown-funded): $315 480 - $526 000 per year

Commercial and Amateur Set Netting (WCNI Harbours)		Economic cost
Option 2b	Keep existing management for set netting, and • Allow ring netting in the harbour where set netting restrictions currently apply. • Improve information on Maui's dolphin distribution and set net activity in the west coast North Island harbours, with a focus in the Manukau Harbour.	Industry estimates economic gain of ~$200 000 per year Information costs to be confirmed and will be determined by research programme design

Commercial Trawling		Economic cost
Option 2	Keep existing management for trawl, and • Put in place extensive monitoring coverage in the commercial trawl fishery between 2 and 7 nautical miles offshore from Maunganui Bluff to Pariokariwa Point.	Monitoring coverage (cost-recovered from industry): 25% coverage ≈ $294 500 per year Full coverage ≈ $1 176 000 per year

MPI notes there is uncertainty related to the current distribution of Maui's dolphin, and the level of interaction between Maui's dolphins and set net and trawl fisheries. However, given the very small size of the Maui's dolphin population, the consequence of any mortality to the population, and considering the potential impact of additional measures on utilisation opportunities MPI recommends you:

- Retain fishing restrictions in the Taranaki region
- Allow for commercial ring netting in the Manukau Harbour, which was an unintended restriction as a result of the previous set net restrictions
- Improve information on Maui's dolphin distribution and set net activity in the WCNI harbours
- Put in place extensive monitoring coverage in the commercial trawl fishery.

MPI considers the recommended options meet the need to manage the residual risk to Maui's dolphins and gather more certain information on dolphin presence and interaction with existing fishing activity.

Alternative options

MPI considered the range of options presented above. MPI notes the full range of options is available to you for consideration should your assessment of the risk to Maui's dolphins from set net and trawl-related threats differ from MPI.

MPI considers that the least conservative options do not address the need to manage the risk to Maui's dolphins, particularly because they would not improve information for ongoing management options dolphin presence and the potential overlap with residual fishing-related risks.

Similarly, MPI does not consider the most conservative options to remove all fishing activity tenable. MPI does not consider the extensiveness of such an approach is required to manage the residual risk given the low likelihood of encountering a dolphin as you move further offshore and at the northern and southern fringes of their range and the considerable economic impact of removing a large portion of New Zealand's inshore and trawl fishery.

2 SUMMARY OF RECOMMENDATIONS

MPI recommends that you:

a) **Note** the Legislative Considerations set out in Section 5 of this Final Advice Paper

Noted

c) **Note** that MPI has considered the level of risk posed by set net and trawl activity off the west coast of the North Island to the Maui's dolphin population;

Noted

d) **Note** that MPI considers the recommended measures reflect the assessment of the likelihood and consequence of a fishing-related Maui's dolphin mortality occurring off the west coast of the North Island;

Noted

Commercial and amateur set net fishery – Coastal

MPI recommends that you:

b) **Agree** to Option 1 (MPI preferred) to keep existing management, including the interim measures to:

- prohibit commercial and amateur set net activity between zero and two nautical miles offshore from Pariokariwa Point to Hawera, and
- prohibit the use of commercial set nets between two and seven nautical miles without an observer on board.

Agreed / Not Agreed

OR

c) **Agree** to Option 2 to keep existing management and amend the interim measures to:

- prohibit commercial and amateur set net activity between zero and two nautical miles offshore from Pariokariwa Point to Hawera, but allow commercial set netting in the area between Bell Block and Cape Egmont from 1 June to 30 September provided;
  - o an observer is onboard
  - o the set nets meet specified length and height requirements
  - o set nets are set or hauled during daylight hours only, and
  - o prohibit the use of commercial set nets between two and seven nautical miles offshore from Pariokariwa Point to Hawera all year round without an observer onboard.

Agreed / Not Agreed

OR

d) **Agree** to Option 3 to keep existing management and put the interim measures in place via regulation to:

- prohibit commercial and amateur set net activity between zero and two nautical miles offshore from Pariokariwa Point to Hawera, and
- prohibit the use of commercial set nets between two and seven nautical miles without an observer on board.

Agreed / Not Agreed

OR

e) **Agree** to Option 4 to keep existing management and extend the commercial and amateur set net prohibition from Pariokariwa Point to Hawera offshore to seven nautical miles.

Agreed / Not Agreed

OR

f) **Agree** to Option 5 to extend the commercial and amateur set net prohibition from Maunganui Bluff to Whanganui and offshore to the 100 m depth contour.

Agreed / Not Agreed

Commercial and amateur set net fishery – west coast North Island harbours

MPI recommends that you:

b) **Agree** to Option 2b (MPI preferred) to keep existing management and

- amend the regulations to allow commercial ring netting (under specified conditions) in the Manukau Harbour where current set net restrictions apply, and
- improve information on dolphin distribution and set net activity in the west coast North Island harbours, with a focus in the Manukau Harbour.

Agreed / Not Agreed

OR

c) **Agree** to Option 1 to keep existing management.

Agreed / Not Agreed

OR

d) **Agree** to Option 2 to keep existing management and

- improve information on dolphin distribution and set net activity in the west coast North Island harbours, with a focus in the Manukau Harbour.

Agreed / Not Agreed

OR

e) **Agree** to Option 3 to keep existing management and

- extend the existing commercial and amateur set net prohibition in the entrance of the Manukau Harbour further into the harbour, and

- improve information on dolphin distribution and set net activity in the west coast North Island harbours, with a focus in the Manukau Harbour.

Agreed / Not Agreed

OR

e) **Agree** to Option 4 to prohibit all commercial and amateur set net activity in all west coast North Island harbours (Kaipara, Manukau, Raglan, Aotea and Kawhia).

Agreed / Not Agreed

Commercial trawl fishery – west coast North Island

MPI recommends that you:

b) **Agree** to Option 2 (MPI preferred) to keep existing management, and

- put in place extensive monitoring coverage in the commercial trawl fishery between two and seven nautical miles offshore from Maunganui Bluff to Pariokariwa Point.

Agreed / Not Agreed

OR

c) **Agree** to Option 1 to keep existing management.

Agreed / Not Agreed

OR

d) **Agree** to Option 3 to keep existing management, and

- extend the trawl prohibition from two to four nautical miles offshore from Kaipara Harbour to Kawhia, and

- put in place an extensive monitoring coverage in the commercial trawl fishery between two and seven nautical miles offshore from Maunganui Bluff to Pariokariwa Point.

Agreed / Not Agreed

OR

e) **Agree** to Option 4 to extend the commercial trawl prohibition from Maunganui Bluff to Hawera and offshore to seven nautical miles.

Agreed / Not Agreed

OR

f) **Agree** to Option 5 to extend the commercial trawl prohibition from Maunganui Bluff to Whanganui and offshore to the 100 m depth contour.

Agreed / Not Agreed

Scott Gallacher
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Hon Nathan Guy
Minister for Primary Industries

/ / 2013

3 REVIEW OUTLINE

3.1 Structure of this paper

This paper consists of the following parts:

- Introduction
  - Summary of the status quo and problem definition
  - Summary of submissions
- Legislative considerations
- Key biological characteristics
- Summary of risk assessment findings on fishing-related threats to Maui's dolphins
- Susceptibility to fishing-related mortality from set nets and trawl nets
- Assessment of the WCNI set net and trawl fisheries
- Other management measures
- Monitoring coverage
- Research and collaboration
- Conclusion
- Appendices

4 INTRODUCTION

Hector's and Maui's dolphins, subspecies endemic to New Zealand, are two of the world's rarest dolphins. Hector's dolphins were gazetted in 1999 as a threatened species under the Marine Mammals Protection Act 1978. Maui's dolphin was identified as a separate subspecies in 2002 and is listed as Nationally Critical under the New Zealand Threat Classification System and Critically Endangered under the International Union for the Conservation of Nature (IUCN) Red List Categories and Criteria. Both classifications indicate the Maui's dolphin is facing a high risk of extinction and that active management is required to mitigate human impacts.

The government's Vision Statement[2] for the management of Hector's and Maui's dolphins includes:

> *"Hector's and Maui's dolphins should be managed for their long-term viability and recovery throughout their natural range."*

As part of a long-term strategy to achieve this vision, and public and government concern over the effect of human-induced mortality on these dolphins, the Hector's and Maui's dolphin TMP was developed in 2008. The TMP is led by the Department of Conservation (DOC) and MPI. The TMP is a non-statutory plan that identifies human-induced threats to Hector's and Maui's dolphin populations and outlines strategies to mitigate those threats.

4.1 Objectives

The goals of this review of the Maui's portion of the TMP are:

1. To ensure that the long-term viability of Maui's dolphins is not threatened by human activities (both direct and indirect); and
2. To further reduce impacts of human activities as far as possible, taking into account advances in technology and knowledge, and financial, social and cultural implications.

There are fishing- and non-fishing-related threats facing Maui's dolphins. You have powers to manage fishing-related threats. The Minister of Conservation will consider measures to manage non-fishing-related threats.

[2] The Vision Statement is derived from the Department of Conservation's 2005 Conservation General Policy.

4.2 Status quo

Restrictions on fishing for managing threats to Maui's dolphins off the west coast of the North Island (WCNI) affect the commercial and amateur set net fishery, and commercial trawl fishery (Map 1).

4.2.1 Set net restrictions and prohibitions

Commercial and amateur set netting is prohibited from Maunganui Bluff to Pariokariwa Point between zero and seven nautical miles offshore, inside the entrances of the Kaipara, Manukau, and Raglan Harbours, and around the Port Waikato river mouth.

The areas closed to set net were put in place to help avoid Maui's dolphin entanglements. This required information on where dolphins and set net fishing co-occur and this was determined using a combination of:

- Strandings and mortalities (that is dead dolphins washed ashore and dolphins recovered entangled in nets)
- Verified public sightings,
- DOC/MPI sightings
- Aerial and boat-based research surveys, and
- The nature of set net activity in the entrances of harbours (or just outside the entrances) where dolphins have been observed.

The introduction of these boundaries began in 2003 (set net ban out to four nautical miles) and the most recent extension of the set net prohibition (prior to the interim measures) was out to seven nautical miles in March 2011[3]. During the development of the TMP in 2008 it was noted although there had been occasional, unsubstantiated public sightings of Maui's dolphins south of Pariokariwa Point, there had been no verified sightings in the area. These sightings were considered to reflect isolated and infrequent use of the area by dolphins. The then Minister of Fisheries decided that the Taranaki region is unlikely to be part of the Maui's dolphin range.

In light of the January 2012 mortality of a Hector's or Maui's dolphin off Cape Egmont in the Taranaki area and the recent population estimate of Maui's dolphins, your predecessor considered it necessary to manage the residual risk in the Taranaki area. Interim measures were put in place for the protection of Maui's dolphins while the review of the Maui's dolphin portion of the TMP was undertaken. The interim measures[4] came into effect in July 2012 and:

- Prohibit commercial and amateur set netting from Pariokariwa Point to Hawera out to two nautical miles, and
- Prohibit commercial set netting from Pariokariwa Point to Hawera between two and seven nautical miles offshore unless an observer is onboard.

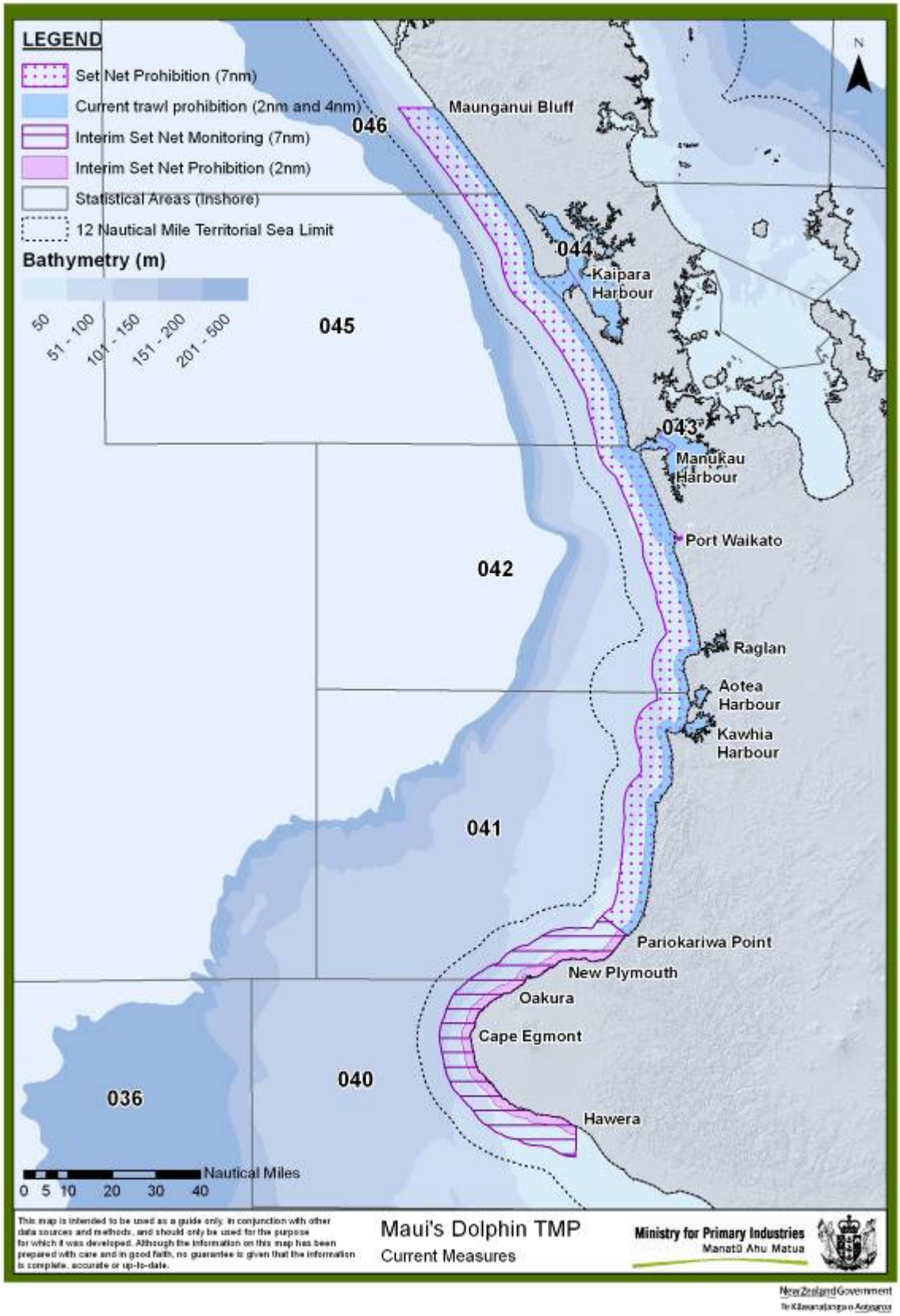
The mandatory observer coverage will not prevent any dolphin mortalities occurring but such monitoring is considered necessary to gather greater information on the presence of dolphins in the area and their subspecies identity to better inform management.

This observer coverage in the restricted area between zero and seven nautical miles costs approximately $0.3 million to $0.5 million per year, and it is currently being funded by the Crown.

[3] Following legal challenge the Minister's decision from the 2008 TMP to extend the set net ban out from four to seven nautical miles (Maunganui Bluff to Pariokariwa Point), interim relief was provided to commercial fishers to allow set netting for rig and school shark from 1 October to 24 December in 2008, 2009, and 2010. In March 2011, after reconsidering his decision, the Minister maintained the extension of the set net prohibition out to seven nautical miles.

[4] Fisheries (Set Net Prohibition from Pariokariwa Point to Hawera) Notice 2012

In addition to the areas where set nets are prohibited, there are other commercial and amateur set net regulations and voluntary systems that may help reduce the likelihood of interactions with Maui's dolphins.



Map 1. Current set net and trawl restrictions and prohibitions off the west coast of the North Island shown with the relevant inshore statistical reporting areas (40 – 46).

Commercial set nets

The following commercial set net rules apply throughout New Zealand fisheries waters[5]:

- Commercial fishers cannot use more than 3000 metres of net per day without written authorisation from the Director General[6]
- Commercial fishers must service their net while it is set at least every 18 hours

Amateur set nets

The following amateur set net rules apply throughout New Zealand fisheries waters[7]:

- Amateur nets must not exceed 60 metres in length
- The use of stakes to secure amateur nets is prohibited
- Amateur set nets must not be set in a way that causes fish to be stranded by the falling tide
- Amateur nets must not be set within 60 metres of another net

MPI also publicises an amateur set net Code of Practice that promotes good netting practice, including:

- Using a net designed for the fish species being targeted
- Deploying a net with anchors that are suitable for sea conditions to prevent losing nets
- Setting a net that can be easily retrieved
- Staying with and regularly checking the net
- Avoiding setting nets when dolphins are present
- Deploying a net for the shortest soak time possible
- Avoiding setting nets overnight

4.2.2 Commercial trawling prohibitions

Commercial trawling is prohibited between zero and two nautical miles offshore between Maunganui Bluff and the Manukau Harbour, and Port Waikato to Pariokariwa Point (Map 1). Between the Manukau Harbour and Port Waikato, trawling is prohibited between zero and four nautical miles offshore. The restrictions were put in place in 2008 to manage the risk that trawlers in this area could catch Maui's dolphins. Trawling is also prohibited in defined areas including: Kaipara Harbour, Manukau Harbour, Hokianga Harbour, Waikato River Mouth, Raglan Harbour, Aotea Harbour, and Kawhia Harbour.

4.2.3 Customary fishing

In 1992 the Crown introduced legislation empowering the making of regulations recognising and providing for customary food gathering and the special relationship between the Tangata Whenua and places of importance for customary food gathering[8]. These regulations enable tangata tiaki/kaitiaki, or a tangata whenua representative appointed for the area, to issue authorisations.

Kaitiaki have a responsibility to ensure the sustainability of fisheries for future generations. Customary authorisations are a key tool of the regulations; however Kaitiakitanga is not limited to only authorisations. While Kaitiaki may continue to issue authorisations for

[5] Fisheries (Commercial Fishing) Regulations 2001
[6] Off the WCNI one fisher has authorisation to use more than 3000 m of net per day between 12 and 60 nautical miles from shore.
[7] Fisheries (Amateur Fishing) Regulations 1986
[8] Fisheries (Kaimoana Customary Fishing) Regulations 1998

customary food gathering in an area that is subject to commercial and/or recreational closure, it is discouraged.

The current management measures (and those proposed in this paper) do not impose restrictions on Maori customary fishing, which is authorised by kaitiaki. This is consistent with measures put in place to date in respect of Hector and Maui dolphins. The DOC incident database has no Maui's dolphin mortalities attributable to customary set net fishing. MPI understands the use of set nets for customary fishing is low off the WCNI (occasionally targeting taonga species like mako (rig)/lemon shark) and, accordingly, believes the associated risk to Maui's dolphins is low because of the low level of activity.

MPI received verbal comment from some iwi representatives that in Taranaki the local kaitiaki are reluctant to issue any customary permits to enable set netting for some species because of the set net ban in place for commercial and recreational fishers. MPI was told that this was impacting on local iwi being able to provide for their people.

MPI will work alongside tangata tiaki/kaitiaki to raise awareness of the issues and to sustainably manage fisheries and protected species like the Maui's dolphin.

4.2.4 Effectiveness of current measures

Low levels of independent bycatch monitoring by observers means that the level of interaction between trawling and commercial set nets and Maui's dolphins outside the closed areas under the management framework (pre-interim measures) cannot be determined with certainty. Limited monitoring results in uncertainty around catch rates of Maui's dolphins in set net and trawl gear (including any geographical and seasonal variations in catch rates) and consequently the effectiveness of the closed area is unknown.

Fishers are required by law to report any dolphin entanglement. However, MPI cannot be certain that fishers always see and report all fishing-related mortalities. Consequently, the reported fishing-related mortalities may be underestimates and, as such, MPI cannot determine with certainty the extent of actual Maui's dolphin mortalities caused by fishing. However, refer to section 4.3.1 for further information.

4.3 Problem definition

A review of the current management measures to mitigate the risk of a fishing-related mortality in the Maui's dolphin population is appropriate because:

- The most recent Maui's dolphins research estimates:
  - there are approximately 55 dolphins over 1 year old and the population is likely to be declining[9]
  - the population can sustain at most one human-induced mortality every 10 to 23 years without impacting on its ability to rebuild and ensure long-term sustainability[10]
  - the population does stand a chance of recovery if human-induced mortalities are adequately reduced[11].
- A Hector's or Maui's dolphin died in a commercial set net off Cape Egmont, Taranaki in January 2012 ('the January mortality') outside of the areas closed to set net fishing after the development of the TMP in 2008. Subsequently a Hector's dolphin was found washed up south of Cape Egmont in April 2012.
- Information indicates that fishing is the greatest known cause of human-induced mortality of Maui's dolphins.
- The government is concerned over the status and trends of the Maui's dolphin population and has an overall commitment to rebuild threatened species.

[9] Hamner *et al.* (2012)
[10] Wade *et al* in Currey *et al.* (2012)
[11] Currey *et al.* (2012)

MPI considers that much of the risk to the Maui's dolphin population has been managed with the management measures in place throughout large portions of their range. However, there remains an unknown level of residual risk of fishing-related mortality to Maui's dolphins off the WCNI. This residual risk is thought to be posed at the margins of Maui's dolphin distribution, that is, where Maui's dolphin may occasionally range but their presence is considered rare and infrequent.

4.3.1 New information available

For the review of the Maui's dolphin portion of the TMP, MPI and DOC convened a risk assessment workshop in June 2012 to identify, analyse and evaluate all threats to Maui's dolphins[12]. It also identified those threats that pose the greatest risk to achieving management objectives of the TMP.

The risk assessment scoring was conducted by an expert panel of domestic and international specialists in marine mammal science and ecological risk assessment. The panel considered all of the known actual or potential threats to the population and provided estimates of associated impacts (*e.g.* dolphin deaths) based on the estimated spatial overlap between the dolphin distribution and the distribution of each threat, and the expected level of vulnerability of the dolphins to each threat. For each threat, each panel member estimated the number of associated dolphin mortalities arising from the threat, *and* the level of uncertainty around that estimate. The risk assessment sought to identify threats that, at current levels, were likely to affect population trends within the next five years.

To inform the assessment an estimated spatial distribution for Maui's dolphins was agreed to by the panel (based on a combination of statistical analyses from survey data in areas where data were adequate and application of habitat proxies based on expert knowledge in data-poor areas). The estimated dolphin distribution could then be overlaid with spatial distributions of activities identified as threats to Maui's dolphin. The limits of the dolphin distribution included Maunganui Bluff in the north, Whanganui in the south, and an offshore limit of seven nautical miles. The panel reflected in the map that the likelihood of a dolphin encounter declined with distance south of Raglan and distance offshore.

The risk assessment panel's scores suggested a broad range of plausible values for fishing-related Maui's dolphin mortalities over the next 5 years (combining the estimates of all expert panellists yields a median estimate of approximately 5 dolphins per year, with 95 percent of the distribution of scores being between 0.3 and 8 dolphins per year). Notwithstanding the uncertainty, these scores equate to about 95 percent of total human-induced Maui's dolphin mortality as estimated by the risk assessment panel.

Population projections based on the panel's estimated total mortalities suggest that there is about a 96 percent likelihood of population decline in the Maui's dolphin population over the next 5 years. The population projections suggest that, at the estimated median rate of human-induced mortality, the population will decline at 7.6 percent per year (projections based on the full range of estimated mortalities range from a possible 13.8 percent decline per year to a possible 0.1 percent increase)[13].

The risk assessment report considered the chances the Maui's dolphin population can recover given its current status even if sources of human-induced mortality were eliminated. The panel judged that the population could recover if the population grew at its maximum estimated growth rate of 1.8 percent per year in the absence of human impacts. Further evidence they considered supported recovery include:

[12] Currey *et al.* (2012).

[13] Note the panel's scores suggest a rate of population change that is more negative than, but broadly consistent with, a recent empirical estimate by Hamner *et al.* (2012). Hamner et al. estimated a population decline of 3 percent per year (with a 95 percent confidence that population change was between an 11 percent decline to a 6 percent increase), noting a downward or upward trend could not be confirmed with 95 percent confidence. Subsequent analysis by Wade et al (Appendix 1 in Currey *et al.* 2012) estimated using the data from Hamner et al estimate that based on the empirical evidence available there is a 75.3 probability the population is declining.

- evidence in other cetacean populations that if human-induced mortalities are adequately reduced the population does stand a chance of recovery,
- the level of genetic diversity in the Maui's dolphin population is higher than expected given the estimated size of the population,
- a near even sex ratio but with slightly more females in the Maui's population, and
- the presence of Hector's dolphins within the Maui's population, which provides the potential for interbreeding between the subspecies and possible population replenishment from immigration.

MPI notes the range in scores on the estimated number of dolphin mortalities per year reflects the high degree of uncertainty about the impact of the cumulative and individual threats to Maui's dolphins. The estimates represented a judgement by the panel members, given available information and taking into account input from stakeholders and other informed workshop attendees. MPI is using the risk assessment as a guide to inform where mitigation might be best placed to reduce the risk to Maui's dolphins from fishing-related mortality, including the type and location of fishing activities considered the greatest threat.

4.3.2 Need for action

The need for you to act will be determined by careful consideration of your responsibilities under the Fisheries Act 1996 ('the Act'). Factors you need to consider in making your decision include:

- Biology of the Maui's dolphins including:
  - Abundance and population trends
  - Alongshore, harbour, and offshore distribution
  - Vulnerability of the population to human-induced impacts
  - Known susceptibility of the population to fishing
- Assessment of the effect of set net fishing, including:
  - Characterisation of the fishery
  - Effectiveness of current measures in mitigating threats
  - Information on, or likelihood of, set net related mortalities or interactions with Maui's dolphins
- Assessment of the effect of trawl fishing, including:
  - Characterisation of the trawling fishery
  - Effectiveness of current measures in mitigating threats
  - Information on, or likelihood of, trawl related mortalities or interactions with Maui's dolphins
- Overall assessment of the effect of fishing-related mortality on Maui's dolphins off the WCNI and whether it is necessary pursuant to sections 11 or 15(2) of the Act for you to impose more measures in the area.

The degree of risk of fishing-related mortality relates to the likelihood of an encounter with fishing gear. This is determined by the local abundance of Maui's dolphins and the frequency and nature of fishing in that area. The frequency of fishing can be influenced by management measures, and the likelihood of an interaction resulting in mortality can be reduced by the use of effective management measures. An understanding of distribution and likelihood of interaction is required to determining the appropriate management measure.

4.4 Consultation

Section 12 of the Act requires you to consult with such person or organisation as you consider are representative of those classes of persons having an interest in the stock or the effects of fishing on the aquatic environment in the area concerned. This includes Maori, environmental, commercial and recreational interests.

The process also requires you to provide for the input and participation of tangata whenua having a non-commercial interest in the stock concerned, or an interest in the effects of fishing on the aquatic environment in the area concerns and have particular regard to kaitiakitanga.

On 24 September 2012, MPI and DOC released a consultation document for seven weeks of public consultation. The document was published on the MPI and former fisheries external websites, the DOC external website, and stakeholder letters were sent to persons and organisation with an interest and/or affected by the proposals contained in the document. The distribution list included tangata whenua, and environmental, recreational and commercial sector stakeholders.

MPI also participated in targeted engagement with various stakeholders and public meetings, which included representatives from tangata whenua, the fishing industry, non-commercial fishing interests, and ENGOs.

Some of the options presented in this final advice paper for your consideration are different than those consulted on. These differences reflect additional information or proposals received from stakeholders during the consultation process. Additional management measures for your consideration are included in each of the fishery/area specific sections as well as section 10.

4.4.1 Summary of submissions

The seven week consultation period ended on Monday 12 November 2012. Late submissions (88) continued to arrive up to 5 December 2012. A total of 70,976 submissions were received that commented on fishing-related impacts and/or general protection of the Maui's dolphin[14].

The consultation document and copies of all submissions received are provided in an accompanying volume to this advice paper.

Of the total number of submissions received, 70 521 were electronic and mail form or petition submissions that originated from the following organisations:

- Forest and Bird (228, 97 with additional comments)
- Green Party (353, 30 with additional comments)
- Greenpeace NZ (18388)
- Let's Face It (4818 visual signatories)
- Maui's & Hector's Dolphins Education/Action Inc. (51)
- Maui's Last Stand (308, 64 with additional comments)
- NABU – Change.org (14880, 2936 with additional comments)
- NABU – Mail Form (12)
- One Voice France (42)
- WWF New Zealand & International (31441)[15]

[14] The Ministry for Primary Industries has not summarised submissions received that addressed specific non-fishing-related threats to the Maui's dolphin population outside its mandate (for example, oil and gas, mining, and shipping).
[15] These letters were sent to Hon John Key between August and November 2012 and are being noted as part of the public feedback received on the review of the TMP.

Submissions were received also from (and/or on behalf of) 86 organisations listed in Table 1. An additional 281 submissions were received from individuals (a subset of which is listed in Table 2).

Table 1: Organisations that submitted on the Maui's dolphin TMP consultation paper

Organisations submitting			
Customary, commercial and recreational representatives	Councils/Local Boards/ Regional Development Agencies	ENGOs/Conservation Boards/Societies/Other	
Challenger Finfisheries Management Co.	Auckland Council	Auckland Labour Environment Network	"Let's Face It"
Counties Sports Fishing Club Inc.	Devonport-Takapuna Local Board	Auckland Conservation Board	Maui's & Hector's Dolphins Education/Action Inc.
New Zealand Recreational Fishing Council	Manukau Harbour Forum	A Rocha Aotearoa	Muriwai Environmental Action Community Trust
Sanford Limited	Taranaki Chamber of Commerce	Earthrace Conservation	NABU International – Foundation for Nature
Seafood New Zealand	Taranaki Regional Council	Environmental Defence Society	New Zealand Marine Sciences Society
South East Finfish Management Co.	Waiheke Local Board	Environment and Conservation Organisations of NZ	Nga Motu Marine Reserve Society Inc.
Te Atiawa (Taranaki) Holdings Ltd.	Waitakere Ranges Local Board	Greenpeace	Project Jonah
Taranaki Iwi Trust	Whau Local Board	Forest & Bird	Taranaki/Whanganui Conservation Board
Te Atiawa (Taranaki) Settlements Trust	Venture Taranaki Trust	Forest & Bird – Manawatu Branch	Waitakere Ranges Protection Society Inc.
Te Ohu Kaimoana Trustee Limited		Forest & Bird – Mercury Bay Branch	West Coast *Tai Poutini* Conservation Board
Te Runanga o Ngati Whatua		Friends of Taputeranga Marine Reserve Trust	Whale & Dolphin Conservation Society
Te Uri o Hau Settlement Trust – Environs Holdings		Forest & Bird – North Canterbury Branch	WWF International
		Additional international organisations in the footnote below[16]	WWF – New Zealand
		Korokoro Environmental Group	

[16] NZ Whale & Dolphin Trust, Humane Society International, Sea Shepherd, Society for Conservation Biology (SCB) – Victoria University of Wellington chapter, Care for the Wild International, Animal Welfare Institute, International Fund for Animal Welfare, World Society for the Protection of Animals, Cetacean Society International, American Cetacean Society, International Marine Mammal Project of Earth Island Institute, Campaign Whale, Whale Conservation Institute, Nantucket Marine Mammal Conservation Program, Origami Whales Project, The Whaleman Foundation, Save the Whales Again!, Surfers for Cetaceans, Ocean Care, Natural Resources Defense Council, Ric O'Barry's Dolphin Project, Fundacion Yubarta, Instituto Baleia Jubarte, Org. Para la Conservacion de Cetaceos – Uruguay, Mammals Encounters Education Research, Programa EcoMar, East Caribbean Coalition for Environmental Awareness, Pacific Whale Foundation, Comarino , Fundacion Cethus, acorema, equilibrio Azul, fun demar – Fundacion Dominicana de Estudios Marinos Inc, EIA, Elsa Nature Conservancy – Japan, Pro Wildlife, PreservePlanet.org, Green Heritage Fund Suriname, Green Vegans, Asociacion Verde de Panama (ASVEPA), Centro para la Conservacion y Desarrollo de Samana – Dominican Republic

Table 2: Subset of individuals that submitted on the Maui's dolphin TMP consultation paper

Individuals submitting		
Commercial fishers	Customary and recreational fishers	Academics
G Mackenzie	T Rea	Otago University – Dr E Slooten
A Wilson	B Chamberlain	Otago University – Dr S Dawson
DM Mawson	J Rawling *et al*. (+4)	Otago University – Dr W Rayment
Mr. J Ansley	M Roberts	Otago University – Dr J Howarth
Mrs. J Ansley	D Lawrence	Massey University – Dr C Cheyne
I McDougall	P Mullings	Auckland University – Dr S Knight-Lenihan
C Powell	A Woodger	GNS Science – D Strong
K Torpey	G Katipa	
G Torpey	R Reid	
R Ansley	M Parker	
P Botica	M Emerson	
K Mawson (Egmont Seafoods Ltd)		

Consultation process

Submission comments

A number of submissions considered the seven week consultation period too short to make a comprehensive submission given the size and complexity of the consultation document. Concerns and suggestions raised included:

- Only key issues need to be included in the consultation paper to make it shorter and more accessible to a broader audience.
- There was insufficient time to discuss the issues with constituents or individuals/groups they represent.
- There was a lack of public notification about the consultation period and process.
- There were insufficient face-to-face meetings or public engagement.

While some submissions felt the consultation paper and accompanying risk assessment report were too long and/or complex, other submitters expressed their appreciation that all available information was collated and presented in one place to help inform the review.

MPI response

MPI considers the seven week consultation period to be reasonable and notes that nearly all submissions were received by the deadline, which indicates a large number of people had time to comment. MPI also accepted late submissions and considered those during the analysis of submissions.

MPI considers there is a need to find a balance between making decisions in a reasonable period and allowing enough time for comment. MPI recognises the consultation document contained a lot of background information. However, it was important that information was available for all stakeholders to access. The consultation document was available in sections to enable those interested in the high-level summary information to access those portions alone, rather than all the background material.

Characterisation of submissions

Customary fishing interests

Submissions received from iwi were supportive of a collaborative or integrated approach to the management of human-induced threats on Maui's dolphin. Some submissions were supportive of a complete ban on set net and trawl activity to provide greater protection for the dolphins. Others considered information too uncertain or unfairly balanced towards the detriment of the fishing industry with which they also had commercial interests.

Additional themes included:

- There is opportunity for kaitiaki to participate in the management of fisheries and fishing-related impacts.
- Supportive of discussions on fishing gear exemptions and modification of fishing practices (e.g. supportive of seasonal closures as a tool to manage risk to the dolphins).

Commercial fishing interests

Eight submissions[17] from organisations representing (or supporting submissions made on behalf of) the fishing industry opposed any additional management options that would result in any increase in spatial restrictions or exclusion to the set net or trawl fisheries. Most of these submissions supported:

- the status quo,
- a relaxation of current measures to allow some fishing in areas where it is currently prohibited,
- some increased monitoring but noted that any monitoring effort should be Crown-funded. Although Seafood New Zealand (SNZ) indicates a cost-share model could be discussed if some fishing was allowed within a current restricted area,
- More research on dolphin distribution and non-fishing-related threats that may be contributing to the decline of the population.

Some expressed doubts about the risk assessment and other empirical findings about the Maui's dolphin distribution, abundance and rate of population decline.

Many noted they have not seen a Maui's dolphin in the areas they fish and their activities pose no risk to the dolphins because the dolphins are not present.

Recreational fishing interests

Two submissions[18] were received from organisations representing recreational fishers. NZRFC supports retaining current management measures for set net activity in Taranaki and the harbours, and an extension of the trawl ban to four nautical miles offshore from Kaipara to Tirua Point. CSFC support the status quo with respect to set net activity in the Manukau Harbour.

Individual submissions from, or on behalf of, recreational fishers were focused mainly on the proposed set net ban extension in the Manukau Harbour. They considered there was no new information to support such a measure and that the dolphins are not present inside the harbours. Some noted the dolphins may occasionally frequent the entrances but that these areas already have sufficient restrictions in place.

Councils, boards, regional development agencies

Ten submissions were received from local councils/boards, chambers of commerce, and one regional development agency[19].

[17] Challenger Finfisheries Management Co., Sanford Ltd, Seafood New Zealand, South East Finfish Management Co., Te Atiawa (Taranaki) Holdings Ltd, Taranaki Iwi Trust, Te Atiawa (Taranaki) Settlements Trust, Te Ohu Kaimoana Trustee Ltd.
[18] Counties Sport Fishing Club Inc (CSFC), NZ Recreational Fishing Council (NZRFC)
[19] Auckland Regional Council, Taranaki Regional Council, Waitakere Ranges Local Board, Whau Local Board, Waiheke Local Board, Devonport-Takapuna Local Board, Ruth Dyson (Labour Party), Mayor Wade-Brown (Wellington), Taranaki Chamber of Commerce, Venture Taranaki Trust

The Auckland Council with supportive motions by local boards in the region recommended that the use of commercial and amateur set nets and commercial trawl be banned out to the 100 m depth contour, within the harbours and along a 'corridor' between the North and South Islands.

The Taranaki Chamber of Commerce (TCC) and Venture Taranaki Trust highlighted the uncertainty in information and lack of evidence regarding the presence of Maui's dolphins in the Taranaki region. They supported a risk management approach versus and exclusionary one and suggested some commercial fishing within the current prohibition area could be permitted. TCC considers there is adequate protection for the dolphins in their known range, which is not Taranaki.

In the absence of removal of fishing-related threats most submissions considered monitoring and the introduction of a robust observer programme necessary. Some expressed a need for 100 percent coverage in light of the rarity of an encounter in some areas but the high consequences to the population should one occur.

Environmental non-governmental organisations and community groups

Submissions from, or on behalf of, 67 organisations represented environmental non-governmental organisations (ENGOs), Conservations Boards and societies were received.

These submissions consider the management options proposed vastly inadequate to address the threat from fishing-related activities to the Maui's dolphin population. The majority of these submissions supported a ban on set net and trawl activities firstly out to the 100 m depth contour, and a ban of all set net activity in the WCNI harbours.

Within these submissions, five indicated if a ban out to the 100 m depth contour was not feasible they would support a set net and trawl ban out to at least 12 nautical miles from shore. Three indicated a minimum ban out to seven nautical miles from shore should at least be considered.

Supporting reasons for their positions included:

- The very small population size requires immediate and effective management action
- The current management measures/approach has shown to be ineffective therefore a precautionary one needs to be adopted.
- The risk assessment findings and the PBR estimate.
- The management measures proposed would not prevent a Maui's dolphin mortality.
- The absence of proof is not evidence and the lack of information or uncertainty does not excuse the failure to make precautionary decisions.
- The possibility of New Zealand becoming the next country (after China) to allow the extinction of an endemic marine mammal.
- New Zealand's international obligations under the United Nations Convention on the Law of the Sea (UNCLOS) or Convention on Biological Diversity (CBD)

Academics and research institutes

A number of submissions have been received from scientists or academics people, or organisations. Most consider that the scientific advice provided in the Risk Assessment has not been translated into management options in the consultation paper. They consider that the protection measures proposed are inconsistent with the available data.

Given the national (Fisheries Act, Marine Mammal Protection Act) and international obligations (Convention on Biological Diversity and the United Nations Convention on the Law of the Sea) ratified by New Zealand, they would have expected the Consultation Paper to include management options that more effectively avoid, remedy and/or mitigate fisheries impacts on Maui's dolphins than currently proposed.

They consider that none of the options presented in the discussion document have a realistic chance of achieving the recovery of the Maui's dolphin population. They all support the IUCN and IWC recommendations to protect the population from gillnet and trawl fisheries, from the coastline (including harbours) out to the 100 m depth contour - or an offshore distance that is consistent with it (*i.e.* 12 nautical miles).

They base their support for the IUCN and IWC recommendations on the following points:

- The current estimate of the population size and its classification as "critically endangered" by the IUCN.
- The risk assessment panel made it clear that recovery is still possible, but decisive management action is urgently needed.
- Due to the paucity of research on the species and, in the absence of robust information, a precautionary approach is needed.
- They consider that management decisions should be based on the best available science, which supports the IUCN recommendations.
- The size and shape of protected areas should be decided on the basis of the dolphins' distribution and not on current overlap between dolphins and fishing.

Some submitters support a change to more selective and sustainable fishing methods which may provide economic benefits to the fishing industry in the long term.

General public submissions

The majority of submissions from individuals (through their personal or petition/form based letters) considered the measures proposed by MPI in the consultation paper inadequate to address the threat from fishing-related activities to the Maui's dolphin population.

Petition or form based

Over 70 800 submissions received opposed the management options proposed by MPI:

- Almost all of which suggesting protection measures greater than the options presented in the paper were required, including various combinations of the following:
    - A ban on set net in all west coast North Island harbours[20], and/or
    - A ban on set net and trawl out to the 100 m depth contour, and/or
    - A ban on set net and trawl out to 12 nautical miles from shore and/or
    - A ban on set net and trawl out to 7 nautical miles from shore.
- The alongshore extent of the proposed bans varied, but included:
    - along the entire range of Maui's dolphin
    - from Maunganui Bluff to Whanganui
    - along the entire west coast of the North Island

Individual

The vast majority of the public submissions received supported increasing protection measures for the Maui's dolphin and doing so by extending the bans on set net and trawl activity. Most expressed support for a general fishing ban, others explicitly noted their support for a set net and trawl ban out to the 100 m depth contour, within the harbours and the provision of a corridor between the North and South Islands.

Additional comments from individuals and via the petition or form-based submissions included a range of reasons for the support of extensive fishing bans off the WCNI, including:

- the need to do everything possible to avoid a species extinction
    - extinction is forever, the fishing can come back
- the need for creatures to be protected for future generations
- concerns about New Zealand's international image
- concerns about the ecosystem as a whole and a desire to protect the oceans and its inhabitants, and
- disbelief that the government would continue to put greed, profits and industry ahead of conservation.

[20] Some submissions also proposed a trawl ban in all west coast North Island harbours but this is already a prohibited activity.

5 LEGISLATIVE CONSIDERATIONS

In making any decisions under the Act you must:

- act in a manner consistent with New Zealand's international obligations relating to fishing and with the provisions of the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992 (section 5).

- bear in mind and conform to the purposes of the Act (as set out in section 8) to provide for the utilisation of fisheries resources while ensuring sustainability:
    - ensuring sustainability means maintaining the potential of fisheries resources to meet the reasonably foreseeable needs of future generations and avoiding, remedying, or mitigating any adverse effects of fishing on the aquatic environment;
    - utilisation means conserving, using, enhancing, and developing fisheries resources to enable people to provide for their social, economic, and cultural well-being.

- take into account the environmental principles set out in section 9 of the Act:
    - associated or dependent species should be maintained above a level that ensures their long-term viability[21];
    - biological diversity is maintained, and;
    - habitat of particular significance for fisheries management should be protected.

- take into account the following information principles as set out under section 10 of the Act:
    - decisions should be based on best available information;
    - decision makers should take into account any uncertainty in the available information;
    - decision makers should be cautious when information is uncertain, unreliable or inadequate, and;
    - the absence of, or any uncertainty in, any information should not be used as a reason for postponing or failing to take any measure to achieve the purpose of the Act.

- take into account the requirements regarding sustainability measures set out in section 11 of the Act.

See Appendix 1 for further analysis of the statutory background.

5.1.1 Implementing your decisions

You may consider two tools under the Act to put in place the management options presented in this paper:

- Sustainability measures via regulation or Gazette notice under section 11, or
- Sustainability measures via regulation under section 15(2).

Section 11

Section 11 of the Act allows the Minister to set or vary any sustainability measure for one or more stocks or areas after taking into account the affects of fishing on the environment, existing controls under the Act and the natural variability of the stock concerned. Section 11 sustainability measures can be put in place by either regulation or Gazette notice.

[21] The term "long term viability" is defined in the Act as meaning there is a low risk of collapse of the species and the species has the potential to recover to a higher biomass level.

Section 15

Section 15(2) allows you, in the absence of a population management plan and after consultation with the Minister of Conservation, to take such measures that you consider are necessary to avoid, remedy, or mitigate the effect of fishing-related mortality on any protected species[22]. You must consider what is 'necessary' in light of the purpose and principles of the Act. Such measures may include, but are not limited to, setting a limit on fishing-related mortality[23]. Any sustainability measure set under section 15(2) would be introduced by way of regulation.

Section 15(3) provides that you may require, or authorise the chief executive to require any person or class or persons (listed in section 189) to give you or the chief executive such information on fishing-related mortality as you or the chief executive, as the case may be, considers necessary. That information may be required in the approved manner and form.

Section 15(4) allows you to recommend the making of such regulations under section 298 of the Act as are considered necessary or expedient for putting in place any measures referred to in section 15(2) or section 15(3).

Case law on Section 15(2)

The Court of Appeal has commented that in considering whether to take any measure under section 15(2), you are required to form a view as to the extent which (or perhaps the point at which) utilisation of the fish resource threatens the sustainability of the protected species[24].

The Court of Appeal also commented on the difference between your obligations in relation to harvestable species and protected species. The Court commented that in the context of a harvestable species, balancing utilisation objectives and conservation values requires utilisation to the extent it is possible[25]. However, the Court noted that setting a fishing-related mortality limit for protected species under section 15(2) requires a different type of exercise[26].

The Court indicated that section 15(2) involved balancing risks on one hand against utilisation advantages on the other[27]. You are required to address the extent to which use of fisheries resources conflicted with conservation of the protected species. The Court also commented that "fishing-related mortality" refers only to the death of the protected species in the course of fishing activity.

Precautionary approach

The Court of Appeal[28] has recognised that a precautionary approach is available to you when considering the extent to which use of fisheries resources threatened the sustainability of a protected species population. The context of this case was the impact of squid fishing on the sea lion population. This approach was endorsed by Mallon J in the High Court in 2009 when considering measures put in place to protect Hector's and Maui's dolphins[29].

[22] Section 15(2) of the Act applies if there is no population management plan (PMP) that has been approved under section 14F of the Wildlife Act 1953 or section 3E of the Marine Mammals Protection Act (MMPA). Maui's dolphins are a protected species for the MMPA. Therefore, they are also 'protected species' under the definition in the Act and section 15. There is no PMP in place for Maui's dolphins. In the absence of a PMP, section 15(2) of the Act applies.
Section 15(2) of the Act applies if there is no population management plan (PMP) that has been approved under section 14F of the Wildlife Act 1953 or section 3E of the Marine Mammals Protection Act (MMPA).

[23] MPI is not proposing to introduce any fishing-related mortality limits (FRML) for Maui's dolphins in this paper. However, MPI does discuss the concept of a FRML as a possible management approach later in the paper. MPI notes that should a confirmed fishing-related mortality of a Maui's dolphin occur before, or after, you make your decisions on any additional long-term measures you can look to put in place emergency measures to further reduce fishing-related threat to the Maui's dolphin population.

[24] *The Squid Case*: *Squid Fishery Management Company v Minister of Fisheries* (Unreported, Court of Appeal, 13 July 2004) Hammond, William Young, O'Regan JJ) para 79.

[25] *The Squid Case,* para 75.

[26] *The Squid Case,* para 77.

[27] *The Squid Case,* para 77.

[28] *The Squid Case*, para79.

[29] *New Zealand Federation of Commercial Fishermen Inc et al* v *Minister of Fisheries and Chief Executive of Ministry of Fisheries* High Court, Wellington, 23 February 2010, CIV 2008-485-2016, para 19).

6 KEY BIOLOGICAL CHARACTERISTICS

This section summarises the best available information on Maui's dolphin abundance and population trends; alongshore, harbour, and offshore distribution; and vulnerability of the population to fishing-related threats.

6.1 Uncertainty in the biological information

When reviewing the biological information, the following areas of uncertainty are relevant to your deliberations.

6.1.1 Abundance and population trend of Maui's dolphins

There is some uncertainty about the current population estimate for Maui's dolphins. MPI notes that previous abundance estimates are not directly comparable and we should be cautious about drawing firm conclusions from them about specific levels of population decline. However, all Maui's dolphin abundance estimates consistently show that the population is very small, and the available information suggests it has probably declined from higher levels of abundance.

6.1.2 Distribution of Maui's dolphins

Sightings data (and acoustic detections in harbours) have been used to infer the likely alongshore, within harbour, and offshore extent of the Maui's dolphin range in the absence of confirmed observations (which require genetic testing). The uncertainty in Maui's dolphin distribution is due to the:

- small population size of Maui's dolphins (leading to naturally infrequent sightings);
- range in reliability of sightings information[30];
- snapshot nature of aerial and boat-based surveys and where that effort has been concentrated;
- inability to confirm, without genetic testing, whether a sighting or acoustic detection is of a Hector's dolphin or Maui's dolphin, and;
- limited information available on the extent and frequency of use of WCNI harbours by Maui's dolphins.

6.1.3 Vulnerability of Maui's dolphin population to human-induced threats

The nature of Potential Biological Removal (PBR) analysis[31], or any modelling exercise relying on estimated biological and variable inputs, does not necessarily lend itself to decision making with certainty. Rather, it provides a general indication of the ability of the population to sustain human-induced mortalities.

6.1.4 Long-term viability

Biological and stochastic factors[32] mean that there is a great deal of uncertainty around the minimum abundance that will ensure the long-term viability of Maui's dolphins, and consequently there is no definitive guidance for you on the level above which the species should be maintained. However, for the size of the population to be viable in the long term relies on the effectiveness of the management measures currently in place.

[30] MPI and DOC consider that a scale of reliability can be applied to sighting information to support analysis of Hector's and/or Maui's dolphin distribution off the WCNI. The scale of reliability is a continuum from most reliable (and lease uncertain, that is Category 1 sighting) to least reliable (and most uncertain or likely another species, that is a Category 5). Note that the reliability scale is not linear. Public sightings are subject to a systematic validation procedure, and their reliability varies depending on the category they are assigned during the verification process. Those sightings given high scores are more reliable than unverified public sighting (for example, Categories 1 and 2 versus 4 and 5). MPI has referred to those sightings with a validation category of 1, 2 or 3 to inform development of final advice.

[31] PBR analysis is intended to provide an indication of the vulnerability of Maui's dolphins to human-induced impacts. It is calculated using a minimum abundance estimate for the population, a recovery factor, and an assumed or known maximum net productivity rate.

[32] When populations are small there is a tendency for them to decline further due to the survival or reproduction of individuals being compromised when they are at low numbers. Such effects are referred to as Allee effect or depensation and are particularly important for social animals like dolphins. Demographic stochasticity refers to fluctuations in population trends due to inherent variability in the survival or reproductive success of individuals. It occurs at small population sizes and can result in skewed sex ratios.

6.2 New Zealand's Maui's dolphins

6.2.1 Taxonomic status

Key Points

- Maui's dolphin (*Cephalorhynchus hectori maui*) was identified as a separate subspecies distinct from Hector's dolphins (*Cephalorhynchus hectori hectori*) in 2002.
- Prior to this time these two subspecies were considered to be geographically separate populations of Hector's dolphins (*Cephalorhynchus hectori*).
- Hector's and Maui's dolphins are not visually distinct and can only be differentiated through genetic testing or skeletal analysis.

6.2.2 Biological vulnerability of the Maui's dolphin population to human-induced mortality

Key Points

- Maui's dolphins are vulnerable to the effects of human-induced mortality, including fishing-related mortality for the following reasons. Maui's dolphins:
  - Become sexually mature at a relatively late age (about 7-9 years).
  - Are relatively short lived (up to 22 years) compared with their age at maturity
  - Have a low reproductive rate (a female has a single calf every 2-3 years).
  - Favour shallow waters less than 100 m deep and have a localised inshore distribution (i.e. overlap with many human coastal activities).
  - Have a small population (and consequently may have few breeding females).

6.2.3 Abundance

Key Points

- Abundance of Maui's dolphins greater than 1 year of age is estimated at 55 (with a 95 percent confidence that the number of dolphins over 1 year old is between 48 and 69).
- The most recent abundance estimate is lower than the previous abundance estimate from 2004 of 111 individuals (with a 95 percent confidence that the population was between 48 and 252 individuals).
- The methods used in the two studies were very different so the results are not directly comparable as they focus on different sub-groups of the population.

6.2.4 Population trends

Key Points

- Most recent empirical research estimates the Maui's dolphin population to be declining at 3 percent per year (with a probability of decline of 75.3 percent).
- Previous and most recent research findings are consistent with Maui's dolphins having a small population that is likely declining.
- The ability to detect a decline in population size becomes increasingly difficult as population size decreases.

6.2.5 Distribution of Maui's dolphins off the WCNI

Alongshore and southern distribution

- Historical samples of beachcast dolphins confirm Maui's dolphins inhabited the New Plymouth and Taranaki regions as recently as 1989 (see Appendix 2, Map 1).
- More recently a beachcast Hector's dolphin was found near Opunake, Taranaki, in April 2012.
- Since 2001 all genetic sampling of *live* Maui's and Hector's dolphins off the WCNI has occurred between the Kaipara Harbour and Raglan (see Appendix 2, Map 2).
- Genetic sampling between 2001 and 2011:
    - Shows the highest frequency of Maui's dolphin encounters occurs between the Manukau Harbour and south of Port Waikato
    - Confirms Maui's dolphin presence between the Kaipara Harbour and Raglan.
    - Showed the maximum distance travelled by a single Maui's dolphin alongshore was approximately 80 km over a year. Several Maui's were found to move 30 to 40 km in a few days.
    - Confirms the presence of *live* Hector's dolphins off the WCNI, but that they represent less than 3 percent of live Hector's and Maui's dolphins sampled.
- Where genetic sampling has not occurred, the most southern sighting by DOC staff of a Maui's or Hector's dolphin was just south of the Mokau River (see Appendix 2, Map 3).
- Public sightings of Maui's and/or Hector's dolphins have been reported to DOC in the Taranaki region, including two sightings supported by video/photographic evidence (see Appendix 4, Map 4).

Submission comments

A variety of submissions were received that discuss the southern distribution of Maui's dolphins.

A few submissions describe individual's own or their family's experience observing Maui's and/or Hector's dolphins in the Taranaki region as recently as 2006 and 2007. Greenpeace noted two sightings off the Taranaki coast at the Maui A and Maui B oil platforms this year, which are located just beyond the 100 m depth contour.

Seafood New Zealand (SNZ) and other industry submissions[33] highlight the uncertainty over the presence of Maui's dolphins in the Taranaki area. They consider there is sufficient information to confirm that Maui's dolphins are not present south of Pariokariwa Point or in the Taranaki region. SNZ considers that the amount of research survey effort (since 2006) and observer monitoring (since July 2012) without a confirmed sighting of a dolphin south of the Mokau River shows there is not a lack of effort but rather an absence of dolphins in the area.

SNZ notes that while there may be a presence of dolphins in the Taranaki area on a most infrequent basis, it considers those dolphins more likely to be Hector's dolphins rather than Maui's dolphins. It also considers that any dolphin found outside the Kaipara to Raglan region can be presumed to be a Hector's dolphin.

Te Ohu Kaimoana (TOKM) consider that in the highly unlikely event that a Maui dolphin was found in the Taranaki region it would only occur when the water is warmer in the summer months (late December to February).

[33] Egmont Seafoods Ltd., Sanford Ltd., Taranaki Chamber of Commerce, Taranaki commercial fishers, Te Ohu Kaimoana Ltd.

MPI analysis

MPI considers the current distribution of Maui's dolphin in the area south of the set net restrictions (pre-interim measures) is uncertain. Sightings of Maui's and/or Hector's dolphins and stranding data are used to determine the southern extent of the Maui's dolphin range. This information includes:

- Historical samples from beachcast dolphins confirming Maui's dolphins in Kawhia harbour (2000), Taranaki (1980s), Whanganui (1920s) and Wellington (1870s) regions.
- One confirmed Hector's dolphin beachcast near Opunake, Taranaki in April 2012.
- Public sightings reported to DOC of Maui's and/or Hector's dolphins throughout the Taranaki area (1970s to 2012), with varying degrees of reliability.

There is, however, uncertainty in the information used to infer the southern distribution of Maui's dolphins due to the following factors:

- Sightings cannot distinguish between Hector's or Maui's dolphin. Genetic testing is required.
- Sightings data collected by DOC varies in reliability. Duplicate research sightings are considered the most reliable and public sightings are subject to varying degrees of reliability depending on the information provided during the validation process[34].
- The small size of the Maui's dolphin population means they are likely to have a contracted range, consistent with an apparent northward trend in beachcast Maui's dolphin records over time. However, there is insufficient information to determine the alongshore limits within that contracted range. New research also shows that Maui's dolphins can travel alongshore distances up to 80 km in a year, which is much further than previously known[35].
- There is insufficient information to infer seasonal changes in Maui's dolphin movements including their alongshore range.

MPI acknowledges that both Hector's and Maui's dolphins are found off the WCNI. Genetic analysis has confirmed both beachcast and live Hector's dolphins. However, these Hector's dolphins represent less than five percent of all Maui's and Hector's dolphins sampled north of Hawera.

MPI notes the public sightings of these dolphins further south of Taranaki (off the Kapiti coast, Wellington harbour, and Wairarapa coast) are generally considered to be Hector's dolphins. Two beachcast Hector's dolphins have been sampled on the Kapiti coast (1967, 2005) and one sighting in the Wellington Harbour (2009) were confirmed through biopsy to be Hector's dolphins.

MPI considers the information available on Maui's dolphin current presence south of Pariokariwa Point to be uncertain, but that the likelihood of encountering a dolphin declines with distance south of Raglan. Strandings data suggest the area was a part of Maui's historical range, while the sightings data suggests that Hector's and/or Maui's in the Taranaki area are now rarely or infrequently seen.

[34] All public sighting reported to DOC undergo a validation procedure. Those sightings that can be validated are considered more reliable than unverified public sightings.
[35] Hamner *et al.* (2012)

Offshore distribution

- Knowledge of the offshore distribution of dolphins relies heavily on aerial surveys, which means sightings may be of Maui's and/or Hector's dolphins as no tissue samples are collected for genetic testing.
- Research and government/public sighting information suggests that Maui's and/or Hector's dolphins off the WCNI are most prevalent in the area from shore to four nautical miles offshore.
- There have been seven aerial research surveys across six years that included areas beyond four nautical miles offshore. The most reliable survey sightings observed five separate occurrences of Maui's and/or Hector's dolphins between four and seven nautical miles offshore.
- There has been one validated public sighting (Category 3) of a Maui's or Hector's dolphin off the WCNI near the 100 m depth contour. This sighting was near the Maui A platform (approximately 19 nautical miles offshore, southwest of Taranaki) in April 2012. The validation category of this sighting means it is considered reliable anecdotal evidence about Maui's or Hector's presence offshore
- Best available information suggests Maui's and/or Hector's dolphins off the WCNI are present in the area beyond four nautical miles from shore, although the extent of their presence is unknown.

Submission comments

The majority of submissions received from ENGOs, academics, general public, local councils/boards and politicians contend that best available information supports that Maui's dolphin offshore distribution ranges out to the 100 m depth contour[36]. Greenpeace submits recent offshore sightings out near the 100 m depth contour southwest of Taranaki show these dolphins range further offshore, including:

- A Maui's or Hector's dolphin was sighted from the Maui A platform south west of Taranaki (situated in 110 m water depth) in April 2012.
- An additional sighting reported to Greenpeace of a Maui's or Hector's dolphin from the Maui B platform (situated in 103 m water depth) this year.

Other submissions point to recent research on Hector's dolphins that shows the offshore boundary of distribution of Hector's dolphins is approximated by the 100 m depth contour[37].

In addition they note that research on the distribution of an endangered species at very low abundance is hampered by the rarity of sightings and therefore it is difficult to be certain whether the limits of a species' range have been observed.

Industry submissions suggest different known limits of Maui's dolphins. Sanford note known habitat areas of Maui's dolphins to be within two nautical miles, and that Maui's are not known to frequent waters further than four nautical miles. Conversely, SNZ consider there is good evidence that the core range for Maui's dolphin is the coastal area from Kaipara Harbour to Raglan Harbour to a distance of four nautical miles offshore and that protection is necessary within that core area.

MPI analysis

MPI considers that a scale of reliability can be applied to sightings of these dolphins to enable better analysis on their offshore distribution. This scale of reliability is a (non-linear) continuum from most reliable (and least uncertain) to least reliable (and most uncertain).

[36] The 100 m depth contour is a line on a map that indicates that water depth. Off the west coast of the North Island, the 100 m dept contour varies in its distance from the shore, ranging from approximately 3.8 to 40 nautical miles from shore.
[37] Dawson *et al.* (2004), Du Fresne & Mattlin (2009), Rayment *et al.* (2010), (2011), Slooten *et al.* (2004), (2005), (2006).

MPI considers duplicate research sightings to be the most reliable, followed by research sightings made by individual researchers, and DOC or MPI staff with GPS positions. Public sightings that undergo a systematic validation process are considered more reliable than public sightings that are unverified. The evidence/information provided during the validation process (e.g. photograph, GPS position, detail of encounter) will determine whether a public sighting is assessed as a Category 1 (most reliable) to a Category 5 (least reliable).

Aerial research surveys off the WCNI suggest that Hector's and/or Maui's dolphins observed are most abundant between the shore and 4 nautical miles offshore (from Kaipara Harbour to Raglan), and they make infrequent visits beyond four and out to seven nautical miles. There is limited information to suggest whether the dolphins' distribution changes seasonally (that is, more concentrated in the inshore within 4 nautical miles over summer, and more dispersed offshore in winter).

Research establishing that dolphins prefer waters within the 100 m depth contour has only been undertaken for Hector's dolphins. It is unknown how significant the 100 m depth contour is to the distribution of Maui's dolphins, or indeed what their offshore limit is. The offshore distance of the 100 m depth contour varies between Pariokariwa Point and Hawera (from approximately 3.9 nautical miles to 39 nautical miles offshore).

MPI considers there is evidence for Hector's dolphins that they distribute themselves out to the 100 m depth contour off the South East coast of the South Island. Maui's dolphins are closely related to Hector's and may have similar habitat preferences. However, it is inherently difficult to detect the offshore range of Maui's dolphins because of their low abundance. There is much less data from the North Island due to the small population size of Maui's dolphins to determine whether the 100 m depth contour represents a limit on the offshore distribution of this population.

In developing the consultation paper, MPI was unaware of the:

- validated public sighting (Category 3) of a Maui's or Hector's dolphin off the WCNI at the Maui A oil platform (approximately 19 nautical miles offshore, southwest of the Taranaki coast) this year, and
- The anecdotal (non-verified) sighting at the Maui B platform (approximately 15 kilometres southwest of the Maui A platform).

MPI was informed by DOC of the Maui A sighting on 14 November 2012. MPI considers the Maui A sighting a reliable anecdotal report of a Maui's or Hector's dolphin offshore near the 100 m depth contour. MPI considers this new information important for you to take into account when making your decision under the Act.

MPI's assessment of the information available suggests that Maui's dolphins are more prevalent in the area between the shore and four nautical miles, but are also present at times in the area beyond four nautical miles. The frequency of their presence beyond four nautical miles is unknown.

Available information suggests that Maui's dolphins are not uniformly distributed offshore; however, this information is limited and therefore insufficient to precisely determine offshore areas where Maui's dolphins may be more prevalent than others. Available information suggests that the likelihood of encountering a dolphin declines with distance from shore.

Harbour distribution

- Four dolphin carcasses have been found in the WCNI harbours.
  - A Maui's dolphin was found beachcast in Kawhia Harbour in 2000.
  - A Maui's dolphin was washed up in the entrance of the Manukau Harbour as a result of entanglement in a net in 2002.
  - A Hector's dolphin (2012) and a Maui's or Hector's dolphin (1985) have been found beachcast in the Manukau Harbour
  - It cannot be determined whether these dolphins died within the harbours or whether their bodies were washed in with the strong tidal currents.
- All research and public sightings of Maui's and/or Hector's dolphins have occurred within the current set net ban areas.
- 37 acoustic detections of Hector's and/or Maui's dolphins (over a period of five days) have been recorded in the Manukau Harbour within the current set net ban area.
- A single acoustic detection was recorded in the Kaipara Harbour in 2007 approximately 10 km south of the harbour side of the entrance beyond the current set net prohibitions.
- Public sighting information is variable, but suggests Hector's and/or Maui's dolphins are most commonly found near the mouths of the harbours and less frequently observed within the harbour entrances/channels. There have been no reported sightings inside the harbours beyond the current protection measures.
- There is no information to indicate how often or how far Hector's and/or Maui's dolphins may travel into WCNI harbours beyond the entrances where the current set net bans are in place.

Submission comments

A number of submissions from ENGOs and the general public consider the information available clearly shows that Maui's dolphins use the WCNI harbours.

Other submitters note they have never seen a Maui's dolphin in the Manukau Harbour. Most of them[38] point out that they and members of their families, or people they know, have been fishing and, or, living in the harbour for many years and have never observed Maui dolphins in the harbour. Given the absence of sightings, they do not consider there to be any risk to the dolphins in the harbour.

One submission notes there are hundreds and thousands of people that visit the beaches and wharf within the harbour, plus all the boating, and there has not been any sighting of a Maui's dolphin.

A number of commercial and recreational submissions question the acoustic detection research that has been conducted and used to infer anything about dolphin use of or distribution within the harbours. They consider the reliability of that information to be poor or uncertain and that accurate and reliable information should be used to verify dolphin distribution in the harbours.

MPI analysis

For the WCNI harbours, Hector's and/or Maui's dolphins have been most frequently observed near or in the entrance channels of harbours. Research and public sightings near the Raglan, Kawhia and Aotea harbours have all occurred near harbour entrances, within the current set net restriction boundaries.

[38] P. Ashby, P. Goddard, Anonymous, J. Rowling *et al.*, T. Rea, K. Torpey, G. Torpey, P. Mullings, M. Emerson, B. Chamberlain, M. Roberts.

In the Manukau Harbour, all public and research sightings, acoustic detections, and reported strandings have occurred in the entrance channels within the existing set net restriction boundary.

In the Kaipara Harbour, public sightings are concentrated at the entrance channel of the harbour. There has been one acoustic-detection[39] of a Hector's or Maui's dolphin in the Kaipara Harbour along a channel approximately 10 km south of the entrance beyond the closed set net area.

Since the 2008 review of the TMP the information resulting from acoustic detection surveys (from 2005 to 2008) has undergone scientific peer review and been published[40]. MPI acknowledges there are limitations in the range of acoustic detectors. On average, they detect dolphins that are within a radius of approximately 200 m, meaning dolphins have to be quite close and vocalising to be detected. As a result, the acoustic detections represent a minimum estimate of the use of the sampled area of the harbours.

There is no information to indicate the extent and frequency of Maui's dolphin movements into and within the harbours beyond the existing closed areas. As already noted, public sighting reports of Hector's and/or Maui's dolphins are limited to the harbour entrance areas despite extensive boating activity inside the harbours. MPI considers the limited sightings reports support the suggestion that Hector's and/or Maui's dolphins' use of these harbours is likely rare and infrequent.

6.2.6 Vulnerability of Maui's dolphins to human-induced threats

Key points

- Potential Biological Removal (PBR) analysis is intended to provide an indication of the vulnerability of Maui's dolphins to human-induced impacts.
- The PBR analysis estimates the maximum number of human-induced dolphin mortalities that may occur while allowing the stock to reach or maintain its optimum sustainable population (OSP) size with high probability.
- The most recent PBR analysis for Maui's dolphin:
    - Estimates the population can sustain one human-induced mortality every 10 to 23 years.
    - Suggests that this population can only sustain very low levels of human-induced mortality from all sources of impact.

<u>Submission comments</u>

Dawson notes the PBR model is not intended for application to very small populations. The model has no consideration of potential Allee effects[41], and does not properly deal with demographic stochasticity at low population sizes[42]. Dawson considers the model provides a useful point of comparison and calculation of maximum allowable level of fishing-related mortality, which equates to one dolphin every 23 years. Dawson emphasises that this calculation in such a small population is optimistic and includes *all* human impacts, not just those incidental to fishing.

[39] Acoustic detection is when the noises (echolocation signals) the dolphins (in this case Hector's and Maui's) make were recorded in the harbour.
[40] Rayment *et al.* (2011)
[41] When populations are small there is a tendency for them to decline further due to the survival or reproduction of individuals being compromised when they are at low numbers. Such effects are referred to as Allee effects.
[42] Demographic stochasticity refers to fluctuations in population trends due to inherent variability in the survival or reproductive success of individuals. It occurs at small population sizes and can result in skewed sex ratios.

MPI analysis

PBR modelling offers some guidance on the effect that human-induced mortality may have on the ability of a population to rebuild to OSP. The PBR analysis suggests that Maui's dolphins can only sustain very low levels of human-induced mortality from all sources of impact. However, there are limitations as noted by Dawson.

The nature of PBR analysis, or any modelling exercise relying on estimated biological and variable inputs, does not necessarily lend itself to decision making with certainty. Rather, it provides a general indication of the ability of the population to sustain human-induced mortalities.

MPI notes also that PBR analysis assumes a population target size of OSP or a relatively rapid recovery rate goal. While OSP is recognised as a good target population size because it results in the maximum productivity of a population, OSP is not a legislated target nor does the Act contain a legislated recovery rate goal. Instead, you should take into account that one of the environmental principles of the Act is that associated and dependent species should be maintained above a level that ensures their long term viability (section 9(a)).

7 RISK ASSESSMENT WORKSHOP FINDINGS ON FISHING-RELATED THREATS

Summary of Risk Assessment Workshop findings

- There are ongoing human-induced impacts to the Maui's dolphin population from a number of threats.
- The level of impact for each threat is uncertain, but in aggregate the impacts are considerable.
- The cumulative impact is likely to result in ongoing population decline, posing risk to the population in the long-term.
- The risk is mainly, but not solely, due to fishing-related activities.
- 95.5 percent of estimated human-induced mortalities were attributed to commercial, recreational, customary or illegal fishing-related activities combined, and the remaining 4.5 percent to non-fishing-related threats.
- Commercial set net, commercial trawl and recreational/customary set net fisheries were the threats estimated to have the greatest impact. Within this subset commercial set netting was estimated to pose the greatest threat.
- The risk assessment concluded the level of residual risk to Maui's dolphins:
    - from set net fisheries is greatest off the northern Taranaki coastline out to seven nautical miles and around harbour entrances.
    - from inshore trawl fisheries remains between the boundary of the trawl fishery closured areas (that extend two or four nautical miles offshore) and seven nautical miles offshore, particularly towards the centre of dolphin distribution from Raglan Harbour entrance to the Kaipara Harbour entrance).

Submission comments

A number of submissions[43] expressed scepticism of some of the outputs of the risk assessment report including the:

- estimates of annual dolphin mortality (1 to 8 dolphins, with a median of 5),
    - their plausibility,
    - proportion attributed to fishing-related activities,
    - proportion attributed to non-fishing-related threats, such as disease (e.g. Toxoplasmosis)
- distribution of Maui's dolphin to inform the assessment, and
- estimated rate of decline of the population for the next five year.

These submissions consider the estimate of a 7.6 percent decline in population (~ 5 dolphins) per annum over the next five years is inconsistent with other empirical estimates that suggest a population decline of 2.8 percent decline (~1.5 dolphins) per annum from 2001 to 2011. They suggest the numbers to be implausible and would indicate the restrictions on set net and trawl activity that have been put in place to date have actually increased the mortality of Maui's as a result of fishing, and failed to mitigate the threat considered to be the greatest risk.

SNZ also disputes any 'agreement' by the expert panel on the distribution of Maui's dolphins off the WCNI. They consider that the workshop considered risk to dolphins of the genus *Cephalorhynchus* (which includes both Maui's and Hector's dolphins) and highlight specifically when distinguishing between Hector's and Maui's dolphins was important.

[43] Including Egmont Seafood Ltd., Seafood New Zealand, Te Ohu Kaimoana Ltd.,

A number of submissions suggest that focusing on the effect of fishing-related mortality to Maui's dolphins was unbalanced given information that other activities (such as disease) pose a risk to the survival of Maui's dolphins.

Conversely, the majority of submissions received from ENGOs, the general public, local councils/boards and academics, note:

- information used to inform the assessment indicates that fishing effort data shows substantial overlap between Maui's dolphins and fishing methods known to cause dolphin mortality, in particular gillnet and trawl fisheries
- a high level of fishing intensity and frequency along the boundaries of the current protected areas and within areas where one fishing method is banned but another is not (ie, trawl activity occurring with the areas set nets are banned)
- the panel estimated Maui's dolphins range at least as far south as Whanganui and at least out to seven nautical miles offshore, well beyond the current protected area and any proposed extension of protection.
- estimated declines in population indicate that the closed areas are not large enough and must encompass the entire distribution of the population.

MPI analysis

MPI considers the range in scores from the risk assessment panel on the estimated number of dolphin mortalities per year reflects the high degree of uncertainty about the impact of the cumulative and individual threats to Maui's dolphins.

MPI is using the risk assessment as a guide to inform where mitigation might be best placed to reduce the risk to Maui's dolphins from fishing-related mortality, including the type and location of fishing activities considered the greatest threat. MPI also notes the risk assessment was undertaken prior to the interim measures coming into effect.

The risk assessment provided estimates of mortality and of the rate of population decline that are broadly consistent with the empirical estimate of population decline when uncertainty in the estimates is considered[44]. While the median estimated rate of decline from the risk assessment was 7.6 percent per year, the 95 percent confidence limits of this estimate are broad (ranging from a possible 13.8 percent decline per annum to a possible 0.1 percent increase) and the empirical estimate falls within this range.

The probability of population decline was also consistent across both approaches. There was about 96 percent chance of population decline estimated from the risk assessment as compared with an approximately 75 percent to 97 percent chance of decline from the empirical estimates[45]. This provides consistent evidence that the population is likely to be declining, at a rate that remains uncertain.

MPI notes that while the subspecies identity of individual dolphins cannot be verified by methods short of genetic testing, the estimated spatial distribution of Maui's dolphins agreed by the panel and used in the risk assessment was generated with respect to the total WCNI population of *Cephalorhynchus*, based on sightings, strandings, survey data, and presumed habitat affinities. Critically, there was no suggestion that Maui's dolphins preferentially inhabit part of this distribution while the low numbers of Hector's dolphins that occasionally occur off the WCNI preferentially inhabit another part. As a consequence the dolphin distribution used by the workshop can be regarded as the best available representation *of the Maui's dolphin population,* but an unidentified *Cephalorhynchus* dolphin in any part of this distribution will have a low but non-zero probability of actually being a Hector's dolphin.

[44] Currey *et al.* (2012); Hamner *et al.* (2012)
[45] Currey *et al.* (2012); Hamner *et al.* (2012); Wade *et al.* (2012) in Currey *et al.* (2012)

MPI supports improving information on the level of impact other non-fishing-related threats have on the population. MPI considers such information will help identify additional tools that can be used to improve the design and implementation of management measures to address such risks. Notwithstanding the potential for non-fishing-related threats to impact the population, MPI notes that fishing-related threats are still estimated to have the greatest known human-induced impact[46].

[46] See section 4.3.1 for description of the Risk Assessment Workshop.

8 SUSCEPTIBILITY TO FISHING-RELATED MORTALITY FROM SET NETS AND TRAWL

Set nets

- Dolphins are known to be susceptible to being entangled in set nets because:
  - Dolphins have been observed entangled in set nets.
  - Dolphin distribution overlaps with commercial and amateur set net fisheries.
  - Dolphins are not able to detect monofilament nets which make them susceptible to entanglement.
- There have been 46 reported Hector's and/or Maui's dolphin mortalities between 1921 and April 2012 off the WCNI.
- Reported mortalities probably only provide an indication of the nature of the threats from fishing to the dolphins, as the cause of death is established for only 12 of the 46 reported mortalities.
- Of the 46 reported mortalities between 1921 and 2012, there are 3 known set net related mortalities, and 3 other mortalities show evidence of net marks or other indications of interaction with fishing nets.

Trawling

- Dolphins are known to be susceptible to being entangled in trawl nets because:
  - Dolphins have been observed entangled in trawl nets;
  - Dolphin distribution overlaps with commercial trawl fisheries;
- Of the 46 reported mortalities of Hector's and/or Maui's dolphins off the WCNI between 1921 and 2012, none have been attributed to interaction with trawl nets.
- Of all reported entanglements of Hector's in the DOC incident database, trawling has caused 20 of the 117 (17 percent) known entanglements.

Submission comments

The majority of submissions received (primarily from ENGOs, general public, academics, local councils/boards, politicians) noted that set net and trawl fishing is the greatest known human-induced threat to Maui's dolphins.

They also submit that reported mortalities in fishing gear are likely to be under reported. EDS considers there is little incentive for fishers to report such incidents because by doing so they may jeopardise their ability to continue fishing.

Forest & Bird highlight the very low level of observer coverage, resulting in inadequate independent monitoring of these fisheries to determine whether current measures are being complied with and all bycatch or interactions being reported.

Other submissions note that as the Maui's dolphin population continues to decline and the consequence of a human-induced mortality becomes even higher, and the incentive not to report interactions becomes even greater.

Industry submissions provide varying perspectives on whether Maui's dolphins are susceptible to fishing-related mortality from set nets or trawl:

Coastal set netting

- TOKM note there has never been a single confirmed case of a Maui's dolphin being caught in set nets in Taranaki.
- McDougall contends the dolphin caught in his commercial set net in January 2012 was a Hector's species and the only one he has encountered in 15 years.
- Powell contends that no Hector's type dolphin has been seen or captured even though all vessels have had 100 percent observer coverage [since 26 July 2012]
- Sanford note that MPI observers on the Taranaki based vessels have been able to confirm that to date no Maui's dolphins have been viewed within the interim protected area. This information validates earlier fishers' statement that they had not seen Maui's dolphins in the area and the absence of dolphin bycatch reported on the non-fish protected species catch return forms.

Harbour set netting

- Botica considers that Maui's and almost all of the dolphins that have been found entangled in nets were found in mullet (drag) nets and that the use of guide ropes and supporting anchors in set nets mean there is minimal risk that these nets break free and could result in an entanglement.
- K Torpey considers:
  - there has never been a set net entanglement of a Maui's dolphin
  - the only risk to Maui's dolphins comes from illegal fishing (recreational drift nets with no anchors or names on their floats)
  - well anchored set nets deployed in line with the tide in the harbours vibrate in the strong currents so they are easy to detect by any marine mammal, including Maui's dolphins
  - this set net vibration does not occur along the coast where there is no tidal flow and the nets are set across the tide and stand much taller than those deployed in the harbours
- G Torpey considers:
  - One Maui's or Hector's dolphin was caught in a set net off Taranaki
  - All other entanglements have been in recreational illegal drift nets
  - 90 percent of recreational drag nets sold in New Zealand fishing shops are floating nets (drift nets)
  - If drift nets are a prohibited activity in areas like Port Waikato where it was deemed a threat to Maui's dolphins then maybe the laws should be changed to ban all floating nets

Trawling

- Sanford note that their vessels and the commercial fishers who fish Sanford annual catch entitlement (ACE) on their behalf have been actively trawling the WCNI for many decades. These fishers have never reported catching a Maui's dolphin.
- SNZ note that while occasional captures of Hector's dolphins have occurred in South Island trawl fisheries there is no evidence that Maui's dolphins are likely to be captured in WCNI trawl fisheries operating outside the core range of Maui's dolphins where trawling is already prohibited.
- SNZ note there has been some monitoring of the flatfish fleet using low headline nets on the South Island (Banks Peninsula, South Canterbury, and Te WaeWae Bay) in the past four years and that no Hector's dolphins have been captured during that period.

A number of industry and recreational submissions consider that the impact of, or threat posed by, fishing-related activities are overstated and that more work should be done to address threats such as disease and predation. They consider these factors pose a greater threat to the population than fishing-related activities.

MPI analysis

MPI recognises that fishing is the greatest known human-induced impact on Maui's dolphins (based on reported mortalities where cause of death can be assigned) and that set net activity poses a risk to the population. MPI agrees that illegally deployed nets (whether they be set nets, drag nets or drift nets) pose a risk to the Maui's dolphin population off the WCNI. Similarly, loss of nets if care is not taken to deploy and retrieve them correctly, or those lost because of bad weather all pose a risk to the population.

MPI notes there may be an incentive for fishers to under report or not report fishing interactions with protected species, including Maui's dolphins. However, the reporting of the Hector's or Maui's dolphin mortality in January 2012 in Taranaki is testament that fishers can and do responsibly report at least some accidental captures.

MPI acknowledges there has been low monitoring coverage in the trawl and set net fisheries to date (excluding the 100 percent coverage in the Taranaki set net fishery since the interim measures came into effect). MPI advises there is a need to improve independent monitoring coverage. MPI notes the risk to Maui's dolphins from coastal set net activity along the Taranaki coast, set net activity in the harbours and commercial trawling is dependent on the degree to which these activities and Maui's dolphin distribution overlaps.

MPI does not consider that the very limited coverage to date and the absence of reported incidental sightings by fishers are adequate to confirm that Maui's dolphins are not present in an area. Given the very low Maui's dolphin population spread over a large area, even high levels of coverage may be expected to nonetheless yield zero sightings over extended time periods, even in locations well within the Maui's dolphins' spatial distribution.

MPI notes that there is no way to distinguish between a Hector's and a Maui's dolphin by visual examination alone; subspecies differentiation is possible only with genetic analyses. Based on the only information available (*i.e.* location of capture) it is possible that any dolphin captured off WCNI but not positively identified (including the January mortality) could be either a Hector's or a Maui's dolphin.

MPI notes that the absence of capture information specific to Maui's dolphins in situations where Hector's dolphins are known to have been captured does not suggest that Maui's dolphins are somehow less vulnerable to that threat. Rather, the absence of capture data is a foreseeable consequence of their low population size and low independent observer coverage. There is no scientifically plausible reason to expect the vulnerability (*i.e.* the probability of capture per encounter with the threat) should be any different for Maui's dolphins than for Hector's dolphins.

MPI notes that the way set nets are deployed differs along the coast versus within the harbours, which may change the risk profile these activities pose. However, MPI does not consider that these variations in deployment remove risk; rather the level of risk may differ. MPI considers there is insufficient information based on the Maui's dolphin biology to determine whether they are able to detect set nets based on the net vibration in the water and how that may differ between the coast and within the harbours. In addition, to avoid entanglement, Maui's dolphins would not only have to detect the nets, but also perceive the nets as a threat and avoid them. It is clear, however, that dolphins do not always detect and avoid monofilament netting, which makes them vulnerable to entanglement and drowning.

Non-fishing-related impacts provide important context for your reconsideration of the vulnerability of Maui's dolphins to human-induced impacts. While fishing-related mortality is identified as the greatest known threat to the Maui's population, risk of mortality remains from other human-induced threats. These other factors can be considered when determining the extent to which risk factors like fishing activity are managed.

9 ASSESSMENT OF THE WCNI SET NET AND TRAWL FISHERIES

This section summarises the best available information to characterise the WCNI set net and trawl fisheries, their overlap with the Maui's dolphin population, and the potential residual risk posed by the fisheries to the long-term viability of the population.

You must consider whether the residual risk to Maui's dolphins from fishing-related mortality is acceptable. If so, then no further measures would need to be put in place to reduce risk. However, if you deem the current residual risk unacceptable then the options outlined below should be considered to reduce uncertainty or risk, or remove that risk.

When reviewing this information the following areas of uncertainty are relevant to your deliberations.

9.1 Uncertainty in information

When reviewing the assessment and level of residual risk of each fishery/area, the following areas of uncertainty are relevant to your deliberations.

9.1.1 Fishing activity

The information on where some fishing activities are concentrated is uncertain. In the set net fishery a lack of fine scale reporting information makes it difficult to determine exactly how much effort occurs and where it is distributed along the coast and within the harbours in relation to Maui's dolphin distribution.

9.1.2 Level of fishing-dolphin interactions

The information on the extent of fishing impacts on the Maui's dolphin population is uncertain. This is primarily due to limited information on the amount of overlap between fishing and dolphin distribution, the level of fishing-dolphin interactions, and trends in population abundance. This uncertainty makes it difficult for MPI to determine the extent to which fishing has had, is having, or will have, an adverse effect on the Maui's dolphin population. However, the risk assessment suggest most human-induced mortality is fishing related and both the risk assessment and empirical research results indicate that, under pre-interim measures management settings, there was a high likelihood of the population declining.

9.1.3 Costs and impacts on fishers of measures proposed

There is uncertainty around the impacts that the proposed management options (spatial closures or monitoring requirements) will have on people's social, cultural and economic wellbeing, including:

- limited information about some of the fishing activities (*e.g.*, effort and target species in the recreational set net fishery).
- a lack of fine scale reporting in the set net fishery to determine exactly how much effort would be displaced under the proposed options.
- insufficient information to precisely cost-out the expected cost of observer coverage in the fisheries because it would depend on the observer programme design (including number of days and vessels requiring coverage, and the duration of such a programme – months or years).

9.2 WCNI set net fishery from Pariokariwa Point to Hawera

Characterisation of commercial set net activity off the Taranaki coast

- Commercial set net fishery along this coast primarily targets blue warehou, rig and school shark.
- A total of 10 commercial set net vessels have operated in the area in the last three years.
- Commercial fishing effort is concentrated within 4 nm of the shore.
- Location of commercial fishing effort (e.g. south or north of New Plymouth) depends on the species being targeted and when fishing occurs (seasonal variation).

Characterisation of customary set net activity off the Taranaki coast

- The level of customary set net activity between Pariokariwa Point and Hawera cannot be quantified. Set net fishing is a culturally important activity for tangata whenua along this coast and is primarily used to target taonga species like mako (rig)/lemon shark.
- Customary permit data does not show any harvest in this area, but the locations of where customary take occurs are not always provided.

Characterisation of recreational set net activity of the Taranaki coast

- The level of recreational set net activity between Pariokariwa Point and Hawera cannot be quantified. Recreational set net fishing is a culturally important activity for many New Zealanders to enjoy leisurely or rely on for sustenance fishing.

The Taranaki region from Pariokariwa Point south to Hawera is fished by non-commercial (inshore) and commercial (both inshore and offshore) set netters. Best available information suggests where set net effort occurs is influenced by the species being targeted as well as the season when fishing occurs. Most set net activity in this area was (prior to the interim measures coming into effect) concentrated from Cape Egmont northwards, between zero and four nautical miles offshore.

<u>Submission comments</u>

Industry submissions (Egmont Seafood Ltd, SNZ, TOKM) note that the key species targeted in the winter are warehou and rig, and these species were (prior to the interim measures coming into effect) harvested within two nautical miles from shore.

SNZ estimates that Taranaki commercial set net fishers currently derive around 20% of their revenue from catching warehou. They state the majority of warehou is caught within two nautical miles of the coast between June and August although the season can extend into September. They note that fishers had access to the warehou fishery in 2011/12 as the interim restrictions did not come into effect until the end of July 2012.

SNZ estimates these fishers also derive around 15% of their revenue from catching rig. SNZ notes that while the majority of rig is currently caught outside the two nautical mile area, the most productive fishery in the past has been catching rig within two nautical miles of the coast. They note this fishery provided fishers with a safe option to generate revenue when weather conditions prevent them fishing further offshore. Fishers would operate in the north when the southerly winds blew and in the south when the northerly winds blew, essentially operating a winter/spring fishery between June and November.

No submissions were received on the characteristics of the recreational set net fishery.

MPI analysis

MPI consider the comments from industry to provide additional information that is useful to better characterise the set net fishery in the Taranaki area. MPI has taken note of this when considering the additional options put forward by industry for MPI's consideration.

9.2.1 Residual risk from existing commercial and amateur set net prohibitions and restrictions

Assessment of residual risk from existing set net measures and dolphin distribution

- Distribution information of Maui's dolphins from Pariokariwa Point to Hawera is uncertain. The limited sightings and strandings data in this area suggests Hector's and/or Maui's dolphins are rarely or infrequently seen.
- Since the 2008 TMP the 2012 beachcast Hector's dolphin near Opunake, the January 2012 mortality of a Hector's or Maui's dolphin, verified public sightings and anecdotal reports confirm dolphins are present in the area. However, some of these dolphins are Hector's rather than Maui's.
- Between 2008 and when the interim measures came into effect in July 2012 there was no observer coverage in the set net fishery along this coast.
- Since the interim measures came into effect (July 2012), all set net effort between two and seven nautical miles offshore between Pariokariwa Point and Hawera has had observer coverage. Observers have reported no interactions or sightings of Maui's dolphins during this time.

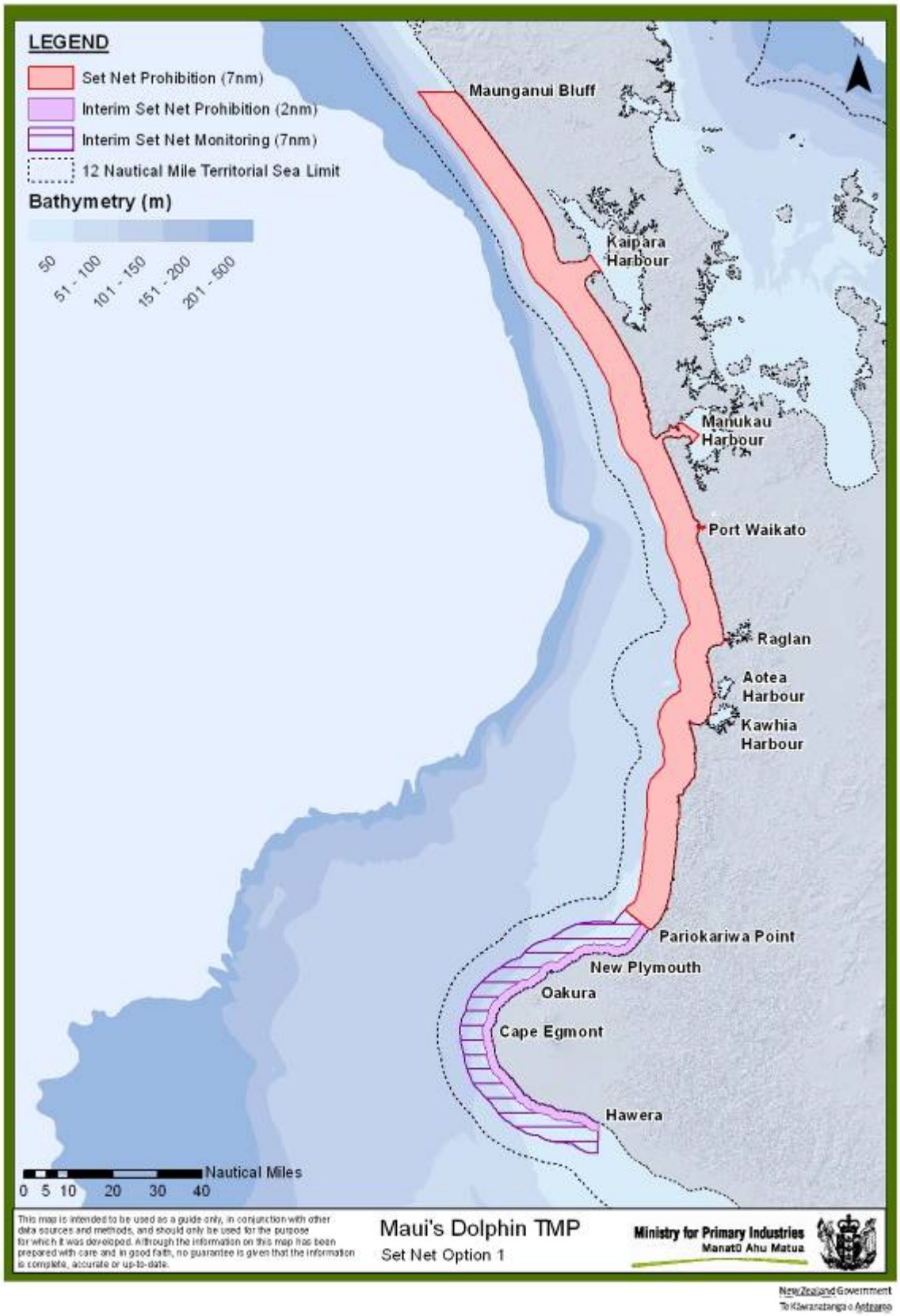
Commercial and amateur set netting is currently prohibited between: Maunganui Bluff and Pariokariwa Point (out to seven nautical miles); Pariokariwa Point to Hawera (out to two nautical miles); and Pariokariwa Point to Hawera (from two and seven nautical miles without an observer onboard) (Map 2).

Submission comments

Industry submits there is no justification for any/additional/current interim prohibitions on commercial set netting in the Taranaki area based on the following points:

- There is no conclusive evidence that the Maui's dolphin population has declined in the last decade, although a small decline appears possible;
- The January 2012 dolphin capture was just as likely, if not more likely to be a Hector's dolphin and such a determination would not have lead to the implementation of the interim measures;
- There is no evidence to suggest Maui's dolphins frequent the proposed area.
- Since observers were put in place in July there have been no observations of any dolphins (Maui's or Hector's) in the area.

The majority of submissions consider that given the small population size a precautionary approach to the management of Maui's dolphins is warranted with urgency. They consider that while the current fishing prohibitions have reduced the risk to Maui's dolphins in some areas, the remaining level of risk is unsustainable and will not support the recovery of the population.



Map 2. Current (*status quo*) commercial and amateur set net restrictions off the west coast of the North Island.

MPI analysis

MPI notes that no dolphins have been observed during the observer coverage that occurred from the end of July to present. However, MPI does not consider this coverage and time period adequate to confirm that Maui's dolphins are or are not present in the area.

MPI notes the population is small, Taranaki is on the fringe of their range, and previous public sightings of Maui's or Hector's dolphins off the Taranaki coast suggest they are rarely or infrequently seen. MPI is committed to long-term gains in information and considers the removal of any management measures to manage the risk in the area to be premature.

MPI considers that the proximity of the area to the Maui's dolphins' core range means there remains potential for Maui's dolphins to occasionally range south of Pariokariwa Point[47]. But given that the area is outside their core range and the overall number of Maui's dolphins is very small, and the likelihood of encountering a dolphin declines with distance from their core range, MPI consider the relative likelihood of an interaction occurring is low.

However, that likelihood is also dependent on the intensity of fishing activity, which is high in this area, and MPI notes the consequence of any fishing-related mortality to the Maui's dolphin population is high. A single mortality will have a significant effect by slowing or preventing the population from increasing in size.

9.2.2 Assessment of the need for management action

Key Points

Whether it is necessary for you to manage the impacts of set net fishing in the Taranaki region on Maui's dolphins depends on your assessment of the likelihood of fishing-related mortality occurring and the consequence of mortality to the Maui's dolphin population.

Overall, MPI considers there is a need for management measures to be in place because:

- The risk assessment findings indicate that prior to the interim measures coming into effect the likely overlap between set net activity and dolphin distribution posed residual risk.
- Sightings information from various sources of differing reliability indicates that Hector's and/or Maui's dolphins are present in the Taranaki region, albeit they are rarely or infrequently seen.
- A Hector's or Maui's dolphin was accidently killed in a commercial set net off of Cape Egmont.
- Although the likelihood of dolphin mortality from fishing is considered low, the consequence of mortality to the Maui's dolphin population is very high.
- Notwithstanding, you can take a different view of the level of risk to Maui's dolphins based on the information presented in this paper.

MPI considers there is uncertainty about the extent and frequency of Maui's dolphin presence between Pariokariwa Point and Hawera. This uncertainty makes it difficult to quantify the residual risk that exists in the Taranaki region.

The information principles in the Act provide you with guidance on how to respond to uncertain information. See Appendix 1 below for a discussion of these principles. A precautionary approach is available to you (see discussion in section 5 above).

[47] This assessment is supported by conclusions in Currey *et al.* (2012) that the northern Taranaki coastline out to 7 nm offshore is an area of residual risk. However, the risk assessment did not take into account the interim measures in place from Pariokariwa Point to Hawera as they were put in place after the risk assessment occurred.

9.2.3 MPI Proposed Management Options

Commercial and Amateur Set Netting (off the WCNI - Taranaki)	
Option 1 (MPI Preferred)	*Status quo*: Keep existing management, including the interim measures to: • retain the set net prohibition between 0 and 2 nautical miles offshore from Pariokariwa Point to Hawera; • retain the prohibition on the use of commercial set nets between 2 and 7 nautical miles offshore from Pariokariwa Point to Hawera without an observer onboard. The interim measures would be reviewed in 2015 to inform management going forward.
Option 1b (New)	Amend the interim measures to: • prohibit set net between 0 and 2 nautical miles offshore from Pariokariwa Point to Hawera from 1 October to 31 May; • prohibit set net between 0 and 2 nautical miles offshore from Pariokariwa Point to Hawera from 1 June to 30 September, excluding the area between Bell Block and Cape Egmont provided an observer is onboard, and within that area o place restrictions on the length and height of set nets o limit setting and hauling of set to daylight hours • prohibit the use of commercial set nets between 2 and 7 nautical miles offshore from Pariokariwa Point to Hawera all year round without an observer onboard. The interim measures would be reviewed in 2015 to inform management going forward.
Option 2	Keep existing management, and put the interim measures in place via regulation to: • retain the set net prohibition between 0 and 2 nautical miles offshore from Pariokariwa Point to Hawera; • prohibit the use of commercial set nets between 2 and 7 nautical miles offshore from Pariokariwa Point to Hawera without an observer onboard.
Option 3	Keep existing management, and • Extend the set net prohibition between 0 and 4 nautical miles offshore from Pariokariwa Point to Hawera. • Prohibit the use of commercial set nets between 4 and 7 nautical miles offshore from Pariokariwa Point to Hawera without an observer onboard.
Option 4 (New)	Keep existing management and extend the set net prohibition between 0 and 7 nautical miles offshore from Pariokariwa Point to Hawera.
Option 5 (New)	Extend the set net prohibition out to the 100 m depth contour from Maunganui Bluff to Whanganui.

Submissions received that comment on the options proposed in the consultation paper are discussed within the assessment of each option. MPI notes that the majority of submissions received consider the management options consulted on are inadequate to address the fishing-related risk to the Maui's dolphin population from set net activity and proposed more extensive measures (refer to Options 4 and 5).

Option 1 (Status quo)

Option 1 (Map 2 above) would keep the interim measures and:

- prohibit commercial and amateur set net fishing between zero and two nautical miles offshore from Pariokariwa Point to Hawera, and
- prohibit the use of commercial set nets between two and seven nautical miles offshore from Pariokariwa Point to Hawera without an observer onboard the vessel.

Under Option 1 MPI would continue to pay for the cost of observer services out of Crown-funds. The measures would be in place to allow for at least three years of observer coverage because the low likelihood of detection of these dolphins requires long term monitoring. The information gathered would be reviewed in 2015 (or sooner if a dolphin was captured) to provide a better basis to inform and refine any future management decisions.

Submission comments

Only one submission received supported Option 1 as written. Sanford supported Option 1 as an interim measure with human observers until the end of the 2012/13 fishing year and then mandatory electronic coverage up until 2016.

Five industry submissions[48] disagree with Option 1 being presented as the *status quo*. They consider the *status quo* should have been the measures in place prior to the interim restrictions because:

- there have been no sightings of dolphins whilst observers have been present on vessels since the end of July 2012 (approximately four months).
- there is no new information to suggest that there are Hector's dolphin species present in the area from Pariokariwa Point to Hawera.

Ten industry and regional development agency submissions[49] propose a variation of Option 1 (*i.e.* "managed access") that includes some ability for commercial set net fishers to fish between zero and two nautical miles offshore to target warehou and rig in the winter months. MPI has reviewed this proposal and an additional option has been added for your consideration (see Option 1b for more information).

A number of submissions disagreed with the southern boundary of the current set net ban area, with some suggesting the southern boundary should extend to the Whanganui river mouth, Kapiti coast, or the Wellington harbour.

Summary

Option 1 considers the need to manage the risk to Maui's dolphins while gathering more information on dolphin presence in the area. The proposed closure area will manage the risk to Maui's dolphins in the inshore area (out to two nautical miles) where the January mortality occurred, and the alongshore range based on the maximum travel distance recorded for Maui's dolphins.

One-hundred percent observer coverage between two and seven nautical miles offshore does not prevent any dolphin mortalities from occurring. However, such observer coverage will provide independent monitoring and reporting of fishing interactions with, or sightings of Hector's and/or Maui's dolphins beyond two nautical miles.

Option 1 assumes the uncertainty in information on whether and how often Maui's dolphins are present in the Taranaki area should be addressed by requiring mandatory observer services costs, which would be Crown-funded.

[48] Egmont Seafoods Ltd., DM Mawson, C Powell, J Ansley, J Ansley,

[49] Egmont Seafoods Ltd., DM Mawson, I MacDougall, J Ansley, J Ansley, R Ansley, C Powell, Seafood New Zealand, Te Ohu Kaimoana Ltd, Venture Taranaki Trust

MPI would work with DOC on finding opportunities for taking biopsies of any Hector's and/or Maui's dolphins sighted by the observers to verify subspecies identity and improve information on whether Maui's dolphins are present in the Taranaki area.

Effectiveness
MPI is unable to quantify the residual risk to Maui's dolphins given the uncertainty in their distribution in the Taranaki area and therefore the vulnerability of Maui's to set net activity in the area.

Using a qualitative assessment MPI considers a spatial closure out to 2 nautical miles will manage the risk to Maui's dolphins in the inshore areas where the January mortality occurred. However, a two nautical mile boundary does not cover the Maui's dolphin known offshore distribution.

The offshore distribution information available for Hector's and/or Maui's dolphins off the WCNI suggests they are most frequently observed within four nautical miles (but within four nautical miles they are more often observed between zero and four nautical miles) and make infrequent visits to areas beyond four nautical miles. Residual risk would remain for any dolphins that travel further offshore than two nautical miles.

Impact on fishers
The primary cost associated with Option 1 is the economic impact on the fishing industry and the wider economy.

Economic impact
MPI notes that the economic impact estimates are notional given that the interim measures are already in place (since July 2012). There were approximately 6-8 commercial set net fishers that were directly affected by the measures.

Industry has submitted that should these measures remain in place a significant portion of catch (pre-interim measures) will not be harvested because the species predominantly targeted (rig and warehou) are caught between zero and two nautical miles. Industry also considers the economic impact estimates MPI has produced do not reflect the actual amount of catch that comes out of the area based on the statutory reporting data used to inform the assessment.

MPI has used catch effort and landings data to estimate the value of set net landings coming from the area and the potential volume of landings that would be lost or displaced. MPI uses the latitude and longitude positions fishers are required to complete on their statutory reporting forms. MPI notes there are limitations to the position data reported in that:

- latitude and longitude reporting is only required to be accurate to plus or minus one nautical mile.
- the latitude and longitude coordinates indicate the start position of the net. This may not, given the length of nets used, accurately reflect the spatial area the nets are set in.

To address the ongoing disagreement on the economic estimates based on assignment of catch MPI has undertaken additional analysis to present:

- a midpoint estimate based on the information that is reported and distributes catch within two nautical miles of the reported start position (in accordance with the definition in the reporting regulations) (Method 1), and
- an upper bound estimate (Method 2) based on the maximum amount of effort we can ascribe to the area.

MPI considers the estimates from Method 1 are plausible and likely the best approximations given the information available. Method 2 assumes all effort report, as starting within two nautical miles of the boundaries of a close area, falls within the closed area. MPI considers these numbers to be an upper bound of the amount of effort that could fall within a closed area, but likely to be an overestimate. Both are provided for you to take into account when making your decision.

A detailed economic impact analysis for each of the management options proposed can be found in Appendix 4.[50].

The economic impacts of Option 1 are:

Estimated using landings data from 4 year average of October fishing year data[51]

	Method 1 (MPI preferred)	Method 2 (Upper bound)
Annual Revenue Loss	$339 280	$728 004
Annual Value Add Impact	$569 991	$1 223 046
Capitalised Future Value Impact	$1 911 267	$4 110 080
Subtotal = Cost to Industry	$2 481 258	$5 333 126

These estimates should be treated as indicative because they do not fully account for the ability of fishers to shift their effort outside of the two nautical mile boundary, noting that the remaining set net closures off the WCNI has already resulted in a large area loss.

Observer coverage

Observer coverage provides a way to continue to gather more certain information on dolphin presence in the area and interactions with fishing activity. However, given the small size of the Maui's dolphin population and the rare and infrequent occurrence of dolphins that have been observed in the area, any information gathering effort would require a long-term commitment.

Observer coverage is typically cost recovered from the fishing industry. Under Option 1, the costs of observer coverage would continue to be met by the Crown. MPI considers Option 1 appropriate due to the uncertainty in information and because there is a need to gather better information on dolphin distribution in the Taranaki region. The consequence of Crown-funded observer coverage is that there may be a reduction in Crown revenue because available observer cost recovery days will reduce.

MPI estimates the ongoing cost of mandatory observer coverage between the two and seven nautical mile area to be:

	Midpoint	Upper Estimate
Estimated Annual Cost	$315 480	$526 000
Total Estimated Cost to 2015 (3 years coverage)	$946 440	$1 578 000

Further discussion on observer coverage, how these estimates were derived, and submission comments relating specifically to observer coverage can be found in section 11.

[50] The catch information used to estimate the potential economic impacts has been improved from that used in the assessment of the interim measures to better account for actual landings and to incorporate landings information for vessels < 6 metres in length. Information to inform this analysis is based on fisher catch reporting data that is groomed and matched with landings information. It includes catch reporting data where it provided by start position or statistical area using the same methods as applied in the development of the 2008 TMP.

[51] All economic impacts for this region (Pariokariwa Point to Hawera) have been estimated using catch effort and landing data from a 4 year average of October fishing year data, and the October 2011/12 fishing year.
MPI notes that the October fishing year data for 2011/12 does not have any landings from the 0 to 2 nautical mile area for the last two months of the fishing year (August and September) because of the interim measures coming into effect.
Long term losses have been included in Appendix 4 (section 17) to acknowledge that the management option may result in long term impacts on the commercial fishery.

Non-commercial impact

The value of recreational set net fishing is unable to be quantified, but MPI notes that recreational fishers have and would be impacted as they are less likely (or able) to set net beyond two nautical miles from shore or travel further south to continue to set net. Recreational fishers are not subject to observer coverage requirements, so any recreational fisher that is able to set net beyond two nautical miles from shore would not monitored.

Keeping the interim measures are likely to mean recreational set net fishers:

- travel further afield to be able to continue to use that method,
- switch to alternative fishing methods, or
- are displaced out of the fishery all together (if they are unable to travel or diversify).

These impacts may result in additional costs being incurred (for example, fuel, purchase of new gear, reliance on purchasing rather than catching their own fish, increased time away from friends and family).

Option 1b

Option 1b (Map 3) would amend the interim measures to:

- prohibit set net between zero and two nautical miles offshore from Pariokariwa Point to Hawera from 1 October to 31 May;
- prohibit set net between zero and two nautical miles offshore from Pariokariwa Point to Hawera from 1 June to 30 September, excluding the area between Bell Block and Cape Egmont provided an observer is onboard;
    - with restrictions on set net height and length, and daylight operations.
- prohibit the use of commercial set nets between two and seven nautical miles offshore from Pariokariwa Point to Hawera all year round without an observer onboard.

Under Option 1b MPI would discuss with industry a cost-share model to pay for observer services costs. In the absence of a cost-share model MPI would cover the costs of observer coverage with Crown funding. The amended interim measures would be in place to allow for at least three years of observer coverage because the low likelihood of detection of these dolphins requires long term monitoring. The information gathered would be reviewed in 2015 (or sooner if a dolphin was captured) to provide a better basis to inform and refine any future management decisions.

<u>Submission comments</u>

Ten industry and regional development agency submissions[52] propose a variation of Option 1 (*i.e.* "managed access") that includes some ability for commercial set net fishers to fish between zero and two nautical miles offshore to target warehou and rig in the winter months.

One proposal was to allow a winter warehou fishery (from June to September) in the zero to two nautical mile zone between Bell Block and Cape Egmont. The second proposal was to allow a winter rig fishery (from June to November) in the zero to two nautical mile zone from Pariokariwa Point to Hawera.

Submissions in support of enabling a winter fishery noted the following:

- A need to ensure the local fishing industry is economically viable until the TMP or interim measures are reviewed in 2014.
- A winter fishery would provide additional utilisation opportunities within the two nautical mile closed area without imposing risk to the Maui's dolphin population.
- Constraints/conditions on how set net activity occurs in the proposed area would pose a low risk, including:

[52] Egmont Seafoods Ltd., DM Mawson, I MacDougall, Mr J Ansley, Mrs J Ansley, R Ansley, C Powell, Seafood New Zealand, Te Ohu Kaimoana Ltd, Venture Taranaki Trust

- "Managed access" means having an observer on board set net vessels while testing and verifying the effectiveness of mitigation measures. It is impossible to test and verify the effectiveness of mitigation measures in areas where they are not allowed to fish,
- A seasonal opening with nets both shorter in length and height,
- Pingers on all nets,
- Hauling of nets only during daylight, and
- Codes of practice – no nets set or hauled if a dolphin is observed.

- In the highly unlikely event that a Maui dolphin did turn up in Taranaki it would most likely occur when the water is warmer in the summer months of December to February.
- If the ability to fish within the limits of the protected measures was provided it could be appropriate for the costs of observers to be recovered in part from industry.

MPI Analysis

MPI notes there is no biological information to conclude that a winter fishery poses no or little risk should Maui's dolphins occasionally be present in the area. Research surveys along the coast have been seasonally biased towards summer observation. Although there may be an increase in public sightings of Maui's and/or Hector's dolphins in the Taranaki region, this may be an artefact of the general increase in water activities in the summer months as opposed to dolphin movement.

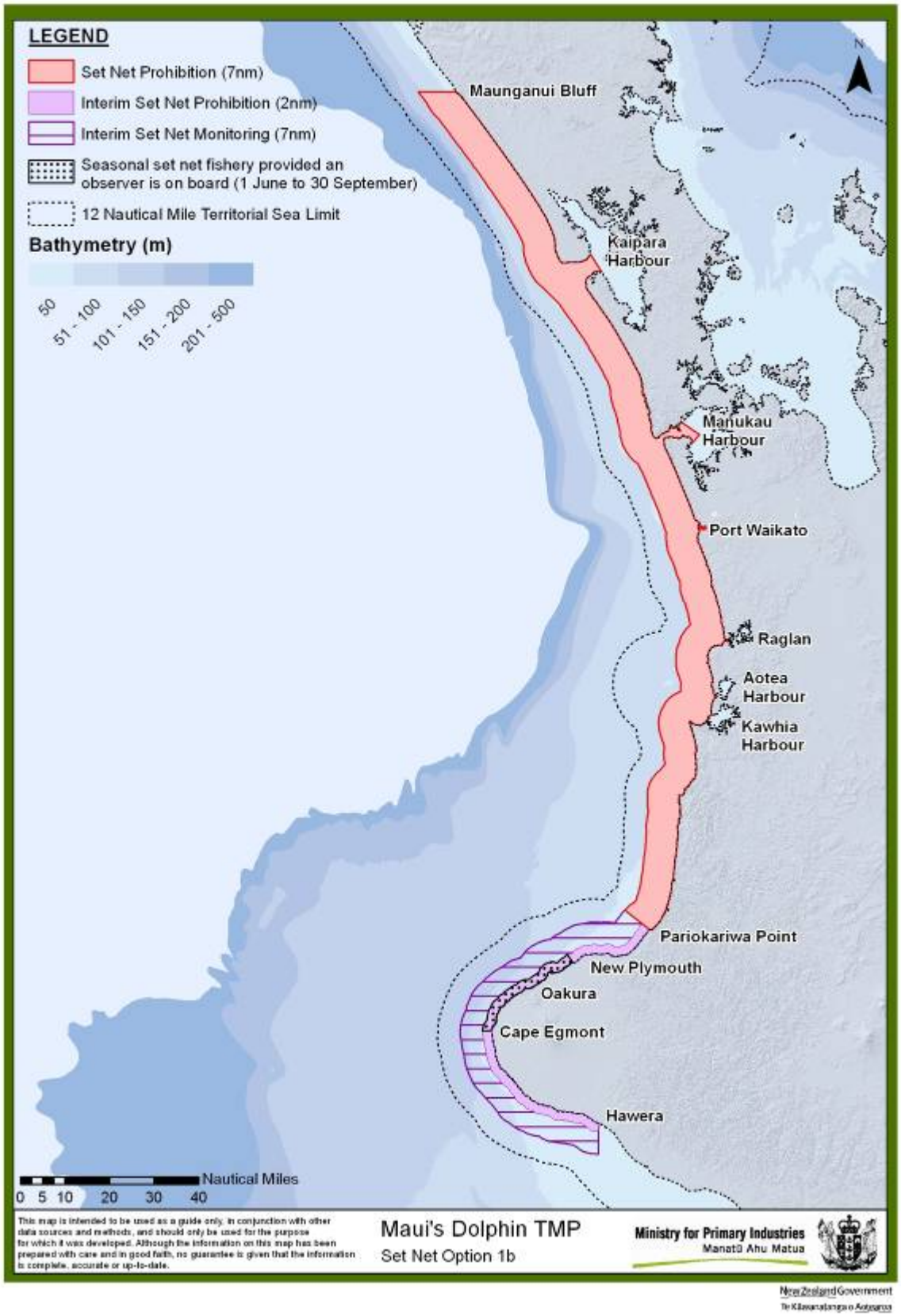
Constraining the duration of any set net activity or the way the gear is deployed reduces the risk compared with open access (if no restrictions were in place), but allows a level of risk during that time period. MPI cannot quantify what that level of risk would be other than the risk is greater compared with the other options presented.

MPI also does not consider any conclusive evidence could be gathered by testing mitigation measures in the area to inform management going forward. This is because of the:

- uncertainty of whether Maui's are present in the area,
- low likelihood of encountering a dolphin (Hector's or Maui's) should they be present, and
- lack of evidence regarding the effectiveness of mitigation tools (such as pingers). MPI notes that available information is insufficient to conclude whether pingers act as a deterrent, attractant, or are undetected by Maui's or Hector's dolphins.

MPI notes that access to the winter fisheries would alleviate some of the financial impacts these fishers have experienced since the interim measures came into effect. MPI presents an option to allow for a winter warehou fishery because the duration and area of the fishery is smaller, which would provide for the lowest increase in residual risk based on the industry proposals.

MPI advise that should you wish to proceed with this approach a lead-in to 2014 would be appropriate. This would increase the level of information on dolphin presence or absence to be used to inform detailed rules to mitigate potential interaction risks. MPI note, for instance, that observer coverage has not occurred throughout an entire winter period, which is when the proposed season would occur.



Map 3: Proposed commercial and amateur set net restrictions for Option 1b off the west coast of the North Island.

Summary
Option 1b proposes to allow commercial set net fishers to operate in the zero to two nautical mile area between Bell Block and Cape Egmont from July to September. MPI notes the option is scalable (time period and spatial area) and can be modified should you want to consider a variation of the option.

Option 1b is appropriate if you consider the level of risk to the Maui's population posed by set net activity in the zero to two nautical mile area is acceptable in the winter months, and you wish to alleviate some of the economic pressures the commercial fishers are incurring.

One-hundred percent observer coverage in the Bell Block to Cape Egmont area does not prevent any dolphin mortalities from occurring. The observer coverage provide independent monitoring and reporting of fishing interactions with, or sightings of Hector's and/or Maui's dolphins beyond two nautical miles, and within the zero and two nautical mile area from Bell Block to Cape Egmont.

MPI would work with DOC on finding opportunities for taking biopsies of any Hector's and/or Maui's dolphins sighted by the observers to verify subspecies identity and improve information on whether Maui's dolphins are present in the Taranaki area.

Effectiveness
Option 1b imposes a greater level of risk to the Maui's dolphin population than Option 1 and increases their risk of their entanglement with set nets should they be present during a winter fishery. MPI notes that this risk would be confined to the spatial area where fishing can occur and the duration of that activity. Option 1b shifts the balance of sustainability and utilisation toward greater utilisation.

Impact on fishers
The primary cost associated with Option 1b is the economic impact on the fishing industry and the wider economy. The costs would be less than those estimated for Option 1.

Economic impact
MPI notes that allowing access to their key target species would alleviate some of the economic costs incurred under Option 1.

Industry estimates that enabling the fishers to access the warehou fishery in this area between June and September would provide over $200 000 of revenue annually to fishers.

MPI has used catch effort and landings data to estimate the value of set net landings coming from the area and the potential volume of landings that would be **gained**. As with Option 1, MPI has presented the analysis using both Method 1 and Method 2 to present the midpoint and upper bound estimates. A detailed economic impact analysis for each of the management options proposed can be found in Appendix 4.

Estimated using landings data from 4 year average of October fishing year data[53]

	Method 1 (MPI preferred)	Method 2 (Upper bound)
Annual Revenue Gained	$58 532	$187 499
Annual Value Add Gained	$98 334	$314 999
Capitalised Future Value Gained	$293 016	$959 943
Subtotal = Gain to Industry	$391 351	$1 274 942

[53] All economic impacts for this region (Pariokariwa Point to Hawera) have been estimated using catch effort and landing data from a 4 year average of October fishing year data, and the October 2011/12 fishing year.
MPI notes that the October fishing year data for 2011/12 does not have any landings from the 0 to 2 nautical mile area for the last two months of the fishing year (August and September) because of the interim measures coming into effect.
Long term losses have been included in Appendix 4 to acknowledge that the management option may result in long term impacts on the commercial fishery.

These estimates should be treated as indicative only because they do not fully account for fisher behaviour. The analysis does not account for how they may modify their effort either within the two nautical mile boundary during the winter fishery or outside of the two nautical mile boundary. MPI notes that the remaining set net closures off the WCNI have already resulted in a large area loss.

Observer coverage

Option 1b assumes the uncertainty in information on whether and how often Maui's dolphins are present in the Taranaki area should be addressed by requiring mandatory observer services costs, which would be Crown-funded. MPI notes that industry has suggested a cost-share model could be considered should they be allowed to fish in the proposed area in the winter, which could be explored.

MPI has insufficient information to determine how observer coverage requirements may differ under this option compared with Option 1.

MPI has assumed Option 1b would require the same level of observer coverage as outlined in Option 1 to enable commercial set netting to continue between two and seven nautical miles from shore, and access the zero to two nautical mile area between Bell Block and Cape Egmont for a four month winter fishery. The same limitations would apply to those vessels able to, or not currently able to carry an observer.

MPI estimates the ongoing cost of mandatory observer coverage between the zero and seven nautical mile area to be:

	Midpoint	Upper Estimate
Estimated Annual Cost	$315 480	$526 000
Estimated Cost to 2015 (3 years coverage)	$946 440	$1 578 000

Further discussion on observer coverage, how these estimates were derived, and submission comments relating specifically to observer coverage can be found in section 11.

Non-commercial impact

Option 1b does not include any allowance for recreational fishers to access the proposed area as commercial fishers. Any access to the Bell Block to Cape Egmont area would require 100 percent observer coverage, which is currently not available to the recreational sector. Therefore, MPI considers the impact of Option 1b on recreational fishers to be the same as discussed in Option 1.

Option 2

Option 2 (Map 4) would put the interim measures in place via regulation to:

- prohibit commercial and amateur set net fishing between zero and two nautical miles offshore from Pariokariwa Point to Hawera;
- prohibit the use of commercial set nets between two and seven nautical miles offshore from Pariokariwa Point to Hawera without an observer onboard the vessel.

The difference between Option 1 and 2 is that from a technical perspective, Option 2 will provide better consistency with the pre-existing set net ban laws and accessibility of the law to stakeholders (they will be consolidated in one place under the same regulations). This is because the measures will be put into the Statutory Regulation Series.

The penalty provisions will remain the same under both Option 1 and 2.

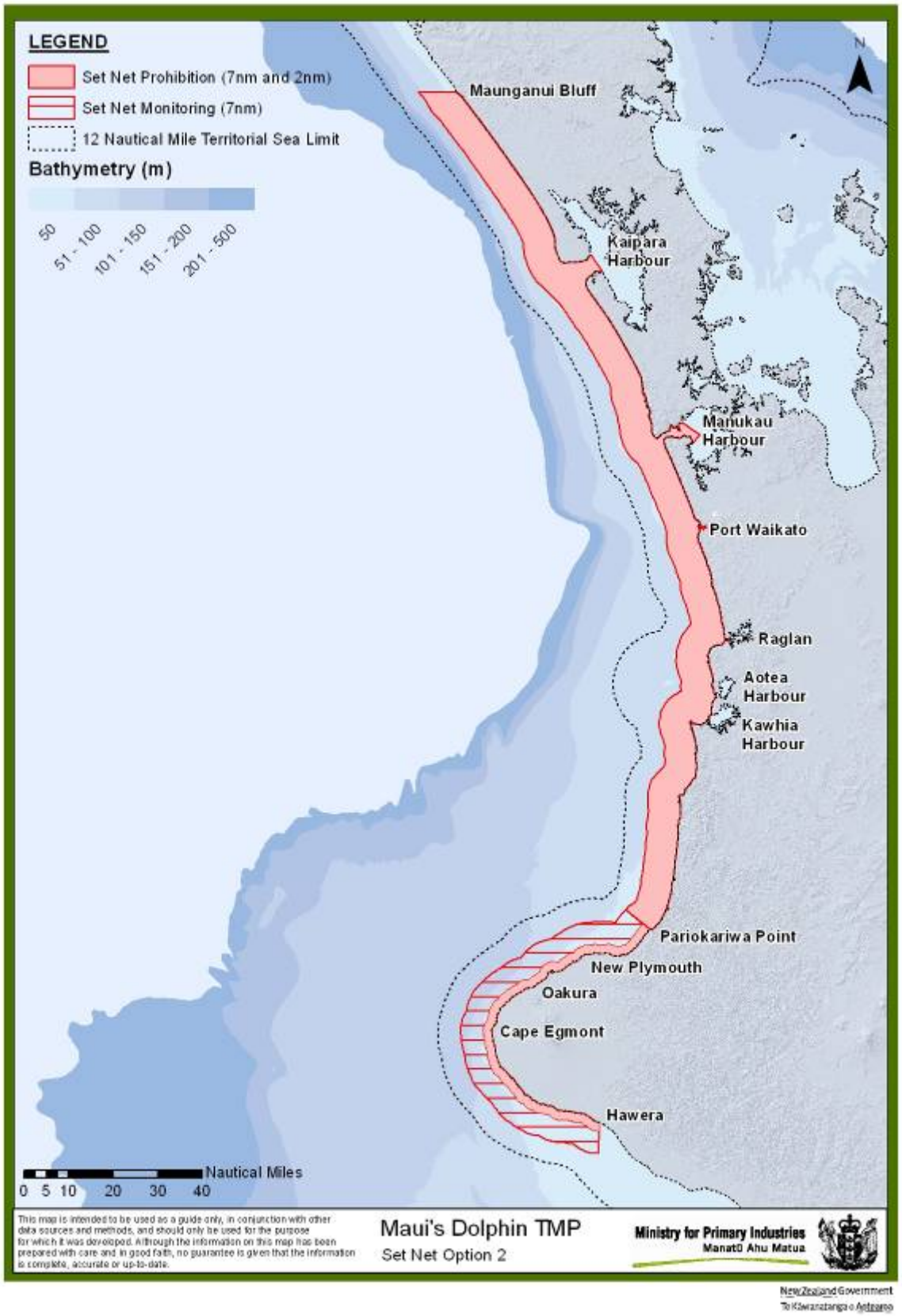
In addition, MPI would require observer services to be cost-recovered from industry beginning 1 October 2013. Observer coverage is typically cost recovered from the fishing industry from quota owners based on the area and fishstocks that are relevant to the fishing vessels in question. Allowing set net activity to continue beyond the two nautical mile boundary means residual risk remains to any Maui's dolphin present that travels beyond two nautical miles.

Because Hector's and/or Maui's dolphins have been present in the area and the consequence of an interaction is high, MPI needs to be able to detect with certainty whether an interaction with a Maui's occurs. To do so 100% observer coverage and long-term monitoring are required. MPI would assess the information gathered to inform and refine any future management decisions.

MPI would continue, under Option 2, to work with DOC on finding opportunities for taking biopsies of any Hector's and/or Maui's dolphins sighted to verify subspecies identity.

<u>Submission comments</u>

Egmont Seafoods Limited (ESL) opposes observer services costs being cost-recovered from industry as of 1 October 2013. They submit there is no evidence of Maui's dolphins within the area of the interim restrictions and the fishing industry has already incurred significant losses to their incomes and assets. ESL states the industry cannot afford to cover the cost of observer services as their businesses are now marginal with reduced catches of the two main set net target species (rig and warehou).



Map 4: Proposed commercial and amateur set net restrictions for Option 2 off the west coast of the North Island.

Effectiveness
Option 2 is as effective as Option 1 in terms of removing the residual risk to Maui's dolphins in the inshore area where the January mortality occurred. Residual risk would remain for any dolphins that travel further offshore than two nautical miles.

Impact on fishers
Option 2 will make permanent the impact on commercial and amateur set net use opportunities since the restrictions were put in place as interim measures. The primary cost associated with Option 2 is the economic impact on the fishing industry and the wider economy.

Economic impact
MPI estimates that the same vessels and proportion of the fishery would be affected as discussed in Option 1. Therefore, the estimates of potential displacement or loss of landings in Option 1 and 2 are the same.

Observer coverage
Option 2 also requires the same level of observer coverage as outlined in Option 1 to enable commercial set netting to continue between two and seven nautical miles from shore. The same limitations would apply to those vessels able to, or not currently able to carry an observer.

However, in putting in place the current measures via regulation MPI considers the costs of this observer coverage should be covered by industry. MPI proposes that cost recovery observer services for this area would come into effect for 1 October 2013 if this option was adopted.

MPI acknowledges cost-recovery of observer coverage from industry will impact the economic return the fishers receive from the fishery. Option 2 balances the long term need to manage the risk to Maui's dolphins and gather more certain information, while enabling set netting to continue.

MPI estimates the ongoing cost of mandatory observer coverage between the two and seven nautical mile area to be:

	Midpoint	Upper Estimate
Estimated Annual Cost	$315 480	$526 000
Estimated Cost to 2015 (3 years coverage)	$946 440	$1 578 000

Further discussion on observer coverage, how these estimates were derived, and submission comments relating specifically to observer coverage can be found in section 11.

Non-commercial impact
MPI considers the impact of Option 2 on recreational fishers to be the same as discussed in Option 1.

Option 3

Option 3 (Map 5) would:

- prohibit commercial and amateur set net fishing between zero and four nautical miles offshore from Pariokariwa Point to Hawera; and
- prohibit the use of commercial set nets between four and seven nautical miles offshore from Pariokariwa Point to Hawera without an observer onboard the vessel.

Under Option 3, MPI would look to cost recover observer services from industry.

MPI would continue to work with DOC to find opportunities for taking biopsies of any Hector's and/or Maui's dolphins sighted to verify subspecies identity.

As with Options 1 and 2, 100 percent observer coverage between four and seven nautical miles would not prevent any dolphin mortalities from occurring. Instead, observer coverage would provide independent monitoring and reporting of fishing interactions with, or sightings of, Hector's and/or Maui's dolphins beyond four nautical miles.

Submission comments

28 submissions support an extension of the set net ban out to four nautical miles. However, a number of those submissions considered the extension inadequate and preferred the extension go to seven or twelve nautical miles offshore, or to the 100 m depth contour. They supported Option 3 because it was the maximum proposed by MPI in the consultation paper.

Industry submissions oppose any extension of the ban out to four nautical miles. They consider that there is no evidence of Maui's dolphins in the area and therefore no need to increase any restrictions. ESL submits that no further restrictions should be considered until there is certainty of the distribution of Maui's dolphins.

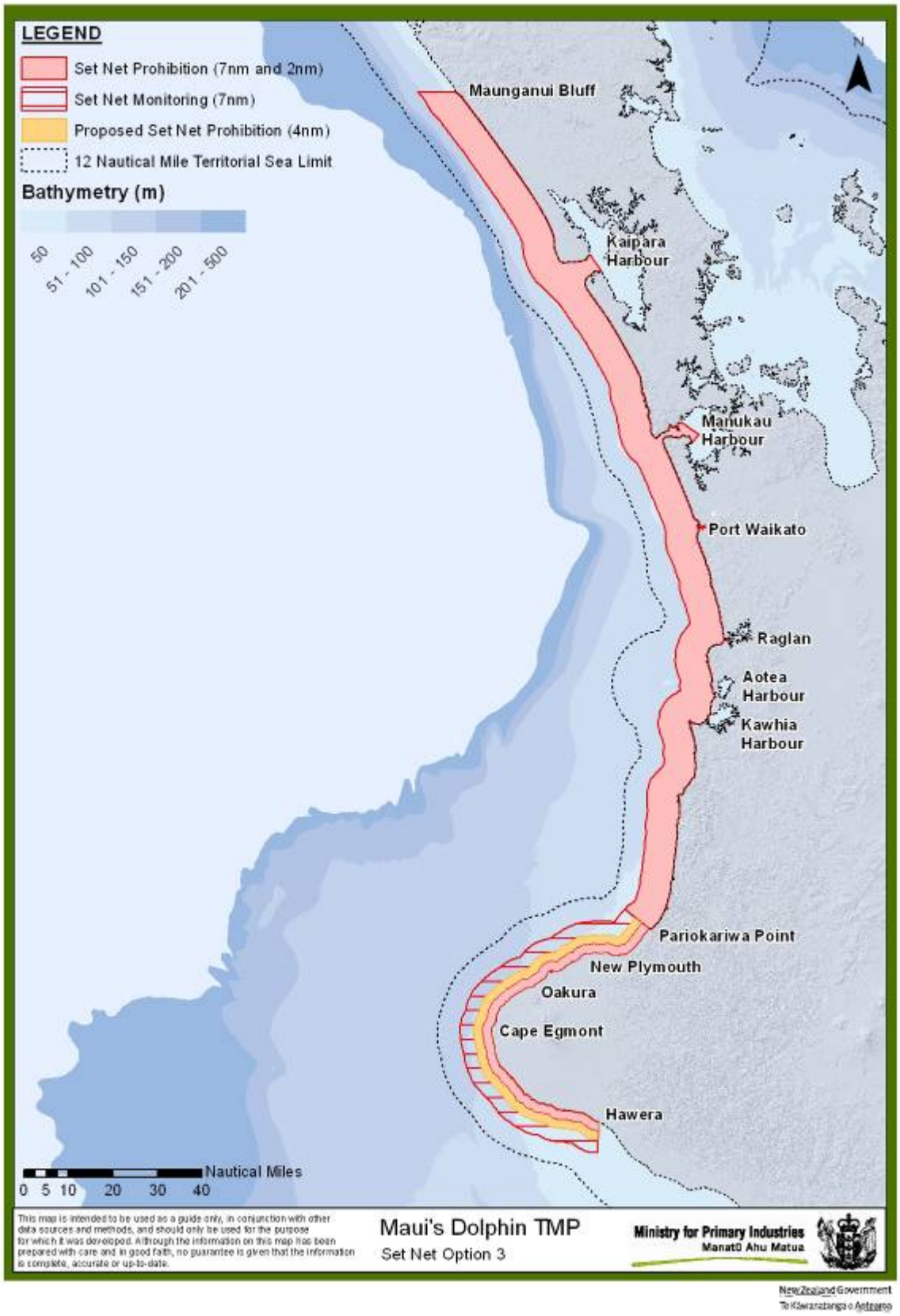
Summary

Option 3 is a more conservative option given the Taranaki area is outside Maui's dolphin core range and the overall number of Maui's is very small. Option 3 is appropriate if you consider it necessary to reduce the residual risk of a set net related mortality in the offshore area where Hector's and/or Maui's dolphins observed off the WCNI are most prevalent (between zero and four nautical miles). This option removes a greater level of residual risk in the area south of Pariokariwa Point than Option 1, 1b and 2.

Effectiveness

A spatial closure out to four nautical miles will provide you with greater certainty that risks to Maui's dolphins south of Pariokariwa Point will be avoided. Option 3 includes the offshore range where Maui's and/or Hector's are most frequently observed (between zero and four nautical miles), including the area where the January mortality occurred.

Residual risk would remain for any Maui's dolphin that is present and travels offshore beyond four nautical miles. MPI considers the likelihood of interactions between four and seven nautical miles is low, and smaller than the likelihood of interactions in Option 2, but the consequence of an interaction remains very high.



Map 5: Proposed commercial and amateur set net restrictions for Option 3 off the west coast of the North Island, including an extension of the set net prohibition from two to four nautical miles and 100% observer coverage between four and seven nautical miles.

Impact on fishers

Option 3 would have the greatest impact on commercial and amateur fishers in the Taranaki area. The primary cost associated with Option 3 is the economic impact on the fishing industry and the wider economy.

Economic impact

MPI estimates 6-8 commercial vessels and a large proportion of set net fishery from Pariokariwa Point to Hawera would be directly affected. The ability for commercial set net fishers to adjust their fishing behaviour by moving further offshore beyond four nautical miles may be constrained. The species mix caught between four and seven nautical miles offshore may not align with their annual catch entitlement (ACE) packages, which enable them to target and land certain species (most commonly found between zero and four nautical miles from shore) without financial penalties.

Catch effort and landings data have been used to estimate the value of set net landings coming from the area and the potential volume of landings that would be lost or displaced. A detailed analysis of the economic impacts can be found in Appendix 4.

Estimated using landings data from 4 year average of October fishing year data[54]

	Method 1 (MPI preferred)	Method 2 (Upper bound)
Annual Revenue Gained	$646 425	$1 398 926
Annual Value Add Gained	$1 085 994	$2 350 195
Capitalised Future Value Gained	$3 649 399	$8 199 641
Subtotal = Gain to Industry	$4 735 393	$10 549 836

These estimates should be treated as indicative only because they do not fully account for the ability of fishers to shift their effort outside of the closed area, noting that the remaining set net closures off the WCNI has already resulted in a large area loss. In addition, fishers are already affected by the interim measures in place between zero and two nautical miles offshore, which would be captured by the estimates above.

Observer coverage

MPI considers that those currently carrying an observer under the interim measures could also do so under Option 3. However, the costs associated with observer coverage under Option 3 may be less than estimated in Option 1 and 2. The area of observation is smaller (between four and seven nautical miles offshore) and a closure out to four nautical miles may mean continuing set net activity beyond 4 nautical miles would not be cost effective if the species mix does not align with fishers' ACE packages.

MPI estimates the ongoing cost of mandatory observer coverage between the four and seven nautical mile area to be:

	Midpoint	Upper Estimate
Estimated Annual Cost	$315 480	$526 000
Estimated Cost to 2015 (3 years coverage)	$946 440	$1 578 000

Further discussion on observer coverage, how these estimates were derived, and submission comments relating specifically to observer coverage can be found in section 11.

[54] All economic impacts for this region (Pariokariwa Point to Hawera) have been estimated using catch effort and landing data from a 3 year and 4 year average of October fishing year data, and the 1 October 2011/12 fishing year.
MPI notes that the October fishing year data for 2011/12 does not have any landings from the 0 to 2 nautical mile area for the last two months of the fishing year (August and September) because of the interim measures coming into effect.
Long term losses have been included in Appendix 4 to acknowledge that the management option may result in long term impacts on the commercial fishery.

The costs of observer coverage under Option 3 would be cost-recovered from the industry, which will impact the economic return the fishers receive from the fishery. Option 3 maintains the requirement to gather more information on dolphin presence and potential interactions with set net fishing beyond four nautical miles offshore.

Non-commercial impact
The value of recreational set net fishing is unable to be quantified. However, it is likely that Option 3 would remove virtually all recreational set net activity in the region.

MPI considers the increased costs in travelling further afield (particularly offshore beyond four nautical miles) would make the activity cost-prohibitive. Recreational vessels are generally smaller and there would likely be logistical and safety issues preventing them from doing so. Fishers will be required to change their fishing method, which could change the costs associated with being able to continue to recreationally fish. For some species, set net is the most practical method to successfully target them leaving few alternatives to continue to catch certain species or force them to target different species that may be less desirable.

Option 4

Option 4 (Map 6) would extend the set net ban south from Pariokariwa Point to Hawera and offshore to seven nautical miles.

Submission comments
A number of submissions noted their support for a set net prohibition to extend at least as far as seven nautical miles along the range of Maui's dolphin distribution. Rationale for a seven nautical mile offshore boundary included:

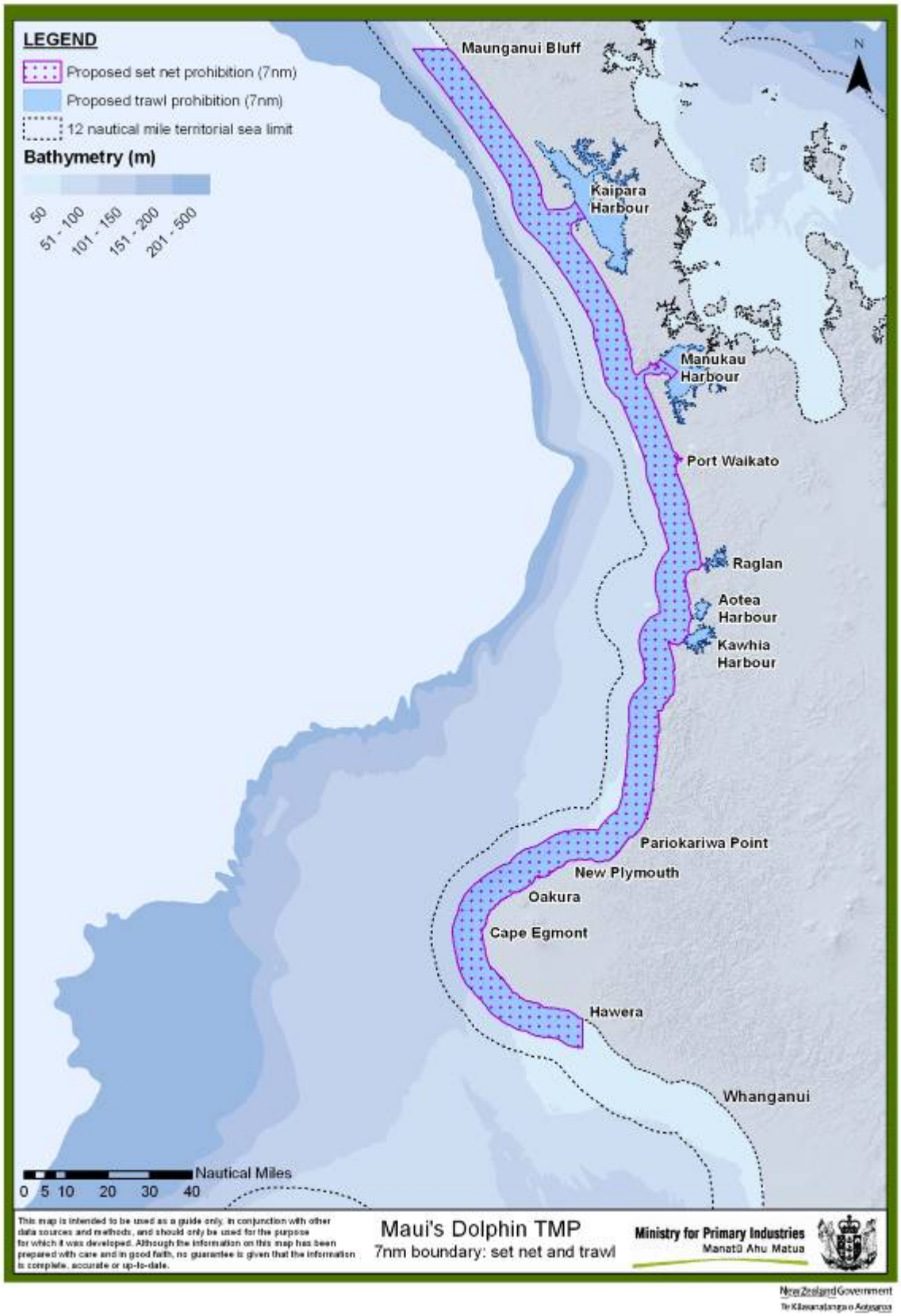
- The boundary would reflect the offshore distribution map produced by the risk assessment panel.
- The boundary would provide protection in the majority of areas where the greatest level of residual risk has been identified.
- There have been reliable survey sightings of Maui's and/or Hector's dolphins off the WCNI out to seven nautical miles.

Additionally, some submissions raise concerns at the variability in offshore protection measures in different parts of Maui's dolphin's range. Dawson, for example, considers it illogical to have Maui's dolphins protected from gillnetting to seven nautical miles offshore in one area, but only to two or four nautical miles offshore in other areas.

Summary
Option 4 is a more conservative option than Option 3 given the Taranaki area is outside of Maui's dolphin core range and the overall number of Maui's is very small. Option 4 is appropriate if you consider it necessary to reduce the residual risk of a set net-related mortality in the Taranaki region in the offshore range where Hector's and/or Maui's dolphins have been observed (as found in aerial research surveys) closer to their core range.

An offshore boundary of seven nautical miles takes into account information on Maui's and/or Hector's dolphins observed off the WCNI. This information shows they can, at times, range as far offshore as seven nautical miles and is consistent with the current set net prohibition from Maunganui Bluff to Pariokariwa Point.

MPI considers the likelihood of an interaction out to seven nautical miles to be low given the small size of the population and the likelihood of encountering a dolphin declines with distance from shore. Consequently, MPI considers that there is a low likelihood of a fishing-related mortality occurring out to seven nautical miles near the margins of their current range (*i.e.* the Taranaki area).



Map 6. Submission proposal to prohibit commercial and amateur set net and trawl activity out to seven nautical miles from shore off the west coast of the North Island.

Effectiveness
This option is appropriate if you consider it necessary to remove most of the risk of a set net related mortality in the offshore area where Hector's and/or Maui's dolphins have been observed off the WCNI.

Impact on fishers
This option would have moderately-high impact on commercial and amateur fishers off the WCNI, but significantly affect some participants far more than others. The primary costs associated with this option are the economic impact on the fishing industry and the wider economy, as well as the removal of a fishing activity commonly used by recreational fishers to provide food for their families.

MPI has estimated the economic impact on the set net fisheries using catch effort and landings data to estimate the value of set net landings within this area and the potential volume of landings that would be lost or displaced. The detail of the economic analysis can be found in Appendix 4.

The economic impacts of a set net prohibition out to seven nautical miles are:

Estimated using landings data from 4 year average of October fishing year data[55]

	Set net prohibition (Maunganui Bluff to Hawera)
Annual Revenue Loss	$918 677
Annual Value Add Impact	$1 543 377
Capitalised Future Value Impact	$5 271 194
Subtotal = Cost to Industry	$6 814 571

Some of this loss is unlikely to be permanent as some of the catch and landings may be caught using other fishing methods. However, this adjustment could take time to eventuate and an unknown proportion may be lost for an extended period of time until alternative harvesting methods are developed.

MPI considers it would be very difficult for recreational fishers to utilise some fisheries to the extent they currently do when set netting. Catches of some of those species will probably decrease, and opportunities to continue to access those species would depend on the uptake of alternative methods that enable them to continue fishing (e.g. hand lining).

[55] All economic impacts have been estimated using catch effort and landing data from a 4 year average of October fishing year data, and the 1 October 2011/12 fishing year. Long term losses have been included in Appendix 4 to acknowledge that the management option may result in long term impacts on the commercial fishery.

Option 5

Option 5 (Map 7) would extend the set net prohibition from Maunganui Bluff south to Whanganui and out to the 100 m depth contour.

Submission comments

Justification for a set net prohibition out to the 100 m depth contour included:

- The above measures are recommended by the International Whaling Commission (IWC) Scientific Committee, the IUCN Cetacean Specialist Group, and the New Zealand Marine Sciences Society to eliminate what is considered the greatest known human-induced threat to the Maui's dolphin population.
- Offshore sightings out at the 100 m depth contour, despite the population being at such a low level, confirm their presence out to this depth and reinforce the need to protect them throughout their habitat range.
    - A Maui's or Hector's dolphin was sighted from the Maui A platform south west of Taranaki (situated in 110 m water depth) in April 2012.
    - An additional sighting reported to Greenpeace of a Maui's or Hector's dolphin from the Maui B platform (situated in 103 m water depth) this year.
- Research establishing that Hector's dolphin off the south east coast of the South Island favour shallow waters less than 100 m depth, which in the absence of information on Maui's dolphin should be considered the best proxy given they are of the same species and demonstrate similar characteristics
- The acoustic detections and sightings of these dolphins in and around the harbours suggest they are likely to be present and vulnerable to any set net activity.

Most submissions considered if protection out to the 100 m depth contour was not provided, then any set netting or trawling allowed to continue within this area have in place full (mandatory) observer coverage for by-catch reporting.

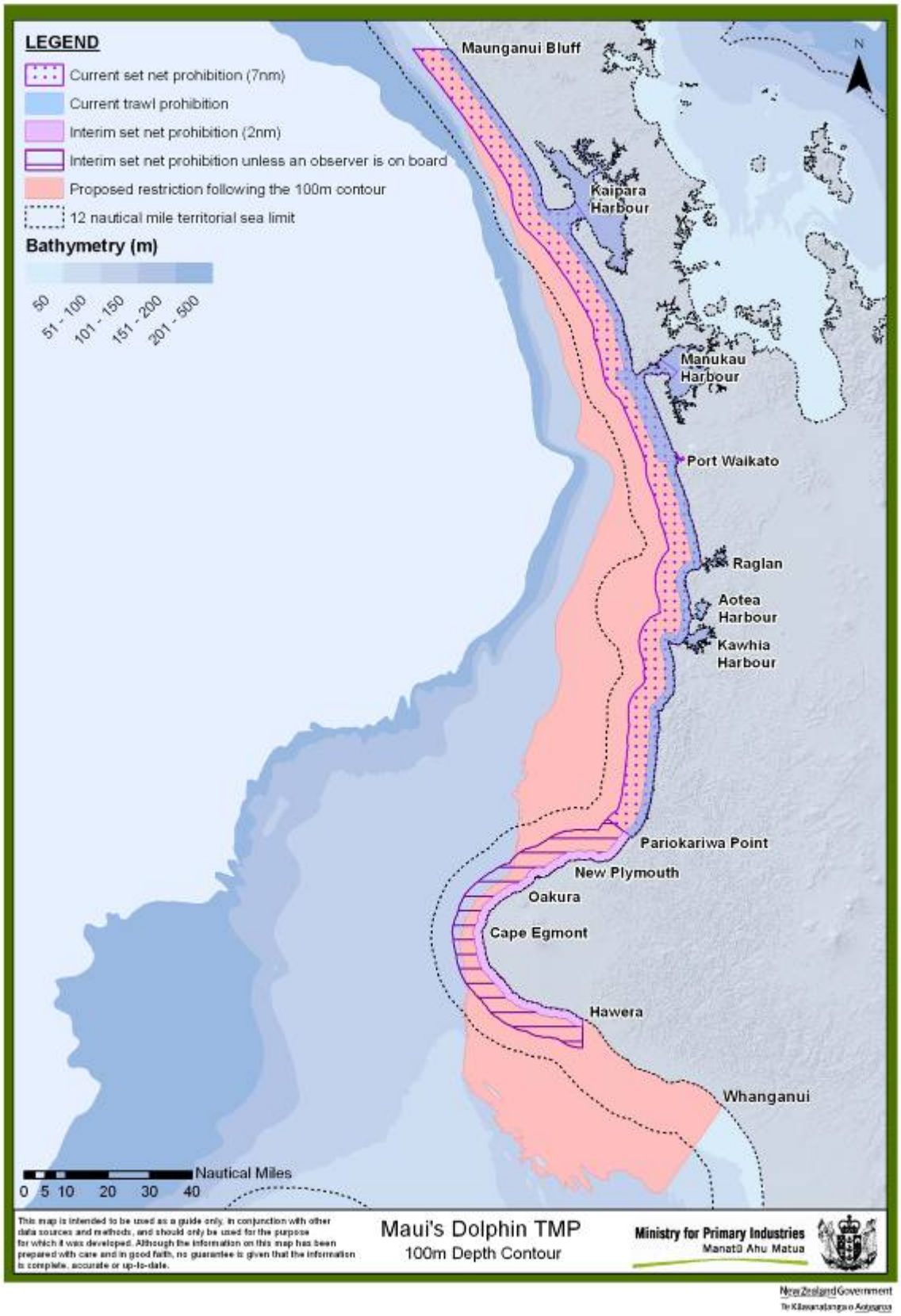
MPI Analysis

In developing the consultation paper, MPI was unaware of the:

- validated public sighting (Category 3) of a Hector's or Maui's dolphin off the WCNI at the Maui-A oil platform (approximately 19 nautical miles offshore, southwest of the Taranaki coast) this year, and
- The anecdotal (non-verified) sighting at the Maui-B platform.

MPI was informed by DOC of the Maui-A sighting on 14 November 2012. MPI considers this new information important for you to take into account when making your decision under the Act.

MPI notes there is residual risk from set net activities beyond the areas where management measures are currently in place for Maui's dolphins. MPI also notes that the options proposed in the consultation paper would not remove *all* residual risk to the population.



Map 7. Current commercial and amateur set net restrictions off the west coast of the North Island, overlaid with the approximate boundary of the 100 m depth contour as proposed in submissions.

Summary
Whether it is necessary for you to manage the impacts of set net activity out to the 100 m depth contour (or suitable proxy) depends on your assessment of the likelihood of fishing-related mortality occurring and the consequence of mortality to the Maui's dolphin population.

MPI considers the likelihood of an interaction beyond seven nautical miles to be low given the small size of the population and the likelihood of encountering a dolphin declines with distance from shore. Consequently, MPI considers that there is a low likelihood of a fishing-related mortality occurring beyond seven nautical miles. MPI notes the consequence of a single fishing-related morality is very high.

Effectiveness
The removal of set activity out to the 100 m depth contour (or suitable proxy) is the most conservative option. This option is appropriate if you consider it necessary to remove almost all risk of a set net-related mortality in the offshore area where Hector's and/or Maui's dolphins have been observed off the WCNI.

Impact on fishers
This option would have the greatest impact on commercial and amateur fishers off the WCNI. The primary costs associated with this option are the economic impact on the fishing industry and the wider economy, as well as the removal of a fishing activity commonly used by recreational fishers to provide food for their families.

MPI has estimated the economic impact on the set net fisheries using catch effort and landings data to estimate the value of set net and trawl landings within this area and the potential volume of landings that would be lost or displaced. The detail of the economic analysis can be found in Appendix 4.

The economic impacts of a set net ban out to the 100 m depth contour are:

Estimated using landings data from 4 year average of October fishing year data[56]

	Set net prohibition (100 m depth contour)
Annual Revenue Loss	$1 872 803
Annual Value Add Impact	$3 146 310
Capitalised Future Value Impact	$12 320 979
Subtotal = Cost to Industry	$15 467 289

Some of this loss is unlikely to be permanent as some of the catch and landings may be caught using other fishing methods. However, this adjustment could take time to eventuate and an unknown proportion may be lost for an extended period of time until alternative harvesting methods are developed.

MPI considers it would be very difficult for recreational fishers to utilise some fisheries to the extent they currently do when set netting. Catches of some of those species will probably decrease, and opportunities to continue to access those species would depend on the uptake of alternative methods that enable them to continue fishing (e.g. hand lining).

[56] All economic impacts have been estimated using catch effort and landing data from a 4 year average of October fishing year data, and the 1 October 2011/12 fishing year. Long term losses have been included in Appendix 4 to acknowledge that the management option may result in long term impacts on the commercial fishery.

9.3 WCNI harbours' set net fishery

Characterisation of commercial set net activity in the harbours

- Commercial set net fishery in the harbours primarily targets flatfish, rig and mullet.
- Most fishing effort in the Raglan and Kawhia harbours does not include reporting by position (that is including latitude and longitude).
- Fishing effort in the Kaipara and Manukau harbours can be quantified because they are distinct statistical reporting areas, although there is uncertainty as to where in those harbours fishing activity occurs.
- Where position information is available in the Manukau Harbour, it suggests a high intensity of set net activity along the boundary of the current set net restrictions. However, this information is highly uncertain given the low level of reporting by position.
- There have been a maximum of 44 and 64 commercial set net vessels operating within the Kaipara and Manukau harbour, respectively, in the last three years.

Characterisation of customary set net activity in the harbours

- The level of customary set net activity in the west coast North Island harbours cannot be quantified. However, MPI recognises that set net fishing is a culturally important activity for customary fishers.

Characterisation of recreational set net activity in the harbours

- The level of non-commercial set net activity in the west coast North Island harbours cannot be quantified. Recreational set net fishing is a culturally important activity for many New Zealanders that enjoy leisurely or rely on for sustenance fishing

Commercial and non-commercial set netting occurs in all west coast harbours (Kaipara, Manukau, Raglan, Aotea[57] and Kawhia). The main set net target species in the harbours are flatfish, rig and grey mullet. Virtually all parts of all the harbours are fished, from intertidal upper reaches to the deeper channels towards the entrances. However, the available information suggests that where set net effort occurs in the harbours is influenced by the species being targeted.

Submission comments

Industry submissions explain that they operate a very selective, specialised and sustainable fishery. Industry submissions describe how set netting in the Manukau harbour is quite different to set netting on the West coast. K. Torpey explains for example that their nets are set up and down the tide – not across it as on the coast. G. Torpey also specifies that the size of the nets and their position in the water column are different to the settings on the West coast.

G Torpey explains that set netting in the Manukau harbour is his livelihood and his primary target species is rig. He target rig in the deep holes of the Manukau Harbour, where 90 percent of his rig catch is caught and this fish is all exported to Australia.

Recreational fishers submit that set netting is a legitimate and traditional way to catch fish for pleasure and to provide food for their families. They consider most recreational fishers will stay with or nearby their nets during that time.

[57] No commercial fishing occurs in Aotea Harbour because a mātaitai is in place.

Both industry and recreational submissions suggest there are a limited number of days suitable for fishing in the Manukau. Weather, tides, strong currents and the seasonal availability/non-availability of target species limits fishing effort. T. Rea submits set netting is not a random activity but one that takes planning and correct gear to enjoy success.

MPI analysis

MPI consider the comments from industry to provide additional information that is useful to better characterise the set net fishery in the harbours of the WCNI. MPI has taken note of this when considering the additional options put forward by industry for MPI's consideration.

9.3.1 Residual risk from existing commercial and amateur set net prohibitions and restrictions

Assessment of residual risk from existing harbour set net measures and dolphin distribution

- Since 2008 there has been a total of 22 days observer coverage between November and December 2008 in the WCNI harbour set net fishery, and:
  - This coverage occurred in the Manukau Harbour.
  - No interactions with, or sightings of, Maui's dolphins was observed.
- Best available information suggests that:
  - Hector's and/or Maui's dolphins are more likely to be observed near the entrances to the Kaipara, Manukau and Raglan harbours, and Port Waikato river mouth, while their presence in the channels is rare and infrequent.
  - Set net activity in these areas is prohibited under the current regulations.
  - There has been a single acoustic detection of a Hector's and/or Maui's dolphin inside the Kaipara Harbour beyond the current set net restriction boundaries.
- MPI is unable to quantify the residual risk to Maui's dolphins in WCNI harbours from set net activity given the uncertainty in the distribution information of the dolphins in the harbours as well as set net activity.
- Using a qualitative assessment, MPI considers some residual risk may remain given the proximity of the harbours to the Maui's dolphin core range, and their occasional movements into the harbour channels.
- The risk is greater where the intensity of set net activity is high and its proximity to where dolphins have been most commonly observed.
- However, MPI consider the likelihood of interactions with set net activity in the harbours to be low given that:
  - harbours are outside the range where the dolphins are most commonly observed,
  - the overall number of Maui's dolphins is very small, and
  - the level of risk is dependent on whether (and how frequent) the dolphins may travel beyond the harbour entrance channels (of which there is little information).

Sixteen of the nineteen submitters focussing on the harbours state that they have never seen a Maui dolphin in the Manukau harbour. Most of them[58] point out that they and members of their families, or people they know, have been fishing and, or, living in the harbour for many years and have never observed Maui dolphins in the harbour. For this reason, they do not consider there to be any risk to the dolphins in the harbour given the absence of sightings.

Four submitters[59] report that they have seen Maui dolphins in the entrance of the Manukau harbour. D. Lawrence finds amazing that an area in the inner part of the harbour has a set

[58] P. Ashby, P. Goddard, Anonymous, J. Rowling *et al.*, T. Rea, K. Torpey, G. Torpey, P. Mullings, M. Emerson, B. Chamberlain, M. Roberts.
[59] D. Lawrence, Counties Sport Fishing Club, P. Botica, Seafood New Zealand.

net ban while literally hundreds and thousands of people visit the beaches and wharf there, plus all the boating, and there has not been any sighting of a Maui dolphin.

A. and G. Wadsworth, as members of the general public, state that if a Maui's dolphin had been seen in the Manukau harbour especially over the past 5-10 years when the Maui's dolphin has been in the news someone would have seen it and there would have been publicity and talk in the area about it. Four submitters also add that they have never caught a Maui's dolphin.

One submitter says that legal recreational fishing is not the cause responsible of the death of the Maui's dolphins. This is supported by three submitters[60] who explain that recreational fishers set their nets in few feet of water. Some submitters point out that the mesh size used on recreational set nets is too small to present a risk for the Maui dolphins. In addition, two submitters state that recreational fishers stay next to their nets. Furthermore, three submitters explain that recreational fishers only fish for few hours each time and two add that recreational fishers fish in accordance with good netting practice.

With regard to the commercial fishery, several commercial fishers explain that nets vibrate in the strong currents making them less ghost like to the dolphins. P. Botica explains that the currents, the catch and the flotsam create a "pull down" effect that effectively shrinks the area of coverage of the net by approximately halving the height of the net. K. Torpey also explains that nets in the harbour are sinking nets, which means that if they were to become free, once they start to move, they roll up rather than float. He considers that once they are rolled up they pose no threat.

The Auckland Council considers the available information shows set net activity is intense along the current closure boundary in the Manukau Harbour. They consider the risk of a dolphin entanglement high given the fairly common occurrence of dolphins utilising the harbour, the peak density of Maui's dolphins on the coast beyond, and the possibility of a dolphin wandering further into the channels beyond the boundary. They also consider the acoustic detection of a dolphin inside the South Head of the Kaipara Harbour means further management measures are required and propose a closure of the channel area where the detection was made.

<u>MPI analysis</u>

Due to the non-requirement for the recreational fishers to report their fishing activity, the intensity and location of the recreational fishing effort is unknown. In addition, as the law only requires fine-scale spatial information reporting for commercial vessels above 6 meters, the amount of information is very limited as most of the set net vessels fishing in the harbour are less than 6 meters. Where information is available it is biased towards the behaviour of very few individuals and not representative of total effort/intensity.

As a consequence, the intensity and location of the commercial set net fishing effort is almost unknown. The information available does not allow MPI to draw any conclusions about the overall set net fishing effort in the harbour. Furthermore, there is a lack of information with regard to the presence of Maui dolphins in the inner Manukau harbour and the frequency at which they visit the latter.

MPI then is unable to quantify the residual risk to Maui's dolphins in WCNI harbours from set net activity.

[60] P. Goddard, Anonymous, J. Rowling *et al.*

9.3.2 Assessment of the need for management action

Key Points

Whether it is necessary for you to manage the impacts of set net fishing in the WCNI harbours on Maui's dolphins depends on your assessment of the likelihood of fishing-related mortality occurring and the consequence of mortality to the Maui's dolphin population.

There is uncertainty about Maui's dolphin presence in the WCNI harbours beyond the entrance channels where they have been detected, the location of set net activity in the harbours, and where the two are most likely to overlap. This uncertainty makes it difficult to quantify the residual risk in these harbours.

Overall, MPI considers there is a need for additional management measures because:

- The risk assessment finding indicate that there is residual risk in the harbours, particularly in the Manukau Harbour
- Sightings and acoustic detections indicate the dolphins may occasionally enter portions of the harbours.
- The uncertainty in where fishing effort is concentrated and distributed.
- The consequence of any mortality to the population as discussed above (but noting the uncertainty also discussed above)
- Notwithstanding, you can take a different view of the level of risk to Maui's dolphins based on the information presented below.

As discussed previously, the information principles in the Act provide you with guidance on how to respond to uncertain information.

9.3.3 Management Options

Commercial and Amateur Set Netting (WCNI Harbours)	
Option 1	*Status quo:* Keep existing management
Option 2	Keep existing management and • Improve information on dolphin distribution and set net activity in the west coast North Island harbours, with a focus in the Manukau Harbour.
Option 2b (MPI preferred)	Keep existing management for set netting, and • Allow commercial ring netting in the Manukau Harbour where current set net restrictions apply (under specified conditions), and • Improve information on dolphin distribution and set net activity in the west coast North Island harbours, with a focus in the Manukau Harbour.
Option 3	In addition to existing management for set netting: • Extend the existing set net ban in the entrance of the Manukau Harbour further into the harbour. • Improve information on dolphin distribution and set net activity in the west coast North Island harbours, with a focus in the Manukau Harbour.
Option 4 (New)	Prohibit set net activity in all west coast North Island harbours.

Submissions received that comment on the options proposed in the consultation paper are discussed within the assessment of each option. MPI notes that the majority of submissions received considered MPI's proposals inadequate to address the fishing-related risk to the Maui's dolphin population and proposed more extensive measures (refer to Option 4).

Option 1 (Status quo)

Option 1 would keep the current management measures in place for WCNI harbours (Map 8). You may consider that the residual risks of fishing-related mortality from set net fishing in the harbours are acceptable and that further measures to avoid, remedy or mitigate the effects of fishing-related mortality on Maui's dolphins are not currently required.

The *status quo* remains a valid option given uncertainty over the nature and extent of Maui's dolphin distribution and use of the harbours, the vulnerability of the dolphins to fishing-related mortality from set net activity in the harbours, and the impact on fisheries users.

Submission comments

Few submissions received are in favour of Option 1. Amongst the submissions received, three submitters speaking on behalf of the recreational fishery expressed being in favour of the Option 1. They mentioned that the *status quo*, acknowledged in the plan as a viable option, is a more than adequate control and no additional action should be taken.

Two submitters from the general public also support the *status quo* option; one stating that the ban is completely unnecessary and any further net ban would be ludicrous, the other one mentioning that a further ban should only be put in place if there is incontrovertible evidence that the Maui's dolphin has actually been seen in the area affected and as they believe it has not, an additional ban should not occur.

Three submitters, on behalf of the commercial fishery, consider that the closures have done nothing to save or protect the Maui dolphins as they consider that the dolphins are not present in the Manukau harbour, and have never been, but also that the set net ban is a totally unnecessary reaction.

Some submitters[61], both with a commercial and/or a recreational perspective, would prefer to see the set net ban modified either by changing the boundaries (*i.e.* go back to pre-2008) or by lifting the ban as they consider it as unnecessary.

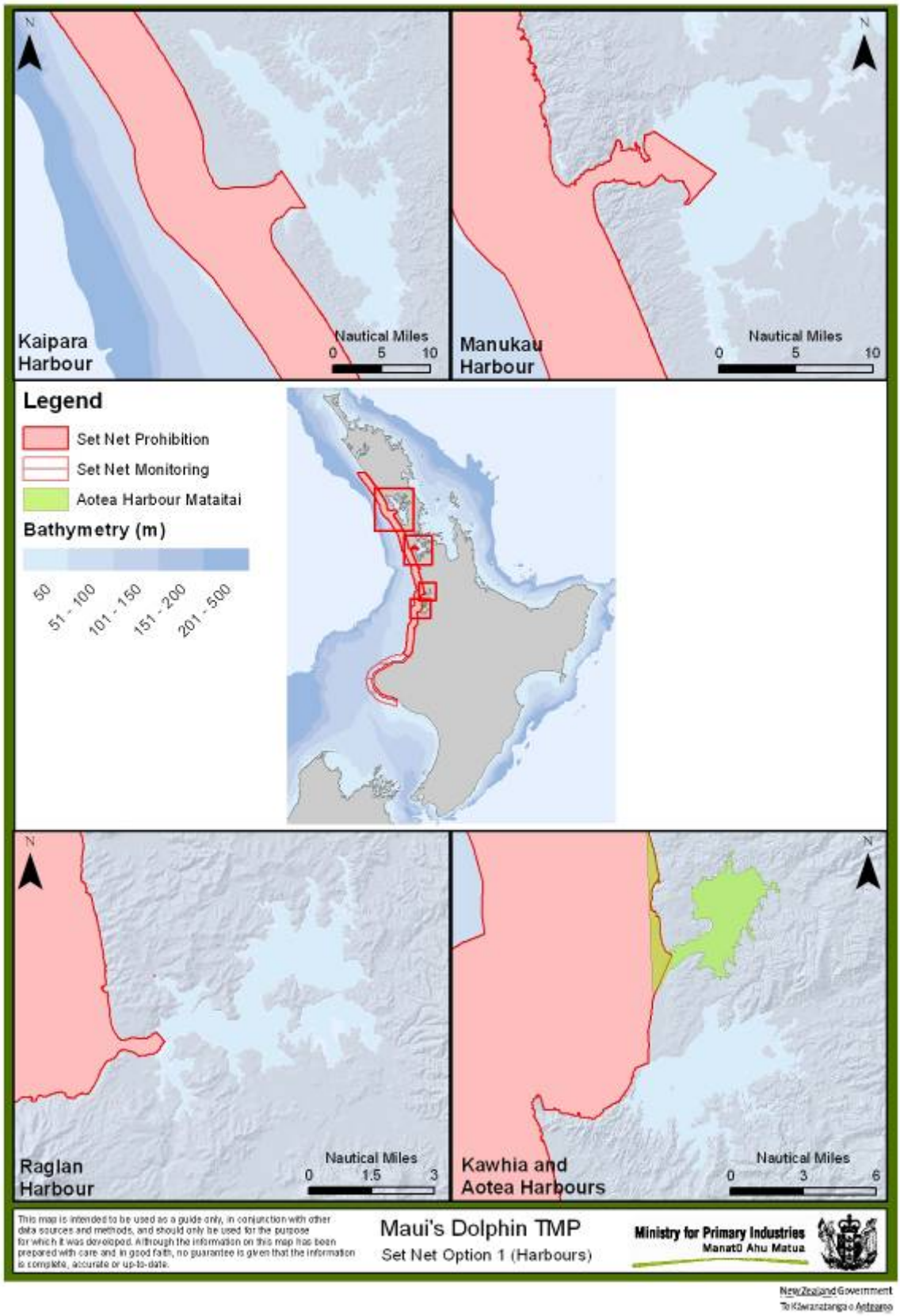
MPI Analysis

Option 1 is appropriate if you consider the level of risk posed by set net activity in the harbours is acceptable, but do not consider that the collection of quantitative information on the nature of that risk is a priority.

Effectiveness

Option 1 will not mitigate risk of Maui's dolphin entanglement with set nets.

[61] P. Goddard, Anonymous, J. Rowling *et al.*, D. Lawrence, P. Mullings, M. Emerson, M. Roberts.



Map 8. Current (*status quo*) commercial and amateur set net restrictions within the west coast North Island harbours.

Option 2

Option 2 would keep the current management measures for the WCNI harbours (Map 8 shown above) and improve information in two areas:

- Maui's dolphin use of the WCNI harbours, with a focus in the Manukau Harbour, and;
- where commercial and amateur set net activity is occurring in the harbours.

Submission comments

Ten[62] submissions are in favour of Option 2, but seven[63] of them would prefer to see the set net ban modified either by changing the boundaries (*i.e.* go back to pre-2008), by lifting the ban as they consider it as unnecessary or by allowing some targeted fishery in the current banned area under strict conditions (see Option 2b below). This position is commonly shared by people speaking on behalf of the commercial and recreational components.

Option 2 consists on improving information on Maui dolphin distribution and set net activity in the WCNI harbours, with a focus in the Manukau Harbour. To do so, MPI requested the submitters to comment on additional sustainability measures that may support reducing the risk of fishing-related mortality on the Maui dolphin population. Seven submitters consider that there is a need for more research. In order to improve the knowledge with regard to the Maui dolphin distribution and movements a number of submissions supported the use of electronic devices. Sanford recommends using either satellite tagging to monitor dolphin movement or acoustic recording devices that record the crossing of animals into other water spaces.

In addition, SNZ, Sanford and three members of the general public[64] recommend making compulsory the fine-scale reporting in the areas where ring netting could be authorised by asking both recreational and commercial set netters to accurately report in real time the placement of their nets including start and end points irrespective of whether the net was placed from vessel or land. SNZ also states that they would investigate the practicality and cost of the wider adoption of locator beacons in inshore fisheries. One submitter from the fishing industry said that the industry will continue to evaluate other forms or risk reduction or mitigation.

One member of the general public[65] suggests that MPI should work with local iwi/hapu and affected communities to improve awareness of the impact of set net fishing, create favourable attitudes towards set net bans, and have ownership of their contribution to the recovery of Maui's dolphin populations in their areas.

Summary

Option 2 is appropriate if you consider the level of risk posed by set net activity in the harbours is acceptable, and collection of quantitative information on the nature of that risk is a priority.

MPI recognises the importance of improving information on Maui's dolphin distribution in the harbours to improve management of fishing-related threats to the population. In particular, there is insufficient information to quantify the degree of overlap between Maui's dolphins and set net activity in the harbours.

Given the information available suggests that Maui's dolphin presence in the harbours is rare and infrequent, improving information on dolphin distribution and set net activity is important. Option 2 proposes to focus improving this information initially on the Manukau Harbour given

[62] D. Lawrence, T. Rea, K., Torpey, G. Torpey, P. Mullings, M. Emerson, B. Chamberlain, P. Botica, Sanford, Seafood New Zealand.
[63] D. Lawrence, K., Torpey, G. Torpey, P. Mullings, M. Emerson, Sanford, Seafood New Zealand.
[64] D. Cowley, V. Cole, M. Guerra.
[65] A. Davies

the risk assessment identified it as an area where there may be a high degree of overlap with set net activity and its proximity to the core distribution of Maui's dolphins.

Effectiveness
Option 2 will not mitigate risk of Maui's dolphin entanglement with set nets, but will improve information on the nature and extent of any risk posed by set net activity within the WCNI harbours.

MPI would investigate ways of improving information on Maui's dolphin presence in the harbours, including how far, how often, and where in the harbour they may be present. As a first step, MPI considers the annual planning and review process (proposed in section 12 of this paper) as an appropriate framework to identify possible research projects or monitoring programmes to support the collection of this information.

Impact on fishers
In order to improve information on set net activity in the harbours MPI consider a range of tools could be used. MPI would collaborate with industry on the design of any tools to improve fine spatial scale reporting to ensure it would provide meaningful information to inform management.

One approach to improving information on set net activity in the harbours is to require set net vessels (regardless of their size) to provide the latitude and longitude positions of their activity within the harbours, include start and end positions of their nets. This information would allow MPI to identify the areas where fishing intensity is greatest in comparison to Maui's dolphin distribution. The need for finer-spatial scale reporting of set net activity is discussed further in section 10.

Option 2b

Option 2b would amend the current management measures in the Manukau Harbour to allow ring netting in the area where set net activity is currently prohibited (see Map 9). This option would also include improving information in two areas:

- Maui's dolphin use of the WCNI harbours, with a focus in the Manukau Harbour, and;
- where commercial and amateur set net activity is occurring in the harbours.

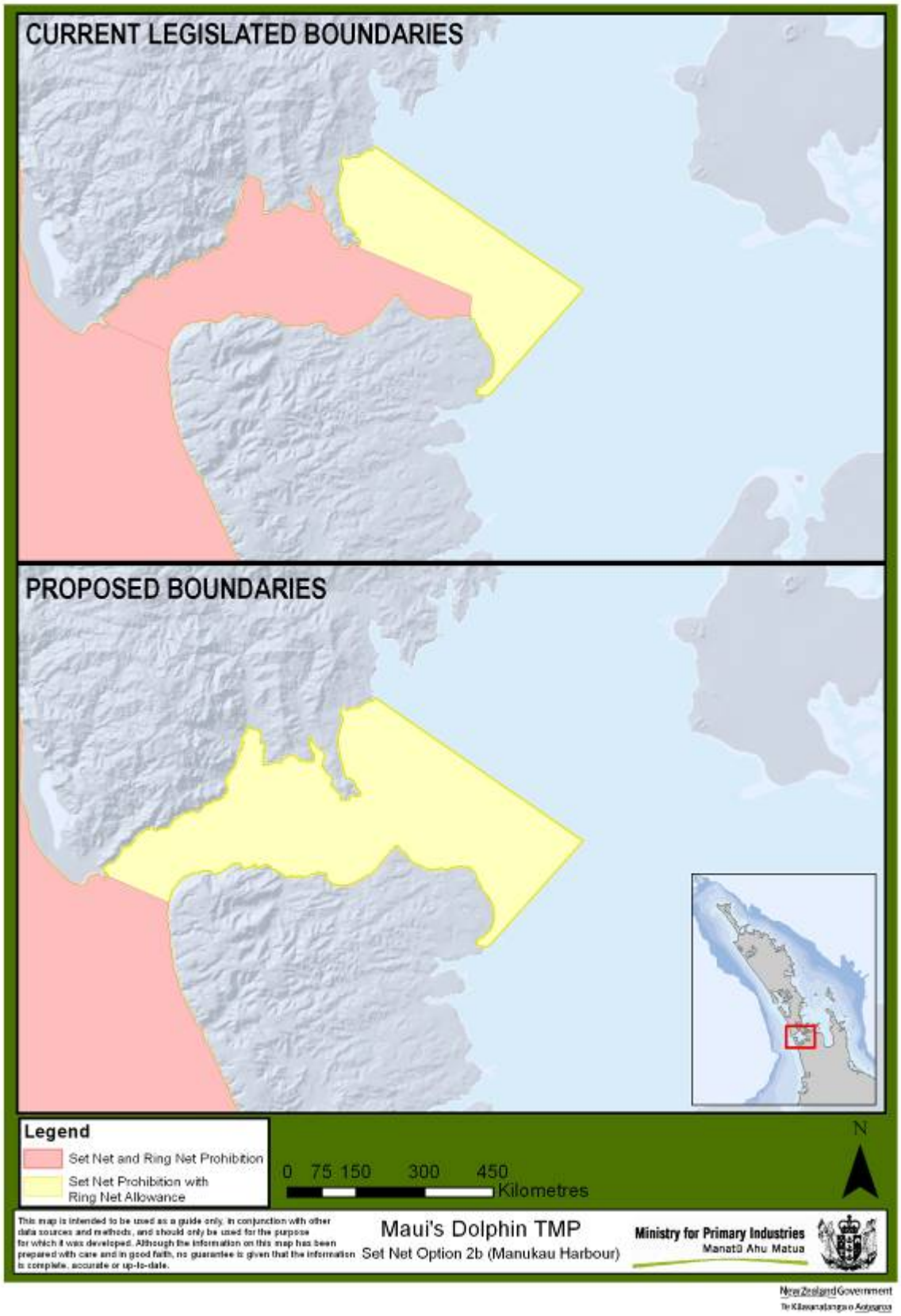
Under the ring netting exemption fishers would:

- be required to operate only one ring net at a time under constant attendance,
- allow the net to soak for a maximum period of 30 minutes, and
- only be allowed to set and haul during daylight conditions.

The maximum dimensions of the net would be 3 metres by 600 metres, with a mesh size no less than 90 mm. Nets would be required to have floats attached to ensure the head line floats on the surface and a lead-line or weighting along the bottom to keep the net upright in the water.

Ring netting is a common fishing method used to target mullet and kahawai in the Manukau and Kaipara Harbours. Ring netting has been described as:

> *'where the boat circles a school of fish with a wall of net... lay the net round in a circle or C shape. The net has a series of floats on the top and a lead-line along the bottom to keep it upright in the water. Once the fish are encircled you use the boat to panic them into the net; then haul the net into the boat.'*



Map 9. Proposed exemption area for ring netting in the Manukau Harbour (Option 2b).

Submission comments

Few submitters proposed to modify the current set net ban in the Manukau harbour, allowing for a better exploitation of the resources of the harbour, by permitting ring netting with attendance in the entire Manukau harbour including the closed areas. The submissions consider that ring netting is a low risk form of netting that is based on a small net being used to encircle or corral a school of fish and then immediately retrieving the net. They add that this is a form of targeted fishing where the school of fish is identified by electronic scanning. The submitters also explain that soak times are short and the net is either attached to, or in close proximity to, the vessel at all times.

Two commercial fishers recommend that if boat transponders were to be compulsory, then they should be compulsory to all commercial vessels that wish to fish in the closed areas, regardless of length, if they became to be reopened for ring netting.

SNZ note that ring netting is allowed in the area of the Manukau harbour closed to set netting in the 2008 TMP decision and as they consider that ring netting poses no threat to Maui dolphins, it should be permitted in the Manukau harbour area currently closed to ring netting as an unintended consequence of the 2003 prohibition on set netting.

SNZ with the help of commercial fishers have provided detailed information on the ring net fishing method and how it could be implemented in the harbour entrance area. This includes technical specificities of the gears (*e.g.* mesh size, maximum length of the nets) and the fishing conditions (*e.g.* daylight fishing, maximum soak time). Two industry submissions are also suggesting that the code of practice for commercial fishermen should be reviewed and improved if in the future some areas in the existing closed area were to be opened up for attended ring netting.

Summary
Currently, commercial ring netting is allowed under interim relief for mullet only in the area of the Manukau harbour which was closed to set netting in 2008 (shown in yellow in the top panel, Map 9). The initial prohibition of ring netting in this area was an unintended restriction as a result of the decision to extend the set net prohibition further into the harbour in 2008[66].

Under Option 2b the area open to ring netting would be expanded to include the harbour channel (shown in yellow in the bottom panel, Map 9). Specified conditions would apply to the length and height of ring nets used, as well as the time and duration they could be deployed.

Option 2b is appropriate if you consider the level of risk posed by set net activity in the harbours is acceptable, collection of quantitative information on the nature of that risk is a priority, and an allowance for commercial ring netting in the existing set net ban area a low and acceptable level of risk to the Maui's population.

Effectiveness
Option 2b will not mitigate risk of Maui's dolphin entanglement with set nets, but will improve information on the nature and extent of any risk posed by set net activity within the WCNI harbours.

Given ring netting involves deployment of a net for a shorter period of time and is under constant attendance, MPI consider this method may provide an alternative fishing method that is capable of avoiding, remedying or mitigating the effects of fishing on Maui's dolphins. MPI would work with industry and compliance to ensure the conditions with which ring netting

[66] *New Zealand Federation of Commercial Fishermen Inc et al* v *Minister of Fisheries and Chief Executive of Ministry of Fisheries* High Court, Wellington, 23 February 2010, CIV 2008-485-2016, para 282).

were permitted to operate could be monitored/inspected to allow for review of its use should the risk of the activity be more than negligible.

In order to be effective, a code of practice would need to be set in place stating the specific conditions under which commercial fishers would be allowed to ring net in the defined area. MPI would work with the industry to review and improve this code of practice.

Impact on fishers

Option 2b would allow fishers to better exploit the resources of the Manukau harbour, while also improving information on where fishers operate in the harbours (as discussed in Option 2). SNZ note that this would also allow for a reduction in set nets set adjacent to the closed area and reduce fishing pressure further into the harbour.

Economic impacts

SNZ estimates that the proposal would provide additional revenue of $200,000 annually to fishers. MPI does not have the relevant data to confirm that estimation.

Non-commercial impact

The non-commercial impacts would be the same as in Option 2. Any authorisation to ring net in the currently closed areas would only apply to the commercial fishery. However, allowing commercial fishers back in the closed area to ring net could remove some of the fishing pressure in the inner part of the harbour and provide some resources to the recreational fishers.

Option 3

Option 3 (Map 10) builds on the importance of improving information outlined in Option 2 and 2b and proposes to also remove some residual risk to Maui's dolphins. This option would extend the existing set net closure in the Manukau Harbour to encompass an area where the deep water channel(s) extend into the harbour[67], and improve information on dolphin distribution and use of the harbours as well as potential overlap with set net activity. The proposed extension is being considered because:

- of the harbour's proximity to the core distribution of Maui's dolphins;
- the greatest number of sightings of Hector's and/or Maui's dolphins in a WCNI harbour have occurred in the entrance channel of the Manukau Harbour, and;
- there is intense set net activity in the channels along the boundary of the current set net restrictions, which is close to the areas where dolphins have been observed.

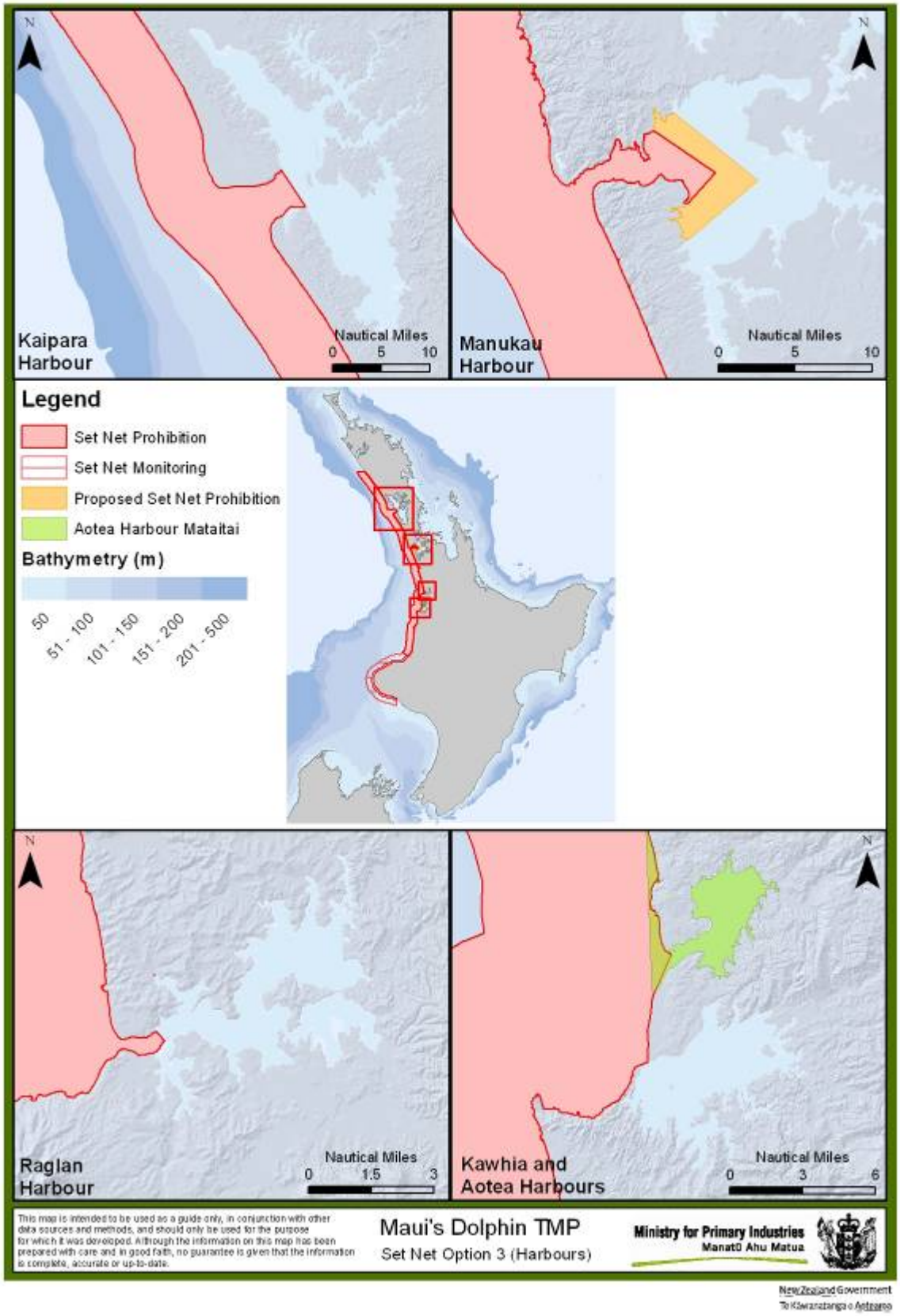
It is uncertain if, how often, and for how long Maui's dolphins may enter the Manukau Harbour. Distribution information (sightings and acoustic detections) suggests presence of Hector's and/or Maui's dolphins in the entrance channel of the Manukau Harbour is intermittent and infrequent.

<u>Submission comments</u>

Many of the submissions received are in favour of a better protection of the Maui dolphins and support an extension of the set net ban further into the harbours, and more specifically in the Manukau harbour.

The majority of submissions received call for a complete ban on set netting in all WCNI harbours and considered the proposed extension in adequate. However, four ENGOs and one person from the scientific community support the Option 3 in the absence of a broader ban.

[67] The proposed area encompasses the majority of channels where water depth is ≥ 10 metres. Northern position coordinates of 36°58.12'S, 174°38.67'E, eastern coordinates of 37°02.47'S, 174°45.58'E (on a light buoy in Papakura Channel), and southern coordinates of 37°06.36'S, 174°40.12'E (Matakawau Point). The additional area coverage is approximately 66 km^2.



Map 10. Proposed extension of the commercial and amateur set net prohibition in the Manukau Harbour (Option 3).

A number of submissions are opposed to an extension of the set net ban as it would destroy the rights of the fishers to feed their families. Some of them also consider that the extension would also induce a loss of social and cultural well-being.

Other submissions consider the proposed set net ban in the Manukau harbour unnecessary ("totally unjustifiable, pointless and futile to extend a net ban when it is patently unnecessary") or would like to see the closed area reduced ("The existing exclusion zone in the Manukau harbour is more than adequate and in reality could be removed to a point closer to the heads") or the ban lifted.

Summary
This option is a more biologically conservative option that would remove risk to the dolphins should they travel beyond the current set net ban boundary in the Manukau harbour. Option 3 is appropriate if you consider it necessary to take a more cautious approach and extend the set net closure in the Manukau Harbour where Maui's dolphins may occasionally visit, while also improving information on Maui's dolphin distribution and use of WCNI harbours and where set net activity occurs.

Effectiveness
MPI is unable to quantify the residual risk to Maui's dolphins in the Manukau Harbour given the uncertainty in their distribution or use of the harbour and therefore their vulnerability to set net activity in the area.

Using a qualitative assessment MPI considers an extension of the set net ban further into the Manukau Harbour would lower the risk of Maui's dolphin entanglement with set nets if they do venture beyond the harbour entrance channel and, if so, are more likely to remain in the channels when they do.

Residual risk would remain for any Maui's dolphin that travels further into the harbour beyond the proposed extended set net ban boundary. Residual risk also remains for any Maui's dolphin that travels beyond the current set net closures in the Kaipara, Raglan or Kawhia harbours.

Impact on fishers
Option 3 would impact on commercial and amateur fishers currently operating just along the boundary of the set net closure in the Manukau Harbour. The primary cost associated with Option 3 is the economic impact on the fishing industry and the wider economy.

Economic impacts
There are on average 32 commercial fishers that set net in the Manukau Harbour. Due to the limited position information on where these fishers operate in the harbour, MPI has estimated the potential impact of Option 3 by assuming 100 percent of the rig fishery would be affected. MPI has assumed the set net fishery that operates in the channels that extend into the harbour from the entrance primarily targets rig. Rig is the most valuable fishery in the Manukau Harbour based on the proportion of the rig fishstock (SPO 1) that is harvested in the harbour and MPI's estimate of fish prices (see Appendix 4).

However, MPI considers that the aggregate impact of this option may differ. Undoubtedly a small proportion of the flatfish and mullet fisheries may remain uncaught and some portion of the rig fishery may continue to be caught as bycatch in the set net activity that continues beyond the ban area. Fishers may also still target the harbour mullet fisheries using ring nets and the harbour flatfish with flatfish nets. Assuming the extension of the set net ban mainly impacts the rig fishery then MPI estimates 6 - 8 fishers will be most impacted.

One fisher considered an extension of the ban would mean set netting for rig in the Manukau harbour would become uneconomical for him. He explains that unlike other fishers he has the resource to redirect his fishing effort to other fisheries, but doing so would likely increase

personal costs and risks and place additional pressure on the fish reserves and fishermen in those areas. Finally, he reminds that since the last closure, although the demand and retail price for rig has slightly increased, three Licensed Fish Receivers have left the industry as there was simply less stock available for them to purchase, process and export.

Another fisher notes that his business will not survive and he will not be able to maintain his mortgages if there was to be any further closure or restriction on what there currently is. He also emphasises that the set net fishery from the Manukau Harbour supply food directly into Auckland that people from low economic incomes rely on.

Some members of the general public, some recreational fishers and most of the commercial fishers who have submitted agree that extending the set net ban further into the Manukau harbour will deprive some commercial fishers from their livelihoods.

The potential economic impacts of Option 3:

Estimated using landings data from 1 October 2011 to 30 September 2012 for Manukau Harbour

Annual Value Impact	$390 942
Capitalised Future Value Impact	$920 337
Subtotal = Cost to Industry	$1 311 279

These estimates should be treated as indicative because they do not fully account for the ability of fishers to shift their effort further into the harbour, noting that the remaining set net closure area has already resulted in a large area loss where certain fish species may be best targeted (that is, in the channels where water depth is >10 metres).

Non-commercial impact
The value of recreational set net fishing is unable to be quantified. MPI cannot determine the extent of the impact on recreational set net fishers operating near the entrance of the Manukau Harbour.

Recreational set net fishers in the harbour mainly target species like grey mullet, flatfish, and rig. MPI consider those fishers targeting rig are likely to be most affected by this option given they are often caught in the deeper channels. Best available information suggests mullet and flounder are targeted further in the harbour, or that alternative fishing methods could be used to continue fishing these species in the proposed set net ban area.

However, MPI also notes that some recreational fishers may have difficulty in accessing species that they cannot catch effectively using a different type of gear. People who normally fish in the area will have to travel to fish so fishing costs may increase, and any shift in commercial effort may result in increased competition between commercial and recreational fishers in a smaller area.

Option 4
Option 4 would prohibit all set net activity in all the WCNI harbours.

Submission comments
The majority of submissions received in support of a complete ban on set net and trawl activity out to the 100 m depth contour were also in support of a complete ban on set net activity in the WCNI harbours (Kaipara, Manukau, Raglan, Aotea and Kawhia). Their rationale for this action was similar to that discussed above and reflected the recommendations by the IWC and IUCN.

Conversely, most submissions received on behalf of commercial and recreational fishers regarding the WCNI harbours argue that the removal of set net activity in the harbours (particularly the Manukau Harbour) is not necessary, and that existing restrictions could be

removed in some cases. They argue there is no substantiated evidence that the dolphins use these areas. They also consider there would be a substantial social, cultural and economic impact on fishers relative to negligible or no benefits to the dolphins.

Summary
Whether it is necessary for you to manage set net activity within all WCNI harbours depends on your assessment of the likelihood of fishing-related mortality occurring and the consequence of mortality to the Maui's dolphin population.

MPI considers the likelihood of an interaction within the WCNI harbours to be low given the small size of the population and the likelihood of encountering a dolphin declines as you move beyond the current set net boundaries further into the harbours. Consequently, MPI considers that there is a low likelihood of a fishing-related mortality occurring inside the WCNI harbours.

Effectiveness
The removal of set net activity in all WCNI harbours is the most conservative option. This option is appropriate if you consider it necessary to remove all risk of a set net-related mortality in the harbours where Hector's and/or Maui's dolphins may travel but the extent to which they do so is considered rare and infrequent.

Impact on fishers
This option would have the greatest impact on commercial and amateur fishers in the harbours. The primary costs associated with this option is the economic impact on the fishing industry and the wider economy, as well as the removal of a fishing activity commonly used by recreational fishers to provide food for their families.

MPI has estimated the economic impact on the set net fisheries using catch effort and landings data to estimate the value of set net landings within the Kaipara and Manukau Harbours (where area specific information is available) and the potential volume of landings that would be lost or displaced. The detail of the economic analysis can be found in Appendix 4.

The economic impacts of a set net ban in the Manukau and Kaipara Harbour are:

Estimated using landings data from 4 year average of October fishing year data[68]

	Kaipara Harbour	Manukau Harbour
Annual Revenue Loss	$1 496 486	$673 796
Annual Value Add Impact	$2 514 097	$1 131 977
Capitalised Future Value Impact	$5 939 177	$2 746 656
Subtotal = Cost to Industry	$8 453 273	$3 878 634

Some of this loss is unlikely to be permanent as some of the catch and landings may be caught using other fishing methods. However, this adjustment could take time to eventuate and an unknown proportion may be lost for an extended period of time until alternative harvesting methods are developed.

MPI considers it would be very difficult for recreational fishers to utilise some fisheries to the extent they currently do when set netting. Catches of some of those species will probably decrease, and opportunities to continue to access those species would depend on the uptake of alternative methods that enable them to continue fishing (e.g. hand lining).

[68] All economic impacts have been estimated using catch effort and landing data from a 4 year average of October fishing year data, and the 1 October 2011/12 fishing year. Long term losses have been included in Appendix 4 to acknowledge that the management option may result in long term impacts on the commercial fishery.

9.4 WCNI Trawl Fishery

Characterisation of the trawl fishery

- The trawl fishery along this coast primarily targets trevally, snapper, and gurnard.
- There are approximately 30 trawl fishers operating 39 vessels off the WCNI in statistical reporting areas 40 to 46
- Vessels greater than 46 m in length cannot trawl inside 12 nm where fishing-related management measures are proposed.
- Trawl positioning information suggests comparatively higher trawl activity along the coast:
    - Between 2 and 7 nautical miles offshore
        - North of the Kaipara Harbour, and
        - Between Raglan and Kawhia;
    - Between 4 and 7 nautical miles offshore between the Kaipara and Manukau harbours, and;
    - Between 2 and 4 nautical miles between New Plymouth and Oakura.
- Where trawling effort is concentrated depends on the season and species being targeted.

Commercial trawling is prohibited between zero and two nautical miles offshore between Maunganui Bluff and the Manukau Harbour, and Port Waikato to Pariokariwa Point (Map 11). Between the Manukau Harbour and Port Waikato trawling is prohibited between zero and four nautical miles offshore. Trawling is also prohibited in all WCNI harbours.

Submission comments

Industry submissions describe variable trawl operations that depend on the species being targeted. Those fishers targeting gurnard, flatfish and John Dory will use very low headline height 'scraper' trawls. These trawls are towed slower than higher flying ones, as the target species are relatively slow moving. Those fishers targeting snapper and trevally will require a faster towing speed and a headline height 1.5-2.5 times larger than the 'scraper' trawls.

MPI Analysis

MPI considers the comments from industry provide additional information that is useful to better characterise the trawl fishery off the WCNI. MPI has taken this into consideration in assessing any need for management action and proposed management options.

Map 11. Current (*status quo*) trawling prohibitions along the coast off the WCNI.

9.4.1 Residual risk from existing commercial trawl prohibitions and restrictions

Assessment of residual risk from existing trawl measures and dolphin distribution

- Trawling activity overlaps with Maui's dolphin range, however, there have been no reported Maui's dolphin interactions with trawlers.
- Trawling is known to catch other dolphin species off the WCNI and Hector's dolphins in South Island waters. However, South Island trawlers have a higher probability of catching a Hector's dolphin due to the higher dolphin abundance.
- Since 2008 less than 0.5 percent (on average) of the WCNI inshore trawl fishery has been observed. During that coverage there was one observation of two Hector's and/or Maui's dolphins off the coast of Raglan in 2009.
- There is insufficient information to determine if the absence of reported mortalities equates to the absence of trawl-related mortalities because monitoring is very low.
- Any Maui's dolphin coming into the areas where trawl activity occurs may be at risk of entanglement.
- Most trawling activity is highly concentrated outside 4 nautical miles where Maui's dolphins are less frequently observed. The risk assessment concluded the risk posed by trawl to be less than that of set nets, but still likely to exceed the PBR.
- The risk assessment indicated (based on overlap of activity and dolphin distribution) that residual risk remains:
    - between the boundary of the trawl fishery closures areas (that extend to two or four nautical miles offshore) and
    - seven nautical miles offshore, particularly towards the centre of dolphin distribution (from Raglan Harbour entrance to the Kaipara Harbour entrance).
- The likelihood of an entanglement dependent on where Maui's dolphins are likely to occur and the intensity of trawl activity in that area, and the likelihood of entanglement where the two overlap.
- The uncertainty in the likelihood of an interaction between the two makes it difficult to quantify the residual risk.

Submission comments

Industry submissions report they do not see or interact with Maui's dolphin off the WCNI in their operations. Sanford note that their vessels and the commercial fishers who fish Sanford ACE generally work the territorial seas from two nautical miles, but can go closer when hunting particular stocks. Their fishers have never reported catching a Maui's dolphin.

Similarly, Raglan Trawling also note they do not see Maui's dolphins during their operations, which are mainly concentrated in the area south of Raglan to Marakopa between two and four nautical miles offshore.

Conversely, the majority of submissions received from ENGOs, the general public, academics, and local councils note that trawlers can and do take dolphins, have caught Hector's dolphins, and could take a Maui's dolphins. Auckland Council submits that observations during a NIWA snapper trawl survey found Maui's dolphins being positively attracted to the cod end of the trawl net upon haul back. They also consider there is underreporting and retracted reporting of Maui's taken by a trawler.

WWF notes there is very little reliable information on the numbers of dolphins killed in trawl fisheries. They consider that with very low observer coverage (<1% in some years) there is a lack of independent monitoring to verify whether existing protection measures were suitable and effective, making any future management decisions easier. WWF submit that because the Maui's population is so small there is no choice but to fully protect them from all fishing-related threats, including trawl, across their entire range.

9.4.2 Assessment of the need for management action

Key Points

Whether it is necessary for you to manage the impacts of trawl fishing off the WCNI on the Maui's dolphin population depends on your assessment of the likelihood of fishing-related mortality occurring and the consequence of mortality to the population

Overall, MPI considers there is a need for additional management measures because:

- Trawl activity overlaps with Maui's dolphin distribution
- Maui's dolphins are susceptible to entanglement in trawl nets,
- There is insufficient monitoring coverage to determine the level of any interaction between Maui's dolphins and the trawl fishery, and
- Despite the lower level of residual risk from trawl activity, the consequence of any fishing-related mortality to the Maui's dolphin population is high.
- Notwithstanding, you can take a different view of the level of risk to Maui's dolphins based on the information presented below.

As discussed previously, the information principles in the Act provide you with guidance on how to respond to uncertain information.

9.4.3 MPI proposed management options

Commercial Trawling	
Option 1	*Status quo*: Keep existing management.
Option 2 (MPI Preferred)	Put in place extensive monitoring coverage in the commercial trawl fishery between 2 and 7 nautical miles offshore from Maunganui Bluff to Pariokariwa Point.
Option 3	• Extend the trawl ban from 2 to 4 nautical miles offshore from Kaipara Harbour to Kawhia Harbour. • Put in place extensive monitoring coverage in the commercial trawl fishery between 2 and 7 nautical miles offshore from Maunganui Bluff to Pariokariwa Point.
Option 4 (New)	Extend the trawl prohibition between 0 and 7 nautical miles offshore from Maunganui Bluff to Hawera.
Option 5 (New)	Extend the trawl prohibition out to the 100 m depth contour from Maunganui Bluff to Whanganui.

MPI has characterised and analysed the main trawl fisheries between Maunganui Bluff and Pariokariwa Point. This analysis has been used to identify the number of fishers that will possibly be affected by the proposed options and the nature of effects on catch and value.

Submissions received that comment on the options proposed in the consultation paper are discussed within the assessment of each option. MPI notes that the majority of submissions received considered MPI's proposals inadequate to address the fishing-related risk to the Maui's dolphin population and proposed more extensive measures (see Options 4 and 5).

Option 1 (Status quo)

Option 1 would keep the current management measures (Map 11 shown above). You may consider that the risks of fishing-related mortality from trawling are acceptable and that further measures to avoid, remedy or mitigate the effects of fishing-related mortality on Maui's dolphins are not necessary now. The *status quo* is an acceptable approach if you consider current management (*i.e.* existing trawl prohibitions and monitoring coverage) mitigates entanglement risk sufficiently.

Submission comments

Sanford and Raglan Trawling Ltd indicate their support for Option 1. Raglan Trawling Ltd notes that with their present vessels, they currently operate a cost effective operation, with a focus on the environment and quality of product, and achieve a modest profit. The key to our present success lies in having a low volume – high value approach. Both note they have not encountered Maui's dolphins during their operations.

Egmont Seafoods Ltd consider the current restricted area provides adequate protection for the Maui's dolphin in their core range from trawling.

Option 2

Option 2 (Map 12) would put in place an extensive monitoring programme in the commercial trawl fishery between two and seven nautical miles offshore between Maunganui Bluff and Pariokariwa Point. Option 2 is appropriate if you consider:

- trawlers pose a low risk to Maui's dolphins;
- the level of risk from trawl activities is acceptable, and;
- collection of quantitative information on the nature of that risk is a priority.

MPI considers extensive monitoring coverage would be required because of the low likelihood of an interaction between Maui's dolphins and trawl gear. The consequence of any trawl-related mortality to the population would be high, and there is a need to ensure that any such mortality could be detected.

Given that there have been no reported or observed Maui's dolphin mortalities from trawlers, MPI recommends monitoring coverage as a valid option for you to consider. Further controls on trawlers could be considered in the future if monitoring information indicates risk to Maui's dolphins from this method.

Submission comments

Sanford considers mandatory observer coverage on the west coast trawl fisheries to be unnecessary and the costs borne by fishers and the wider community too high. However, if Crown funded Sanford would support observations (electronic) to confirm the fishers' zero reporting of dolphin bycatch when trawl vessels work between Manukau Harbour and Port Waikato out from four nautical miles.

Egmont Seafoods Ltd considers any observer coverage should be concentrated to the area where the Maui's dolphins are known to inhabit (*i.e.* Manukau Harbour to Port Waikato). They consider it pointless to have observer coverage outside this area as it is unlikely to sight a Maui's dolphin let alone observe an interaction with trawling.

Raglan Trawling state they would have to operate a larger craft with higher attendant costs and a considerably increased turnover to be viable. The proposed observer costs would dictate that we would need to upscale our operation, use a lot more fuel, utilise high flying trawls (that may increase the risk of interaction with Maui's dolphins) and work more adverse weather to achieve a similar return. They consider such an approach flies in the face of their ethos, which has been to deliver the highest quality fish, with the lowest outgoings and least environmental impact. As an alternative they propose the use of cameras as opposed to observers as a more cost effective way to monitor. They suggest cameras activated upon lifting trawls would save a lot of outlay.

Summary

MPI considers the level of monitoring coverage in the inshore trawl fishery needs to be increased to provide robust information to inform any assessment of the level of interaction between trawl activity and the Maui's dolphin population. Option 2 balances the need to reduce the uncertainty in the risk trawling poses to Maui's dolphins, by gathering more certain information on dolphin presence and potential interactions with trawl nets, while enabling trawling to continue.

Map 12. The proposed area requiring extensive monitoring coverage in the west coast North Island commercial trawl fishery (Option 2).

Effectiveness

Option 2 will not mitigate risk of entanglement with trawl nets, but will provide quantitative information on the nature and extent of any risk posed by trawlers to the Maui's dolphin population. Observer coverage or electronic monitoring provides independent observations and reporting of fishing interactions with and sightings of Hector's and/or Maui's dolphins in the area.

Impact on fishers

Observer coverage

There are approximately 21 fishers operating about 28 vessels (< 46 metres) off the WCNI between Maunganui Bluff and Pariokariwa Point (between two and seven nautical miles offshore) that would require monitoring. The primary impact associated with Option 2 is the costs associated with observer coverage.

The overall impact of Option 2 on commercial fishers is difficult to quantify because MPI is unable to confirm the extent to which individual vessels are reliant on having access to the area between two and seven nautical miles offshore as part of their fishing operations. Some vessels may opt out of monitoring costs by refraining from trawling inside the proposed monitoring zone. MPI cannot determine what proportion of vessels may refrain from fishing inside the monitoring zone and what impact this might have on the value of the WCNI trawl fishery.

MPI considers the level of coverage necessary to observe whether any interactions occur between the trawl fishery and Maui's population to be very high, and at or near 100 percent. This requirement is influenced by the likelihood of encountering a dolphin, the intensity of the trawl activity, and the likelihood of an interaction where the two overlap.

MPI notes that requiring 100 percent coverage immediately in the trawl fishery would be hampered by the costs and resourcing requirements. MPI is therefore proposing a staged rollout of over a number of years. MPI considers the use of electronic monitoring programmes may provide a longer-term cost effective solution, but in the interim is proposed coverage based on the use of observers.

This is due to practical limitations concerning observer recruitment, but also to allow operators to adjust to significant increases in expectations of coverage. For instance, observer coverage could ramp up by 25 percent each year over 4 years to reach target levels. Such an approach is scalable.

These costs would cost-recovered from the industry, and may impact the economic return some fishers receive from the fishery. MPI notes Option 2 may impact on smaller scale fishers and vessels disproportionately when compared with larger fishing companies.

MPI estimates the maximum cost to be between:

	Midpoint	Upper Estimate
Estimated Annual Cost	$294 500	$310 000
Estimated Cost Year 1 (25% coverage)	$294 500	$310 000
Estimated Cost Year 2	$588 050	$619 000
Estimated Cost Year 3	$882 550	$929 000
Estimated Cost Year 4 (100% coverage)	$1 176 100	$1 238 000

Further discussion on observer coverage, how these estimates were derived, and submission comments relating specifically to observer coverage can be found in section 11.

Option 3

Option 3 (Map 13) would:

- extend the trawl prohibition from two to four nautical miles offshore from Kaipara Harbour to Kawhia Harbour, and;
- put in place extensive monitoring coverage in the commercial trawl fishery between two and seven nautical miles offshore from Maunganui Bluff to Pariokariwa Point.

Submission comments

A number of submissions supported extending the prohibition on trawl activity. Most supported much more extensive trawl prohibitions (see Options 4 and 5). However, some considered the extension out to four nautical miles would provide better protection in the alongshore range where Maui's dolphins have been confirmed and have been found offshore.

NZRFC supports extending the trawl ban to four nautical miles offshore from Kaipara Harbour to Tirua Point. They also consider Vessel Monitoring Systems (VMS) should be placed on all commercial vessels off the WCNI. They propose any vessel that does fish inside the area from Kaipara Harbour to Tirua Point must carry a registered observer onboard.

Raglan Trawling considers Option 3 would result in "give it all to Sanford". They consider that Sanford already holds most of the quota and will need to harvest it with their larger vessels further offshore. They note that extending the ban out to four nautical miles would likely mean the end of the inshore fleet, with the attendant skills and jobs; this is how to do it. As an alternative they suggest the use of 'scraper trawls' as a mitigation measures in the two to four nautical mile zone. They also recommend the use of cameras as opposed to observers to reduce costs.

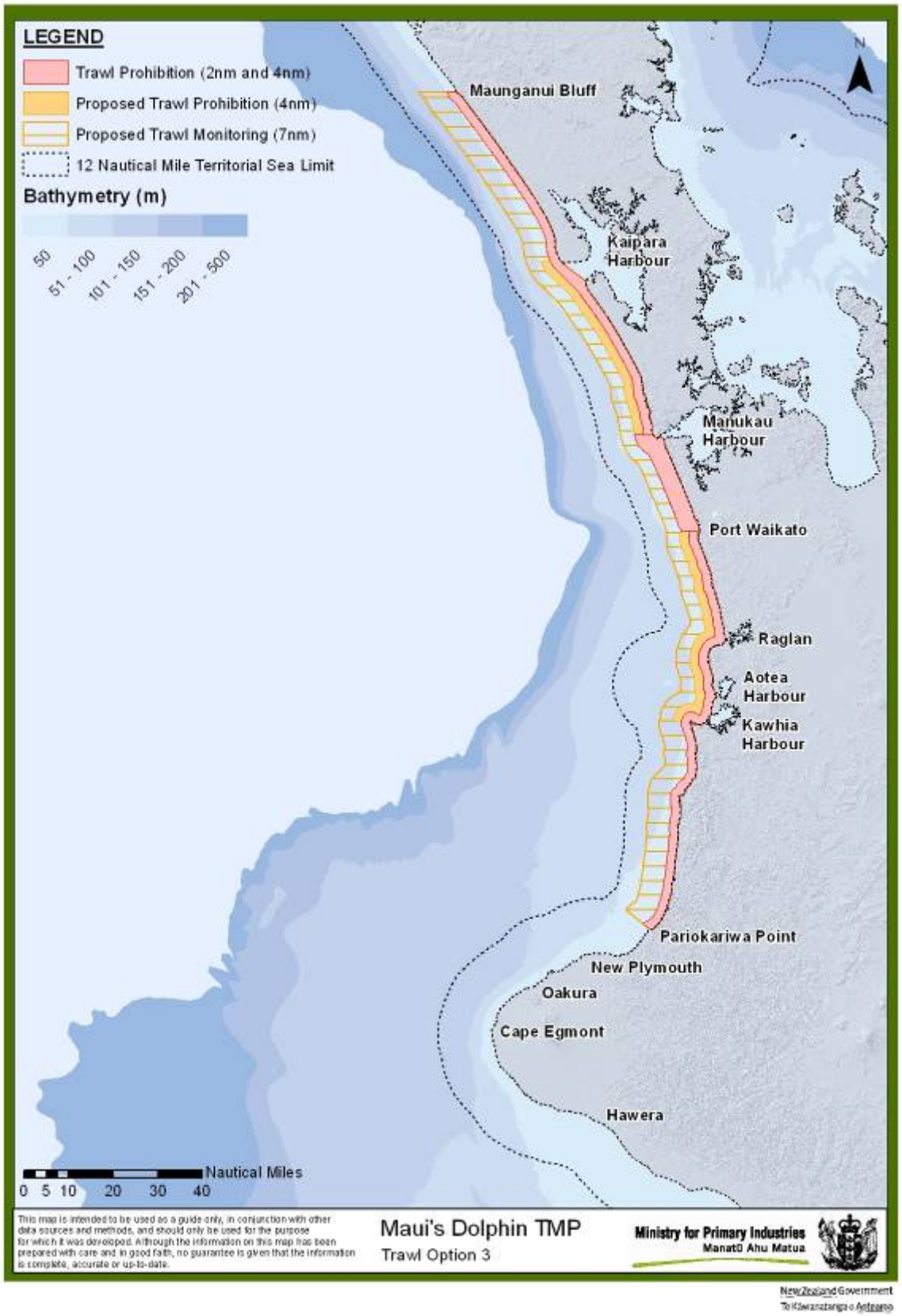
Egmont Seafoods Ltd. considers there is no evidence to suggest trawling has any interaction with Maui's dolphin and therefore, no need to extend any restrictions.

Summary

Option 3 is appropriate if you considers it necessary to immediately remove additional residual risk from trawling to Maui's dolphins in the alongshore and offshore range where Maui's have been confirmed since 2000 and Hector's and/or Maui's are most frequently observed. Option 3 is a more biologically conservative measure than Option 2.

Independent observations/monitoring outside the proposed trawl ban area would provide quantitative information on the nature and extent of any residual risk posed by trawling to Hector's and/or Maui's dolphins in areas where sightings have been less frequent.

MPI notes the extension of the trawl prohibition would have a significant effect on some individual fishers compared to others that are able to diversify their operations or shift their effort to deeper waters.



Map 13. The proposed areas requiring 100 percent monitoring coverage and an extension of the trawl prohibition from two to four nautical miles, in the WCNI trawl fishery (Option 3).

Effectiveness

A spatial closure out to four nautical miles will remove the risk of trawlers interacting with Maui's dolphins in the alongshore area between Kaipara Harbour and Kawhia where their presence has been confirmed since 2000[69]. Risk of entanglement with trawl gear would remain outside the area of the closure (beyond four nautical miles, and to the north and south of the closure boundaries).

The 4 nautical mile offshore boundary provides greater coverage of the known offshore distribution of Hector's and/or Maui's dolphins that have been observed off the WCNI. MPI cannot quantify the nature of any remaining risk to Maui's dolphins beyond four nautical miles between the Kaipara Harbour and south of Kawhia because of uncertainty in Maui's dolphin distribution and whether there is any interaction with trawl gear. However, putting in place extensive monitoring coverage outside the proposed trawl prohibition area will provide quantitative information on the nature and extent of any remaining risk.

Impact on fishers

Option 3 will have the greatest impact on commercial trawl fishers. The primary cost associated with Option 3 is the economic impact on the fishing industry and the wider economy. The overall impact of Option 3 is difficult to quantify because the extent to which individual vessels are reliant on access to the proposed closed area, and the remaining area where monitoring would be required, is unknown.

Economic impact

MPI estimates that 12 fishers and 12 vessels will be directly affected by extending the trawl ban out to four nautical miles from Kaipara Harbour to Kawhia. Those fishers and vessels that are displaced from extending the trawl ban are likely to have to either shift their effort (offshore or alongshore) and/or be unable to harvest their target species. The species mix caught beyond four nautical miles offshore or further alongshore may not align with their annual catch entitlement (ACE) packages, which enable them to target and land certain species (in the area being closed) without financial penalties.

MPI has estimated the potential economic impacts of Option 3 (see Appendix 4 for detailed analysis):

Estimated using landings data from the 2011/12 October fishing year

Annual Revenue Loss	$685 642
Annual Value Add Impact	$1 151 880
Capitalised Future Value Impact	$4 038 460
Subtotal = Cost to Industry	$5 190 340

These estimates should be treated as indicative only because they do not fully account for the ability of fishers to shift their effort outside the proposed closed area. MPI notes that some fishers and smaller vessels may be disproportionately impacted compared with larger fishing companies. If fishers cannot modify their fishing activities and are unable to fish outside the proposed closed area, the value of quota for some stocks targeted may decrease.

Observer coverage

MPI considers the ability of, and limitations on, vessels fishing outside the closed area to carry an observer on board are the same as discussed in Option 2. Cost-recovery from the industry for any observer coverage would also apply.

[69] Genetic sampling has confirmed live Maui's dolphins between the Kaipara Harbour and Raglan, and a single stranded Maui's dolphin near Kawhia (Albatross Bay).

In the absence of information on displacement or removal from fishery with the proposed closure MPI will assume the cost of a monitoring will be **no more** than the range outlined in Option 2:

	Midpoint	Upper Estimate
Estimated Annual Cost	$294 500	$310 000
Estimated Cost Year 1 (25% coverage)	$294 500	$310 000
Estimated Cost Year 2	$588 050	$619 000
Estimated Cost Year 3	$882 550	$929 000
Estimated Cost Year 4 (100% coverage)	$1 176 100	$1 238 000

Further discussion on observer coverage, how these estimates were derived, and submission comments relating specifically to observer coverage can be found in section 10.

Option 4

Option 4 (Map 14) would prohibit trawl activity from Maunganui Bluff south to Hawera and to seven nautical miles offshore.

Submission comments

Four submissions noted their support for a trawl prohibition to extend at least as far as seven nautical miles along the range of Maui's dolphin distribution. Rationale for a seven nautical mile offshore boundary included:

- The boundary would reflect the offshore distribution map produced by the risk assessment panel.
- The boundary would provide protection in the majority of areas where the greatest level of residual risk has been identified.
- There have been reliable survey sightings of Maui's and/or Hector's dolphins off the WCNI out to seven nautical miles.

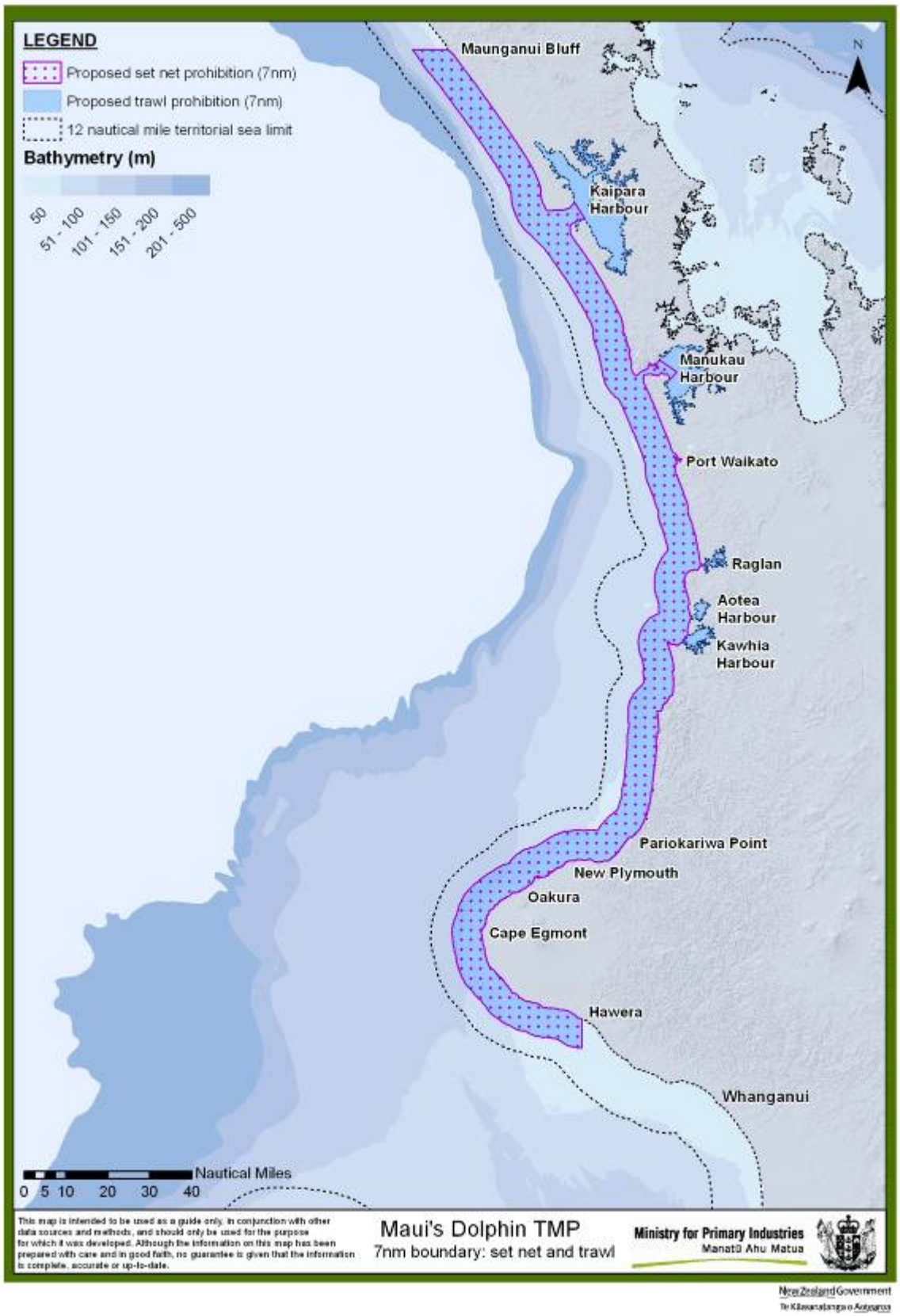
Summary

Option 4 is a more conservative option than Option 3 given the overall number of Maui's is very small, and the residual risk posed by trawl is considered low. Option 4 is appropriate if you consider it necessary to reduce the residual risk of a trawl-related mortality in the offshore range where Hector's and/or Maui's dolphins have been observed (as found in aerial research surveys) and into the alongshore area where they are rarely or infrequently seen.

An offshore boundary of seven nautical miles takes into account information on Maui's and/or Hector's dolphins observed off the WCNI. This information shows they can, at times, range as far offshore as seven nautical miles and is consistent with the current set net prohibition from Maunganui Bluff to Pariokariwa Point.

MPI considers the likelihood of an interaction out to seven nautical miles to be low given the small size of the population, the likelihood of encountering a dolphin declines with distance from shore, and the lower level of residual risk from trawl. Consequently, MPI considers that there is a low likelihood of a fishing-related mortality occurring out to seven nautical miles and near the margins of their current range (*i.e.* the Taranaki area and north of Kaipara Harbour).

Whether you consider it necessary to manage the impacts of trawl out to seven nautical miles depends on your assessment of the likelihood of fishing-related mortality occurring and the consequence of mortality to the Maui's dolphin population.



Map 14. Submission proposal to prohibit commercial and amateur set net and trawl activity out to seven nautical miles from shore off the west coast of the North Island.

Effectiveness

The removal of set net and trawl activity out to seven nautical miles a moderately conservative option in comparison to the proposal to prohibit those activities out to the 100 m depth contour. This option is appropriate if you consider it necessary to remove most of the risk of a trawl-related mortality in the offshore area where Hector's and/or Maui's dolphins have been observed off the WCNI.

Impact on fishers

This option would have moderate-high impact on commercial fishers off the WCNI, but significantly affect some participants far more than others. The primary costs associated with this option are the economic impact on the fishing industry and the wider economy, as well as the removal of a fishing activity commonly used by recreational fishers to provide food for their families.

MPI has estimated the economic impact on the trawl fisheries using catch effort and landings data to estimate the value of trawl landings within this area and the potential volume of landings that would be lost or displaced. The detail of the economic analysis can be found in Appendix 4.

The economic impacts of a trawl prohibition out to seven nautical miles are:

Estimated using landings data from 4 year average of October fishing year data[70]

	Trawl prohibition (Maunganui Bluff to Hawera)
Annual Revenue Loss	$4 593 773
Annual Value Add Impact	$7 717 539
Capitalised Future Value Impact	$28 561 654
Subtotal = Cost to Industry	$36 279 193

These estimates should be treated as indicative only because they do not fully account for the ability of fishers to shift their effort outside the proposed closed area. Some of this loss is unlikely to be permanent as some of the catch and landings may be caught using other fishing methods. However, this adjustment could take time to eventuate and an unknown proportion may be lost for an extended period of time until alternative harvesting methods are developed.

[70] All economic impacts have been estimated using catch effort and landing data from a 4 year average of October fishing year data, and the 1 October 2011/12 fishing year. Long term losses have been included in Appendix 4 (section 12) to acknowledge that the management option may result in long term impacts on the commercial fishery.

Option 5

Option 5 (Map 15) would prohibit all trawl activity from Maunganui Bluff south to Hawera and out to the 100 m depth contour.

Submission comments

Justification for a set net prohibition out to the 100 m depth contour included:

- The above measures are recommended by the International Whaling Commission (IWC) Scientific Committee, the IUCN Cetacean Specialist Group, and the New Zealand Marine Sciences Society to eliminate what is considered the greatest known human-induced threat to the Maui's dolphin population.
- Offshore sightings out at the 100 m depth contour, despite the population being at such a low level, confirm their presence out to this depth and reinforce the need to protect them throughout their habitat range.
    - A Maui's or Hector's dolphin was sighted from the Maui A platform south west of Taranaki (situated in 110 m water depth) in April 2012.
    - An additional sighting reported to Greenpeace of a Maui's or Hector's dolphin from the Maui B platform (situated in 103 m water depth) this year.
- Research establishing that Hector's dolphin off the south east coast of the South Island favour shallow waters less than 100 m depth, which in the absence of information on Maui's dolphin should be considered the best proxy given they are of the same species and demonstrate similar characteristics
- The acoustic detections and sightings of these dolphins in and around the harbours suggest they are likely to be present and vulnerable to any set net activity.

ENGO, academic, and general public submissions consider the vulnerability of the population to human-induced mortality (PBR) requires eliminating those threats that are currently manageable, in particular fisheries mortality, which the risk assessment estimated accounts for more than 95 percent of human-induced mortality. They noted human-induced impacts needed to be reduced to zero and that no other Maui's dolphin mortality from human-induced impacts can occur in the next 23 years.

Most submissions considered if protection out to the 100 m depth contour was not provided, then any set netting or trawling allowed to continue within this area have in place full (mandatory) observer coverage for by-catch reporting.

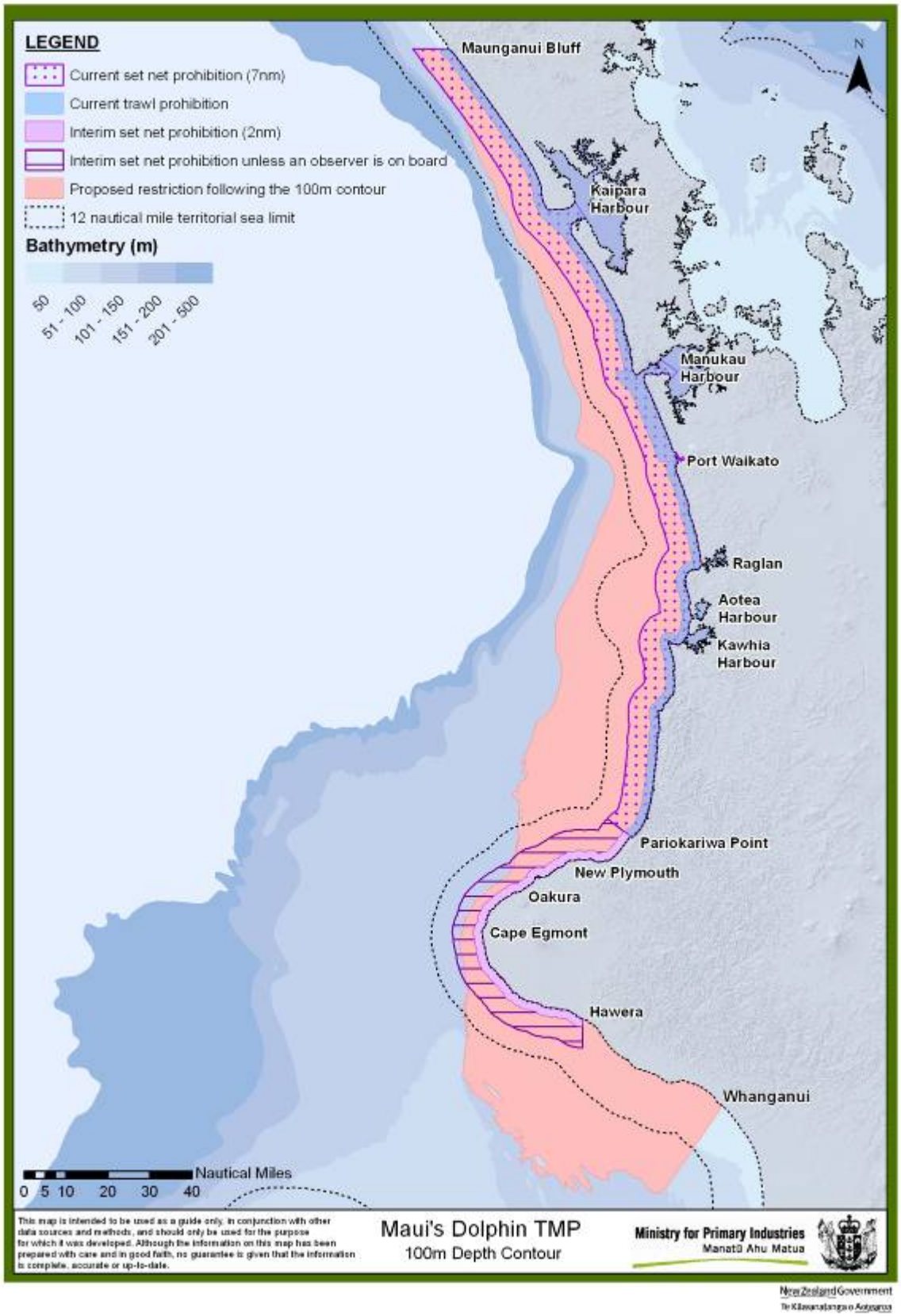
Summary

As discussed previous, MPI was unaware of the verified public sighting at the Maui A platform near the 100 m depth contour in April of this year. MPI considers this new information important for you to take into account when making your decision under the Act.

MPI notes there is residual risk from trawl activities beyond the areas where management measures are currently in place for Maui's dolphins. MPI also notes the options proposed in the consultation paper would not remove *all* residual risk to the population.

Whether it is necessary for you to manage the impacts of trawl activity out to the 100 m depth contour (or suitable proxy) depends on your assessment of the likelihood of fishing-related mortality occurring and the consequence of mortality to the Maui's dolphin population.

MPI considers the likelihood of an interaction beyond seven nautical miles to be low given the small size of the population and the likelihood of encountering a dolphin declines with distance from shore. Consequently, MPI considers that there is a low likelihood of a fishing-related mortality occurring beyond seven nautical miles. MPI notes the consequence of a single fishing-related morality is very high.



Map 12. Current commercial and amateur set net and trawl restrictions off the west coast of the North Island, overlaid with the approximate boundary of the 100 m depth contour as proposed in submissions.

Effectiveness
The removal of trawl activity out to the 100 m depth contour (or other suitable proxy) the most conservative option. This option is appropriate if you consider it necessary to remove almost all risk of a trawl-related mortality in the offshore area where Hector's and/or Maui's dolphins have been observed off the WCNI.

Impact on fishers
This option would have the greatest impact on commercial and amateur fishers off the WCNI. The primary costs associated with this option are the economic impact on the fishing industry and the wider economy, as well as the removal of a fishing activity commonly used by recreational fishers to provide food for their families.

MPI has estimated the economic impact on the trawl fisheries using catch effort and landings data to estimate the value of set net and trawl landings within this area and the potential volume of landings that would be lost or displaced. The detail of the economic analysis can be found in Appendix 4.

The economic impacts of a trawl ban out to the 100 m depth contour are:

Estimated using landings data from 4 year average of October fishing year data[71]

	Trawl prohibition (100 m depth contour)
Annual Revenue Loss	$9 422 689
Annual Value Add Impact	$15 830 118
Capitalised Future Value Impact	$59 245 418
Subtotal = Cost to Industry	$75 075 536

These estimates should be treated as indicative only because they do not fully account for the ability of fishers to shift their effort outside the proposed closed area, noting that a substantial portion of the offshore area would be lost. If fishers are unable to fish outside the proposed closed area, the value of quota for some stocks targeted may decrease.

Some of this loss is unlikely to be permanent as some of the catch and landings may be caught using other fishing methods. However, this adjustment could take time to eventuate and an unknown proportion may be lost for an extended period of time until alternative harvesting methods are developed.

[71] All economic impacts have been estimated using catch effort and landing data from a 4 year average of October fishing year data, and the 1 October 2011/12 fishing year. Long term losses have been included in Appendix 4 (section 12) to acknowledge that the management option may result in long term impacts on the commercial fishery.

10 OTHER MANAGEMENT MEASURES

10.1 Finer spatial scale reporting

MPI highlighted in the consultation paper that one of the challenges in assessing the residual risk posed by set net activity to the Maui's dolphin population is determining whether an interaction within fishing gear is likely (i.e. based on the distribution of the dolphins and where the fishing activity occurs).

Under current set net reporting requirements:

- Vessels smaller than six meters are not required to report the latitude and longitude of the start positions of their net;
- Most vessels operating in harbours fall within six meters in length, and therefore only record the statistical reporting area in which they operate;
- Vessels greater than six meters in length report the latitude and longitude of their start position, which:
    - is accurate to plus or minus one nautical mile (i.e. approximately 1.85 km);
    - does not include the end position of their net (which can be as long as 3000 m), and;
- Vessels greater than six meters in length are also not required to report a position of any additional net set, if it is set within two nautical miles of the first net.

This reporting framework may not, given the length of nets used, be a true indicator of the spatial area the nets are set in. For example, a three kilometre net may start outside two nautical miles from shore, but have most of the net set within the two nautical mile zone.

The uncertainty in where set net effort is being concentrated within the WCNI harbour or along the coast makes it difficult to assess the residual risk that remains for Maui's dolphins. The lack of finer spatial scale reporting also makes it difficult to assess the impact of proposed measures on industry that may results in the displacement or removal of fishing effort.

MPI proposed in the consultation document to require set net vessels (regardless of their size) to provide the latitude and longitude positions of their activity and both the start and end positions of their nets. This will aid decision making in the future.

<u>Submission comments</u>

A number of submissions that commented on finer spatial scale reporting were supportive of improving the information on where activity occurs and how the effort is distributed (including Sanford and SNZ).

SNZ consider the absence of fine-scale information has led to conflicts as to the cost or benefit or proposed protection measures. They recommend that the limits of the existing data are recognised and, where necessary, additional data are gathered to support fine-scale spatial information needs. SNZ recommends MPI urgently engage with industry to establish how this information can be collected reliably and efficiently from set net vessels, irrespective of vessel size.

SNZ recommends MPI investigates the practicality and cost of the wider adoption of locator beacons in inshore fisheries. The use of locator beacons was also supported by commercial submitters that operate in the Manukau Harbour.

MPI analysis

Improving information on where set net activity occurs, and the intensity of that activity is important. This information can be used to inform management on the likelihood of an interaction with Maui's dolphins, and to better evaluate the economic impact of management measures that involve displacement of catch.

MPI considers the improvement would apply to all commercial set net activity, not just that off the WCNI. Consequently MPI will look to amend the statutory reporting forms. However, this will require additional consultation with all other commercial set net fishers that are likely to be affected.

In the interim, MPI will recommend the Director General require all WCNI set net fishers to provide information additional to that in the specified reporting regulations on the start and end position of each of their nets set, whether or not any additional net is set within two nautical miles of the first.

10.2 Changes to fishing behaviour or practices

MPI invited stakeholders to comment on, or propose, practical restrictions on fishing behaviour that could be considered to reduce the likelihood of a Maui's dolphin becoming entangled in set or trawl nets. These restrictions could be considered under a regulatory and/or voluntary (that is, a code of practice) framework and logistical, compliance and practical issues would need to be examined prior to implementation.

To reduce the risk of fishing-related mortality from set netting, MPI received comments on the following mitigation measures:

- Reduction in total length and/or number of set nets that can be deployed at any one time.
- Compulsory set net attendance.
- Reduction in soak times.
- Seasonal closures.
- Including a 'watch period' under voluntary codes of practice to ensure no dolphins are in the area before a net is set.
- Proper setting of gear, including:
    - avoiding setting of set nets prior to poor weather setting in, which may cause gear to break free increasing risk of entanglements, and;
    - proper disposal of broken gear or torn nets as they can be a hazard resulting in entanglement or ingestion of the debris.

Submission comments

Some submissions supported changes to fishing practices if they were likely to remove or reduce the risk of Maui's dolphin entanglement. However, many of these submissions considered unless the changes or restrictions were listed and discussed in the consultation paper they could not support them. They considered without sufficient information on the proposals it was unknown if they would pose a risk to the dolphins.

Forest & Bird consider there is not enough information to allow seasonal opening and closing of gill net fisheries along the WNCI. However, they believe that more information about seasonal distribution is needed and consider it a research priority.

One commercial fisher said this may be a good opportunity to require all fishers to stay with their nets. Another considered a low headline height in the trawl fishery could act as a mitigation measure and reduce any chance of interaction/entanglement. The industry proposals regarding ring netting in the Manukau harbour and set netting in the Taranaki region included a reduction in total length and/or height of nets and/or total number of nets

that could be deployed at any one time (discussed in the respective sections above). A number of submissions supported good gear practice and thought there should be greater effort on ensuring compliance with proper deployment and attendance of nets.

Some industry submissions considered recreational drag nets were actually operating as drift nets, and were occasionally being lost. They and other submissions received considered that all floating nets (drift nets) should be banned.

MPI analysis

MPI supports reviewing and strengthening codes of practices for any set net activity that continues along the WCNI or in the harbours. MPI also encourages all stakeholders to report on poor practices and illegal deployment of nets so compliance is aware of such activity and can respond.

MPI considers there is insufficient information on many of the proposals received to thoroughly assess whether they would act as an effective mitigation measure. However, MPI notes that some of these measures have been put in place elsewhere to reduce the likelihood of a Hector's dolphin becoming entangled in set or trawl nets. These measures include a maximum headline height of trawl nets in some areas and various requirements for recreational fishers to stay with their nets.

MPI notes there has been varying interpretations of whether 'drift netting' is a banned activity in New Zealand. MPI considers there is a need to clarify and better define some of the types of fishing activity that are being used. Drift netting is illegal in the following situations:

Under the Driftnet Prohibition Act 1991, driftnet means a gillnet or other net that –

a) either singly or tied or connected together in combination with other nets is more than 1 kilometre in length; and
b) acts by enmeshing, entrapping, or entangling any fish or marine life; and
c) acts by drifting in the water, or on the surface of the water; and
d) does not have attached to it sufficient means of anchoring it to any point of land or the sea bed (irrespective of whether the net has attached to it any means of being attached to any vessel)

No vessel shall be used for, or no person shall engage in, driftnet fishing in New Zealand fisheries waters.

Under the Fisheries (Auckland Kermadec Areas Commercial Fishing) Regulations 1986 and the Fisheries (Auckland Kermadec Areas Amateur Fishing) Regulations 1986, drift net means a net that—

a) acts by enmeshing, entrapping, or entangling any fish or marine life; and
b) acts by drifting in the water or on the surface of the water; and
c) is not attached to—
   (i) a vessel; or
   (ii) any point of land; or
   (iii) the sea bed or river bed

A commercial fisher or person must not use a drift net for fishing within the designated waters lying within the Port Waikato River.

Under the above definitions, outside of Port Waikato, any drift net less than 1 kilometre in length is legal and may be used by commercial or recreational fishers. There is no maximum net length specified for drift nets within the regulations.

There is minimal drift netting activity undertaken by commercial fishers off the WCNI or in the harbours. MPI does not have any figures to estimate the amount of drift net activity undertaken by recreational fishers; however, anecdotal evidence suggests it would be minimal. However, if you consider the use of drift nets of any type (given the definitions

above) to pose an unacceptable risk to the Maui's dolphin population you may consider it necessary to prohibit their use off the WCNI where Maui's may range.

10.3 Use of acoustic pingers as a mitigation tool

A number of industry submissions have raised the use of acoustic pingers on set nets to deter Maui's dolphins from approaching the gear and avoid entanglement. Some fishers in the Taranaki region have already deployed pingers on their nets and others suggest their use should be required to deter dolphins from their nets.

MPI analysis

MPI and DOC have investigated the use of pingers in the past and consider the efficacy of these devices to be unproven for Maui's or Hector's dolphins. Pingers have proven to be effective for some cetacean species but have not been effectively tested on Maui's or Hector's dolphins. It is also not known what undesired impacts pingers may cause; for example, exclusion of the dolphins from their natural habitat and foraging areas (for high intensity deterrent pingers) or attracting inquisitive dolphins from further afield (low intensity warning pingers).

Therefore, the benefits of these devices are currently unknown and requiring their use could result in unnecessary costs being imposed on industry or problems for the dolphins. MPI does not consider there to be sufficient evidence to require their use.

Additional data collection would be required to determine whether or not they are effective. Because of the low likelihood of an encounter with a Maui's dolphin (at the margins or edge of their distribution and given their low population size), a long term monitoring programme would be required. MPI considers testing of the efficacy of pingers may be better trialled within the Hector's dolphin population where the likelihood of an encounter is greater to improve the quality and quantity of data.

Requiring the use of pingers alone would not be sufficient to determine whether or not pingers are effective in reducing the risk of fishing-related mortality to Maui's dolphins from set nets.

10.4 Protection of the North/South Island 'Corridor'

The majority of submissions received that were in support of a complete ban on set net and trawl activity out to the 100 m depth contour, also recommended additional protection measures between Taranaki and across the Cook Strait.

These submissions point to the presence of Hector's dolphins off the WCNI amongst the Maui's dolphin population and the possibility of interbreeding between the two subspecies as reason for such protection. Although there not there is no evidence of mating between these Hector's dolphin migrants and Maui's dolphins there is potential for this connectivity to enhance the genetic diversity and improve the long-term viability of the Maui's dolphin population.

Conversely, SNZ consider that the possibility of interbreeding between Hector's and Maui's dolphins has not been considered carefully from a conservation policy perspective. They suggest interbreeding would break down the apparently reproductive isolation and also reduce the morphological distinctiveness between the populations. SNZ proposes that would result in the Maui's subspecies being reabsorbed back into the wider Hector's species.

MPI analysis

MPI notes that while there is potential for interbreeding that may enhance the genetic diversity of the Maui's dolphin population, there is currently no evidence of mating between these subspecies.

MPI considers subspecies interbreeding may improve long-term population viability, and is unlikely to result in the loss of what makes Maui's distinctive (i.e. the unique haplotype will persist as part of a more diverse population).

Given there has been no evidence of interbreeding to date long-term observation in the Taranaki region is the most likely way to detect dolphins moving through. The most recent sighting off the Maui-A platform suggests the possibility of dolphins transiting between the two islands, but the origin of the dolphin that was sighted is unknown.

MPI supports continued research to determine if there is mixing between Maui's and South Island Hector's populations, which could have implications for the potential recovery of Maui's dolphins and any future management measures.

10.5 Setting a fishing-related mortality limit (FRML)

A number of submissions consider there is a strong need for clear population management objectives on which to base the TMP. SNZ suggests that management of protected species should be based on appropriate risk assessment and management frameworks as has been proposed for the management of seabird incidental bycatch. Such frameworks establish the levels of risk posed by fishing and allow for the identification and implementation of risk management measures appropriate to the level of risk. This approach is also supported by Sanford.

Most submitters are concerned at the lack of monitoring that has occurred in the set net and trawl fisheries since the TMP was developed in 2008. They consider that without an effective monitoring programme the current and any new protection measures cannot be accurately assessed to determine whether or not they have addressed the threat set net and trawl activity pose to the population.

MPI Analysis

MPI agrees that a risk management framework can provide a more transparent rule approach to managing protected species. SNZ notes that a range of protection measures will always include spatial closures but may also include other approaches, such as maximum allowable fishing-related incidental mortalities and monitoring.

MPI consider the concept of setting a limit on fishing-related mortality (FRML) in conjunction with monitoring is a proposal worth exploring. Under section 15(2) of the Act, the Minister may, after consultation with the Minister of Conservation take such measures as he or she considers are necessary to avoid, remedy, or mitigate the effect of fishing-related mortality on any protected species, and such measures may include setting a FRML. A FRML is consistent with what SNZ describes above.

For Maui's dolphin a FRML would need to be to set below the level of the PBR. This approach recognises the fact that PBRs were not designed to apply to very small populations where Allee and stochastic effects are likely to occur and that non-fisheries related mortality must be considered as part of the PBR. A FRML need not necessarily relate to a limit for a single year (indeed, the PBR approach was not developed to provide hard annual catch limits) and, arguably, could be set for an extended period of up to several decades.

However, MPI notes that implementing a FRML would require 100 percent monitoring coverage to reliably detect captures. MPI acknowledges that establishing 100 percent

monitoring coverage (whether through observers and/or electronic monitoring) will take some time to implement and involves significant costs.

MPI consider the concept of a FRML an idea worth exploring, perhaps through a combination of research advisory groups to determine the biological limits, and how the model could be refined with new information, and a working group of managers, science and stakeholders to determine how much of an overall mortality limits is allocated to fisheries impacts and across fishing methods. MPI considers this approach worth considering but notes it will take time to develop and cannot be used to manage residual risk in the short term.

11 MONITORING COVERAGE

MPI considers there are two main components to monitoring and evaluating the threat/impact of fishing activity to the Maui's dolphin population; compliance with current management measures and the ability to observe the nature and extent of the overlap between fishing-related activities and Maui's dolphins.

These two areas of monitoring are important to guide decisions on how to best manage those interactions. Such information will help MPI assess the effectiveness of exiting fishing-related management measures and whether more mitigation measures are required to avoid, remedy or mitigate the adverse effects of those threats.

Submission comments

The above themes were reiterated strongly in the majority of submissions received.

ENGOs, general public, local councils/boards, politicians, and petition comments included:

Observer coverage

- Because of the small size of the population and low likelihood of encounter, the amount of monitoring coverage would have to be at or near 100% to ensure detection of a Maui's dolphin mortality given the high consequence to the population.
- Increased coverage should begin immediately (some submissions note this should remain in place until full protection measures are put in place out to the 100 m depth contour)
- Observers do not prevent mortality but will provide independent verification of any interaction that occurs
- The risk of further mortalities must be eliminated not just observed
- Increased observer coverage has been proposed and discussed in the past with little action

Compliance

- There is insufficient information on the level of compliance to date with the current measures, the effectiveness of that monitoring and enforcement measures, and proposals for improvement.
- Some fishers are operating illegally within closed areas under the cover of night. Vessel Monitoring Systems should be required on all vessels to ensure they are complying with the current restrictions.

Industry comments varied but focused mainly on:

- Whether observer coverage was required in certain areas/fisheries, and
- If observer coverage was increased who should bear the cost of that activity.

Most industry submissions considered that any observer/monitoring costs should be borne by the Crown. Alternative cost models are proposed depending on whether monitoring coverage is done by observers or electronic tools, or whether current protection measures are relaxed to allow monitored in certain areas.

MPI Analysis

MPI will address the various submissions in more detail in the subsequent sections. Submissions comments on specific monitoring proposals are discussed in the respective fisheries/areas.

11.1 Need for increased monitoring

MPI's monitoring objectives include:

- Gathering information on the nature and extent of interactions between fishing activity and Maui's dolphins, and
- Assessing compliance with mandatory and voluntary mitigation measures.

MPI considers that where management measures do not eliminate risk, monitoring is required to verify the effectiveness of the chosen management action. The greater the residual risk, the greater the imperative for increased monitoring.

Monitoring allows for an analysis of Maui's dolphin interactions with fishing activities in areas where the distribution of the dolphins and fishing overlap. Monitoring does not reduce the risk to Maui's dolphins but does reduce the uncertainty in the level of risk the activity poses to the population and identifies the highest risk areas and activities.

The Marine Mammals Protection Act 1978, the Wildlife Act 1953, and the Fisheries Reporting Regulations 2001 require fishers to report protected species interactions, including dolphin entanglements. This reporting helps MPI determine the extent and nature of interactions.

The extent of fishing-related impacts on Maui's dolphins is unknown. This is primarily due to limited information on the level of fishing-dolphin interactions and trends in Maui's dolphin abundance; both of which make it difficult for MPI to determine the extent to which fishing has had, is having, or will have, an adverse effect. Additionally, cryptic mortality from undetected interactions between fishing gear and dolphins can also occur from lost gear, or the dolphin naturally falling out of the net prior to being hauled in.

The absence of documented fishing-related Maui's dolphin mortalities since 2008 in the presence of current management measures does not necessarily equate to absence of fishing-related mortalities. Documented fishing-related mortality is likely to underestimate total fishing-related mortality[72]. Incentives to report entanglements are poor and some fishers fear they may be subject to onerous mitigation measures if reported mortalities are too high.

There are incentives to report mortalities (for example, legal obligations and penalties) but there is a lack of independent monitoring to detect compliance. There are also incentives for under reporting of fishing-related mortalities because they could result in more management measures that impact on fishing opportunities. However, the reporting of the January mortality in a commercial set net, as discussed above, is testament to the fact that fishers can and do responsibly report accidental captures.

Independent monitoring of fisheries provides an opportunity to gather reliable, unbiased information about fisheries interactions with Maui's dolphins.

11.2 Levels and costs of monitoring coverage

11.2.1 Observer coverage in the set net fishery from Pariokariwa Point to Hawera

Since 2008 (when the TMP was first developed) and prior to the interim measures coming into effect on 26 July 2012 there has been no monitoring coverage in the set net fishery in the Taranaki region or elsewhere along the WCNI.

Under the interim measures, MPI is funding 100 percent observer coverage for any commercial set net fisher operating from Pariokariwa Point to Hawera between two and seven nautical miles offshore. For the 2011/12 October fishing year that coverage equalled 91 set netting days (approximately 10 percent of the total number of set netting days in

[72] See Currey et al (2012) for further information.

statistical reporting areas 40 and 41). Between 1 October 2012 and 25 November an additional 73 set netting days have been observed in this area.

There are four set net vessels that have operated between two and seven nautical miles during this time with an observer onboard. In addition, a local cray boat has also taken observers on board when they are available to increase coverage in the area.

Since the interim measures came into place there have been no sightings of, or interactions with Hector's and/or Maui's dolphins observed.

Proposed coverage
The options MPI has presented regarding observer coverage from Pariokariwa Point to Hawera include 100 percent monitoring coverage out to seven nautical miles whether a ban on set net activity is in place from zero to two (Option 1 and 2), or zero to four (Option 3) nautical miles from shore.

Observer coverage provides a way to continue to gather more certain information on dolphin presence in the area and interactions with fishing activity. However, given the small size of the Maui's dolphin population and the rare and infrequent occurrence of dolphins that have been observed in the area, any information gathering effort would require a long-term commitment.

Option 1

In the absence of information on displacement or removal from the fishery MPI has estimated upper bound on the number of fishing days requiring coverage based on the average number of fishing days per year between zero and seven nautical miles. The lower bound estimate is based on observer coverage within the interim measure restrictions and the programs projected annual days for 2012/13.

Based on the coverage to-date, the estimated per sea-day cost for this area is ~$660. MPI estimates the ongoing cost of mandatory observer coverage between the two and seven nautical mile area to be between $315 480 and $526 000 a year. The cost of observer coverage has been made using the following assumptions:

- An estimate of 478 to 526 days fished per year[73].
- Observer costs of $660 (based on current coverage) and $1000 (maximum) per day.

The total estimated cost over a three year period (until 2015) is between $946 440 and $1 578 000. MPI considers at least three years of coverage is required because of the low population size of the Maui's dolphin and the rare and infrequent movement of Hector's and/or Maui's into the region.

Option 2

Under Option 2 the cost estimates for Option 1 would carry over. The difference between the two options is that the monitoring required is considered 'permanent' for Option 2 and would require regulatory change to remove.

Option 3

MPI considers the costs associated with observer coverage under Option 3 are likely to be less than estimated in Option 1 and 2 because the area of observation is smaller (between four and seven nautical miles offshore). Additionally, although those set net vessels currently carrying an observer under the interim measures could also do so under Option 3, a

[73] Lower bound based on observer projections. The upper bound is calculated based on the average annual number of trip days from 2008/09 to 2010/11 between Pariokariwa Point and Hawera 0 to 7 nautical miles offshore.

closure out to four nautical miles may mean continuing set net activity between four and seven nautical miles would not be cost effective if the species mix does not align with fishers' ACE packages.

MPI estimates an average of 206 fishing days per year (between 2008/09 – 2010/11) has occurred between four and seven nautical miles. However, MPI is unable to estimate potential displacement of fishers into this area from the two to four nautical miles, or whether they would be shut out of the fishery, if the set net ban is extended out to four nautical miles.

In the absence of information on displacement or removal from the fishery MPI estimate the cost of mandatory observer coverage between four and seven nautical mile area using the same assumptions as described under Option 1. Under this scenario MPI estimates the cost of observer coverage to be no more than $315 480 to $526 000.

The costs of observer coverage under Option 3 would be cost-recovered from the industry, which would impact the economic return the fishers received from the fishery if this option was chosen. Option 3 maintains the requirement to gather more information on dolphin presence and potential interactions with set net fishing beyond four nautical miles offshore. MPI considers the likelihood of interactions between four and seven nautical miles is low, and smaller than the likelihood of interactions in Option 2, but the consequence of an interaction remains very high.

11.2.2 Observer coverage in the set net fishery in WCNI harbours

Since 2008 there has been a total of 22 days of observer coverage on set netting vessels operating in the WCNI harbours. All this coverage occurred within the Manukau Harbour in November/December 2008 and equals approximately 1.3% of total set net days fished in the 2008/2009 October fishing year.

There were two vessels that participated in this coverage and there were no sightings of, or interactions with, Hector's and/or Maui's dolphins observed.

Proposed coverage

Due to the nature of set net activity in the harbours (and small vessel sizes) an intensive monitoring program is considered cost prohibitive. On average 32 commercial fishers operate each year in the Manukau Harbour, 50 in the Kaipara Harbour, and there were over 5500 days fished in both harbours combined in the 2010/11 October fishing year alone. However, MPI is committed to identifying opportunities to improve information on the location and intensity of set net activity in the harbour. MPI considers this could, in the first instance, be addressed by changing the reporting requirements to enable finer spatial scale reporting of each set net.

Submission comments

Two submissions from commercial fishers in the Manukau Harbour indicated they were happy to help or demonstrate their set net practices with observers on their vessels and have carried observers in the past to show they had no interaction with or sightings of Maui's dolphins.

SNZ do not see a need for observing fishing activity in the Manukau or Kaipara Harbours. They consider the objective of monitoring of the Manukau Harbour is to establish whether Maui's dolphins frequent the harbours beyond their existing set net prohibitions. However, SNZ do consider that more detailed information on the distribution of fishing effort within the harbours is required.

MPI analysis

MPI considers there may be occasions for some opportunistic placement of observers but that would be discussed with industry to ensure the objectives of the coverage were both clear and cost-effective.

11.2.3 Observer coverage in the WCNI trawl fishery

Since 2008 observer coverage of inshore trawl vessels operating in statistical reporting areas 40 to 45 has ranged as follows[74]:

	2008/09	2009/10	2010/11	2011/12
Observed fishing days	12	0	0	6
Total trawl days	959	885	799	1063
% coverage	1.25%	0%	0%	0.56%

During this period one observation of a Hector's and/or Maui's dolphin was made by an observer. A fleeting observation of two adult dolphins was made near the entrance of Raglan Harbour in February 2009 (inside the trawl prohibition areas). The sighting lasted less than one minute before the dolphins disappeared from view.

The management options discussed in the consultation paper for the trawl fishery were not explicit about what level the monitoring coverage should be increased to, just that it should be extensive.

MPI presented options with associated costs that assumed 100 percent monitoring coverage off the WCNI in the trawl fishery. MPI considers a high level of, and long-term commitment to, monitoring coverage is required because of the small size of the Maui's dolphin population and the low likelihood of fishing-related interactions.

Proposed coverage

There are approximately 21 fishers operating about 28 vessels (< 46 metres) off the WCNI between Maunganui Bluff and Pariokariwa Point (between two and seven nautical miles offshore) that would require monitoring.

MPI considers the level of monitoring coverage in the inshore trawl fishery needs to be increased to provide robust information to inform any assessment of the level of interaction between trawl activity and the Maui's dolphin population. To do so MPI is proposing a staged increased in monitoring coverage over the next four years as follows:

- 2013/14 – 25% coverage
- 2014/15 – 50% coverage
- 2015/16 – 75% coverage
- 2016/17 – 100% coverage

The primary impact associated with Option 2 is the costs associated with observer coverage. The overall impact of Option 2 on commercial fishers is difficult to quantify because MPI is unable to confirm the extent to which individual vessels are reliant on having access to the area between two and seven nautical miles offshore as part of their fishing operations.

Similarly for Option 3 MPI is unable to confirm the extent to which individual vessels are reliant on having access to the area between four and seven nautical miles as part of their fishing operations.

Some vessels may opt out of monitoring costs by refraining from trawling inside the proposed monitoring zone. MPI cannot determine what proportion of vessels may refrain from fishing inside the monitoring zone and what impact this might have on the value of the WCNI trawl fishery.

[74] Information is based on vessels less than 46 metres in length and operating in the inshore fishery targeting GUR, JDO, LEA, SCH, SNA, SPO, TAR, TRE, TRU, WAR)

In the absence of information on opting out of the area where monitoring coverage would be required, MPI has estimated the potential costs using a number of assumptions:

- An estimate of 1238 days of trawling per year, all of which are monitored in four years time[75].
- Observer costs of $950 per sea day based on previous inshore trawl coverage off the South Island.

Using those assumptions and the proposal to ramp up coverage in the fishery from 25 percent in 2013/14 to 100 percent in 2016/17, the estimated cost per year would be as follows:

- 2013/14 – 25% coverage – 310 sea days = $294 500
- 2014/15 – 50% coverage – 619 sea days = $588 050
- 2015/16 – 75% coverage – 929 sea days = $882 550
- 2016/17 – 100% coverage – 1238 sea days = $1 176 100

These costs would be cost-recovered from the industry, and may impact the economic return some fishers receive from the fishery. MPI notes Option 2 may impact on smaller scale fishers and vessels disproportionately when compared with larger fishing companies.

Submission comments

As noted previously, there were a number of comments from industry on the proposed observer coverage in the WCNI trawl fishery. Some considered any required observer coverage should be constrained to the Manukau Harbour to Port Waikato area (between four and seven nautical miles). Others suggested that electronic monitoring would be a better and more cost effective means of improving information.

MPI Analysis

MPI would collaborate with industry on the design of any monitoring programme to ensure it would provide meaningful coverage to inform management as well as identify cost efficiencies. This includes identifying alternative approaches, if effective, to gain the information MPI requires.

[75] Calculated based on the average annual number of trip days in the commercial trawl fishery from 2008/09 to 2010/11 between Maunganui Bluff to Pariokariwa Point, and 2 to 7 nm offshore.

11.3 Types of monitoring available

There are two approaches to improving independent monitoring of fisheries interactions with Maui's dolphins:

- Observers, and
- Electronic monitoring.

The design of any monitoring programme is critical to ensure the level of monitoring put in place is appropriate to maximise the ability to detect a possible interaction between fishing and Maui's dolphins. MPI will collaborate with industry to ensure the design of any monitoring programme will achieve its objectives and consider the most cost-effective way it can be delivered. MPI notes that given the consequence of any interaction with the Maui's dolphin population and its small population size the level of monitoring coverage required is likely to be substantial and long-term.

11.3.1 Observers

MPI uses fisheries observers to monitor interactions between fishing vessels and protected species including Hector's and Maui's dolphins. MPI considers observers to provide the most reliable monitoring programme.

MPI has a pool of 40-45 fisheries observers across the country whose role is to go out on commercial fishing vessels (n=1,278) to observe whether commercial catch reports are an accurate record of what was caught and gather information on interactions between fishing vessels and protected species.

Benefits of observers include:

- Providing information on the distribution of various protected species (e.g. marine mammals, seabirds, turtles, white sharks).
- Independent monitoring on the types of interactions that occur between marine mammals and fishing vessels.
- Collection of multiple pieces of information on the nature of interactions with dolphins (for example, biological samples for genetic analyses).
- Communication of the legal requirements to report dolphin captures to fishers and the importance of reporting such captures.
- Facilitating the return of carcasses of certain protected species for necropsy.
- Reporting on, or recommending, ways to avoid or mitigate the effects of fishing on protected species.

However, there are significant costs that include:

- Difficulty placing observers on boats (that is, some fishing vessels are too small to be able to take an observer and crew).
- Inshore fishing is dependent on weather and other factors, so changes to trips at short notice can be difficult and costly to coordinate with the observer programme,
    - This can require some observers to be placed at local ports for several months, so they can be deployed at short notice.
- Inshore observer coverage is expensive ($650 – 1000 per day) and coverage, as a proportion of total fishing activity, is low. Expansion of the programme across a large proportion of the inshore fleet off the WCNI could:
    - Remove a large part of the profit margin from the WNCI inshore fishery, and
    - Affect the viability of some individual fishing operations.
- Personnel requirements to meet the capacity required to deliver extensive monitoring coverage off the WCNI in both the trawl and set net fisheries.

11.3.2 Electronic monitoring

Electronic monitoring (video cameras) is used in many fisheries around the world for a variety of purposes. Electronic monitoring has been used successfully in New Zealand waters aboard set net and trawl boats to monitor interactions with protected species. Trials in Canterbury in 2003-04 showed that at least some captured Hector's dolphins were identifiable using this technology.

Electronic monitoring units typically consist of a hard drive that records information by video camera(s) fixed above the vessel deck. The cameras on board the vessel may be activated in two ways: (1) at the beginning of fishing event, or (2) when the trawl winch starts. As fish are landed on the deck of the boat the camera records images in the field of view. The video footage is independently reviewed on shore and species identified.

The costs associated with an electronic monitoring programme generally include:

- Equipment (either purchased to own or leased),
- Installation fee, and
- Retrieval and analysis of footage (depending on the design of the monitoring programme).

The exact costs will vary depending on the equipment used and the design of the monitoring programme, however, the estimates outlined in Table 11.1 provide figures to determine the magnitude of the funds that would be required.

Table 11.1 Estimated capital and running costs of an electronic monitoring programme.

	Purchase of equipment	Lease of equipment (per yr)	Installation	Analysis of footage (per day)
Average cost	$10 000	$1 000	$1 500	$250
Maximum cost	$16 000	$1 600	$ 2 000	$500

In the long term electronic monitoring is likely to be more affordable to fishers than observers. However, MPI notes there can be substantial upfront costs. In addition, purchased monitoring equipment would have to be replaced approximately every three to five years depending on its ability to withstand wear and tear.

MPI is currently investing approximately $250,000 in the Timaru area on inshore set net and one trawl boat to test the efficacy and practicality of video electronic monitoring for protected species interactions. It is hoped that this trial may provide proof of concept for a cost effective way of achieving 100 percent observed coverage of the inshore fleet.

In addition to financial costs, there are limitations in electronic monitoring programmes in terms of providing consistent and reliable detection of bycatch. MPI considers the design of an electronic monitoring system would need to address possible difficulties in identifying a fishing-related mortality:

- If a dolphin is buried under high volumes of catch on the vessel deck.
- If fish landed onboard a vessel are put directly into the hold preventing a dolphin being observed.
- If a dolphin is released or falls from a net before the net is retrieved onboard.
- In the event of a technical failure.

MPI considers that some electronic monitoring technologies currently in use around the world may be able to observe bycatch of threatened or protected species like the Maui's dolphin. However, rigorous testing and development alongside observers will be required to determine its efficacy.

11.4 Compliance

To assess compliance with mandatory and voluntary mitigation measures, MPI works closely with its fishery officers, other compliance personnel, and acts on information from the public to determine where laws may be broken or codes of practice not followed.

Submission comments

A number of submissions expressed concern at the level of compliance and associated monitoring off the WCNI. Some submissions suggested that all vessels should be required to use VMS to allow for near real time and retrospective information on vessel position and, by inference, fishing activity.

MPI Analysis

MPI is committing to ensuring the compliance programmes in place are effective to ensure that both commercial and recreational fishers comply with the various prohibitions in place off the WCNI. MPI is currently reviewing technological advancement in the types of monitoring that have been suggested to improve compliance effectiveness and efficiency.

11.4.1 General MPI compliance monitoring

MPI is committed to enforcing all fishing related regulations, including those aimed at protecting endangered species such as Maui's dolphin. Fishing in closed areas, using prohibited fishing methods or improper use of gear incur harsh penalties, including loss of gear and/or significant fines.

MPI employs 89 Fishery Officers and 225 Honorary Fisheries Officers (HFO's) around the country who monitor people using our coastal fishery resources and ensure fishery regulations are adhered to. MPI is acknowledged as the leading country among 41 countries surveyed recently for the quality of its fisheries monitoring control and surveillance work[76].

11.4.2 Compliance monitoring in the Maui's dolphin restriction/prohibition zones

Staffing

In the five districts offices that cover the areas where Maui's dolphin protection measures in place, MPI employs 37 MPI Fisheries Officers and there are 94 Honorary Fisheries Officers (HFO's) (Table 11.2).

Although Fisheries Officers work closely together, each District Office covers different regions; Fisheries Officers based in Northland cover Maunganui Bluff to Kaipara Harbour, those in North Shore/Manukau cover Kaipara to Port Waikato, those in Hamilton cover Port Waikato to Pariokariwa Point, and New Plymouth Officers cover the area from Pariokariwa Point to Hawera (with additional support available from Wellington).

Table 11.2 Fishery and Honorary Fishery Officers operating along the west coast of the North Island.

	Fishery Officers	Honorary Fishery Officers
Northland District Office	6	17
North Shore District	12	27
Manukau District Office	13	31
Hamilton District Office	4	9
New Plymouth District Office	2	10
Total	37	94

[76] Fisheries Centre at the University of British Columbia, Canada

Monitoring

To assess compliance with mandatory and voluntary mitigation measures, MPI works closely with fishery officers, other compliance personnel, and acts on information from the public to determine where laws may be broken or codes of practice not followed. There are several ways that recreational and commercial fisheries compliance is monitored off the WCNI where Maui's dolphins range and fishing restrictions apply:

1. MPI Fishery Officers: These staff conduct a range of work from beach patrols checking what fishers have caught, port/boat ramp checks, response patrols (where public have raised concerns), to complex sting operations.

2. Honorary Fisheries Officers: MPI engages the services of unpaid volunteer Fisheries Officers to supplement the permanent Fisheries Officers. These are voluntary staff that mainly conduct inspections/education at boat ramps and help out in Fishery Operations, and are only responsible for recreational monitoring.

3. At-sea Inspections: MPI in conjunction with the New Zealand Defence Force (NZDF) undertakes naval surveillance. MPI Fishery Officers accompany Navy staff and board vessels at sea to monitor compliance. Timing of at-sea inspections depends on NZDF availability.

Compliance

Recreational

Over the past 4 years, there has been a 94 percent compliance rate for recreational inspections (from ~3,000 inspections per year) in the WCNI area where Maui's dolphin restrictions apply. These inspections apply to all recreational activities, not just those activities that are prohibited to protect the Maui's dolphins. Inspections carried out along this coast account for 9 percent of the total recreational inspections carried out by MPI in NZ (Table 11.3)

Table 11.3 MPI recreational inspections along the west coast of the North Island from 2008/09 to 2012/13.

	2008-09	2009-10	2010-11	2011-12	2012-13
No. of Rec Inspections *	3,090	3,058	3179	2,748	629
Observed Compliance rate *	95.5% (141 breaches)	95.5% (137 breaches)	92.5% (241 breaches)	93.7% (171 breaches)	93.5% (41 breaches)
Total no. of National Inspections	31,670	32,461	35,267	37,823	7,602
% of total inspections carried out on West Coast	10%	9%	9%	7%	8%
No. of Recreational Patrols by Northland District Office	No data available		301	338	97
No. of Recreational Patrols by Auckland District Office			226	359	122
No. of Recreational Patrols by Waikato District Office			449	347	87
No. of Recreational Patrols by Wellington/Taranaki District Office			427	499	149

*Inspections carried out in Kaipara, New Plymouth, South Kaipara, Raglan and Manukau Harbour (limited to Orau Bay, Big Bay, Wattle Bay, Graham's Beach only) areas

Fisheries Officers do not record the specifics of their daily work considered as business-as-usual (*i.e.* recreational inspections). Therefore, there is no information available on the number of set-nets inspected per day or area.

Commercial

Between 2008-09 and 2011-12 there were, on average, 72 commercial breaches per year in the WCNI area where Maui's dolphin restrictions apply. Of these, about 12 per year were for set-nets. Note that there were only 5 set-net breaches per year in 2010/11 and 2011/12 and zero recorded so far in the 2012/12 year. Data on the total number of commercial inspections by MPI specific for the area where Maui's dolphin fishing-related restrictions were not available as it is not recorded at the sub-region level. Therefore, to provide an approximate indication of MPI commercial inspection, data from the North Islands West Coast (including Auckland/Wellington Regions) showed that there was a total of, on average, 1840 commercial inspections per year (Table 11.4).

Table 11.4 MPI Commercial Inspections from 2008/09-2012/13 for the west coast of the North Island and compliance in the area where Maui Dolphin protection measures are in place[77].

	2008-09	2009-10	2010-11	2011-12	2012-13
No. of Commercial Inspections by compliance region	LFR 485 VESSEL 1696 Client details 179 Total Inspections 2360	LFR 108 VESSEL 2424 Client details 379 Total Inspections 2911	LFR 89 VESSEL 401 Client details 268 Total Inspections 758	LFR 72 VESSEL 1074 Client details 187 Total Inspections 1333	LFR 26 VESSEL 594 Client details 172 Total Inspections 792
Observed Compliance Rate for Maui Dolphin sub-region*	48 breaches 19 Set net	95 breaches 17 Set net	92 Breaches 5 Set net	52 Breaches 5 Set net	26 Breaches 0 Set net
Total no. of National Inspections by compliance region	LFR 1913 VESSEL 7922 Client details 848 Total Inspections 10683	LFR 2,034 VESSEL 8393 Client details 1169 Total Inspections 11596	LFR 1,603 VESSEL 8114 Client details 1221 Total Inspections 10938	LFR 1,235 VESSEL 7528 Client details 1090 Total Inspections 9853	LFR 105 VESSEL 3697 Client details 711 Total Inspections 4513

*Covers the Kaipara, New Plymouth, South Kaipara, Raglan and Manukau Harbour (limited to Orau Bay, Big Bay, Wattle Bay, Graham's Beach only) areas

Offences

There was one Regulation with offences specifically linked to set-netting in the WCNI area where Maui's dolphin restrictions apply (specifically the Pariokariwa Point/Hawera area) over the last 5 years. The warning was issued for a breach of Fisheries (Central Area Commercial Fishing) Regulations (Section 6C) in Awapuni, New Plymouth. No other offences were found for the last five years for set netting in that area.

Other

Data Entry: MPI is currently developing a new compliance database system that will enable all compliance information to be accessible within a single system and allow fishery officers to check/enter real-time information to the system. This system (to be available in 2013) will improve efficiency and accessibility of information to inform compliance and enforcement operations.

[77] Data Sources: LFR data via LFR Premises Total Details Inspection report
VESSEL VIA Report vessel details by inspection detail type
Client details via Client details inspection type
Breaches via incident report and filtering results

Resourcing: Under any management measure that requires inspection and/or seizing of set nets or monitoring of trawl vessels off the WCNI, MPI will need to ensure there is the expertise as well as vessel availability in the different regions.

Patrol Aircraft: The Maritime Patrol Force (operated by the Royal New Zealand Air Force) conducts surveillance patrol in New Zealand's 200-nautical-mile exclusive economic zone (EEZ). The Maritime Patrol Force consists of six Orions whose tasks include monitoring international shipping, pleasure craft and foreign fishing boats. This surveillance provides information to help New Zealand control shipping and fisheries activities within the EEZ.

12 RESEARCH AND COLLABORATION

12.1.1 Research

MPI and DOC proposed the development of an annual planning and review process to provide a transparent and more systematic procedure for determining future research and monitoring requirements for Hector's and Maui's dolphins. There are currently a couple of frameworks in place that research is delivered through, but efficiencies and collaborative opportunities could be improved amongst agencies and external parties.

The annual planning and review process would:

- Develop an ongoing review framework for an overarching strategy for research, monitoring and collaboration.
- Review the current management questions of both MPI and DOC to identify and prioritise the key information needs to aid future management decisions.
- Develop an adequate programme for monitoring the population and compliance of any mitigation measures.
- Outline approaches to address the information needs to assist MPI and DOC in developing research proposals or monitoring programmes for following year(s).
- Review the performance (i.e. quality, deliverables, and targets) of any research projects and monitoring programmes that were undertaken and/or completed in the current year.

The benefits of such a review process would effectively inform future reviews of the TMP in a timely manner, and enable Government to respond more urgently if required. New information gained would be assessed as it becomes available. The results would guide research priorities for the following year and inform managers if there is a need to revisit management actions.

Submission comments

Submissions received that commented on the proposed research planning process were supportive of such a framework.

TOKM consider the Crown needs to be more proactive in finding ways to get better information on Maui's dolphins instead of continuing to count dead dolphins and restricting fishing via area closures etc to minimise any chance of mortalities being above the PBR. They consider these measures only estimate how many dead dolphins the population can cope with before it starts to decline but doesn't help the population to rebuild and overcome risks overall.

A number of submissions, particularly from industry recommend a collaborative approach to manage threats to Maui's dolphins, involving those industries likely to be impacted. They submit that more research is needed to establish the range and habitat of Maui's dolphins, the extent of other threats (for example, the impacts of disease and increasing predation), and on intervention techniques that will support recovery of the population (for example, breeding programmes, translocation, and satellite tagging).

A number of ENGOs submit ongoing research and monitoring was essential to determining the effectiveness of any protection measures. They also considered, however, the absence of information should not be used as reason to defer management action.

MPI Analysis

Research and subsequent management responses to non-fishing-related impacts on Maui's dolphins fall outside the scope of MPI's mandate but are being considered by DOC in their share of this review of the Maui's dolphin Threat Management Plan.

MPI agrees that more research is required on:

- Maui's dolphin distribution: southern extent, in harbours, offshore and seasonal movements.
- The genetic flow within and between Hector's and/or Maui's dolphin populations: risk of population fragmentation, home range size, migration, level of population mixing.
- Maui's dolphin abundance: baseline monitoring, trends over time, and collection of DNA samples.
- The nature and extent of fishing-related mortalities in the Maui's dolphin population from different fishing methods.

Ongoing research is a critical component of the TMP. MPI and DOC will work together to ensure a robust, coordinated and targeted research programme with clear milestones and reviews is in place.

One part of this will be to gather better information on dolphin presence. MPI will look to convene a technological advisory group in 2013 to inform an assessment of the most appropriate technological tools available to monitor and gather robust information on dolphins. This may include consideration of technologies such as video monitoring, acoustic detectors and satellite tagging. MPI is committed to improving information on the potential level of interaction between fishing activity and the Maui's dolphin to better inform and refine management going forward.

12.1.2 Collaboration

MPI considers that the ability to improve information available to define and monitor fishing-related risk to Maui's dolphins requires a collaborative approach among tangata whenua and stakeholders.

A collaborative approach with customary, recreational, commercial and environmental interests has the potential to develop innovative and integrated solutions to address many of the human-induced threats that are affecting the population, including fishing-related threats.

Submission comments

There was considerable support in submissions across a variety of stakeholder groups for a more collaborative approach to addressing fishing-related threats. Some industry submissions noted they were supportive of a partnership approach to work together towards common agreed objectives. Others considered a review of codes of practice, the trial and uptake risk reduction or mitigation tools where proven effective should be encouraged.

MPI Analysis

MPI considers that enabling and partnering with customary, recreational and commercial fishers and important pathway to identifying the effective measures to reduce the risk of fishing-related mortality to the Maui's dolphin.

MPI is committed to engaging in these discussions to facilitate the trials of alternative fishing methods, mitigation tools, and cost effective monitoring programmes to inform management going forward.

13 CONCLUSION

You are free to choose a mix of management options but should, given the uncertainty in information on biological risk, carefully consider the impact on use when determining the appropriate options.

Depending on the nature and extent of the threat from different fishing methods to the Maui's dolphin population, you could choose a higher level of risk mitigation for methods that pose the highest threat. You could also choose a lower level of risk mitigation for methods that pose a lesser threat to the population. That is, the level of mitigation that you consider necessary may vary between the:

- type of fishing activity,
- balance struck between utilisation and sustainability, and
- need to ensure long-term viability (including biological diversity) of the Maui's dolphin population.

MPI notes the Act does not oblige you to reduce the risk of fishing-related mortalities to zero. However, the susceptibility of the Maui's dolphin population to fisheries-related impacts suggests you should be cautious determining the degree of acceptable risk of fishing-related mortality.

The options presented consider the need to manage the risk to Maui's dolphins and/or gather more certain information on dolphin presence as well as interactions between dolphins and fishing-related threats.

14 APPENDIX 1: MPI STATUTORY CONSIDERATIONS

14.1 Purpose of the Fisheries Act 1996

In making any decision you must bear in mind and conform to the purpose of the Fisheries Act 1996 ('the Act'), as set out in section 8: "To provide for the utilisation of fisheries resources while ensuring sustainability".

Ensuring sustainability means:

(a) Maintaining the potential of fisheries resources to meet the reasonably foreseeable needs of future generations; and
(b) Avoiding, remedying, or mitigating any adverse effects of fishing on the aquatic environment.

As defined under section 2 of the Act, the aquatic environment would include Maui's dolphins.

MPI considers that in providing for the utilisation of a fisheries resource, enabling people to provide for their social, economic and cultural wellbeing is a relevant consideration when setting a sustainability measure. This consideration is also consistent with the goal of the TMP 'to further reduce impacts of human activities as far as possible, taking into account advances in technology and knowledge, and financial, social and cultural implications'. It is up to you to determine how much weight to give to wellbeing in making his overall decision.

More restrictive sustainability measures are likely to have a greater impact on utilisation. The nature and extent of additional management necessary to avoid, remedy, or mitigate the effects of fishing on Maui's dolphins, if any, will depend on the balance between sustainability and utilisation you considers appropriate. The selection of the most appropriate suite of measures requires you to weigh the benefits of more effective mitigation against the likely costs of those measures.

14.2 Environmental principles

The environmental principles set out in section 9 of the Fisheries Act (1996) ('the Act') are relevant when considering whether measures are necessary to avoid, remedy or mitigate the effects of fishing-related mortality on Maui's dolphins. These principles are:

- Associated or dependent species should be maintained above a level that ensures their long-term viability;
- Biological diversity of the aquatic environment should be maintained;
- Habitat of particular significance for fisheries management should be protected.

Maui's dolphins are an associated or dependent species as defined in the Act. MPI considers you should take into account maintaining the Maui's dolphin species above a level that ensures long-term viability.[78] This consideration is consistent with the goal of the TMP, 'to ensure that the long-term viability of Hector's dolphins is not threatened by human activities'.

14.3 Information principles

Under section 10 of the Act, decision makers, including you, shall take into account the following information principles:

- Decisions should be based on best available information[79];
- Decision makers should take into account any uncertainty in the available

[78] Fisheries Act 1996, section 2: 'Long-term viability' of Maui's dolphins would mean there is a low risk of collapse of the species, and the species has the potential to recover to a higher biomass level.
[79] Fisheries Act 1996, section 2. 'Best available information' means the best information that, in the particular circumstances, is available without unreasonable, cost, effort, or time.

information;
- Decision makers should be cautious when information is uncertain, unreliable or inadequate, and;
- The absence of, or any uncertainty in, any information should not be used as a reason for postponing or failing to take any measure to achieve the purpose of the Act.

The degree of uncertainty and the adequacy of the available information are matters for you to assess and weigh in making decisions on any measures he considers necessary to avoid, remedy or mitigate the effects of fishing-related mortality on Maui's dolphins.

14.4 Sustainability measures

Section 11(1) of the Act allows you to set or vary any sustainability measure for one or more stocks or areas after taking into account the affects of fishing on the environment. You must also take into account existing controls under the Act and the natural variability of the stock concerned.

Before setting or varying any sustainability measures you must have regard to the provisions listed in section 11(2) of the Act.

Section 11(2)(a): You must have regard to any provisions of any regional policy statement, regional plan, or proposed regional plan under the Resource Management Act 1991 that apply to the coastal marine area and are considered relevant.

- Objectives outlined in the New Zealand coastal policy statement seek to protect indigenous biological diversity in the coastal environment by avoiding adverse effects on indigenous species that are listed at risk or threatened.
- The Taranaki Regional Policy Statement and Coastal Plan contain general policies and objectives that provide for the maintenance of habitats and biodiversity of indigenous marine fauna.
- The Waikato Regional Policy Statement and Coastal Plan contain general policies and objectives that provide for the development and use of natural and physical resources while avoiding, remedying or mitigating adverse effects on biodiversity in the region.
- The Auckland Regional Council Policy Statement and Coastal Plan contain general policies and objectives that provide for the preservation or protection, and avoidance of significant adverse effects on threatened species.

Section 11(2)(b): You must have regard to any management strategy or management plan under the Conservation Act 1987 that apply to the coastal marine area and are considered relevant. The Auckland, Waikato and Wanganui Conservation Management Strategies are relevant to the areas under consideration. These Conservation Management Strategies do not specifically reference management of Maui's dolphins, but do discuss the protection of threatened indigenous natural fauna.

Section 11(2)(c): You must have regard to sections 7 and 8 of the Hauraki Gulf Marine Park Act 2000 that apply to the coastal marine area. The areas under consideration in this consultation paper do not fall within the Hauraki Gulf Marine Park.

Section 11(2)(d): You must have regard to any provisions of a planning document lodged by a customary marine title group under section 91 of the Marine and Coastal Area (Takutai Moana) Act 2011. That act establishes the process for applying for a coastal marine title, but no such title has been granted yet.

Section 11(2A)(a) and (c): You must take into account any conservation services or fisheries services or any decision not to require such services. The options proposed in this paper

support objectives outlined in the DOC Marine Mammal Action Plan and Conservation Services Plan.

Section 11(2A)(b): You must take into account any relevant and approved fisheries plans. There are no fisheries plans approved for inshore fisheries that apply to this area at this time. The National Fisheries Plans for Inshore Fisheries have been released as drafts and are being trialled over the next couple of years. The environmental objectives in the draft plans are consistent with the proposals outlined in this paper.

Section 11(3)(d) allows you to set or vary the fishing methods that may be used in any area.

Section 11(4)(b): You may implement any sustainability measure or the variation of any sustainability measures, as set or varied under subsection (1),

(i) by notice in the *Gazette*; or

(ii) by recommending the making of regulations under section 298.

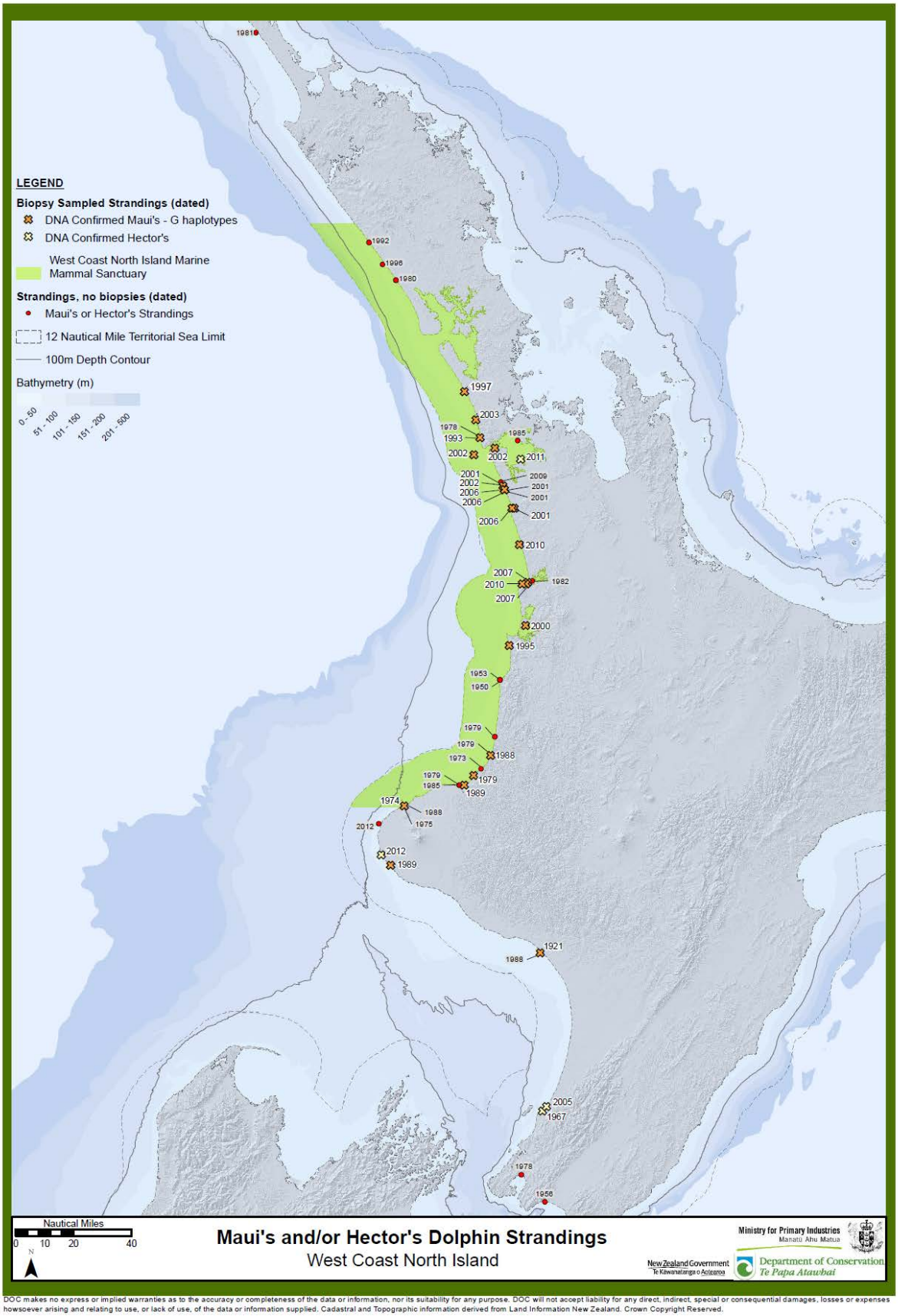
14.5 International obligations

Section 5(a) of the Fisheries Act requires that it be interpreted in a manner consistent with New Zealand's international obligations relating to fishing. New Zealand is party to a number of international conventions including the Convention of Biological Diversity and the United Nations Convention on the Law of the Sea (UNCLOS). These conventions generally require measures to avoid remedy or mitigate fishing-related mortalities of associated, dependent and/or endangered species, to ensure their conservation status is improved or sustained and that the genetic diversity of the species is maintained. The management options presented in this paper are consistent with these obligations.

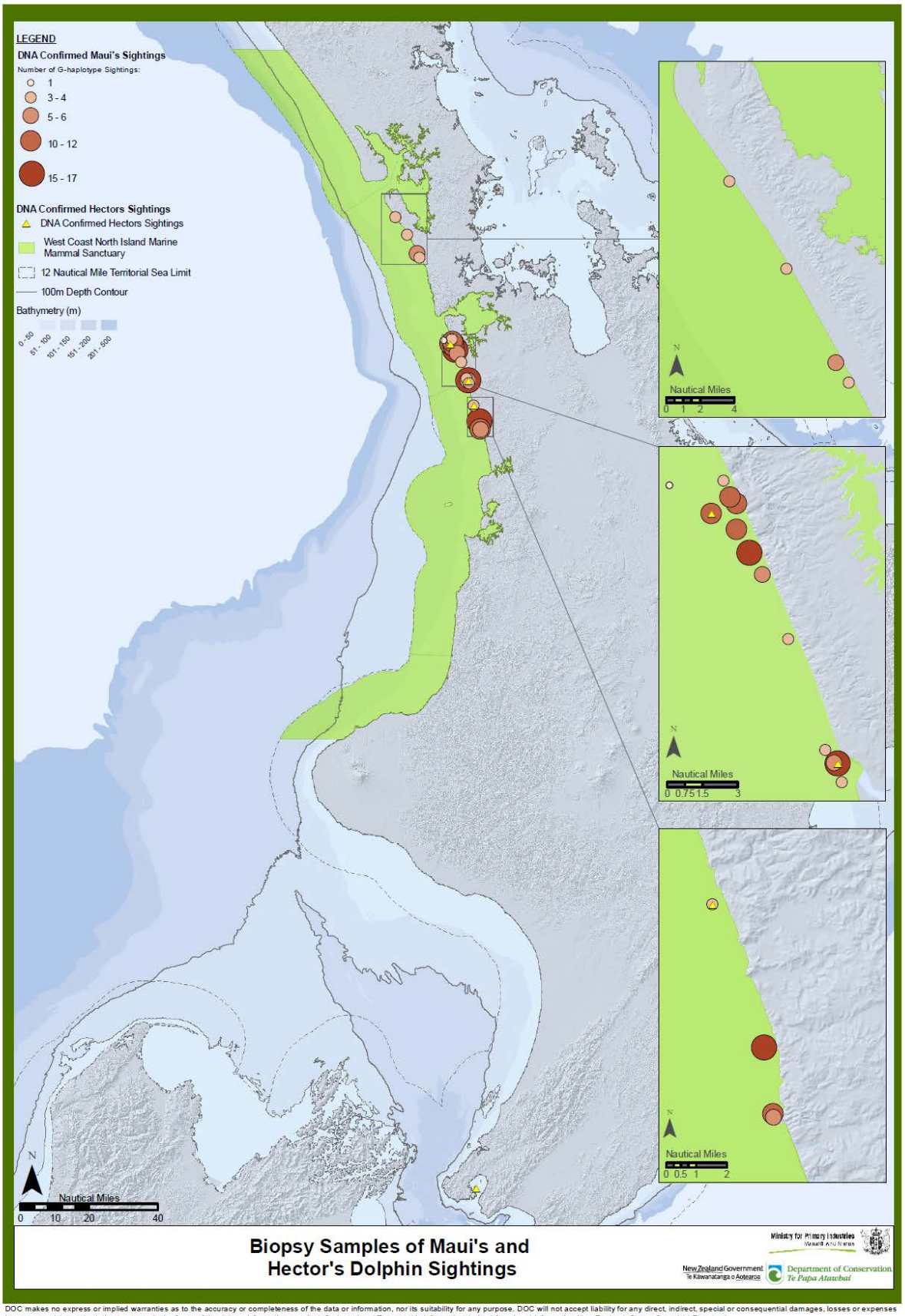
14.6 Treaty of Waitangi (Fisheries Claims) Settlement Act 1992

The proposed management options do not impose restrictions on Maori customary fishing, which is authorised by kaitiaki. This is consistent with measures put in place to date in respect of Hector's and Maui's dolphins. Quota held by Maori controlled interests has the same status as all other commercial quota. It is not protected from the consequences of sustainability measures put in place to address the adverse effects of fishing on protected species.

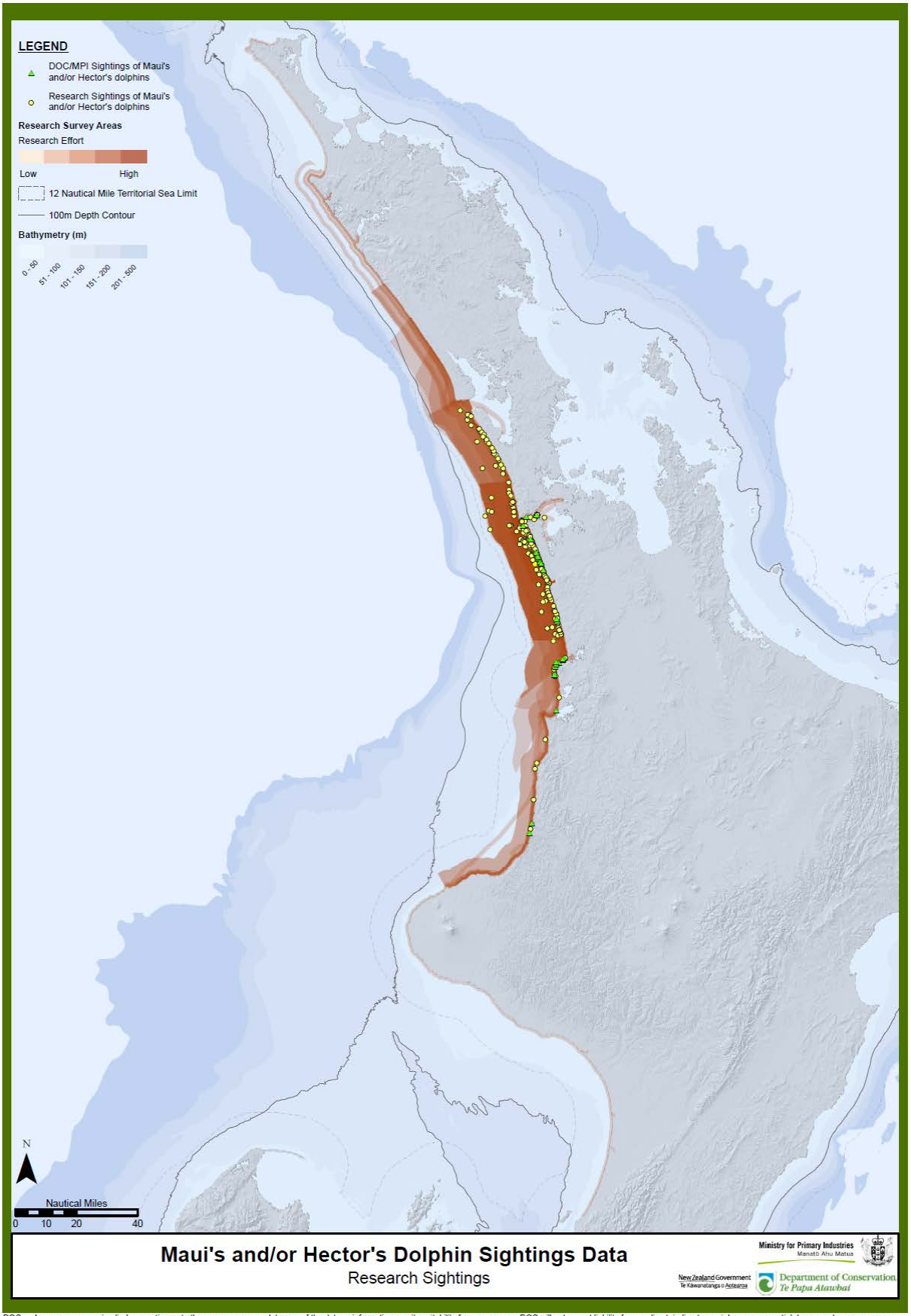
15 APPENDIX 2: SUPPORTING MAPS



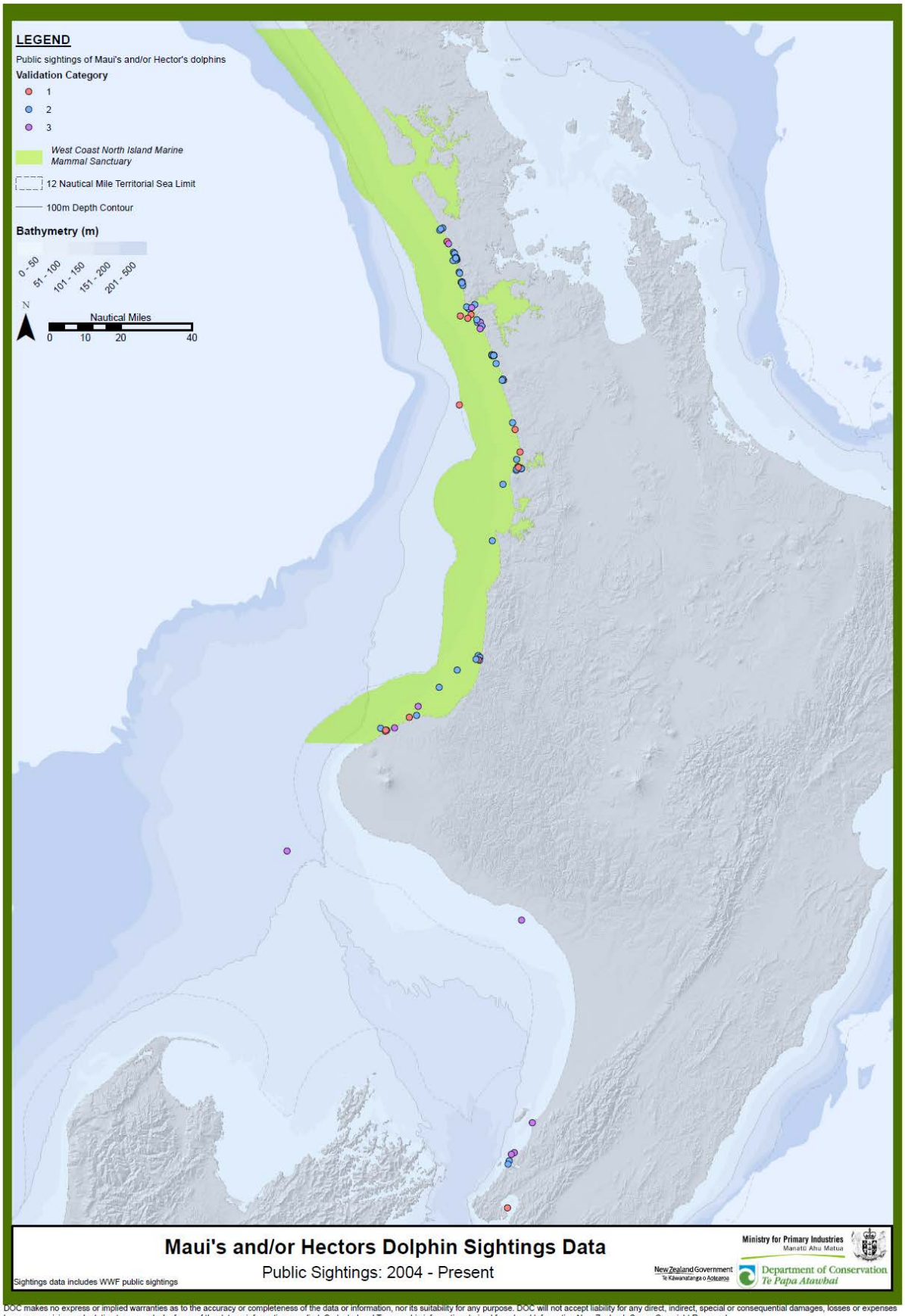
Map 1. Locations of Maui's dolphins and Hector's dolphins (DNA confirmed) and Maui's or Hector's (subspecies unknown) mortalities along the west coast of the North Island.



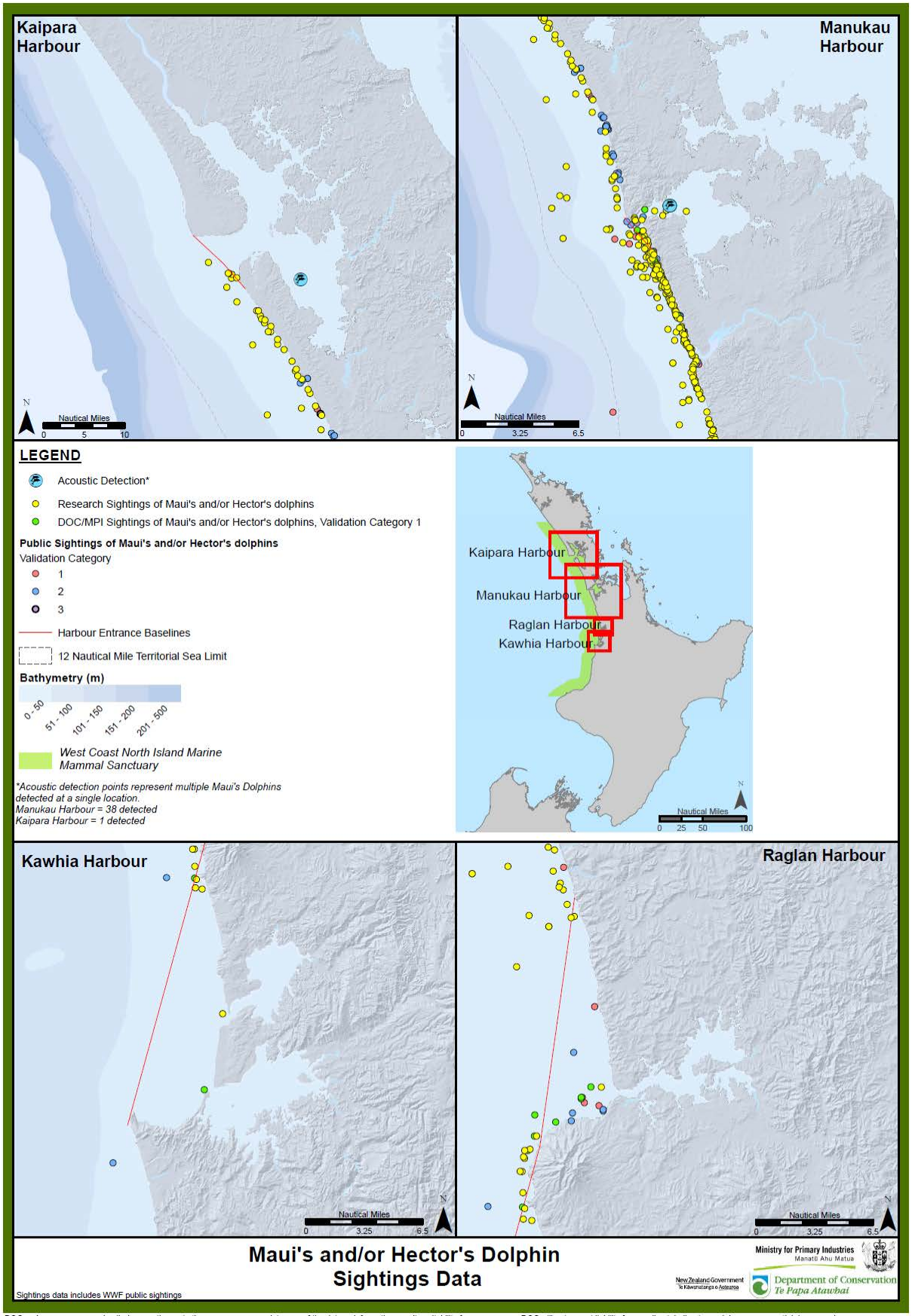
Map 2. Locations of live Maui's dolphins and Hector's dolphins sighted and biopsied off the west coast of the North Island.



Map 3. Locations of research and DOC/MPI sightings of Maui's and/or Hector's dolphins off the west coast of the North Island. Research survey areas are also identified and show the variation in the intensity of research effort that has occurred along the coast and offshore.



Map 4 Locations of public sightings of Maui's and/or Hector's dolphins off the west coast of the North Island. These sightings represent those that have been subject to a validation process and categorised in terms of reliability as Category 1, 2 or 3.



Map 5. Locations of research (including acoustic detections), DOC/MPI, and public sightings (Categories 1, 2 and 3) of Maui's and/or Hector's dolphins in or near the Kaipara, Manukau, Aotea/Kawhia and Raglan harbours along the west coast of the North Island.

16 APPENDIX 3: ADDITIONAL SUBMISSION ANALYSES

Issues raised
Assessment of Maui's dolphin abundance and population trends • Inability to compare the most recent and previous population estimates • A lack of peer review through the Aquatic Environment Working Group Process on the use of genetic tag-recapture methods and their accuracy to estimate abundance • Exclusion of dolphin less than 1 year old in the genetic tag-recapture work • Inclusion of possible Hector's dolphins the 2004 aerial assessment • An apparent 'halving' of the population in a period of 5-6 years Whether the remaining population is viable given the most recent abundance estimate
MPI analysis and response
MPI acknowledge that the Hamner et al. (2012) and the Slooten et al. (2007) abundance estimates are not directly comparable to indicate population decline. Although there is some uncertainty around historical abundance estimates, information suggests that the Maui's dolphin population has declined from higher levels of abundance (Pilcher and Baker, 2000; Pilcher 2002). There is uncertainty about the rate and magnitude of the decline of the Maui's dolphin population. The Hamner et al. (2012) research on the genetic tag-recapture method has undergone peer review processes both externally and within DOC with participation from MPI. MPI has confidence in the research findings and is satisfied with the peer review process undertaken.

Issues raised
Modification or merging of QMA boundaries for some stocks
MPI analysis and response
The Auckland Council suggested amalgamating the quota management areas (QMAs SPO8 and SPO1) for rig in order to provide flexibility for commercial fishers faced with exclusion from traditional fishing areas. As noted, the Act does provide for QMAs to be amalgamated under certain conditions. However, there are important fishery management considerations in addition to those legislative requirements. Amalgamation could provide flexibility as suggested to mitigate the effects of dolphin protection measures on fishing, but would also transfer additional fishing effort and catch to other areas. The potential effects of increased effort and catch on those areas and fisheries would need to be carefully considered to avoid creating other problems. In addition, long-standing processors and markets within the Taranaki area would be affected by a lack of local supply (of rig and likely other species), and the flexibility does not apply to those operations which support fishing. These are options for quota owners to consider.

17 APPENDIX 4: ECONOMIC IMPACTS ANALYSIS OF FISHING-RELATED OPTIONS

17.1 Overview

This analysis focuses on the economic impact of the following options that may result in displacement or loss of catch with regards to set netting (coastal), setting netting (harbours) and trawling on the west coast of the North Island.

Commercial and Amateur Set Netting (Coastal)	
Option 1	*Status quo*: Keep existing management, including the interim measures to: • retain the set net prohibition between 0 and 2 nautical miles offshore from Pariokariwa Point to Hawera; • prohibit the use of commercial set nets between 2 and 7 nautical miles offshore from Pariokariwa Point to Hawera without an observer onboard. The interim measures would be reviewed in 2015 to inform management going forward.
Option 1b	Amend the interim measures to: • prohibit set net between 0 and 2 nautical miles offshore from Pariokariwa Point to Hawera from 1 October to 31 May; • prohibit set net between 0 and 2 nautical miles offshore from Pariokariwa Point to Hawera from 1 June to 30 September, excluding the area between Bell Block and Cape Egmont provided an observer is onboard; • prohibit the use of commercial set nets between 2 and 7 nautical miles offshore from Pariokariwa Point to Hawera all year round without an observer onboard. The interim measures would be reviewed in 2015 to inform management going forward.
Option 2	Keep existing management, and put the interim measures in place via regulation to: • retain the set net prohibition between 0 and 2 nautical miles offshore from Pariokariwa Point to Hawera; • prohibit the use of commercial set nets between 2 and 7 nautical miles offshore from Pariokariwa Point to Hawera without an observer onboard.
Option 3	Keep existing management, and • Extend the set net ban between 0 and 4 nautical miles offshore from Pariokariwa Point to Hawera. • Prohibit the use of commercial set nets between 4 and 7 nautical miles offshore from Pariokariwa Point to Hawera without an observer onboard.
Option 4	Prohibit set net between zero and seven nautical miles from Pariokariwa Point to Hawera.
Option 5	Prohibit set net out to the 100 m depth contour from Maunganui Bluff to Whanganui.

Commercial and Amateur Set Netting (Harbours)	
Option 1	*Status quo*: Keep existing management.
Option 2	Keep existing management, and Improve information on Maui's dolphin distribution and set net activity in the west coast North Island harbours, with a focus in the Manukau Harbour.
Option 2b	Keep existing management, and Amend the regulations to allow commercial ring netting within the Manukau Harbour where set net restrictions are in place (to the boundary of where the 2003 measures were extended).
Option 3	Keep existing management, and • Extend the existing set net ban in the entrance of the Manukau Harbour further into the harbour. • Improve information on Maui's dolphin distribution and set net activity in the west coast North Island harbours, with a focus in the Manukau Harbour.
Option 4	Prohibit set net activity in all WCNI harbours

Commercial Trawling	
Option 1	*Status quo*: Keep existing management.
Option 2	Keep existing management, and Put in place extensive monitoring coverage in the commercial trawl fishery between 2 and 7 nautical miles offshore from Maunganui Bluff to Pariokariwa Point.
Option 3	Keep existing management, and • Extend the trawl ban from 2 and 4 nautical miles offshore from Kaipara Harbour to Kawhia Harbour. • Put in place extensive monitoring coverage in the commercial trawl fishery between 2 and 7 nautical miles offshore from Maunganui Bluff to Pariokariwa Point.
Option 4	Prohibit trawl fishing between zero and seven nautical miles from Pariokariwa Point to Hawera.
Option 5	Prohibit trawl fishing out to the 100 m depth contour from Maunganui Bluff to Whanganui.

This analysis will provide the long term economic impact estimates using the two different methodologies. These are described in more detail in sections 17.3.2 and 17.3.3.

17.2 Total revenue loss estimates: Appropriate estimate of price of fish

To estimate the direct revenue losses, two sets of information are required: estimates of landed prices and estimates of the reduction in landings that would be caused by putting in place the additional set net ban.

The Ministry for Primary Industries (MPI) compared port price and export price to various recent data on landed fish prices. MPI acknowledges that port price appears to be substantially below recent landed prices. However, there are also problems with export price as a measure of the price paid to harvesters. For some species, exports are a small percent of landings and may not reflect the broader market. Export price includes the value of services that occur after harvesting, such as unloading fees, auction commissions, expenses for processing and freezing, and transportation. Rather than choosing either port price or export price, MPI combined information on port price and export price with its best judgment to produce its price estimates (Table 1).

Table 1. Estimates of Fish Prices.

Species	Port Price (2012-13 fishing year)	Export-derived price (2010-11 fishing year)	MPI estimate
Blue Warehou	$1.08/kg	$2.01/kg	$2.01/kg
School Shark	$2.41/kg	$4.49/kg	$2.30/kg
Rig	$3.71/kg	$6.64/kg	$5.03/kg
Trevally	$1.87/kg	$1.97/kg	$1.20/kg
Northern Spiny Dogfish	N/A	N/A	$1.00/kg
Snapper	$5.70/kg	$10.41/kg	$7.00/kg
Kahawai	$0.71/kg	$1.01/kg	$0.80/kg
Spiny Dogfish	$0.32/kg	$1.06/kg	$1.00/kg
Gurnard	$2.49/kg	$5.42/kg	$2.85/kg
Blue Mackerel	$0.42/kg	$1.52/kg	$1.00/kg
Flatfish	2.95/kg	9.29/kg	3.00/kg
Grey Mullet	3.60/kg	9.88/kg	3.00/kg
Yellow-eyed Mullet	3.44/kg	9.88/kg	3.00/kg
Parore	$2.01/kg	N/A	$2.01/kg
John Dory	$6.99/kg	$12.42/kg	$7.50/kg
Tarakihi	$3.85/kg	$4.46/kg	$4.00/kg
Leatherjacket	$0.75/kg	$2.41/kg	$1.00/kg
Red Cod	$0.77/kg	$1.85/kg	$0.90/kg

17.3 Estimates of income impacts

The revenue losses by sector and area were used to estimate income effects. This section explains how income effects were estimated.

MPI has developed estimates of lost income using value added estimates from an input-output model of the economy. Value added is the difference between the value of output and cost of goods and services purchased from other sectors. Note that value added includes income earned by labour (as wages and salaries) and by capital (as profits). While value added in an input-output model varies slightly from other definitions of income, it is an adequate estimate of income for present purposes. Those estimates were derived in a research project by Market Economics (Research Project SEC2006-10) under a contract with the then Ministry of Fisheries (MFish). This study is an update of methodology in McDermott Fairgray Group (2000) "Economic Impact Assessment for New Zealand Regions" prepared for New Zealand Seafood Industry Council (SeaFIC). The methods used in the two reports are identical; only the time-frame of the estimates is different. MPI used the estimates from the current research, rather than the estimates from the 2000 report, because the underlying economic model has been updated by ten years and better reflects current economic conditions.

Input-output models enable estimation of how a change in output of one industry will affect value added in that industry and more broadly in the economy. Using the Market Economics estimates, MPI estimated lost value added into four categories:

- Value added lost in the harvesting sector (direct harvesting income);
- Value added lost in the processing sector (direct processing income);
- Value added lost in sectors that supply harvesting and processing (indirect income); and
- Value added lost in the broader economy as the three types of income above are spent and generate income for suppliers of a wide array of goods (induced income).

Table 2 presents the ratios derived from Market Economics model to estimate each of the value added components above. These ratios represent separate impacts; double-counting that would occur because of economic interrelationships has been removed.

Table 2. Estimates of value added impacts from Market Economics model.

	Ratio of value added to harvesting sector total output
Direct harvesting value added	.25
Processing value added	.46
Indirect value added	.56
Induced value added	.41

Table 2 can be interpreted as follows. A $1 million reduction in landings would reduce annual value added in harvesting by $250,000, in processing by $460,000, in industries that supply harvesting and processing by $560,000, and in the broader economy through flow-on effects by $410,000.

Note that the methodology estimates all income earned by the harvesting sector and the processing sector under national income accounting definitions of value added. Because harvesters and processors own a substantial majority of the quota, the national accounts definition of value added would include income from quota holdings by processors and harvesters. The value added from quota could include either ACE sales or the increased income earned by a harvester who does not have to purchase ACE.

17.3.1 Impact on quota values

Estimates of quota value were also computed by MPI. This section explains the methodology used to estimate quota values.

MPI concludes that the costs of adjustment will be shared between harvesters and quota owners. There is a market for ACE for each QMA. The restrictions will decrease the demand for ACE in the restricted areas, because the costs of fishing in those areas will increase. On the other hand, the demand for ACE for QMAs not directly affected by a proposed set net ban may increase as some vessels change their fishing patterns. The relative sharing of the costs of adjustment between harvesters and quota owners will depend upon the relative changes in supply and demand for ACE, both in the markets directly affected by the interim relief and in some ACE markets indirectly affected by the interim relief. MPI lacks information to make reliable predictions about how individual ACE markets will be affected.

MPI assumes that the loss in quota value is proportional to the reduction in landings.

A double-counting error occurs if both ACE and quota value are used to determine losses to society. Quota has value because it generates ACE. The value of quota is the present value of the expected future ACE generated by the quota.

As noted above, the method of applying national income account income multipliers to total revenues implicitly includes any ACE value generated by firms in the sectors that own quota. Where quota value loss is accounted for directly in losses, the income generated from ACE (either explicitly by sale or implicitly through use by the quota owner) must be deducted from income estimates to avoid the double counting error (above).

MPI believes it is useful to separate the likely impact on quota value (which is equivalent to the impact on the present value of future ACE income) from other income losses. This information can help assess the likely distributional impacts of restrictions on quota owners as compared to harvesters.

17.3.2 Estimates of overall impacts

The method described above estimates the first-year impacts of options. The first-year impacts present an incomplete estimate of losses, because some of those losses will recur.

For approximating the present value of economic losses, MPI examined each category of loss and used its best judgment on how best to approximate the relation of the first-year loss to the present value of all future losses. MPI capitalised first-year income losses into permanent losses by making the following assumptions.

a) **Quota value.** If the restrictions are permanent, the loss of quota value is permanent. Therefore quota value lost is a permanent loss. Because quota value captures the present value of ACE, ACE value should not be included in income to avoid double-counting.

b) **Removing ACE value from income.** To avoid double-counting ACE price, the value of ACE earned by fishing, processing and fishing supply sectors must be deducted from income in sectors that own ACE. Absent information on how ACE value is reflected in the national accounts (upon which the input-output model is based), MPI assumed that 30% of ACE value flows to the harvesting sector, 50% to the processing sector, and 20% to other supply sectors.

c) **Direct income in harvesting.** If the capital and labour in the harvesting sector cannot be easily transferred to other harvesting uses, losses equal to several years of income will be incurred as resources are unemployed or underemployed. Both the capital and labour in harvesting are relatively specialized, so the adjustment period of several years might be expected. Previous research by Aranovus[80] confirms the general observation that the average age of those employed in fishing is relatively high, so retirement is possible for some set net harvesters, in particular. Likewise, because New Zealand's fisheries do not have significant unexploited fishery resources, some displaced harvesting capital is likely to be retired. To approximate the losses through the adjustment period, a loss of 5 times the initial displaced annual income is used in calculations.

d) **Direct income in processing.** The capital and labour in processing is less specialized to particular species, so the likely adjustment period will not be as long for processing. A loss of 2.5 times the initial annual displaced income is used in calculations.

e) **Indirect income in supply sectors.** The sectors supplying the fishing and processing sectors also supply very similar products to the broader boating and food processing industries. There may be one-time inventory losses if highly specialized inventories, such as set nets, become obsolete because of the restrictions. A loss of 1.5 times the initial displaced income in supply industries is used in calculations.

f) **Induced income in broader economy.** When income is lost in harvesting, processing, and fishing supply sectors, the broader economy will see reduced economic activity because of reduced consumption by those who earn income in the directly affected sectors. However, the broader economy will adjust to these changes by shifting resources towards other uses. How easy it will be for the economy to adjust depends upon (a) the relative magnitude of the impact and (b) the demand for other outputs by the economy. In the present context, the total changes are small in relation to the overall New Zealand economy and the New Zealand economy is currently operating at high levels of employment and capacity use. For these reasons, MPI considers that the broader adjustments by the economy will be rapid and that all of the adjustment costs will be incurred within one year. Therefore, MPI

[80] Penny et al (2007): http://www.fish.govt.nz/ en-nz/Consultations/Archive/2008/Hectors+dolphins/Socio+economic.htm

suggests that one year of induced income losses are an appropriate estimate of total losses.

MPI emphasises that the estimated multiples in the preceding paragraph are informed judgments. They are inherently imprecise. And because they multiply the annual impacts, they are the single most important driver of the final estimates of the present value of impacts. MPI considers that they are appropriate for thinking about how changes are likely to unfold in the future. They are especially useful in understanding qualitatively which restrictions are associated with the largest costs, and which restrictions are less important in terms of overall cost impacts. But it is inappropriate to read high precision into the present value of losses that are computed from these income multiples.

17.3.3 New Zealand Treasury's Present Value methodology

In prior consultations, industry has suggested the issue of recurring losses should be addressed by assuming that all losses are permanent. The Present Value methodology outlined in New Zealand's Treasury's Cost Benefit Analysis Primer[81] can be used to assess permanent loss.

MPI does not consider that all the income losses are permanent, so an assumption that all losses are permanent is inappropriate. MPI considers that some of the capital and labour that is displaced will find employment elsewhere in the economy. These movements to other employment will not immediate, so there can be significant transition costs. A useful way to think of these transition costs is to ask how long labour and capital are likely to take to find similar employment elsewhere.

However, MPI has estimated overall impacts using Treasury's Present Value methodology to provide stakeholders the estimates cost impact using both methodologies using the Treasury default discount rate of 10%.

The assumption around quota value and induced income in the broader economy (described above) are still appropriate when using Treasury's Present Value methodology.

17.3.4 Key assumptions

It is clear that the assumed length of time that it takes capital and labour displaced from the fishing industry to be put use by the broader economy affects the present value of the impact numbers. MPI does not consider that some of the labour and capital will be retired permanently and that discounting over 20 years is not appropriate in this case.

However, given the issues outlined previously, MPI has provided the estimates of the annual income effects and capitalized future value effects using both the MPI methodology and Treasury methodology as the economic impact is likely to be somewhere in this range.

MPI considers that while it is likely that the associated by-catch from targeting species outline in each of the options below (set netting and trawling) could be caught by other fishers using different methods, there will be an impact on the revenue of the individual fishers who target species in this area who use set nets or trawl nets. A 10% adjustment will be used in the calculations to allow for the revenue from bycatch species.

Some of the management options being proposed include mandatory monitoring coverage. The proposed monitoring will have a cost associated with it but these estimates are provided in Section 11. Therefore, the costs associated with the proposed monitoring have been excluded from this analysis.

The analysis below assumes that all catch is lost (and not caught elsewhere in the relevant QMAs). MPI considers there will be some adjustment by the fishing industry to the options

[81] http://www.treasury.govt.nz/publications/guidance/planning/costbenefitanalysis/primer

proposed below but it is impossible to predict exactly how the fishing industry will adjust. Some fishers will be able to adjust better than others. The economic impact numbers below are therefore considered a worst case scenario.

17.4 Method used to calculate percentage of displaced landings

The commercial landing and catch effort data that was used in the economic impact analyses was extracted from MPI's New Zealand Fisheries reporting database in November 2012. To estimate the percentage of landings for an entire stock that could be affected by each of the management options being considered, the following steps were taken:

1. Fishing events (for example, a single trawl shot with non-zero catch) were retrieved for fishing trips where at least one event was reported as being in statistical reporting areas 40 to 46, or where GPS (latitude and longitude coordinates) position started within one of these statistical reporting areas.

2. Fishing events with missing trip numbers, unknown statistical reporting area, missing gear method codes or missing dates were groomed where possible to assign a likely value to the missing field. This approach maximised the possible number of fishing events for analysis.

3. Fishing events were grouped by distinct types of fishing activity based on fishing method used and catch composition (classified as a 'fishery segment').

4. The species composition of the catch was calculated from estimated catch weights for each species or species group.

5. Effort details for each fishing event were identified. If effort information was missing medians for the stratum of the same year, statistical reporting area, fishing method and fishery segment were used.

6. A subsample of fishing events was used to calculate the landings of a fishstock per unit of effort for each strata of unique combinations of year, statistical reporting area, fishing method and fishery segment. Subsamples comprised complete fishing trip records with matching trip landing records and where only one fishing method was used in the trip. A share of the trip landings of all fishstocks was apportioned to each fishing event in proportion to estimated catch values or number of events in the trip.

7. Fishing intensity (effort per ha) of each fishing event was calculated by assigning fishing effort to a polygon representing the best possible information about where that even occurred, and dividing the units of effort into the polygon area.

    a. In the case of set netting reporting by coordinates of start position, event effort was assigned in two ways:
        i. Method 1: event effort was assigned to a circle of two nautical miles radius from the start position (in accordance with the statutory definition of a set net event for the Netting Catch, Effort and Landing Return (NCELR) reporting forms).
        ii. Method 2 (applied to the Taranaki region only): all event effort reported as starting within two nautical miles of the boundaries of a closed area, was assigned to falling within the closed area (providing an upper bound/maximum amount of effort that could fall within the closed area, but is likely to be an overestimate).

    b. In the case of set net events that report only by statistical area (mostly boats less than 6 m in length), event effort was spread over a polygon of the likely fishable area for that type of fishing. MPI has assumed that fishing vessels less than 6 m in length operate within enclosed waters or within two nautical

miles of the coast.

c. In the case of a trawl event, effort was assigned to a polygon constructed from start and end latitude and longitude positions of each tow and the width of the reported wingspread of the trawl. Where end positions were not reported they were estimated using tow length calculated from speed and duration of the tow and using the direction of the start position of the next tow.

8. Fishing event data that was within the area where fishing was permitted and feasible (that is, not on land) was used to calculate fishing intensity. The fishing effort that was used was scaled up to adjust for any missing effort (for example, where errors in coordinates placed an event on land or within a prohibited area or the last trawl of each day where direction was not estimated).

9. Average annual effort expected to be displaced by proposed restrictions was estimated by including all fishing events to a proposed restriction area, and for each event, calculating the hectares of overlap and multiplying by the fishing intensity. Effort overlapping with the restriction area was then summed over each fishing year and averaged over the years.

10. Expected displaced catch was estimated by multiplying displaced effort by catch per unit effort for all fishstocks caught within the respective stratum of year, stat area, fishing method and fishery segment.

11. The spatial distribution of fishery segments was mapped by aggregating estimated fishing intensity of all fishing events within a segment to a raster grid of two km cell resolution on the New Zealand Transverse Mercator (NZTM) 2000 coordinate system.

17.5 Estimated impacts on coastal set netting (Pariokariwa Point to Hawera)

This section reports the estimated economic impacts on commercial set net fishers from Pariokariwa Point to Hawera.

To estimate the impacts of Option 1 (same as 2), 1b, and 3; ACE and quota prices for the set net species targeted from Pariokariwa Point to Hawera are required for these calculations. Table 17.3 presents the average ACE transfer price (2011/12 fishing year) and the average quota price (since 2001) for the species most affected. This data will be used in the calculations of quota value lost and to remove the double-counting of ACE income from income estimates.

Table 3. ACE and Quota prices for set net species (Pariokariwa Point to Hawera).

Species	2011-12 ACE price ($/tonnes)	Average quota price since 2001 ($/tonnes)
Blue Warehou (WAR8)	$407.00	$2,436.21
School Shark (SCH8)	$1256.90	$14,769.60
Rig (SPO8)	$445.30	$13,456.40
Trevally (TRE7)	$283.00	$5,210.72
Northern Spiny Dogfish	N/A	N/A
Snapper (SNA8)	$5265.70	$48,783.10
Kahawai (KAH8)	$258.80	$3,010.07
Spiny Dogfish (SPD8)	$35.90	$351.42
Gurnard (GUR8)	$521.60	$2,716.01
Blue Mackerel (EMA7)	$153.10	$917.76

Since Northern Spiny Dogfish is not a QMS species, there are no ACE or quota prices available to be used in the analysis.

To estimate the economic impact on the commercial set net fleet, MPI first estimated the percentage of catch in this area (by QMA). These estimates used MPI data on set net activity.

MPI has calculated the percentage of each species caught in the area from Pariokariwa Point to Hawera using the last completed fishing year (1 October 2011 to 30 September 2012), and the 2008/09 to 2011/12 four year average. MPI has calculated these percentages using both Method 1 and Method 2 described above in section 17.4. These percentages are presented in Table 4 (Method 1) and Table 5 (Method 2).

Table 4. Percentage of set net landings from Pariokariwa Point to Hawera displaced or gained under each management option. (Method 1)

	Option 1 and 2 % of catch displaced		Option 1a % of catch gained		Option 3 % of catch displaced	
Species	4 Year Avg.	OCT 2011-2012	4 Year Avg.	OCT 2011-2012	4 Year Avg.	OCT 2011-2012
Blue Warehou	21.5%	31.7%	10.4%	18.4%	48.7%	64.5%
School Shark	4.0%	3.1%	0.5%	0.6%	9.0%	6.8%
Rig	12.2%	12.1%	0.8%	0.5%	19.6%	18.4%
Trevally	0.4%	0.6%	0.1%	0.1%	0.8%	1.0%
Northern Spiny Dogfish	8.4%	8.6%	2.8%	2.7%	17.5%	17.1%
Snapper	0.4%	0.5%	0.1%	0.1%	0.8%	0.9%
Kahawai	1.1%	1.1%	0.1%	0.2%	1.9%	2.1%
Spiny Dogfish	4.5%	4.2%	0.6%	0.2%	8.7%	7.1%
Gurnard	1.0%	1.3%	0.2%	0.3%	2.0%	2.4%
Blue Mackerel	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%

Table 5. Percentage of set net landings from Pariokariwa Point to Hawera displaced or gained under each management option. (Method 2)

	Option 1 and 2 % of catch displaced		Option 1a % of catch gained		Option 3 % of catch displaced	
Species	4 Year Avg.	OCT 2011-2012	4 Year Avg.	OCT 2011-2012	4 Year Avg.	OCT 2011-2012
Blue Warehou	52.2%	71.0%	30.2%	45.4%	64.7%	75.3%
School Shark	9.9%	7.3%	1.8%	1.8%	14.8%	11.5%
Rig	23.3%	20.9%	3.0%	1.6%	27.2%	25.1%
Trevally	0.8%	1.0%	0.2%	0.2%	3.7%	5.6%
Northern Spiny Dogfish	19.8%	19.0%	8.2%	6.9%	26.3%	22.4%
Snapper	0.8%	1.0%	0.2%	0.2%	3.6%	4.1%
Kahawai	2.1%	2.2%	0.4%	0.4%	3.7%	3.9%
Spiny Dogfish	9.6%	7.6%	1.9%	0.5%	17.2%	13.7%
Gurnard	2.2%	2.6%	0.7%	0.9%	22.2%	20.3%
Blue Mackerel	0.1%	0.1%	0.0%	0.0%	0.1%	0.1%

MPI will provide economic impact estimates below using the four year average, and the 2011/12 October fishing year percentage figures, and percentage figures to show the difference these assumptions make to the economic impact numbers.

17.5.1 Option 1 and 2: Ban set nets between 0 and 2 nautical miles offshore from Pariokariwa Point to Hawera

Option 1 (ban set nets between zero and two nautical miles offshore in the area from Pariokariwa Point to Hawera) will have the smallest impact on the number of species and fishers affected but fishers will have limited options to adjust their behaviour to reduce the impact on their fishing activities.

METHOD 1

Tables 6 and 7 present MPI estimates of landed revenues for set netters. These tables use impacts from Table 4 (Method 1) and the price estimates from Table 1. Table 6 is calculated using the four year average data and Table 7 uses data from the October 2011/12 fishing year.

Table 6. Estimates of the Economic Impact (four year average data).

Species	4 Year Average Catch (tonnes)	Total Revenue from Catch	Total Revenue + 10% (bycatch)	Loss of Revenue between 0-2nm
Blue Warehou	123.52	$248,277.80	$273,105.58	$58,622.51
School Shark	533.03	$1,225,972.18	$1,348,569.40	$53,833.87
Rig	222.59	$1,119,625.30	$1,231,587.83	$150,020.39
Trevally	1934.26	$2,321,115.65	$2,553,227.21	$10,375.59
Northern Spiny Dogfish	39.37	$39,365.16	$43,301.67	$3,618.46
Snapper	1322.25	$9,255,767.84	$10,181,344.63	$39,866.09
Kahawai	452.41	$361,926.03	$398,118.63	$4,223.25
Spiny Dogfish	208.69	$208,692.09	$229,561.30	$10,333.98
Gurnard	225.77	$643,451.06	$707,796.16	$7,235.38
Blue Mackerel	2852.31	$2,852,306.34	$3,137,536.97	$1,150.66
TOTAL	7,914.20	$18,276,499.44	$20,104,149.38	$339,280.17

Table 7. Estimates of the Economic Impact (October 2011/2012 fishing year data).

Species	October 2011/2012 Fishing Year Catch (tonnes)	Total Revenue from Catch	Total Revenue + 10% (bycatch)	Loss of Revenue between 0-2nm
Blue Warehou	96.17	$193,302.91	$212,633.20	$67,412.51
School Shark	506.03	$1,163,863.55	$1,280,249.91	$39,469.93
Rig	204.50	$1,028,635.00	$1,131,498.50	$137,139.61
Trevally	1861.64	$2,233,972.82	$2,457,370.11	$13,770.00
Northern Spiny Dogfish	50.84	$50,839.94	$55,923.93	$4,826.66
Snapper	1364.79	$9,553,555.62	$10,508,911.18	$54,156.78
Kahawai	512.47	$409,976.45	$450,974.09	$5,094.37
Spiny Dogfish	237.98	$237,984.70	$261,783.17	$10,897.75
Gurnard	211.15	$601,787.79	$661,966.57	$8,642.39
Blue Mackerel	2574.00	$2,574,003.05	$2,831,403.36	$1,166.24
TOTAL	7,619.59	$18,047,921.83	$19,852,714.01	$342,576.25

Table 6 shows the annual lost revenue between zero and two nautical miles is just under $0.34 million, Table 7 shows the annual lost revenue between zero and two nautical miles is just over $0.34 million.

Tables 8 and 9 apply the ratios in Table 2 to revenue estimates in Tables 6 and 17.7 to derive the estimated annual value added changes for set net harvesters in the area from Pariokariwa Point to Hawera.

Tables 8 and 9 also present the MPI estimates of banning set netting between zero and two nautical miles from shore. Tables 8 and 9 are computed by applying the factors from section 17.3.2 to the annual income data in the Table and using the ACE and quota values in Table 3.

Table 8. Estimated annual income effects and Present Value of banning set netting between zero and two nautical miles from shore in the area from Pariokariwa Point to Hawera (4 year average data) – MPI Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$84,820.04	$301,040.26	$385,860.30
Processing income lost	$156,068.88	$287,622.23	$443,691.11
Indirect income lost	$189,996.89	$260,383.35	$450,380.25
Induced income lost	$139,104.87	$0.00	$139,104.87
Quota value	$0.00	$1,062,221.55	$1,062,221.55
TOTAL	$569,990.68	$1,911,267.40	$2,481,258.08

The estimated loss of annual value added is $0.57 million and the estimated loss of future capitalised value is $1.91 million. The total estimated economic impact is just under $2.48 million.

Table 9. Estimated annual income effects and Present Value of banning set netting between zero and two nautical miles from shore in the area from Pariokariwa Point to Hawera (October 2011/2012 fishing year data) – MPI Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$85,644.06	$298,475.14	$384,119.21
Processing income lost	$157,585.07	$285,841.71	$443,426.79
Indirect income lost	$191,842.70	$261,815.02	$453,657.72
Induced income lost	$140,456.26	$0.00	$140,456.26
Quota value	$0.00	$1,065,056.37	$1,065,056.37
TOTAL	$575,528.10	$1,911,188.25	$2,486,716.35

The estimated loss of annual value added is $0.58 million and the estimated loss of future capitalised value is $1.91 million. The total estimated economic impact is just under $2.49 million.

Tables 10 and 11 show the estimates of the present value of banning set netting between zero and two nautical miles from shore using Treasury's Present Value methodology.

Table 10. Estimated annual income effects and Present Value of banning set netting zero and two nautical miles from shore in the area from Pariokariwa Point to Hawera (4 year average data) – Treasury Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$84,820.04	$806,940.87	$891,760.92
Processing income lost	$156,068.88	$1,484,771.21	$1,640,840.09
Indirect income lost	$189,996.89	$1,807,547.56	$1,997,544.45
Induced income lost	$139,104.87	$0.00	$139,104.87
Quota value	$0.00	$1,062,221.55	$1,062,221.55
TOTAL	$569,990.68	$5,161,481.19	$5,731,471.87

The estimated loss of annual value added is $0.57 million and the estimated loss of future capitalised value is $5.16 million. The total estimated economic impact is just over $5.73 million.

Table 11. Estimated annual income effects and Present Value of banning set netting between zero and two nautical miles from shore in the area from Pariokariwa Point to Hawera (October 2011/2012 fishing year data) – Treasury Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$85,644.06	$814,780.25	$900,424.31
Processing income lost	$157,585.07	$1,499,195.65	$1,656,780.73
Indirect income lost	$191,842.70	$1,825,107.75	$2,016,950.45
Induced income lost	$140,456.26	$0.00	$140,456.26
Quota value	$0.00	$1,065,056.37	$1,065,056.37
TOTAL	$575,528.10	$5,204,140.02	$5,779,668.12

The estimated loss of annual value added is $0.58 million and the estimated loss of future capitalised value is $5.20 million. The total estimated economic impact is just under $5.78 million.

Using Method 1, banning set nets between zero and two nautical miles from shore in the area from Pariokariwa Point to Hawera would have an estimated impact of between $2.48 million to $5.78 million on the wider New Zealand economy.

METHOD 2

Tables 12 and 13 present MPI estimates of landed revenues for set netters. These tables use impacts from Table 5 (Method 2) and the price estimates from Table 1. Table 12 is calculated using the four year average data and Table 13 uses data from the October 2011/12 fishing year.

Table 12. Estimates of the Economic Impact (four year average data).

Species	4 Year Average Catch (tonnes)	Total Revenue from Catch	Total Revenue + 10% (bycatch)	Loss of Revenue between 0-2nm
Blue Warehou	123.52	$248,277.80	$273,105.58	$142,652.01
School Shark	533.03	$1,225,972.18	$1,348,569.40	$133,360.11
Rig	222.59	$1,119,625.30	$1,231,587.83	$286,818.51
Trevally	1934.26	$2,321,115.65	$2,553,227.21	$21,614.31
Northern Spiny Dogfish	39.37	$39,365.16	$43,301.67	$8,567.57
Snapper	1322.25	$9,255,767.84	$10,181,344.63	$86,418.59
Kahawai	452.41	$361,926.03	$398,118.63	$8,176.13
Spiny Dogfish	208.69	$208,692.09	$229,561.30	$21,991.86
Gurnard	225.77	$643,451.06	$707,796.16	$15,705.03
Blue Mackerel	2852.31	$2,852,306.34	$3,137,536.97	$2,699.63
TOTAL	7,914.20	$18,276,499.44	$20,104,149.38	$728,003.73

Table 13 Estimates of the Economic Impact (October 2011/2012 fishing year data).

Species	October 2011/2012 Fishing Year Catch (tonnes)	Total Revenue from Catch	Total Revenue + 10% (bycatch)	Loss of Revenue between 0-2nm
Blue Warehou	96.17	$193,302.91	$212,633.20	$150,895.65
School Shark	506.03	$1,163,863.55	$1,280,249.91	$93,981.42
Rig	204.50	$1,028,635.00	$1,131,498.50	$235,979.99
Trevally	1861.64	$2,233,972.82	$2,457,370.11	$24,964.60
Northern Spiny Dogfish	50.84	$50,839.94	$55,923.93	$10,624.95
Snapper	1364.79	$9,553,555.62	$10,508,911.18	$102,796.47
Kahawai	512.47	$409,976.45	$450,974.09	$10,138.19
Spiny Dogfish	237.98	$237,984.70	$261,783.17	$19,840.81
Gurnard	211.15	$601,787.79	$661,966.57	$17,365.22
Blue Mackerel	2574.00	$2,574,003.05	$2,831,403.36	$2,491.80
TOTAL	7,619.59	$18,047,921.83	$19,852,714.01	$669,079.10

Table 12 shows the annual lost revenue between zero and two nautical miles is just over $0.73 million, Table 13 shows the annual lost revenue between zero and two nautical miles is just over $0.67 million.

Tables 14 and 15 apply the ratios in Table 2 to revenue estimates in Tables 12 and 13 to derive the estimated annual value added changes for set net harvesters in the area from Pariokariwa Point to Hawera.

Tables 14 and 15 also present the MPI estimates of banning set netting between zero and two nautical miles from shore. Tables 14 and 15 are computed by applying the factors from section 17.3.2 to the annual income data in the Table and using the ACE and quota values in Table 3.

Table 14. Estimated annual income effects and Present Value of banning set netting between zero and two nautical miles from shore in the area from Pariokariwa Point to Hawera (4 year average data) – MPI Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$182,000.93	$631,846.58	$813,847.51
Processing income lost	$334,881.72	$605,405.89	$940,287.60
Indirect income lost	$407,682.09	$555,891.52	$963,573.61
Induced income lost	$298,481.53	$0.00	$298,481.53
Quota value	$0.00	$2,316,936.22	$2,316,936.22
TOTAL	$1,223,046.27	$4,110,080.21	$5,333,126.48

The estimated loss of annual value added is $1.22 million and the estimated loss of future capitalised value is $4.11 million. The total estimated economic impact is just under $5.33 million.

Table 15. Estimated annual income effects and Present Value of banning set netting between zero and two nautical miles from shore in the area from Pariokariwa Point to Hawera (October 2011/2012 fishing year data) – MPI Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$167,269.78	$572,387.95	$739,657.72
Processing income lost	$307,776.39	$549,473.52	$857,249.91
Indirect income lost	$374,684.30	$509,234.26	$883,918.56
Induced income lost	$274,322.43	$0.00	$274,322.43
Quota value	$0.00	$2,096,770.49	$2,096,770.49
TOTAL	$1,124,052.89	$3,727,866.22	$4,851,919.11

The estimated loss of annual value added is $1.12 million and the estimated loss of future capitalised value is $3.73 million. The total estimated economic impact is just over $4.85 million.

Tables 16 and 17 show the estimates of the present value of banning set netting between zero and two nautical miles from shore using Treasury's Present Value methodology.

Table 16. Estimated annual income effects and Present Value of banning set netting between zero and two nautical miles from shore in the area from Pariokariwa Point to Hawera (4 year average data) – Treasury Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$182,000.93	$1,731,477.47	$1,913,478.41
Processing income lost	$334,881.72	$3,185,918.55	$3,520,800.27
Indirect income lost	$407,682.09	$3,878,509.54	$4,286,191.63
Induced income lost	$298,481.53	$0.00	$298,481.53
Quota value	$0.00	$2,316,936.22	$2,316,936.22
TOTAL	$1,223,046.27	$11,112,841.79	$12,335,888.06

The estimated loss of annual value added is $1.22 million and the estimated loss of future capitalised value is $11.11 million. The total estimated economic impact is just under $12.34 million.

Table 17. Estimated annual income effects and Present Value of banning set netting between zero and two nautical miles from shore in the area from Pariokariwa Point to Hawera (October 2011/2012 fishing year data) – Treasury Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$167,269.78	$1,591,331.67	$1,758,601.44
Processing income lost	$307,776.39	$2,928,050.27	$3,235,826.65
Indirect income lost	$374,684.30	$3,564,582.93	$3,939,267.23
Induced income lost	$274,322.43	$0.00	$274,322.43
Quota value	$0.00	$2,096,770.49	$2,096,770.49
TOTAL	$1,124,052.89	$10,180,735.36	$11,304,788.25

The estimated loss of annual value added is $1.12 million and the estimated loss of future capitalised value is $10.18 million. The total estimated economic impact is just over $11.30 million.

Using Method 2, banning set nets between zero and two nautical miles from shore in the area from Pariokariwa Point to Hawera would have an estimated impact of between $4.85 million to $12.34 million on the wider New Zealand economy.

17.5.2 Option 1b – Allow set netting between zero and two nautical miles from shore in the area between Bell Block and Cape Egmont from June to September

Option 1b would allow set netting between zero and two nautical miles from shore in the area from Bell Block and Cape Egmont between June and September.

MPI has calculated the percentage of each species caught between zero and two nautical miles between Bell Block and Cape Egmont from June to September. These percentages are presented above in Table 4 (Method 1) and Table 5 (Method 2). MPI has used the same methodological approach as is used to estimate percent of catch displaced and economic loss to estimate both percent of catch and revenue gained.

METHOD 1

Tables 18 and 19 present MPI estimates of landed revenues for set netters. These tables use impacts from Table 4 and the price estimates from Table 1. Table 18 is calculated using the four year average data. Table 19 uses the 2011/12 October fishing year data.

Table 18. Estimates of the Economic Impact (four year average data).

Species	4 Year Average Catch (tonnes)	Total Revenue from Catch	Total Revenue + 10% (bycatch)	Gain of Revenue between 0-2nm
Blue Warehou	123.52	$248,277.80	$273,105.58	$28,482.02
School Shark	533.03	$1,225,972.18	$1,348,569.40	$6,947.84
Rig	222.59	$1,119,625.30	$1,231,587.83	$9,269.47
Trevally	1934.26	$2,321,115.65	$2,553,227.21	$1,656.40
Northern Spiny Dogfish	39.37	$39,365.16	$43,301.67	$1,231.19
Snapper	1322.25	$9,255,767.84	$10,181,344.63	$7,019.23
Kahawai	452.41	$361,926.03	$398,118.63	$523.18
Spiny Dogfish	208.69	$208,692.09	$229,561.30	$1,266.14
Gurnard	225.77	$643,451.06	$707,796.16	$1,593.58
Blue Mackerel	2852.31	$2,852,306.34	$3,137,536.97	$543.34
TOTAL	7,914.20	$18,276,499.44	$20,104,149.38	$58,532.39

Table 19. Estimates of the Economic Impact (October 2011/2012 fishing year data).

Species	October 2011/2012 Fishing Year Catch (tonnes)	Total Revenue from Catch	Total Revenue + 10% (bycatch)	Gain of Revenue between 0-2nm
Blue Warehou	96.17	$193,302.91	$212,633.20	$39,228.65
School Shark	506.03	$1,163,863.55	$1,280,249.91	$8,126.01
Rig	204.50	$1,028,635.00	$1,131,498.50	$5,970.17
Trevally	1861.64	$2,233,972.82	$2,457,370.11	$1,340.09
Northern Spiny Dogfish	50.84	$50,839.94	$55,923.93	$1,510.59
Snapper	1364.79	$9,553,555.62	$10,508,911.18	$6,537.36
Kahawai	512.47	$409,976.45	$450,974.09	$707.20
Spiny Dogfish	237.98	$237,984.70	$261,783.17	$412.65
Gurnard	211.15	$601,787.79	$661,966.57	$2,292.10
Blue Mackerel	2574.00	$2,574,003.05	$2,831,403.36	$518.24
TOTAL	7,619.59	$18,047,921.83	$19,852,714.01	$66,643.04

Table 18 shows the annual revenue gain between under Option 1b is just under $0.06 million, Table 19 shows the annual revenue gain between under Option 1b is just under $0.07 million.

Tables 20 and 21 applies the ratios in Table 2 to revenue estimates in Tables 18 and 19 to derive the estimated annual value added changes for set net harvesters in the area from Bell Block to Cape Egmont.

Tables 20 and 21 present the MPI estimates of allowing a winter warehou fishery between Bell Block and Cape Egmont from zero to two nautical miles from shore. Tables 20 and 21 are computed by applying the factors from section 17.3.2 to the annual income data in the Table and using the ACE and quota values in Table 3.

Table 20. Estimated annual income effects and Present Value of allowing set netting between zero and two nautical miles from shore in the area between Bell Block and Cape Egmont from June to September (four year average data) – MPI Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income gained	$14,633.10	$50,467.69	$65,100.79
Processing income gained	$26,924.90	$48,397.42	$75,322.32
Indirect income gained	$32,778.14	$44,627.65	$77,405.79
Induced income gained	$23,998.28	$0.00	$23,998.28
Quota value	$0.00	$149,523.50	$149,523.50
TOTAL	$98,334.42	$293,016.26	$391,350.68

The estimated gain of annual value added is just under $0.10 million and the estimated gain in future capitalised value is $0.29 million. The total estimated economic gain is just over $0.39 million.

Table 21. Estimated annual income effects and Present Value of allowing set netting between zero and two nautical miles from shore in the area between Bell Block and Cape Egmont from June to September (October 2011/ 2012 data) – MPI Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income gained	$16,660.76	$57,546.51	$74,207.27
Processing income gained	$30,655.80	$55,175.09	$85,830.89
Indirect income gained	$37,320.10	$50,828.70	$88,148.80
Induced income gained	$27,323.65	$0.00	$27,323.65
Quota value	$0.00	$156,858.13	$156,858.13
TOTAL	$111,960.31	$320,408.42	$432,368.73

The estimated gain in annual value added is $0.11 million and the estimated gain in future capitalised value is $0.32 million. The total estimated economic gain is just over $0.43 million.

Tables 22 and 23 show the estimates of the present value of allowing set netting between zero and two nautical miles from shore in the area from Bell Block and Cape Egmont between June and September using Treasury's Present Value methodology.

Table 22. Estimated annual income effects and Present Value of allowing set netting between zero and two nautical miles from shore in the area between Bell Block and Cape Egmont from June to September (4 year average data) – Treasury Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income gained	$14,633.10	$139,212.91	$153,846.01
Processing income gained	$26,924.90	$256,151.76	$283,076.66
Indirect income gained	$32,778.14	$311,836.93	$344,615.07
Induced income gained	$23,998.28	$0.00	$23,998.28
Quota value	$0.00	$149,523.50	$149,523.50
TOTAL	$98,334.42	$856,725.10	$955,059.52

The estimated gain in annual value added is just under $0.10 million and the estimated gain in future capitalised value is $0.86 million. The total estimated economic gain is just under $0.96 million.

Table 23. Estimated annual income effects and Present Value of allowing set netting between zero and two nautical miles from shore in the area between Bell Block and Cape Egmont from June to September (October 2011/2012 fishing year data) – Treasury Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income gained	$16,660.76	$158,503.20	$175,163.96
Processing income gained	$30,655.80	$291,645.89	$322,301.69
Indirect income gained	$37,320.10	$355,047.17	$392,367.27
Induced income gained	$27,323.65	$0.00	$27,323.65
Quota value	$0.00	$156,858.13	$156,858.13
TOTAL	$111,960.31	$962,054.38	$1,074,014.69

The estimated gain of annual value added is $0.11 million and the estimated gain of future capitalised value is $0.96 million. The total estimated economic gain is just over $1.07 million.

Using Method 1, allowing set netting between zero and two nautical miles from shore in the area between Bell Block and Cape Egmont from June to September would have an estimated gain of between $0.39 million to $1.07 million on the wider New Zealand economy.

METHOD 2

Tables 24 and 25 present MPI estimates of landed revenues for set netters. These tables use impacts from Table 5 (Method 2) and the price estimates from Table 1. Table 24 is calculated using the four year average data and Table 25 uses data from the October 2011/12 fishing year.

Table 24. Estimates of the Economic Impact (four year average data).

Species	4 Year Average Catch (tonnes)	Total Revenue from Catch	Total Revenue + 10% (bycatch)	Gain of Revenue between 0-2nm
Blue Warehou	123.52	$248,277.80	$273,105.58	$82,352.12
School Shark	533.03	$1,225,972.18	$1,348,569.40	$24,084.13
Rig	222.59	$1,119,625.30	$1,231,587.83	$36,796.64
Trevally	1934.26	$2,321,115.65	$2,553,227.21	$5,573.21
Northern Spiny Dogfish	39.37	$39,365.16	$43,301.67	$3,538.91
Snapper	1322.25	$9,255,767.84	$10,181,344.63	$22,915.12
Kahawai	452.41	$361,926.03	$398,118.63	$1,742.82
Spiny Dogfish	208.69	$208,692.09	$229,561.30	$4,305.04
Gurnard	225.77	$643,451.06	$707,796.16	$4,742.44
Blue Mackerel	2852.31	$2,852,306.34	$3,137,536.97	$1,448.79
TOTAL	7,914.20	$18,276,499.44	$20,104,149.38	$187,499.21

Table 25. Estimates of the Economic Impact (October 2011/2012 fishing year data).

Species	October 2011/2012 Fishing Year Catch (tonnes)	Total Revenue from Catch	Total Revenue + 10% (bycatch)	Gain of Revenue between 0-2nm
Blue Warehou	96.17	$193,302.91	$212,633.20	$96,575.63
School Shark	506.03	$1,163,863.55	$1,280,249.91	$22,883.62
Rig	204.50	$1,028,635.00	$1,131,498.50	$18,665.17
Trevally	1861.64	$2,233,972.82	$2,457,370.11	$3,772.80
Northern Spiny Dogfish	50.84	$50,839.94	$55,923.93	$3,881.45
Snapper	1364.79	$9,553,555.62	$10,508,911.18	$18,438.99
Kahawai	512.47	$409,976.45	$450,974.09	$2,020.69
Spiny Dogfish	237.98	$237,984.70	$261,783.17	$1,253.84
Gurnard	211.15	$601,787.79	$661,966.57	$5,898.29
Blue Mackerel	2574.00	$2,574,003.05	$2,831,403.36	$1,276.39
TOTAL	7,619.59	$18,047,921.83	$19,852,714.01	$174,666.87

Table 24 shows the annual revenue gain allowing set netting between zero and two nautical miles from shore in the area between Bell Block and Cape Egmont from June to September is just over $0.19 million, Table 25 shows the annual gain in revenue is just over $0.17 million.

Tables 26 and 27 apply the ratios in Table 2 to revenue estimates in Tables 24 and 25 to derive the estimated annual value added changes for set net harvesters in the area from Bell Block to Cape Egmont.

Tables 26 and 27 also present the MPI estimates of allowing set netting between zero and two nautical miles from shore in the area between Bell Block and Cape Egmont from June to

September. Tables 26 and 27 are computed by applying the factors from section 17.3.2 to the annual income data in the Table and using the ACE and quota values in Table 3.

Table 26. Estimated annual income effects and Present Value of allowing set netting between zero and two nautical miles from shore in the area between Bell Block and Cape Egmont from June to September (4 year average data) – MPI Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income gained	$46,874.80	$161,481.53	$208,356.33
Processing income gained	$86,249.64	$154,880.35	$241,129.99
Indirect income gained	$104,999.56	$142,920.84	$247,920.40
Induced income gained	$76,874.68	$0.00	$76,874.68
Quota value	$0.00	$500,661.21	$500,661.21
TOTAL	$314,998.67	$959,943.93	$1,274,942.60

The estimated gain in annual value added is $0.31 million and the estimated gain in future capitalised value is $0.96 million. The total estimated economic gain is just under $1.27 million.

Table 27. Estimated annual income effects and Present Value of allowing set netting between zero and two nautical miles from shore in the area between Bell Block and Cape Egmont from June to September (October 2011/2012 fishing year data) – MPI Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income gained	$43,666.72	$149,542.04	$193,208.75
Processing income gained	$80,346.76	$143,540.61	$223,887.37
Indirect income gained	$97,813.45	$132,961.86	$230,775.31
Induced income gained	$71,613.42	$0.00	$71,613.42
Quota value	$0.00	$430,596.75	$430,596.75
TOTAL	$293,440.34	$856,641.25	$1,150,081.59

The estimated gain in annual value added is $0.29 million and the estimated gain in future capitalised value is $0.86 million. The total estimated economic gain is just over $1.15 million.

Tables 28 and 29 show the estimates of the present value of allowing set netting between zero and two nautical miles from shore in the area between Bell Block and Cape Egmont from June to September using Treasury's Present Value methodology.

Table 28. Estimated annual income effects and Present Value of allowing set netting between zero and two nautical miles from shore in the area between Bell Block and Cape Egmont from June to September (4 year average data) – Treasury Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income gained	$46,874.80	$445,946.42	$492,821.22
Processing income gained	$86,249.64	$820,541.41	$906,791.05
Indirect income gained	$104,999.56	$998,919.98	$1,103,919.54
Induced income gained	$76,874.68	$0.00	$76,874.68
Quota value	$0.00	$500,661.21	$500,661.21
TOTAL	$314,998.67	$2,766,069.02	$3,081,067.70

The estimated gain in annual value added is $0.31 million and the estimated gain in future capitalised value is $2.77 million. The total estimated economic gain is just under $3.08 million.

Table 29. Estimated annual income effects and Present Value of allowing set netting between zero and two nautical miles from shore in the area between Bell Block and Cape Egmont from June to September (October 2011/2012 fishing year data) – Treasury Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income gained	$43,666.72	$415,426.09	$459,092.81
Processing income gained	$80,346.76	$764,384.01	$844,730.77
Indirect income gained	$97,813.45	$930,554.45	$1,028,367.90
Induced income gained	$71,613.42	$0.00	$71,613.42
Quota value	$0.00	$430,596.75	$430,596.75
TOTAL	$293,440.34	$2,540,961.31	$2,834,401.65

The estimated gain in annual value added is $0.29 million and the estimated gain in future capitalised value is $2.54 million. The total estimated economic gain is just over $2.83 million.

Using Method 2, allowing set netting between zero and two nautical miles from shore in the area between Bell Block and Cape Egmont from June to September would have an estimated gain of between $1.15 million to $3.08 million on the wider New Zealand economy.

17.5.3 Option 3 - Ban set nets between 0 and 4 nautical miles offshore from Pariokariwa Point to Hawera

Option 3 (ban set nets between zero and four nautical miles offshore in the area from Pariokariwa Point to Hawera) will have an increased impact on more species and fishers will have fewer options to adjust their behaviour to reduce the impact on their fishing activities.

MPI has calculated the percentage of each species caught between zero and four nautical miles nautical miles from Pariokariwa Point to Hawera for the 4 year averages and the 2011/12 October fishing year. These percentages are presented above in Table 4 (Method 1) and Table 5 (Method 2).

METHOD 1

Tables 30 and 31 present MPI estimates of landed revenues for set netters. These tables use impacts from Table 4 and the price estimates from Table 1. Table 30 is calculated using the four year average year data and Table 31 uses data from 2011/12 October fishing year.

Table 30. Estimates of the Economic Impact (four year average data).

Species	4 Year Average Catch (tonnes)	Total Revenue from Catch	Total Revenue + 10% (bycatch)	Loss of Revenue between 0-4nm
Blue Warehou	123.52	$248,277.80	$273,105.58	$132,988.81
School Shark	533.03	$1,225,972.18	$1,348,569.40	$121,412.03
Rig	222.59	$1,119,625.30	$1,231,587.83	$241,051.33
Trevally	1934.26	$2,321,115.65	$2,553,227.21	$19,802.66
Northern Spiny Dogfish	39.37	$39,365.16	$43,301.67	$7,587.55
Snapper	1322.25	$9,255,767.84	$10,181,344.63	$79,200.95
Kahawai	452.41	$361,926.03	$398,118.63	$7,465.09
Spiny Dogfish	208.69	$208,692.09	$229,561.30	$20,046.67
Gurnard	225.77	$643,451.06	$707,796.16	$14,433.75
Blue Mackerel	2852.31	$2,852,306.34	$3,137,536.97	$2,436.34
TOTAL	7,914.20	$18,276,499.44	$20,104,149.38	$646,425.16

Table 31. Estimates of the Economic Impact (October 2011/2012 fishing year data).

Species	October 2011/2012 Fishing Year Catch (tonnes)	Total Revenue from Catch	Total Revenue + 10% (bycatch)	Loss of Revenue between 0-4nm
Blue Warehou	96.17	$193,302.91	$212,633.20	$137,092.04
School Shark	506.03	$1,163,863.55	$1,280,249.91	$86,907.52
Rig	204.50	$1,028,635.00	$1,131,498.50	$208,296.21
Trevally	1861.64	$2,233,972.82	$2,457,370.11	$23,455.28
Northern Spiny Dogfish	50.84	$50,839.94	$55,923.93	$9,569.88
Snapper	1364.79	$9,553,555.62	$10,508,911.18	$96,491.26
Kahawai	512.47	$409,976.45	$450,974.09	$9,388.42
Spiny Dogfish	237.98	$237,984.70	$261,783.17	$18,573.60
Gurnard	211.15	$601,787.79	$661,966.57	$16,066.71
Blue Mackerel	2574.00	$2,574,003.05	$2,831,403.36	$2,266.27
TOTAL	7,619.59	$18,047,921.83	$19,852,714.01	$608,107.19

Table 30 shows the annual lost revenue between zero and four nautical miles is just under $0.65 million, Table 31 shows the annual lost revenue between zero and four nautical miles of just under $0.61 million.

Tables 32 and 33 applies the ratios in Table 2 to revenue estimates in Tables 30 and 31 to derive the estimated annual value added changes for set net harvesters in the area from Pariokariwa Point to Hawera.

Tables 32 and 33 present the MPI estimates of banning set netting between zero and four nautical miles from shore. Tables 32 and 33 are computed by applying the factors from section 17.3.2 to the annual income data in the Table and using the ACE and quota values in Table 3.

Table 32. Estimated annual income effects and Present Value of banning set netting between zero and four nautical miles from shore in the area from Pariokariwa Point to Hawera (four year average data) – MPI Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$161,606.29	$555,737.79	$717,344.08
Processing income lost	$297,355.57	$533,144.22	$830,499.79
Indirect income lost	$361,998.09	$492,538.40	$854,536.49
Induced income lost	$265,034.31	$0.00	$265,034.31
Quota value	$0.00	$2,067,978.20	$2,067,978.20
TOTAL	$1,085,994.27	$3,649,398.62	$4,735,392.89

The estimated loss of annual value added is $1.09 million and the estimated loss of future capitalised value is $3.64 million. The total estimated economic impact is just under $4.74 million.

Table 33. Estimated annual income effects and Present Value of banning set netting between zero and four nautical miles from shore in the area from Pariokariwa Point to Hawera (2011/12 October fishing year data) – MPI Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$152,026.80	$516,315.10	$668,341.90
Processing income lost	$279,729.31	$496,140.86	$775,870.17
Indirect income lost	$340,540.03	$462,046.26	$802,586.29
Induced income lost	$249,323.95	$0.00	$249,323.95
Quota value	$0.00	$1,922,750.18	$1,922,750.18
TOTAL	$1,021,620.09	$3,397,252.40	$4,418,872.49

The estimated loss of annual value added is $1.02 million and the estimated loss of future capitalised value is $3.40 million. The total estimated economic impact is just under $4.42 million.

Tables 34 and 35 show the estimates of the present value of banning set netting between zero and four nautical miles from shore using Treasury's Present Value methodology.

Table 34. Estimated annual income effects and Present Value of banning set netting between zero and four nautical miles from shore in the area from Pariokariwa Point to Hawera (4 year average data) – Treasury Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income gained	$161,606.29	$1,537,451.73	$1,699,058.02
Processing income gained	$297,355.57	$2,828,911.19	$3,126,266.76
Indirect income gained	$361,998.09	$3,443,891.88	$3,805,889.97
Induced income gained	$265,034.31	$0.00	$265,034.31
Quota value	$0.00	$2,067,978.20	$2,067,978.20
TOTAL	$1,085,994.27	$9,878,233.00	$10,964,227.27

The estimated loss of annual value added is $1.09 million and the estimated loss of future capitalised value is $9.88 million. The total estimated economic impact is just over 10.96 million.

Table 35. Estimated annual income effects and Present Value of banning set netting between zero and four nautical miles from shore in the area from Pariokariwa Point to Hawera (October 2011/2012 fishing year data) – Treasury Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income gained	$152,026.80	$1,446,316.64	$1,598,343.43
Processing income gained	$279,729.31	$2,661,222.61	$2,940,951.92
Indirect income gained	$340,540.03	$3,239,749.26	$3,580,289.29
Induced income gained	$249,323.95	$0.00	$249,323.95
Quota value	$0.00	$1,922,750.18	$1,922,750.18
TOTAL	$1,021,620.09	$9,270,038.69	$10,291,658.78

The estimated loss of annual value added is $1.02 million and the estimated loss of future capitalised value is $9.27 million. The total estimated economic impact is just under $10.29 million.

Under Method 1, banning set nets between zero and four nautical miles nautical miles from shore in the area from Pariokariwa Point to Hawera would have an estimated impact of between $4.42 million to $10.96 million on the wider New Zealand economy.

Method 2

Tables 36 and 37 present MPI estimates of landed revenues for set netters. These tables use impacts from Table 5 and the price estimates from Table 1. Table 36 is calculated using the four year average year data. Table 37 uses data from the 2011/12 October fishing year.

Table 36. Estimates of the Economic Impact (four year average data).

Species	4 Year Average Catch (tonnes)	Total Revenue from Catch	Total Revenue + 10% (bycatch)	Loss of Revenue between 0-4nm
Blue Warehou	123.52	$248,277.80	$273,105.58	$176,724.67
School Shark	533.03	$1,225,972.18	$1,348,569.40	$199,304.71
Rig	222.59	$1,119,625.30	$1,231,587.83	$334,962.75
Trevally	1934.26	$2,321,115.65	$2,553,227.21	$93,210.45
Northern Spiny Dogfish	39.37	$39,365.16	$43,301.67	$11,375.79
Snapper	1322.25	$9,255,767.84	$10,181,344.63	$368,780.20
Kahawai	452.41	$361,926.03	$398,118.63	$14,697.51
Spiny Dogfish	208.69	$208,692.09	$229,561.30	$39,577.27
Gurnard	225.77	$643,451.06	$707,796.16	$156,997.66
Blue Mackerel	2852.31	$2,852,306.34	$3,137,536.97	$3,294.68
TOTAL	7,914.20	$18,276,499.44	$20,104,149.38	$1,398,925.69

Table 37. Estimates of the Economic Impact (October 2011/2012 fishing year data).

Species	October 2011/2012 Fishing Year Catch (tonnes)	Total Revenue from Catch	Total Revenue + 10% (bycatch)	Loss of Revenue between 0-4nm
Blue Warehou	96.17	$193,302.91	$212,633.20	$160,071.41
School Shark	506.03	$1,163,863.55	$1,280,249.91	$147,235.73
Rig	204.50	$1,028,635.00	$1,131,498.50	$284,520.13
Trevally	1861.64	$2,233,972.82	$2,457,370.11	$136,753.89
Northern Spiny Dogfish	50.84	$50,839.94	$55,923.93	$12,499.52
Snapper	1364.79	$9,553,555.62	$10,508,911.18	$430,163.94
Kahawai	512.47	$409,976.45	$450,974.09	$17,639.05
Spiny Dogfish	237.98	$237,984.70	$261,783.17	$35,970.24
Gurnard	211.15	$601,787.79	$661,966.57	$134,144.32
Blue Mackerel	2574.00	$2,574,003.05	$2,831,403.36	$2,588.75
TOTAL	7,619.59	$18,047,921.83	$19,852,714.01	$1,361,586.99

Table 36 shows the annual lost revenue between zero and four nautical miles is just under $1.40 million, Table 37 shows the annual lost revenue between zero and four nautical miles of just over $1.36 million.

Tables 38 and 39 applies the ratios in Table 2 to revenue estimates in Table 36 and 37 to derive the estimated annual value added changes for set net harvesters in the area from Pariokariwa Point to Hawera.

Tables 38 and 39 present the MPI estimates of banning set netting between 0 and 4 nm from shore. Tables 38 and 39 are computed by applying the factors from section 17.3.2 to the annual income data in the Table and using the ACE and quota values in Table 3.

Table 38. Estimated annual income effects and Present Value of banning set netting between zero and four nautical miles from shore in the area from Pariokariwa Point to Hawera (four year average data) – MPI Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$349,731.42	$1,054,345.69	$1,404,077.11
Processing income lost	$643,505.82	$1,030,171.69	$1,673,677.51
Indirect income lost	$783,398.39	$1,036,235.30	$1,819,633.69
Induced income lost	$573,559.53	$0.00	$573,559.53
Quota value	$0.00	$5,078,887.90	$5,078,887.90
TOTAL	$2,350,195.17	$8,199,640.58	$10,549,835.74

The estimated loss of annual value added is $2.35 million and the estimated loss of future capitalised value is $8.20 million. The total estimated economic impact is just over $10.55 million.

Table 39. Estimated annual income effects and Present Value of banning set netting between zero and four nautical miles from shore in the area from Pariokariwa Point to Hawera (2011/12 October fishing year data) – MPI Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$340,396.75	$984,921.87	$1,325,318.61
Processing income lost	$626,330.02	$968,273.48	$1,594,603.50
Indirect income lost	$762,488.72	$1,000,320.70	$1,762,809.42
Induced income lost	$558,250.67	$0.00	$558,250.67
Quota value	$0.00	$5,183,197.41	$5,183,197.41
TOTAL	$2,287,466.15	$8,136,713.45	$10,424,179.60

The estimated loss of annual value added is $2.29 million and the estimated loss of future capitalised value is $8.14 million. The total estimated economic impact is just under $10.42 million.

Tables 40 and 41 show the estimates of the present value of banning set netting between zero and four nautical miles from shore in the area from Pariokariwa Point to Hawera using Treasury's Present Value methodology.

Table 40. Estimated annual income effects and Present Value of banning set netting between zero and four nautical miles from shore in the area from Pariokariwa Point to Hawera (4 year average data) – Treasury Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income gained	$349,731.42	$3,327,192.18	$3,676,923.61
Processing income gained	$643,505.82	$6,122,033.62	$6,765,539.43
Indirect income gained	$783,398.39	$7,452,910.49	$8,236,308.88
Induced income gained	$573,559.53	$0.00	$573,559.53
Quota value	$0.00	$5,078,887.90	$5,078,887.90
TOTAL	**$2,350,195.17**	**$21,981,024.18**	**$24,331,219.35**

The estimated loss of annual value added is $2.35 million and the estimated loss of future capitalised value is $21.98 million. The total estimated economic impact is just under $24.33 million.

Table 41. Estimated annual income effects and Present Value of banning set netting between zero and four nautical miles from shore in the area from Pariokariwa Point to Hawera (October 2011/2012 fishing year data) – Treasury Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income gained	$340,396.75	$3,238,386.16	$3,578,782.91
Processing income gained	$626,330.02	$5,958,630.53	$6,584,960.55
Indirect income gained	$762,488.72	$7,253,985.00	$8,016,473.71
Induced income gained	$558,250.67	$0.00	$558,250.67
Quota value	$0.00	$5,183,197.41	$5,183,197.41
TOTAL	$2,287,466.15	$21,634,199.09	$23,921,665.24

The estimated loss of annual value added is $2.29 million and the estimated loss of future capitalised value is $21.63 million. The total estimated economic impact is just over $23.92 million.

Under Method 2, banning set nets between zero and four nautical miles nautical miles from shore in the area from Pariokariwa Point to Hawera would have an estimated impact of between $10.42 million to $24.33 million on the wider New Zealand economy.

17.5.4 Option 4: Estimating the impact of a set net ban out seven nautical miles

Option 4 (prohibit set nets from Pariokariwa Point to Hawera and out to seven nautical miles) will have an increased impact on more species and fishers will have fewer options to adjust their behaviour to reduce the impact on their fishing activities.

MPI has calculated the percentage of each species caught between zero and seven nautical miles nautical miles from Pariokariwa Point to Hawera for the four year averages and the 2011/12 October fishing year. These percentages are presented below in Table 42 (calculated using Method 1).

Table 42. Percentage of set net landings from Pariokariwa Point to Hawera displaced under a set net ban out to seven nautical miles.

	% of catch displaced	
Species	4 Year Avg.	OCT 2011-2012
Blue Warehou	64.7%	72.8%
School Shark	13.2%	9.0%
Rig	23.7%	20.6%
Trevally	2.4%	2.4%
Northern Spiny Dogfish	22.2%	20.5%
Snapper	1.1%	1.1%
Kahawai	11.6%	7.4%
Spiny Dogfish	11.3%	8.2%
Gurnard	2.6%	2.8%
Blue Mackerel	0.1%	0.1%

Banning set net out to seven nautical miles will have a significant impact on the number of species and fishers affected and fishers will have limited options to adjust their behaviour to reduce the impact on their fishing activities.

Tables 43 and 44 present MPI estimates of landed revenues for trawl fishers. These tables use impacts from Table 42 and the price estimates from Table 1. Table 43 is calculated using the four year average data. Table 44 uses the 2011/12 October fishing year data.

Table 43. Estimates of the Economic Impact (four year average data).

Species	4 Year Average Catch (tonnes)	Total Revenue from Catch	Total Revenue + 10% (bycatch)	Loss of Revenue
Blue Warehou	123.52	$248,277.80	$273,105.58	$176,595.25
School Shark	533.03	$1,225,972.18	$1,348,569.40	$178,208.45
Rig	222.59	$1,119,625.30	$1,231,587.83	$291,479.27
Trevally	1934.26	$2,321,115.65	$2,553,227.21	$60,465.17
Northern Spiny Dogfish	39.37	$39,365.16	$43,301.67	$9,601.27
Snapper	1322.25	$9,255,767.84	$10,181,344.63	$108,798.57
Kahawai	452.41	$361,926.03	$398,118.63	$46,185.58
Spiny Dogfish	208.69	$208,692.09	$229,561.30	$25,992.89
Gurnard	225.77	$643,451.06	$707,796.16	$18,364.72
Blue Mackerel	2852.31	$2,852,306.34	$3,137,536.97	$2,985.88
TOTAL	7,914.20	$18,276,499.44	$20,104,149.38	$918,677.04

Table 44. Estimates of the Economic Impact (2011/12 Fishing Year data).

Species	2011-12 Fishing Year Catch (tonnes)	Total Revenue from Catch	Total Revenue + 10% (bycatch)	Loss of Revenue
Blue Warehou	96.17	$193,302.91	$212,633.20	$154,897.27
School Shark	506.03	$1,163,863.55	$1,280,249.91	$114,742.61
Rig	204.50	$1,028,635.00	$1,131,498.50	$233,069.98
Trevally	1861.64	$2,233,972.82	$2,457,370.11	$58,678.57
Northern Spiny Dogfish	50.84	$50,839.94	$55,923.93	$11,466.67
Snapper	1364.79	$9,553,555.62	$10,508,911.18	$118,531.50
Kahawai	512.47	$409,976.45	$450,974.09	$33,386.06
Spiny Dogfish	237.98	$237,984.70	$261,783.17	$21,520.40
Gurnard	211.15	$601,787.79	$661,966.57	$18,456.64
Blue Mackerel	2574.00	$2,574,003.05	$2,831,403.36	$2,545.30
Total	7,619.59	$18,047,921.83	$19,852,714.01	$767,295.01

Table 43 shows the annual lost revenue is just under $0.92 million. Table 44 shows the annual lost revenue is just under $0.77 million.

Tables 45 and 46 apply the ratios in Table 5 to revenue estimates in Tables 43 and 44 to derive the estimated annual value added changes for trawl fishers.

Tables 45 and 46 present the MPI estimates of banning set net out to seven nautical miles. Tables 45 and 46 are computed by applying the factors from section 17.3.2 to the annual income data in the table and using the ACE and quota values in Table 3.

Table 45. Estimated annual income effects and Present Value of banning set net out to seven nautical miles (4 year average data) – MPI Methodology

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$229,669.26	$773,694.39	$1,003,363.65
Processing income lost	$422,591.44	$744,268.67	$1,166,860.11
Indirect income lost	$514,459.14	$696,758.33	$1,211,217.47
Induced income lost	$376,657.59	$0.00	$376,657.59
Quota value	$0.00	$3,056,472.92	$3,056,472.92
TOTAL	$1,543,377.42	$5,271,194.31	$6,814,571.73

The estimated loss of annual value added is $1.54 million and the estimated loss of future capitalised value is $5.27 million. The total estimated economic impact is just over $6.81 million.

Table 46. Estimated annual income effects and Present Value of banning set net out to seven nautical miles (2011/12 October fishing year data) – MPI Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$191,823.75	$641,328.88	$833,152.63
Processing income lost	$352,955.70	$617,564.36	$970,520.06
Indirect income lost	$429,685.20	$580,969.83	$1,010,655.04
Induced income lost	$314,590.95	$0.00	$314,590.95
Quota value	$0.00	$2,529,123.96	$2,529,123.96
TOTAL	$1,289,055.61	$4,368,987.03	$5,658,042.65

The estimated loss of annual value added is $1.29 million and the estimated loss of future capitalised value is $4.37 million. The total estimated economic impact is just under $5.66 million.

Tables 47 and 48 show the estimates of the present value of banning set net out to seven nautical miles using Treasury's Present Value methodology.

Table 47. Estimated annual income effects and Present Value of banning set net out to seven nautical miles (4 year average data) – Treasury's Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$229,669.26	$2,184,973.13	$2,414,642.39
Processing income lost	$422,591.44	$4,020,350.56	$4,442,942.00
Indirect income lost	$514,459.14	$4,894,339.82	$5,408,798.96
Induced income lost	$376,657.59	$0.00	$376,657.59
Quota value	$0.00	$3,056,472.92	$3,056,472.92
TOTAL	$1,543,377.42	$14,156,136.44	$15,699,513.86

The estimated loss of annual value added is $1.54 million and the estimated loss of future capitalised value is $14.16 million. The total estimated economic impact is just under $15.70 million.

Table 48. Estimated annual income effects and Present Value of banning set net out to seven nautical miles (2011/12 October fishing year data) – Treasury's Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$191,823.75	$1,824,927.49	$2,016,751.24
Processing income lost	$352,955.70	$3,357,866.58	$3,710,822.28
Indirect income lost	$429,685.20	$4,087,837.57	$4,517,522.77
Induced income lost	$314,590.95	$0.00	$314,590.95
Quota value	$0.00	$2,529,123.96	$2,529,123.96
TOTAL	$1,289,055.61	$11,799,755.59	$13,088,811.20

The estimated loss of annual value added is $1.29 million and the estimated loss of future capitalised value is $11.80 million. The total estimated economic impact is just under $13.09 million.

17.5.5 Estimating the impact of a set net ban out to the 100 m depth contour

Option 5 (prohibit set nets from Maunganui Bluff to Whanganui and out to the 100 m depth contour) will have an increased impact on more species and fishers will have little ability to adjust their behaviour to reduce the impact on their fishing activities.

MPI has calculated the percentage of each species caught between from Maunganui Bluff to Whanganui and out to the 100 m depth contour for the four year averages and the 2011/12 October fishing year. These percentages are presented below in Table 49 (calculated using Method 1).

Table 49. Percentage of set net landings from Maunganui Bluff to Whanganui displaced under a set net ban out to the 100 m depth contour.

	% of catch displaced	
Species	4 Year Avg.	OCT 2011-2012
Blue Warehou	77.2%	72.7%
School Shark	42.4%	25.8%
Rig	61.1%	47.7%
Trevally	1.4%	1.3%
Northern Spiny Dogfish	44.9%	38.2%
Snapper	1.8%	1.6%
Kahawai	2.6%	2.5%
Spiny Dogfish	25.8%	14.3%
Gurnard	4.1%	3.6%
Blue Mackerel	0.1%	0.1%

Banning set net out to the 100 m depth contour will have a significant impact on the number of species and fishers affected and fishers will have no real options to adjust their behaviour to reduce the impact on their fishing activities.

Tables 50 and 51 present MPI estimates of landed revenues for trawl fishers. These tables use impacts from Table 49 and the price estimates from Table 1. Table 50 is calculated using the four year average data. Table 51 uses the 2011/12 October fishing year data.

Table 50. Estimates of the Economic Impact (four year average data).

Species	4 Year Average Catch (tonnes)	Total Revenue from Catch	Total Revenue + 10% (bycatch)	Loss of Revenue
Blue Warehou	123.52	$248,277.80	$273,105.58	$210,732.84
School Shark	533.03	$1,225,972.18	$1,348,569.40	$572,141.03
Rig	222.59	$1,119,625.30	$1,231,587.83	$752,395.45
Trevally	1934.26	$2,321,115.65	$2,553,227.21	$35,638.86
Northern Spiny Dogfish	39.37	$39,365.16	$43,301.67	$19,437.01
Snapper	1322.25	$9,255,767.84	$10,181,344.63	$180,045.45
Kahawai	452.41	$361,926.03	$398,118.63	$10,355.46
Spiny Dogfish	208.69	$208,692.09	$229,561.30	$59,250.27
Gurnard	225.77	$643,451.06	$707,796.16	$29,132.59
Blue Mackerel	2852.31	$2,852,306.34	$3,137,536.97	$3,674.68
TOTAL	7,914.20	$18,276,499.44	$20,104,149.38	$1,872,803.64

Table 51. Estimates of the Economic Impact (2011/12 Fishing Year data).

Species	2011-12 Fishing Year Catch (tonnes)	Total Revenue from Catch	Total Revenue + 10% (bycatch)	Loss of Revenue
Blue Warehou	96.17	$193,302.91	$212,633.20	$154,630.18
School Shark	506.03	$1,163,863.55	$1,280,249.91	$330,271.26
Rig	204.50	$1,028,635.00	$1,131,498.50	$539,525.31
Trevally	1861.64	$2,233,972.82	$2,457,370.11	$32,453.97
Northern Spiny Dogfish	50.84	$50,839.94	$55,923.93	$21,339.05
Snapper	1364.79	$9,553,555.62	$10,508,911.18	$169,504.27
Kahawai	512.47	$409,976.45	$450,974.09	$11,233.04
Spiny Dogfish	237.98	$237,984.70	$261,783.17	$37,446.64
Gurnard	211.15	$601,787.79	$661,966.57	$23,876.10
Blue Mackerel	2574.00	$2,574,003.05	$2,831,403.36	$2,704.96
Total	7,619.59	$18,047,921.83	$19,852,714.01	$1,322,984.78

Table 50 shows the annual lost revenue is just over $1.87 million. Table 51 shows the annual lost revenue is just over $1.32 million.

Tables 52 and 53 apply the ratios in Table 5 to revenue estimates in Tables 50 and 51 to derive the estimated annual value added changes for trawl fishers.

Tables 52 and 53 present the MPI estimates of banning set net out to the 100 m depth contour from Maunganui Bluff to Whanganui. Tables 52 and 53 are computed by applying the factors from section 17.3.2 to the annual income data in the table and using the ACE and quota values in Table 3.

Table 51. Estimated annual income effects and Present Value of banning set net out to the 100 m depth contour from Maunganui Bluff to Whanganui (4 year average data) – MPI Methodology

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$468,200.91	$2,088,710.90	$2,556,911.81
Processing income lost	$861,489.68	$1,943,479.48	$2,804,969.16
Indirect income lost	$1,048,770.04	$1,522,696.33	$2,571,466.37
Induced income lost	$767,849.49	$0.00	$767,849.49
Quota value	$0.00	$6,766,092.41	$6,766,092.41
TOTAL	$3,146,310.12	$12,320,979.12	$15,467,289.24

The estimated loss of annual value added is $3.15 million and the estimated loss of future capitalised value is $12.32 million. The total estimated economic impact is just under $15.47 million.

Table 53. Estimated annual income effects and Present Value of banning set net out to the 100 m depth contour from Maunganui Bluff to Whanganui (2011/12 October fishing year data) – MPI Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$330,746.19	$1,409,912.07	$1,740,658.27
Processing income lost	$608,573.00	$1,318,250.08	$1,926,823.07
Indirect income lost	$740,871.47	$1,062,543.43	$1,803,414.91
Induced income lost	$542,423.76	$0.00	$542,423.76
Quota value	$0.00	$4,685,902.75	$4,685,902.75
TOTAL	$2,222,614.42	$8,476,608.33	$10,699,222.75

The estimated loss of annual value added is $2.22 million and the estimated loss of future capitalised value is $8.48 million. The total estimated economic impact is just under $10.70 million.

Tables 54 and 55 show the estimates of the present value of banning set net out to the 100 m depth contour from Maunganui Bluff to Whanganui using Treasury's Present Value methodology.

Table 54. Estimated annual income effects and Present Value of banning set net out to the 100 m depth contour from Maunganui Bluff to Whanganui (4 year average data) – Treasury's Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$468,200.91	$4,454,259.20	$4,922,460.11
Processing income lost	$861,489.68	$8,195,836.93	$9,057,326.61
Indirect income lost	$1,048,770.04	$9,977,540.61	$11,026,310.65
Induced income lost	$767,849.49	$0.00	$767,849.49
Quota value	$0.00	$6,766,092.41	$6,766,092.41
TOTAL	$3,146,310.12	$29,393,729.15	$32,540,039.27

The estimated loss of annual value added is $3.15 million and the estimated loss of future capitalised value is $29.39 million. The total estimated economic impact is just over $32.54 million.

Table 55. Estimated annual income effects and Present Value of banning set net out to the 100 m depth contour from Maunganui Bluff to Whanganui (2011/12 October fishing year data) – Treasury's Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$330,746.19	$3,146,574.99	$3,477,321.18
Processing income lost	$608,573.00	$5,789,697.98	$6,398,270.98
Indirect income lost	$740,871.47	$7,048,327.98	$7,789,199.45
Induced income lost	$542,423.76	$0.00	$542,423.76
Quota value	$0.00	$4,685,902.75	$4,685,902.75
TOTAL	$2,222,614.42	$20,670,503.69	$22,893,118.12

The estimated loss of annual value added is $2.22 million and the estimated loss of future capitalised value is $20.67 million. The total estimated economic impact is just under $22.89 million.

17.5.6 Summary of economic impacts

Table 56 summarises the economic impacts of the proposed options for the set net activity off the WCNI calculated in the sections above. MPI believes that the impacts are likely to be between the MPI methodology estimate and Treasury methodology estimate depending on the option selected.

Table 56. Total Estimated Economic Impacts of Options 1, 1b, 3, 4 and 5.

	MPI methodology				Treasury methodology			
	Method 1		Method 2		Method 1		Method 2	
Set Net Prohibition	4 year average	2011/12 fishing year	4 year average	2011/12 fishing year	4 year average	2011/12 fishing year	4 year average	2011/12 fishing year
Option 1 & 2 Pariokariwa Point to Hawera out to 2 nautical miles	$2.48 million	$2.49 million	$5.33 million	$4.85 million	$5.73 million	$5.78 million	$12.34 million	$11.30 million
Option 1b (winter warehou fishery)	$0.39 million	$0.43 million	$1.27 million	$1.15 million	$0.96 million	$1.07 million	$3.08 million	$2.83 million
Option 3 Pariokariwa Point to Hawera out to 4 nautical miles	$4.74 million	$4.42 million	$10.55 million	$10.42 million	$10.96 million	$10.29 million	$24.33 million	$23.92 million
Option 4 Pariokariwa Point to Hawera and out to 7 nautical miles	$6.81 million	$5.66 million	-	-	$15.70 million	$13.09 million	-	-
Option 5 Maunganui Bluff to Whanganui out to the 100 m depth contour	$15.47 million	$10.70 million	-	-	$32.54 million	$22.89 million	-	-

17.6 Estimated impacts on extending the set net ban in the Manukau Harbour

This section reports the estimated economic impacts on commercial set net fishers in the Manukau Harbour.

Option 1 (*Status quo*) for these harbours will not be analysed as it does not have a negative economic impact on commercial set net fishers.

Option 2 for the harbours will not be analysed as it does not involve the loss or displacement of catch, and any negative economic impact on commercial set net fishers would depending on the design of any monitoring programme.

To estimate the potential impact of Option 3 (extend the set net prohibition in the entrance of the Manukau Harbour) and Option 4 (prohibit set nets in the WCNI harbours) on commercial set net fishers; ACE and quota prices for the set net species targeted in the Manukau Harbours are required for these calculations.

Table 57 presents the average ACE transfer price (2010/11 October fishing year) and the average quota price (since 2001) for the species most affected. This data will be used in the calculations of quota value lost and to remove the double-counting of ACE income from income estimates.

Table 57. ACE and Quota prices for set net species (Manukau and Kaipara Harbours).

Species	2011/12 ACE price ($/tonnes)	Average quota price since Oct 01 ($/tonnes)
Grey Mullet (GMU1)	$452.20	$4,060.06
Yellow-eyed Mullet (YEM9)	$134.70	$3,498.74
School Shark (SCH1)	$1,420.90	$16,863.30
Trevally (TRE7)	$283.00	$5,210.72
Flatfish (FLA1)	$345.10	$2,728.34
Rig (SPO1)	$461.60	$5,363.81
Kahawai (KAH8)	$258.80	$3,010.07
Parore (PAR9)	$259.90	$2,617.57

17.6.1 Option 3 – Extending the set net ban in the Manukau Harbour

MPI estimates Option 3 (ban set netting in the harbour) will most impact on the rig fishery and those fishers who rely target the species. These fishers will have limited options to adjust their behaviour to reduce the impact on their fishing activities.

To estimate the economic impact on the commercial set net fleet, MPI first estimated the percentage of catch in this area (by QMA). These estimates used MPI data on set net activity in the Manukau Harbour statistical reporting area (43).

MPI has calculated the percentage of each species landed in the Manukau Harbour for the last completed fishing year (1 October 2011 to 30 September 2012), the 2008/09 to 2010/12 three year average, and the 2008/09 to 2011/12 four year average. These percentages are presented in Table 57.

Table 58. Percentage of set net landings from the Manukau Harbour.

	Manukau Harbour	
Species	4 Year Average	2011-12 Fishing Year
Grey Mullet	9.6%	8.8%
Yellow-eyed Mullet	51.3%	31.6%
School Shark	0.1%	0.1%
Trevally	0.9%	0.7%
Flatfish	7.1%	7.0%
Rig	13.5%	15.5%
Kahawai	2.3%	1.7%
Parore	15.5%	18.2%

MPI has analysed the economic impact by assuming the rig fishery is most impacted and other species may still be caught in areas outside the set net ban area or by other methods. MPI will provide economic impact estimates below using the four year average percentage figure and last completed fishing year (2011/12 October fishing year) percentage figures to show the difference these assumption make to the economic impact numbers

Tables 59 and 60 present MPI estimates of landed revenues for set netters assuming the rig fishery is most affected by the extended set net ban. These tables use impacts from Table 58 and the price estimates from Table 1. Table 59 is calculated using the four year average data. Table 60 uses the 2011/12 October fishing year data.

Table 59. Estimates of the Economic Impact (four year average data).

Species	4 Year Average Catch (tonnes)	Total Revenue from Catch	Total Revenue + 10% (bycatch)	Loss of Revenue extending set net ban
Rig	310.40	$1,561,322.08	$1,717,454.29	$232,703.86
TOTAL	**310.40**	$1,561,322.08	$1,717,454.29	$232,703.86

Table 60. Estimates of the Economic Impact (2011/12 October fishing year data).

Species	2011-12 Fishing Year Catch (tonnes)	Total Revenue from Catch	Total Revenue + 10% (bycatch)	Loss of Revenue extending set net ban
Rig	322.53	$1,622,311.31	$1,784,542.44	$276,446.54
TOTAL	**322.53**	$1,622,311.31	$1,784,542.44	$276,446.54

Table 59 shows the annual lost revenue is just under $0.23 million. Table 60 shows the annual lost revenue is just under $0.28 million.

Tables 61 and 62 applies the ratios in Table 2 to revenue estimates in Tables 59 and 60 to derive the estimated annual value added changes for set net harvesters.

Tables 61 and 62 present the MPI estimates of extending the set net ban in the Manukau Harbour. Tables 61 and 62 are computed by applying the factors from section 17.3.2 to the annual income data in the table and using the ACE and quota values in Table 58.

Table 61. Estimated annual income effects and Present Value of extending the set net ban in the Manukau harbour (4 year average data) – MPI Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$58,175.96	$261,759.24	$319,935.21
Processing income lost	$107,043.77	$243,342.29	$350,386.06
Indirect income lost	$130,314.16	$189,647.12	$319,961.28
Induced income lost	$95,408.58	$0.00	$95,408.58
Quota value	$0.00	$225,588.16	$225,588.16
TOTAL	$390,942.48	$920,336.81	$1,311,279.29

The estimated loss of annual value added is $0.39 million and the estimated loss of future capitalised value is $0.92 million. The total estimated economic impact is just over $1.31 million.

Table 62. Estimated annual income effects and Present Value of extending the set net ban in the Manukau harbour (2011/12 Fishing Year data) – MPI Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$69,111.64	$310,963.64	$380,075.27
Processing income lost	$127,165.41	$289,084.74	$416,250.15
Indirect income lost	$154,810.06	$225,296.19	$380,106.25
Induced income lost	$113,343.08	$0.00	$113,343.08
Quota value	$0.00	$267,993.26	$267,993.26
TOTAL	$464,430.19	$1,093,337.83	$1,557,768.02

The estimated loss of annual value added is $0.46 million and the estimated loss of future capitalised value is $1.09 million. The total estimated economic impact is just under $1.56 million.

Tables 63 and 64 show the estimates of the present value of extending the set net ban in the Manukau harbour using Treasury's Present Value methodology.

Table 63. Estimated annual income effects and Present Value of banning set netting in the Manukau harbour (4 year average data) – Treasury's Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$58,175.96	$553,460.74	$611,636.71
Processing income lost	$107,043.77	$1,018,367.76	$1,125,411.54
Indirect income lost	$130,314.16	$1,239,752.06	$1,370,066.22
Induced income lost	$95,408.58	$0.00	$95,408.58
Quota value	$0.00	$225,588.16	$225,588.16
TOTAL	$390,942.48	$3,037,168.72	$3,428,111.20

The estimated loss of annual value added is $0.39 million and the estimated loss of future capitalised value is $3.04million. The total estimated economic impact is just over $3.43 million.

Table 64. Estimated annual income effects and Present Value of extending the set net ban in the Manukau harbour (2010/11 October fishing year data) – Treasury's Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$69,111.64	$657,497.95	$726,609.58
Processing income lost	$127,165.41	$1,209,796.22	$1,336,961.63
Indirect income lost	$154,810.06	$1,472,795.40	$1,627,605.46
Induced income lost	$113,343.08	$0.00	$113,343.08
Quota value	$0.00	$267,993.26	$267,993.26
TOTAL	$464,430.19	$3,608,082.83	$4,072,513.02

The estimated loss of annual value added is $0.46 million and the estimated loss of future capitalised value is $3.61 million. The total estimated economic impact is just over $4.07 million.

Extending the set net ban further into the Manukau Harbour would have an estimated impact of between $1.56 million to $4.07 million on the wider New Zealand economy.

17.6.2 Estimating the impact of a set net ban in the Kaipara and Manukau Harbours

This section reports the estimated economic impacts on commercial set net fishers in the Kaipara and Manukau Harbours. To estimate the economic impact on the commercial set net fleet, MPI first estimated the percentage of catch in this area (by QMA). These estimates used MPI data on set net activity in the Kaipara Harbour (statistical reporting area 44) and the Manukau Harbour (statistical reporting area 43).

MPI has calculated the percentage of each species landed in the Manukau and Kaipara Harbours for the last completed fishing year (1 October 2011 to 30 September 2012), the 2008/09 to 2010/12 three year average, and the 2008/09 to 2011/12 four year average. These percentages are presented in Table 65.

Table 65. Percentage of set net landings from the Kaipara and Manukau Harbours.

	Kaipara Harbour		Manukau Harbour	
Species	4 Year Average	2011-12 Fishing Year	4 Year Average	2011-12 Fishing Year
Grey Mullet	16.6%	15.2%	9.6%	8.8%
Yellow-eyed Mullet	10.6%	18.2%	51.3%	31.6%
School Shark	0.3%	0.0%	0.1%	0.1%
Trevally	0.6%	0.6%	0.9%	0.7%
Flatfish	35.9%	30.4%	7.1%	7.0%
Rig	18.9%	20.0%	13.5%	15.5%
Kahawai	7.2%	3.4%	2.3%	1.7%
Parore	60.5%	57.8%	15.5%	18.2%

MPI will provide economic impact estimates below using the four year average percentage figure and last completed fishing year (2011/12 October fishing year) percentage figures to show the difference these assumption make to the economic impact numbers

Kaipara Harbour

Tables 66 and 67 present MPI estimates of landed revenues for set netters in the Kaipara Harbour. These tables use impacts from Table 65 and the price estimates from Table 1. Table 66 is calculated using the four year average data. Table 67 uses the 2011/12 October fishing year data.

Table 66. Estimates of the Economic Impact (four year average data).

Species	4 Year Average Catch (tonnes)	Total Revenue from Catch	Total Revenue + 10% (bycatch)	Loss of Revenue extending set net ban
Grey Mullet	803.66	$2,410,986.81	$2,652,085.49	$441,073.61
Yellow-eyed Mullet	11.26	$33,790.52	$37,169.57	$3,933.89
School Shark	696.24	$1,601,360.97	$1,761,497.07	$4,557.83
Trevally	1934.26	$2,321,115.65	$2,553,227.21	$14,682.65
Flatfish	550.26	$1,650,779.97	$1,815,857.96	$652,746.45
Rig	310.40	$1,561,322.08	$1,717,454.29	$324,757.65
Kahawai	452.41	$361,926.03	$398,118.63	$28,729.96
Parore	19.44	$39,070.67	$42,977.74	$26,004.25
TOTAL	4,777.94	$9,980,352.69	$10,978,387.96	$1,496,486.29

Table 67. Estimates of the Economic Impact (2011/12 October fishing year data).

Species	2011-12 Fishing Year Catch (tonnes)	Total Revenue from Catch	Total Revenue + 10% (bycatch)	Loss of Revenue extending set net ban
Grey Mullet	841.49	$2,524,474.68	$2,776,922.15	$420,990.95
Yellow-eyed Mullet	12.17	$36,502.26	$40,152.49	$7,310.79
School Shark	690.84	$1,588,941.81	$1,747,835.99	$508.69
Trevally	1861.64	$2,233,972.82	$2,457,370.11	$14,994.02
Flatfish	432.23	$1,296,676.22	$1,426,343.84	$433,837.14
Rig	322.53	$1,622,311.31	$1,784,542.44	$356,069.88
Kahawai	512.47	$409,976.45	$450,974.09	$15,185.18
Parore	17.77	$35,711.69	$39,282.86	$22,711.50
TOTAL	4,691.14	$9,748,567.24	$10,723,423.96	$1,271,608.15

Table 66 shows the annual lost revenue is just under $1.50 million. Table 67 shows the annual lost revenue is just over $1.27 million.

Tables 68 and 69 applies the ratios in Table 2 to revenue estimates in Tables 66 and 67 to derive the estimated annual value added changes for set net harvesters.

Tables 68 and 69 present the MPI estimates of banning set net in the Kaipara Harbour. Tables 68 and 69 are computed by applying the factors from section 17.3.2 to the annual income data in the table and using the ACE and quota values in Table 57.

Table 68. Estimated annual income effects and Present Value of banning set net in the Kaipara harbour (4 year average data) – MPI Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$374,121.57	$1,610,853.51	$1,984,975.09
Processing income lost	$688,383.70	$1,504,497.28	$2,192,880.97
Indirect income lost	$838,032.33	$1,205,097.62	$2,043,129.94
Induced income lost	$613,559.38	$0.00	$613,559.38
Quota value	$0.00	$1,618,728.43	$1,618,728.43
TOTAL	$2,514,096.98	$5,939,176.83	$8,453,273.81

The estimated loss of annual value added is $2.51 million and the estimated loss of future capitalised value is $5.94 million. The total estimated economic impact is just over $8.45 million.

Table 69. Estimated annual income effects and Present Value banning set net in the Kaipara harbour (2011/12 Fishing Year data) – MPI Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$317,902.04	$1,373,964.14	$1,691,866.18
Processing income lost	$584,939.75	$1,282,727.67	$1,867,667.42
Indirect income lost	$712,100.56	$1,025,041.64	$1,737,142.20
Induced income lost	$521,359.34	$0.00	$521,359.34
Quota value	$0.00	$1,370,979.36	$1,370,979.36
TOTAL	$2,136,301.69	$5,052,712.80	$7,189,014.49

The estimated loss of annual value added is $2.14 million and the estimated loss of future capitalised value is $5.05 million. The total estimated economic impact is just over $7.19 million.

Tables 70 and 71 show the estimates of the present value of prohibiting set net in the Kaipara Harbour using Treasury's Present Value methodology.

Table 70. Estimated annual income effects and Present Value of banning set netting in the Kaipara harbour (4 year average data) – Treasury's Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$374,121.57	$3,559,229.43	$3,933,351.00
Processing income lost	$688,383.70	$6,548,982.15	$7,237,365.85
Indirect income lost	$838,032.33	$7,972,673.92	$8,810,706.25
Induced income lost	$613,559.38	$0.00	$613,559.38
Quota value	$0.00	$1,618,728.43	$1,618,728.43
TOTAL	$2,514,096.98	$19,699,613.93	$22,213,710.91

The estimated loss of annual value added is $2.51 million and the estimated loss of future capitalised value is $19.70 million. The total estimated economic impact is just over $22.21 million.

Table 71. Estimated annual income effects and Present Value of banning set net in the Kaipara harbour (2010/11 October fishing year data) – Treasury's Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$317,902.04	$3,024,381.29	$3,342,283.32
Processing income lost	$584,939.75	$5,564,861.57	$6,149,801.32
Indirect income lost	$712,100.56	$6,774,614.08	$7,486,714.65
Induced income lost	$521,359.34	$0.00	$521,359.34
Quota value	$0.00	$1,370,979.36	$1,370,979.36
TOTAL	$2,136,301.69	$16,734,836.30	$18,871,137.99

The estimated loss of annual value added is $2.14 million and the estimated loss of future capitalised value is $16.73 million. The total estimated economic impact is just over $18.87 million.

Banning set net in the Kaipara Harbour would have an estimated impact of between $7.19 million to $22.21 million on the wider New Zealand economy.

Manukau Harbour

Tables 72 and 73 present MPI estimates of landed revenues for set netters in the Manukau Harbour. These tables use impacts from Table 65 and the price estimates from Table 1. Table 72 is calculated using the four year average data. Table 73 uses the 2011/12 October fishing year data.

Table 72. Estimates of the Economic Impact (four year average data).

Species	4 Year Average Catch (tonnes)	Total Revenue from Catch	Total Revenue + 10% (bycatch)	Loss of Revenue extending set net ban
Grey Mullet (GMU1)	803.66	$2,410,986.81	$2,652,085.49	$254,504.60
Yellow-eyed Mullet (YEM9)	11.26	$33,790.52	$37,169.57	$19,085.38
School Shark (SCH1)	696.24	$1,601,360.97	$1,761,497.07	$1,313.15
Trevally (TRE7)	1934.26	$2,321,115.65	$2,553,227.21	$22,050.04
Flatfish (FLA1)	550.26	$1,650,779.97	$1,815,857.96	$128,487.37
Rig (SPO1)	310.40	$1,561,322.08	$1,717,454.29	$232,703.86
Kahawai (KAH8)	452.41	$361,926.03	$398,118.63	$8,995.07
Parore (PAR9)	19.44	$39,070.67	$42,977.74	$6,656.40
TOTAL	4,777.94	$9,980,352.69	$10,978,387.96	$673,795.86

Table 73. Estimates of the Economic Impact (2011/12 October fishing year data).

Species	2011-12 Fishing Year Catch (tonnes)	Total Revenue from Catch	Total Revenue + 10% (bycatch)	Loss of Revenue extending set net ban
Grey Mullet (GMU1)	841.49	$2,524,474.68	$2,776,922.15	$243,373.06
Yellow-eyed Mullet (YEM9)	12.17	$36,502.26	$40,152.49	$12,697.61
School Shark (SCH1)	690.84	$1,588,941.81	$1,747,835.99	$1,392.45
Trevally (TRE7)	1861.64	$2,233,972.82	$2,457,370.11	$17,711.20
Flatfish (FLA1)	432.23	$1,296,676.22	$1,426,343.84	$100,218.58
Rig (SPO1)	322.53	$1,622,311.31	$1,784,542.44	$276,446.54
Kahawai (KAH8)	512.47	$409,976.45	$450,974.09	$7,847.89
Parore (PAR9)	17.77	$35,711.69	$39,282.86	$7,163.80
TOTAL	4,691.14	$9,748,567.24	$10,723,423.96	$666,851.15

Table 72 shows the annual lost revenue is just over $0.67 million. Table 73 shows the annual lost revenue is just under $0.67 million.

Tables 74 and 75 applies the ratios in Table 2 to revenue estimates in Tables 72 and 73 to derive the estimated annual value added changes for set net harvesters.

Tables 74 and 75 present the MPI estimates of banning set net in the Manukau Harbour. Tables 74 and 75 are computed by applying the factors from section 17.3.2 to the annual income data in the table and using the ACE and quota values in Table 57.

Table 74. Estimated annual income effects and Present Value of banning set net in the Manukau harbour (4 year average data) – MPI Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$168,448.97	$726,149.39	$894,598.35
Processing income lost	$309,946.10	$678,119.04	$988,065.14
Indirect income lost	$377,325.68	$542,769.44	$920,095.12
Induced income lost	$276,256.30	$0.00	$276,256.30
Quota value	$0.00	$799,618.62	$799,618.62
TOTAL	$1,131,977.05	$2,746,656.49	$3,878,633.54

The estimated loss of annual value added is $1.13 million and the estimated loss of future capitalised value is $2.75 million. The total estimated economic impact is just under $3.88 million.

Table 75. Estimated annual income effects and Present Value banning set net in the Manukau harbour (2011/12 Fishing Year data) – MPI Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$166,712.79	$720,853.13	$887,565.92
Processing income lost	$306,751.53	$672,953.15	$979,704.68
Indirect income lost	$373,436.64	$537,612.80	$911,049.44
Induced income lost	$273,408.97	$0.00	$273,408.97
Quota value	$0.00	$778,261.81	$778,261.81
TOTAL	$1,120,309.92	$2,709,680.90	$3,829,990.82

The estimated loss of annual value added is $1.12 million and the estimated loss of future capitalised value is $2.71 million. The total estimated economic impact is just over $3.83 million.

Tables 76 and 77 show the estimates of the present value of extending the set net ban in the Manukau harbour using Treasury's Present Value methodology.

Table 76. Estimated annual income effects and Present Value of banning set netting in the Manukau harbour (4 year average data) – Treasury's Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$168,448.97	$1,602,549.97	$1,770,998.94
Processing income lost	$309,946.10	$2,948,691.95	$3,258,638.05
Indirect income lost	$377,325.68	$3,589,711.94	$3,967,037.62
Induced income lost	$276,256.30	$0.00	$276,256.30
Quota value	$0.00	$799,618.62	$799,618.62
TOTAL	$1,131,977.05	$8,940,572.48	$10,072,549.53

The estimated loss of annual value added is $1.13 million and the estimated loss of future capitalised value is $8.94 million. The total estimated economic impact is just over $10.07 million.

Table 77. Estimated annual income effects and Present Value of banning set net in the Manukau harbour (2010/11 October fishing year data) – Treasury's Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$166,712.79	$1,586,032.72	$1,752,745.50
Processing income lost	$306,751.53	$2,918,300.20	$3,225,051.72
Indirect income lost	$373,436.64	$3,552,713.28	$3,926,149.92
Induced income lost	$273,408.97	$0.00	$273,408.97
Quota value	$0.00	$778,261.81	$778,261.81
TOTAL	$1,120,309.92	$8,835,308.00	$9,955,617.92

The estimated loss of annual value added is $1.12 million and the estimated loss of future capitalised value is $8.84 million. The total estimated economic impact is just over $9.96 million.

Banning set net in the Manukau Harbour would have an estimated impact of between $3.83 million to $10.07 million on the wider New Zealand economy.

17.6.3 Summary of economic impacts

Table 78 summarises the economic impacts calculated in the sections above. MPI believes that the impacts are likely to be between the MPI methodology estimate and Treasury methodology estimate depending on the option selected.

Table 78. Total Estimated Economic Impacts of Options 3 and 4.

		MPI Methodology		Treasury Methodology	
		4 year average	2011/12 Fishing Year	4 year average	2011/12 Fishing Year
Option 3	Extend the Set net prohibition in the Manukau Harbour	$1.31 million	$1.56 million	$3.43 million	$4.07 million
Option 4	Prohibit set net in the Kaipara Harbour	$8.45 million	$7.19 million	$22.20 million	$18.87 million
	Prohibit set net in the Manukau Harbour	$3.88 million	$3.83 million	$10.07 million	$9.96 million

17.7 Estimated impacts on trawling

This section reports the estimated economic impacts on commercial trawl fishers under the proposed management options.

Option 1 (*Status quo*) for these ranges will not be analysed as it does not have a negative economic impact on trawl fishers.

Option 2 involves extensive monitoring coverage, so an analysis of the economic impact is not undertaken using the above methodologies.[82] Estimates of the cost of monitoring coverage can be found in section 11.

To estimate the impacts of Option 3 (ban trawling out to four nautical miles from shore between Kaipara Harbour and Kawhia) on commercial trawl fishers, Option 4 (prohibit trawling out to seven nautical miles from Maunganui Bluff to Hawera) and Option 5 (prohibit trawling out to the 100 m depth contour from Maunganui Bluff to Whanganui); ACE and quota prices for the trawl species targeted in the three ranges are required for these calculations.

Table 79 presents the average ACE transfer price (2010/11 fishing year) and the average quota price (since 2001) for the species most affected in this area. This data will be used in the calculations of quota value lost and to remove the double-counting of ACE income from income estimates.

Table 79. ACE and Quota prices for trawl species (Kaipara Harbour to Kawhia).

Species	2010/11 ACE price ($/tonnes)	Average quota price since Oct 01 ($/tonnes)
John Dory (JDO1)	$885.30	$10,912.20
School Shark (SCH1)	$1,420.90	$16,863.30
Rig (SPO1)	$461.60	$5,363.81
Trevally (TRE7)	$283.00	$5,210.72
Snapper (SNA8)	$5,265.70	$48,783.10
Kahawai (KAH8)	$258.80	$3,010.07
Tarakihi (TAR1)	$1,297.10	$17,704.40
Gurnard (GUR1)	$966.00	$1,552.73
Flatfish (FLA1)	$345.10	$2,728.34

To estimate the economic impact on the commercial trawl fleet, MPI first estimated the percentage of catch in this area (by QMA). These estimates used MPI data on trawl activity.

MPI will provide economic impact estimates below using the last completed fishing year (2011/12 fishing year) percentage figures and the four year average percentage figures to show the difference these assumptions make to the economic impact numbers.

[82] The extensive monitoring coverage proposed in Options 2 and 3 are not analysed in this section; the estimates for monitoring are found in the MPI chapter (Section 6 of this paper).

17.7.1 Option 3 - Ban trawling out to 4 nautical miles from Kaipara Harbour to Kawhia

Option 3 (ban trawling out to four nautical miles from Kaipara Harbour to Kawhia) will have the biggest impact on the number of species and fishers affected and fishers will have no real options to adjust their behaviour to reduce the impact on their fishing activities.

MPI has calculated the percentage of each species landed from the Kaipara Harbour to Kawhia area between two and four nautical miles offshore for the 2008/09 to 2011/12 four year average and the last completed fishing year (1 October 2011 and 30 September 2012). These percentages are presented in Tables 80.

Table 80. Percentage of trawl landings between zero and four nautical miles nautical miles offshore from Kaipara Harbour to Kawhia.

Kaipara Harbour to Kawhia (Option 3)		
Species	4 Year Average	2011-12 Fishing Year
John Dory	1.1%	2.5%
School Shark	0.8%	1.5%
Rig	0.3%	0.7%
Trevally	1.2%	1.3%
Snapper	2.0%	3.3%
Kahawai	1.2%	1.7%
Tarakihi	0.2%	0.4%
Gurnard	2.0%	5.2%
Flatfish	0.2%	0.5%

Tables 81 and 82 present MPI estimates of landed revenues for trawl fishers. These tables use impacts from Table 80 and the price estimates from Table 1. Table 81 is calculated using the four year average data. Table 82 uses the 2011/12 October fishing year data.

Table 81. Estimates of the Economic Impact (four year average data).

Species	4 Year Average Catch (tonnes)	Total Revenue from Catch	Total Revenue + 10% (bycatch)	Loss of Revenue between 2–4 nm
John Dory	376.78	$2,825,843.17	$3,108,427.48	$34,534.05
School Shark	696.24	$1,601,360.97	$1,761,497.07	$14,432.94
Rig	310.40	$1,561,322.08	$1,717,454.29	$5,067.24
Trevally	1934.26	$2,321,115.65	$2,553,227.21	$30,892.42
Snapper	1322.25	$9,255,767.84	$10,181,344.63	$207,145.58
Kahawai	452.41	$361,926.03	$398,118.63	$4,593.16
Tarakihi	1305.86	$5,223,436.47	$5,745,780.11	$12,033.16
Gurnard	1042.34	$2,970,676.80	$3,267,744.48	$64,178.24
Flatfish	550.26	$1,650,779.97	$1,815,857.96	$3,448.01
TOTAL	7,990.81	$27,772,228.97	$30,549,451.87	$376,324.78

Table 82. Estimates of the Economic Impact (2011/12 Fishing Year data).

Species	2011-12 Fishing Year Catch (tonnes)	Total Revenue from Catch	Total Revenue + 10% (bycatch)	Loss of Revenue between 2–4 nm
John Dory	351.20	$2,633,983.01	$2,897,381.31	$72,687.79
School Shark	690.84	$1,588,941.81	$1,747,835.99	$25,545.65
Rig	322.53	$1,622,311.31	$1,784,542.44	$11,833.89
Trevally	1861.64	$2,233,972.82	$2,457,370.11	$33,147.96
Snapper	1364.79	$9,553,555.62	$10,508,911.18	$350,710.56
Kahawai	512.47	$409,976.45	$450,974.09	$7,636.45
Tarakihi	1138.05	$4,552,205.70	$5,007,426.27	$18,513.55
Gurnard	978.77	$2,789,483.96	$3,068,432.35	$158,701.95
Flatfish	432.23	$1,296,676.22	$1,426,343.84	$6,865.09
TOTAL	7,652.52	$26,681,106.89	$29,349,217.58	$685,642.90

Table 81 shows the annual lost revenue is just over $0.38 million. Table 82 shows the annual lost revenue is just under $0.69 million.

Tables 83 and 84 apply the ratios in Table 5 to revenue estimates in Tables 81 and 82 to derive the estimated annual value added changes for trawl fishers.

Tables 83 and 84 present the MPI estimates of banning trawling out to four nautical miles from Kaipara Harbour to Kawhia. Tables 83 and 84 are computed by applying the factors from section 17.3.2 to the annual income data in the table and using the ACE and quota values in Table 79.

Table 83. Estimated annual income effects and Present Value of banning trawling out to four nautical miles from Kaipara Harbour to Kawhia (4 year average data) – MPI Methodology

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$94,081.20	$192,081.39	$286,162.58
Processing income lost	$173,109.40	$200,836.34	$373,945.74
Indirect income lost	$210,741.88	$260,447.90	$471,189.78
Induced income lost	$154,293.16	$0.00	$154,293.16
Quota value	$0.00	$1,679,869.60	$1,679,869.60
TOTAL	$632,225.63	$2,333,235.23	$2,965,460.86

The estimated loss of annual value added is $0.63 million and the estimated loss of future capitalised value is $2.33 million. The total estimated economic impact is just under $2.97 million.

Table 84. Estimated annual income effects and Present Value of banning trawling out to four nautical miles from Kaipara Harbour to Kawhia (2011/12 October fishing year data) – MPI Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$171,410.72	$365,953.87	$537,364.59
Processing income lost	$315,395.73	$379,239.54	$694,635.27
Indirect income lost	$383,960.02	$477,720.08	$861,680.10
Induced income lost	$281,113.59	$0.00	$281,113.59
Quota value	$0.00	$2,815,546.63	$2,815,546.63
TOTAL	$1,151,880.06	$4,038,460.11	$5,190,340.18

The estimated loss of annual value added is $1.15 million and the estimated loss of future capitalised value is $4.04 million. The total estimated economic impact is just under $5.19 million.

Tables 85 and 86 show the estimates of the present value of extending the trawl ban out to four nautical miles between Kaipara Harbour and Kawhia using Treasury's Present Value methodology.

Table 85. Estimated annual income effects and Present Value of banning trawling out to four nautical miles from Kaipara Harbour to Kawhia (4 year average data) – Treasury's Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$94,081.20	$895,047.45	$989,128.65
Processing income lost	$173,109.40	$1,646,887.31	$1,819,996.71
Indirect income lost	$210,741.88	$2,004,906.29	$2,215,648.17
Induced income lost	$154,293.16	$0.00	$154,293.16
Quota value	$0.00	$1,679,869.60	$1,679,869.60
TOTAL	$632,225.63	$6,226,710.64	$6,858,936.28

The estimated loss of annual value added is $0.63 million and the estimated loss of future capitalised value is $ 6.23million. The total estimated economic impact is just over $6.86 million.

Table 86. Estimated annual income effects and Present Value of banning trawling out to four nautical miles from Kaipara Harbour to Kawhia (2011/12 October fishing year data) – Treasury's Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$171,410.72	$1,630,726.84	$1,802,137.57
Processing income lost	$315,395.73	$3,000,537.39	$3,315,933.12
Indirect income lost	$383,960.02	$3,652,828.13	$4,036,788.15
Induced income lost	$281,113.59	$0.00	$281,113.59
Quota value	$0.00	$2,815,546.63	$2,815,546.63
TOTAL	$1,151,880.06	$11,099,638.99	$12,251,519.06

The estimated loss of annual value added is $1.51 million and the estimated loss of future capitalised value is $11.10 million. The total estimated economic impact is just under $12.25 million.

17.7.2 Estimating the impact of a trawl prohibition out to seven nautical miles

MPI has calculated the percentage of each species caught in the area using the last completed fishing year (1 October 2011 to 30 September 2012), and the 2008/09 to 2011/12 four year average. MPI has calculated these percentages using Method 1 described above in section 16.4. These percentages are presented in Table 87.

Table 87. Percentage of trawl landings from Maunganui Bluff to Hawera displaced under a trawl prohibition out to seven nautical miles.

Species	4 Year Average	2011-12 Fishing Year
John Dory (JDO1)	8.5%	13.8%
School Shark (SCH1)	7.8%	9.9%
Rig (SPO1)	2.5%	4.4%
Trevally (TRE7)	24.4%	27.9%
Snapper (SNA8)	22.5%	28.2%
Kahawai (KAH8)	13.3%	14.0%
Tarakihi (TAR1)	2.8%	3.9%
Gurnard (GUR1)	13.4%	23.8%
Flatfish (FLA1)	1.2%	2.0%
Gurnard (GUR8)	31.4%	34.8%
Leatherjacket (LEA2)	11.3%	10.9%
Tarakihi (TAR8)	10.5%	11.7%
John Dory (JDO2)	9.5%	10.1%
Spiny Dogfish (SPD8)	6.3%	7.0%
Rig (SPO8)	3.1%	4.6%
Blue Warehou (WAR8)	2.0%	3.0%
Red Cod (RCO2)	1.6%	0.5%
School Shark (SCH8)	2.6%	4.4%

Prohibiting trawl out to seven nautical miles from Maunganui Bluff to Hawera will have a significant impact on the number of species and fishers affected and fishers will have limited options to adjust their behaviour to reduce the impact on their fishing activities.

Tables 88 and 89 present MPI estimates of landed revenues for trawl fishers. These tables use impacts from Table 87 and the price estimates from Table 1. Table 88 is calculated using the four year average data. Table 89 uses the 2011/12 October fishing year data.

Table 88. Estimates of the Economic Impact (four year average data).

Species	4 Year Average Catch (tonnes)	Total Revenue from Catch	Total Revenue + 10% (bycatch)	Loss of Revenue
John Dory (JDO1)	376.78	$2,825,843.17	$3,108,427.48	$264,097.15
School Shark (SCH1)	696.24	$1,601,360.97	$1,761,497.07	$136,521.00
Rig (SPO1)	310.40	$1,561,322.08	$1,717,454.29	$43,672.23
Trevally (TRE7)	1934.26	$2,321,115.65	$2,553,227.21	$622,324.00
Snapper (SNA8)	1322.25	$9,255,767.84	$10,181,344.63	$2,294,094.65
Kahawai (KAH8)	452.41	$361,926.03	$398,118.63	$53,102.36
Tarakihi (TAR1)	1305.86	$5,223,436.47	$5,745,780.11	$161,416.94
Gurnard (GUR1)	1042.34	$2,970,676.80	$3,267,744.48	$437,596.09
Flatfish (FLA1)	550.26	$1,650,779.97	$1,815,857.96	$21,301.42
Gurnard (GUR8)	225.77	$643,451.06	$707,796.16	$222,248.91
Leatherjacket (LEA2)	330.20	$330,197.78	$363,217.56	$41,186.46
Tarakihi (TAR8)	207.59	$830,345.82	$913,380.40	$95,613.26
John Dory (JDO2)	140.30	$1,052,283.90	$1,157,512.29	$109,797.06
Spiny Dogfish (SPD8)	208.69	$104,346.04	$114,780.65	$7,210.96
Rig (SPO8)	222.59	$1,119,625.30	$1,231,587.83	$37,783.76
Blue Warehou (WAR8)	123.52	$185,281.94	$203,810.14	$4,139.79
Red Cod (RCO2)	410.93	$369,832.70	$406,815.97	$6,711.66
School Shark (SCH8)	533.03	$1,225,972.18	$1,348,569.40	$34,955.43
Total	**10,393.43**	$33,633,565.70	$36,996,922.27	$4,593,773.13

Table 89. Estimates of the Economic Impact (2011/12 Fishing Year data).

Species	2011-12 Fishing Year Catch (tonnes)	Total Revenue from Catch	Total Revenue + 10% (bycatch)	Loss of Revenue
John Dory (JDO1)	351.20	$2,633,983.01	$2,897,381.31	$400,896.34
School Shark (SCH1)	690.84	$1,588,941.81	$1,747,835.99	$173,179.04
Rig (SPO1)	322.53	$1,622,311.31	$1,784,542.44	$78,238.67
Trevally (TRE7)	1861.64	$2,233,972.82	$2,457,370.11	$685,059.42
Snapper (SNA8)	1364.79	$9,553,555.62	$10,508,911.18	$2,961,404.76
Kahawai (KAH8)	512.47	$409,976.45	$450,974.09	$63,190.71
Tarakihi (TAR1)	1138.05	$4,552,205.70	$5,007,426.27	$192,987.40
Gurnard (GUR1)	978.77	$2,789,483.96	$3,068,432.35	$728,777.20
Flatfish (FLA1)	432.23	$1,296,676.22	$1,426,343.84	$28,397.71
Gurnard (GUR8)	211.15	$601,787.79	$661,966.57	$230,156.65
Leatherjacket (LEA2)	282.77	$282,769.99	$311,046.99	$33,966.24
Tarakihi (TAR8)	239.15	$956,588.32	$1,052,247.15	$122,899.35
John Dory (JDO2)	132.78	$995,842.88	$1,095,427.17	$110,332.92
Spiny Dogfish (SPD8)	237.98	$118,992.35	$130,891.59	$9,127.65
Rig (SPO8)	204.50	$1,028,635.00	$1,131,498.50	$51,717.64
Blue Warehou (WAR8)	96.17	$144,255.90	$158,681.49	$4,796.34
Red Cod (RCO2)	570.54	$513,485.93	$564,834.52	$3,064.00
School Shark (SCH8)	506.03	$1,163,863.55	$1,280,249.91	$56,362.38
Total	**10,133.59**	$32,487,328.60	$35,736,061.46	$5,934,554.42

Table 88 shows the annual lost revenue is just over $4.59 million. Table 89 shows the annual lost revenue is just over $5.93 million.

Tables 90 and 91 apply the ratios in Table 5 to revenue estimates in Tables 88 and 89 to derive the estimated annual value added changes for trawl fishers.

Tables 90 and 91 present the MPI estimates of banning trawl out to seven nautical miles from Maunganui Bluff to Hawera. Tables 90 and 91 are computed by applying the factors from section 17.3.2 to the annual income data in the table and using the ACE and quota values in Table 79.

Table 90. Estimated annual income effects and Present Value of banning trawl out to seven nautical miles from Maunganui Bluff to Hawera (4 year average data) – MPI Methodology

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$1,148,443.28	$2,567,641.04	$3,716,084.33
Processing income lost	$2,113,135.64	$2,637,359.63	$4,750,495.26
Indirect income lost	$2,572,512.95	$3,223,854.36	$5,796,367.31
Induced income lost	$1,883,446.98	$0.00	$1,883,446.98
Quota value	$0.00	$20,132,799.28	$20,132,799.28
TOTAL	$7,717,538.86	$28,561,654.30	$36,279,193.16

The estimated loss of annual value added is $7.71 million and the estimated loss of future capitalised value is $28.56 million. The total estimated economic impact is just under $36.28 million.

Table 91. Estimated annual income effects and Present Value of banning trawl out seven nautical miles from Maunganui Bluff to Hawera (2011/12 October fishing year data) – MPI Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$1,483,638.60	$3,299,491.96	$4,783,130.57
Processing income lost	$2,729,895.03	$3,392,486.70	$6,122,381.73
Indirect income lost	$3,323,350.47	$4,161,285.50	$7,484,635.97
Induced income lost	$2,433,167.31	$0.00	$2,433,167.31
Quota value	$0.00	$25,570,956.12	$25,570,956.12
TOTAL	$9,970,051.42	$36,424,220.27	$46,394,271.69

The estimated loss of annual value added is $9.97 million and the estimated loss of future capitalised value is $36.42 million. The total estimated economic impact is just under $46.39 million.

Tables 92 and 93 show the estimates of the present value of banning trawl out to seven nautical miles from Maunganui Bluff to Hawera using Treasury's Present Value methodology.

Table 92. Estimated annual income effects and Present Value of banning trawl out to seven nautical miles from Maunganui Bluff to Hawera (4 year average data) – Treasury's Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$1,148,443.28	$10,925,788.34	$12,074,231.63
Processing income lost	$2,113,135.64	$20,103,450.55	$22,216,586.19
Indirect income lost	$2,572,512.95	$24,473,765.89	$27,046,278.85
Induced income lost	$1,883,446.98	$0.00	$1,883,446.98
Quota value	$0.00	$20,132,799.28	$20,132,799.28
TOTAL	$7,717,538.86	$75,635,804.07	$83,353,342.93

The estimated loss of annual value added is $7.71 million and the estimated loss of future capitalised value is $75.64 million. The total estimated economic impact is just over $83.35 million.

Table 93. Estimated annual income effects and Present Value of banning trawl out to seven nautical miles from Maunganui Bluff to Hawera (2011/12 October fishing year data) – Treasury's Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$1,483,638.60	$14,114,690.39	$15,598,329.00
Processing income lost	$2,729,895.03	$25,971,030.33	$28,700,925.36
Indirect income lost	$3,323,350.47	$31,616,906.48	$34,940,256.96
Induced income lost	$2,433,167.31	$0.00	$2,433,167.31
Quota value	$0.00	$25,570,956.12	$25,570,956.12
TOTAL	$9,970,051.42	$97,273,583.32	$107,243,634.74

The estimated loss of annual value added is $9.97 million and the estimated loss of future capitalised value is $97.27 million. The total estimated economic impact is just over $107.24 million.

17.7.3 Estimating the impact of a trawl ban out to the 100 m depth contour

To estimate the impacts of a trawl ban out to the 100 m depth contour MPI first estimated the percentage of catch in this area (by QMA). These estimates used MPI data on trawl activity.

MPI has calculated the percentage of each species caught in the area using the last completed fishing year (1 October 2011 to 30 September 2012), and the 2008/09 to 2011/12 four year average. MPI has calculated these percentages using Method 1 described above in section 16.4. These percentages are presented in Table 94.

Table 94. Percentage of trawl landings from Maunganui Bluff to Whanganui displaced under a trawl ban out to the 100 m depth contour.

Species	4 Year Average	2011-12 Fishing Year
John Dory (JDO1)	16.6%	23.2%
School Shark (SCH1)	13.6%	15.8%
Rig (SPO1)	4.3%	6.5%
Trevally (TRE7)	52.7%	52.6%
Snapper (SNA8)	47.7%	51.1%
Kahawai (KAH8)	24.4%	23.1%
Tarakihi (TAR1)	5.1%	6.2%
Gurnard (GUR1)	22.0%	33.6%
Flatfish (FLA1)	2.0%	2.8%
Gurnard (GUR8)	64.8%	64.5%
Leatherjacket (LEA2)	39.8%	25.4%
Tarakihi (TAR8)	21.6%	25.2%
John Dory (JDO2)	19.9%	21.3%
Spiny Dogfish (SPD8)	17.1%	17.0%
Rig (SPO8)	7.1%	10.3%
Blue Warehou (WAR8)	4.6%	6.1%
Red Cod (RCO2)	3.2%	1.1%
School Shark (SCH8)	6.1%	9.3%

Banning trawl out to the 100 m depth contour will have a significant impact on the number of species and fishers affected and fishers will have no real options to adjust their behaviour to reduce the impact on their fishing activities.

Tables 95 and 96 present MPI estimates of landed revenues for trawl fishers. These tables use impacts from Table 94 and the price estimates from Table 1. Table 95 is calculated using the four year average data. Table 96 uses the 2011/12 October fishing year data.

Table 95. Estimates of the Economic Impact (four year average data).

Species	4 Year Average Catch (tonnes)	Total Revenue from Catch	Total Revenue + 10% (bycatch)	Loss of Revenue
John Dory (JDO1)	376.78	$2,825,843.17	$3,108,427.48	$516,243.33
School Shark (SCH1)	696.24	$1,601,360.97	$1,761,497.07	$239,475.02
Rig (SPO1)	310.40	$1,561,322.08	$1,717,454.29	$74,326.74
Trevally (TRE7)	1934.26	$2,321,115.65	$2,553,227.21	$1,344,792.51
Snapper (SNA8)	1322.25	$9,255,767.84	$10,181,344.63	$4,859,174.74
Kahawai (KAH8)	452.41	$361,926.03	$398,118.63	$97,008.90
Tarakihi (TAR1)	1305.86	$5,223,436.47	$5,745,780.11	$294,768.73
Gurnard (GUR1)	1042.34	$2,970,676.80	$3,267,744.48	$718,728.51
Flatfish (FLA1)	550.26	$1,650,779.97	$1,815,857.96	$36,123.19
Gurnard (GUR8)	225.77	$643,451.06	$707,796.16	$458,776.16
Leatherjacket (LEA2)	330.20	$330,197.78	$363,217.56	$144,669.83
Tarakihi (TAR8)	207.59	$830,345.82	$913,380.40	$197,144.25
John Dory (JDO2)	140.30	$1,052,283.90	$1,157,512.29	$230,122.31
Spiny Dogfish (SPD8)	208.69	$104,346.04	$114,780.65	$19,607.21
Rig (SPO8)	222.59	$1,119,625.30	$1,231,587.83	$87,566.85
Blue Warehou (WAR8)	123.52	$185,281.94	$203,810.14	$9,356.76
Red Cod (RCO2)	410.93	$369,832.70	$406,815.97	$12,946.90
School Shark (SCH8)	533.03	$1,225,972.18	$1,348,569.40	$81,857.34
Total	**10,393.43**	$33,633,565.70	$36,996,922.27	$9,422,689.28

Table 96. Estimates of the Economic Impact (2011/12 Fishing Year data).

Species	2011-12 Fishing Year Catch (tonnes)	Total Revenue from Catch	Total Revenue + 10% (bycatch)	Loss of Revenue
John Dory (JDO1)	351.20	$2,633,983.01	$2,897,381.31	$673,414.70
School Shark (SCH1)	690.84	$1,588,941.81	$1,747,835.99	$276,096.66
Rig (SPO1)	322.53	$1,622,311.31	$1,784,542.44	$115,927.36
Trevally (TRE7)	1861.64	$2,233,972.82	$2,457,370.11	$1,293,060.29
Snapper (SNA8)	1364.79	$9,553,555.62	$10,508,911.18	$5,369,818.43
Kahawai (KAH8)	512.47	$409,976.45	$450,974.09	$104,053.88
Tarakihi (TAR1)	1138.05	$4,552,205.70	$5,007,426.27	$310,333.53
Gurnard (GUR1)	978.77	$2,789,483.96	$3,068,432.35	$1,031,999.23
Flatfish (FLA1)	432.23	$1,296,676.22	$1,426,343.84	$40,553.07
Gurnard (GUR8)	211.15	$601,787.79	$661,966.57	$427,130.28
Leatherjacket (LEA2)	282.77	$282,769.99	$311,046.99	$79,013.28
Tarakihi (TAR8)	239.15	$956,588.32	$1,052,247.15	$265,316.99
John Dory (JDO2)	132.78	$995,842.88	$1,095,427.17	$233,046.90
Spiny Dogfish (SPD8)	237.98	$118,992.35	$130,891.59	$22,204.34
Rig (SPO8)	204.50	$1,028,635.00	$1,131,498.50	$116,002.61
Blue Warehou (WAR8)	96.17	$144,255.90	$158,681.49	$9,724.57
Red Cod (RCO2)	570.54	$513,485.93	$564,834.52	$6,316.22
School Shark (SCH8)	506.03	$1,163,863.55	$1,280,249.91	$119,304.40
Total	**10,133.59**	$32,487,328.60	$35,736,061.46	$10,493,316.75

Table 95 shows the annual lost revenue is just over $9.42 million. Table 96 shows the annual lost revenue is just under $10.49 million.

Tables 97 and 98 apply the ratios in Table 5 to revenue estimates in Tables 95 and 96 to derive the estimated annual value added changes for trawl fishers.

Tables 97 and 98 present the MPI estimates of banning trawl out to the 100 m depth contour from Maunganui Bluff to Whanganui. Tables 97 and 98 are computed by applying the factors from section 17.3.2 to the annual income data in the table and using the ACE and quota values in Table 79.

Table 97. Estimated annual income effects and Present Value of banning trawl out to the 100 m depth contour from Maunganui Bluff to Whanganui (4 year average data) – MPI Methodology

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$2,355,672.32	$5,214,970.52	$7,570,642.84
Processing income lost	$4,334,437.07	$5,366,600.11	$9,701,037.18
Indirect income lost	$5,276,706.00	$6,602,380.78	$11,879,086.78
Induced income lost	$3,863,302.61	$0.00	$3,863,302.61
Quota value	$0.00	$42,061,466.79	$42,061,466.79
TOTAL	$15,830,117.99	$59,245,418.20	$75,075,536.19

The estimated loss of annual value added is $15.83 million and the estimated loss of future capitalised value is $59.25 million. The total estimated economic impact is just under $75.08 million.

Table 98. Estimated annual income effects and Present Value of banning trawl out to the 100 m depth contour from Maunganui Bluff to Whanganui (2011/12 October fishing year data) – MPI Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$2,623,329.19	$5,788,869.88	$8,412,199.07
Processing income lost	$4,826,925.70	$5,960,834.22	$10,787,759.92
Indirect income lost	$5,876,257.38	$7,348,830.86	$13,225,088.23
Induced income lost	$4,302,259.87	$0.00	$4,302,259.87
Quota value	$0.00	$46,138,732.56	$46,138,732.56
TOTAL	$17,628,772.13	$65,237,267.52	$82,866,039.65

The estimated loss of annual value added is $17.63 million and the estimated loss of future capitalised value is $65.24 million. The total estimated economic impact is just under $82.87 million.

Tables 99 and 100 show the estimates of the present value of banning trawl out to the 100 m depth contour from Maunganui Bluff to Whanganui using Treasury's Present Value methodology.

Table 99. Estimated annual income effects and Present Value of banning trawl out to the 100 m depth contour from Maunganui Bluff to Whanganui (4 year average data) – Treasury's Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$2,355,672.32	$22,410,838.72	$24,766,511.04
Processing income lost	$4,334,437.07	$41,235,943.25	$45,570,380.32
Indirect income lost	$5,276,706.00	$50,200,278.74	$55,476,984.73
Induced income lost	$3,863,302.61	$0.00	$3,863,302.61
Quota value	$0.00	$42,061,466.79	$42,061,466.79
TOTAL	$15,830,117.99	$155,908,527.50	$171,738,645.49

The estimated loss of annual value added is $15.83 million and the estimated loss of future capitalised value is $155.91 million. The total estimated economic impact is just over $171.74 million.

Table 100. Estimated annual income effects and Present Value of banning trawl out to the 100 m depth contour from Maunganui Bluff to Whanganui (2011/12 October fishing year data) – Treasury's Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$2,623,329.19	$24,957,209.37	$27,580,538.56
Processing income lost	$4,826,925.70	$45,921,265.24	$50,748,190.95
Indirect income lost	$5,876,257.38	$55,904,148.99	$61,780,406.37
Induced income lost	$4,302,259.87	$0.00	$4,302,259.87
Quota value	$0.00	$46,138,732.56	$46,138,732.56
TOTAL	$17,628,772.13	$172,921,356.17	$190,550,128.30

The estimated loss of annual value added is $17.63 million and the estimated loss of future capitalised value is $172.92 million. The total estimated economic impact is just over $190.55 million.

17.7.4 Summary of economic impacts

Table 101 summarises the economic impacts calculated in the sections above. MPI believes that the impacts are likely to be between the MPI methodology estimate and Treasury methodology estimate depending on the option selected.

Table 101. Total Estimated Economic Impacts of Options 3, 4 and 5.

		MPI Methodology		Treasury Methodology	
		4 year average	2011/12 Fishing Year	4 year average	2011/12 Fishing Year
Option 3	Trawl prohibition from Kaipara Harbour to Kawhia out to four nautical miles offshore	$2.97 million	$5.19 million	$6.86 million	$12.25 million
Option 4	Trawl prohibition out to 7 nautical miles from Maunganui Bluff to Hawera	$36.28 million	$46.39 million	$83.33 million	$107.24 million
Option 5	Trawl ban out to the 100 m depth contour	$75.08 million	$82.87 million	$171.74 million	$190.55 million