Review of the Maui's dolphin Threat Management Plan

Consultation Paper

Ministry for Primary Industries
Manatū Ahu Matua

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Department of Conservation
Te Papa Atawhai

Review of the Maui's Dolphin Threat Management Plan

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Contents

Page

1.0 Purpose

The purpose of this consultation paper is to support a review and update of the Maui's dolphin portion of the Hector's and Maui's dolphin Threat Management Plan (TMP). The previous TMP was undertaken five years ago in 2007. This review process aims to reassess management measures based on updated information on the Maui's dolphin population, the human-induced threats they are exposed to, and their vulnerability to those threats.

To provide context to the management measures proposed in this paper:

> 'Hector's dolphin(s)' refers to the South Island subspecies (*Cephalorhynchus hectori hectori*), while 'Maui's dolphin(s)' refers to the North Island subspecies (*Cephalorhynchus hectori maui*). 'Hector's and Maui's dolphins' refers to the species collectively (*Cephalorhynchus hectori*). 'Hector's and/or Maui's dolphins' refers to both subspecies, and is used where the identification of the subspecies cannot be confirmed. This approach is taken to avoid confusion and enable distinction between the North and South Island subspecies' and the species as a whole.

Section 6 from the Ministry for Primary Industries (MPI) and Section 7 from the Department of Conservation (DOC) outline initial views on some proposals to effectively manage fishing-related and non-fishing-related human-induced threats to Maui's dolphins, respectively. The views and recommendations outlined in the paper are preliminary and are provided as a basis for consultation with stakeholders.

DOC and MPI welcome written submissions on the proposals contained in this document. All written submissions must be received no later than 5pm on Monday 12 November 2012.

Written submissions should be sent directly to:

Maui's dolphin TMP
PO Box 5853
Wellington 6011

Or email:

MauiTMP@mpi.govt.nz (To comment on fishing-related options proposed by MPI)

MauiTMP@doc.govt.nz (To comment on non-fishing-related options proposed by DOC)

All submissions are subject to the Official Information Act and can be released, if requested, under the Act. If you have specific reasons for wanting to have your submission withheld, please set out your reasons in the submission. MPI and DOC will consider those reasons when making any assessment for the release of submissions if requested under the Official Information Act.

MPI and DOC will consider all submissions, and following an analysis of submissions final recommendations will be developed for each agency's respective Minister to consider.

2.0 Document Structure

This document is structured as follows:

Section 3: Overview
This section summarises the purpose of the Hector's and Maui's dolphin Threat Management Plan, why the Maui's portion is being reviewed, and a brief summary of the management options and tools that are discussed in the later chapters.

Section 4: Context
This section provides context on the biology of Hector's and Maui's dolphins, and the abundance, distribution and vulnerability of the Maui's dolphin population off the west coast of the North Island to human-induced mortality.

Section 5: Threats to Maui's dolphins
This section summarises the actual and potential human, and non-human, induced threats to the Maui's dolphin population on the west coast of the North Island.

Section 6: Ministry for Primary Industries' fishing-related management proposals
This section outlines the Ministry for Primary Industries proposals to manage fishing-related threats to the Maui's dolphin population.

Section 7: Department of Conservation non-fishing-related management proposals
This section outlines the Department of Conservation's proposals to protect Maui's dolphins by managing non-fishing-related threats to the population.

Section 8: Research, monitoring and collaboration
This section summarises current (2012/13) monitoring activities off the west coast of the North Island and outlines an annual planning process for determining future research and monitoring requirements. This section also discusses how the public (including tangata whenua, stakeholders, government agencies, ENGOs) can assist government in these areas to reduce human-induced threats to the Maui's dolphin population.

Sections 9 to 13: Appendices
This section provides additional information including maps, fisheries characterisation, economic impact assessments, and references.

3.0 Overview

3.1 WHAT IS THE HECTOR'S AND MAUI'S DOLPHIN THREAT MANAGEMENT PLAN (TMP)?

Hector's and Maui's dolphins are endemic to New Zealand and are considered to be one of the world's rarest dolphin species. They were gazetted in 1999 as a threatened species under the Marine Mammals Protection Act 1978. Maui's dolphins are listed as Nationally Critical under the New Zealand Threat Classification System, and Critically Endangered under the International Union for the Conservation of Nature Red List Categories and Criteria.

The government's Vision Statement[1] 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 Threat Management Plan (TMP) was developed in 2008[2]. The Hector's and Maui's TMP is led by the Department of Conservation (DOC) and the Ministry for Primary Industries (MPI). The TMP is not a statutory document; rather it is management plan that identifies human-induced threats to Hector's and Maui's dolphin populations and outline strategies to mitigate those threats.

The goals of the Hector's and Maui's dolphin TMP are to:

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

3.2 WHY ARE WE REVIEWING THE MAUI'S DOLPHIN PORTION OF THE TMP?

The Hector's and Maui's dolphin TMP is designed to:

- describe the nature and extent of threats to Hectors and Maui's dolphins; and
- put in place strategies to reduce those threats which are human-induced.

On 13 March 2012, in light of new information, the Minister for Primary Industries and the Minister of Conservation announced that the review of the Maui's dolphin portion of the TMP would be brought forward from 2013 and undertaken in 2012.

The review of the Maui's portion of the TMP will reconsider the management strategies and/or research that will support the recovery of the Maui's dolphin population. In considering how to deliver on the TMP goals for the Maui's portion the Minister for Primary Industries and Minister of Conservation each must consider and meet their legislative obligations. The relevant statutory considerations for the Minister for Primary Industries are described in Section 6, and for the Minister of Conservation in Section 7 of this document.

[1]The Vision Statement is derived from the DOC's Conservation General Policy.
[2] The previous Ministry of Fisheries and DOC: http://www.fish.govt.nz

3.2.1 New information available

3.2.1.1 Maui's dolphin mortalities

On 2 January 2012, a Hector's or Maui's dolphin died in a commercial set net off Cape Egmont, Taranaki ('the January mortality')[3]. The mortality was reported by the fisher to be a Hector's dolphin but the dolphin was not retained to confirm subspecies identity. It is however, not possible to visually distinguish between Hector's and Maui's dolphins. This mortality occurred outside of the area subject to fishing-related closures put in place during the 2008 TMP review.

On 26 April 2012, an unrelated dolphin stranding (cause of death was found to be natural) was discovered south of where the January mortality occurred (Kina Road Beach, near Opunake, Taranaki). DNA testing on this dolphin found it to be a Hector's dolphin.

Given the DNA findings from the Opunake stranding in April, the likely subspecies identity (a Hector's or Maui's dolphin) of the January mortality is equivocal.

3.1.1.2 Maui's dolphin abundance estimate

A new estimate of the population abundance of Maui's dolphins has been released by DOC[4]. The abundance of Maui's dolphins' over 1 year of age is estimated to be 55 (with a 95 percent confidence that the number of dolphins over 1 year old is between 48 and 69).

An updated Potential Biological Removal (PBR) estimate was commissioned by DOC based on the new population abundance estimate[5]. The PBR analysis estimates the maximum number of dolphins, not including natural mortalities, which may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population size with high probability[6].

The updated PBR analysis estimates the Maui's dolphin population can sustain one human-induced mortality every 10 to 23 years without impacting on its ability to rebuild to its optimum sustainable population size.

3.2.2 Risk assessment report

To support the review of the TMP, a risk assessment workshop was held in June 2012 with the purpose of identifying, analysing and evaluating all threats to Maui's dolphins found off the west coast of the North Island (WCNI)[7]. All new information on Maui's dolphin biology and potential threats was evaluated and incorporated in the risk assessment workshop process, and was used to estimate the level of impact and corresponding risk posed by these threats, individually and collectively. The risk assessment scoring was conducted by an expert panel of domestic and international specialists in marine mammal science and ecological risk assessment. The method for the risk assessment involved five key steps: defining Maui's dolphin distribution, threat identification, threat characterisation including the spatial distribution of the threat, threat scoring, and subsequent analysis.

The outcome of the panel's threat scoring was used to assess the cumulative impact and associated population risk posed by all threats combined (and also disaggregated the impacts

[3] Reported by-capture of a Hector's or Maui's dolphin off Taranaki: Nov 2011-Jan 2012 Incident Update.
[4] Hamner et al (2012): www.doc.govt.nz/documents/conservation/native-animals/marine-mammals/mauis-dolphin-abundance-estimate-report.pdf
[5] Wade et al Appendix 1 in Currey et al (2012).
[6] Wade (1998).
[7] Currey et al (2012).

of the respective threats) to identify those threats that pose the greatest risk to the Maui's dolphin. It also identified several threats that may have a low likelihood, but which, given the small population size of Maui's dolphins, may have detrimental consequences for the population. Further information on the risk assessment outcomes is discussed in Section 5.

3.3 SUMMARY OF MANAGEMENT OPTIONS AND OTHER TOOLS

A range of management options has been developed for consideration to manage the effects of human-induced mortality on Maui's dolphins. It is acknowledged, that:

- The nature and extent of human-induced threats to Maui's dolphins is still highly uncertain, due to gaps in available information.
- Through the Marine Mammals Protection Act 1978, and a range of other legislative instruments and policies (outlined in Section 7), the Minister of Conservation can consider and seek to put in place measures that may be necessary to manage species recovery to a viable population size throughout its natural range.
- The Minister for Primary Industries may, after consultation with the Minister of Conservation, take such measures he or she considers are necessary to avoid, remedy, or mitigate the effects of fishing-related mortality on any protected species.
- A precautionary approach is available to the Minister for Primary Industries when considering the extent to which utilisation threatens the sustainability of a protected species population[8].

MPI and DOC consider a combination of the tools available under the Fisheries Act 1996 and the Marine Mammals Protection Act 1978 will allow an integrated approach to the management of human-induced threats to the Maui's dolphin population. MPI and DOC consider an integrated approach is the best way to meet the goals of the review of the Maui's portion of the TMP.

A similar approach has been adopted in the past through the Hector's and Maui's TMP where both Acts were utilised to address and manage the fisheries-related and non-fishing-related risks, by MPI and DOC, respectively. It is recognised that MPI is better placed in terms of resourcing (primarily through fisheries officers and observers) to actively enforce and monitor any fishing restrictions. MPI control of fishing restrictions also removes regulatory duplication and any on the water confusion as to who enforces such restrictions. Although fishing restrictions could be put in place within a Marine Mammal Sanctuary under the Marine Mammals Protection Act 1978, for the purposes of the TMP it has been agreed by Ministers that fishing restrictions will be considered under the Fisheries Act 1996, which has stronger penalties and more capability for enforcement.

[8] The Court of Appeal (*Squid Fishery Management Co* v *Minister of Fisheries* (13 July 2004, CA39/04, para 79) has recognised that a precautionary approach is available to the Minister. The context of this case was the impact of squid fishing on the New Zealand sea lion population. This approach was followed by Mallon J in the High Court in 2009 when considering measures put in place to protect Hector's and Maui's dolphins (*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).

3.3.1 Fishing-related threat management options

Scientific and anecdotal information indicates fishing is the greatest known human-induced impact on Maui's dolphins. The risk of fishing-related mortality on Maui's dolphins is dependent on the degree to which fishing activity and Maui's dolphin distribution overlap. To address these risks a range of options to reduce the risk of fishing-related mortality for the Maui's dolphin population are considered, summarised below and explained in more detail in Section 6. For context on any place names referenced in the body of this paper, refer to Map 1 in Appendix 1.

Commercial and Amateur Set Netting (Coastal)	
Option 1	*Status quo*: Keep existing management, including the interim measures to: • retain the set net ban 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, and; • pay for observer services costs with Crown-funding. 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 ban 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, and; • require observer services costs to be cost-recovered from industry beginning 1 October 2013.
Option 3	• 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.

Commercial and Amateur Set Netting (Harbours)	
Option 1	*Status quo*: Keep existing management.
Option 2	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 3	• 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.

Commercial Trawling	
Option 1	*Status quo*: Keep existing management.
Option 2	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 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.

MPI also discusses additional sustainability measures that may support reducing the risk of fishing-related mortality on the Maui's dolphin population. These additional measures would be considered in conjunction with the broader options discussed above where they may further mitigate the potential fishing-related impacts on dolphins while allowing for the use of fisheries resources. The options discussed include:

(1) Fishing gear exemptions:
- Exclude some fishing methods from the set net prohibitions if they are likely to avoid, remedy or mitigate any adverse effects of fishing on the Maui's dolphin population.
- For example, exclude the activity of ring netting from the set net prohibitions in the Manukau Harbour, and other WCNI harbours.

(2) Finer spatial-scale reporting requirements for commercial set net fishers:
- Improve information on the distribution and intensity of fishing effort in areas of potential overlap with Maui's dolphin distribution.
- For example, require commercial set net fishers to report the start and end position of each set net they deploy.

(3) Changes to fishing behaviour practices:
- Consider changes to fishing behaviour or practices that are likely to avoid, remedy or mitigate any adverse effects of fishing on the Maui's dolphin population.
- For example:
  - reduce the total length and/or number of set nets that can be deployed at any one time,
  - introduce seasonal closures in the commercial and amateur set net fishery, and/or
  - introduce maximum headline heights for trawl nets.

Section 6 of this document provides more detail of each of these options.

3.3.2 Non-fishing-related threat management options

While fishing-related threats are the greatest known human-induced impact on Maui's dolphins, they are not the only potential source of impact. The risk assessment workshop held in June 2012 suggested that each of the non-fishing-related human-induced threat had between 30% and 60% likelihood of exceeding the PBR, even in the absence of all other threats[9]. To reduce the risk to Maui's dolphins from these threats a range of options are proposed, summarised below and explained in more detail in Section 7.

West Coast North Island (WCNI) Marine Mammal Sanctuary (MMS) Variation		
MMS Option 1	*Status quo*	No MMS variation
MMS Option 2	MMS extension	Extension of the WCNI MMS south to Hawera and offshore to 12 nautical miles

Options to reduce risk to Maui's dolphins from Seismic Surveying (SS), *option can be implemented in conjunction with any of the other options. See also Figure 7.1.		
SS Option 1	*Status quo*	Reliance on the Code of Conduct for seismic survey operations (the Code) and the existing MMS regulations.
SS Option 2a	Current Sanctuary + seismic restrictions consistent with Code	Maintaining the current sanctuary boundaries plus variation of the legal restrictions on seismic surveying within the MMS to be consistent with the Code.
SS Option 2b	Current Sanctuary + Seismic prohibition	Maintaining the current sanctuary boundaries plus a prohibition on seismic surveying operations within the MMS.
SS Option 3a	Extension of MMS + extension of seismic restrictions	Extend the MMS south to Hawera and offshore 12 nm plus extending the existing legal restrictions on seismic surveying operations within the MMS.
SS Option 3b	Extension of MMS + seismic restrictions consistent with Code	Extend the MMS south to Hawera and offshore 12 nm plus a variation of the legal restrictions on seismic surveying within the MMS to be consistent with the Code.
SS Option 3c	Extension of MMS + Seismic prohibition	Extend the MMS south to Hawera and offshore 12 nm plus a prohibition on seismic surveying operations within the MMS.
SS Option 4	Stand-along Regulations	Develop stand-alone regulations under the Marine Mammals Protection Act to regulate seismic operations.
SS Option 5 (additional)*	Prohibit petroleum mining	Prohibition of petroleum mining throughout the MMS. This option could be implemented in addition to one of the options 1 to 4 above.

[9] Currey et al (2012).

Options to reduce risk to Maui's dolphins from Seabed Mineral Exploitation (SME), *option can be implemented in conjunction with any of the other options. See also Figure 7.2.		
SME Option 1	*Status quo*	No change in MMS Restrictions in specified areas (4 nm core distribution area; 2 nm elsewhere).
SME Option 2a	Current Sanctuary + offshore limit 4 nautical miles	Maintain the current sanctuary boundaries plus extending the current mining restrictions to 4 nm offshore within the entire sanctuary.
SME Option 2a	Current Sanctuary + offshore limit 7 nautical miles	Maintain the current sanctuary boundaries plus extending the current mining restrictions to 7 nm offshore within the entire sanctuary.
SME Option 2c	Current Sanctuary + depth contour offshore limit	Maintain the current sanctuary boundaries plus extending the current mining restrictions to a suitable depth contour along the length of the entire sanctuary.
SME Option 3a	Extension of MMS + extension of mining restrictions to 2nm offshore	Extend the MMS south to Hawera and offshore to 12 nm plus extending the current mining restrictions to 2 nm offshore throughout the extension.
SME Option 3b	Extension of MMS + extension of mining restrictions to 4nm offshore	Extend the MMS south to Hawera and offshore to 12 nm plus extending the current mining restrictions to 4 nm offshore within the entire sanctuary.
SME Option 3c	Extension of MMS + extension of mining restrictions to 7 nautical miles offshore	Extend the MMS south to Hawera and offshore to 12 nm plus extending the current mining restrictions to 7 nm offshore within the entire sanctuary.
SME Option 3d	Extension of MMS + extension of mining restrictions to depth contour	Extend the MMS south to Hawera and offshore to 12 nm plus extending the current mining restrictions to a suitable depth contour along the length of the entire sanctuary.
SME Option 4 (additional)*	Moratorium on active mining	Moratorium on the active seabed mineral mining phase within the MMS, for the 5 year duration of the TMP. This option could be implemented in addition to one of the options 1 to 3 above.
SME Option 5	Code of Conduct	Develop a Code of Conduct for seabed minerals exploitation similar to that for seismic surveying.

Options to reduce risk to Maui's dolphins from Commercial Marine Mammal Tourism (CT), *option can be implemented in conjunction with any of the other options		
CT Option 1	*Status quo*	No regulatory change.
CT Option 2	Moratorium under the MMPR	A moratorium on commercial marine mammal tourism permits under the Marine Mammals Protection Regulations (MMPR) targeting Maui's dolphins.
CT Option 3	Restrictions within MMS	• No commercial tourism targeting Maui's dolphins. • No swimming with Maui's dolphins. • 10 minute time limit for opportunistic viewing for recreational boats, in addition to observing MMPR 18 to 20.
CT Option 4 (additional)*	Increased engagement and compliance	Increase education on MMPR 18 to 20; increase compliance and monitoring of marine mammal tourism in Maui's dolphins range.

Options to reduce risk to Maui's dolphins from Commercial Shipping (CS)		
CS Option 1	*Status quo*	No additional measures for commercial shipping.
CS Option 2	PSSA	Submission to International Maritime Organisation seeking Particularly Sensitive Sea Area (PSSA) designation, with measures such as heightened navigational controls or prohibition of all discharges.
CS Option 3	ATBA	Submission to International Maritime Organisation seeking Area to Be Avoided (ATBA) designation.

Options to reduce risk to Maui's dolphins from Marine Spills (Oil & Harmful Substance) (MS). A range of options could be implemented together.		
MS Option 1	*Status quo*	No additional action taken.
MS Option 2	Actively monitored zone	Using Automatic Identification System (AIS) technology for vessel related compliance purposes and to reduce risk of accidents that could cause oil and other spills in Maui's dolphins range.
MS Option 3	DOC involvement with OPAC	Active involvement in the Oil Pollution Advisory Committee (OPAC) to ensure that response planning includes consideration of Maui's dolphins.
MS Option 4	DOC involvement with OWR	Increased involvement with Massey University Oiled Wildlife Response (OWR) Team to ensure increased collaboration in responses and identification of research gaps, with respect to Maui's dolphins.

Options to reduce risk to Maui's dolphins from Land-based Activities and Coastal Development (CD). A range of options could be implemented together.		
CD Option 1	Maui's dolphins considered in resource consent applications	Advocating for Maui's/Hector's dolphin protection when consulted on any relevant resource consent applications.
CD Option 2	Engagement with Territorial Authorities and Regional Councils	Engaging with Territorial Authorities and Regional Councils during planning processes and reviews of plans to ensure adequate regard is given throughout known and potential Maui's dolphin range.
CD Option 3	NZCPS and CMS revision	Amending provisions in the New Zealand Coastal Policy Statement (NZCPS) and Conservation Management Strategies (CMS)s which direct councils to identify and protect Maui's dolphin habitat.
CD Option 4	Awareness in RMA process	Ensuring that teams responsible for Resource Management Act (RMA) consent processing are aware of the potential impacts of proposed activities on Maui's dolphins.
CD Option 5	Liaison regarding pollution	Identify sources of pollution that could threaten Maui's dolphins and promote appropriate controls to the administering bodies.

Options to reduce risk to Maui's dolphins from Thundercat Racing (TR). A range of options could be implemented together.	
TR Option 1	'Soft-start' concept similar to seismic surveying, gradually building up noise levels prior to the start of races to give dolphins the opportunity to leave the area.
TR Option 2	Specified practice areas/times.
TR Option 3	Posting of observers to look out for Maui's dolphins.
TR Option 4	Aerial observation of areas prior to race start to ensure no dolphins are in the area.

Options to reduce risk to Maui's dolphins from Surf Life Saving events (SLS). Both options could be implemented together.	
SLS Option 1	Ongoing engagement with Surf Life Saving clubs looking at educational options.
SLS Option 2	Utilising observers during competitions and/or training events to look out for Maui's dolphins.

Options to reduce risk to Maui's dolphins from Recreational boating (RB). A range of options could be implemented together.	
RB Option 1	Promotion and enforcement of the Marine Mammals Protection Regulations.
RB Option 2	Development of appropriate advocacy tools to support community engagement work.
RB Option 3	Targeted advocacy over summer months when recreational boaters are most active.
RB Option 4	Working with Maritime New Zealand and other boating interest groups (such as Coastguard, regional safe-boat forums, harbourmaster interest groups and boat shows) to effectively engage the target audience.

Options to reduce risk to Maui's dolphins from Scientific Research (SR). A range of options could be implemented together.	
SR Option 1	Regular engagement and training with scientists and DOC staff regarding best practice techniques for use on Hector's and Maui's dolphins.
SR Option 2	Ensuring anyone undertaking research is appropriately qualified.
SR Option 3	Strict adherence to current legislation and standard operating procedures.
SR Option 4	Developing stricter risk assessment protocols regarding permit processing.
SR Option 5	Research undertaken is guided by research priorities and a researching planning process (Section 8.1 for more details of options regarding research planning).
SR Option 6	Any research granted a permit has to be able to demonstrate clear benefits for the population and the gains MUST outweigh the risk.

Options to reduce risk to Maui's dolphins from Disease (D). A range of options could be implemented together.	
D Option 1	Ongoing necropsy of Maui's dolphins found beachcast to determine incidence of disease, including *Toxoplasma gondii*.
D Option 2	Research to understand the origin of *Toxoplasma gondii*, the impacts of it on the population, and whether there are ways to mitigate against it (see research, Section 8.2.1.2, for further details).
D Option 3	Engagement with stakeholder groups to raise awareness and encouraging safe practices to minimise the occurrence of *Toxoplasma gondii* getting into waterways and the sea.

3.4 RESEARCH, MONITORING, AND COLLABORATION

3.4.1 Research

MPI and DOC propose to develop an annual planning and review process to provide a more systematic procedure for determining future research and monitoring requirements to support management of the Maui's dolphin.

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 DOC and MPI 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, noting that due to small population size of the Maui's dolphin it will be difficult to reliably assess the effectiveness of current management measures.
- Outline approaches to address the information needs to assist DOC and MPI in developing research proposals or monitoring programmes for the following year(s).
- Review the performance (that is quality, deliverables, and targets) of any research projects and monitoring programmes that were undertaken and/or completed in the current year.

3.4.2 Monitoring

MPI proposes to continue 100 percent observer coverage in the set net fishery off the Taranaki coast between Pariokariwa Point and Hawera, as well as work with industry to develop an extensive monitoring programme in the WCNI trawl fishery.

MPI will also continue to work on compliance, and act on information from the public to determine where compliance with both mandatory and voluntary mitigation measures need to be improved.

DOC proposes to use a combination of boat and aerial surveys, community engagement programme and commercial fisher liaison programme to continue to improve information on Maui's dolphin distribution off the WCNI.

MPI and DOC propose the annual planning and review process for research also be used as a tool to develop effective and targeted monitoring programmes where information is most required.

3.4.3 Collaboration

3.4.3.1 Iwi Partnerships

MPI and DOC recognise their statutory and regulatory obligations to Māori and the important contribution made by tangata whenua to fisheries and non-fisheries management, and the wider environment.

The Fisheries Act 1996 provides for input and participation, consultation and regard to Kaitiakitanga. Section 4 of the Conservation Act 1987 recognises the obligations of the Crown to Māori as Treaty of Waitangi partners, providing the basis for government (among other objectives) to enable whānau, hapū and iwi to fulfil their kaitiakitanga responsibilities

towards Maui's dolphin, as one part of a broader responsibility for protecting the health of the marine environment.

MPI and DOC are seeking input from tangata whenua into the development, review and implementation of the TMP and encourage participation by whānau, hapū and iwi into the active protection of Maui's dolphins.

3.4.3.2 Other stakeholders

Furthermore, DOC and MPI consider the review of the TMP as providing a platform for all stakeholders to engage and take action to reduce threats to Maui's dolphins. To support this discussion DOC and MPI have listed some suggestions for various groups that share an interest in protecting this unique subspecies. Collaborative projects or initiatives may be possible where these groups have a shared interest in a region or on a particular activity. For example, there is uncertainty about Maui's dolphin distribution and use of the WCNI harbours, but the harbours and catchments are areas of intensive use in which tangata whenua and various stakeholder bodies have an interest.

Suggestions for collaboration include:

- Report sightings and strandings of dolphins.
- Review the named research priorities, comment on their suitability and undertake or support projects where possible.
- Provide input into the research planning process.
- Help develop better tools for reporting sightings or raising public awareness.
- Seek opportunities to collaborate with others, government, industry, community groups, whānau, hapū and iwi to increase the capacity of research.

3.5 IMPLEMENTATION

The updated Maui's portion of the Hector's and Maui's dolphin TMP will outline the management framework for managing human-induced threats to Maui's dolphins. The plan will outline: the biological characteristics, the vulnerability of the species to human-induced threats and provide a characterisation of those threats, the management measures in place to reduce the risk of human-induced mortality, and research and monitoring sections that provide both a framework for gathering and reviewing new information to update the plan.

The Minister for Primary Industries will consider all submissions and best available information on fishing-related-threats and the Minister of Conservation will consider all submissions and best available information on non-fishing-related threats. The Ministry for Primary Industries will, after consultation with the Minister of Conservation, decide on what management measures will be put in place to address fishing-related threats. The Minister of Conservation will decide what management measures will be put in place to address non-fishing-related threats.

The Minister for Primary Industries and Minister of Conservation can choose different management measures for each type of fishing or non-fishing-related threat, respectively, and could also choose to bring in measures immediately or over time. The Minister for Primary Industries decision(s) to address fishing-related threats will be based on the level of risk they consider appropriate for the Maui's dolphin population as a whole. Likewise for the Minister of Conservation who will choose management measures to address non-fishing-related threats.

Increased levels of monitoring (for example, observer coverage and/or electronic monitoring on fishing vessels) and research will be recommended to analyse the effectiveness of any management measures.

The resulting TMP for Maui's dolphins will contain those management measures agreed to by Ministers and will be available in 2013. The TMP will be of five years' duration and aspects such as the research and monitoring programmes will be subject to ongoing, annual review. As new information comes to light, the TMP may be modified at any stage to better reflect current understanding.

4.0 Context

This chapter provides a detailed summary of the biology of Maui's dolphins including information on its distribution off the west coast North Island. Its purpose is to summarise the latest scientific information that informs the fisheries-related management measures proposed in Section 6, and non-fishing-related management measures proposed in Section 7.

4.1 NEW ZEALAND'S MAUI'S DOLPHINS

4.1.1 Taxonomic status

Hector's and Maui's dolphins are endemic to New Zealand, meaning they are only found in New Zealand's waters. The species, *Cephalorhynchus hectori*, is divided into two subspecies (based on genetic and skeletal differences):

- *Cephalorhynchus hectori hectori* – Hector's dolphin, which occurs principally in South Island waters and occasionally off the west coast of the North Island, and
- *Cephalorhynchus hectori maui* – Maui's dolphin, which occurs in the waters off the north west coast of the North Island (WCNI). Map 1 in Appendix 1 shows the area referred to in this document as WCNI.

Maui's dolphins have been classified as distinct from the Hector's dolphin subspecies since 2002[10]. Prior to this time they were considered to be a geographically separate population of Hector's dolphins.

4.1.2 Physical description

Hector's dolphins and Maui's dolphins are not visually distinct and can only be differentiated through genetic testing or skeletal analysis. Hector's and Maui's dolphins are easily identified by their colouring (a combination of grey shading, creamy white and black), and a rounded ('Mickey Mouse' ear shaped) black dorsal fin[11]. The flippers have rounded tips and the body of the dolphin is stocky and well built.

4.1.3 Reproduction

Hector's and Maui's dolphins are short-lived with a maximum reported age of 22 years[12]. They also show a late onset of maturity. Females first give birth at age 7-9 years, while males tend to reach sexual maturity at age 6-9. Hector's and Maui's dolphins are slow breeders; females give birth to one calf every two to three years, although calving-intervals of between three to six years may occur[13].

4.1.4 Diet

Hector's and Maui's dolphins appear to feed mostly in small groups. The dolphins feed opportunistically, both at the bottom and throughout the water column and take a variety of species[14]. Surface schooling fish (for example, yellow-eyed mullet, kahawai) are eaten along with benthic fishes such as ahuru and red cod[15].

4.1.5 Social structure and behaviour

Maui's dolphins are generally found in small groups of four to five individuals, although

[10] Baker et al (2002); Pichler (2002); Hamner (2008)
[11] Jefferson et al (2008)
[12] Rayment et al (2009a)
[13] Slooten (1991); Bräger (1998)
[14] Slooten and Dawson (1988)
[15] Miller et al (2012)

larger aggregations (≥ 8 dolphins) are occasionally seen[16]. Group size of Hector's and Maui's dolphins appears to be smaller on average in winter than in summer[17]. While Hector's and Maui's dolphins form relatively closed groups of animals, within these groups of individuals both males and females tend to associate loosely with a relatively large number of other individuals within each group[18].

4.1.6 Abundance of Maui's dolphins

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 is between 48 and 252 individuals). However, the methods used in the two studies are not directly comparable.

The most recent abundance estimate of population size for the Maui's dolphin is 55 individuals over 1 year of age (with a 95 percent confidence that the number of dolphins over 1 year old is between 48 and 69)[19]. Other surveys that have estimated Maui's dolphin abundance occurred in 1985, 1998, 2001-02, and 2004 (Table 4.1).

Table 4.1. Estimates of abundance (N) and associated 95% confidence limits (CL) for Maui's dolphins based on small-boat surveys, aerial sighting surveys, and genotype capture-recapture (GCR) [20]. (Source: Wade et al in Appendix 1 in Currey et al (2012))

Reference	Survey source	Applicable year(s)	N	Lower CL	Upper CL
Dawson and Slooten (1988)	Small boat strip transect	1985	134	n.a.	n.a
Martien *et al.* (1999)	Small boat strip transect	1985[21]	140	46	280
Russell (1999)	Small boat	1998	80	n.a.	n.a.
Ferreira and Roberts (2003)	Aerial line transect	2001/02	75	48	130
Baker *et al.* (2012)	Small boat GCR	2002[22]	69	52	100
Slooten *et al.* (2006)	Aerial line transect	2004	111	48	252
Hamner *et al.* (2012)	Small boat GCR	2010/11[23]	55	48	69

There were no systematic surveys to estimate Maui's dolphin abundance prior to 1984-85. The 2012 population estimate for Maui's dolphins is lower than the 2004 estimate, but the methods used in the two studies are not directly comparable because of differences in the methods used.

[16] Oremus et al (2012)
[17] Rayment et al (2006)
[18] Bräger (1999); Slooten et al (1993)
[19] Hamner et al (2012): Abundance estimate was calculated using genetic mark recapture analysis.
[20] Genotype capture-recapture (GCR) is a method for assessing population status through repeated genetic sampling and identification of individuals and statistical analysis of individual sighting records.
[21] Note: The estimate and confidence intervals in Martien et al (1999) were recalculated from the sightings reported in Dawson and Slooten (1988); ie, these are not independently derived.
[22] Note: Calculated here with a two-sample, closed-population model using genotype capture-recapture from samples collected in the years 2001 and 2003, as reported in Baker et al (2012).
[23] Note: The estimate and confidence intervals do not include two individuals identified as migrant Hector's dolphins, based on genotype population assignment.

DOC and MPI acknowledge there is uncertainty associated with Maui's dolphin abundance estimates (as shown by the wide confidence limits for each abundance estimate). However, all Maui's dolphin abundance estimates signal that the population is very small[24].

4.1.7 Population trends of Maui's dolphins

Key Points

- Most recent 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.

There are no comparative abundance estimates to show population trends of Maui's dolphins over time. However, population modelling and genetic analyses do show that Maui's dolphin abundance has declined. It is important to note the ability to detect a decline in population size becomes increasingly difficult as population size decreases.

A series of population models estimated Maui's dolphin abundance off the WCNI between the 1970s to mid 1980s[25]. Results approximated that between 1970 and 1985 the abundance of Maui's dolphins in some parts of the WCNI (indicated by fishing statistical reporting areas) had reduced by 3 - 10 times. The models were based on back-calculations using an estimated set net entanglement rate, and data on bycatch from fishing effort and abundance estimates from 1985[26]. Therefore, the method used is subject to wide confidence limits because of the difficulty in estimating both historical and current fishing-related mortality rates.

Although the population modelling estimates have a high level of uncertainty they corroborate trends observed in Maui's dolphin abundance in later genetic analyses. [27] Genetic analyses have used two approaches to infer trends in Maui's dolphin population abundance:

1. Examination of the recent and historical estimates of genetic diversity in the population over time found:
    - Low genetic diversity in the Maui's dolphin population, indicated local group differences or loss of diversity due to local group decline.
    - The Tajima D statistic, a conservative measure of recent population bottlenecks[28], also supported the suggestion of a recent decline in this population[29].

2. Population modelling (of individuals over 1 year old) based on genetic mark recapture analyses[30], which estimated a(n):
    - annual survival rate of the population at 84 percent (with a 95 percent confidence that the annual survival rate is between 75 and 90 percent), and;
    - population decline of -3 percent per year (with a 95 percent confidence that the population change is between a -11 percent decline to +6 percent increase per year)

[24] Regardless of method used to calculate abundance.
[25] Note: Parameters in the modelling work typically include estimates of dolphin productivity, current abundance, and estimates of fishing-related mortality.
[26] Burkhart and Slooten (2003)
[27] Pichler and Baker (2000); Pichler (2002); Hamner et al (2012): All detected a decline in the genetic diversity of the Maui's dolphin population that is more consistent with a recent decline in abundance than with other factors like sex bias or loss of populations. DNA from museum specimens and living dolphins indicates the population has lost two thirds of the maternal lineage of its mitochondrial DNA.
[28] Tajima D statistic is a method for detecting evidence that a population has undergone a population bottleneck, or a rapid reduction in abundance that can result in reduced genetic diversity.
[29] Pichler (2002)
[30] Hamner et al (2012)

- with a 75.3 percent probability that the Maui's dolphin population is declining[31].

- The 2012 estimate is consistent with Maui's dolphins having a small population, and suggest a decline in population size over the last decade.

4.1.8 Distribution of Maui's dolphins off the WCNI as confirmed from DNA samples

Maui's dolphins are visually identical to Hector's dolphins. Sightings of Hector's and/or Maui's dolphins supported by collection of samples for genetic analyses allow the subspecies identity of the dolphin(s) observed to be verified. The distribution of Maui's dolphins based on DNA analysis is discussed in this section. DNA samples cannot always be collected from sightings. Section 4.1.9 discusses the distribution of Hector's and/or Maui's dolphins from all sightings and strandings records in this area, which can be used to infer distribution of the Maui's dolphin population.

The presence of Maui's dolphins (and Hector's dolphins that may travel up from parts of the South Island) off the WCNI has been confirmed[32] by genetic analyses (Table 4.2). This information has been used to develop a series of maps that display the location of sightings and strandings where Maui's dolphins have been confirmed (Maps 2 and 3, Appendix 1). More than 95 percent of the 91 Maui's and Hector's dolphins that have been genetically sampled off the WCNI between 2001 and 2012 were Maui's[33].

Table 4.2. Sources of distribution data where Maui's dolphins have been confirmed by DNA analysis.

Author(s) and/or Source	Season	Distance Offshore	Year	Area Covered
DOC (unpubl. historical data)	Various	Various	Various	Kaipara Harbour to Wellington Harbour
Pichler and Baker (2000)	Various	N/A	Various	Kaipara Harbour to Whanganui
Pichler (2002)	Various	N/A	Various	Kaipara Harbour to Whanganui
Baker et al (2012)	Spring/Summer	N/A	2001 to 2006	Kaipara Harbour to Tirua Point
Hamner et al (2012)	Summer	1 nautical mile	2010, 2011	North Kaipara to south Tirua Point

[31] Wade et al in Appendix 1 in Currey et al (2012)
[32] 'Confirmed' means a sample was taken from the observed or beach-cast dolphin for genetic testing to verify subspecies identity.
[33] Based on mitochondrial DNA and nuclear DNA testing. Sources: Baker et al (2012); Hamner et al (2012).

4.1.8.1 Maui's dolphin alongshore distribution

Key Points

- Historical samples indicate Maui's dolphins inhabited the New Plymouth and Taranaki regions as recently as 1989.
- Since 2001 all genetic sampling of live dolphins off the WCNI has occurred between the Kaipara Harbour and Raglan.
- 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.
    - Confirms the most southern sample of a live Maui's dolphin was north of Raglan in 2010.
    - Showed the maximum distance travelled by a single Maui's dolphin alongshore was approximately 80 km over a year, with several moving 30 to 40 km within days to a year.
    - Confirms the presence of Hector's dolphins off the WCNI, but that they represent less than 3 percent of live Hector's and Maui's dolphins sampled.

Historical evidence confirms the Maui's dolphin population off the WCNI occupied a much larger geographic range– including the Taranaki, Whanganui, and Wellington coastal regions (Table 4.3)[34]. Maui's dolphin stranding records point to a contraction in alongshore distribution off the WCNI in recent history that may be coincident with a decline in abundance.

Since 2001, Maui's dolphin sightings and beachcast/stranded have been confirmed along the coast between the Kaipara and Raglan Harbours (Maps 2 and 3 in Appendix 1). The highest concentration of confirmed sightings is found between Manukau Harbour and Port Waikato within 1 nautical mile of the coast. This area is commonly described as the 'core range' for Maui's dolphins, and is supported by recent genetic sampling[35].

All of the genetic sampling of live dolphins conducted between 2001 and 2011 occurred along the coast between the Kaipara Harbour and Raglan[36]. Tissue samples were collected from dolphins observed in this area from January 2001 to March 2011, with most survey effort occurring within 1 nautical mile[37] of the coast (Map 4 in Appendix 1). A total of 89 individuals were sampled alive or dead in this area and time period, including:

- 35 Maui's dolphins sampled alive between 2001 and 2006;
- 32 Maui's dolphins sampled alive between 2010 and 2011;
- 7 Maui's dolphins sampled in both the 2001-06 and 2010-11 periods;
- 13 Maui's dolphins sampled after death between 2001 and 2011, and;
- 2 Hector's dolphin migrants sampled alive between 2010 and 2011.

In summary, the available information indicates that most Hector's and Maui's dolphins observed off the WCNI (particularly between the Kaipara Harbour and Raglan) are likely to be Maui's dolphins.

Southern Distribution

Only one Maui's dolphin has been sampled south of Raglan since 1989. In 2000 a beachcast

[34] Some historical samples are held at Te Papa Tongarewa, and Puke Ariki museum in Taranaki.
[35] Baker et al (2012), Hamner et al (2012)
[36] Note: The area surveyed extended along the WCNI from North Kaipara to south Tirua point.
[37] Oremus et al (In press): In the 2010 and 2011 surveys approximately 6% of survey effort occurred between 1 and 3 nm offshore.

Maui's dolphin was found in Albatross Bay, Kawhia Harbour. However, historical samples confirm Maui's dolphins occupied the Taranaki region, and were present further south in the Taranaki, Whanganui and Wellington regions (Table 4.3).

Table 4.3. Historical locations of beachcast or stranded Maui's dolphins (subspecies confirmed by genetic testing) found south of Raglan; date of collection ordered by most recent. Source: DOC Hector's and Maui's Incident database[38].

Location	Date
Albatross Bay, Kawhia Harbour, Waikato	5 March 2000
Urenui Beach, Taranaki	12 November 1989
Opunake Beach, Taranaki	8 April 1989
Tongaporutu River, Taranaki	27 September 1988
Oakura Beach, Taranaki	28 August 1974
Castlecliff, Whanganui	1 May 1921
Wellington Harbour	1873

Since 2001 when genetic sampling of live dolphins began, the most southern confirmation of a Maui's dolphin occurred just north of Raglan Harbour in 2010. The uncertainty over whether Maui's dolphins occur south of Raglan comes from the limited genetic sampling south of Raglan since 2001 to confirm subspecies identity where Hector's and/or Maui's dolphins have been observed. Notably Hector's and/or Maui's dolphins have been observed south of Raglan; these sightings are discussed in Section 4.1.9.

Genetic sampling has also established that the home range of Maui's dolphins is greater than previously believed[39]. The maximum distance travelled by a single individual sampled alongshore was 80 km (over a 375 day period), and several dolphins moved in the order of 30 to 40 km (over 3, and up to 363, day periods).

4.1.8.2 Maui's dolphin distribution offshore

Investigations of offshore distribution of Maui's dolphins relies primarily on aerial surveys, meaning sightings may be of Hector's and/or Maui's dolphins as no tissue samples are collected.

The alongshore boat surveys used to conduced biopsy analyses have been concentrated within 1 nautical mile from shore to maximise the likelihood of encounters with groups of dolphins[40]. The objective of the biopsy surveys has been to use genetic capture-recapture to provide estimates of population abundance and trends, rather than establish offshore distribution of Maui's.

4.1.8.3 Maui's dolphin distribution in harbours

Key Points

- Two Maui's dolphins have been found in the WCNI harbours (confirmed by genetic analysis).
    - One dolphin was found beachcast in Kawhia Harbour in 2000.
    - The second dolphin died as a result of entanglement in a net in the entrance of the Manukau Harbour in 2002.

[38] www.doc.govt.nz/dolphinincidents
[39] Hamner et al (2012)
[40] Baker et al.(2012); Hamner et al (2012)

There are two confirmed Maui's dolphins that have been found in the WCNI harbours. The first was a beachcast Maui's dolphin found in Albatross Bay, Kawhia Harbour, in 2000[41]. The second Maui's dolphin was found entangled (likely in a recreational set net) and floating in the Manukau Harbour entrance in 2002[42].

All other available research (including acoustic detections) and sighting information in WCNI harbours does not include supporting genetic analysis to confirm subspecies identity and are therefore addressed in Section 4.1.9.

4.1.9 Distribution of Hector's and/or Maui's dolphins from all data types[43]

4.1.9.1 Sightings sources

Most sightings of Hector's and/or Maui's dolphins during research surveys, and by public and government officials (e.g. conservancy or fishery officers) do not include sampling to confirm subspecies identity. This means the dolphin sightings could be either Maui's or Hector's. Locations of these sightings are shown on Maps 4 (research effort), Map 5 (public sightings) and Map 6 (harbours) in Appendix 1.

Available information on the distribution of Hector's and/or Maui's dolphins off the WCNI (summarised in Table 4.4) includes research survey sightings, sightings by government staff, and public sightings.

Sightings information for Hector's and/or Maui's dolphins off the WCNI from 2000 to 2009 was summarised in 2010[44.] In addition, DOC holds their Hector's and Maui's dolphin sightings information in the DOC sightings catalogue[45]. Both sources contain sighting information from regional DOC offices records, independent research study sightings, DOC-led surveys, government officials (DOC and Ministry of Fisheries/Ministry for Primary Industries staff), and the public.

Table 4.4. Sources of recent distribution data for Hector's and/or Maui's dolphins, (adapted from Du Fresne 2010).

Author(s) and/or Source	Season	Distance Offshore (nautical miles)	Year	Area Covered
Ferreira and Roberts (2003)	Summer	5	2000/01 and 2001/02	North Cape to Paraparaumu
Slooten et al (2005) Slooten et al (2006)	Summer, Winter	5 or 10	2004	Maunganui Bluff to New Plymouth
Scali (2006)	Winter	10	2006	Muriwai to Carters Beach
Rayment and Du Fresne (2007)	Spring	10	2007	Muriwai to Carters Beach
Childerhouse et al (2008)	Winter	10	2008	Muriwai to Carters Beach
Stanley (2009)	Winter	10	2009	Baylys Beach to Kawhia Harbour
DOC (unpubl. data)	Various	Various	Various	Sightings made during various alongshore surveys, in addition to recent harbour-focused efforts
DOC (unpubl. data)	Various	Various	Various	Opportunistic sightings reported by members of the public

[41] Duignan et al (2003). Dolphin was too decomposed to determine its cause of death, but signs of recent feeding suggested a sudden death, which the authors speculate may possibly relate to entanglement.
[42] The entrance area of the Manukau Harbour has been closed to recreational and commercial set netting since 2003.
[43] All WCNI research, sightings, strandings, and acoustic detection data are discussed including where subspecies identity is not confirmed.
[44] Du Fresne (2010)
[45] Before identification of the Maui's dolphin subspecies in 2002, Maui's dolphin sightings and mortalities on the WCNI were generally recorded as North Island Hector's dolphins. The first sighting was reporting in 1922, however, regular sightings began in the 1970s.

4.1.9.2 Sightings reliability

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 (Table 4.5). That is, the sightings observed are that of the Hector's and/or Maui's dolphins and not any other dolphin species. The scale of reliability is a continuum from most reliable (and least uncertain, that is Category 1) to least reliable (and most uncertain or likely another species, that is a Category 5)[46].

Table 4.5. Categories for ranking the reliability of sightings of Hector's and/or Maui's dolphins off the west coast of the North Island. Examples provided do not cover the full range of possible sightings for each category.

Category	Description	Examples
1	Report from a source of known reliability; or High quality photo with landmark; or High quality photo with no landmark but detailed description of location.	Duplicate research sightings Research sightings made by an individual researcher
2	Description provided that is consistent with a Hector's and/or Maui's dolphin, detailed location description and/or GPS position.	DOC or MPI staff sighting with GPS position Verified public sighting with GPS position
3	Description provided that is consistent with a Hector's and/or Maui's dolphin, but the location is outside the known current range of the species.	Research sightings made by individual 'inexperienced' researcher Sighting made from an oil platform, further offshore than regularly observed
4	Description is inconsistent with a Hector's and/or Maui's dolphin.	Unverified public sightings with or without GPS position
5	The report is for a South Island location (Hector's dolphin); or The report is incomplete. The interview does not enable the report to be scored in any of the previous categories; or The interview was not able to be conducted; or The report is another dolphin species.	Any sighting without GPS position given. Any sighting with an unreliable GPS position given. Sighting information is unverifiable or consistent in describing another species.

Research surveys are undertaken using standardised protocols and methods, which are conducted by trained observers specifically looking for Hector's and Maui's dolphins. Within research survey sightings, those made by two observers of the same individual dolphin or group of dolphins (known as a 'duplicate' sighting) provides the greatest level of certainty[47].

Anecdotal public sightings are largely subjective and their robustness is more difficult to quantify than scientific information. Most public sightings of Hector's and/or Maui's dolphins have been recorded within 4 nautical miles from shore, as most recreational activities occur close to shore. Public sightings are subject to a systematic validation procedure. Those sightings given high scores are more reliable than unverified public sightings (for example, Categories 1 and 2 versus 4 and 5). Public sightings within the DOC sightings catalogue have been subjected to a systematic validation procedure since 2004.

Verification of public sightings considers whether evidence of the sighting is provided and

[46] Note that the reliability scale is not linear with research sightings considerably more reliable than DOC and Ministry staff sightings. Verified public sightings vary in their reliability depending on the category given during the verification process. Unverified public sightings and any without a GPS position are much less reliable than sightings made by researchers, or DOC and Ministry staff.

[47] For example, Rayment and Du Fresne (2007)

previous track record of accurate sightings[48]. The validation procedure includes interviews conducted either by DOC staff or an experienced marine mammal scientist using a standardised interview process. From June 2012 all validation interviews have been undertaken by an independent marine mammal scientist.

Verified public sightings provide the most robust anecdotal evidence about Hector's and/or Maui's dolphin distribution (Map 5 in Appendix 1 shows the public sightings that have been verified as Category 1, 2, or 3, indicating a higher reliability). Details of sighting information relevant to discussion of alongshore, harbour, and offshore distributions are discussed below.

4.1.9.3 Hector's and/or Maui's dolphins alongshore distribution off the WCNI

Key Points

- The most southern sighting by DOC staff of a Hector's and/or Maui's dolphin was just south of the Mokau River.
- Public sightings of Hector's and/or Maui's dolphins have been reported throughout the Taranaki region, and includes two sightings supported by video/photographic evidence

Most Hector's and/or Maui's dolphin sightings occur between the Kaipara and Raglan Harbours (Maps 4 and 5 in Appendix 1). The highest concentration of sightings is found between Manukau Harbour and Port Waikato within 4 nautical miles of the coast.

Two live Hector's dolphins have been genetically sampled between the Kaipara Harbour and Raglan. In addition, two Hector's dolphin mortalities off the WCNI have been confirmed (one in the Manukau Harbour in 2011, and the other stranded on Kina Roach Beach near Opunake, south of Cape Egmont in 2012).

In summary, the available indicates that most Hector's and/or Maui's dolphin sightings off the WCNI occur along the coast between the Kaipara Harbour and Raglan.

Southern Distribution
Historical strandings of Hector's and/or Maui's dolphins off the WCNI have been found in the Taranaki, Whanganui, and Wellington coastal regions (Table 4.6). No samples were taken to confirm subspecies identity of these individuals.

The most southern sighting by DOC staff of a Hector's and/or Maui's dolphin was reported just south of the Mokau River in 2008 (DOC, unpublished). Public sightings of Hector's and/or Maui's dolphins have been reported to DOC from north of the Kaipara Harbour south throughout the Taranaki area (Map 5 in Appendix 1).

[48] Russell (2008)

Table 4.6. Historical locations of beachcast or stranded Hector's and/or Maui's dolphins (subspecies identity unknown) found south of Raglan; date of collection ordered by most recent. Source: DOC Hector's and Maui's Incident database.

Location	Date
Oakura Beach, Taranaki	6 December 1988
Castlecliff, Whanganui River, Whanganui	11 March 1988
Onareo Beach, Taranaki	14 December 1985
Onareo Beach, Taranaki	17 April 1979
Mokau River Mouth, Taranaki	11 March 1979
Tongaporutu River, Taranaki	5 February 1979
Waiiti, Taranaki	26 January 1979
Oakura Beach, Taranaki	24 August 1975
Pukearuhe, Waiiti, Taranaki	1 January 1973
Waikanae, Kapiti Coast	1 January 1967
Nukuhakari Beach, Waikato	20 December 1953

The alongshore distribution of Maui's dolphins off the WCNI may extend further south than Pariokariwa Point and Oakura; the southern boundaries of the fishing-, and non-fishing-, related management measures, respectively, put in place after the 2008 TMP. Information to support this includes the:

- historical samples from stranded and beach-cast Maui's dolphins in the Taranaki, Whanganui and Wellington regions;
- southern most sighting of Hector's and/or Maui's dolphins by DOC staff, and maximum travel distance by Maui's dolphins observed to date;
- public sightings of Hector's and/or Maui's dolphins reported south of Pariokariwa Point and in the Taranaki Bight, which include two Category 1 sightings, both of which were supported by video/photographic evidence[49], and;
- the mortality of a Hector's or Maui's dolphin in a commercial set net off the coast of Cape Egmont.

The uncertainty over whether Maui's dolphins occur south of Pariokariwa Point and Oakura comes from the:

- lack of research sightings in the area;
- small number of verifiable public sightings, and;
- limited amount of genetic sampling south of Raglan to confirm subspecies identity where Hector's and/or Maui's dolphins have been observed.

This uncertainty is influenced by a range of factors, including:

- the small population size;
- the snap shot nature of research surveys (as they are undertaken for a limited period and reliant on suitable weather/sea conditions);
- the lower amount of research survey effort south of Raglan and especially south of New Plymouth (that is, more effort has been focused where observations are more likely to occur), and;
- genetic evidence confirming a Hector's dolphin stranding in the Taranaki region south of Pariokariwa Point.

[49] One sighting occurred south of Waiongona (south of Waitara) in 2009 and the other in Port Taranaki in 2007.

4.1.9.4 Hector's and/or Maui's dolphin offshore distribution

Key Points

- Research on the offshore distribution of Maui's dolphins relies heavily on aerial surveys, which means sightings may be of Hector's and/or Maui's dolphins as no tissue samples are collected for genetic testing.
- Research and government/public sighting information suggests that Hector's and/or Maui's dolphins off the WCNI are most prevalent in the area from shore to 4 nautical miles offshore.
- There have been seven aerial research surveys across six years that included areas beyond 4 nautical miles offshore of the WNCI. The most reliable survey sightings observed five separate occurrences of Hector's and/or Maui's dolphins outside 4 nautical miles.
- Best available information suggests Hector's and/or Maui's dolphins off the WCNI are present in the area beyond 4 nautical miles from shore, although the extent of their presence is unknown

Research and sighting information suggests that Hector's and/or Maui's dolphins off the WCNI are most prevalent in the area between shore and 4 nautical miles, but are also sometimes present in the area beyond 4 nautical miles from shore. There have been seven aerial research surveys across six years that included areas beyond 4 nautical miles off the WCNI. These surveys sighted nine separate occurrences of Hector's and/or Maui's dolphins outside 4 nautical miles; the validity for which four is more uncertain (Table 4.7).

Table 4.7. Distance offshore of the west coast North Island where Hector's and/or Maui's dolphins have been reported more than 4 nautical miles offshore during aerial research surveys, and by the public between 1982 and 2009 (listed from most to least reliable).

Description	Distance offshore (nautical miles)	Date	Source
Duplicate research sighting	4.05**$^{\infty}$	October 2007	Rayment and Du Fresne (2007)
Single research sighting	4.30*$^{\infty}$	May 2008	Childerhouse et al (2008)
	4.49*$^{\infty}$	August 2006	Scali (2006)
	6.18*$^{\infty}$	June 2009	Stanley (2009)
	6.87$^{\infty ?}$	August 2006	Scali (2006)
Verified public sighting with GPS	8.65	February 2002	DOC catalogue #226
Single research sighting (inexperienced observer)	8.20*$^{\varphi}$	August 2006	Scali (2006)
	9.20*$^{\varphi}$	August 2006	Scali (2006)
	9.70*$^{\varphi}$	August 2006	Scali (2006)
	10.30*$^{\varphi}$	August 2006	Scali (2006)
Unverified sightings with GPS	4.28	July 2004	DOC catalogue #202
	5.33	April 2009	DOC catalogue #560
	67.17	April 1982	DOC catalogue #4641
Unverified sightings with no GPS	5.00	February 2009	WWF 2010

** Indicates a duplicate research sighting of Maui's dolphins

*Indicates a single researcher sighting of Maui's dolphins

$^{\varphi}$ Indicates a less reliable sighting due to concerns about observer inexperience (Scali 2006)

$^{\infty}$Indicates a more reliable sighting by appropriately experienced observers under suitable survey protocols (Du Fresne 2010).

The only duplicate sighting of Hector's and/or Maui's dolphins beyond 4 nautical miles from shore occurred during the 2007 survey, where two researchers saw the same two Hector's and/or Maui's dolphins at 4.05 nautical miles from shore[50].

Some surveys have not resulted in any sightings beyond 4 nautical miles[51]. However, these surveys predominantly sampled in summer and observations suggest that the Hector's and/or Maui's dolphins observed off the WCNI are distributed further offshore more often during winter than summer[52]. For example, one study found most summer sightings (75 percent) occurred within one nautical mile of shore, compared to 33.3 percent in the winter[53]. However, the maximum offshore distances between summer and winter were similar at 3.09 and 3.33 nautical miles, respectively. In addition, the aerial and boat-based surveys have also focused a greater amount of effort within 5 nautical miles from shore, thereby limiting their ability to detect any Hector's and/or Maui's dolphins offshore beyond 4 nautical miles.

There are uncertainties associated with some of the offshore sighting's information. The Scali (2006) survey highlighted some concerns with the validity of the findings[54]. However, although the survey was not formally peer reviewed, both DOC and an independent researcher[55] consider the survey design to be consistent with the design of peer reviewed surveys that are considered reliable[56]. Two sightings reported by Scali (2006) at 4.49 and 6.87 nautical miles from shore were made by researchers considered to be experienced, and are considered to be reliable. Other sightings beyond 4 nautical miles from shore (those at 8.20, 9.20, 9.70 and 10.30 nautical miles) were considered unreliable due to concerns about observer inexperience although they had undertaken some training[57].

Research establishing that Hector's and Maui's dolphins prefer waters within the 100 m depth contour has only been undertaken for Hector's dolphins on the South Island, which has shown that dolphins can regularly be seen out to the 100 metre depth contour[58]. It is, however, unknown how significant the 100 metre depth contour is to the distribution of Maui's dolphins off the WCNI. Aerial and boat surveys have observed Maui's most often within 4 nautical miles of shore and present out to 7 nautical miles. The observations reported beyond 7 nautical miles are considered less reliable. It is unknown what the offshore limit is of Maui's dolphins, and how often and how far they may travel offshore. The ability to detect these limits is difficult given their low abundance.

The uncertainty over whether Maui's dolphins off the WCNI make infrequent visits outside 4 nautical miles comes from a relatively small number of research sightings beyond 4 nautical miles. This uncertainty may be influenced by a range of factors, including the:

- small population size;
- snap shot nature of boat-based and aerial surveys (that are undertaken for a limited period and reliant on suitable weather/sea conditions);
- limited survey effort past 4 nautical miles (ie, more effort has been focused on

[50] Rayment and Du Fresne (2007)
[51] Documented by Ferreira and Roberts (2003), Slooten et al (2005, 2006)
[52] Slooten et al (2006)
[53] Slooten et al (2005)
[54] Concerns included: the relatively high number of Maui's dolphin sightings in one flight when sea conditions were not perfect and that many of the sightings happened further offshore than expected. The researcher also noted a high inconsistency between observers, suggesting that inexperience of some of the surveyors may have contributed to these inconsistencies and to the uncertainty around the findings in general.
[55] Du Fresne (2010)
[56] For example: Ferreira and Roberts (2003), Slooten et al (2005), Slooten et al (2006)
[57] Du Fresne (2010)
[58] Rayment et al (2010); Du Fresne and Mattlin (2009)

alongshore distribution);
- limited survey effort conducted in winter (changes in Hector's and/or Maui dolphin behaviour and distribution seasonally is uncertain), and;
- lack of genetic analyses to confirm that sightings from aerial surveys are solely Maui's dolphins.

In summary, the available information indicates that Hector's and/or Maui's dolphins observed off the WCNI are sometimes present beyond 4 nautical miles from shore although the extent of their presence in this area is unknown.

4.1.9.5 Hector's and/or Maui's dolphin distribution in harbours

Key Points

- Research sightings of Hector's and/or Maui's dolphins have occurred in the entrances of the Manukau, Raglan, Aotea and Kawhia harbours.
- Acoustic detections of Hector's and/or Maui's dolphins include:
    - A single acoustic detection recorded in the Kaipara Harbour in 2007 approximately 10 km south of the harbour side of the entrance beyond the current set net prohibitions.
    - A total of 37 acoustic detections recorded in the Manukau Harbour in 2005 and one acoustic detection in 2007 within the current set net ban area.
- Public sighting information is variable, but suggests Hector's and/or Maui's dolphins occasionally travel within the harbour entrances.
- There is no information to indicate how often or how far Hector's and/or Maui's dolphins observed may travel into WCNI harbours beyond the entrances.

Information suggests that Hector's and/or Maui's dolphins do use WCNI harbours, although the frequency and extent of that use is unknown[59]. There have been two boat surveys[60] and one acoustic survey programme[61] that have sampled within harbours to determine the distribution of, or use by, Hector's and/or Maui's dolphins.

In addition there have been some reported sightings of Hector's and/or Maui's dolphins by both the public and government officials in WCNI harbours, particularly in the entrances or channels (Map 6 in Appendix 1). This information is summarised in Table 4.8[62].

[59] In addition to the Maui's dolphin mortalities discussed above (section 4.1.8.3) there was a Hector's dolphin mortality recorded in the Manukau Harbour in 2012.
[60] Hamner et al (2012): Undertaken during the 2010 and 2011 February – March periods.
[61] Rayment et al (2011): Monitoring was partitioned into austral summer (October – March) and austral winter (April – September) among four harbours (Kaipara, Manukau, Raglan, and Kawhia) between October 2005 and August 2008.
[62] Baselines used to define the boundaries of harbour entrances (obtained from LINZ – Land Information New Zealand) were used to determine what sightings occurred within the harbours. They do not differentiate between sightings in channels, at the entrance or mouths given the variability in how these descriptions could apply to each harbour.

Table 4.8. Hector's and/or Maui's dolphin sightings (public, research, government) or acoustic detections in the WCNI harbours.

Information	Kaipara	Manukau	Raglan	Aotea/Kawhia
Public sightings[63] (All categories, 1922 to present)	9	38	43	1 7
Public sightings, (Categories 1-3, 2004 to present)	3	3	9	0
Research sightings	1	17 (not incl. acoustic)	2	4
DOC/MPI sightings	0	3	6	1
Acoustic surveys	1 detection	38 detections	0	0

The use of acoustic monitoring methods often has higher detection rates for target species that are cryptic or occur at low densities than the use of visual surveys[64]. The detection range for T-PODS[65] provides for limited spatial coverage (for eample, an effective detection radius of ~198 metres and a maximum detection range of ~431 metres). This means a dolphin needs to be relatively close and oriented towards the T-PODS to be detected[66].

Passive acoustic monitoring[67] has detected Hector's and/or Maui's dolphins inside the Manukau and Kaipara Harbours[68]. The T-POD data showed a single acoustic detection occurred in the Kaipara Harbour (2006) approximately 10 km inside the Kaipara harbour, south of South Head. The detection radius of the T-PODS shows the Hector's or Maui's dolphin was well inside the Kaipara Harbour beyond the area currently subject to fishing-related restrictions. There were 38 acoustic detections in the Manukau Harbour; 37 detections were recorded in November 2005 (on 5 different days, 4 of which were consecutive) and a single detection in November 2007. All the Manukau Harbour detections occurred in the entrance area currently subject to fishing-related restrictions.

In summary, the available information suggests that Hector's and/or Maui's dolphins have entered the Kaipara, Manukau, and Raglan Harbours, although the frequency and extent of the use of those harbours is unknown and unable to be inferred from presently available information. The uncertainty in Hector's and/or Maui's dolphins' use of WCNI harbours is influenced by a range of factors, including the:

- small population size;
- lack of genetic sampling to confirm subspecies of Hector's and/or Maui's dolphins sighted or acoustically detected in the harbours;
- snap shot nature of aerial or boat-based surveys (that are undertaken for a limited period and reliant on weather/sea conditions), and;
- limited survey effort in WCNI harbours, particularly the Raglan, Kawhia and Aotea harbours.

[63] Sighting reliability is category 3, outside current known range of Hector's and/or Maui's dolphin distribution off the WCNI
[64] Mellinger et al (2007)
[65] T-PODS are an instrument used for detecting and logging dolphins and whales by listening to the noises they make.
[66] Rayment et al (2009b)
[67] Passive acoustic monitoring means inactively listening to the sources of sound.
[68] Rayment et al (2011). The detections recorded in the harbours may have underestimated the presence of Maui's dolphins based on the methods and decision rules used to classify the detections. A large number of detections were excluded because of spurious noise generated by non-biological noise (for example, sediment noise created by waves or tidal movements) that masked genuine dolphin noise or created false detections.

4.1.10 Status of the species

Key Points

- Maui's dolphins are a threatened species in New Zealand
- Under the New Zealand Threat Classification System they are classified as Nationally Critical
- Under the International Union for the Conservation of Nature Red List Categories and Criteria they are classified as Critically Endangered
- Both classifications indicate the Maui's dolphin is facing a high risk of extinction

Maui's dolphins were declared a "threatened species" by the Minister of Conservation in 1999. In addition to their threatened species status, there are two classification systems that have been applied to the Maui's dolphin population: the New Zealand Threat Classification System and the International Union for the Conservation of Nature (IUCN) Red List Categories and Criteria.

The New Zealand Threat Classification System has been developed by the DOC and sets out a system for classifying species according to the threat of extinction using criteria that has specifically been developed for New Zealand[69]. There are seven rankings within the Threat Classification System. The highest ranking is Nationally Critical, followed by Nationally Endangered through to the lowest ranking, Range Restricted. Maui's dolphins were given a threat ranking of Nationally Critical and their survival and recovery is considered Conservation Dependent[70]. The four main parameters used to assign threat ranking were total population size, population trend, geographical range, and whether the subspecies has been directly or indirectly affected by humans[71].

The second classification system that applies to Maui's dolphins is the International Union for the Conservation of Nature (IUCN) Red List Categories and Criteria. This is the international system for classifying species at high risk of global extinction. There are seven categories described for ranking species according to the IUCN Red List and Categories Criteria. In order of severity these are: Extinct, Extinct in the Wild, Critically Endangered, Endangered, Vulnerable, Near Threatened, and Of Least Concern. Under the criteria, Maui's dolphin has been classified as Critically Endangered, such that the best available evidence indicates that this subspecies is considered to be facing an extremely high risk of extinction.[72]

Both of these threat classifications indicate that active management is required to mitigate human impacts.

4.1.11 Social and cultural value of Hector's and Maui's dolphins

Hector's and Maui's dolphins are found only in New Zealand waters and are New Zealand's only endemic dolphin species. As one of the world's rarest dolphins, they are viewed as a very special component of New Zealand's and the world's marine biodiversity. With the increase in public awareness of the marine environment and our knowledge of marine species and ecosystems, Hector's and Maui's dolphins have become a symbol of marine species conservation in New Zealand.

[69] Molloy et al (2002)
[70] Baker et al (2010): Conservation Dependent means the subspecies is likely to move to a higher threat category if current management ends.
[71] Townsend et al (2008)
[72] Reeves et al (2008)

Hector's and Maui's dolphins are revered as a taonga by Maori. Tutumairekurai is the most common of the Maori names for Hector's and Maui's dolphins, meaning ocean dweller. Some Maori believe that the spirits of the dead become tutumairekurai. Te Aihe a Maui, Te ika a Maui, Papakanua, Tūpoupou, Popoto, and Upokohue are other names also used.

Social values relating to Hector's and Maui's dolphins have been reflected:

- in government policy[73];
- in petitions to parliament and letters to Ministers about the conservation of Hector's and Maui's dolphins, and;
- through general social commentary in the media.

In general, there is an expressed desire for greater Maui's dolphin abundance and fewer (or no) human-induced deaths.

New Zealand is internationally recognized for its management of the marine environment. In particular, it is known for its stance on marine mammal issues such as whaling and has a strong presence in the international community regarding marine mammal protection and conservation issues. New Zealand's management of marine mammals in national waters is therefore of significant international interest.

[73] Conservation General Policy 2005, 4.4(f) *Protected marine species should be managed for their long-term viability and recovery throughout their natural range*.

4.2 VULNERABILITY OF THE MAUI'S DOLPHIN POPULATION 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 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.

The following biological characteristics of Maui's dolphins make them vulnerable to the effects of human-induced mortality. Maui's dolphins:

1. Become sexually mature at a relatively late age (about 7-9 years).
2. Are relatively short lived (up to 22 years).
3. Have a low reproductive rate (a female has a single calf every 2-3 years).
4. Favour shallow waters less than 100 m deep and have a localised inshore distribution (i.e. overlap with many human coastal activities).
5. Have a small population (and consequently may have few breeding females).

The Maui's dolphin population appears to be maintaining an equal sex ratio, or potentially a slight female bias, which would potentially be favourable for reproduction. However, even if one assumes an even sex ratio, the number of mature females may be less than one quarter of the population, resulting in extremely low productivity potential.

Small population size couple with low productivity may suppress the population growth rate even in the absence of human-induced mortality. Depensation and stochastic events (for example, disease and catastrophic weather) may remain very real extinction threats[74].

In addition to having a low population growth rate, Maui's dolphins appear to more frequently undertake small-scale movements rather than large-scale movements, which could increase their susceptibility to population fragmentation. Although larger than previously believe, their home range is still small in comparison with other species with an average alongshore home range of at least 35.5 km[75].

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, which may occur while allowing the population to reach or maintain its optimum sustainable population (OSP) size with high probability.

[74] Depensation is a negative effect on population growth that becomes proportionately greater as population size declines. Populations experiencing depensation are prone to further reductions in size, even in the absence of extinction, and therefore have a greater risk of extinction.
[75] Oremus et al (In press)

DOC has commissioned an updated PBR estimate for Maui's dolphins based on the most recent estimate of population abundance[76]. The updated PBR estimates the Maui's dolphin population can sustain one human-induced mortality every 10 to 23 years[77].

PBR modelling gives an indication of how much human-induced mortality a population can sustain and recover to its maximum net productivity level. For Maui's dolphins the PBR analysis suggests that this population can only sustain very low levels of human-induced mortality from all sources of impact.

PBR analysis relies on estimated or known biological and variable inputs. Where the uncertainty of the inputs is high, PBR provides a general indication of the vulnerability of the population to mortalities. Additionally, PBR analysis assumes a population target size of OSP. While OSP is recognised as a good target population size because it results in the maximum productivity of a population, it is not a legislated target.

[76] Wade et al , Appendix 1 in Currey et al. (2012)

[77] This assessment of PBR (Wade 1998) assumes the following input values: a minimum abundance estimate of 48 (the lower 20th percentile (log-normal) of the estimate from Hamner *et al.* 2012), a recovery factor of 0.1 (Taylor *et al*. 2003), and a maximum net productivity rate of either 0.018 (Slooten and Lad 1991) or 0.04 (Wade 1998).

5.0 Threats to Maui's dolphins

There are many actual and potential threats facing Hector's and Maui's dolphins, including fishing-related mortality (for example, through net entanglement), boat strike, pollution, disease, mining and tourism impacts. Some of these threats are a direct cause of dolphin mortality, where others may impact on the population through sub-lethal impacts (for example, reducing reproductive success and habitat degradation).

For the review of the Maui's dolphin portion of the TMP in 2012, a risk assessment workshop was convened to identify, analyse and evaluate all threats to Maui's dolphins. It also identified those threats that pose the greatest risk to achieving management objectives of the TMP[78]. The range of potential threats identified is set out below, along with a general description of their impacts.

The risk assessment workshop was facilitated by scientists from the Royal Society of New Zealand, MPI and DOC. The risk assessment scoring was conducted by an expert science panel ('the panel') that considered all of the known actual or potential threats to Maui's dolphins based on the estimated degree of overlap between the dolphin distribution and the distribution of the threat. The risk assessment sought to identify threats that were likely to affect population trends within the next five years. While these more immediate threats form the primary focus of the proposals by MPI and DOC, there are a number of longer-term threats that may also impact on the long term viability Maui's dolphins.

The panel estimated that 1 to 8 Maui's dolphin mortalities (a median of 5) were likely to occur each year from all threats over the next five years. The broad confidence limits for this estimate reflect the uncertainty within and between panellists.

Fishing-related activities accounted for about 95 percent of total estimated mortalities compared with 5 percent from mining and oil activities, vessel traffic, pollution and disease combined. Within fishing-related activity, commercial and non-commercial set net fisheries were estimated to have a greater impact on Maui's dolphins than commercial trawling. The assessed level of Maui's dolphin mortalities (all threats combined) is 75.5 times the level of PBR. All threat categories had a $\geq$ 30 percent likelihood of exceeding the PBR in the absence of other threats.

The risk assessment panel's estimates suggest that there is a 95.7 percent likelihood of the population declining over the next five years. Based on the total estimated number of Maui's dolphin mortalities it was projected that the population will decline by 7.6 percent each year for the next five years.

The nature of all potential threats to Maui's dolphins is set out below, along with a general description of their impact(s). DOC maintains a database relating to Hector's and Maui's dolphins, which includes information about reported incidents involving mortality (such as beach-cast animals, bycatch and boat strike) and also incidents such as live strandings (Table 5.1). Many of the incident reports were sourced from Government agencies other than DOC or from research institutes. A standardised incident reporting procedure, in place since 1994, means most incidents include a standard set of data and photographs. Necropsies are undertaken where possible to help establish cause of death. Regular updates of this database including links to pathology reports can be found online at www.doc.govt.nz/dolphinincidents.

[78] Currey et al (2012)

Table 5.1. Reported mortalities of Hector's and/or Maui's dolphins off the WCNI between 1921 and July 2012. Source is the DOC Hector's and Maui's Dolphin Incident database.

Description of Incident	Incidents
Known entanglement – animal was known (from incident report) to have been entangled and died. [79]	3
Probable entanglement – net marks on the body and one other definite indication of capture such as mutilation; or the pathology report lists probable entanglement as cause of death	1
Possible entanglement – net marks on the body and a mention of the net marks in the incident report; or the pathology report lists probable entanglement as cause of death	2
Human interaction – no sign of net entanglement but definite signs of other types of human interaction such as high degree of mutilation.	1
Possible human interaction – no signs of net entanglement but indications of other types of human interaction such as marks that resemble knife wounds.	1
Not determinable – carcass too decomposed for necropsy.	7
Unknown – cause of death unexplained or not definitive (eg, "open" diagnosis in pathology report).	3
Biological – cause of death deemed to be from natural causes, including disease[80]	4
Not assessed – carcass was not necropsied or recovered, or the cause of death was not assessed (typical of historical mortalities).	24
TOTAL	46

5.1 HUMAN-INDUCED THREATS TO MAUI'S DOLPHINS

5.1.1 Fishing threats

Because Maui's dolphins have a close inshore distribution, their range overlaps with commercial and non-commercial set net fisheries, and inshore trawl fisheries. Fishing-related mortality through net entanglement is recognised as the greatest single threat to Maui's dolphins off the WCNI (Table 5.1).

5.1.1.1 Set net

Key points

- 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.
  - Dolphins need to surface to breathe so they are susceptible to drowning if caught in set nets.
- 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 with nets.

[79] Two confirmed Maui's dolphins, the other a Hector's or Maui's dolphin as carcass was not recovered.
[80] Two of the three natural causes relate to Toxoplasmosis.

The definition of set net in fisheries regulations is broad and encompasses most fishing methods and gear that enmesh fish. Most often the practice of set netting involves the placing of a net, either in mid-water, or on or near the sea floor (Figure 5.1). Set nets are made from fine nylon, so fish can't detect them. Set nets are non selective and catch marine life that swims into them and gets tangled. Fish bigger than the net's mesh size get tangled in the net by their gills or fins; smaller fish swim through the net.

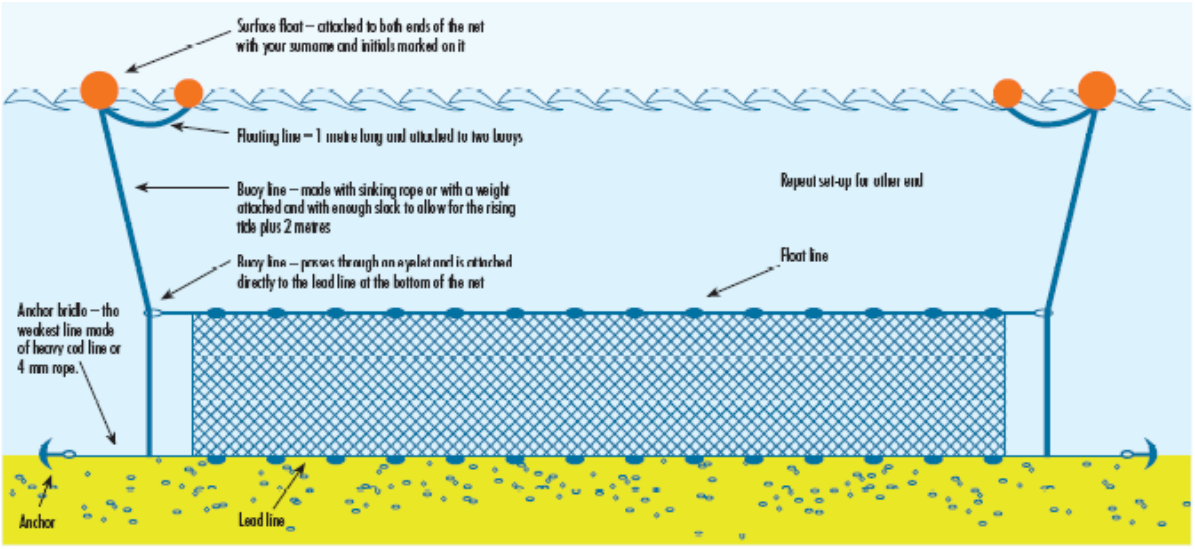


Figure 5.1. Features of a typical set net.

Set netting usually occurs in shallow waters within a few miles of the coast, and the nets are often left unattended and/or overnight. Recreational fishers may only use one set net that does not exceed 60 metres in length, unless on a vessel where two set nets may be used provided they have the proper mesh size and do not exceed 10 metres in length. Recreational set netters are also not permitted to set their net within 60 metres of any other net. [81]

Commercial fishers are restricted to using a set net (or a combination of nets) that are no greater than 1000 metres in total length, unless they are operating in waters where the upper edge of the set net is more than 2 metres below the sea surface[82]. In that circumstance commercial fishers are restricted to using a set net (or a combination of nets) that are no greater than 3000 metres in total length. Commercial set nets can be up to 10 metres high and are often set sequentially, with multiple nets extending over kilometres.

The vulnerability of Hector's and Maui's dolphins to net entanglement, particularly in inshore set nets, has been established through a combination of interviews with fishers, independent observer programmes and necropsies of by-caught and beach-cast animals. The summer period is considered the time of year when Hector's and Maui's dolphins are at most risk of set net entanglement.

The DOC Hector's and Maui's Incident database is used to record information about human interactions with these dolphins across the whole of New Zealand. The information in this database shows that 14 percent of the total reported incidents, 37 percent of incidents where information on the cause of death is available, and 70 percent of incidents where cause of

[81] Refer to Fisheries (Amateur Fishing) Regulations 1986.
[82] Refer to Fisheries (Commercial Fishing) Regulations 2001.

death is entanglement, are attributable to set net entanglement[83]; indicating that set netting is the greatest known cause of human-induced Hector's and Maui's dolphin mortalities.

A subset of these reports can be extracted for just the WCNI (shown above in Table 5.1). In this area a total of 46 reported Hector's and/or Maui's dolphin mortalities off the WCNI between 1921 and July 2012. Reported mortalities likely 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 (approximately 26 percent). Of the 46 reported mortalities there are 3 known set net related mortalities, and 3 other mortalities that show either evidence of net marks or other indications of interaction with fishing nets, accounting for 50 percent of mortalities where cause of death can be assessed.

5.1.1.2 Trawling

Key points

- 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;
  - Dolphins need to surface to breathe so they are susceptible to drowning if caught in trawl nets.
- 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 and Maui's dolphins in the DOC incident database, trawling has caused 20 of the 117 (17 percent) known entanglements.

Trawling involves towing a specialised net. Steel paravanes (trawl doors) are adjusted to "fly" through the water in opposing directions and hold the mouth of the net open. The net is set to herd fish into its mouth, and eventually into the cod end (Figure 5.2). In New Zealand, most trawling is carried out near the bottom, and in water depths ranging from around 10 metres to more than 1000 metres deep.

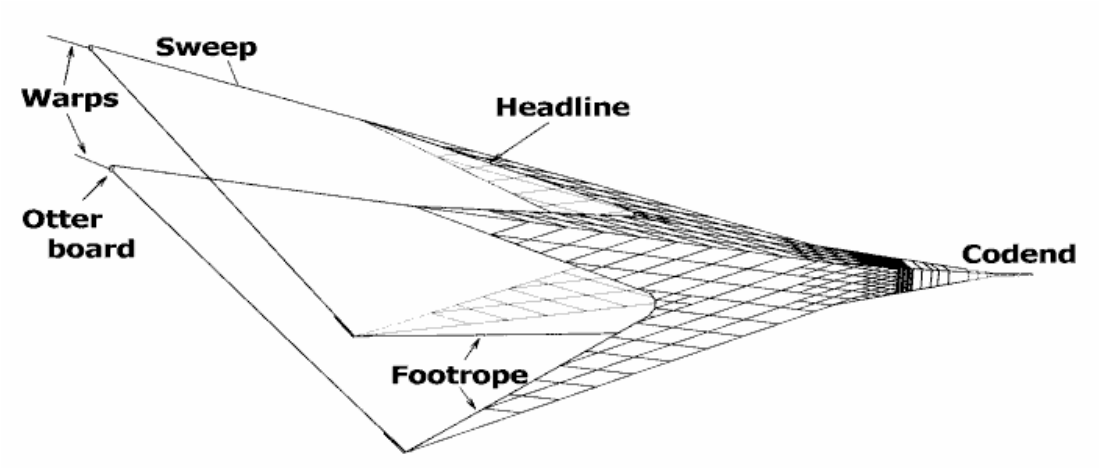


Figure 5.2. Features of a Trawl Net[84]

There have been no reported mortalities of Maui's dolphins where the cause of death can be attributed to trawling. However, Hector's dolphins have been known to become caught by

[83] Since 1921 when the first incident was recorded. Natural mortalities are included in the database.
[84] Source: Australian Fisheries Management Authority. South East Trawl Fishery Bycatch Action Plan (2001). http://www.afma.gov.au/

inshore trawl vessels where nets are towed along the sea floor or in mid-water. Total reported instances of Hector's dolphins caught in trawl nets are low compared to set nets. However, the focus of observer programmes and interview programmes to assess Hector's dolphin bycatch off the South Island has tended to target set net fisheries. Nevertheless, the incident rate (per day fishing) appears to be lower for trawl than set net fisheries.

Since 1921, there have been 20 reported Hector's dolphin mortalities definitely attributable to trawling (around 6 percent of incidents with a known cause of death). All of these incidents were in South Island trawl fisheries and occurred within 2 nautical miles from shore.

5.1.1.3 Other fishing threats

Other fishing threats to Hector's and Maui's dolphins that have been identified include cray potting and drift netting.

Cray potting involves setting a baited trap on the seafloor. These traps (pots) are either made from nylon mesh; or are made from steel and wire. There have been three known incidents of Hector's dolphins becoming entangled in a rock lobster pot line.[85] All of these incidents have occurred in the Kaikoura region. There has been no incident of a Maui's dolphin becoming entangled in a rock lobster pot line. Given the level of cray potting activity that occurs off the WCNI this fishing activity is considered to pose a low level of risk to the Maui's dolphin population.

Drift netting is a form of set netting where nets are not anchored to land or the sea bed so they drift freely with the current. Drift nets float freely with the current and do not roll up like set nets commonly do, which poses a high level of risk to Hector's and Maui's dolphins because any net that drifts into the dolphins range may entangle them. There are current drift net prohibitions that exist in New Zealand waters including within Port Waikato.[86] As drift netting is a prohibited fishing activity any management measures to address the risk the activity poses to the Maui's dolphin population would need to be captured through compliance and education programmes.

5.1.1.4 Marine farming

Marine farms have the potential to affect Maui's dolphins in many ways, including:

- Habitat competition, displacement, and fragmentation
- Entanglement
- Noise disturbance from construction activities and increased boat traffic
- Debris ingestion
- Ecological effects on the food supply of dolphins

Aquaculture operations off the WCNI are comprised mainly of Greenshell™ mussel and Pacific oyster production within the Kaipara and Manukau Harbours. Given the level and location of the aquaculture activities occurring off the WCNI, they are considered to pose a low level of risk to the Maui's dolphin population.

Habitat competition and fragmentation

The effect of aquaculture on whales and dolphins is a relatively new field of study, and limited information is available at this stage. A key concern would be the potential impact of marine farms in areas of existing high use by Maui's dolphins and areas used for breeding, calving, nursing or other critical activities (for example, feeding grounds). There is potential

[85] One incident in: 1989; 1997; and in 2004. All three resulted in death of the dolphin involved.
[86] Driftnet Prohibition Act 1991 and Fisheries (Auckland and Kermadec Areas Commercial Fishing) Regulations 1986

for habitat fragmentation to occur in areas where there are continuous series of marine farms that modify a large stretch of coastline. This is particularly so for Maui's dolphins, because of their small home range.

Entanglement in aquaculture operations
Entanglement of marine mammals in aquaculture operations appears to be especially problematic for large whales, but mussel farms are generally considered to be low risk for dolphin entanglement.

Noise
An increase in underwater noise and human activity can be expected during construction, maintenance and harvesting of marine farms. The effects of this disturbance on marine mammals near shellfish farms are unstudied, and there is conflicting anecdotal evidence about noise avoidance behaviour of cetaceans as a result of industrial activities.

Vessel traffic
Vessel traffic associated with marine farms typically consists of slower vessels (8 – 13 km) that cannot change direction very quickly, and therefore there is a low risk of boat strike. The amount of vessel traffic associated with marine farms is a low proportion of total traffic, including in areas where the aquaculture industry is well developed.

Debris
Potentially harmful operational by-products of mussel farms include lost lines, farm support buoys, and plastics. Debris can build up on the seabed directly below mussel farms. While such problems should be minimal in properly maintained farms, the potential for material loss is very real after stormy weather and in poorly maintained farms. Generally, the only materials lost more often are small pieces of lashing (<100 mm) and intact floats without attached lashing.

Potential hazards associated with Maui's dolphins include entanglement and/or plastic ingestion. However, there is little information to indicate whether marine mammals in New Zealand are affected by debris from aquaculture.

Prey availability and foraging
Marine farm structures may also interfere with dolphins' sonar signals and communication, reducing the ability of dolphins to hunt successfully. Dolphins that hunt collaboratively for schooling fish (for example, dusky, common and Hector's and Maui's dolphins) may be adversely affected.

Alternatively, some fish species are known to aggregate around shallow water structures and thereby provide areas of higher fish abundance than in the open water. This can make good foraging areas for coastal dolphin species, and Hector's dolphins are sometimes known to feed around bivalve marine farms.

5.1.2 Non-fishing-related threats

5.1.2.1 Seismic surveying

Marine seismic survey investigations to determine sub-seabed geophysical formations are most frequently associated with oil and gas exploration activities. However, they are also employed in seabed minerals mining, in scientific research and for installation of submarine cables and pipelines.

Seismic surveying involves using high-intensity acoustic sources to generate underwater sound, which is directed in a narrow, focused beam towards the seafloor. Towed arrays of hydrophones detect energy reflected from deep within the sub-seafloor formations, to give a detailed picture of structures. Depending on application, the underwater sound generated can be significant, and there is potential for a range of direct (physical trauma; for example, internal organ damage, hearing loss, decompression illness) and indirect (non-trauma; for example, masking communication/navigation, prey avoidance, behavioural) negative impacts on marine mammals. Impacts can be particularly pronounced in shallow waters, where dissipation of sound energy may be limited.

Seismic survey activities are regulated within the existing West Coast North Island Marine Mammal Sanctuary. Outside this area, DOC established voluntary guidance in 2006 which was replaced by a Code of Conduct in August 2012. There is no evidence to suggest that the activity has ever been subject to any other regulatory control, such as might be possible under s16(1) of the Resource Management Act 1991.

Past seismic survey tracks in the region of interest can be found in Map 7 (Appendix 1).

5.1.2.2 Seabed minerals exploitation[87]

The primary seabed minerals interest in the relevant area of the WCNI is ironsand from seafloor sediments – which is a general term for sand-sized grains of heavy iron-rich minerals. The prospecting, exploration and mining phases of seabed minerals exploitation have a range of possible impacts increasing in potential magnitude with each successive stage, with similar potential for increasing associated recovery times. The extent and significance of effects will depend on a number of factors including:

- the sensitivity of habitats and species;
- the scale of activities;
- the method and rate of extraction, and;
- the nature of the benthic environment being disturbed.

Potential effects on Maui's dolphins as well as benthic environments and marine ecosystems include disturbance through presence and/or noise, displacement, increased risk of vessel strike or entanglement, sediment plume generation, mobilisation of naturally occurring contaminants (such as heavy metals), trophic effects (impacting prey species and fisheries), coastal habitat degradation due to changes in coastal processes and pollution from vessel discharges, offshore processing or harmful substance spills.

It should be noted that impacts could be compounded by the cumulative effects of multiple mining projects being undertaken simultaneously in the Maui's dolphin range.

Prospecting

Prospecting phases may involve seismic and magnetometer (towed or aerial) surveying, as well as acoustic swath mapping to determine bathymetry. In addition, physical sampling (taking cores, often with a sonic drill) is likely over relatively large areas to quantify ore concentrations at various depths within sediment layers. Cores are likely to be about 10-15 cm in diameter and affect a very small proportion of the sediment habitats in the area.

[87] Information on potential impacts sourced fromMacDiarmid et al (2011)

Exploration
Using the results of the prospecting phase to focus on areas showing promise, the exploration phase involves more intensive evaluation of potential mining sites at the order of 30-50 km^2 (within permit blocks of the order of 300-500 km^2) to identify sites capable of sustaining mining for a decade or more. Obtaining sediment cores and drill logs to better quantify ore concentrations at various depths is likely to continue during this phase but will probably be most concentrated over a small proportion (<1-5 percent) of the licence area. Small scale dredging (taking samples of approximately 5 m^3) by divers using hand-held suction systems may also occur.

Mining
No seabed minerals mining permits have been issued, but this would logically follow the exploration phase if results indicated that commercially viable quantities of minerals were present. During mining, extraction methods such as suction-cutter dredge technology or other standard dredging techniques will likely be used, removing or disturbing significant quantities of seabed sediment from a few metres to tens of metres deep depending on the three-dimensional distribution of the resource. The extent of area directly affected at any one time is likely to vary depending on the size of the mining permit area and method used for extraction. Under a mining permit the holder will seek to progressively mine the resource over the majority of the permit over the duration for the permit (20-40 years). For example an economic rate of iron sand extraction could disturb around 10-15 (or more) square kilometres of the sea floor a year.

Mining will likely involve sequential removal of sediments and backfilling of excavation pits with de-ored sediments, causing as much as 100% mortality to benthic organisms in the affected area and generation of significant sediment plumes. Coarse particles would be deposited quickly, but fine particles could travel significant distances of the order of 5-20% of the permitted area. Operational noise is likely to be significant.

Recovery times would vary according to the species concerned. Small benthic organisms may recover in months, whereas larger species (such as shellfish) could take years. While pelagic species are likely to return once activities cease, it is difficult to predict trophic effects that could continue to impact on mobile species for several years before prey species abundance and distribution return to normal. There is likely to be some change in species structure as a result of disturbance.

Mining permitting and consenting
New Zealand Petroleum and Minerals is responsible for issuing prospecting, exploration and mining Permits under the Crown Minerals Act 1991 (which is currently subject to legislative review), and the Continental Shelf Act 1964. Within 12 nautical miles environmental effects are managed primarily through the Resource Management Act 1991 (‘RMA’) by the relevant regional council. Depending on the nature of the regional coastal plan, activities that would be undertaken during prospecting and exploration phases such as core sampling would likely be considered a permitted activity, whereas any form of dredging would probably be discretionary. Beyond 12 nautical miles, minerals activities will be covered by the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012. Discretionary activities will require marine consent from the Environmental Protection Authority.

Locations of minerals permits in the region of interest can be found in Map 8 (Appendix 1), and further detailed information on permits and permit holders can be found on the

New Zealand Petroleum and Minerals website (www.nzpam.govt.nz) – though it should be noted that mining targets will likely only be a fraction of the total permitted area.

5.1.2.3 Commercial marine tourism

Tourist vessels interacting with marine mammals have the potential to impact on individuals or the population both directly and indirectly. Direct effects are mainly through vessel strike, but indirect effects may range from altering the animals' activity budgets (e.g. reduction in foraging or resting behaviour), masking of biologically important behaviours (increased noise levels interfering with communication and echolocation), to displacement from an area.[88]

Marine tourism – subject to DOC permit

Permit based tourism includes tourist ventures that hold a Department of Conservation Commercial Marine Mammal Tourism Permit, which allows the holder to specifically look for and view marine mammals according to their permit conditions. There are currently no permitted tour operators that specifically target Maui's dolphins within their range.

Marine tourism – not subject to DOC permit

Non-permit based tourism refers typically to tour operators offering some sort of scenic trip or charter fishing, where the viewing of marine mammals is not a planned activity as a part of the trip, therefore they do not hold a Commercial Marine Mammal Tourism permit. These vessels should not be actively seeking out marine mammals, but should they come across them opportunistically, as with recreational boating traffic, they must abide by the Marine Mammal Protection Regulations (1992) ('the MMPR'). Regulations 18-20 specifically prescribe safe boating behaviour around marine mammals. The exact level of unpermitted tourism that occurs in the Maui's range is difficult to determine and limited ability to undertake compliance is of concern. However, given the exposed characteristic of the coastline, unpermitted tourism is likely to be minimal in comparison with more sheltered areas.

5.1.2.4 Vessel traffic

Other general vessel traffic has the ability to impact Maui's dolphins in much the same way as marine tourism. From direct to indirect effects including; physical injury or death, noise, altering activity budgets, masking biologically important behaviours, to displacement from an area. This mostly includes recreational boats, but of particular relevance to Maui's dolphins are; Thundercat racing, and Surf Life Saving events which may take place within the dolphins range. These vessels may have limited visibility of dolphins when at high speed, and the noise levels from these vessels is likely to be higher than the smaller recreational boats.

5.1.2.5 Pollution

The near-shore habitat of Maui's dolphins exposes them to a variety of pollutants and contaminants such as organochlorines, heavy metals, oil spills and plastic debris, which may be derived from land or maritime activities. Stormwater discharges are known to be significant point-sources of such pollution, but there are also risks from discharges associated with shipping. See Map 9 (Appendix 1) for locations of point source discharges that may reflect areas of higher risk of pollution.

Organochlorines

Maui's dolphins have a high metabolic rate, have a relatively high trophic position in the food web (that is, they are top predators), and live in coastal inshore environments which increase their likelihood of accumulating toxins such as organochlorines[89]. The effects of the build up

[88] Bejder and Samuels (2003)
[89] Reijnders and Aguilar (2002)

of toxic chemicals in marine mammals can include immune suppression and the development of infectious diseases, reproductive impairment (for example, sterility in some cases), and the generation of tumours[90]. The toxins are also transferred between mother-calf pairs both through the placenta prior to birth as well as through lactation after birth[91]. Studies on Hector's and Maui's dolphins show high levels of organochlorines such as DDT, PCBs and dioxins[92]. It was difficult to make comparisons between Maui's dolphins and South Island Hector's populations due to the small sample size of Maui's available for the study, however, toxins tended to be considerably higher for the WCNI than for the WCSI, but less than the levels observed on the ECSI. The high levels observed in the various populations highlight the vulnerability of Maui's or Hector's dolphins to coastal human activities (for example, agriculture, industry etc)[93]. While no Maui's dolphins sampled have exhibited PCB levels over the concentration level considered to have immunological or reproductive effects, trace elements and other emerging contaminant levels have yet to be studied[94]. Due to the industry activities and various forms of coastal development along the west coast of the North Island, there is concern over the potential for increased levels of organochlorines in Maui's dolphins.

Metals

Non-essential metals (for example, mercury, lead and cadmium), which have little or no recorded biological function, can accumulate and are toxic even at low concentrations. However, some data exists for Hector's dolphins showing evidence of accumulation of high levels of cadmium, though low levels of lead[95]. Data on the effects of metal toxicity is sparse, and the risk for Maui's dolphins is not quantified. For other species there is evidence that high levels of non-essential metals may have resulted in or contributed to chronic illness and mortality of cetaceans[96].

While there is currently no information on the levels in Maui's dolphins, similar to other forms of pollution, the risk of pollution impacting on this population could increase in the future.

Oil spills

While cetaceans are presumed to be less vulnerable to oiling than many other marine species such as otters and seabirds, oil may damage the eyes, and inhalation of surface vapours can damage their lungs. Also, oil spills may have long-term impacts on prey populations such as fish and benthic invertebrates[97]. Understanding of the long-term impact of oil spills on cetaceans has grown following the Exxon Valdez oil spill in 1989[98]. Prior to the spill it was not clear whether cetaceans could detect and avoid oil, however, research suggests that while vision can help cetaceans to detect thick oil, they often rely on tactile response in order to avoid the oil, meaning that they will still come in contact with it and run the risk of ingestion or inhalation[99]. It has been suggested that the lack of an olfactory system for cetaceans may make it more difficult for these species to avoid oil than other species[100]. Little is known about the effects of oil spills on cetaceans in New Zealand, so information from overseas is vital. A study on the effects of the Exxon Valdez oil spill on Orca/Killer whales found that

[90] Summarised in Stockin et al (2010)
[91] Stockin et al (2007)
[92] Stockin et al (2007); (2010)
[93] O'Shea (1999)
[94] Stockin et al (2010)
[95] Slooten and Dawson (1994)
[96] Beland et al (1993)
[97] Hines (2011)
[98] Matkin et al (2008)
[99] Smultea and Wursig (1995)
[100] Matkin et al (2008)

two groups of whales suffered losses of 33 and 41% in the year following the oil spill and that 16 years after the oil spill one group had still not recovered to pre-spill numbers[101]. This suggests that while the likelihood of a spill in New Zealand may not be high, the consequence of a spill on a small inshore population of cetaceans with a small home range could be catastrophic.

The grounding of the MV *Rena* off the Astrolabe Reef, off Tauranga in 2011 highlighted the potential impact of an oil spill on the New Zealand marine environment. It is important to note that it is not just the oil itself that may impact on the dolphins, but many aspects of an oil spill response will have direct or indirect effects on the population, eg, the use of dispersants to clean up the oil, increased vessel activity in the area, the use of sonar for tracking lost cargo etc. Prior to this, other significant oil spills from commercial vessels have been relatively infrequent events in New Zealand waters, though there has been six of note since 1990:

- 1998, *Don Wong 52*9 - Stewart Island (with 400 tonnes of automotive gas oil spilled)
- 1999, *Rotoma* - Poor Knights Island (oily bilge discharge of approx 7 tonnes spilled)
- 2000, *Sea Fresh* - Chatham Islands (60 tonnes of diesel spilled)
- 2002, *Jody F Millennium* – Gisborne (25 tonnes of fuel oil spilled)

Though significant oil spills from commercial vessels have not occurred within the Maui's dolphin range, there were have been a number of incidents involving the 74,000GRT iron sands carrier MV *Taharoa Express* which routinely operates in the vicinity of Kawhia Harbour. The *Taharoa Express* has now been replaced by a purpose built vessel, the *Taharoa Destiny* in order to address safety issues experienced during previous operations. While risks have been reduced significantly, regular and ongoing operations of a large vessel within the Maui's dolphin range have inherent associated risks. However, these can be minimised through effective management practices.

All of New Zealand's offshore oil and gas production currently occurs in the Taranaki Region. There have been two significant spills, both associated with Floating Production, Storage and Offload (FPSO) facilities - the Tui field FPSO *Umuroa* estimated spill of 20-25 tonnes in 2007, and the Maari field FPSO *Raroa* estimated spill of 1 tonne of oil in 2010. In both instances the spills resulted in shoreline impacts, on the south Taranaki and Kapiti coasts respectively. Most of the Taranaki fields are currently producing gas condensate, which though volatile and relatively quick to evaporate through weathering processes, contains liquid fractions that could remain on the water surface and impact shorelines. Naturally occurring reservoir pressure in the Taranaki fields is variable, some being insufficient to flow oil in significant quantities should a production well lose integrity, some requiring additional pressurisation support, and others which would free flow. In addition, there are specific risks associated with FPSO operations such as offshore storage and offloading of oil to shuttle tankers, though these are minimised through appropriate operational procedures derived from international best practice.

Modelling of a major, continuous spill from the Tui or Maari installations illustrates that oil could potentially affect all of the North Island's West Coast (see Map 10 in Appendix 1), which is a broadly similar scenario to the other fields. However, continued release spills are rare, and geographical spread of single release spills is much more limited in extent. According to the oil spill risk modelling there is a slightly higher risk around the Taranaki coastline based on future oil exploration activities. Drilling activity is predicted to be limited in the next 12 months with only one new well scheduled in the offshore Taranaki region, with proposals to drill a further 10 wells in and around the Maui's range over the next 4 years.

[101] Matkin et al (2008)

Harmful substance spills

Risks associated with spills are not limited to oil products, but may involve other harmful substances carried as cargo or used in maritime activities such as offshore drilling. While marine oil spill impacts can be severe, for the most part the material remains on the water surface where tried and tested response options are at least possible. This is not necessarily the case with other harmful substances such as chemicals, which may mix readily with water and quickly enter the water column. In these instances, response options are extremely limited and there may be no possibility of avoiding widespread effects other than relying on natural dilution processes. Even a product as seemingly innocuous as milk powder can have significant impacts due to oxygen depletion, which can be particularly pronounced in confined areas with limited tidal exchange such as inlets and harbours. In such instances,

while direct effects on Maui's dolphins are unlikely, indirect effects on prey species could be significant in specific areas.

The probability of oil or other harmful substance spills from maritime activities remains small, though consequences could be devastating to the Maui's dolphin population in a worst case scenario.

Locations of exploration and mining permits can be found in Map 8, and a summary of risks associated with oil spills around the New Zealand coast can be found in Map 10 (Appendix 1)[102].

Operational discharges

During normal operations of vessels and offshore installations, certain low-levels of discharges (oil, chemicals, sewage, garbage etc) are permitted providing strict criteria are met according to the location where the discharge occurs (either within or beyond 12 nautical miles). Regulations will either be administered by the relevant regional council under the Resource Management (Marine Pollution) Regulations 1998 or by Maritime New Zealand through a range of Marine Protection Rules. In most normal operating circumstances the risk of impacts from discharges is considered to be low as the strict limits that apply would minimise harmful effects. However, faulty equipment, deliberate acts, or the presence of pathogens in sewage from humans or livestock carried on board commercial vessels have the potential to pose significant risks.

Plastic debris

Plastic debris constitutes a potential threat to marine mammals as they can become physically entangled in floating debris or ingest the debris[103]. If not removed the debris can cause drowning, suffocation, strangulation, starvation and injuries or infections and it can also impair important behaviour such as foraging and predator avoidance through increased drag[104]. Ingestion of plastic can cause a range of problems that have the potential of being fatal including stomach ruptures, digestive problems, and starvation[105]. It is difficult to quantify the impact of ingestion of plastics on marine mammals, and there is no current evidence for Maui's dolphins. Additionally as the most common entanglement material for whales and dolphins is fishing gear it is usually difficult to determine if the entanglement is from active fishing gear or lost or discarded gear.[106]

[102] Derived from Maritime New Zealand's 2010 Oil Spill Risk Assessment. The sensitivities identified in the map relate primarily to oil spills. However, there is some cross-over with harmful substances, as in some cases the ecological sensitivities will be the same.
[103] Simmonds (2012)
[104] Ceccarelli (2009)
[105] Jacobsen et al (2010)
[106] Simmonds (2012)

The potential risk of entanglement from poor fishing practices is addressed in Section 6 (MPI chapter)) of this document.

Pathogens
As a coastal species, Maui's dolphins may be exposed to a range of pathogens that end up in the sea from farm run-off, through sewer outfalls or shipping, as well as through direct or indirect contact with other marine species. While there may be an anthropogenic source for some pathogens, the exact origin of Toxoplasmosis and Brucella is not confirmed. Therefore, these are discussed in the later Section 5.2.1 on parasites and disease.

5.1.2.6 Coastal development

Land-use
Land-based activities such as forest clearance, sub-division and agriculture within catchments draining towards the Maui's dolphin habitat have primarily indirect impacts on the population through terrestrial run-off processes. Sedimentation (both in suspension and deposition) and changes in nutrient flows, in addition to pollution inputs noted earlier, may cause ecological consequences at differing trophic levels, impacting on the diversity and abundance of prey species. Therefore, land management practices are an important consideration in mitigating threats to Maui's dolphins. Morrison et al (2009)[107] provides a useful summary of potential impacts on coastal fisheries, which is of direct ecological relevance to predators such as Maui's dolphin.

Significant point and non-point source discharges within the historic Maui's dolphin range can be seen in Map 9 (and coastal activities are summarised in Map 11 in Appendix 1).

Marine Construction
Construction in the Coastal Marine Area, associated with such installations as wharves, jetties, breakwaters etc, may involve disturbance through presence, habitat fragmentation, sediment resuspension, vessel strike, pile-driving and other sources of noise.

Aside from very small-scale construction projects with limited, localised impacts, no significant developments have been identified in the Maui's dolphin historic range that would cause particular concerns.

Dredging and dredge spoil disposal
Dredging is necessary to maintain navigable waterways, and is primarily associated with commercial ports. Most dredged material is transported to marine dump sites and disposed of in the Coastal Marine Area in accordance with Coastal Permits issued by the relevant regional council under the Resource Management Act 1991 ('the RMA'). Effects may include sedimentation and resuspension of contaminants, which accumulate from industrial and maritime activities in port environments.

There are two main ports on the west coast of the North Island - Onehunga (in the Manukau Harbour) and Taranaki.

Port of Onehunga requires regular dredging of relatively small volumes of sediment (5000-10,000 m^3 annually) which is disposed of in a reclamation project at another Ports of Auckland facility, the Fergusson Container Terminal reclamation on the Waitemata Harbour (Auckland's east coast).

Port Taranaki currently holds two consents for spoil disposal in relation to their maintenance

[107] Morrison et al (2009)

dredging activities. One allows up to 400,000 m^3 in any one dredging campaign, and up to 730,000 m^3 for any three successive dredging campaigns (or any seven year period – whichever comes first), to be disposed of within inshore disposal areas. The second consent allows up to 2,000,000 m^3 to be disposed of within an offshore disposal area. Clean sediments, primarily sand, can be disposed within inshore areas for the purposes of beach renourishment as the main port breakwater interrupts the northerly littoral drift pattern, while the offshore is for surplus or contaminated material. Maintenance dredging in Port Taranaki is usually undertaken every two years, and currently involves disposal of around 100,000 m^3. Accumulated sediments are comprised mainly of clean sand being brought into the port from the surrounding coastline by long-shore drift and tidal movement. Marine disposal of sand does not have the same level of risk of plume generation as finer sediments, and general absence of contamination reduces risks even further.

Wave and Tidal Energy

Marine renewable energy remains largely at the research and development/pre-commercial level, with a wide range of device designs being trialled in various places around the world.

Deployment of marine renewable energy devices is in early stages internationally, and the level of understanding about actual impacts on marine mammals is limited as a result. Potential impacts will vary between construction and operational phases, which include disturbance through presence and/or noise, displacement, and risk of vessel strike.

It is considered unlikely that dolphins would be physically injured through collision with an underwater turbine blade given the slow operational speeds of equipment (around 5 rpm). One of the few examples of long-term commercial scale marine energy deployment worldwide is the Seagen tidal generator that was installed in Strangford Loch in Northern Ireland in 2008. The project was consented on the basis of adaptive management, with an agreed Environmental Monitoring Programme that included specific monitoring for marine mammals through visual observation (66 months), passive acoustic monitoring (54 months) and trials of active sonar over a 4 year post-installation period. Results indicated that there have been no major impacts detected from the monitoring programmes, and no changes in abundance of either seals or porpoises[108].

Within the Maui's dolphin range Crest Energy has gained resource consent for staged deployment of up to 200 tidal energy devices in the mouth of the Kaipara Harbour. Progression through each stage can only be achieved in accordance with an agreed Environmental Monitoring Plan, providing that effects are within predicted ranges. Monitoring data will be evaluated by the consent authority (Northland Regional Council) under section 128 of the RMA, before the start of each stage of the project. Monitoring will also occur continuously during operation of the power station.

Two years of baseline data will be collected prior to the Stage 1 deployment, with monitoring continuing during Stage 1 and for a minimum of 12 months after completion of Stage 1 prior to initiation of Stage 2. A similar process will apply for the transition between later stages. The stages are for 3, 20, 40, 80 and 200 turbines.

5.1.2.7. Scientific interactions

Marine mammal research can utilise non-invasive or invasive or methods. Non-invasive methods can pose a threat to Maui's dolphins through harassment and boat strike in the same

[108] Alistair Davison, Royal Haskoning UK, pers. comm.

manner that marine tourism may adversely affect the dolphins (see Sections 5.1.2.3 and 5.1.2.4). Non-invasive research methods do not require a DOC marine mammal research permit granted under the Marine Mammals Protection Act, but are subject to the MMPR regulations 18-20. Regulations 18-20 dictate appropriate behaviour around marine mammals. It is important to note that the impacts from non-invasive research, while similar to commercial tourism or recreational boat traffic, are likely to be reduced given the experience of the researchers in operating safely around marine mammals.

Invasive methods, however, could potentially pose a threat to Maui's dolphins through complications arising from the techniques such as tagging (including satellite or other transmitters) and taking biopsy samples. These are considered under the MMPA as "take" and therefore require a application for a permit under the MMPA to undertake the work. As a part of the requirements for the permit application Animal Ethics Committee approval is required. There is a DOC Standard operating procedure which provides guidance on approval of permits. As a part of the process permits may be subject to conditions developed to ensure risks to the safety or wellbeing of the dolphins are mitigated. Impacts of scientific interaction on Maui's dolphins are likely to be minimal due to strict permitting and animal ethics approval requirements as outlined in section here.

5.1.2.8 Shooting

Although there have been historical reports of dolphins being shot, there are no known recent incidents.

5.1.2.9 Climate change

Trying to anticipate future effects of climate change on the Maui's dolphin population is difficult as predictions are largely speculative. The interactions between ocean processes and climate are complex and effects may vary greatly between areas. However, a number of possible negative future effects of climate change on marine mammals have been highlighted[109], the greatest of which probably arises from changes in food source. Those species with a limited habitat range, such as Maui's dolphins, may be especially vulnerable to changes in prey distribution and abundance.

Impacts of climate change can be direct or indirect. Direct effects could include the a shift in species' distribution if temperature is a limiting factor, however at present there is no direct evidence this could be the case for Maui's dolphins. Indirect effects of changes in temperature include prey availability affecting the distribution, abundance, community structure, susceptibility to disease and contaminants (due to immuno suppression and mobilisation of contaminants from blubber reserves), reproductive success, and ultimately, survival of marine mammal species.

Rising sea levels may degrade the coastal habitat as could construction of structures to protect coastal areas from sea level changes. Changes in rainfall patterns and increased nutrient run-off, as well as changes in temperature, salinity, pH and CO_2 could potentially increase the scale in incidence of toxic algal blooms and the input of terrestrially derived pathogens into coastal areas. Changes in ocean currents, upwellings and fronts may result in changes to the distribution and occurrence of prey associated with these environmental changes.

Storm frequency, wind speed and wave conditions are predicted to intensify with climate change and severe weather events may pose a physical threat to dolphins. There may also be increased energetic costs to dolphins from responding to increases in disturbance that may

[109] Simmonds and Isaac (2007); Robinson et al (2005)

affect foraging and reproduction. In conjunction with rising sea levels, such weather events may exacerbate damage to coastal ecosystems, further degrading Maui's dolphin habitat.

5.2 NON-HUMAN INDUCED THREATS TO MAUI'S DOLPHINS

Non-human-induced threats include those naturally occurring causes of mortality that any population is subject to, such as disease, predation, extreme weather events and small population effects. The intrinsic rate of population increase accounts for these natural sources of mortality. This means that a population that is still growing and is not subject to human-induced mortality can feasibly continue to grow at its maximum rate even with natural mortality. Natural mortality only becomes an issue when human-induced mortality results in the population being more susceptible to natural mortality. An example of this would be if as a result of human-induced mortality a population was displaced to an area where the risk of predation is increased. The following section outlines what is known about the key sources of non-human induced mortality to Maui's dolphins.

5.2.1 Disease[110]

Different types of disease can impact on a population. There are natural diseases, diseases that are transferred from other species or land-based run-off, and stress induced disease. While the later two may be anthropogenic in origin there is minimal evidence to confirm the origin of diseases such as *Brucella* and Toxoplasmosis. As such they are discussed in this section; however, DOC and MPI note that effort is needed to determine the origin of such diseases and if able to be controlled or minimised, appropriate steps are taken (see Section 8.1.1 on research priorities).

5.2.1.1 Brucella

An assessment of the health of Hector's dolphins during a trial tagging study at Banks Peninsula found that most results were within expected ranges or not significantly different compared with similar species. One of the tagged animals tested positive for the antibodies to *Brucella abortus* (or a similar organism). *Brucella* is a pathogen of terrestrial mammals that can cause late pregnancy abortion, and has been seen in a range of cetacean species elsewhere. In 2006 *Brucella* was identified in a dead Maui's dolphin and this could have serious ramifications for this critically small population. Marine strains of *Brucella* may be transmitted horizontally (transmitted between peers) and vertically (transmitted from mother to foetus). Findings so far show that Hector's and Maui's dolphins have been exposed to the *Brucella* bacteria, although the actual importance of disease due to this agent is unclear at present.

5.2.1.2 Toxoplasmosis

Toxoplasmosis is a parasitic disease that spreads through ingestion of infected meat, ingestion of material contaminated by faeces from cat, or by transmission from mother to foetus. Toxoplasmosis can cause death, behavioural changes, still births, and reduced reproductive rate. The main source of infection for dolphins is likely to be through freshwater run-off from surfaces contaminated by cat faeces. It is unknown what the role of fish play in the potential infection pathway, but it is known that Toxoplasma oocysts can survive for months in water.

From the Department of Conservation Hector's and Maui's dolphin incident database and necropsy work from Massey University, 5 of 23 Hector's dolphins, and 2 of 3 Maui's dolphins had fatal toxoplasmosis (for example, this was the primary cause of death).

[110] Roe, W. Massey University, personal communication, 18 August 2012.

Further testing showed that of dolphins that died of other causes, 61% were also infected with Toxoplasma[111].

5.2.1.3 Other disease

Bacterial and fungal pneumonia have also been noted in several Hector's dolphins, and may have played a role in the deaths of some animals. This may be indicative of other intense, but sub-lethal, stress on the dolphins that lead to pneumonia or could be related to genetic factors causing decreased immune function.

Whale lice are found on freshly dead dolphins and at close range they can be seen living on dolphins as small dark brown spots, but do not appear to cause any harm. Several species of gastrointestinal nematodes, lungworms and flukes have also been found in Hector's dolphins. There is no evidence that these parasitic infections alone could have caused death.

5.2.2 Predation

Sharks are thought to be the main predators of Hector's and Maui's dolphins. Shark species known to consume these dolphins are great white, blue and broad-nosed seven-gilled sharks. Orca, mako sharks and bronze whaler sharks may also predate Hector's and Maui's dolphins, but there are no known instances of this occurring.

There are two reported instances of white sharks eating Hector's or Maui's dolphins off the North Island's west coast, , including an instance in the waters off New Plymouth in 2005 where are white pointer was caught incidentally and a Hector's or Maui's dolphin was found in its stomach[112]. Hector's dolphin remains have been found in the gut contents of seven-gilled sharks and blue sharks. A seven-gilled shark caught in the Manukau harbour was found to have Hector's or Maui's dolphin remains within its stomach.

5.2.3 Weather

Pathological reports of dead Hector's dolphins suggest extreme weather events have been a possible reason for the separation of stranded calves from mothers[113]. As discussed in Section 5.1.2.10, increases in the frequency of extreme weather events are predicted due to climate change, which have the potential to adversely affect Maui's dolphins.

5.2.4 Small population effects[114]

Given the size of the Maui's dolphin population it is vulnerable to small population effects such as stochastic and Allee effects. Stochastic effects refer to the inherent variability in the survival and reproductive success of individuals, which can result in fluctuating population trends for small populations. Therefore, small populations with very low growth rates are much more sensitive to random variations in survival and reproduction, and random environmental changes.

Stochastic effects are different from Allee effects (or depensation effects) that small populations may also experience if the survival or reproduction of individuals is compromised when they are at low abundance and therefore low densities.

Small populations may also suffer from reductions in genetic variability, also referred to as inbreeding depression. Loss of genetic diversity increases sensitivity to environmental change, and can also lead to increased extinction risk.

[111] Roe, W. Massey University, Unpublished Data, August 2012.
[112] Duffy and Williams (2001).
[113] DOC 2012: Hector's and Maui's dolphin incident database. www.doc.govt.nz/dolphinincidents
[114] For more discussion on stochastic and Allee effects see also: Currey *et al.* (2012), or Stephens and Sutherland (1999).

6.0 MPI's fishing-related management proposals

6.1 SUMMARY

The Ministry for Primary Industries (MPI) is seeking tangata whenua and stakeholder views on a range management measures to mitigate the risk of each fishing-related threat that has been identified for the Maui's dolphin population off the WCNI.

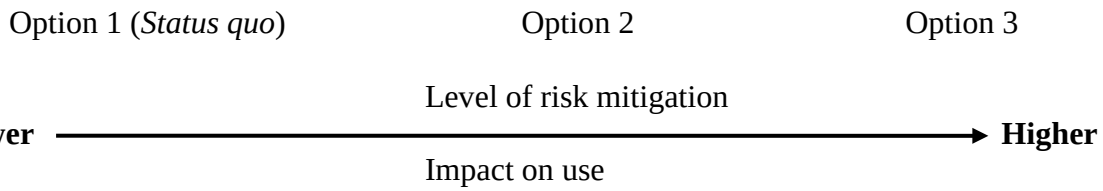
Commercial and Amateur Set Netting (Coastal)		Estimated Cost[115]
Option 1	*Status quo*: Keep existing management, including the interim measures to: • retain the set net ban between 0 and 2 nautical miles offshore from Pariokariwa Point to Hawera; • prohibit the use of commercial set nets between 2 and 7 nautical miles offshore from Pariokariwa Point to Hawera without an observer onboard, and; • pay for observer services costs with Crown-funding. The interim measures would be reviewed in 2015 to inform management going forward.	Annual Value Add: $482 200 Capitalised future value: $2 196 670 Observer coverage (Crown-funded): $334 010 - $526 000 per year
Option 2	Keep existing management, and put the interim measures in place via regulation to: • retain the set net ban 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, and; • require observer services costs to be cost-recovered from industry beginning 1 October 2013.	Annual Value Add: $482 200 Capitalised future value: $2 196 670 Observer coverage (cost-recovered from industry): $334 010 - $526 000 per year
Option 3	• 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.	Annual Value Add: $885 932 Capitalised future value: $3 162 581 Observer coverage (cost-recovered from industry): $334 010 - $526 000 per year

Commercial and Amateur Set Netting (Harbours)		Estimated Cost
Option 1	*Status quo*: Keep existing management.	
Option 2	Improve information on Maui's dolphin distribution and set net activity in the Manukau Harbour.	To be confirmed
Option 3	• 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 Manukau Harbour.	Annual Value Add: $442 999 Capitalised future value: $1 054 843

Commercial Trawling		Estimated Cost
Option 1	*Status quo*: Keep existing management.	
Option 2	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): $786 130 - 1 238 000 per year
Option 3	• 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.	Annual Value Add: $515 108 Capitalised future value: $2 557 348 Monitoring coverage (cost-recovered from industry): $786 130 - 1 238 000 per year

[115] The analyses estimating the economic impact of loss or displacement of catch is found in Appendix 4 (Section 13).

Fishing-related threats include commercial and non-commercial (amateur and customary) set netting and commercial trawling. The 2 or 3 mitigation options for each fishing threat can be categorised by their ability to reduce the risk of fishing-related mortality and impact on fishers. The options also include measures to improve the information available on the level of interaction between fishing-related threats and the Maui's dolphin population (using observers or other monitoring coverage).



MPI also discusses additional sustainability measures that may support reducing the risk of fishing-related mortality on the Maui's dolphin population. These additional measures would be considered in conjunction with the broader options discussed above where they may further mitigate the potential fishing-related impacts on dolphins while allowing for the use of fisheries resources. The options discussed include:

(1) Fishing gear exemptions:
   a. Exclude some fishing methods from the set net prohibitions if they are likely to avoid, remedy or mitigate any adverse effects of fishing on the Maui's dolphin population.
   b. For example, exclude the activity of ring netting from the set net prohibitions in the Manukau Harbour, and other WCNI harbours.

(2) Finer spatial scale reporting requirements for commercial set net fishers:
   a. Improve information on the distribution and intensity of fishing effort in areas of potential overlap with Maui's dolphin distribution.
   b. For example, require commercial set net fishers to report the start and end position of each set net they deploy.

(3) Changes to fishing behaviour practices:
   a. Consider changes to fishing behaviour or practices that are likely to avoid, remedy or mitigate any adverse effects of fishing on the Maui's dolphin population.
   b. For example:
      i. Reduce the total length and/or number of set nets that can be deployed at any one time
      ii. Introduce seasonal closures in the commercial and amateur set net fishery
      iii. Introduce maximum headline heights for trawl nets

MPI is open to considering other fishing-related management measures to those discussed in this chapter.

The regulatory impact analysis requirements apply to the policy development process for this issue. MPI considers the consultation paper contains the substantive RIA elements.

6.1.1 Document structure

This chapter is organised as follows:

- Summary of the status quo
- Summary of the problem definition and need for action
- Objectives of the review and discussion of statutory considerations
- Summary of the key biological characteristics
- Assessment of the WCNI set net fishery by area (coastal and within harbours) and management options
- Assessment of the WCNI trawl fishery and management options
- Other management measures
- Conclusions

6.2 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 6.1). See Appendix 3 (Section 11) for a chronology of management measures.

6.2.1 Set net restrictions and prohibitions

Commercial and amateur set netting is prohibited from Maunganui Bluff to Pariokariwa Point between 0 and 7 nautical miles offshore. The activities are also prohibited in the WCNI harbours inside the entrances to the Kaipara, Manukau, and Raglan Harbours, and Port Waikato river mouth.

The areas closed to set net were put in place to help avoid Maui's dolphin entanglements in the area where their range has been determined by a combination of:

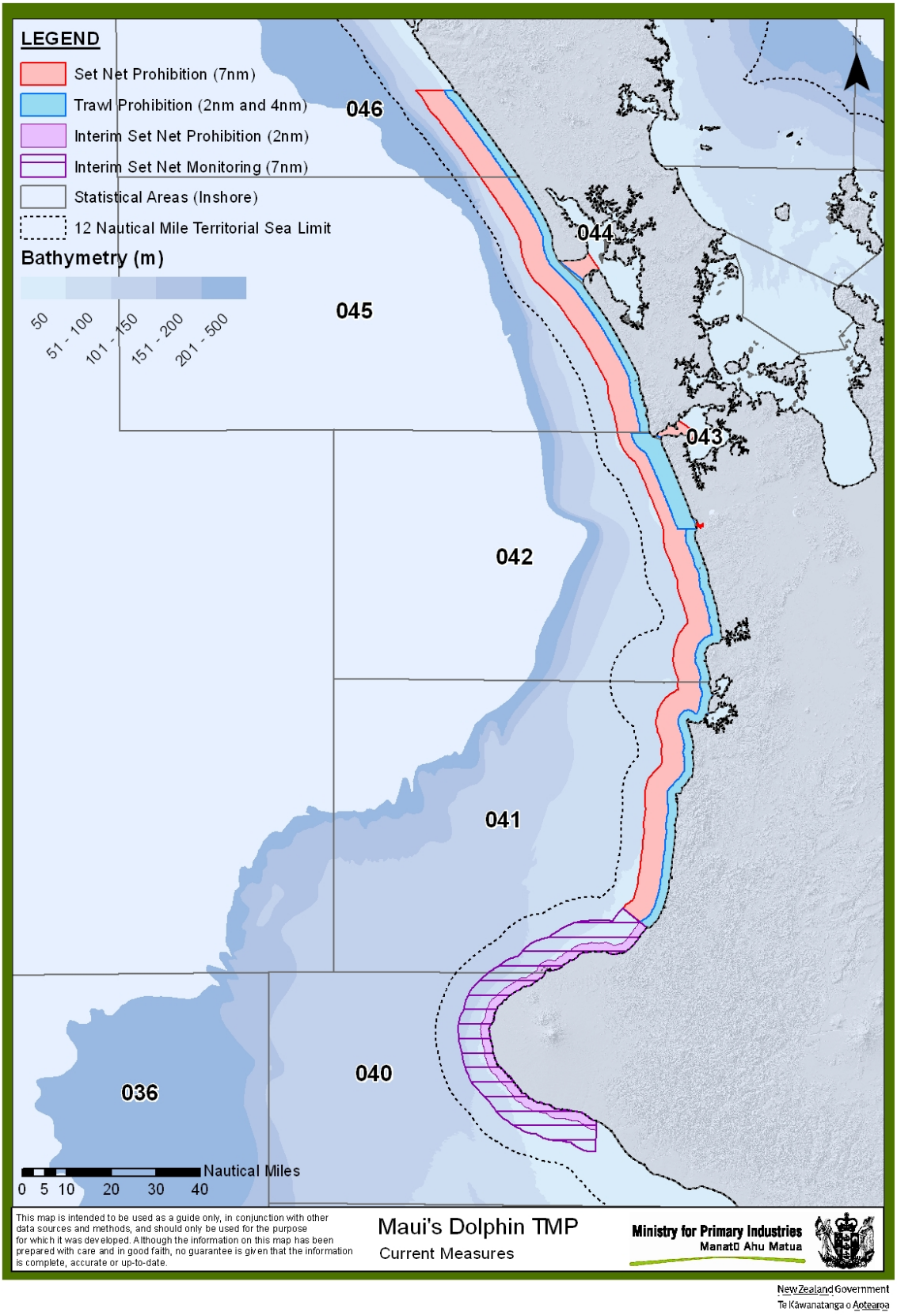
- Strandings (that is dead dolphins washed ashore and dolphins recovered entangled in nets)
- Verified public sightings,
- Aerial and boat-based research surveys, and
- The nature of set net activity in the entrances of harbours (or just outside the entrances) where dolphins have been observed.

These boundaries have been in place since the 2008 review of the TMP. That review noted that while 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 represent isolated and infrequent occurrences. 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 of Cape Egmont in the Taranaki area and the recent population estimate of Maui's dolphins the Minister for Primary Industries ('the Minister') considered it necessary to take a cautious approach and manage the residual risk in the Taranaki area. The focus of the interim measures is the protection of Maui's dolphins while this review of the Maui's dolphin portion of the TMP is undertaken. The interim measures[116] came into effect in July 2012 and:

- Prohibit commercial and amateur set netting from Pariokariwa Point to Hawera out to 2 nautical miles, and
- Prohibit commercial set netting from Pariokariwa Point to Hawera between 2 and 7 nautical miles offshore unless an observer is onboard.

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



Map 6.1. 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).

Observer coverage does not prevent any dolphin mortalities from occurring, however, the monitoring is necessary to gather greater information on the presence of dolphins in the area and their subspecies identity to better inform management. The interim measures will stay in place while the review and the nature of other possible measures to mitigate the risks to Maui's dolphins are decided.

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.

6.2.1.1 Commercial set nets

The following commercial set net rules apply throughout New Zealand fisheries waters[117]:

- Commercial fishers cannot use more than 3000 metres of net per day without written authorisation from the director general.
- Commercial fishers must service their net while it is set at least every 18 hours

6.2.1.2. Amateur set nets

The following amateur set net rules apply throughout New Zealand fisheries waters[118]:

- 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

Similar practices are also followed by commercial set net fishers.

6.2.2 Commercial trawling prohibitions

Commercial trawling is prohibited between 0 and 2 nautical miles offshore between Maunganui Bluff and the Manukau Harbour, and Port Waikato to Pariokariwa Point (Map 6.1). Within this area, between the Manukau Harbour and Port Waikato, trawling is prohibited between 0 and 4 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.

Low levels of bycatch monitoring means that the level of interaction between trawling and commercial set nets and Maui's dolphins outside the closed areas under the current

[117] Fisheries (Commercial Fishing) Regulations 2001
[118] Fisheries (Amateur Fishing) Regulations 1986

management framework (*status quo*) cannot be determined with certainty. Limited monitoring results in uncertainty around catch rates of Maui's dolphins in 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.

6.3 PROBLEM DEFINITION

MPI considers a review of the current management measures (*status quo*) appropriate because:

- New research on Maui's dolphins estimates:
    - there are approximately 55 dolphins over 1 year old and the population is declining
    - the population can sustain one human-induced mortality every 10 to 23 years without impacting on its ability to rebuild and ensure long-term sustainability.
- A Hector's or Maui's dolphin died in a commercial set net off Cape Egmont in January 2012 occurred outside of the areas closed to set net fishing after the 2008 review of the TMP.
- 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.
- There is increasing public awareness and international trends toward being more risk-adverse in relation to human impacts on vulnerable species.

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. The unknown levels of residual risk remain at the margins of Maui's dolphin distribution, that is, where Maui's dolphin may occasionally range but their presence is considered rare.

6.3.1 Need for action

The need for the Minister for Primary Industries ('the Minister') to act will be determined by careful consideration of his obligations under the Fisheries Act 1996 ('the Act'). The assessment of the effect of fishing-related mortality is based on the following factors:

- 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 the Minister to impose more measures in the area.

The Minister 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 the Minister deems the current residual risk unacceptable then the options outlined below should be considered to reduce or remove that risk.

6.4 OBJECTIVES AND STATUTORY CONSIDERATIONS

6.4.1 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.

In considering the issues and options outlined in this consultation paper, or that arise during consultation, the relevant statutory considerations within the Act are taken into account. MPI considers that by meeting the statutory obligations under the Act, the Minister will also meet the goals of the TMP with respect to human threats to the Maui's dolphin population that are within their mandate to manage (that is the effects of fishing).

MPI has undertaken an analysis of the relevant statutory obligations (see Appendix 2 for this analysis) and considers the options in this paper to be consistent with these obligations.

6.4.2 Consultation

Section 12 of the Act requires the Minister to consult with such persons or organisations as the Minister considers 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, including Maori, environmental, commercial and recreational interests.

It also requires the Minister 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 concerned and have particular regard to kaitiakitanga. This paper forms part of that consultation process.

6.4.3 Sustainability measures to manage fishing-related mortality of marine mammals

Two tools under the Act will be considered to put in place any of the management options considered in this consultation paper, or as a result of consultation:

1. Sustainability measures under section 11, or
2. Avoid, remedy or mitigate the effect of fishing related mortality on any protected species under section 15(2) of the Act.

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, extisitng 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.

Section 15(2) allows the Minister, in the absence of a population management plan and after consultation with the Minister of Conservation, to take such measures that he or she considers are necessary to avoid, remedy, or mitigate the effect of fishing-related mortality on any protected species[119]. Such measures may include, but are not limited to, setting a limit on fishing-related mortality[120].

[119] 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.

[120] MPI is not proposing to introduce any fishing relating mortality limits for Maui's dolphins. However, should a confirmed fishing-related

Any sustainability measure set under section 15(2) would be introduced by way of regulation.

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

Section 15(4) allows the Minister 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).

6.4.4 Case law on section 15(2)

The Court of Appeal has commented that in considering whether to take any measure under section 15(2), the Minister is 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[121].

The Court of Appeal also commented on the difference between the Minister's 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[122]. However, the Court noted that setting a fishing-related mortality limit for protected species under section 15(2) requires a different type of exercise[123].

The Court indicated that section 15(2) involved balancing risks on one hand against utilisation advantages on the other[124]. The Minister was 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. Further, relevant to section 15(2) is the impact of fishing on the population of the protected species as a whole, the section does not provide for measures aimed at simply eliminating or reducing individual deaths.[125]

6.4.5 Precautionary approach

The Court of Appeal[126] has recognised that a precautionary approach is available to the Minister 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 followed by Mallon J in the High Court in 2009 when considering measures put in place to protect Hector's and Maui's dolphins[127].

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mortality of a Maui's dolphin occur before long-term measures are consider, the Minister has already indicated he will look to put in place emergency measures to further reduce fishing-related threat to Maui's dolphins.

[121] *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.

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

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

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

[125] *The Squid Case*, para 7.

[126] *The Squid Case*, para79.

[127] *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).

6.5 KEY BIOLOGICAL CHARACTERISTICS

Section 4 (Context) and Section 5 (Threats to Maui's dolphins) of this document summarise 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.

These sections should be read with this chapter as they provide the background information that has informed the development of the fishing-related management options being considered.

6.5.1 Uncertainty in the biological information

6.5.1.1 Abundance and population trend of Maui's dolphins

There is uncertainty around the current population estimate for Maui's dolphins. MPI also notes that previous abundance estimates are not directly comparable to indicate population decline. However, all Maui's dolphin abundance estimates signal that the population is very small, and has likely declined from higher levels of abundance.

6.5.1.2 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 (via genetic testing). The uncertainty in Maui's dolphin distribution is due to the:

- small population size of Maui's dolphins;
- range in reliability of sightings information;
- 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.

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

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 vulnerability of the population to human-induced mortalities.

6.5.1.4 Long-term viability

Biological[128] and stochastic[129] factors 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 the Minister on the level above which the species should be maintained. However, the present size of the population is considered unlikely to be viable in the long term.

[128] 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.

[129] 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.

6.6 WCNI SET NET FISHERY FROM PARIOKARIWA POINT TO HAWERA

6.6.1 Characterisation of the fishery

Commercial Set Net Activity

- 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).

Customary Set Net Activity

- 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.

Recreational Set Net Activity

- 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 is concentrated from Cape Egmont northwards, between 0 and 4 nautical miles offshore.

6.6.1.1 Commercial fishers

MPI has characterised and analysed the main set net fisheries between Pariokariwa Point and Hawera. 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.

6.6.1.2 Customary fishers

MPI has little information on the number of customary set net events around the Taranaki coastline and welcomes tangata whenua to comment on the importance of set net as method used for customary fisheries.

6.6.1.3 Recreational fishers

MPI has little information on the number of recreational set net events around the Taranaki coastline, and welcomes stakeholder information on this. Due to inherent data limitations, any quantitative estimates of the level of recreational activity with set nets will be very inexact.

MPI recognises that set netting is a popular recreational activity. Removing the ability to set net would take away the opportunity that exists now and would detract from a popular activity. MPI welcomes stakeholders' specific comments on the nature and extent of how the proposals might have an impact on their individual circumstances.

6.6.2 Maui's dolphin distribution

6.6.2.1 Southern distribution

Best available information indicates that the Taranaki region was once a part of the geographic range of the Maui's population when abundance was higher. Since 1989, the most southern sighting of a live Maui's dolphin was north of Raglan in 2010 and the most southern beachcast Maui's dolphin was found in Albatross Bay, Kawhia Harbour in 2000 (subspecies identity of both confirmed by genetic testing). These Maui's were found within the set net prohibition boundary put in place as a result of the 2008 review of the TMP. However, 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.

Since the 2008 review of the TMP the most southern sighting of a Hector's or Maui's dolphin by DOC staff was near the Mokau River, north of New Plymouth (and within the 0 to 7 nautical miles set net ban north of Pariokariwa Point). But there have also been public sightings of Hector's or Maui's dolphins south to Cape Egmont. While the reliability of public sightings varies, there have been some verified[130] public sightings in the New Plymouth region.

In addition, a Hector's or Maui's dolphin was entangled in a commercial set net off of Cape Egmont in January 2012 ('the January mortality'). In April 2012, a stranded Hector's dolphin was found on an Opunake beach, just south of where the January mortality occurred.

MPI therefore considers information on the alongshore distribution of Maui's dolphin in the Taranaki area (south of Pariokariwa Point) to be uncertain. The limited information for this area suggests that if Maui's dolphins are present between Pariokariwa Point and Hawera, that their presence is rare and infrequent.

6.6.2.2 Offshore distribution

Maui's dolphins are closely related to Hector's and may have similar habitat preferences. However, it is difficult to detect the offshore range of Maui's dolphins because of their low abundance. Aerial sightings of Hector's and/or Maui's dolphins off the WCNI suggests that they are more prevalent in the area between shore and 4 nautical miles offshore, but have been sighted out to 7 nautical miles. The January mortality off of Cape Egmont occurred within 2 nautical miles from shore.

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, what their offshore limit is, and this is difficult to detect given their low abundance. The offshore distance of the 100 m depth contour varies between Pariokariwa Point and Hawera (from 3.9 nautical miles to 39 nautical miles offshore).

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

Commercial and amateur set netting is currently prohibited between: Maunganui Bluff and Pariokariwa Point (out to 7 nautical miles); Pariokariwa Point to Hawera (out to 2 nautical miles); and Pariokariwa Point to Hawera (from 2 and 7 nautical miles without an observer onboard) (Map 6.2).

[130] As defined in section 4.1.9.1 where all public sighting reported to DOC undergo a validation procedure. Those sightings that can be validated are considered more reliable than unverified public sightings.

Distribution information of Maui's dolphins from Pariokariwa Point to Hawera is uncertain. The limited sightings and strandings data in this area suggests the presence of Hector's and/or Maui's dolphins is rare and infrequent.

Prior to the 2008 review of the TMP only less reliable public sightings (as compared to research sightings) have suggested that dolphins are present south of Pariokariwa Point. The previous Minister considered this information insufficient to close the area. Since this review the recent stranded dolphin near Opunake, the January mortality, 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.

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[131]. But given that the area is outside their core range and the overall number of Maui's dolphins is very small, MPI consider the likelihood of a death from set net activity occurring is low.

However, the consequence of any fishing-related mortality to the Maui's dolphin population is high and a single mortality will have a significant consequence by slowing or preventing the population from increasing in size.

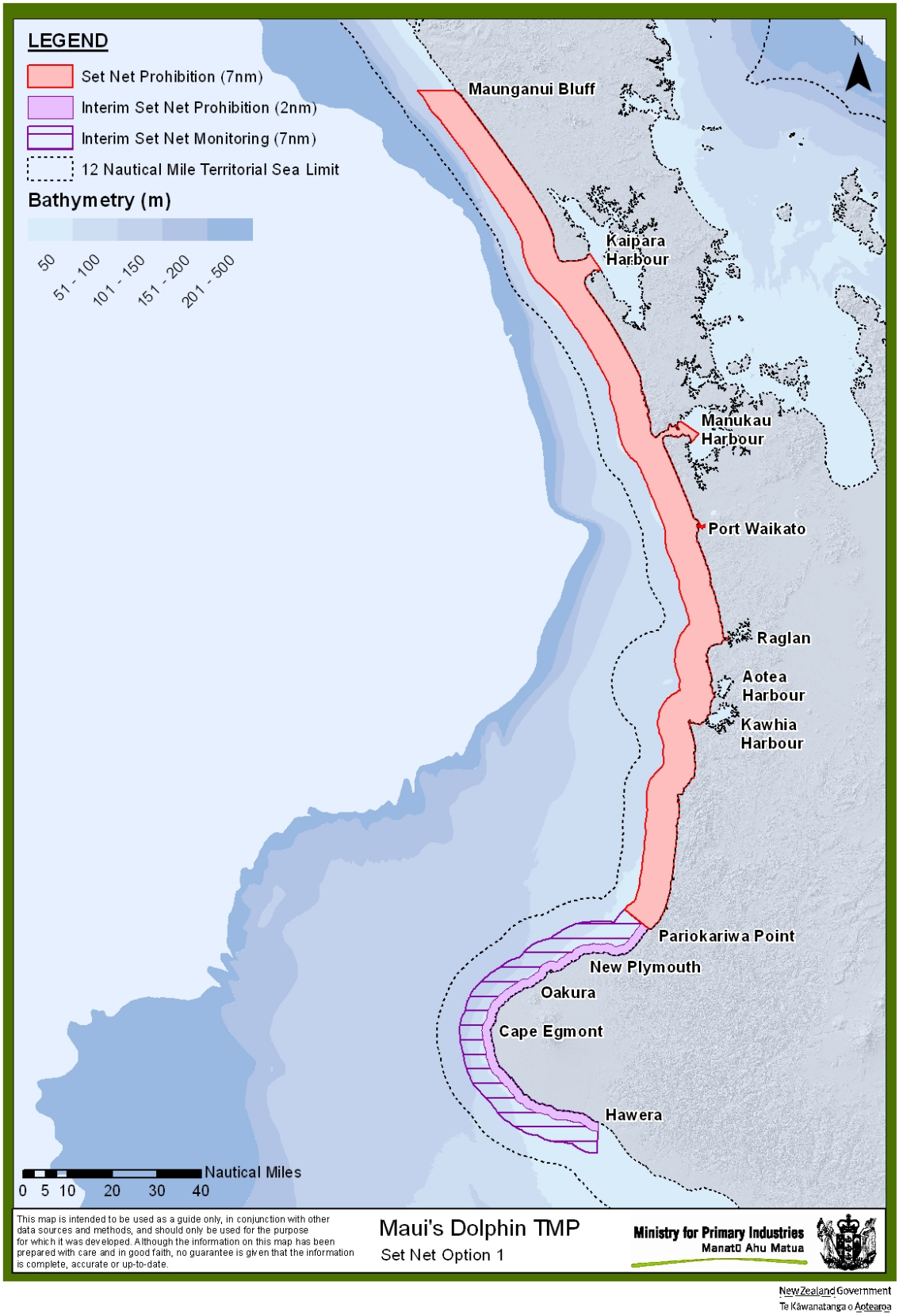
6.6.4 Need to act

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 the Minister with guidance on how to respond to uncertain information. See Appendix 2 (Section 10.3) below for a discussion of these principles. A precautionary approach is available to the Minister (see discussion in Section 6.4.5 above).

MPI considers, given the consequence of any mortality to the population as discussed above (but noting the uncertainty also discussed above) that management measures to address the residual risk from set net activity south of Pariokariwa Point should be considered. Notwithstanding, the Minister can take a different view of the level of risk to Maui's dolphins based on the information presented in final advice that will include comments and information received in submissions.

[131] 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.



Map 6.2. Current (*status quo*) commercial and amateur set net restrictions off the west coast of the North Island.

6.6.5 Management Options

Commercial and Amateur Set Netting	
Option 1	*Status quo*: Keep existing management, including the interim measures to: • retain the set net ban 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, and; • pay for observer services costs with Crown-funding. 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 ban 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, and; • require observer services costs to be cost-recovered from industry beginning 1 October 2013.
Option 3	• 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.

The analysis of options discusses the potential effect of each on amateur and commercial fishers. There is uncertainty around the impacts that the proposed measures will have on people's social, cultural and economic wellbeing. This is primarily because there is limited specific information about the fishing activities (for example, effort and target species) that are affected by the proposals[132].

In providing submissions, stakeholders should provide information on any utilisation, economic, social, and cultural factors that may be relevant to the proposed options. In particular, fishers should provide information on how these proposals may impact on their fishing activities.

Customary fishers

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[133]. 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. While it is a legal practice for Kaitiaki to continue to issue authorisations under a closure it is discouraged. Customary authorisation are a key tool of the regulations, however Kaitiakitanga is not limited to only authorisations.

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 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

[132] Due to the nature of the reporting framework for commercial fishers and no formal reporting of amateur fishing effort.
[133] Fisheries (Kaimoana Customary Fishing) Regulations 1998

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.

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.

6.6.5.1 Option 1 (Status quo)

Option 1 (Map 6.2 above) would keep the interim measures and:

- prohibit commercial and amateur set net fishing 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 vessel, and;
- pay for the cost of observer services out of Crown-funds.

The measures would be reviewed in 2015 after three years of observer coverage (because of the low likelihood of detection of these dolphins) to inform management going forward.

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 2 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 2 and 7 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 2 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.

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 2 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 4 nautical miles (but within 4 nautical miles they are more often observed between 0 and 2 nautical miles) and make infrequent visits to areas beyond 4 nautical miles. Residual risk would remain for any dolphins that travel further offshore than 2 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 are approximately 6-8 commercial set net fishers that were affected by the measures. Industry has submitted previously that a significant portion of catch (pre-interim measures) will not be harvested because the species predominantly targeted are caught between 0 and 2 nautical miles.

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. A detailed economic impact analysis for each of the management options proposed can be found in Appendix 4[134].

The economic impacts of Option 1 are:

Estimated using landings data from 1 April 2011 to 30 March 2012[135]	
Annual Value Impact	$482 200
Capitalised Future Value Impact	$1 714 470
Subtotal = Cost to Industry	$2 196 670

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 2 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 be met by the Crown. Option 1 is appropriate if the Minister considers this approach 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 notes that since the interim measures have come into effect there are four/five vessels that operate between 2 and 7 nautical miles with an observer onboard. In the absence of information on displacement or removal from the fishery MPI will estimate the cost of observer coverage between 2 and 7 nautical miles using the average number of fishing days per year between 0 and 7 nautical miles.

[134] 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.

[135] Based on comments from industry submitters during consultation on the interim measures, all economic impacts for this region (Pariokariwa Point to Hawera) have been estimated using catch effort and landing data from 1 April 2011 to 30 March 2012, as well as the 3 year average of October fishing year data and the 1 October 2010/11 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.

MPI estimates the ongoing cost of mandatory observer coverage between the 2 and 7 nautical mile area to be between $334 010 and $526 000 a year for the next two years. The cost of observer coverage has been made using the following assumptions:

- An estimate of 526 days fished per year[136].
- Observer costs of $635 (average) and $1000 (maximum) per day.

Non-commercial impact
The value of recreational set net fishing is unable to be quantified, but MPI notes there are recreational fishers that have been impacted since the interim measures came into effect. MPI considers recreational set net fishers are less likely to set net beyond 2 nautical miles from shore or travel further south to continue to set net.

Keeping the interim measures are likely to result in recreational set net fishers having to: travel further afield to be able to continue to use that method, switch to alternative fishing methods, or be 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).

6.6.5.2 Option 2

Option 1 (Map 6.2) would put the interim measures in place via regulation to:

- prohibit commercial and amateur set net fishing 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 vessel, and;
- require observer services to be cost-recovered from industry beginning 1 October 2013.

The differences between Option 1 and 2 is that:

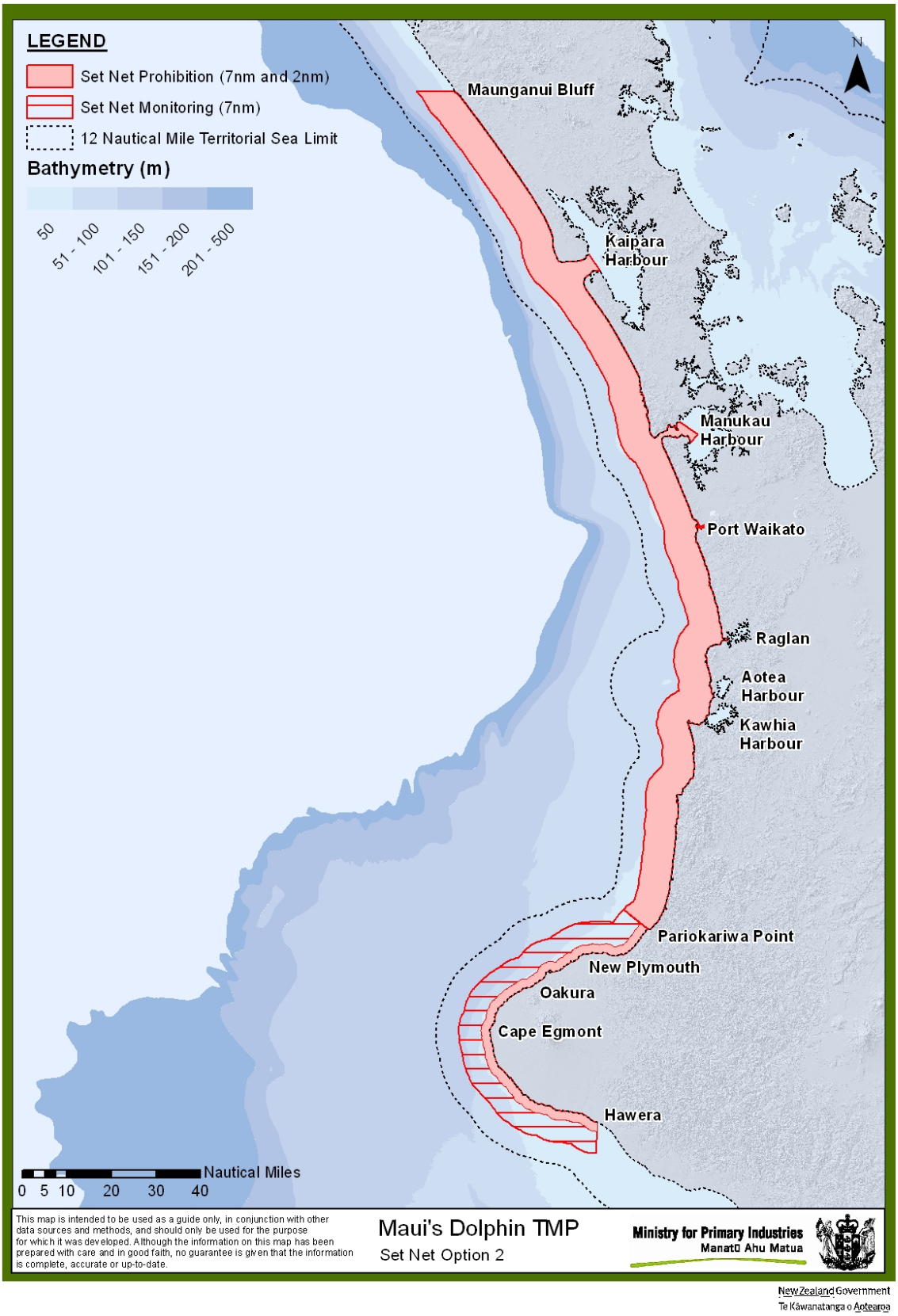
- observer coverage is paid for by industry through the cost-recovery levies, and
- from a technical perspective, Option 2 will provide better consistency with the pre-existing set net ban laws and accessibility of the law to stakeholders (they will be consolidated in one place under the same regulations) because the measures will be put into the Statutory Regulation Series.

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 2 nautical mile boundary means residual risk remains to any Maui's dolphin should they travel beyond 2 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.

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

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.

[136] 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.



Map 6.2. 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 2 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 2 and 7 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 come into effect for 1 October 2013.

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 cost of mandatory observer coverage between 2 and 7 nautical miles to be between $334 010 and $526 000 a year and uses the same assumptions as outlined in Option 1.

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

6.6.5.3 Option 3

Option 3 (Map 6.3) would:

- prohibit commercial and amateur set net fishing 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 the vessel, and;
- require observer services to be cost-recovered from industry.

Option 3 is a more biologically 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 it is considered 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

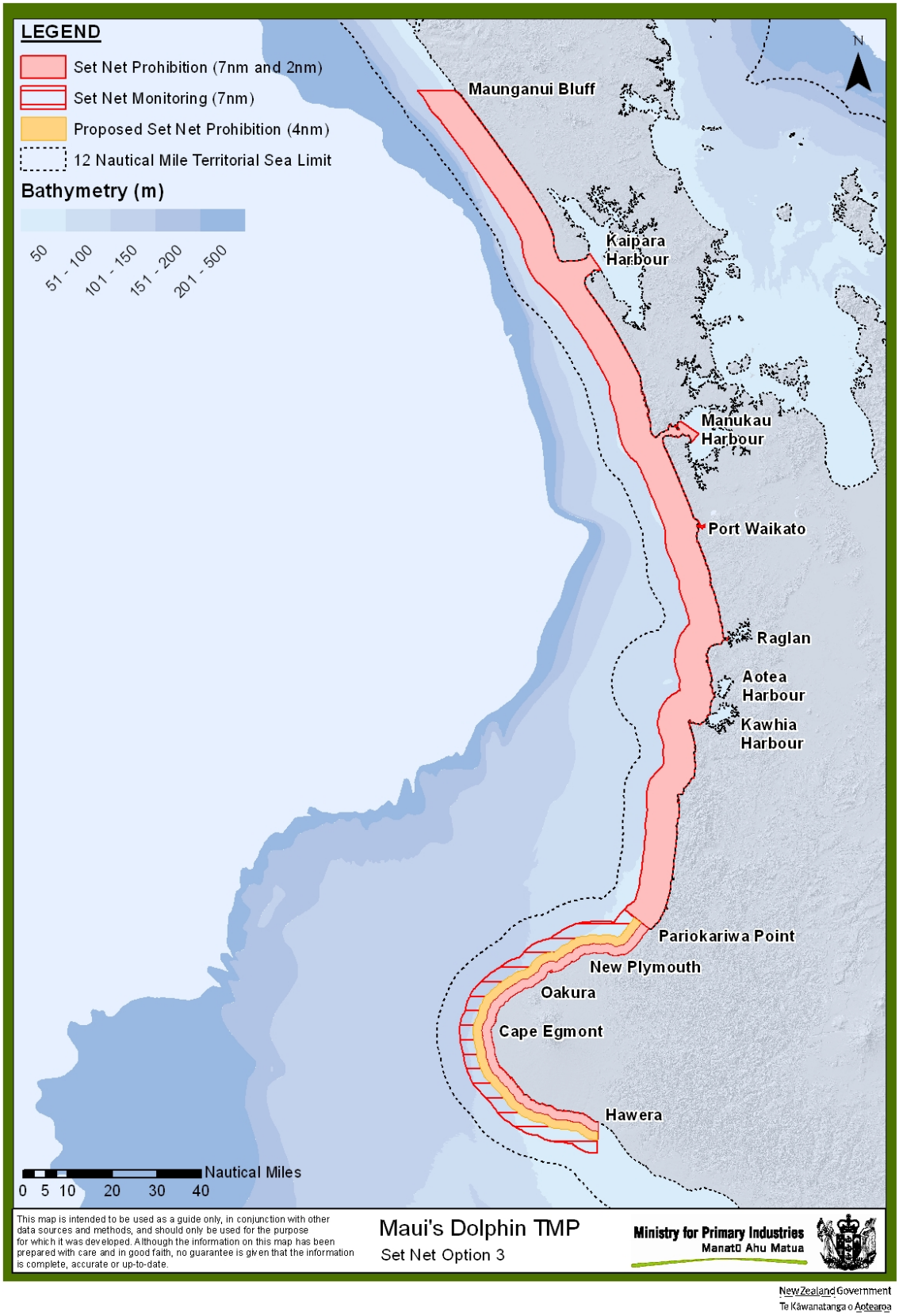
prevalent (between 0 and 4 nautical miles). This option removes a greater level of residual risk in the area south of Pariokariwa Point than Option 1 and 2.

As with Options 1 and 2, 100 percent observer coverage betwee 4 and 7 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 4 nautical miles.

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.

Effectiveness

A spatial closure out to 4 nautical miles will provide the Minister with greater certainty that risks to Maui's dolphins south of Pariokariwa Point will be avoided. Option 3 the offshore range where Maui's and/or Hector's are most frequently observed (between 0 and 4 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 4 nautical miles. MPI considers there is a lower level of residual risk beyond 4 nautical miles where dolphin presence has been observed but the extent of their presence is unknown.



Map 6.3 Proposed commercial and amateur set net restrictions for Option 3 off the west coast of the North Island, including 100% observer coverage and an extension of the set net prohibition from 2 to 4 nautical mile.

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 affected. The ability for commercial set net fishers to adjust their fishing behaviour by moving further offshore beyond 4 nautical miles may be constrained. The species mix caught between 4 and 7 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 0 and 4 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.

The potential economic impacts of Option 3:

Estimated using landings data from 1 April 2011 to 30 March 2012	
Annual Value Impact	$885 932
Capitalised Future Value Impact	$3 162 581
Subtotal = Cost to Industry	$4 048 513

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 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 0 and 2 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 4 and 7 nautical miles offshore) and a closure out to 4 nautical miles may mean continuing set net activity between 4 and 7 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 4 and 7 nautical miles. However, MPI is unable to estimate potential displacement of fishers into this area from the 2 to 4 nautical mile zone, or whether they would be shut out of the fishery, if the set net ban is extended out to 4 nautical miles.

In the absence of information on displacement or removal from the fishery MPI will estimate the cost of mandatory observer coverage between 4 and 7 nautical mile area using the average number of fishing days per year in the entire 0 to 7 nautical mile area. Under this scenario MPI estimates the cost of observer coverage to be no more than $334 010 to $526 000 a year using the following assumptions:

- An estimate of 526 days fished per year[137].
- All fishing effort will transfer from the 0 to 4 nautical mile area into the 4 to 7 nautical mile area.
- Observer costs of $635 (average) and $1000 (maximum) per day.

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 4 nautical miles offshore. MPI considers the likelihood of interactions between 4 and 7 nautical miles is low, and smaller than the likelihood of interactions in Option 2, but the consequence of an interaction remains very high.

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 4 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.

Questions for tangata whenua and stakeholder consideration

- Is the *status quo* an accurate reflection of your experience?
- Where in your experience is coastal set net activity around the Taranaki most concentrated based on target species, and what is its potential overlap with Maui's dolphin distribution?
- Are there any additional or different problems that should be addressed?
- Are there any alternative options that need to be considered?
- Have the key features of each option been accurately set out?
- Have the impacts and benefits of the options been identified and accurately described?
- What is the nature and extent of how the management options might have a social, cultural, or economic impact on iwi circumstances?
- How would the options impact on your set net activities and are there opportunities to continue using this method outside the area where the restrictions are proposed?
- Are there other comments you would like to make about the options proposed?

[137] Calculated based on the average annual number of trip days from 2008/09 to 2010/11 from Pariokariwa Point to Hawera between 0 and 7 nautical miles offshore.

6.7 WCNI HARBOURS' SET NET FISHERY

6.7.1 Characterisation of the fishery

Commercial Set Net Activity

- 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.

Customary Set Net Activity

- 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.

Recreational Set Net Activity

- The level of non-commercial set net activity between Pariokariwa Point and Hawera 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[138] 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.

6.7.1.1 Commercial fishers

MPI has characterised and analysed the main set net fisheries in the WCNI harbours. 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.

6.7.1.2 Customary fishers

MPI has little information on the level of customary set net activity in WCNI harbours. MPI welcomes tangata whenua to comment on the importance of set net as method used for customary fisheries, the taonga species that are targeted within the harbours and where in the harbours this activity most often occurs.

6.7.1.3 Recreational fishers

MPI has little information on the level of recreational set net activity in WCNI harbours, and

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

welcomes stakeholder information on this. Due to inherent data limitations, any quantitative estimates of the level of recreational activity with set nets will be very inexact.

MPI recognises that set netting is a popular recreational activity. MPI welcomes stakeholders' specific comments on the nature and extent of how the proposals might have an impact on their individual circumstances.

6.7.2 Maui's dolphin distribution

For the WCNI harbours, Hector's and/or Maui's dolphins have been most frequently observed near or in the entrance channels of harbours. In Raglan Harbour there have been some research and public sightings near the entrance, and a couple of sightings by government officials within the harbour entrance beyond the current set net restriction boundary. There has been a research sighting at each of the mouths of the Kawhia and Aotea Harbours, in addition to some public and government sightings.

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[139] 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. MPI acknowledges there are limitations in the range of acoustic detectors. However, since the 2008 review of the TMP the information resulting from acoustic detection surveys (from 2005 to 2008) has undergone scientific peer review.

There is no information to indicate the extent and frequency of Maui's dolphin movements into and within the harbours. 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. The harbours are large, however, and lack of data does not necessarily mean absence of dolphins.

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

Commercial and amateur set netting in the WCNI harbours is currently prohibited inside the entrances to the Kaipara, Manukau, and Raglan Harbours, and Port Waikato river mouth (Map 6.4).

MPI is unable to quantify the residual risk to Maui's dolphins given the uncertainty in the distribution information of Maui's dolphins in WCNI harbours. The limited data available suggests Hector's and/or Maui's dolphins are more likely to be observed in the harbour entrance channels (rather than well inside the harbours), and their presence in these channels is rare and infrequent. MPI notes an acoustic detection of a Hector's and/or Maui's dolphin has been recorded inside the Kaipara Harbour along one of the channels, and two government sightings have been reported in the entrance channel of the Raglan Harbour beyond the current set net restriction boundaries.

Using a qualitative assessment, MPI considers some residual risk remains given the proximity of the harbours to the Maui's dolphins' core range, and their occasional movements into and beyond the harbour entrance channels. MPI considers the risk is greater where the intensity

[139] Acoustic detection is when the noises (echolocation signals) the dolphins (in this case Hector's and Maui's) make were recorded in the harbour.

of set net activity is high and its proximity to where dolphins have been most commonly observed, which increases the likelihood of an interaction occurring. However, given that the harbours are outside their core range and the overall number of Maui's dolphins is very small, MPI consider the likelihood of interactions with set net activity in the harbours to be low.

The risk assessment report indicated that residual risk remains along the boundary of the current set net ban in the Manukau Harbour based on Maui's dolphin distribution and location of set net activity. However, MPI notes that there is limited position information of set net activity available under the current reporting regulations. Therefore, the level of residual risk to dolphins should they swim beyond the entrance where they have been sighted and acoustically detected is unknown.

MPI invites stakeholders to comment on the areas of these WCNI harbours most used based on target species, and the intensity of their activity in those areas.

6.7.4 Need to act

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.

The information principles in the Act provide the Minister with guidance on how to respond to uncertain information. MPI considers, given the consequence of any mortality to the population as discussed above (but noting the uncertainty also discussed above) that management measures to address the residual risk from set net activity in the WCNI harbours should be considered. Notwithstanding, the Minister can take a different view of the level of risk to Maui's dolphins based on the information presented in final advice that will include comments and information received in submissions.

6.7.5 Management Options

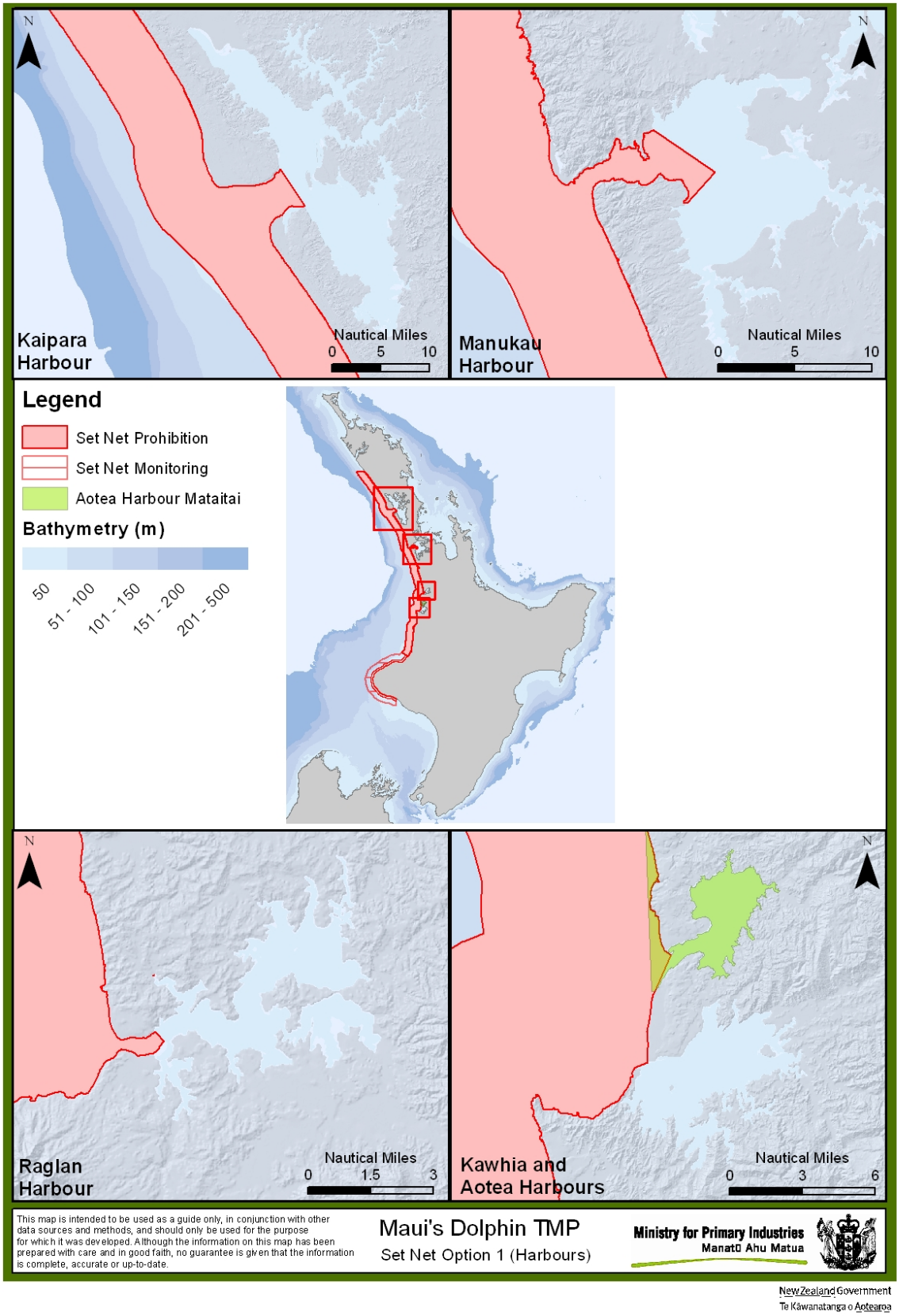
MPI is consulting on the following management options to manage the threats of commercial and amateur set net activity in the WCNI harbours on Maui's dolphins.

Commercial and Amateur Set Netting (WCNI Harbours)	
Option 1	*Status quo:* Keep existing management
Option 2	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 3	• 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.

6.7.5.1 Option 1 (Status quo)

Option 1 would keep the current management measures in place for WCNI harbours (Map 6.4). The Minister 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.



Map 6.4. Current (*status quo*) commercial and amateur set net restrictions within the west coast North Island harbours.

6.7.5.2 Option 2

Option 2 would keep the current management measures for the WCNI harbours (Map 6.4 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.

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 is 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 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.

Option 2 is appropriate if the Minister considers 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.

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 8 of this paper) as an appropriate framework to identify possible research projects or monitoring programmes to support the collection of this information.

MPI invites stakeholders to comment on education or public awareness initiatives that may provide additional ways to improve information on Maui's dolphin distribution and use of the harbours and how that can be incorporated into the research and monitoring frameworks.

Impact on fishers

In order to improve information on set net activity in the harbours MPI considers 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 provided 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.

MPI invites stakeholders to comment on whether such information could be provided using currently available reporting forms, whether the current reporting forms would need to be modified, or whether the information could be provided in an additional reporting form.

MPI invites industry participants to comment on the feasibility of requiring finer special scale reporting, and if applicable, additional methods of improving location of set net activity in the west coast North Island harbours.

6.7.5.3 Option 3

Option 3 (Map 6.5) builds on the importance of improving information outlined in Option 2 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[140], 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.

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 the Minister considers 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.

MPI invites stakeholder comments on whether set net bans in the entrances of the other WCNI harbours should also be extended.

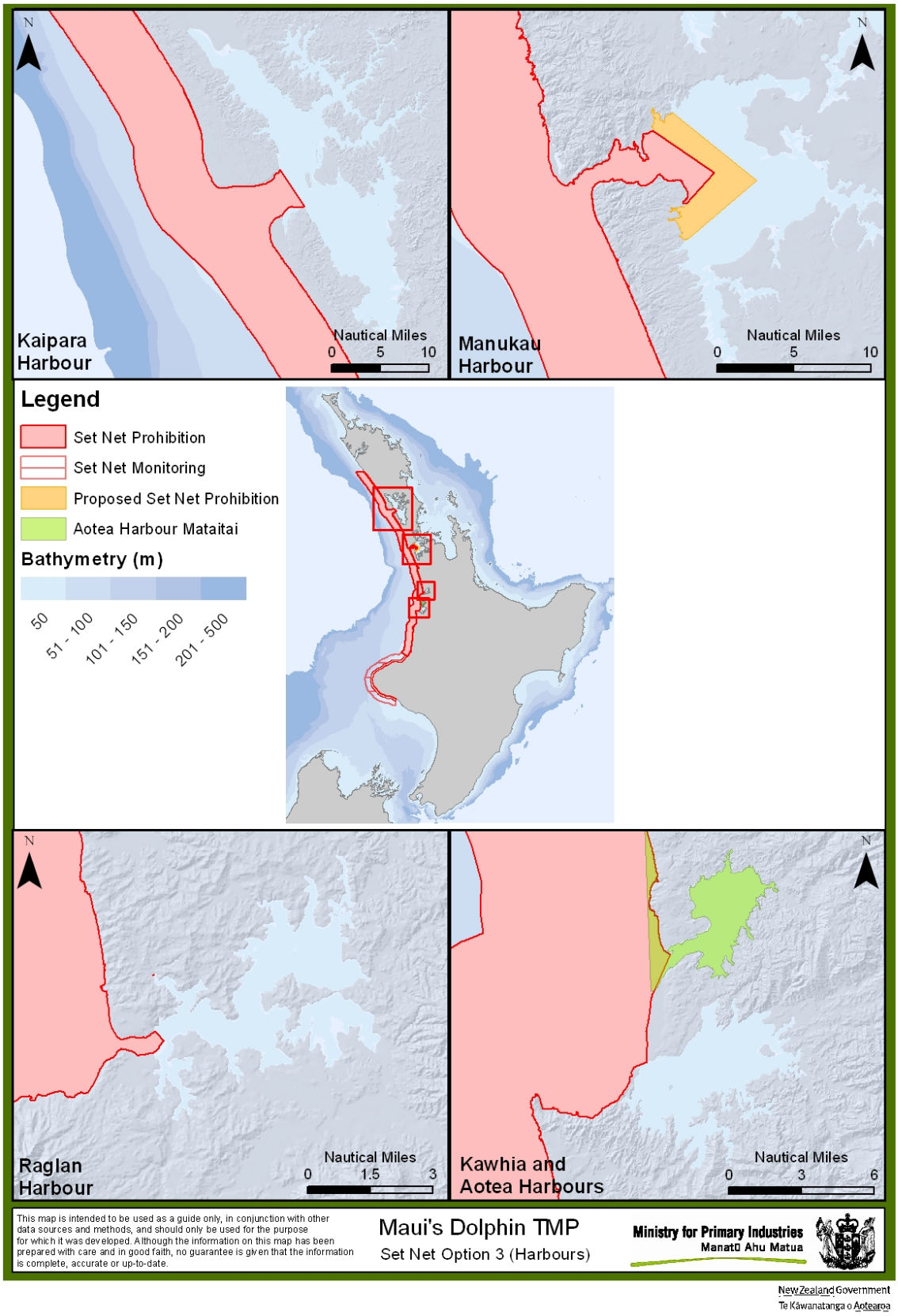
Effectiveness

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.

[140] 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 6.5. Proposed extension of the commercial and amateur set net prohibition in the Manukau Harbour (Option 3).

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.

The potential economic impacts of Option 3:

Estimated using landings data from 1 October 2010 to 30 September 2011 for Manukau Harbour	
Annual Value Impact	$442 999
Capitalised Future Value Impact	$1 054 843
Subtotal = Cost to Industry	$1 497 842

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 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.

Questions for tangata whenua and stakeholder consideration

- Is the *status quo* an accurate reflection of your experience?
- Where in your experience is set net activity in the WCNI harbours most concentrated based on target species, and what is its potential overlap with Maui's dolphin distribution?
- What proportion of your catch of key target species (rig, flatfish, grey-mullet, yellow-eyed mullet, and kahawai) do you estimate would be impacted from the proposed set net ban extension?
- Are there any additional or different problems that should be addressed?
- Are there any alternative options that need to be considered?
- Have the key features of each option been accurately set out?
- Have the impacts and benefits of the options been identified and accurately described?
- What is the nature and extent of how the management options might have a social, cultural, or economic impact on iwi circumstances?
- How would the options impact on your set net activities and are there opportunities to continue using this method outside the area where the restrictions are proposed?
- Are there other comments you would like to make about the options proposed?

6.8 WCNI TRAWL FISHERY

6.8.1 Characterisation of the WCNI trawl fishery

Available information

- The trawl fishery along this coast primarily targets trevally, snapper, and gurnard .
- There are approximately 30 trawl fishers operating 39 vessels on the WCNI.
- 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.

6.8.2 Maui's dolphin distribution

Maui's dolphins are most prevalent in the area between 0 to 4 nautical miles offshore from the Manukau Harbour and south of Port Waikato. Genetic sampling has identified live Maui's alongshore between the Kaipara Harbour and Raglan, and a stranded Maui's dolphin in Albatross Bay near Kawhia. Research sightings of Hector's and/or Maui's dolphins have been observed as far south as the Mokau River.

Aerial surveys suggest that Hector's and/or Maui's dolphins observed off the WCNI are most abundant between the shore and 4 nautical miles offshore (from Kaipara Harbour to Raglan), but that they make infrequent visits beyond 4 nautical miles. The extent of their presence beyond 4 nautical miles is unknown. There is limited information to confirm 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).

6.8.3 Residual risk from existing commercial trawl prohibitions and restrictions

Commercial trawling is prohibited between 0 and 2 nautical miles offshore between Maunganui Bluff and the Manukau Harbour, and Port Waikato to Pariokariwa Point (Map 6.5). Between the Manukau Harbour and Port Waikato trawling is prohibited between 0 and 4 nautical miles offshore. Trawling is also prohibited in all WCNI harbours.

There have been no reported Maui's dolphin interactions with trawlers but trawling activity does overlap with Maui's dolphins range. Trawling is also known to catch other dolphin species off the WCNI and Hector's dolphins in South Island waters (albeit South Island trawlers have a higher probability of catching a Hector's dolphin due to higher dolphin abundance). MPI cannot determine if the absence of reported mortalities necessarily equates to the absence of trawl-related mortalities because monitoring of the WCNI trawl fleet is low.

Commercial trawling occurs along the entire WCNI, although where fishing effort is concentrated depends on the season and species being targeted. Any Maui's dolphin coming into the areas where trawl activity occurs may be at risk of entanglement. MPI considers that 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 estimated as likely to exceed the PBR.[141]

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. MPI considers 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 risk assessment indicated that for the inshore trawl fisheries residual risk remains between the boundary of the trawl fishery closures areas (that extend to 2 or 4 nautical miles offshore) and 7 nautical miles offshore, particularly towards the centre of dolphin distribution (from Raglan Harbour entrance to the Kaipara Harbour entrance). This is supported by trawl positioning information that shows trawl activity is concentrated in these areas.

6.8.4 Need to act

MPI considers there to be uncertainty from the threat posed by trawling within Maui's dolphin range. This uncertainty makes it difficult to quantify the residual risk.

As discussed previously, the information principles in the Act provide the Minister with guidance on how to respond to uncertain information. MPI considers, given the consequence of any mortality to the population as discussed above (but noting the uncertainty also discussed above) that management measures to address the residual risk from trawl activity off the WCNI should be considered. Notwithstanding, the Minister can take a different view of the level of risk to Maui's dolphins based on the information presented in final advice that will include comments and information received in submissions.

[141] Currey et al. (2012)

Map 6.5. Current (*status quo*) trawling prohibitions along the coast off the WCNI.

6.8.5 Management options

MPI is consulting on the following management option to manage the threats of commercial trawling on Maui's dolphins.

Commercial Trawling	
Option 1	*Status quo*: Keep existing management.
Option 2	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.

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.

6.8.5.1 Option 1 (Status quo)

Option 1 would keep the current management measures (Map 6.4 shown above). The Minister 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* remains a valid option given uncertainty over the nature and extent of the impact of fishing-related mortality from trawling on Maui's dolphins and the impact on fisheries users.

6.8.5.2 Option 2

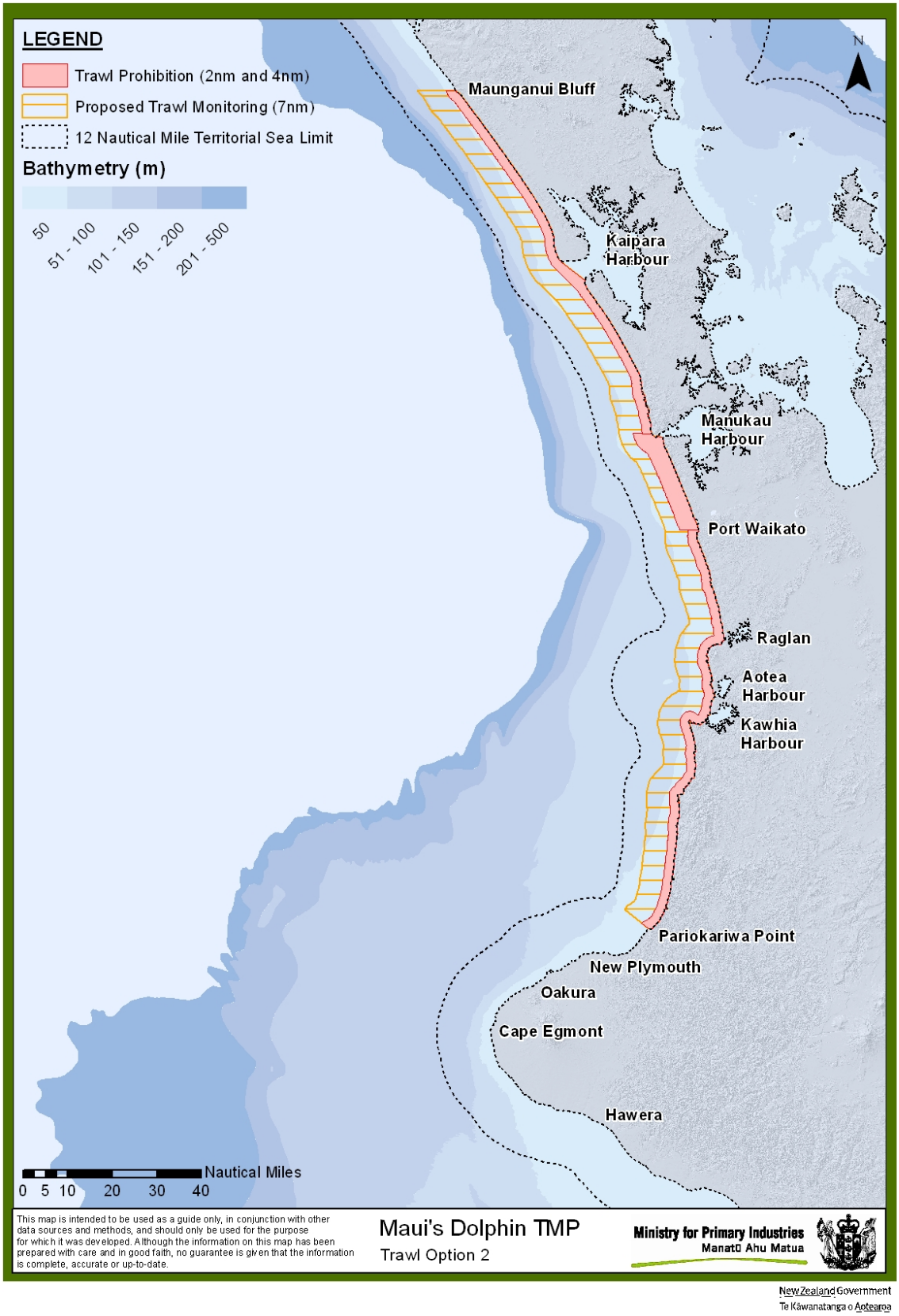
Option 2 (Map 6.5) would put in place an extensive monitoring programme in the commercial trawl fishery between 2 and 7 nautical miles offshore between Maunganui Bluff and Pariokariwa Point. Option 2 is appropriate if the Minister considers:

- 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 the Minister to consider. Further controls on trawlers could be considered in the future if monitoring information indicates risk to Maui's dolphins from this method.

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 6.5. 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 2 and 7 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 2 and 7 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 would collaborate with industry on the design of any monitoring programme to ensure it provided meaningful coverage to inform management as well as identify cost efficiencies. This includes identifying alternative approaches, if effective, to gain the information MPI requires.

In the absence of information on opting out of the area where monitoring coverage would be required, and as the details of any monitoring programme are yet to be worked out, MPI has estimated the potential costs using a number of assumptions:

- An estimate of 1238 days fished per year all of which are monitored[142].
- Observer costs of $635 (average) and $1000 (maximum) per day.

Using those assumptions, MPI estimates the maximum cost to be between $786 130 to $1 238 000 per year. 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.

[142] 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.

6.8.5.3 Option 3

Option 3 (Map 6.6) would:

- extend the trawl ban from 2 to 4 nautical miles offshore from Kaipara Harbour to Kawhia Harbour, 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 is appropriate if the Minister 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.

Effectiveness

A spatial closure out to 4 nautical miles will remove the risk of trawlers interacting with Maui's dolphins in the alongshore area where their presence has been confirmed since 2000[143]. 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.

Risk of entanglement with trawl gear would remain outside the area of the closure. MPI cannot quantify the nature of any remaining risk to Maui's dolphins beyond 4 nautical miles in this area because of the uncertain distribution information and uncertainties about 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.

[143] 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).

Map 6.6. The proposed areas requiring 100% monitoring coverage and an extension of the trawl prohibition from 2 to 4 nautical miles, in the WCNI trawl fishery (Option 3).

Economic impact
MPI estimates that 12 fishers and 12 vessels will be directly affected by extending the trawl ban out to 4 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 4 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 12 for detailed analysis), including an estimated cost of observer coverage:

Estimated using landings data from 1 October 2010 to 30 September 2011	
Annual Value Impact	$515 108
Capitalised Future Value Impact	$2 042 241
Subtotal = Cost to Industry	$2 557 348

These estimates should be treated as indicative 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.

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. That is between $786 130 and $1 238 000 per year.

Questions for tangata whenua and stakeholder consideration

- Is the *status quo* an accurate reflection of your experience?
- Where in your experience is commercial trawling activity off the WCNI most concentrated based on target species, and what is its potential overlap with Maui's dolphin distribution?
- Are there any additional or different problems that should be addressed?
- Are there any alternative options that need to be considered?
- Have the key features of each option been accurately set out?
- Have the impacts and benefits of the options been identified and accurately described?
- What is the nature and extent of how the management options might have a social, cultural, or economic impact on iwi circumstances?
- How would the options impact on your trawl activities and are there opportunities to continue trawling outside the area where the restrictions are proposed?
- Are there other comments you would like to make about the options proposed?

6.9 OTHER VOLUNTARY OR STATUTORY MEASURES

MPI is open to considering other measures that may aid in avoiding, remedying, or mitigating the effects of fishing on Maui's dolphins. Some of the management measures discussed below have been proposed in previous submissions on fishing-related threats to Maui's. MPI considers some of these proposals to be more effective in either reducing uncertainty, or useful in mitigating fishing-related interactions with Maui's dolphins, than others.

Some of these measures may be more effective if instituted under a voluntary rather than regulatory framework. For example, industry can adopt codes of practice with suitable governance and reporting requirements rather than being regulated by the Crown. Other measures may require regulatory implementation to be effective.

MPI invites tangata whenua and stakeholders to comment on the management measures discussed below and whether there are other measures not discussed that MPI should consider.

6.9.1 Alternative gear or fishing methods

MPI is aware that some of the management options will affect the ability of some fishers to harvest certain target species. The legal definition of set netting is very broad and encompasses most fishing methods and gear that enmesh fish.

MPI notes that in referring to set nets, the focus has been on methods that may cause entanglement and death of Maui's dolphins. MPI invites stakeholders to comment on alternative gears or modification of current fishing methods that could be considered to reduce the risk of mortality to Maui's dolphins from entanglement in fishing gear.

6.9.1.1 Ring netting

MPI recognises that ring netting, which is included in the legal definition of set netting may not need to be prohibited to avoid, remedy, or mitigate the effects fishing on Maui's dolphins because of the way the gear is deployed.

Ring netting is a common fishing method used to target mullet and kahawai in the Manukau and Kaipara Harbours. Ring netting has been described[144] 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."*

This method requires the net being in the water for only a short amount of time, under constant attendance. MPI acknowledges that ring netting is prohibited where most set net bans are in effect because of the way set net is defined in the regulations. That is, a set net "includes a gill net or other sort of net that acts by enmeshing, entrapping, or entangling fish."

If ring netting is a suitable method for targeting some species along the coast it could be considered for exemption from the coastal or other WCNI harbour set net prohibitions as well. MPI invites stakeholders to comment on how excluding the activity of ring netting from the set netting prohibition:

[144] *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 174).

- Would impact fishers' ability, or enable them to continue, to harvest their target species
- May create unintended consequences and increase the residual risk to Maui's dolphins, and
- Whether it is suitable to exclude ring netting from the set net prohibitions in WCNI harbours only or along the coast as well.

6.9.1.2 Drag netting

MPI notes that drag netting or beach seining is another alternative method capable for targeting mullet and potentially flatfish.

A drag net or beach seine net means any net or part of a net (including any warp, rope, chain, material, or device used in conjunction with, or attached to, the net) that—

(a) has a buoyancy system on the top edge; and
(b) is weighted on the bottom edge; and
(c) is operated by surrounding any fish and being drawn over the bed of any waters or through any waters to the shore

MPI invites stakeholder to comment on the usefulness of this method to target some species that may be affected by the proposed set net restrictions.

MPI invites stakeholder comments on fishing methods that are encompassed in the legal definition of set netting, but may not be a threat to Maui's dolphins. MPI will provide advice to the Minister, incorporating information from stakeholders on possible non-harmful fishing methods, which may be excluded from regulations on set net restrictions.

6.9.2 Other monitoring or mitigation measures

6.9.2.1 Reporting Requirements

MPI acknowledges that the use of the latitude and longitude co-ordinate data to establish the location of commercial set net activity is not exact and could be improved. Under current set net reporting requirements:

- vessels smaller than six meters are not required to report the latitude and longitude of their start positions of their net;
- most vessel operating in harbours fall within six meters in length and therefore only record the statistical reporting area in which they operate;
- vessels that are required to report the latitude and longitude of their start position are only required to be accurate to plus or minus one nautical mile;
- latitude and longitude reporting of set net activity only indicates the start position of the net;
- vessels which set more than one net are not required to report a position of any additional net, if it is set within 2 nautical miles of the first net, and;
- vessels that are required to report the latitude and longitude of their start position do not have to report the end position of each set 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 3 km net may start outside 2 nautical miles from shore but most is laid within 2 nautical miles from shore). The uncertainty in where set net effort is being concentrated along the coast or within WCNI harbours (as discussed in Section

6.7.5.2) makes it difficult for MPI to better assess the residual risk that remains for Maui's dolphins based on their distribution and overlap with fishing effort. The lack of reporting information also makes it difficult to assess the impact of any proposed management measures on industry.

MPI proposes that all commercial set net operators off the WCNI be required to report the start and end position of their nets to improve assessment of fishing intensity, spatial coverage and potential overlap with dolphin distribution.

MPI invites stakeholders to comment on improving the current reporting requirements by providing more fine scale information.

6.9.2.2 Modifying fishing behaviour

MPI invites stakeholders to comment on 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. MPI notes there are logistical, compliance and practical issues that would need to be considered for each proposal.

To reduce the risk of fishing-related mortality from set netting, MPI invites stakeholders to comment 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.

MPI notes that mitigation measures for set net activity may differ between recreational and commercial fishers. Primarily because of the scale of effort, commercial fishers may be economically and spatially precluded from compulsory net attendance due to the number and size of the nets they have set. For example mandatory set net attendance of a net that may be 1000 metres in length would not necessarily lower risk of entanglement because it would be difficult to recover the set net at a speed that would ensure mortality did not occur. For recreational fishers they have noted in the past that mandatory set net attendance may raise safety concerns or result in unpractical constrains that would reduce overall fishing success.

MPI considers reductions in soak times would be difficult to monitor and enforce. There would be limited ability for fishery officers to determine how long a net was in the water for and whether or not it had been attended in a given time frame. Even if soak times were reduced MPI considers it likely that in some instances the net would just be reset more often; thereby, not actually reducing any residual risk posed by the nets.

To reduce the risk of fishing-related mortality from trawling, MPI invites stakeholders to comment on whether maximum headline heights, for example, would be an alternative mitigation measure.

6.9.2.3 Use of acoustic pingers as a mitigation tool

The use of pingers to reduce interactions between Hector's dolphins and set nets has been investigated and MPI considers the efficacy of these devices to be unproven for Maui's dolphins. Pingers have proven to be effective for some cetacean species but have not been conclusively established as effective for Maui's or Hector's dolphins. It is also not known what undesired impacts pingers may cause, for example exclusion of the Maui's dolphins from their natural habitat and foraging areas.

MPI considers any benefits these devices would provide to be unknown and unclear, which could result in unnecessary costs being imposed on industry. If the use of pingers was required off the WCNI, data collection on the efficacy of this practice would also be required. However, such data collection is unlikely to be feasible given the small population size of Maui's dolphins. 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 from set nets.

6.9.3 Extended protection boundaries

6.9.3.1 Protection within the 100 metre depth contour

MPI considers the likelihood of an interaction between a Maui's dolphin and trawl or set net fishing activity beyond 7 nautical miles to be low. There have few reliable sightings of Hector's and/or Maui's dolphins beyond 7 nautical miles (as discussed in Section 4.1.9.3).

The small population size of Maui's dolphins means that they are likely to have a contracted range. A contracted range can be appropriately managed at a spatial scale that isn't as extensive as may have been (or would be) required if the population was larger and distributed across a wider range. MPI considers improving information on dolphin distribution, fishing activity, and the potential for overlap will enable the spatial scale of management measures to be reviewed, if required, as new information becomes available.

6.9.3.2 Closure of all WCNI harbours

MPI considers there is uncertainty about the distribution of Maui's dolphins in WCNI harbours. Available information suggests Hector's and/or Maui's dolphins:

- are occasionally present in the Kaipara Harbour entrance;
- have been in the Kaipara Harbour beyond the boundary of the set net prohibition;
- are occasionally present in the entrance of the Manukau Harbour near the boundary of the set net prohibition, and;
- have been present in the Raglan Harbour entrance.

MPI cannot determine how often or for how long Maui's dolphins travel to and remain in these entrances, or travel beyond the entrances. MPI would expect more regular evidence, particularly in the Kaipara and Manukau Harbours, if Maui's dolphins frequently travelled into the harbours. The Minister can consider what, if any, other measures are necessary to lessen the likelihood of an entanglement to an acceptable level in light of the distribution information of dolphins observed in the WCNI harbours.

MPI considers a closure of all WCNI harbours to set net fishing is a very risk adverse approach in light on information about the distribution of dolphins, and the impacts on fishers would be substantial.

6.9.3.3 Protection within the 'Corridor'

MPI notes that the presence of two live female Hector's dolphins and the two stranded Hector's (that may have made contact pre mortem) from the South Island off the WCNI is the first documented contact between these two subspecies. 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 supports continued research to determine if there are mixing between Maui's and South Island Hector's populations, which could have implications for the potential recovery of Maui's dolphins.

6.9.4 Research, monitoring and public involvement

6.9.4.1 Research

MPI considers there is a need to improve the level of information necessary to define and monitor any residual risk to the Maui's dolphin population. Where there is an overlap between Maui's dolphins range and activities that threaten them, a high priority needs to be given to gathering more information on the status of the population.

Key information needs and suggested improvements to the research planning framework for Maui's dolphins are discussed in Section 8.

6.9.4.2 Monitoring

When selecting management measures that do not eliminate risk to Maui's dolphins, MPI considers more monitoring is required to verify the effectiveness of the chosen management measure. The greater the residual risk, the greater the imperative for increased monitoring.

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.

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[145].

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 many fishers can and do responsibly report accidental captures. MPI also expects there may be incidents where fishers were unaware their nets had entangled dolphins.

For these reasons MPI has presented options proposing 100 percent monitoring coverage off the WCNI in the set net fishery off the Taranaki coast and extensive coverage 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. Further details on what would need to be considered in the

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

development of a monitoring programme are discussed in Section 8.

6.9.4.3 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.

MPI is committed to enabling and partnering with tangata whenua and stakeholders to achieve the most effective means of reducing risk to the Maui's dolphin. Details on how various groups may want to participate in such initiatives are discussed in Section 8.

6.10 TIMEFRAME FOR IMPLEMENTING MEASURES

The Minister will consider in making his decision, the speed at which any other measures (if applicable) are introduced. The Minister could choose a management option and introduce the measures over a time period to allow for adjustment by users – particularly if measures put in place are onerous in terms of cost. In considering an appropriate transition time period the Minister would need to consider the:

- urgency of the problem, including the effects of fishing-related mortality on Maui's dolphins,
- effectiveness of current measures (risk to dolphins during the period while measures were introduced), and
- effects on fisheries resource users through mitigated impacts on use

The Minister could also choose to phase in measures by putting in place a less onerous option for a certain time period and replacing that with a higher level of mitigation at a later specified date.

6.11 CONCLUSION

The Minister is 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, the Minister could choose a higher level of risk mitigation for methods that pose the highest threat. The Minister 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 the Minister considers necessary may vary between the:

- type of fishing activity;
- balance struck between utilisation and sustainability, and;
- need to ensure viability (including biological diversity) of the Maui's dolphin population.

MPI notes the Act does not oblige the Minister to reduce the risk of fishing-related mortalities to zero. However, the susceptibility of the Maui's dolphin population to fisheries-related impacts suggests the Minister 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.

7.0 Department of Conservation non-fishing-related management proposals

This section outlines the Department of Conservation's (DOC) initial proposals to protect Maui's dolphins through managing non-fishing-related threats within the Maui's dolphin range. Background information on the general biology of Maui's dolphins and the threats facing them (including both human and induced and natural threats) are provided in Section 5 of this consultation document. This chapter should be read in conjunction with Section 5.

Section 7 is structured as follows:

- Implementation
- Introduction
    - Responsibilities
    - Legislative and policy framework
    - Human induced non-fishing threats
    - Objectives
    - Guidance on preparing your submission
- Non-fishing human-induced threats
    - Proposed non-fishing threat management measures
- Regulatory options
    - Regulatory options using the MMPA and Marine Mammal Sanctuary tool
    - West Coast North Island Marine Mammal Sanctuary Variation
    - Seismic Surveying
    - Seabed Mineral Mining
    - Marine Tourism
    - Commercial shipping
- Non-regulatory options
    - Collaboration with Tangata whenua
    - Oil spills
    - Land-based coastal development
    - Vessel traffic
        - Thundercat racing
        - Surf Life Saving
        - Recreational boating
    - Scientific research
    - Population recovery options
        - Translocation
        - Captive breeding
    - Predation
    - Disease

7.1 IMPLEMENTATION

Following analysis of submissions received during consultation, final advice will be provided to the Minister of Conservation. DOC will engage with stakeholders, relevant agencies, tangata whenua, local government, the public and to implement the Minister's decisions contained within the revised Maui's dolphin Threat Management Plan (TMP).

7.2 INTRODUCTION

7.2.1 Responsibilities

DOC is the leading central government agency responsible for the conservation of New Zealand's natural and historic heritage. DOC is responsible for administering and managing Hector's and Maui's dolphins, principally in accordance with the Marine Mammals Protection Act 1978 (MMPA), Marine Mammals Protection Regulations 1992 (MMPR), and in line with the Conservation General Policy. Area based additional protection to Hector's and Maui's dolphins are also provided through marine mammal sanctuaries established under the MMPA. DOC may also advocate for protection by engaging with stakeholders and encouraging protective actions through non-regulatory means.

DOC has mandate under the MMPA to manage fisheries within sanctuaries. The Ministry for Primary Industries (MPI) is the other main agency responsible for managing the protection of, and ensuring the sustainability of Hector's and Maui's dolphins. As outlined previously in section 3.3, it has been agreed that fishing-related threats will be managed by MPI under the Fisheries Act 1996. Therefore, threat mitigation options proposed by DOC in this section are those that address non-fishing human-induced impacts. The MPI consultation chapter is provided in Section 5 of this document.

In addition to DOC and MPI, local government (Territorial Authorities and Regional Councils) manage coastal and marine development (out to 12 nautical miles), and land use activities that may impact on the habitat of Hector's and Maui's dolphins.

7.2.2 Legislative and policy framework

Marine species management is guided by relevant legislation and key policies. Legislation and policies administered by the Department of Conservation are outlined below.

7.2.2.1 Legislation[146]

Marine Mammals Protection Act 1978 (MMPA)

The purpose of the MMPA is to make provision for the protection, conservation and management of marine mammals within New Zealand territorial and fisheries waters. It includes the provision to establish a population management plan or marine mammal sanctuary as management tools.

Marine Mammals Protection Regulations 1992 (MMPR)

The MMPR are prepared under the MMPA and enforced by DOC. The MMPR provide the regulatory framework for behaviour around all marine mammals and permitting regime for commercial tourism.

Conservation Act 1987 (CA)

The CA was developed to promote the conservation of New Zealand's natural and historic resources. It is New Zealand's principal Act concerning the conservation of indigenous biodiversity. Amongst others, it provides for the functions of DOC and management of public conservation land in New Zealand.

[146] http://www.legislation.govt.nz/default.aspx

7.2.2.2 Policies

Conservation General Policy 2005[147]

DOC's Conservation General Policy 2005 was prepared under the CA and provides unified policy for the implementation of a number of Acts. It provides guidance for the administration and management of the MMPA. In developing a plan to manage Maui's dolphins, particular account should be taken of the following policies:

> 4.4 (e) The Department should work with other agencies and interests to promote and develop a marine protected areas network, including marine reserves, wildlife reserves, sanctuaries and other protective mechanisms.
> 4.4 (f) Protected marine species should be managed for their long-term viability and recovery throughout their natural range.
> 4.4 (j) Human interactions with marine mammals and other protected marine species should be managed to avoid or minimise adverse effects on populations and individuals.
> 4.4 (l) The Department should work with other agencies and interests to protect marine species.

New Zealand Biodiversity Strategy[148]

The strategy was prepared in response to the state of decline of New Zealand's indigenous biodiversity and reflects a commitment to the international Convention of Biological Diversity.

Theme Three of the strategy has a Desired Outcome for 2020 that "No human-induced extinctions of marine species within New Zealand's marine environment have occurred. Rare or threatened marine species are adequately protected from harvesting and other human threats, enabling them to recover.

The aim of Objective 3.7 is to "Protect and enhance populations of marine and coastal species threatened with extinction and prevent additional species and ecological communities from becoming threatened".

Department of Conservation Marine Mammal Action Plan 2005-2010[149]

The Marine Mammal Action Plan provides specific outputs with regard to the conservation of marine mammals. Within the plan, the key objectives listed for Hector's and Maui's dolphins are:

> 1. Ecology. To better understand the population ecology, key habitat requirements and threats of the species.
> 2. Human impacts. To effectively protect Hector's and Maui's dolphins against any recreational and commercial fisheries-related mortality and other avoidable adverse effects of tourism and other coastal use and development.
> 3. Species recovery. To facilitate the recovery of the species and ensure that the local and national population dynamics (including the genetic diversity) of the species are maintained and restored to a viable self-sustaining state within its natural range.
> 4. Science. To clarify the role of different research tools in relation to optimal management of the species within distinct geographical areas.

[147] http://www.doc.govt.nz/publications/about-doc/role/policies-and-plans/conservation-general-policy/
[148] http://www.biodiversity.govt.nz/pdfs/picture/nzbs-whole.pdf
[149] http://www.doc.govt.nz/upload/documents/conservation/native-animals/marine-mammals/the-marine-mammal-action-plan.pdf

7.2.2.3 Objective

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

- To ensure that the long-term viability of Maui's dolphins is not threatened by human activities (both direct and indirect); and
- 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.

Within the context of these overarching goals, the primary objective for DOC in the review and further development of the Maui's dolphin TMP is to recover species abundance to a viable population level throughout its historic (natural) range. Over time, as the species recovers in its current core range, it is essential to ensure protection in all other areas within the historic range to enable recovery and repopulation. The absence of recent confirmed sightings within such areas should not preclude consideration of any necessary protection measures which will significantly contribute to population recovery within the historic range.

7.2.2.4 Guidance on preparing a submission

The options discussed in this section are broadly broken into two main categories, the first being regulatory options, and then second being non-regulatory options. Within the regulatory section, most options are independent of one another, meaning as a submitter you would select or provide comment on your preferred option. Within the non-regulatory section the options are not independent of one another and a suite of them could be actioned, therefore you could select and provide comment on multiple options within each section.

To assist with the submission process, option tables are provided in the following sections. There are also a series of general discussion questions that can be applied to each section to help in formulating your submission.

Feedback is also encouraged on alternative options. Comments need not be limited to those presented and discussed within this document.

General questions for whānau, hāpu, iwi and stakeholders to consider:

- What is the nature and extent of how the range of options proposed might have social, cultural or economic impacts?
- Where might DOC better support whānau, hāpu and iwi management of human-induced threats to the Maui's dolphin?
- Where might DOC better support management of human-induced threats to the Maui's dolphin? By other interested parties, for example, existing or ongoing forums, groups or processes.
- What information is missing or has not been considered that might impact or alter the options proposed?
- Are there additional or different human-induced threats to the Maui's dolphins that should be addressed?
- Have the key features of each option been accurately set out?
- What other methods or tools could be applied to manage the described threats?
- Are there any other geographic areas you think should be designated as a marine mammal sanctuary to protect the Maui's dolphin? Please identify these areas and indicate why you support further protection.

In each section potential costs are indicated for each range of options, though benefits are not discussed. The primary benefit of implementing any protection measure is to increase protection to Maui's dolphins to allow for their recovery. Due to the small size of the population there is insufficient data available to quantify the potential benefits for each option presented. However, given the serious risk of extinction and the urgent need for precautionary action, lack of data should not be used as a reason for postponing cost-effective measures to minimise plausible threats as far as possible.

Furthermore, for similar reasons it is extremely difficult to suggest meaningful criteria against which to measure success of options after implementation, especially as timescales for non-fishing threat mitigation are of the order of decades and the population base is so small. While DOC considers monitoring of the population following the implementation of measures important, it cautions over the ability to detect changes within a five year time frame.

7.3 NON-FISHING HUMAN-INDUCED THREATS

In this section potential management options are discussed for all non-fishing-related threats that arise from human activities. The objective is to inform discussions which will help identify preferred threat management options to avoid, remedy or mitigate any potential impacts on the Maui's dolphin population.

The Maui's dolphin risk assessment (discussed in Section 5) identified that non-fishing-related threats also pose a serious risk to the long-term viability of Maui's dolphins. While these threats only represented 4.5% of the estimated dolphin mortalities the median estimated of dolphin mortalities from non-fishing threats combined was 0.27[150], which on its own is higher than the PBR of 1 dolphin in 10 – 23 years[151]. Most of these risks are perceived as occurring over longer timeframes with generally smaller effects compounding over the lifetime of individuals. While many of threats might not impact on the population directly (for example, mortality), they can impact on the population indirectly, through decreased fitness, breeding success, prey availability and habitat degradation. Therefore the cumulative effects of threats such as oil, gas and mining activities, vessel traffic, marine tourism, pollution, coastal development, and research may result in high levels of disturbance, displacement, fragmentation of the population or population decline of Maui's dolphins. See Section 5 for a detailed analysis of the threats to Maui's dolphins.

Research and the growth of knowledge over time on the impacts of non-fishing-related threats will require an adaptive management approach to adequately mitigate any known impacts as well as a collaborative approach to threat mitigation. As a result of new information acquired since the drafting of the 2007 Hector's and Maui's dolphin TMP, research needs have been assessed and new priorities have been set. These will be addressed in Section 8 (Research, monitoring and collaboration).

7.4 PROPOSED NON-FISHING THREAT MANAGEMENT MEASURES

The level of commercial/industrial activity within the Maui's dolphin current and historic range is relatively limited, though there remains the potential for significant impacts in the absence of effective management. Since the number and scale of activities is expected to increase in the coming years, it is critical to ensure appropriate management frameworks are in place.

[150] Currey et al (2012): A risk assessment of threats to Maui's dolphins. www.doc.govt.nz/mauisrisk
[151] Appendix B in Currey et al (2012).

Other risks, such as those arising from terrestrial activities, recreational boating, scientific research, and the like may be harder to quantify and understand but in terms of long-term cumulative impacts there is no less need to ensure effective management.

The range of tools available includes mandatory regulations and voluntary agreements, as well as engagement and education. Depending on the specific circumstances associated with each activity and the nature of the risks identified, an integrated combination of complementary tools may need to be considered. Collaborative and adaptive management across all human-induced threats, based on stakeholder participation under the umbrella of an overarching strategy, is also a possibility.

In this section DOC is seeking input from stakeholders on a possible range of measures to manage non-fishing threats to Maui's dolphins. Some risks can be managed through regulatory means, however, a number of risks sit outside DOC's primary area of responsibility, and as such can only be addressed through processes of engagement and education. Therefore the measures discussed in this section propose a combination of methods that can include Government, industry and public initiatives. The possible range of measures includes:

- Regulatory options. For example, extending the boundaries of the West Coast North Island Marine Mammal Sanctuary and controlling certain high risk activities within.
- Code of conduct options. For example, best practice for seismic surveying and mineral mining companies.
- Strict enforcement of existing legislation. For example, Marine Mammals Protection Act and Marine Mammals Protection Regulations.
- Liaison on best practice with other agencies. For example, regional councils and Maritime New Zealand.
- Targeted engagement with public and community groups.

The options discussed below are broadly broken into two main categories, the first being regulatory options, and then second being non-regulatory options. Within the regulatory section, the options are independent of one another, meaning as a submitter you would select or provide comment on your preferred option. Within the non-regulatory section the options are not independent of one another and a suite of them could be actioned, therefore you could select and provide comment on multiple options within each area.

It should be noted that feedback is also encouraged on alternative options, and should not be limited to those presented and discussed within this document.

7.5 REGULATORY OPTIONS

7.5.1 Regulatory options using the MMPA and Marine Mammal Sanctuary tool

The MMPA provides the Minister of Conservation with various tools to protect marine mammals. Marine Mammal Sanctuaries provide one of the best options to protect Maui's dolphins as the Minister is able to restrict specific activities within it. A sanctuary defines an area that is important to a particular species of marine mammal for feeding, breeding and other important life history behaviours, and may enable the management of human induced threats to that species.

Under the MMPA the Minister of Conservation may, by way of a gazette notice, define any place to be a marine mammal sanctuary. Submissions on any proposed sanctuary (or variations to an existing sanctuary's boundaries) can be received up to 28 days following the publication of the notice. Where any other Minister of the Crown that has the control of any Crown-owned land, foreshore, seabed, or waters of the sea which is declared to be a marine mammal sanctuary or which forms part of one, the consent of that Minister to the declaration needs to be notified concurrently with any notice given by the Minister of Conservation under section 22 of the MMPA. The Minister of Conservation must then consider any written submissions received within the 28 day period. The Minister must then by notice indicate their intention to vary, redefine, or abolish the sanctuary.

7.5.2 West Coast North Island Marine Mammal Sanctuary Variation

The current West Coast North Island Marine Mammal Sanctuary was established in 2008 and currently extends from Maunganui Bluff in Northland to Oakura Beach in Taranaki and an offshore expanse of 12 nautical miles (see Map 1 in Appendix 1). The sanctuary establishes restrictions on seabed mining in parts and on seismic survey activities throughout, as both are known to be potential threats to the dolphins.

The Taranaki-Whanganui region was historically part of the Maui's dolphin population's distribution (Maps in Appendix 1) and decreased sightings in the area provide evidence of range restriction. Despite the infrequency of sightings in the area, they still occur and a Hector's or Maui's dolphin was incidentally caught in a set net in January 2012. To support the recovery of Maui's dolphins throughout their natural range it is therefore important to mitigate threats in the southern extent of their range.

7.5.2.1 Options

Option 1. *Status quo*
This option would see no change to the Sanctuary.

Option 2. Extension of the West Coast North Island Marine Mammal Sanctuary
To designate the area as important to the recovery of Maui's dolphins The Minister of Conservation could extend the boundary of the West Coast North Island (WCNI) Marine Mammal Sanctuary (MMS) south from Oakura Beach to Hawera, offshore to 12 nautical miles (Map 7.1).

Extending the southern boundary of the sanctuary to Hawera is consistent with new research on Maui's dolphin home ranges, which are larger than previously believed. Research found the maximum distance between two sightings of the same individual was 80 km, and several moved in the order of 30-40 km. Hawera is approximately 79 km from where the January 2012 dolphin mortality occurred.

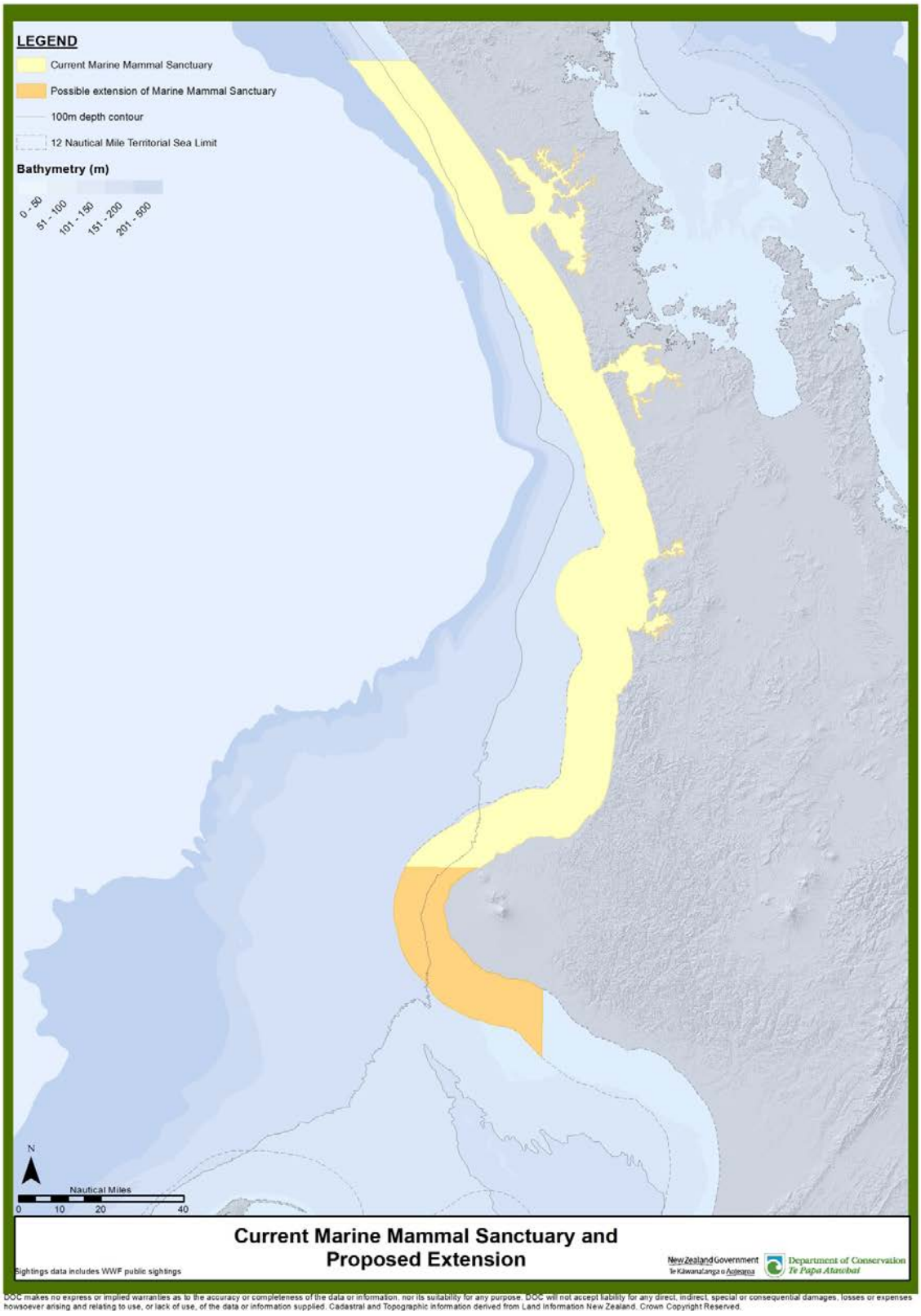
There may be other spatial options for protection of Maui's dolphins, such as the protection of a corridor between the South and the North Island to facilitate gene flow between the two subspecies. While there has been evidence of Hector's dolphins within the Maui's dolphin range, there is as yet no evidence of inter-breeding. It is also unclear the origin of some of the Hector's dolphins, and thus the best spatial option for protection. DOC considers this a high priority area for research and is discussed further in Section 8.1.1.2. In addition, DOC welcomes any comment on additional spatial scales for protection that haven't addressed here.

This option designates the area as being important for the survival of Maui's dolphin (for example, the existence of a MMS can act as a "flag" for decision makers in resource consent

applications under the Resource Management Act 1991 – 'the RMA'). The presence of a sanctuary may also encourage the use of caution in other activities, for instance recreation.

The real strength of establishing a MMS is the additional protection measures that can be established for specific activities. In the area of interest for Maui's dolphin this primarily relates to seismic surveying and seabed minerals mining. Specific issues related to each activity, along with detailed discussion of the options for addressing them within the context of the MMS, are dealt with separately below. Though dealt with individually, a final outcome of the MMS extension could involve regulations addressing both seismic surveying and seabed minerals exploitation.

West Coast North Island (WCNI) Marine Mammal Sanctuary (MMS) Variation		
MMS Option 1	*Status quo*	No MMS variation
MMS Option 2	MMS extension	Extension of the WCNI MMS south to Hawera and offshore to 12 nautical miles



Map 7.1. Proposed extension of the Marine Mammal Sanctuary off the west coast of the North Island.

7.5.3 Seismic surveying

To manage the potential effects of marine seismic surveying, in 2006 the Department of Conservation established voluntary guidelines applicable to operations in New Zealand fisheries waters (the coast to 200 nautical miles). Further to this in 2008 the West Coast North Island Marine Mammal Sanctuary (MMS) was gazetted, and the Notice contained specific regulations covering seismic survey operations[152].

Subsequently in 2010, the Department of Conservation initiated a review of the voluntary guidelines with a view to establishing consistent, mandatory regulation of seismic surveying throughout New Zealand's maritime domain. As a result, the Code of Conduct for Minimising Acoustic Disturbance to Marine Mammals from Seismic Survey Operations (the Code) came into effect on 1 August 2012.

The Code is an interim measure, which will be reviewed after three years prior to the development of regulations. This is to allow sufficient time to incorporate new research on the many scientific uncertainties associated with mitigation measures; to establish the necessary training and qualification frameworks for marine mammal observers; to ensure that the regime is workable; and, for industry to become familiar with the new requirements before mandatory measures are in force. The MMS Notice (along with the other four sanctuary Notices that contain measures for seismic surveying) will be reviewed at the same time to ensure a consistent regulatory regime throughout New Zealand continental waters[153].

The Code is a significant evolution from both the 2006 guidelines and the regulations contained in the MMS Notices, establishing a much more comprehensive and robust regime which increases both the level of protection for marine mammals and the reliability of data generated by independent observers. There are many areas where the Code and the MMS Notices are inconsistent, and in the majority of instances the Code is more stringent.

Though a voluntary regime, in adopting the Code operators agree to commit to its provisions. In addition, the Code is explicit that where there are inconsistencies between the Code and the MMS, the more stringent provisions apply. However, the provisions in the MMS Notice remain mandatory and enforceable as a basic level of protection. Table 7.1 highlights the primary differences between the regulations in the existing MMS and the measures established for each level of survey under the Code.

[152] There is a common misconception that seismic surveys are prohibited within a MMS. However such activities are allowed providing specific conditions are met. For a full list of requirements, see: http://www.doc.govt.nz/upload/documents/conservation/marine-and-coastal/marine-protected-areas/marine-mammals-protection-westcoastnorthisland.pdf

[153] New Zealand continental waters means the territorial sea; the waters of the exclusive economic zone; and, the waters beyond the outer limits of the exclusive economic zone but over the continental shelf, of New Zealand.

Table 7.1 – Comparison of key features of MMS & the Code where SoC is Species of Concern and OMM is Other Marine Mammal. * denotes the more stringent provision.

	MMS	Code Level 1	Code Level 2
Notification	1 month	3 months*	3 months*
Impact Assessment (including sound transmission loss modelling)	No	Yes*	Yes*
Additional mitigation measures possible if sensitivities identified	No	Yes*	Yes*
Mitigation acoustics during line-turns	Yes	Only by agreement*	Only by agreement*
Passive Acoustic Monitoring (PAM)	Yes	Yes	Optional
PAM specifications	No	Yes*	Yes*
PAM required	During poor visibility only	At all times*	At all times (if included)*
Observers	2	4*	2 (4 with PAM)*
Marine mammal coverage	Cetaceans only (whales and dolphins)	All marine mammals (cetaceans and pinnipeds)*	All marine mammals (cetaceans and pinnipeds)*
Mitigation Zones (delayed starts and shut-downs)	1000m - cow/calf pair 500m - cetacean	1500m – SoC/calf* 1000m – SoC* 200m – OMM*	1000m – SoC/calf* 600m – SoC* 200m – OMM*
Pre-start observations	<200m deep – 30mins >200m deep – 60 mins*	30 mins	30 mins
Soft-start required after break in firing	>5 mins*	>10 mins	>10 mins
Observer training and performance standards	No	Yes*	Yes*
Standardised recording and reporting	No	Yes*	Yes*
Authority to delay start or shutdown	Not specified	Qualified Observer*	Qualified Observer*

It should be noted that within the entire Hector's and Maui's dolphin range, depths less than 100 m are considered to be Areas of Ecological Importance for seismic survey operations. This designation triggers additional requirements in the Marine Mammal Impact Assessment stage, and further mitigation measures may be required by DOC depending on identified sensitivities.

7.5.3.1 Options

For the Maui's dolphin risk assessment the impact of seismic surveying was combined within all mining and oil activities. This was estimated to contribute to the equivalent of 0.10 deaths per year (95% confidence interval 0.01-0.46), with a 61.3% likelihood of exceeding the PBR for Maui's dolphins in the absence of all other threats. The impacts from mining and oil activities were further broken down depending on how the activity could impact on the dolphins. In terms of seismic surveying, the greatest concern is noise in the marine

environment. Noise leading to trauma was scored at 0.01 deaths per year (95% CI:<0.01-0.13) and a likelihood of exceeding the PBR of 8.8%, while non-trauma noise effects was scored at 0.03 deaths per year (95% CI: <0.01-0.23) and a likelihood of exceeding the PBR of 28.6%. A number of options could be considered for reducing risks from seismic surveying within the Maui's dolphin natural range (refer to Map 7.1 above):

Option 1. *Status quo* - Reliance on the Code and the existing MMS regulations

This option provides a significant level of base protection for marine mammals, and scope for additional mitigation measures specific to Maui's dolphin to be considered. However, the absence of mandatory, enforceable regulations throughout the natural range is not ideal.

Option 2. Current Sanctuary + possible changes to restrictions within the MMS:

2a) Variation of the legal restrictions on seismic surveying within the MMS to be consistent with the Code

This option involves maintaining the current MMS boundaries, but including the drafting of new legal restrictions within the MMS to have greater consistency with the provisions of the Code (including revocation of existing seismic survey restrictions in the MMS). This is considered premature; the regime being established under the Code needs time to build momentum, particularly in terms of training and availability of suitably qualified and experienced marine mammal observers. Development of regulations may be problematic at this time.

2b) Prohibit seismic surveying operations within the MMS

This option would prohibit seismic surveying within the MMS out to 12 nautical miles (including revocation of existing regulations). This is considered to be an unwarranted response given low risks of negative impacts if seismic survey activities are managed properly through the provisions of the Code and the MMS regulations.

Option 3. Sanctuary extension + possible changes to restrictions within the MMS:

3a) Extension of existing legal restrictions on seismic survey regulations within the MMS

In this option, the MMS would be extended south to Hawera as mentioned in the previous section (7.4.2.1) including an extension of the existing legal restrictions on seismic surveying throughout the extent of the Sanctuary. The Code would still apply (although non-enforceable). This option offers the highest degree of protection and certainty, with specific mitigation measures able to be considered for Maui's dolphins under the Code and a base level of enforceable measures afforded by regulations.

3b) Variation of the legal restrictions on seismic surveying within the MMS to be consistent with the Code

This option is the same as 2a above, but also includes the extension of the MMS south to Hawera. For the same reasons as mentioned above this option is considered to be premature.

3c) Prohibit seismic surveying operations throughout

This option is the same as 2b above, but also includes the extension of the MMS south to Hawera. Likewise it is considered unwarranted at this time.

Option 4. Develop stand-alone regulations under the MMPA to regulate seismic operations

This option would involve developing a set of regulations on seismic surveying under the MMPA. The new set of regulations would be consistent with the provisions of the Code. Such regulations would apply throughout the jurisdiction of the MMPA. These regulations would override or repeal the seismic survey restrictions currently applying in any relevant MMS. This option suffers from the same drawbacks as identified in Option 3 above.

Option 5. Additional option: prohibition of petroleum mining

This option is considered an additional option as it could be implemented along with one of options 1-4 above.

In the existing MMS, while seabed minerals mining is prohibited in certain areas there is no corresponding restriction on oil and gas activities beyond regulations covering seismic surveying. It is acknowledged that both restrictions and prohibitions could be considered to control oil and gas exploration and production activities.

However, within the five year duration of the TMP DOC considers that given the relatively low levels of new activity expected to occur, the risks arising from this sector are managed sufficiently by existing regulations administered by other agencies.

Therefore, the imposition of further regulations within the context of the MMS is considered unnecessary.

Options to reduce risk to Maui's dolphins from Seismic Surveying (SS), *option can be implemented in conjunction with any of the other options		
SS Option 1	*Status quo*	Reliance on the Code of Conduct and the existing MMS regulations
SS Option 2a	Current Sanctuary + seismic restrictions consistent with Code	Maintaining the current sanctuary boundaries plus variation of the legal restrictions on seismic surveying within the MMS to be consistent with the Code of Conduct.
SS Option 2b	Current Sanctuary + Seismic prohibition	Maintaining the current sanctuary boundaries plus a prohibition on seismic surveying operations within the MMS.
SS Option 3a	Extension of MMS + extension of seismic restrictions	Extend the MMS south to Hawera and offshore to 12 nm plus extending the existing legal restrictions on seismic surveying operations within the MMS.
SS Option 3b	Extension of MMS + seismic restrictions consistent with Code	Extend the MMS south to Hawera and offshore to 12 nm plus a variation of the legal restrictions on seismic surveying within the MMS to be consistent with the Code of Conduct.
SS Option 3c	Extension of MMS + Seismic prohibition	Extend the MMS south to Hawera and offshore to 12 nm plus a prohibition on seismic surveying operations within the MMS.
SS Option 4	Stand-along Regulations	Develop stand-alone regulations under the MMPA to regulate seismic operations.
SS Option 5 (additional)	Prohibit petroleum mining	Prohibition of petroleum mining throughout the MMS. This option could be implemented in addition to one of the options 1 to 4 above.

Costs

Costs associated with extension of the MMS and implementation of regulations would be met within routine operations for DOC. Industry has already committed to meeting the additional compliance costs associated with the seismic survey Code of Conduct, which are higher than existing regulations. These costs are considered reasonable, being of the order of <1 to 4% of total operational costs for a typical survey programme.

7.5.4 Seabed minerals exploitation[154]

There is significant potential for development of seabed minerals projects on the west coast of the North Island, with four companies holding interests in eight separate exploration permits, plus an additional company holding a prospecting permit as of August 2012. However, none of these stakeholders has indicated that seabed mining is anticipated to occur within the five year duration of the revised TMP. While activities are limited to prospecting and exploration phases, potential impacts are at the lower end of the scale and could most likely be managed through RMA processes and voluntary measures, though the range of options does include further regulations associated with the MMS and the proposed extension. In any case, management measures should be proportional to nature and scale of effects in each instance.

The threats posed by seabed minerals exploitation are not well understood, but are believed to be more indirect than direct. The benefit of restricting seabed minerals exploitation in the MMS would be reduced risk and disturbance to Maui's dolphins inhabiting the area.

As of August 2012 there are only two seabed minerals permits in the proposed MMS extension area. One is for prospecting that has been granted and the other is a pending application for exploration that has been submitted. Neither permit is for mining.

For an explanation of the different stages of seabed minerals exploitation refer to Section 5.1.2.2.

7.5.4.1. Seabed minerals exploitation management options

As summarised in the previous section on seismic surveying the Maui's dolphin risk assessment suggests that all mining and oil activities have a 61.3% likelihood of exceeding the PBR in the absence of all other threats. In addition to noise impacts, habitat degradation was scored as contributing to 0.03 deaths per year (95% CI: <0.01-0.17) and a 26.4% likelihood of exceeding the PBR. Pollution from mining activities was scored as contributing to <0.01 deaths per year (95% CI: <0.01-0.13) and a 13.4% likelihood of exceeding the PBR.

Offshore limits of geographical restrictions associated with MMS have until now been determined based on distance from the mean high water mark, which has historically been considered a more easily implemented measure for compliance.

However, modern technology provides effective means by which to automatically monitor vessel positions relative to both depth and distance offshore. Automatic Identification System (AIS) technology is now in common use on board vessels to continually monitor vessel position, providing real time information to other maritime users and authorities. Within the

[154] Within this section, any reference to mining is related only to seabed minerals exploitation, not activities associated with oil and gas exploration and production. Furthermore, 'mining' may have differing meanings depending on context. In relation to activities, 'mining' is the final commercial phase of extraction following prospecting and exploration. In relation to the MMS restrictions, 'mining' can include any prospecting, exploration or mining activity for the purposes of regulations. This is due to different definitions under the Crown Minerals Act and MMPA.

system, there is the facility to set pre-determined zones based on position, which can include charted depth contours, which would automatically alert both the vessel master and regulators (to monitor compliance) if particular vessels were approaching a prohibited zone. Using depth to determine the geographical extent of prohibition zones is also potentially easier to implement for vessel operators, as it is a simple alarm entry on standard depth sounders.

Therefore, an alternative approach to defining the extent of prohibition zones for mining activities could be to use a depth contour instead of distance offshore, the most conservative of which would be the 100 metre isobath based on the best information related to species distribution [155]. Other depth contours could be considered, taking into account relative risks balanced against effectively managed resource use. For example, analysis of sightings data could indicate depths at which 80% or 90% distribution is predicted. Feedback is specifically sought on issues related to suitability and definition of depth contours as offshore geographical limits for management measures.

In this context, the following options could be considered further in order to manage potential risks associated with seabed minerals exploitation (see also Map 7.2):

Option 1. ***Status quo***
This option would involve no change to the current MMS and the restrictions on mining within it. Within the geographical extent of the existing sanctuary there are prohibitions on mining activities in specified areas, from the coast to either 4 nautical miles (core distribution area) or 2 nautical miles (everywhere else).

Option 2. Extension of mining restrictions further offshore within the current MMS
Options could be considered to extend coverage of this prohibition offshore within the existing MMS.

2a) Extending the restriction to 4 nautical miles offshore throughout the current MMS would provide a consistent offshore limit and would afford greater protection to the dolphins than is currently offered.

2b) Extending the restriction to 7 nautical miles offshore throughout the current MMS would provide a consistent offshore limit and would afford greater protection to the dolphins than is currently offered.

2c) An alternative approach would be to extend the prohibition zones for mining activities using a suitable depth contour instead of distance offshore.

Option 3. Extension of the MMS south to Hawera and extension of mining restrictions within
In this option the MMS could be extended south to Hawera, and the restrictions on mining within the MMS could be extended both offshore and alongshore (through the extension).

3a) Following the current offshore distance at the southern extent of the current MMS, mining restrictions could be extended through an extension of the MMS out to 2 nautical miles offshore.

3b) Extending the restriction on mining to 4 nautical miles offshore throughout the entire MMS including the extension would provide a consistent offshore limit throughout and afford greater protection to the dolphins.

[155] Slooten et al (2006); Du Fresne and Mattlin (2009)

3c) Extending the restriction on mining to 7 nautical miles offshore throughout the entire MMS including the extension would provide a consistent offshore limit throughout and afford greater protection to the dolphins.

3d) Alternatively the extension of the mining restrictions could be based on a suitable depth contour.

Option 4. Additional Option: Moratorium on the seabed mining phase within the MMS

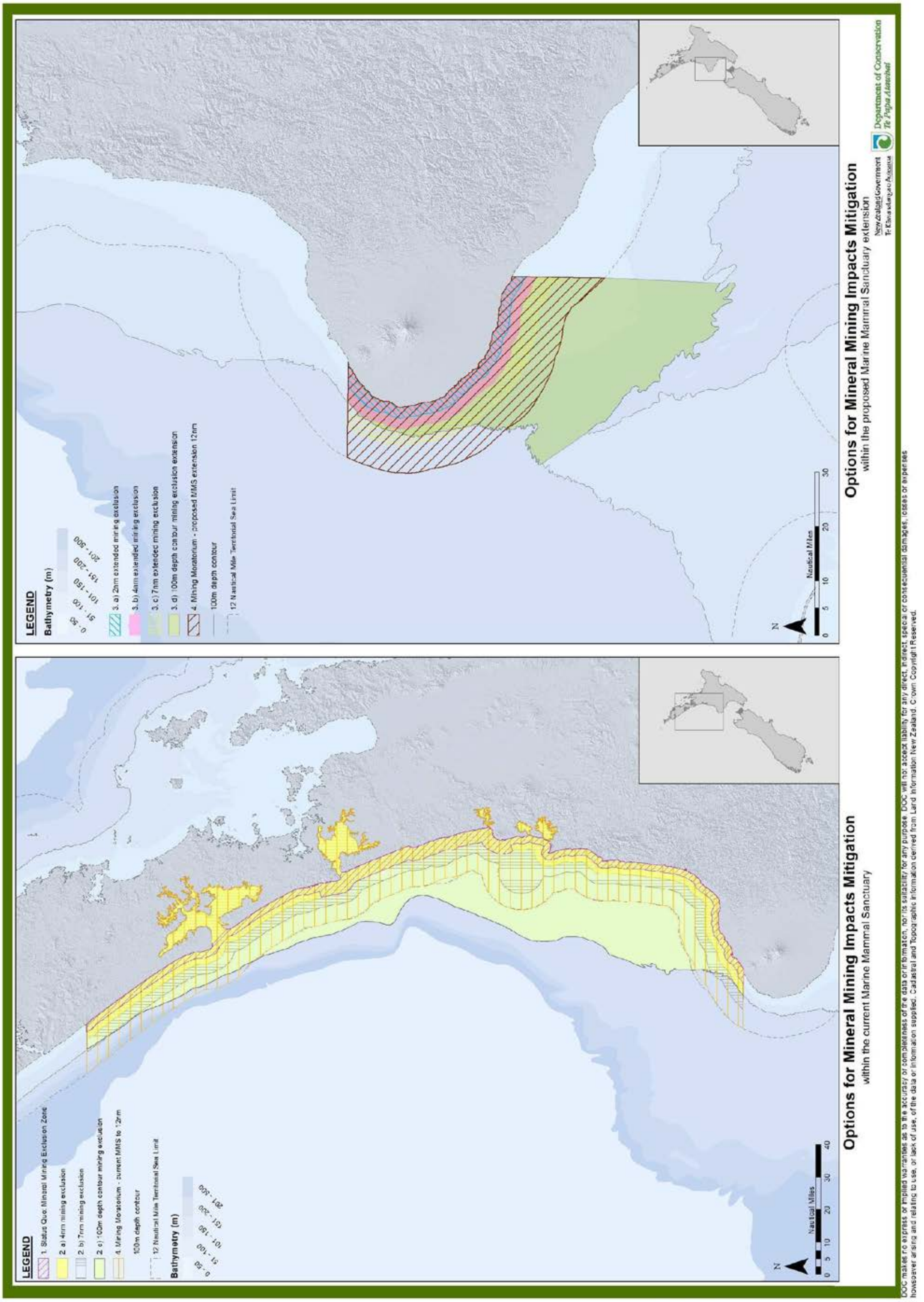
Given the low likelihood of actual mining (as opposed to prospecting and exploration) in the next five years, as an alternative to outright prohibition of all activities there could be a moratorium on the mining phase alone through to the next review phase of the TMP in five years' time. This would still allow for prospecting and exploration to continue. The issue of mining could then be re-examined at the time of the next review in light of experience with earlier stages. This approach would benefit significantly if implemented in conjunction with research focused on identifying and mitigating risks to Maui's dolphin associated with seabed mining.

Option 5. Code of Conduct for seabed minerals exploitation

Recognising the successful development of the seismic survey Code of Conduct with stakeholders, the range of seabed mining activities could also be managed through a similar process. This would involve key stakeholders from across all interests in the sector, with the formation of a working group to develop draft guidelines for targeted consultation before finalisation of a Code of Conduct.

Such engagement processes are considered to be advantageous in minimising conflict and achieving a high degree of buy-in from stakeholders. In addition it is easier to create and implement subsequent regulations, if necessary at the appropriate time, with a high level of voluntary compliance already established.

It is likely that optimum management of seabed minerals exploitation would involve a combination of the measures outlined in the above options.



Map 7.2. Proposed options to address risk from seabed mineral exploitation off the west coast of the North Island.

Options to reduce risk to Maui's dolphins from Seabed Mineral Exploitation (SME), *option can be implemented in conjunction with any of the other options		
SME Option 1	*Status quo*	No change in MMS Restrictions in specified areas (4 nautical miles core distribution area; 2 nautical miles elsewhere).
SME Option 2a	Current Sanctuary + offshore limit 4 nautical miles	Maintain the current sanctuary boundaries plus extending the current mining restrictions to 4 nautical miles offshore within the entire sanctuary.
SME Option 2a	Current Sanctuary + offshore limit 7 nautical miles	Maintain the current sanctuary boundaries plus extending the current mining restrictions to 7 nautical miles offshore within the entire sanctuary.
SME Option 2c	Current Sanctuary + depth contour offshore limit	Maintain the current sanctuary boundaries plus extending the current mining restrictions to a suitable depth contour along the length of the entire sanctuary.
SME Option 3a	Extension of MMS + extension of mining restrictions to 2 nautical miles offshore	Extend the MMS south to Hawera and offshore to 12 nautical miles plus extending the current mining restrictions to 2 nautical miles offshore throughout the extension.
SME Option 3b	Extension of MMS + extension of mining restrictions to 4 nautical miles offshore	Extend the MMS south to Hawera and offshore to 12 nautical miles plus extending the current mining restrictions to 4 nautical miles offshore within the entire sanctuary.
SME Option 3c	Extension of MMS + extension of mining restrictions to 7 nautical miles offshore	Extend the MMS south to Hawera and offshore to 12 nautical miles plus extending the current mining restrictions to 7 nautical miles offshore within the entire sanctuary.
SME Option 3d	Extension of MMS + extension of mining restrictions to depth contour	Extend the MMS south to Hawera and offshore to 12 nautical miles plus extending the current mining restrictions to a suitable depth contour along the length of the entire sanctuary.
SME Option 4 (additional)*	Moratorium on active mining	Moratorium on the active seabed mineral mining phase within the MMS, for the five year duration of the TMP. This option could be implemented in addition to one of the options 1 to 3 above.
SME Option 5	Code of Conduct	Develop a Code of Conduct for seabed minerals exploitation similar to that for seismic surveying.

Costs

A restriction on seabed minerals exploitation within a sanctuary extension could mean a cost to the two proponents in loss of investment in the exploration and prospecting stages if they are unable to continue on to the later stages of mining. As any restrictions on seabed minerals exploitation would not necessarily cover the full extent of the MMS, the actual impacts on stakeholders would depend on the extent of spatial overlap with any proposed operations within the MMS.

The cost of development and implementation of a Code of Conduct could be significant, though as with seismic surveying it is considered reasonable as a proportion of routine operational costs and potential profits.

7.5.5 Marine tourism

Marine tourism activity is very limited at present, and there are no indications that there will be any significant increase. Tourism operators specifically seeking to target Maui's dolphin as a business activity would require a permit from DOC under the MMPA, and would be controlled accordingly in order to prevent disturbance.

Opportunistic viewing by other marine tourism operators (or indeed members of the general public) does not require a permit. However, MMPR 18-20 includes requirements to minimise potential disturbance and reduce the risk of injury to marine mammals during interactions with vessels, though it is unclear how much general awareness there is about the regulation.

7.5.5.1 Options

In the Maui's dolphin risk assessment, commercial tourism was considered to be applicable to Maui's dolphins, though not likely to affect population trends within the next five years. As such it was not scored as its own threat. However, two of the key elements of how tourism impacts on marine mammals are through noise and risk of boat strike and disturbance, which were considered and scored by the panel for vessel traffic in general. It was agreed that small vessels are likely to have the greatest impact on Maui's dolphins as they are generally faster, loud, and highly manoeuvrable. In addition their low profile on the water means the skipper may not be able to spot a dolphin in time to avoid it. Vessel traffic was scored as contributing to 0.07 deaths per year (95% CI: <0.01-0.19) and a 47.8% likelihood of exceeding the PBR even in the absence of all other threats.

Option 1. ***Status quo***

This option would involve no regulatory change.

Option 2. Moratorium

It is possible under the MMPR (Reg 15) to implement a moratorium on commercial marine mammal tourism permits. This can be for operations targeting any marine mammals within a given area, or for operations specifically targeting a species. A moratorium is time bounded and research is undertaken to assess whether the current level of tourism is sustainable and whether the moratorium needs to be maintained. A moratorium is most beneficial in areas where there is a high level of tourism effort and where the effects of tourism may not be well defined. As the level of tourism on the WCNI is minimal and the effects of tourism on dolphins, including Hector's dolphins, is well understood, DOC does not consider this to be the most appropriate option to add benefits to the Maui's dolphin population.

Option 3. Variation to MMS to include restrictions on marine mammal tourism

The situation could be improved by a variation to the MMS Notice that would restrict marine mammal tourism activities along the following lines:

- No commercial tourism operations are allowed to target Maui's dolphins.
- No swimming with Maui's dolphins.
- For recreational boats, in addition to observing MMPR 18-20, opportunistic viewing should have a stipulated time limit of 10 minutes per vessel.

Option 4. Additional option: increased engagement and compliance

This option would involve increased education to raise awareness on the MMPR 18-20, as well as increased compliance and monitoring of marine mammal tourism within the Maui's dolphin range. This option could be implemented in addition to one of the options 1-3 above.

Options to reduce risk to Maui's dolphins from Commercial Marine Mammal Tourism (CT). *Option can be implemented in conjunction with any of the other options.		
CT Option 1	*Status quo*	No regulatory change.
CT Option 2	Moratorium under the MMPR	A moratorium on commercial marine mammal tourism permits under the MMPR targeting Maui's dolphins.
CT Option 3	Restrictions within MMS	• No commercial tourism targeting Maui's dolphins. • No swimming with Maui's dolphins. • 10 minute time limit for opportunistic viewing for recreational boats, in addition to observing MMPR 18 to 20.
CT Option 4 (additional)	Increased engagement and compliance	Increase education on MMPR 18 to 20; increase compliance and monitoring of marine mammal tourism in Maui's dolphins range.

Costs
As there are currently no commercial tourism operators targeting Maui's dolphins specifically, costs of imposing additional restrictions are negligible on existing operators. Recreational boat users may be subjected to behaviour based controls, with no associated costs.

7.5.6 Commercial shipping
A Precautionary Area for shipping was established by the New Zealand government through the International Maritime Organisation (IMO) in 2007, from just north of the Mokau River down to Whanganui and encompassing all of the 6 offshore installations off the Taranaki coast. While no specific measures are associated with this area, its existence alerts passing vessels to the heightened risk of collision with the fixed oil and gas structures.

Various other avenues exist through the IMO to designate high-risk/sensitivity areas and establish specific measures for international vessels. This would provide opportunities to increase protection over and above minimum requirements contained in international conventions.[156]

7.5.6.1 Options
As mentioned in the previous section under commercial tourism, large vessel traffic was considered to be less of a risk to dolphins than small vessel traffic. However, when scoring the risk of boat strike, all vessels were considered. This was scored as contributing to 0.03 deaths per year (95% CI: <0.01-0.10) and a 17.9% likelihood of exceeding the PBR.

Option 1. *Status quo*
No regulations on commercial shipping.

Option 2. Particularly Sensitive Sea Area (PSSA)
Due to the critically endangered status of Maui's and its limited distribution in one discrete area, its entire historic range (including a buffer zone) could be identified as a Particularly Sensitive Sea Area (PSSA) in which measures such as heightened navigational controls or prohibition of all discharges could be required.[157] In order to achieve this, New Zealand would have to make a submission to the IMO for assessment and approval by the Marine

[156] For example, the International Convention for the Prevention of Pollution from Ships – commonly referred to as MARPOL
[157] See the IMO website for full details: http://www.imo.org/blast/blastDataHelper.asp?data_id=14692&filename=510.pdf

Environment Protection Committee. The submission must demonstrate both environmental sensitivities and potential risks from shipping, along with identification of the specific measures being sought to reduce impacts.

A PSSA in the Taranaki region would not necessarily have to be limited to providing additional protection for Maui's dolphin. It could be designed to include a suite of controls that would also benefit other key species such as Hector's dolphin, blue whales and seabirds. This would not only provide additional environmental benefits, but is also likely to significantly increase the chances of approval by the IMO.

Option 3. Area to be Avoided (ATBA)

Further options such as designating an Area to be Avoided (ATBA, similar to those already existing around the Three Kings and the Poor Knights, which can be mandatory) or other vessel routeing measures are also possible through IMO processes. However, since international shipping would need to be allowed continued access to the Port of Taranaki and through Cook Strait (as a freedom of the sea) there would likely be significant opposition encountered through the IMO approval process. Therefore, it is considered that a PSSA offers the most effective means to ensure increased protection.

Options to reduce risk to Maui's dolphins from Commercial Shipping (CS)		
CS Option 1	*Status quo*	No additional measures for commercial shipping.
CS Option 2	PSSA	Submission to International Maritime Organisation seeking Particularly Sensitive Sea Area (PSSA) designation, with measures such as heightened navigational controls or prohibition of all discharges.
CS Option 3	ATBA	Submission to International Maritime Organisation seeking Area to Be Avoided (ATBA) designation.

It should also be noted that international initiatives would not necessarily capture the New Zealand coastal fleet, which should be managed in a consistent manner through domestic regulatory and non-regulatory approaches.

Costs

Costs for establishment of a PSSA or ATBA are limited to departmental staff time. It may be necessary to attend the relevant meeting of the IMO to support the application if the lead agency (MNZ) is not planning on attending.

Operational costs to industry are considered to be negligible or minimal, within the bounds of normal operations for international shipping (such as withholding operational discharges within specified areas). If vessel routing measures are considered, there is potential for indirect costs to increase, though these are likely to be limited given the relatively small area in question and the largely coastal distribution of the species. If it be decided that a PSSA should offer protection to other species in the region, additional measures may possibly include speed restrictions in certain areas or at specific times of the year. As just noted, indirect costs are also likely to be minimal due to the limited geographical area in question.

7.6 NON-REGULATORY OPTIONS

A number of risks sit outside DOCs primary area of responsibility, and as such can only be addressed through processes of engagement and education. Since the various stakeholder groups are complex, comprised of government agencies, local bodies, tangata whenua, and public/community groups, an integrated strategy could be developed to co-ordinate activities for the risks outlined below. There is scope within this for government to take the lead in some areas and provide oversight, whereas in others the community and stakeholder groups could drive the process, as outlined further in Section 8.

7.6.1 Collaboration with **whānau**, hapu and iwi

In proposing development of an engagement and education strategy it is worth highlighting the critical importance of whānau, hāpu and iwi involvement. Maori have a strong spiritual and cultural connection with the moana and have stated they want to be involved with the recovery of Maui's dolphins, which are a taonga species. DOC has obligations to tangata whenua through section 4 of the Conservation Act 1987, and through Treaty Settlements legislation and Protocols which require DOC to give consideration to places and species of significance to Maori.

There is value in DOC enabling whānau, hāpu and iwi to fulfil their kaitiakitanga responsibilities towards the dolphins. It is important that whānau, hāpu and iwi, particularly those in coastal communities, are engaged and enabled to support or get involved in Maui's protection, research and sightings. Appropriate mechanisms for ensuring whānau, hāpu and iwi engagement need to be further developed, particularly at the local level through DOCs Pou Tairangahau and area based Programme Managers' iwi networks (see Section 8.3.1 on collaboration).

DOC is particularly seeking feedback on ways of ensuring whānau, hāpu and iwi are able to effectively engage in the protection of Maui's dolphins.

7.6.2 Oil spills

The oil industry and the maritime sector are generally regarded as being well regulated in terms of spill prevention. In addition New Zealand has a robust, comprehensive and effective oil spill response system. While the probability of a significant marine oil spill is low, consequences could be significant. For the foreseeable future there is no doubt that activities will continue that have inherent risks. In such instances DOCs interest is in mitigating risks as far as practical and possible.

7.6.2.1 Options

The risk assessment addressed the risk of oil spills as a component of pollution. Pollution as a whole was scored as contributing 0.05 deaths per year (95% CI: <0.01-0.36) and a 40.2% likelihood of exceeding the PBR in the absence of all other threats. Oil spills were considered the highest risk threat under pollution, with an estimated 0.02 deaths per year (95% CI: <0.01-0.15) and a 20.4% likelihood of exceeding the PBR in the absence of other threats.

Options could be considered, both to reduce risks of a spill and facilitate better outcomes for Maui's dolphin during spill response.

Option 1. ***Status quo***

This option would require no change, and would rely on the existing MNZ New Zealand Marine Oil Spill Response Strategy to continue to mitigate risks of spills.

Option 2. Actively monitored zone using AIS

As mentioned in the section on seabed mining options, AIS is a technology that could be exploited for vessel related compliance purposes. However, there is also an opportunity to use AIS to significantly reduce the risk of maritime incident and thereby reduce probability of oil spill incidents. An actively monitored zone could be set up to include maritime areas where Maui's dolphin range, with automatic alerting to vessel masters and regulatory authorities in the event of impending collisions. This would be particularly effective in preventing collisions between transiting vessels and fixed installations associated with oil and gas exploration and production.

Option 3. Active involvement in the Oil Pollution Advisory Committee (OPAC)

DOC is identified as a key stakeholder in Maritime New Zealand's Marine Oil Spill Response Strategy, and has a seat on OPAC which provides advice on the strategic and operational direction of the marine oil spill response system. DOC could use this mechanism proactively, to ensure that response planning accounts fully for the particular sensitivities associated with Maui's dolphin.

Option 4. Increased involvement with Massey University Oiled Wildlife Response Team

This could also include fostering a closer working relationship with Massey University's Oiled Wildlife Response Team (contracted to MNZ for wildlife response operations) and identification of research gaps for specific oil spill and response related issues specific to Maui's dolphins.

Options to reduce risk to Maui's dolphins from Marine Spills (Oil & Harmful Substance) (MS). A range of options could be implemented together.		
MS Option 1	*Status quo*	No additional action taken.
MS Option 2	Actively monitored zone	Using AIS for vessel related compliance purposes and to reduce risk of accidents that could cause oil and other spills in Maui's dolphins range.
MS Option 3	DOC involvement with OPAC	Active involvement in the Oil Pollution Advisory Committee (OPAC) to ensure that response planning includes consideration of Maui's dolphins.
MS Option 4	DOC involvement with OWR	Increased involvement with Massey University Oiled Wildlife Response (OWR) Team to ensure increased collaboration in responses and identification of research gaps, with respect to Maui's dolphins.

Costs

Option 2 would likely entail both initial establishment and ongoing costs. It is unclear at this stage what would be necessary to incorporate the requirements of this option within the existing AIS networks. However, since it would only involve modification to existing systems, costs are likely to be minimal (international vessels are already required to be fitted with AIS transponders and two networks are currently operational within the Maui's dolphin historic range). In addition, as there are wider benefits in terms of protecting existing investments (offshore installations), there is potential for industry to share costs. Costs associated with Options 3 and 4 would primarily be considered to be within DOC routine operations.

7.6.3 Land-based activities and coastal development

Territorial Authorities (district and city councils) and Regional Councils control activities under the RMA, including those which may impact Hector's and Maui's dolphins. This is done through the development and implementation of statutory planning documents under the RMA (regional policy statements, regional plans and district plans), which establish a local framework for managing the environment in their area. These statutory planning documents must be given regard to when considering resource consent applications and these documents must give effect to the New Zealand Coastal Policy Statement 2010 (NZCPS)[158] and have regard to any relevant Conservation Management Strategy (CMS)[159].

Examples of activities administered by local government that could potentially impact Maui's and Hector's dolphins include point source discharges, non-point source discharges, coastal space issues, offshore development (including acoustic disturbance and habitat degradation), marine energy infrastructure, oil and gas development and seabed minerals exploitation.

7.6.3.1 Options

The major impacts of land-based coastal activities on Maui's dolphins are through agricultural and industrial run-off, sewage and stormwater discharge, and the resultant trophic effects from increased pollution and turbidity. This was assessed within the scope of pollution at the Maui's dolphin risk assessment along with the risk of oil spills. The elements of pollution associated with land-based activities and coastal development ranged between a 2-10% likelihood of exceeding the PBR in the absence of other threats. Mitigation options concerning local government agencies could include the following:

Options to reduce risk to Maui's dolphins from Land-based Activities and Coastal Development (CD). A range of options could be implemented together.		
CD Option 1	Maui's dolphins considered in resource consent applications	Advocating for Maui's / Hector's dolphin protection when consulted on any relevant resource consent applications.
CD Option 2	Engagement with Territorial Authorities and Regional Councils	Engaging with Territorial Authorities and Regional Councils during planning processes and reviews of plans to ensure adequate regard is given throughout known and potential Maui's dolphin range.
CD Option 3	NZCPS and CMS revision	Amending provisions in the NZCPS and CMSs which direct councils to identify and protect Maui's dolphin habitat.
CD Option 4	Awareness in RMA process	Ensuring that teams responsible for consent processing are aware of the potential impacts of proposed activities on Maui's dolphins.
CD Option 5	Liaison regarding pollution	Identify sources of pollution that could threaten Maui's dolphins and promote appropriate controls to the administering bodies.

[158] The NZCPS is a mandatory national policy statement prepared under the RMA. It is the role of the Minister of Conservation to prepare and approve the NZCPS. Its purpose, as set out in s56 of the RMA is "to state policies in order to achieve the purpose of this Act in relation to the coastal environment of New Zealand".

[159] Conservation management strategies are statutory 10-year regional strategies prepared by each Conservancy that provide an overview of conservation issues and give direction for the management of public conservation land and waters, and species for which the Department of Conservation has responsibility. Their purpose is to implement general policies and establish objectives for the integrated management of natural and historic resources, and for recreation, tourism, and any other conservation purposes.

Costs

There could potentially be additional costs associated with resource consent application, approval and compliance processes. However, measures to offer further protection for Maui's dolphin from land-based effects are consistent with routinely applied measures to minimise environmental degradation arising from pollution of coastal waters. As such, implementation costs are considered negligible to minimal.

7.6.4 Vessel traffic

Vessel activity within the Maui's dolphin range has the potential to affect dolphins directly, through physical injury or death, or indirectly, through acoustic disturbance, altering activity budgets, masking biologically important behaviours and displacement from an area. Most boats pose some risk, but of particular relevance to Maui's dolphins are Thundercat racing and Surf Life Saving vessels, especially during events that take place in Maui's dolphin core range.

7.6.4.1 Thundercat racing

Thundercat racers competing in official events use small inflatable boats, approximately 4 m in length, powered by 40-50 hp outboard engines that are required to be fitted with propeller guards. Races that take place in the Maui's dolphin zone, such as those off Piha, Karioitahi, Port Waikato and Raglan, could pose a threat as vessels may have limited visibility of dolphins when at high speed and operating in and behind the surf zone. While individual Thundercats may not necessarily be louder than comparable engines on recreational boats, the aggregate noise levels will be higher due to the concentration of vessels in limited areas, operating at top speeds in shallow waters. During events, a number of Thundercats racing in unison may compound potential affects. As Thundercats exceed the inshore speed restriction (5 knots within 200 metres of shore), permits are required for events and the MMPR (in particular 18-20) apply.

In the past DOC has worked with race organisers to develop mitigation measures. Observers have been posted at lookout points and on the water prior to and during events to keep watch for Hector's and Maui's dolphins. If dolphins are seen, vessels are required to stop. The Department proposes to continue to work with organisers to further develop mitigation measures for both practicing and the events themselves. Practicing could be of particular concern if undertaken in areas of particular sensitivity without appropriate permitting or mitigation measures.

Regulatory measures for managing the threats of Thundercat racing, including restrictions or even prohibition within the Maui's dolphin core range, could be considered. However, given the low level of perceived risks – especially in the broader context of other high-speed recreational vessels in the area – DOC considers that it would be more effective to manage risks through engagement.

Options

As mentioned in previous sections on commercial tourism and commercial shipping. Vessel traffic was considered to have a 47.8% likelihood of exceeding the PBR in the absence of all other threats.

In addition to the MMPA and MMPR, threat mitigation tools include non-regulatory options such as voluntary agreements, engagement options and education.
Potential mitigation measures to be considered include the following:

Options to reduce risk to Maui's dolphins from Thundercat Racing (TR). A range of options could be implemented together.	
TR Option 1	'Soft-start' concept similar to seismic surveying, gradually building up noise levels prior to the start of races to give dolphins the opportunity to leave the area.
TR Option 2	Specified practice areas/times.
TR Option 3	Posting of observers to look out for Maui's dolphins.
TR Option 4	Aerial observation of area prior to race start to ensure no dolphins are in the area.

Costs

There are potential costs for race organisers in terms of operational planning and use of observers, though given the relatively low number of events these are considered minimal in comparison to routine costs.

7.6.4.2 Surf Life-Saving events

As with Thundercat boats, inflatable Surf Life-Saving vessels generally operate at speed in and around the surf zone. These vessels are 3.8 metres in length and powered by 30 hp outboard engines fitted with propeller guards. As the hull is designed for surf rescue it is soft, not rigid. Therefore strike from the propeller guard itself is probably more of a threat to the dolphins than the hull of the vessel, and may be as great as the propeller when the vessel is moving at speed. However, at low speeds risk of injury would be reduced significantly.

Options

Mitigation options are likely to be similar to those of Thundercats; non-regulatory options that allow informed stakeholder participation.

Options to reduce risk to Maui's dolphins from Surf Life-Saving events (SLS). Both options could be implemented together.	
SLS Option 1	Ongoing engagement with Surf Life Saving clubs looking at educational options.
SLS Option 2	Utilising observers during competitions and/or training events to look out for Maui's dolphins.

Costs

Similar to Thundercat racing, DOC considers that additional costs associated with use of observers during surf lifesaving events are negligible, and could be met within routine operations.

7.6.4.3 Recreational boating

As well as risks associated with boat and propeller strike (recreational vessels are seldom fitted with propeller guards), recreational vessels pose threats by approaching Maui's dolphins to view and interact with them. They have the ability to impact dolphins in much the same way as tourism; by altering activity budgets and masking biologically important behaviours.

In addition to dolphin safety, encouraging prompt reporting of Maui's and Hector's sightings or strandings may assist with improving knowledge of dolphin distribution and identification of sub-species (if prompt reporting enables biopsy opportunities), particularly at the extremes of Maui's dolphin range.

To minimise threats by vessels in general, it is imperative that recreational boaters are familiar with appropriate boating behaviour around marine mammals.

Options

Mitigation options include:

Options to reduce risk to Maui's dolphins from Recreational Boating (RB). A range of options could be implemented together.	
RB Option 1	Promotion and enforcement of the Marine Mammals Protection Regulations.
RB Option 2	Development of appropriate advocacy tools to support community engagement work.
RB Option 3	Targeted advocacy over summer months when recreational boaters are most active.
RB Option 4	Working with Maritime New Zealand and other boating interest groups (such as Coastguard, regional safe-boat forums, harbourmaster interest groups and boat shows) to effectively engage the target audience.

Costs

DOC considers that costs associated with engagement would be within routine operations, and no costs would be imposed through influencing behavioural changes in recreational boating behaviour.

7.6.5 Scientific research

Research is necessary to help decisions relating to the management of Hector's and Maui's dolphins. The interaction of researchers may result in possible impacts associated with the use of vessels and people in close contact with the dolphins. Any invasive techniques used to collect samples may also have an adverse impact. These threats are described in detail in Section 5.1.2.7.

It is imperative that risks to dolphins while undertaking research are minimised and any approved research has benefits for the long-term management of the species. Non-invasive research techniques such as boat and aerial surveys are regulated through the MMPR (Regs 18-20).

Any Hector's or Maui's dolphin research proposing to use an invasive technique such as biopsy sampling or satellite tagging would requires a marine mammal research permit issued under the MMPA, as well as Animal Ethics Approval. The application process for an invasive research permit is guided by the Marine Mammal Research Permitting Standard Operating Procedures which dictates a peer review and internal consultation process as well as providing guidance to decision makers. For a permit to be granted the justification for the research needs to be clear and the benefits to the population MUST outweigh the risk posed to the species by the proposed technique. The application must also detail clear risk mitigation procedures. In a number of meetings held by the Maui's dolphin Recovery Group with the specific aim to discuss research priorities and methods it was agreed that the current technology with regards to satellite tagging of dolphins is not adequate to ensure the benefits outweigh the risks posed to the Maui's dolphin population.

In the Maui's dolphin risk assessment scientific research was not considered applicable to Maui's dolphins. This is because research is an important part in making decisions relating to the management of Hector's and Maui's dolphins, and due to the stringent requirements around undertaking any research. DOC considers this is already well mitigated, however, proposes some improvements that could increase the mitigation of the potential impacts to Maui's dolphins. These include:

Options to reduce risk to Maui's dolphins from Scientific Research (SR). A range of options could be implemented together.	
SR Option 1	Regular engagement and training with scientists and DOC staff regarding best practice techniques for use on Hector's and Maui's dolphins.
SR Option 2	Ensuring anyone undertaking research is appropriately qualified.
SR Option 3	Strict adherence to current legislation and standard operating procedures is followed.
SR Option 4	Developing stricter risk assessment protocols regarding permit processing.
SR Option 5	Research undertaken is guided by research priorities and a researching planning process (Section 8.1 for more details of options regarding research planning).
SR Option 6	Any research granted a permit has to be able to demonstrate clear benefits for the population and the gains MUST outweigh the risk.

Costs

DOC considers the costs associated with these options to be minimal; however feedback on the potential costs of implementing these options is invited.

7.6.6 Disease

There is limited evidence on the impact of disease on this population and the full extent is not well understood. In the Maui's dolphin risk assessment disease was scored low with stress-induced diseases and domestic animal diseases each predicted to contribute <0.01 mortality a year to the population.[160]

There has since been evidence of *Toxoplasma gondii* related deaths to Maui's dolphins as described in Section 5.2.1.2. There is still uncertainty around the origin of the Toxoplasma oocytes in the waterways, its seasonality, how it is transmitted, and about the direct and indirect affects it may have on the dolphin population. Further research is required to have a better understanding of the impacts on Maui's dolphins and how any impacts can be mitigated. As domestic cats are a known vector of Toxoplasmosis there could be options for engagement with local councils, community groups and the general public in order to raise awareness about the issue as well as encouraging safe practices for disposing of feline faeces. However, this should be in conjunction with further research initiatives to guide what initiatives are needed.

The Maui's dolphin risk assessment scored stress-induced and domestic animal diseases low, each contributing <0.01 deaths per year, although stress-induced disease was scored a higher upper bound (95% CI: <0.01-0.35). The overall likelihood of disease exceeding the PBR was estimated to 29.5%. It is important to note that this scoring was prior to receiving information on the Toxoplasmosis related deaths in Maui's dolphins. Therefore, if rescored this threat might be considered to be of higher risk.

[160] Currey *et al* (2012)

Options to reduce risk to Maui's dolphins from Disease (D). A range of options could be implemented together.	
D Option 1	Ongoing necropsy of Maui's dolphins found beachcast to determine incidence of disease, including *Toxoplasma gondii.*
D Option 2	Research to understand the origin of *Toxoplasma gondii*, the impacts of it on the population, and whether there are ways to mitigate against it (Section 8.1.1.2, for further details).
D Option 3	Engagement with stakeholder groups to raise awareness and encouraging safe practices to minimise the occurrence of *Toxoplasma gondii* getting into waterways and the sea.

Costs

As with scientific research, DOC considers the costs for implementing the above options to be minimal to stakeholders. The greatest cost being the financial undertaking of research. DOC invites feedback on the potential costs of these options and how these could be mitigated or supported.

7.6.7 Population recovery options

In endangered species recovery there are a number of management options that can be employed to help boost reproductive potential of the species. These options range from in-situ management (managing the species directly in their natural environment) through to the more extreme cases of ex-situ management (removing them from their natural environment and relocating to a facility). While some of the ex-situ techniques have been successful for terrestrial species, and are commonly employed for many endangered species of birds they carry more risk and are considerably less successful when dealing with marine species. DOC considers the best chance for the recovery of the species is to effectively manage the human-induced threats to Maui's dolphins in their preferred habitat and throughout their full range rather than to employ ex-situ management options. The reasons for this are discussed in more detail below:

7.6.7.1 Captive breeding as a recovery tool

Captive breeding of wild animals poses several risks and DOC does not support this approach. Worldwide, captive breeding of whales or dolphins has only been successful for a limited number of species (bottlenose dolphins and orca). There is considerable risk around the safety and welfare of the dolphins throughout the process of wild-capture and relocation to a facility. It would cause considerable stress to the captured dolphins but also to the remainder of the group. Maui's dolphins are a highly social species with complex and not fully understood interactions. Once at the facility there is concern over the ability to adequately care for dolphins to a high standard.

Dolphin captures, both overseas and within New Zealand have resulted in high mortality rates during the capture, transfer to holding facilities and post capture stress. A previous attempt at housing Hector's dolphins in captivity at Napier, Marineland was unsuccessful. Marineland New Zealand held four wild-caught Hector's dolphins in captivity between 1969-1972. Three died within 2.5 months of being in captivity, the fourth died after 2.5 years in captivity. A petition in 2005 to again hold wild-caught Hector's dolphins was turned down based on the fact that the risks to the animals outweighed the benefits. New Zealand does not have any facilities that would be of suitable standard for facility-based captive breeding. The cost of upgrading or building facilities to an internationally acceptable standard would be considerable.

If the management measure is intended to support the wild population, this requires reintegration of the captured animals back into the wild. This is where the greatest risk to Maui's dolphins lies. Once back in the wild there is no guarantee of the dolphin's survival as the dolphin may have reduced ability to reintegrate socially and to find food. These are highly social, gregarious species and calves are dependent on mothers for several years. Successful reintroduction after a period of being held in captivity is unlikely. Even if successful, there is also increased risk to the wild population through introduction of disease.

It is not known how many dolphins would need to be captured to establish a viable captive population for breeding, and it is likely this management option would require the capture of several dolphins. If a single Maui's dolphin were to die as a result of an attempt of captive breeding, this is a human-induced death. The revised PBR for Maui's dolphins is one human-induced death every 10-23 years. Therefore, the risk posed through capture and captive breeding is considered unacceptable.

In order for re-introduction to occur the area of release would need to have all the human-induced threat's managed for the long-term viability of the Maui's dolphins. This would need to be over a wide spatial area and for the full historic range of the Maui's dolphins. Therefore, DOC considers that in-situ management through the TMP is the most cost-effective, beneficial and humane way to manage the recovery of the critically endangered Maui's dolphin population.

7.6.7.2 Translocation of Hector's dolphins to Maui's range as a recovery tool

Another option that has been mentioned is the translocation of Hector's dolphins to Maui's dolphin range to allow for interbreeding to boost the Maui's population. This option also has associated risks:

Translocation involves the capture and removal of an animal from its habitat and transporting it out of water. Even though the end point is to release the dolphin back into the sea, the first steps of the process are the same as for captive breeding. The capture and removal of a dolphin from the wild is highly invasive and dangerous for the animal in question. As with the release of captive dolphins, the translocation of Hector's to Maui's range also carries the risks of introducing disease into the new population.

While some stranded whales and dolphins have been transported to alternative sites for refloating this is typically over short distances, and involves animals that are in immediate danger of dying if not refloated, not healthy animals. To translocate an otherwise healthy animal putting them at risk of death is considered unacceptable. While the populations of Hector's dolphins are larger than the Maui's dolphin population, they are listed as Endangered by the IUCN, and Nationally Endangered by the New Zealand Threat Classification, the second highest category for both.

In addition, the PBR estimate for the South Island populations is also low[161] and a human-induced mortality to one of these populations as a result of translocation is not an acceptable risk. In considering translocation thought must be given to how many, animals are required as a minimum to capture and move, as relocating only a few is not going to be beneficial to the Maui's population. Also the animals need to be breeding age, and a mix of males and females for this to be effective. Therefore, even capture and translocation of dolphins from the largest

[161] From the former Ministry of Fisheries & DOC 2008, ECSI PBR = 2-4 dolphins/year, SCSI PBR = 0 dolphins/year, WCSI PBR = 7-12 dolphins/year

population with the highest PBR, (West Coast South Island, 7-12 dolphins/year), a translocation operation could put that population at risk of exceeding its PBR.

It is also important to consider that while there is no reason that the two sub-species cannot interbreed, there is no evidence as of yet that they have. Therefore, in the case of translocation and given the current lack of evidence of benefits to the Maui's dolphin population, the risks to any Hector's or Maui's dolphin population clearly do not outweigh the benefits.

DOC is not proposing captive breeding or translocation as options for population recovery as it is considered the risks are too high; however, feedback on this topic is welcome, including perceived costs and benefits associated with these proposals.

7.6.8 Predation

Predation is a non-human induced form of mortality that Maui's dolphins may face. There has been evidence of shark predation on Maui's dolphins; however, this has been minimal (see Section 5.2.2. for details). Great whites, blue and broad-nosed seven-gilled sharks, are the main species that may consume Maui's dolphins.

White sharks are listed as vulnerable on IUCN Red list and have been protected in New Zealand since 2007 under the Wildlife Act 1953. Orca, which may prey on Maui's dolphins, are also listed as Nationally Critical under the New Zealand threat classification. There is concern about the status of several of the other species which may be predators of Maui's dolphins. Given predation is a natural form of mortality, there is limited evidence for the impact of predators on the Maui's dolphin population, and the potential predators are protected species with concern about the status of their populations, DOC does not consider that active control of predator populations is appropriate.

7.6.9 Cumulative impacts of multiple threats

DOC acknowledges there is a lack of understanding about the interaction between threats and the potential impact of such interactions on the Maui's dolphin population (for example, displacement from seismic activity into an area of higher intensity fishing, or decreased fitness through pollution resulting in decreased ability to avoid predators). There is also limited understanding about the cumulative impacts of multiple threats on a population, as threats are often assessed and thus managed in isolation. While, the Maui's dolphin risk assessment provided an opportunity for estimating the potential impact of threats on the population both in isolation, and cumulatively, there remains benefit in better understanding how individual threats interact to affect the population. As there is limited information on this DOC considers it a research gap and is highlighted in Section 8.1.1.2.

8.0 Research, Monitoring and Collaboration

8.1 RESEARCH PLANNING PROCESS

DOC and MPI are proposing 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. This framework may include the establishment of a Research and Monitoring Advisory Group to make recommendations and/or identify the key information needs to answer the management questions and priorities for each agency.

The annual planning and review process would do the following:

- Develop an ongoing review framework for an overarching strategy for research, monitoring and collaboration.
- Review the current management questions of both DOC and MPI 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, noting that due to small population size of the Maui's dolphin it will be difficult to reliably assess the effectiveness of current management measures[162].
- Outline approaches to address the information needs to assist DOC and MPI in developing research proposals or monitoring programmes for the 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.

The framework of an annual planning and review process is still under development, but will consider the high profile nature of the Maui's dolphins and thus the need to be able to conduct these processes efficiently. Both agencies acknowledge the need to streamline this with a similar process for Hector's dolphins.

8.1.1 Research needs

There is a considerable body of information on Hector's and Maui's dolphin distribution, abundance and genetics[163]. Although a significant amount of research has already been conducted on Hector's and Maui's dolphins, there are some key areas where DOC and MPI consider that more research is required for Maui's dolphins specifically. Research is required to help inform future decisions on the management of Maui's dolphins and to monitor the population to assess the efficacy of any management measures put in place following this review.

DOC and MPI have identified four high priority information needs to support current and future management decisions by both agencies (Table 8.1). Many of the information needs outlined below represent areas highlighted as sources of uncertainty in the recent Maui's dolphin risk assessment, particularly those relating to Maui's dolphin distribution, genetics

[162] Jaramillo-Legorreta *et al.* (2007)
[163] Consolidated as an annotated bibliography: Du Fresne *et al.* (2012)

and the level of human-induced mortality[164].

Table 8.1. Joint DOC and MPI high priority information needed to support any future review, implementation or monitoring of management measures to address human-induced impacts on the Maui's dolphin population.

Type of Information	Why Important	Objectives
Maui's dolphin distribution: • Southern extent • In harbours • Offshore • Seasonal movements	Improving information on Maui's dolphin distribution is considered the highest priority for further research. Expanding knowledge on the southern extent of their range and the frequency and extent of their use of harbours would improve our understanding of the impact of human-induced threats on the Maui's dolphin population.	• To assess the extent of Maui's dolphin distribution; e.g. southern extent, in harbours and offshore • To estimate residual risk to the Maui's dolphin population outside of current protection measures. • To assess the nature and extent of seasonal movements of Maui's dolphins. • To assess areas of overlap and the intensity of overlap in these areas between Maui's dolphin and different human activities, and where the dolphins are at greatest risk.
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	Recent findings of Hector's dolphins within the Maui's dolphin range highlight there is overlap between the subspecies. Hector's dolphins are observed on the East Coast of the North Island, around the Kapiti Coast and the Wairarapa, they are also regularly found in the Marlborough Sounds. These areas of overlap or close proximity between neighbouring populations could provide an area of mixing which could have implications for the potential recovery of Maui's dolphins.	• To determine the extent of overlap between Hector's and Maui's distributions on the North Island. • To determine the origin of Hector's dolphins on the North Island through microsatellite assessment. • To determine population substructure and potential risk of fragmentation. • To determine if there are areas of mixing or genetic dispersion between populations. • To assess the potential of interbreeding between subspecies
Maui's dolphin abundance: • Baseline monitoring • Trends over time • Collect DNA samples	Due to the small size of the Maui's dolphin population it is unlikely that the effectiveness of mitigation measures and changes in abundance will be detectable in the short to medium term[165]. The focus of the monitoring should be to maintain baseline data so differences in the population are detectable in the long-term, and information that would require further management actions are detected promptly.	• To determine a best practice methodology for population monitoring to ensure comparability between surveys. • To conduct regular surveys using the best practice methodology to allow for long-term identification of any population trends.
Social research project: • Community involvement • Information gathering • Tools for gathering data	Outside of targeted research surveys, public sightings, and sightings from platforms of opportunity, (for example, fisheries observers, seismic marine mammal observers, etc.) are relied on to gain more information on Maui's dolphins. The Government also relies on community support to encourage safe boating behaviour around dolphins, and to support other initiatives to better protect dolphins.	• To determine the best means of public engagement for encouraging sighting reports, • To develop new tools to assist the public in collecting information about Maui's dolphins • To raise awareness about Maui's dolphins, and encourage safe boating behaviour around the dolphins.

[164] Currey *et al.* (2012)
[165] Example from Jaramillo-Legorreta *et al.* (2007) with vaquita that a 4% increase in population would take at least 25 years of annual surveys to detect

MPI and DOC propose to use the annual planning and review processes discussed above to identify other joint agency information needs, and assess the various methods that may be used to achieve the objectives. In addition, some agency-specific research priorities would improve specific information requirements for MPI and DOC to manage fishing and non-fishing-related threats, respectively.

8.1.1.1 MPI Research Priorities

Type of Information	Objectives
The nature and extent of fishing-related mortalities in the Maui's dolphin population from different fishing methods.	• Quantify the degree of overlap between Maui's dolphins and specific fishing-related activities (e.g. commercial set net and trawl) using best available information on Maui's dolphin distribution. • Estimate the vulnerability of Maui's dolphins to capture for each fishing method using fisheries observer data. • Estimate the total captures of Maui's dolphins in each fishery from the overlap and vulnerability estimates.

8.1.1.2 DOC Research Priorities

Type of Information	Objectives
Impacts of mining	• Quantify the potential overlap between Maui's dolphins and proposed mining activity. • Monitor the impact of exploratory and prospecting stages of mining on Maui's dolphins. • Develop a research programme with industry to model the environmental effects of mining activities in order to predict potential impacts in places where direct observation is not possible. • Develop a programme to test possible mitigation methods for minimising the impacts of mining on Maui's dolphins.
Toxoplasmosis	• Necropsy all carcasses and test for the presence of *Toxoplasma gondii* and other potential lethal agents. • Determine the pathways of *Toxoplasma gondii* into the sea to determine seasonality, prevalence, etc • Test for presence of *Toxoplasma gondii* in other species, eg, fish species, what role do fish play in the infection of Maui's dolphins? • Investigation of alternative methods for disposal of cat faeces, the primary vector for Toxoplasmosis, coupled with community engagement programme to trial alternative methods.
Health screening	• Continue with ongoing necropsy of Hector's and Maui's dolphin carcasses from bycaught, or beachcast animals. • Screen for a range of diseases that may have an effect on the population. • Assess levels of pollutants dolphins are exposed to and whether lethal or sublethal. • Test cortisol levels from a range of tissues (e.g. blood, blubber, saliva) in relation to a stressful event that may have led to the dolphin stranding.
Vessel Traffic	• Characterisation of recreational boat traffic within the Maui's dolphin range • Quantify the degree of overlap between Maui's dolphins and vessel activities (e.g. recreational boats, shipping traffic) using best available information on Maui's dolphin distribution. • Estimate the vulnerability of Maui's dolphins to vessel traffic. • Estimate the total vessel traffic-related mortalities of Maui's dolphins from the overlap and vulnerability estimates.
Cumulative impacts of threats	• Quantify the level of impact of different threats • Understand the interaction, if any, between certain threats in order to better understand cumulative impacts of multiple threats on the population
Trophic interactions and diet	• Determine diet of Maui's dolphins. • Understand the importance of direct trophic interactions on Maui's population. For example, is there overlap between what fisheries are taking and what dolphins are eating, and if so is it enough to impact on Maui's population? • Understand the importance of indirect trophic interactions on Maui's dolphins. For example disruption to the seafloor, water quality or excessive noise in the environment from a range of activities (fishing and non-fishing) that could displace Maui's dolphin preferred prey species.

Questions for tangata whenua and stakeholder consideration

- Have the key features of the proposed annual planning and review process been described?
- Are there any models or frameworks for the annual planning and review process that need to be considered?
- Are there suggestions for where efficiencies in such a process could occur?
- Are there any additional or different research needs that should be addressed?
- Have the rationale and objectives of the research needs been accurately set out?
- Are there other comments you would like to make about the planning and review process or research priorities discussed above?

8.2 MONITORING PROGRAMME

Information on the nature and extent of the overlap between human-induced threats and Maui's dolphins is important to guide decisions on how to best manage those interactions. MPI and DOC consider that monitoring should be focused in areas where Maui's dolphins may overlap with both human-induced threats, and where there are few management measures in place to avoid, remedy or mitigate the adverse effects of those threats. Such information will help both MPI and DOC assess the effectiveness of fishing-, and non-fishing-, related management measures, respectively, and whether more mitigation measures are required.

MPI and DOC consider that the annual planning and review framework for research discussed above may be one means for providing a more transparent and systematic procedure for determining key monitoring requirements for Maui's dolphins.

8.2.1 Ministry for Primary Industries: Monitoring the effects of fishing on Maui's dolphins

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.

Information on the nature and extent of the interaction between fishing-related threats and Maui's dolphins is important to inform decisions on how best to manage those interactions. 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 to which fishers currently report entanglements is unknown and although fishers are currently required by law to report dolphin bycatch, this does not always occur. Incentives to report entanglements are poor and some fishers fear they may be subject to onerous mitigation measures if reported mortalities are too high. However, the reporting of the dolphin mortality in January (as discussed in previous sections) is testament to the fact that many fishers can and do responsibly report accidental captures. 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 be hauled in.

Therefore, it is difficult for MPI to determine the number of Maui's dolphin mortalities caused by fishing. Independent monitoring of fisheries provides an opportunity to gather reliable, unbiased information about fisheries interactions with Maui's dolphins.

This consultation paper contains proposals to increase the level of monitoring in the commercial set net and trawl fisheries. The management options for the trawl fishery are not explicit about what level the monitoring coverage should be increased to, just that it should be extensive.

8.2.1.1 Need for increased monitoring

Given the uncertainty about the nature and extent of fishing-related mortalities involving Maui's dolphins, there are real benefits from increased monitoring to better assess residual risk of fishing interactions under the existing and proposed management measures.

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.

8.2.1.2 Types of monitoring available

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.

There are two approaches to improving independent monitoring of fisheries interactions with Maui's dolphins:

- Electronic monitoring, and
- Observers.

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 8.2 provide figures to determine the magnitude of the funds that would be required.

Table 8.2. 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.

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, and
- If a dolphin is released or falls from a net before the net is retrieved onboard.

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.

MPI invites stakeholders to comment on electronic monitoring programmes that are likely to provide reliable information on fishing-related interactions with Maui's dolphins and their cost-effectiveness.

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.

Benefits of observers include:

- 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, and
- 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.

8.2.1.3 Levels of observer coverage

In the management options outlined in Section 6.0, MPI is proposing:

- Prohibiting set net fishing from Pariokariwa Point to Hawera between 2 to 7 nautical miles offshore without an observer on board
- Put in place extensive monitoring coverage in the trawl fishery from Maunganui Bluff to Pariokariwa Point between 2 to 7 nautical miles offshore

MPI acknowledges the need to consider within these options the:

- Benefits and limitations of the information likely to be gained
- Practicalities associated with increased observer coverage, and
- Costs to industry.

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.

8.2.1.4 Current monitoring

Under the interim measures, MPI is funding 100 percent observer coverage for any commercial set net fisher operating from Pariokariwa Point to Hawera between 2 and 7 nautical miles offshore. This monitoring coverage will remain until the Minister for Primary Industries makes a decision on any monitoring coverage options that are presented in final advice.

8.2.2 Department of Conservation Monitoring Programme

The Department of Conservation undertakes surveys to monitor the Maui's dolphin population. Supplementary to this DOC also regularly receives notifications of sightings and strandings of marine mammals, including Maui's dolphins. This information leads to a better understanding of the distribution of Maui's dolphins both offshore and alongshore.

8.2.2.1 Need for additional monitoring

As with many species it is difficult to know the exact extent of their range. The core range is usually well understood but the extremes less so. This is exacerbated when dealing with a small population size, as with Maui's dolphins. However, to effectively support the recovery of the population, mitigation measures should support recovery throughout the historic range of the population, not just in the core range. For these reasons it is important to increase monitoring effort in the areas where there is still uncertainty about the frequency and numbers of dolphins present. An increased understanding of dolphin presence and habitat use in these areas will better inform management decisions on how to best protect this population.

8.2.2.2 Types of monitoring available

There is a range of monitoring options available, each with their pros and cons discussed below. DOC considers using a suite of methods will result in increased information gains.

Boat surveys

Boat surveys along shore will aid in determining the presence of dolphins along the Taranaki coast. These surveys are constrained by sea conditions and also the distance that can be

searched in a given time period. As such they will be focused on inshore sightings of the dolphins during the summer months when dolphins are likely to be closer inshore. The benefit of boat surveys is the ability to take biopsy samples of the dolphins. These samples will assist

in other research areas, for instance determining the sub-species, sex, as well as some basic health screening looking at pregnancy rates, and levels of pollutants such as organochlorines.

Aerial surveys
Aerial surveys can be undertaken alongshore as well as flying transect lines for detecting dolphins further offshore. These surveys have the added benefit of being able to search a greater area in a given time frame than boat surveys. They also are not as constrained by sea conditions since the height of being in a plane typically increases chances of sighting dolphins. Aerial surveys can operate in conditions with greater wind and sea state than boat surveys. While they do not allow directly for the collection of a biopsy sample, if run in conjunction with boat surveys or a stand by boat crew, dolphin sightings can be reported through to the boat for opportunistic biopsy opportunities.

Community engagement programme
The West Coast North Island marine mammal sanctuary covers approximately 2,164 km of coastline, and extending out to 12 nautical miles the total area of the sanctuary is approximately 1,200,086 hectares and this does not include the south Taranaki region where sightings have occurred. Acknowledging the size of this area and the small population size of the Maui's dolphins, the chances of sighting a dolphin are much reduced at the extremes of their range. For these reasons it is important to increase the chance of sighting dolphins by increasing the number of opportunities for sighting them. This means not just relying on dedicated DOC or research surveys, but also encouraging and making use of other platforms of opportunity (for example marine industry, Airforce flights, shipping, community groups and the general public). While the effort is not uniform and is biased to popular beaches, or fishing locations etc, the benefit of this type of monitoring is that it greatly increases the area of coverage and the number of observers looking for dolphins, and therefore the chance of sighting a dolphin. Prompt reporting of any sightings similar to aerial surveys, will allow DOC to follow up with a boat to verify the sighting and collect a biopsy sample.

Commercial fisher liaison programme
Similar to the community engagement programme fishers are regularly out on the water and covering a wide area. Many will be carrying a fisheries observer onboard. This increases the search area and chance of sighting dolphins, but through liaison with DOC staff, also increases the chances of collecting a biopsy sample.

8.2.2.3 Current monitoring

DOC has four main components proposed for gathering information on Hector's/Maui's dolphin off the Taranaki coastline during the July 2012 to July 2013 financial year. As mentioned above these methods each have various constraints, but when employed together increase the overall chance of observing dolphins, and through collaboration and reporting also increase the chance of collecting a biopsy sample.

(1) Boat surveys using a DOC vessel and collection of biopsy samples
(2) Aerial surveys using a fixed wing aircraft
(3) A community engagement programme to solicit sightings data from the public and follow up response to sightings from DOC
(4) A commercial liaison programme to gather information from the fishing industry

The goals of this programme are to:

- determine presence/absence of Hector's/Maui's dolphin in the Taranaki area;
- obtain biopsy samples for genetic analysis to:
    - determine sub-species of individuals (Hector's or Maui's dolphin)
    - detailed genetics work on population of origin, rate of gene flow etc., sex of individuals sampled
    - additional information such as levels of toxins in blubber; pregnancy rates

8.3 COLLABORATION

DOC and MPI recognise that both agencies can achieve more for the recovery of the Maui's dolphin population through development of collaborative processes. Such processes would better enable both agencies to address some of the gaps highlighted in the research and monitoring sections above. DOC and MPI consider collaborative processes go beyond their own agencies mandates and capacity and can be extended even broader to other public, private, and non-governmental organisations.

Such a collaborative approach has the potential to develop innovative and integrated solutions to address many of the human-induced threats that are affecting the Maui's dolphin population. As such DOC and MPI are seeking feedback and ideas on how you think you could contribute to the protection of Maui's.

To support this discussion DOC and MPI have listed some suggestions below for various groups that share an interest in protecting this unique subspecies. Collaborative projects or initiatives may be possible where these should have a shared interest in a region or on a particular activity. For example, there is significant uncertainty about Maui's dolphin distribution and use of the WCNI harbours and catchments, and the harbours and catchments are areas of intensive use that tangata whenua and various stakeholders have an interest in.

8.3.1 Tangata whenua

- Review the named research priorities and comment on their suitability
- Provide input into the research planning process particularly on research proposals that may take place in their rohe or will assist in their own management of customary fisheries and interactions with Maui's dolphins
- Assist in the gathering of information on Maui's dolphins
- Seek opportunities to collaborate with others, government, industry, research providers, and community groups to increase capacity of iwi forums in gathering information and raising awareness about the cultural importance of Maui dolphin

8.3.2 Research providers

- Review the named research priorities and undertake projects where possible
- Provide input into the research planning process
- Seek opportunities to collaborate with others, government, industry, tangata whenua, community groups to increase the capacity of your research

8.3.3 Industry

- Review the named research priorities and see if there are any you could support financially or logistically
- Provide input into the research planning process
- Assist in the gathering of information on Maui's dolphins

- Seek opportunities to collaborate with others, government, research providers, tangata whenua, and community groups to increase the use of data you collect or your platform of opportunity

8.3.4 Local government

- Report sightings and strandings of dolphins
- Consider what tools you have available to control any human-induced threats to the population
- Provide input into the research planning process
- Seek opportunities to collaborate with others government, research providers, tangata whenua, and industry to increase the capacity for gathering information on Maui's dolphins and sharing ideas on how to protect them

8.3.5 Non-governmental organisations

- Review the named research priorities, comment on their suitability, and undertake or support projects where possible
- Provide input into the research planning process
- Help develop better tools for reporting sightings or raising public awareness
- seek opportunities to collaborate with others, government, industry, tangata whenua, and community groups to increase the capacity of your research

8.3.6. Community groups and general public

- Report sightings and strandings of dolphins
- Help develop better tools for reporting sightings or raising public awareness
- Lead social engagement initiatives to raise awareness (can be led by school groups or community groups)
- Learn how you can decrease rubbish and pollution into the marine environment
- Volunteer as a look out for Maui's dolphins at events which may pose a risk to the dolphins
- Seek opportunities to collaborate with others, government, research providers, tangata whenua, and industry to increase the capacity for gathering information on Maui's dolphins and sharing ideas on how to protect them.

Questions for tangata whenua and stakeholder consideration

- Are there any additional or different collaborative tools or approaches that should be addressed?
- Are there other comments you would like to make about collaborative opportunities to improve protection of the Maui's dolphin population?

9.0 Appendix 1: Maui's dolphin TMP supporting maps

Map 1. Context map identifying the location of commonly referred to place names on the west coast of the North Island in the body of this paper, and the boundaries of the Marine Mammal Sanctuary.

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 Maui's dolphins and Hector's dolphins (DNA confirmed) and Hector's or Maui's (subspecies unknown) mortalities along the west coast of the North Island.

Map 4. 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 5. 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 6. 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.

Map 7. Locations of seismic survey tracks from 2000-2005 and 2006-2010 off the west coast of the North Island.

Map 8. Locations of offshore petroleum, mineral and coal mining permits off the west coast of the North Island.

Map 9. Locations of coastal discharge points and river mouths off the west coast of the North Island.

Map 10. Classification of oil spill risk assessment areas off the west coast of the North Island.

Map 11. Locations of various coastal activities (including dredging, iron sand mining, and marine farms) that occur along the west coast of the North Island.

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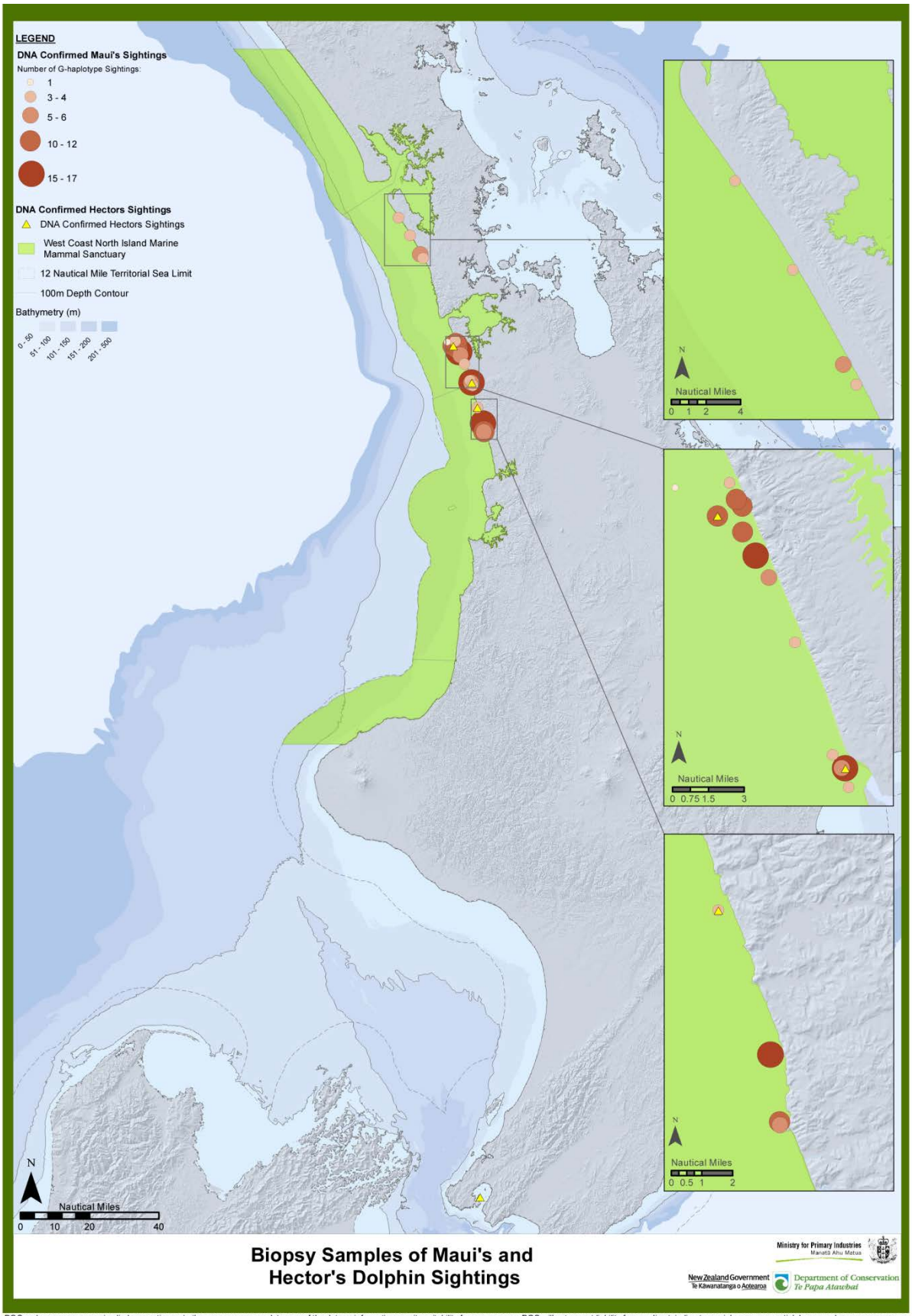
Map 1



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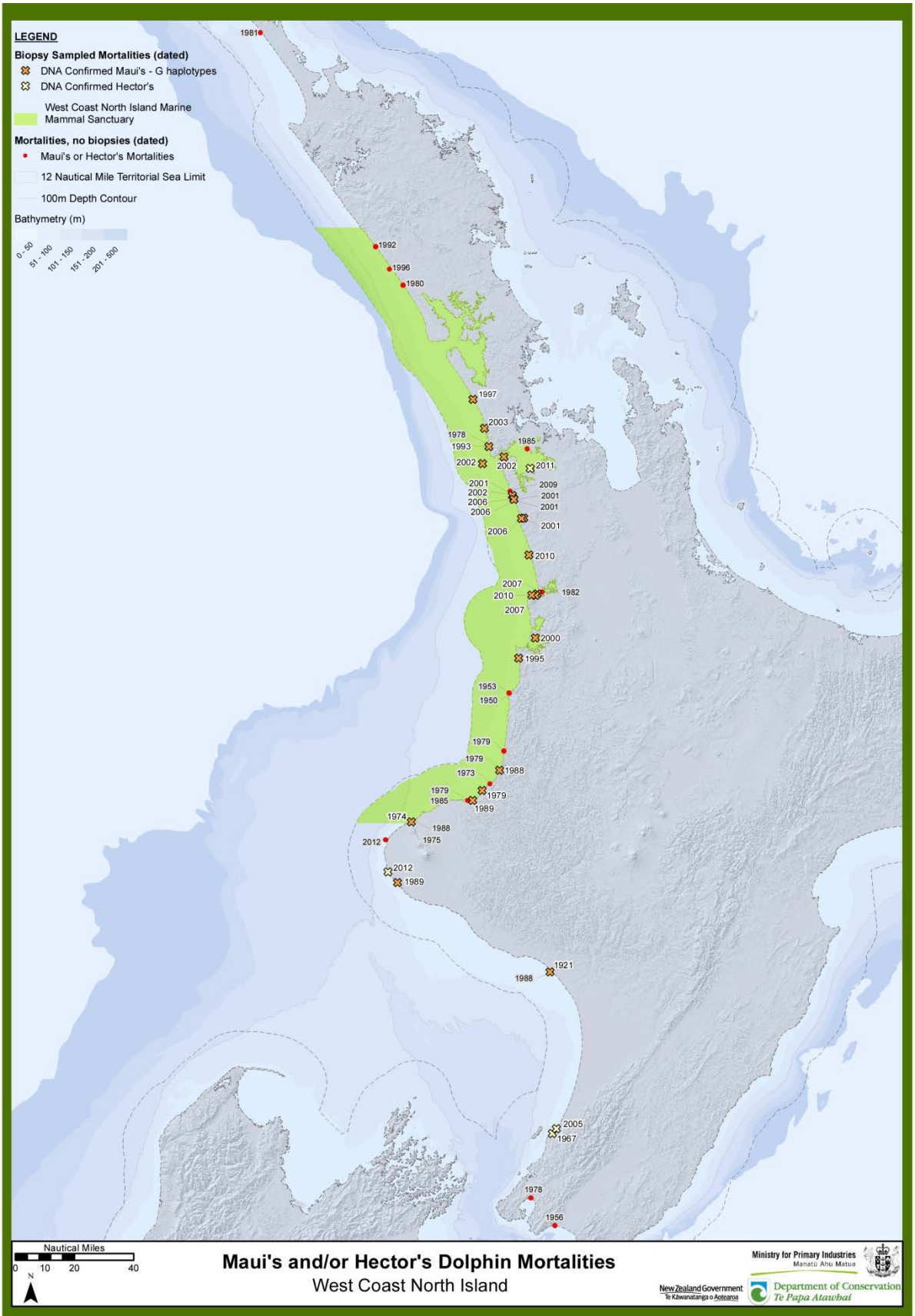
Map 2



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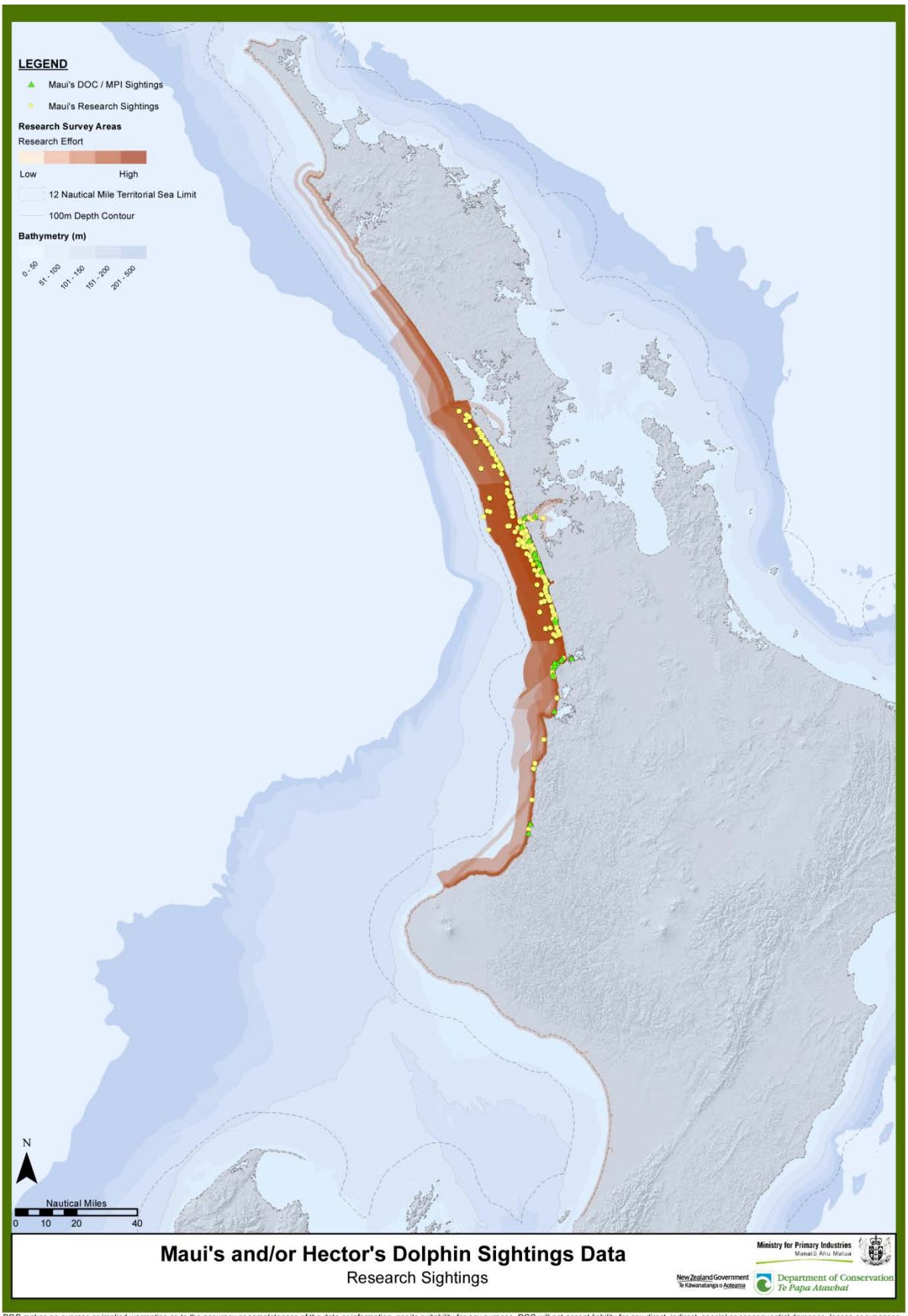
Map 3



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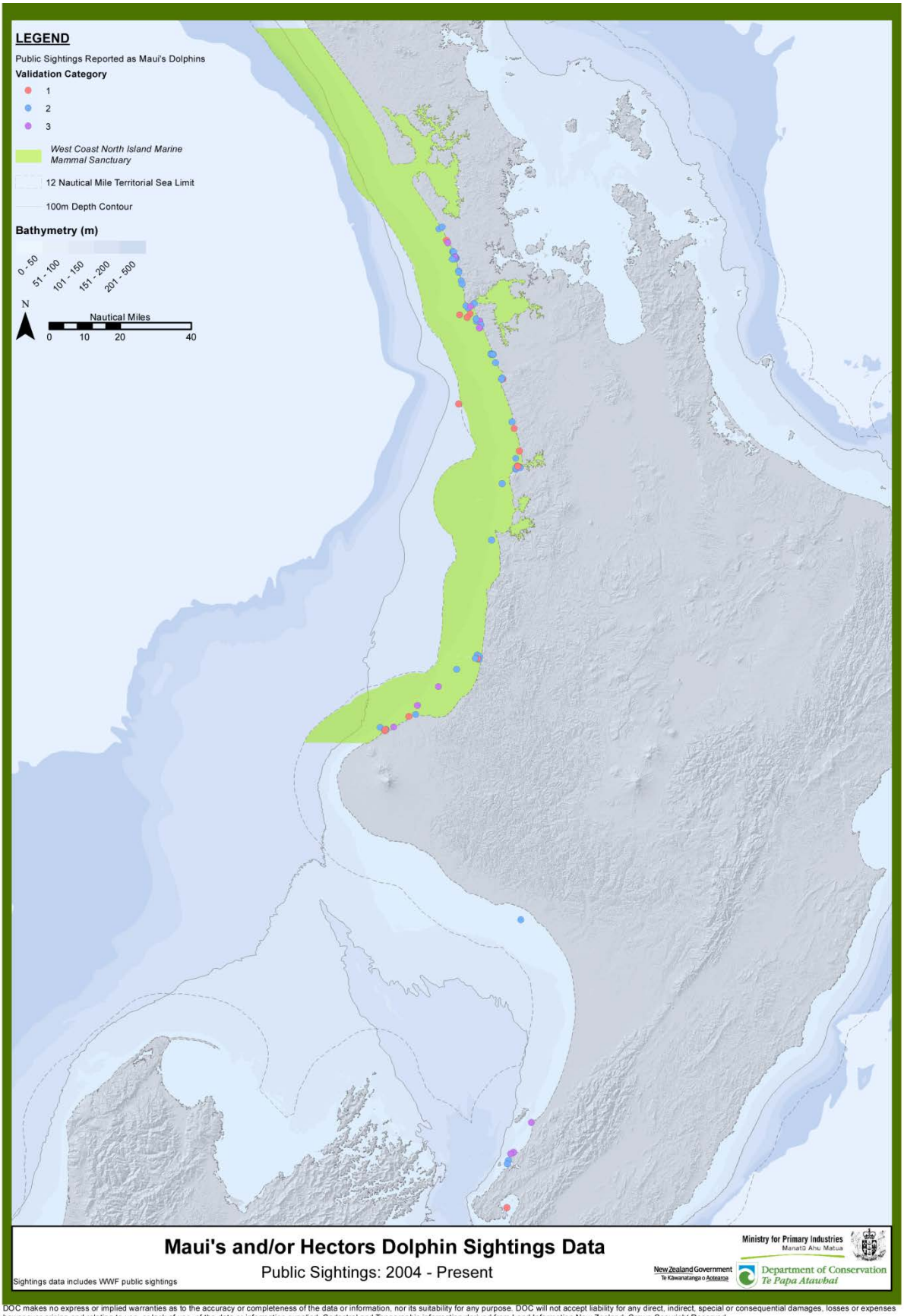
Map 4



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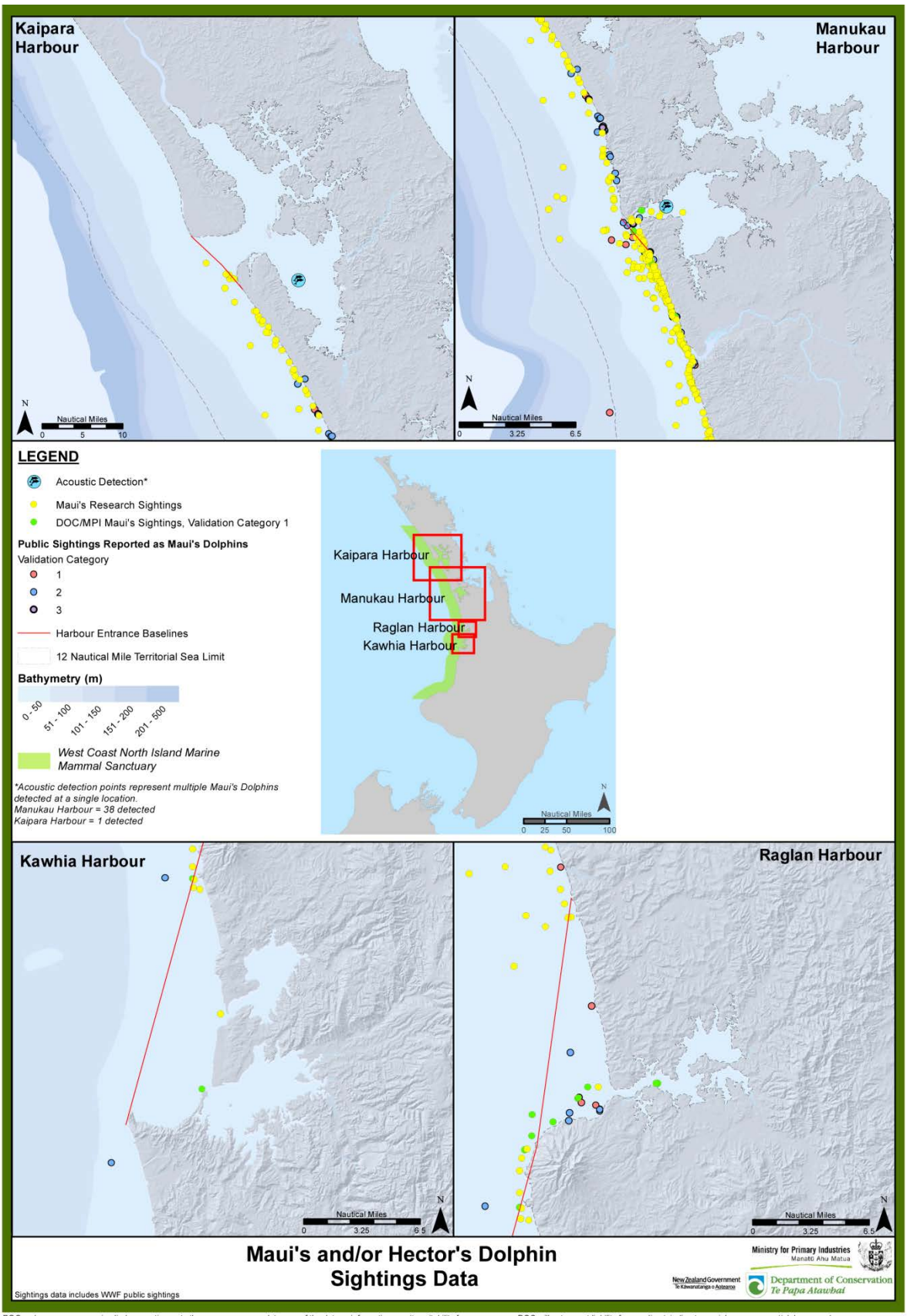
Map 5



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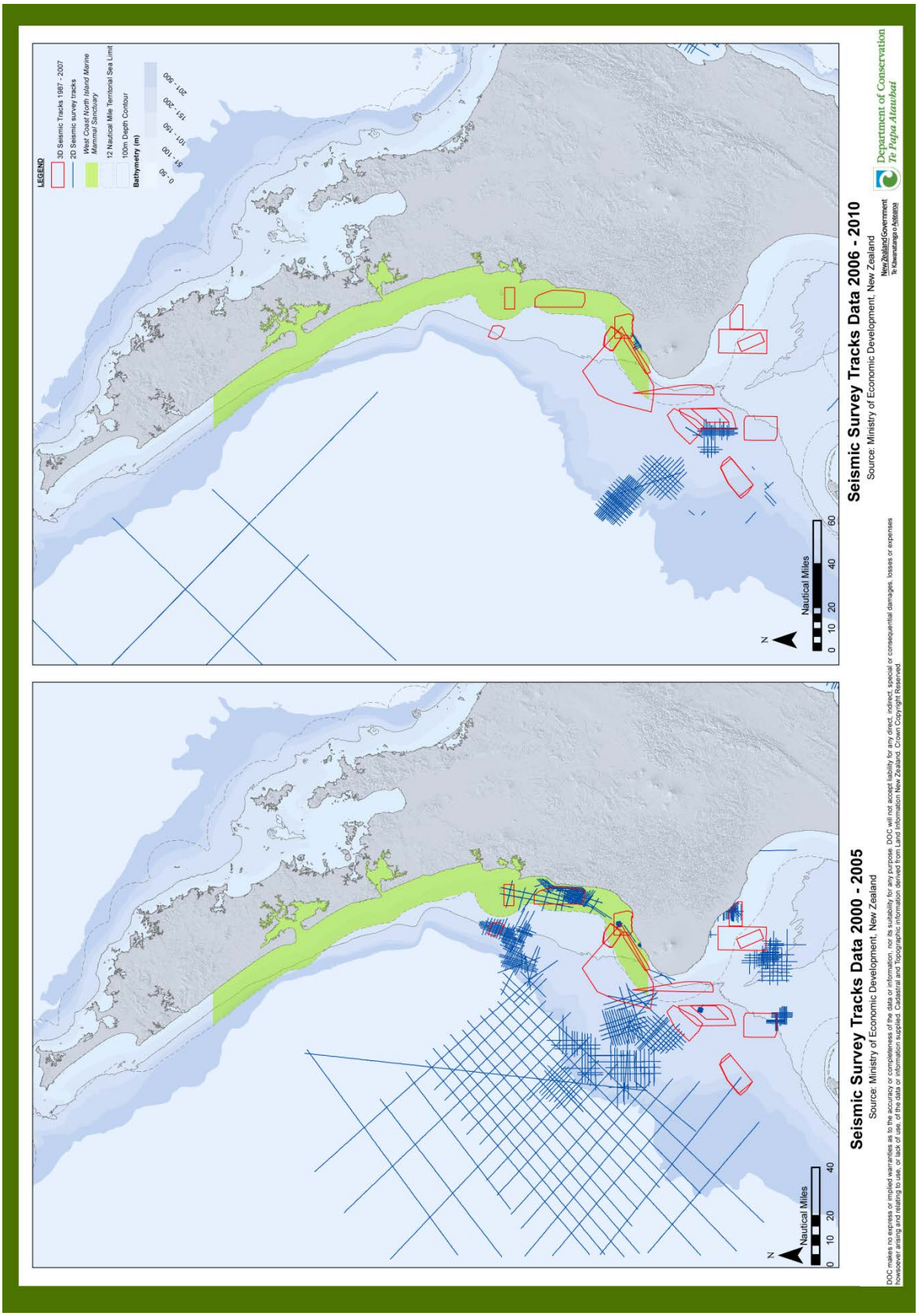
Map 6


LEGEND
3D Seismic Tracks 1987 - 2007
2D Seismic survey tracks
West Coast North Island Marine Mammal Sanctuary
12 Nautical Mile Territorial Sea Limit
100m Depth Contour
Bathymetry (m)
0 - 50
51 - 100
101 - 150
151 - 200
201 - 500
Nautical Miles
0 10 20 40 60
N
Seismic Survey Tracks Data 2006 - 2010
Source: Ministry of Economic Development, New Zealand
Seismic Survey Tracks Data 2000 - 2005
Source: Ministry of Economic Development, New Zealand
Department of Conservation
Te Papa Atawhai
New Zealand Government
Te Kāwanatanga o Aotearoa
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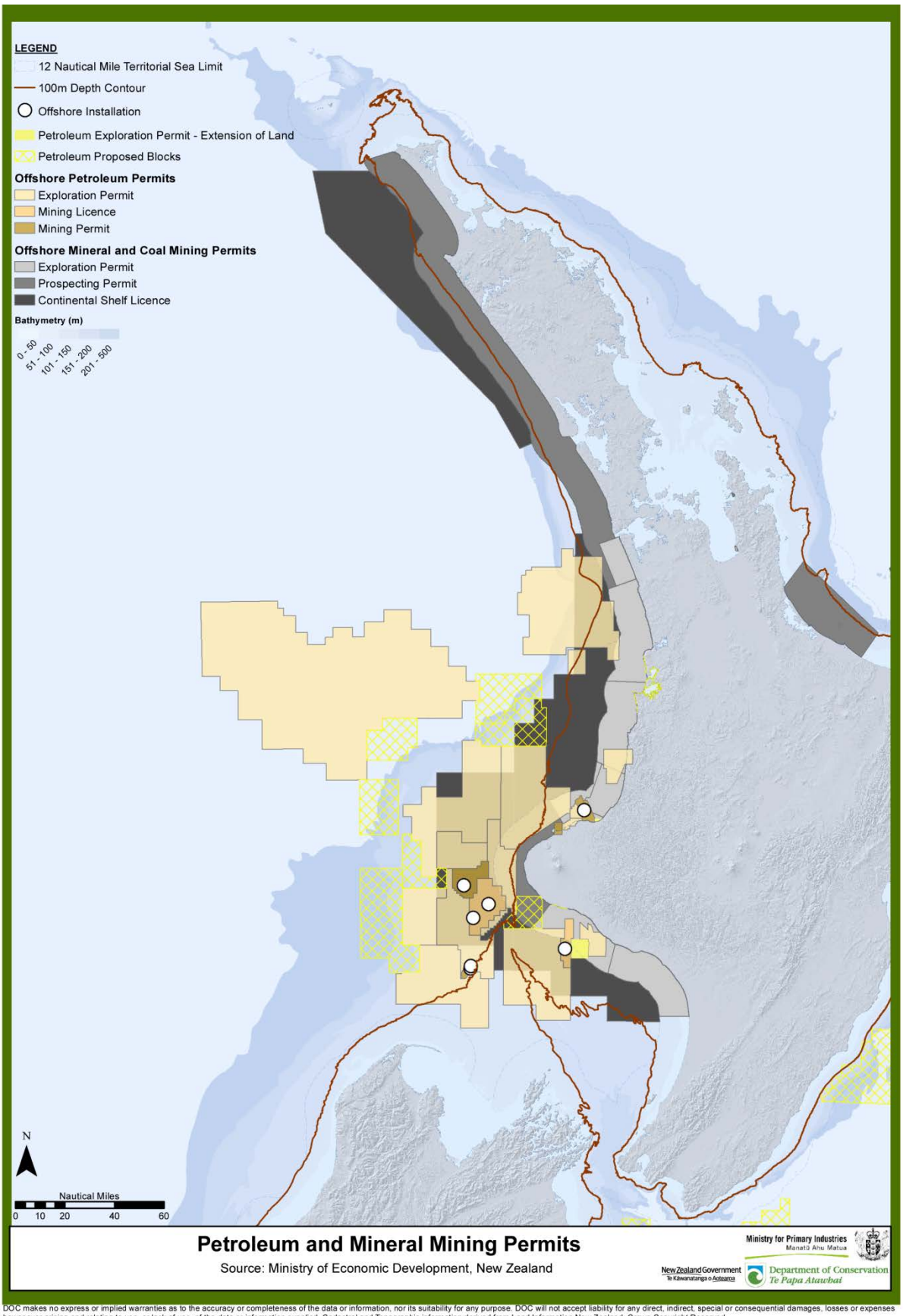
Map 7



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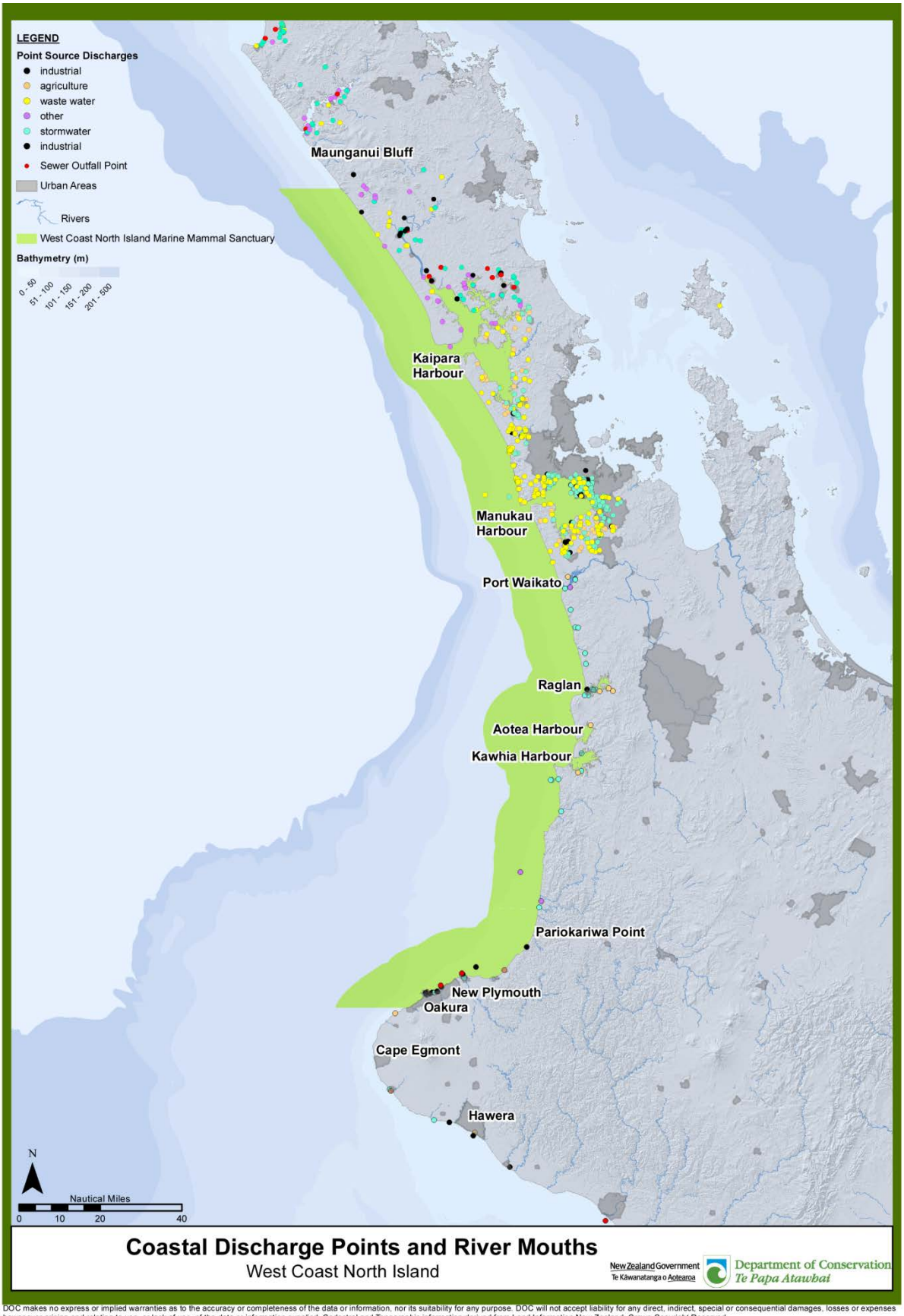
Map 8



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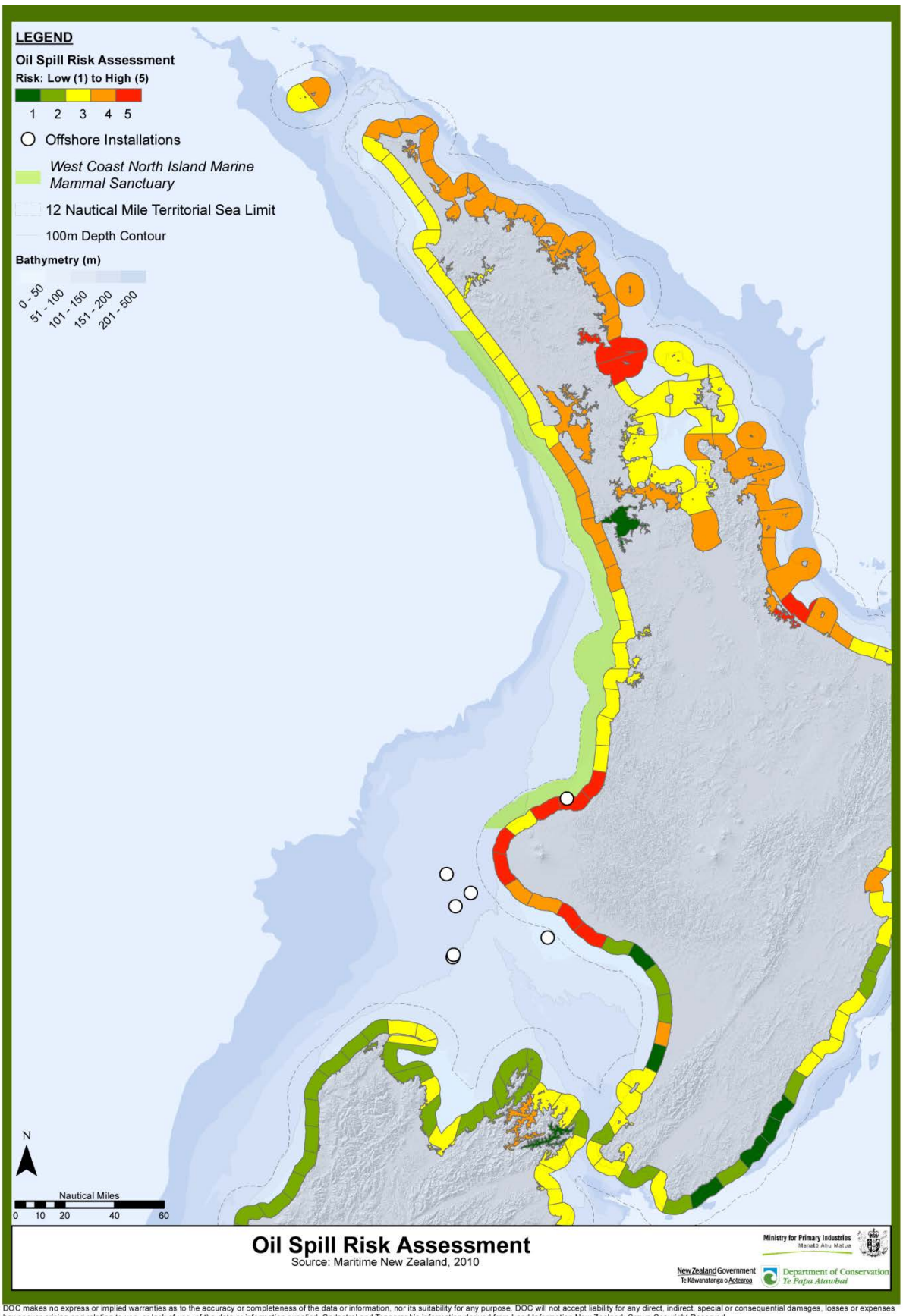
Map 9



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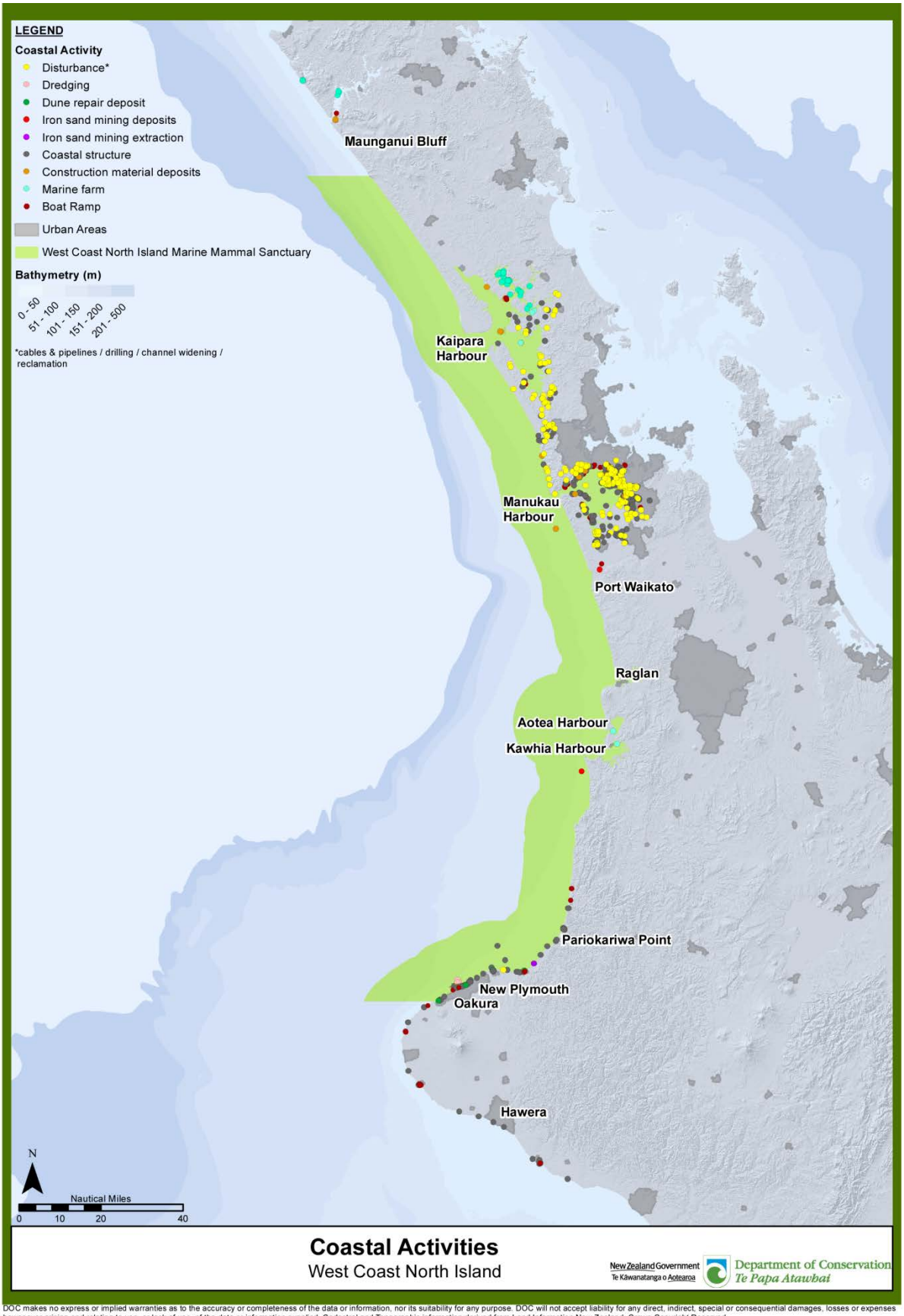
Map 10



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Map 11

10.0 Appendix 2: MPI Statutory Considerations

10.1 PURPOSE OF THE FISHERIES ACT 1996

In making any decision the Minister for Primary Industries 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 the Minister 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 the Minister considers appropriate. The selection of the most appropriate suite of measures requires the Minister to weigh the benefits of more effective mitigation against the likely costs of those measures.

MPI invites submitters to provide further information on the impacts of the proposed management options and the ability of people to provide for their social, economic and cultural wellbeing.

10.2 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 the Minister should take into account maintaining the Maui's dolphin species above a level that ensures long-term viability.[166] 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'.

[166] 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.

10.3 INFORMATION PRINCIPLES

Under section 10 of the Act, decision makers, including the Minister, shall take into account the following information principles:

- Decisions should be based on best available information[167];
- 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.

The degree of uncertainty and the adequacy of the available information are matters for the Minister 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.

10.4 SUSTAINABILITY MEASURES

Before making any decision under sections 15(2) or 15(3) and 298 of the Act the Minister must have regard to the provisions listed in section 11(2) of the Act.

Section 11(2)(a): The Minister 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): The Minister 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. There is nothing specific in these documents relating to the management of Maui's dolphins, but include references to the protection of threatened indigenous natural fauna.

Section 11(2)(c): The Minister 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): The Minister 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

[167] 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.

(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): The Minister 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): The Minister 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(4)(b): The Minister 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.

10.5 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.

10.6 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 awarded to iwi under the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992 and other 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.

11.0 Appendix 3: WCNI Fishery Characterisations

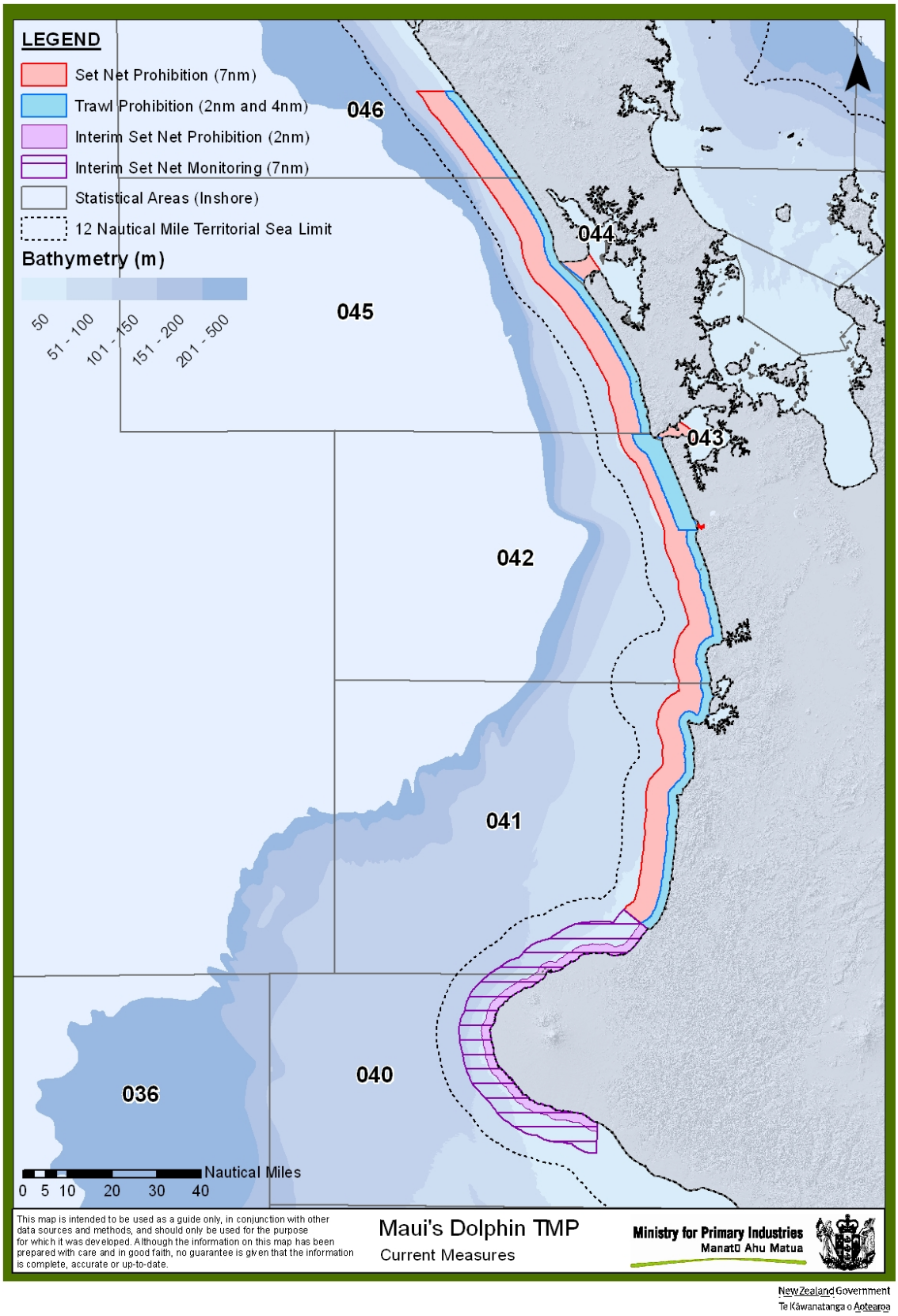
Fishing in the stretch of coastline between Manganui Bluff and Hawera takes place by set netting, trawling, various forms of lining and seining and some potting. Set netting is the method used the most number of hours and by the most individual fishers. Trolling, long lining, ring netting and trawling are also important methods along this coast. Set net is a commonly used gear by recreational fishers but other methods such as rod and line, surf casting, drag netting/beach seining, rock fishing and long lining are also used.

The percentage of commercial reporting by position, the average annual number of vessels, fishers and fished days for the key species for both the commercial set net and trawl activities, are provided in Table 11.1.

Table 11.1: The inshore commercial fisheries in statistical areas 40-46 over the fishing years 2007-08 to 2010-11.

Fishery segment	Methods used	% reporting by position	Average annual no. vessels	Average annual no. fishers	Average annual fished days
Set netting					
flatfish	set net	8	91.3	75.8	4195.0
grey mullet	set net	2	63.8	54.0	1288.3
yellow-eyed mullet	set net	0	9.0	9.0	51.0
rig	set net	61	61.8	56.3	573.5
mixed species	set net	57	71.3	65.3	388.0
kahawai	set net	13	45.3	40.0	311.8
trevally	set net	39	36.8	33.0	176.5
school shark	set net	99	17.8	17.5	164.0
warehou	set net	100	4.8	5.0	152.3
Trawling					
mixed species	bottom trawl (55%)	99	31.3	7.5	306.8
gurnard	bottom trawl(89%)	93	18.8	22.3	188.5
snapper	bottom trawl (88%)	97	20.5	16.3	171.5
trevally	bottom trawl (77%)	99	14.3	10.8	140.3
barracouta	midwater trawl (84%)	100	22.8	14.8	126.0
tarakihi	bottom trawl(90%)	98	14.3	10.5	103.5

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 11.1).



Map 11.1. Current set net and trawl restrictions and prohibitions off the WCNI shown with the relevant inshore statistical reporting areas (40 – 46).

A chronology of all the management measures that have been brought in, as well as show when interim relief has applied is shown here:

Date	Management measures	Interim relief
2003	*From Maunganui Bluff to Pariokariwa Point, including the entrance to the Manukau harbour:* Set netting – commercial and recreational – is prohibited: • between 0 and 4 nautical miles. Trawling is prohibited: • between 0 and 1 nautical mile along the coast, and; • between 0 and 2 nautical miles in areas adjacent to harbours and river mouths.	
October 2008	*From Maunganui Bluff to Pariokariwa Point:* Set netting - commercial and recreational - is prohibited: • offshore to seven nautical miles, and; • in these harbour entrances: o Kaipara Harbour entrance; o Manukau Harbour entrance; o Waikato River entrance; o Raglan Harbour entrance. Trawling is prohibited: • offshore to two nautical miles, and to four nautical miles between Manukau Harbour and Port Waikato. Drift netting - commercial and recreational - is prohibited: • in any part of the Waikato River. Harbours and rivers: • Unless specified, the new prohibitions do not apply to these.	*From 1 October to 24 December in 2008, 2009 and 2010:* Set setting (for rig and school shark) by commercial fishers permitted between 4 and 7 nm from Maunganui Bluff to Pariokariwa Point (excluding the waters lying within 7 nm from Manukau Harbour to Waikato River mouth). *1 October 2008 – present.* Ring netting for mullet in the area where the pre-existing set net ban in the Manukau harbour was extended.
March 2011	Reinstatement: *From Maunganui Bluff to Pariokariwa Point:* Set netting – commercial – is prohibited: • for rig and school shark between 4 and 7 nautical miles.	
July 2012	Interim measures: *From Pariokariwa to Hawera:* Set netting – commercial and recreational – is prohibited: • between 0 and 2 nautical miles. Set netting – commercial– is prohibited: • between 2 and 7 nautical miles in the same area without an observer on board.	

A characterisation of these fisheries illustrate the nature and extent of set net and trawl activity off the WCNI and helps to assess potential costs to fishers from the management options being proposed.

11.1 WCNI SET NET FISHERY

MPI has assessed the commercial set net fishery off the WCNI based on estimated catch effort and landings data. There are approximately 106 fishers operating 133 vessels in the inshore statistical reporting areas 40 – 46 (Figures 11.1 and 11.2).

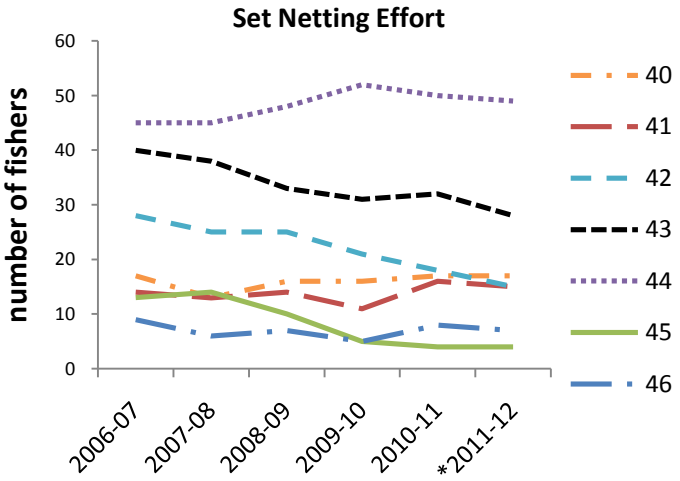


Figure 11.1. Number of commercial set net fishers operating in each of statistical reporting areas 40-46 since 2006/07. Note: numbers not additive as a single fisher may operate across more than one statistical reporting area.

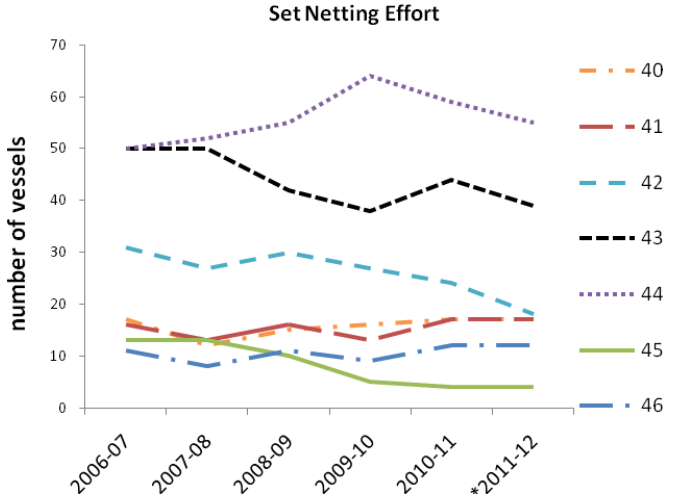


Figure 11.2. Number of commercial set net vessels operating in each of statistical reporting areas 40-46 since 2006/07. Note: numbers not additive as a single vessel may operate across more than one statistical reporting area.

The main commercial set net fisheries off the WCNI vary depending on the species being targeted, which can vary depending on the time of year, and where the set net activity occurs (e.g. offshore, inshore or within harbours).

Recreational set netting is carried out in the Kaipara, Manukau, Kawhia, Raglan and Aotea harbours and between Pariokawira Point and Cape Egmont where the main target species for set netting and drift netting are grey mullet, rig and flounder with kahawai, trevally and

dogfish also being caught. There is also some line fishing, especially in the deeper channels for snapper and other species such as kahawai.

Recreational fishers have reported that harbour based fishing is more focused on sustenance and is more family oriented than line fishing on the coast. Set netting is carried out year round with a higher frequency in summer due to more hours of daylight foe setting and retrieving nets, more time spent at the fishing location while at the family batch, and better weather. Set netting is usually done close to shore in shallow water from small boats.

11.1.1 WCNI Harbours

Most commercial set net fishers off the WCNI fish in the harbours (Kaipara, Manukau, Raglan and Kawhia), particularly the Kaipara (statistical reporting area 44) and the Manukau (statistical reporting area 43) harbours. Landings and estimated values of the main target species in the Kaipara and Manukau Harbours are shown in Tables 11.2 and 11.3.

Table 11.2. Characterisation of the commercial set net fishery in the Manukau Harbour (statistical area 43) using catch effort and landings data for the last three fishing years. Value is calculated using MPI estimated fish prices (Appendix 4).

Manukau Harbour				
Fishery		2008/09	2009/10	2010/11
Flatfish	Landings (tonnes)	31	27	41
	Value ($)	$93 000	$81 000	$123 000
Grey mullet	Landings (tonnes)	187	138	170
	Value ($)	$561 000	$414 000	$510 000
Rig	Landings (tonnes)	22	25	33
	Value ($)	$96 800	$110 000	$145 200
Kahawai	Landings (tonnes)	18	14	23
	Value ($)	$14 400	$11 200	$18 400
Trevally	Landings (tonnes)	13	14	20
	Value ($)	$15 600	$16 800	$24 000

Table 11.3. Characterisation of the commercial set net fishery in the Kaipara Harbour (statistical area 44) using catch effort and landings data for the last three fishing years. Value is calculated using MPI estimated fish prices (Appendix 4).

Kaipara Harbour				
Fishery		2008/09	2009/10	2010/11
Flatfish	Landings (tonnes)	170	140	104
	Value ($)	$510 000	$420 000	$312 000
Grey mullet	Landings (tonnes)	263	207	209
	Value ($)	$789 000	$621 000	$627 000
Rig	Landings (tonnes)	38	42	54
	Value ($)	$167 000	$184 000	$237 600
Kahawai	Landings (tonnes)	32	38	36
	Value ($)	$25 600	$30 400	$28 800
Trevally	Landings (tonnes)	10	17	19
	Value ($)	$12 000	$20 400	$22 800

The Kawhia and Raglan Harbours do not have their own statistical reporting areas; catch effort and landings data are recorded under the much larger statistical reporting areas 41 and

42, respectively. However, flatfish and grey mullet are primarily targeted within harbours. The catch effort and landings data for these species in statistical reporting areas 41 and 42 over the last three fishing years are shown in Tables 11.4 and 11.5.

Table 11.4. Characterisation of the commercial flatfish and grey mullet fisheries in statistical reporting area 41 (containing Kawhia Harbour) using catch effort and landings data for the last three fishing years. Value is calculated using MPI estimated fish prices (Appendix 4).

Statistical Area 41				
Fishery		2008/09	2009/10	2010/11
Flatfish	Landings (tonnes)	9	9	7
	Value ($)	$27 000	$27 000	$21 000
Grey mullet	Landings (tonnes)	3	4	2
	Value ($)	$9 000	$12 000	$6 000

Table 11.5. Characterisation of the commercial flatfish and grey mullet fisheries in statistical reporting area 42 (containing Raglan Harbour) using catch effort and landings data for the last three fishing years. Value is calculated using MPI estimated fish prices (Appendix 4).

Statistical Area 42				
Fishery		2008/09	2009/10	2010/11
Flatfish	Landings (tonnes)	10	6	5
	Value ($)	$30 000	$18 000	$15 000
Grey mullet	Landings (tonnes)	61	40	54
	Value ($)	$183 000	$120 000	$162 000

The relative intensity of fishing effort in the flatfish and grey mullet set net fisheries in the statistical reporting areas 40-46 between the 2006-07 and 2010-11 fishing seasons, in addition to the April 2011 - March 2012 fishing period can be found in the Figures 11.3 and 11.4 respectively.

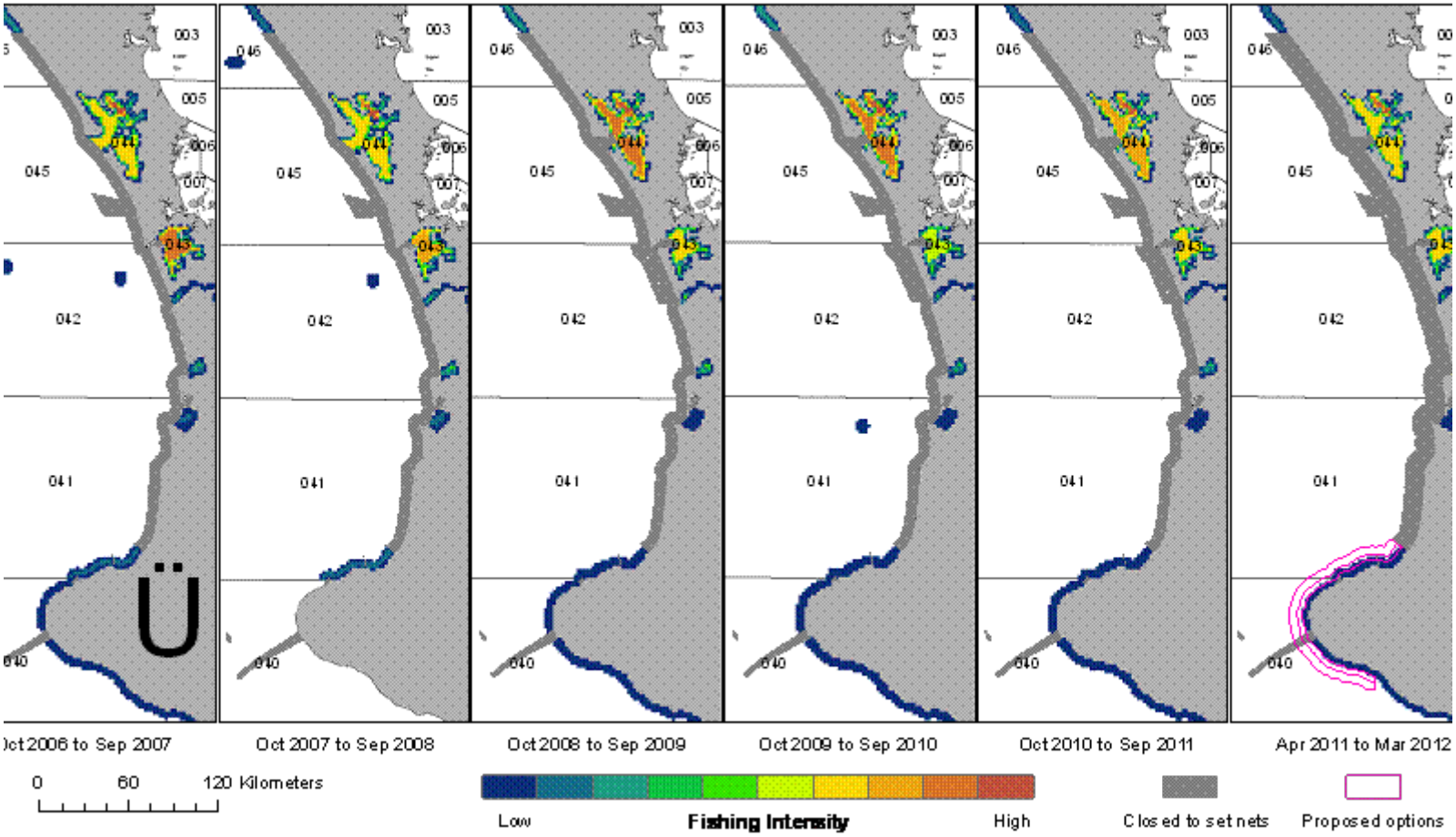


Figure 11.3. Relative intensity of fishing effort in the flatfish set net fishery. 92% of the effort in this fishery reports by statistical area rather than by coordinates of start of each fishing event and this effort is assigned to areas within the statistical area where this fishery is thought to occur. In particular boats less than 6 m in length are assumed to operate within 2 nautical miles of open coast in accordance within safety requirements.

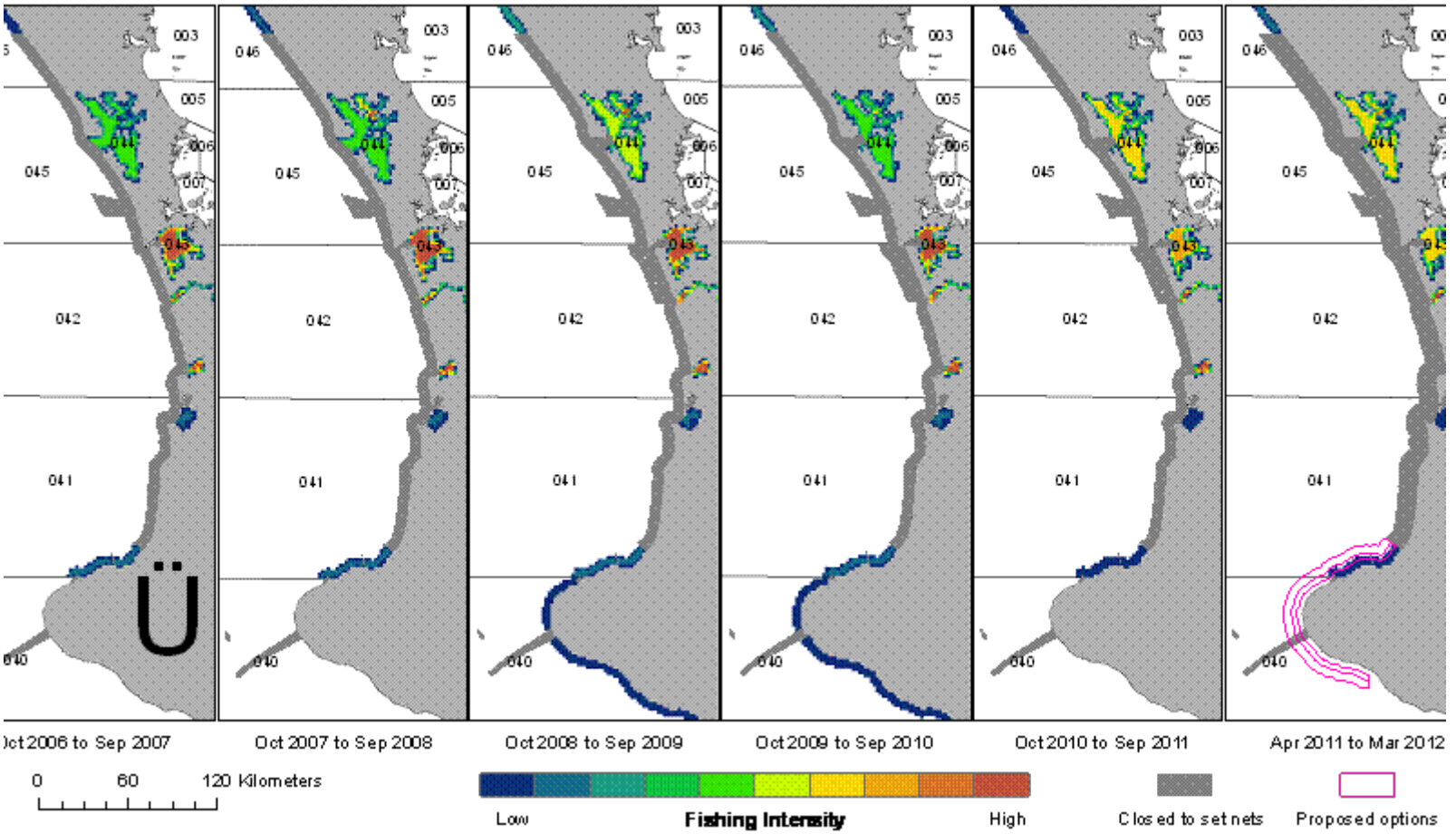


Figure 11.4. Relative intensity of fishing effort in the grey mullet set net fishery. 98% of the effort in this fishery reports by statistical area rather than by coordinates of start of each fishing event and this effort is assigned to areas within the statistical area where this fishery is thought to occur. In particular boats less than 6 m in length are assumed to operate within 2 nautical miles of open coast in accordance within safety requirements.

11.1.2 WCNI – Coastal and Offshore

In 2008 the WCNI set net fishery was restricted out to 7 nautical miles from shore from Maunganui Bluff to Pariokariwa Point. However, industry was awarded interim relief permitting the following:

- Set setting (for rig and school shark) by commercial fishers during the period 1 October to 24 December (inclusive) in waters lying between 4 and 7 nautical miles from the mean high-water mark that extends from Maunganui Bluff to Pariokariwa Point (excluding the waters lying within 7 nautical miles to the seaward of the baseline commencing from a point on the north head of the Manukau Harbour and running south to a point north of the Waikato River mouth).

Interim relief applied from 1 October to 24 December in 2008, 2009 and 2010. The then Minister of Fisheries made his decision in 2011 to close the area where interim relief had applied.

The coast areas most affected by the 2008 closures are statistical areas 42 (north of Kawhia to the Manukau Harbour) and 45 (north of the Manukau Harbour and south of Maunganui Bluff). In statistical area 42, the most commonly caught species (outside of the set net activity that occurs within Raglan Harbour) is school shark (offshore beyond 7 nautical miles), along with a mixed species set net fishery. In statistical area 45 there is no major target fishery and landings of all species caught by set net in 2010/11 equates to < 4 tonnes. The catch effort and landings data for the most commonly caught species in statistical area 42 over the last three fishing years is shown in Table 11.6.

Table 11.6. Characterisation of the most commonly caught species in statistical reporting area 42 (excluding flatfish and grey mullet) using catch effort and landings data for the last three fishing years. Value is calculated using MPI estimated fish prices (Appendix 4).

Statistical Area 42				
Fishery		2008/09	2009/10	2010/11
School shark	Landings (tonnes)	28	11	43
	Value ($)	$64 000	$25 300	$98 900
Rig	Landings (tonnes)	8	2	4
	Value ($)	$35 200	$8 800	$17 600
Snapper	Landings (tonnes)	0.6	0.8	5
	Value ($)	$4 200	$5 600	$35 000
Kahawai	Landings (tonnes)	27	28	28
	Value ($)	$21 600	$22 400	$22 400

The relative intensity of fishing effort in the kahawai, school shark, rig, trevally and warehou set net fisheries which are caught both in the harbours and in the coastal areas of the statistical reporting areas 40 – 46 between the 2006-07 and 2010-11 fishing years, in addition to the April 2011 - March 2012 fishing period can be found in the Figures 11.5 to 11.9 respectively.

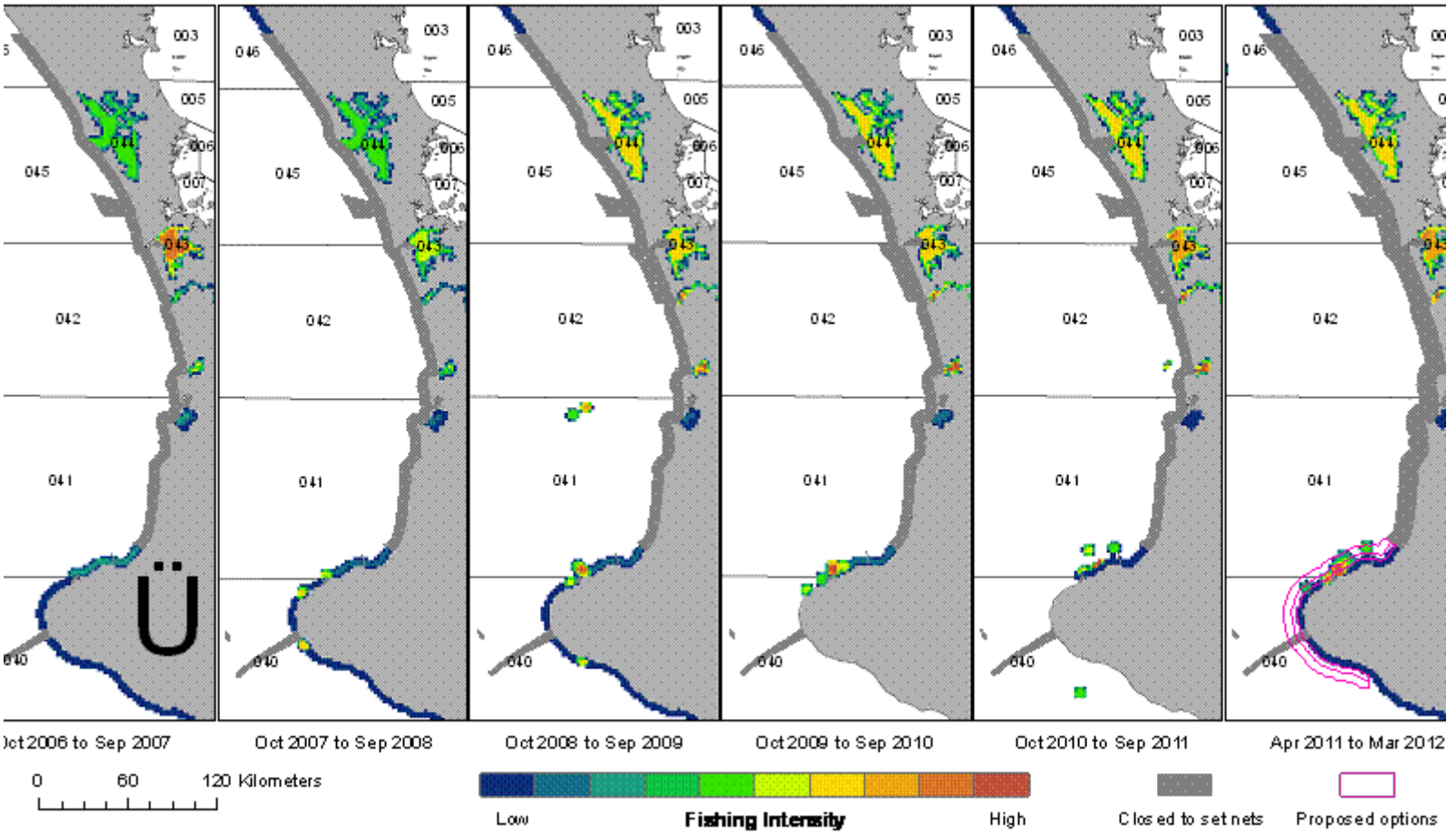


Figure 11.5. Relative intensity of fishing effort in the kahawai set net fishery. 87% of the effort in this fishery reports by statistical area rather than by coordinates of start of each fishing event and this effort is assigned to areas within the statistical area where this fishery is thought to occur. In particular boats less than 6 m in length are assumed to operate within 2 nautical miles of open coast in accordance within safety requirements.

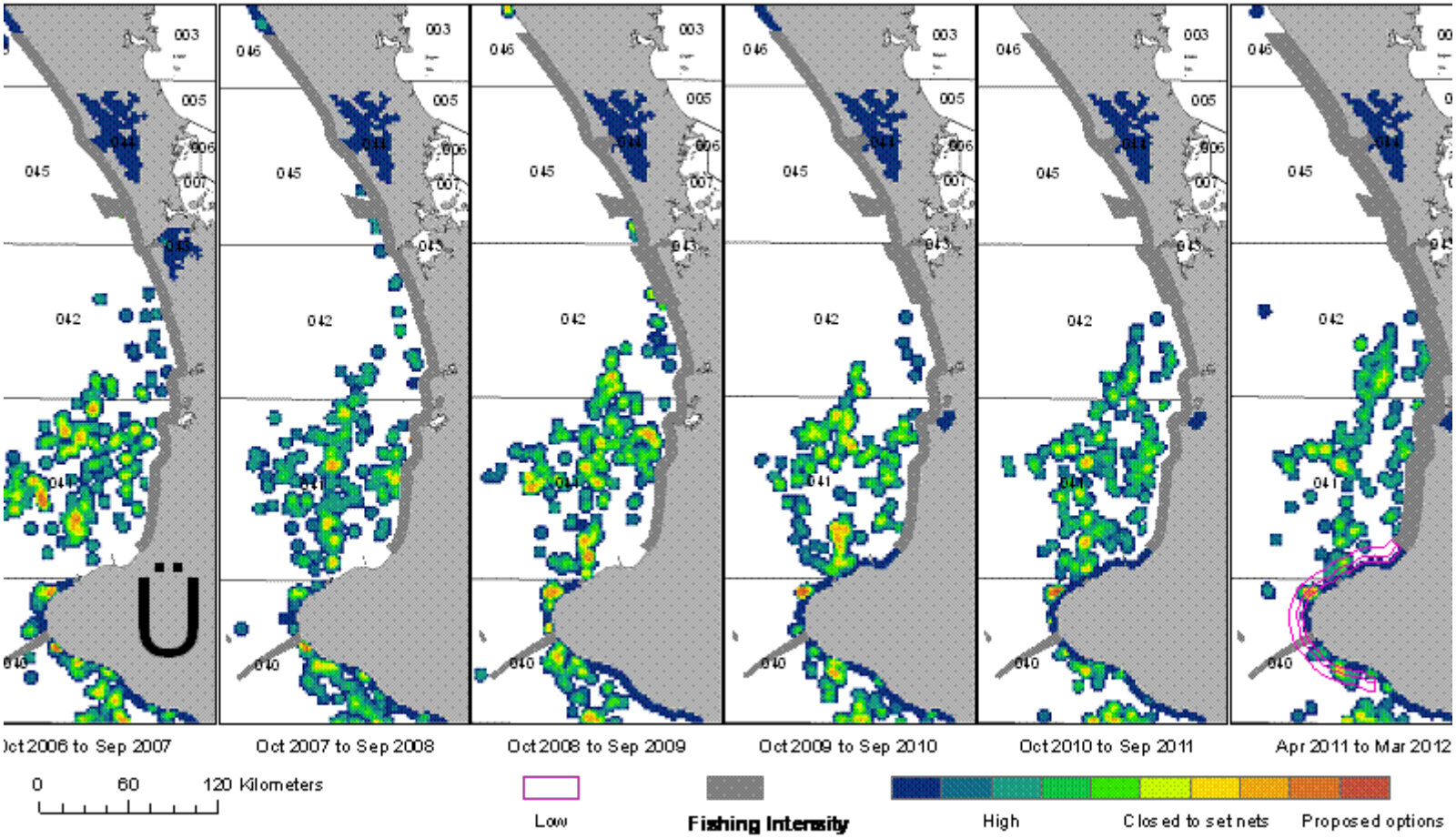


Figure 11.6. Relative intensity of fishing effort in the school shark set net fishery. 1% of the effort in this fishery reports by statistical area rather than by coordinates of start of each fishing event and this effort is assigned to areas within the statistical area where this fishery is thought to occur. In particular boats less than 6 m in length are assumed to operate within 2 nautical miles of open coast in accordance within safety requirements.

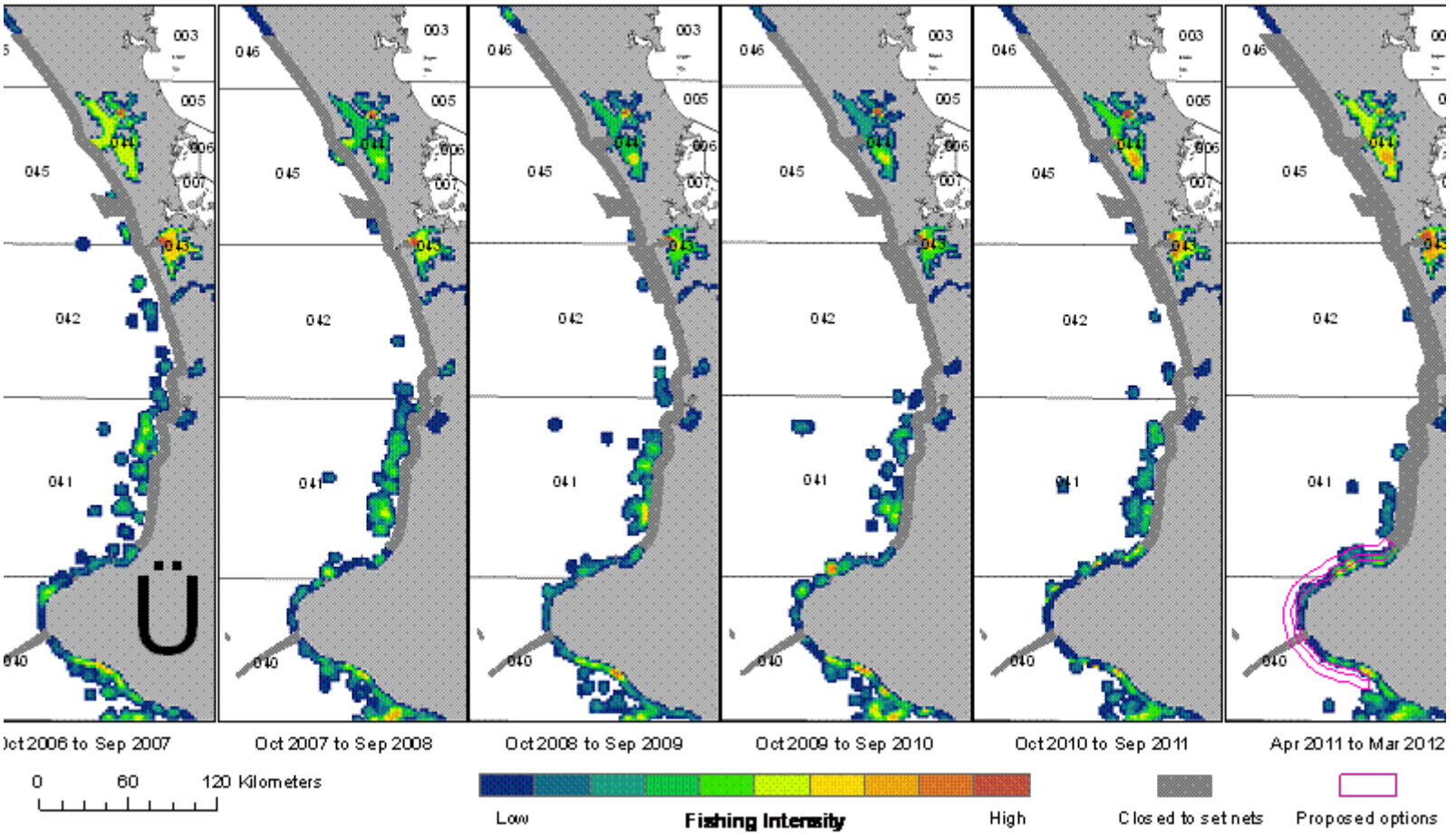


Figure 11.7. Relative intensity of fishing effort in the rig set net fishery. 39% of the effort in this fishery reports by statistical area rather than by coordinates of start of each fishing event and this effort is assigned to areas within the statistical area where this fishery is thought to occur. In particular boats less than 6 m in length are assumed to operate within 2 nautical miles of open coast in accordance within safety requirements.

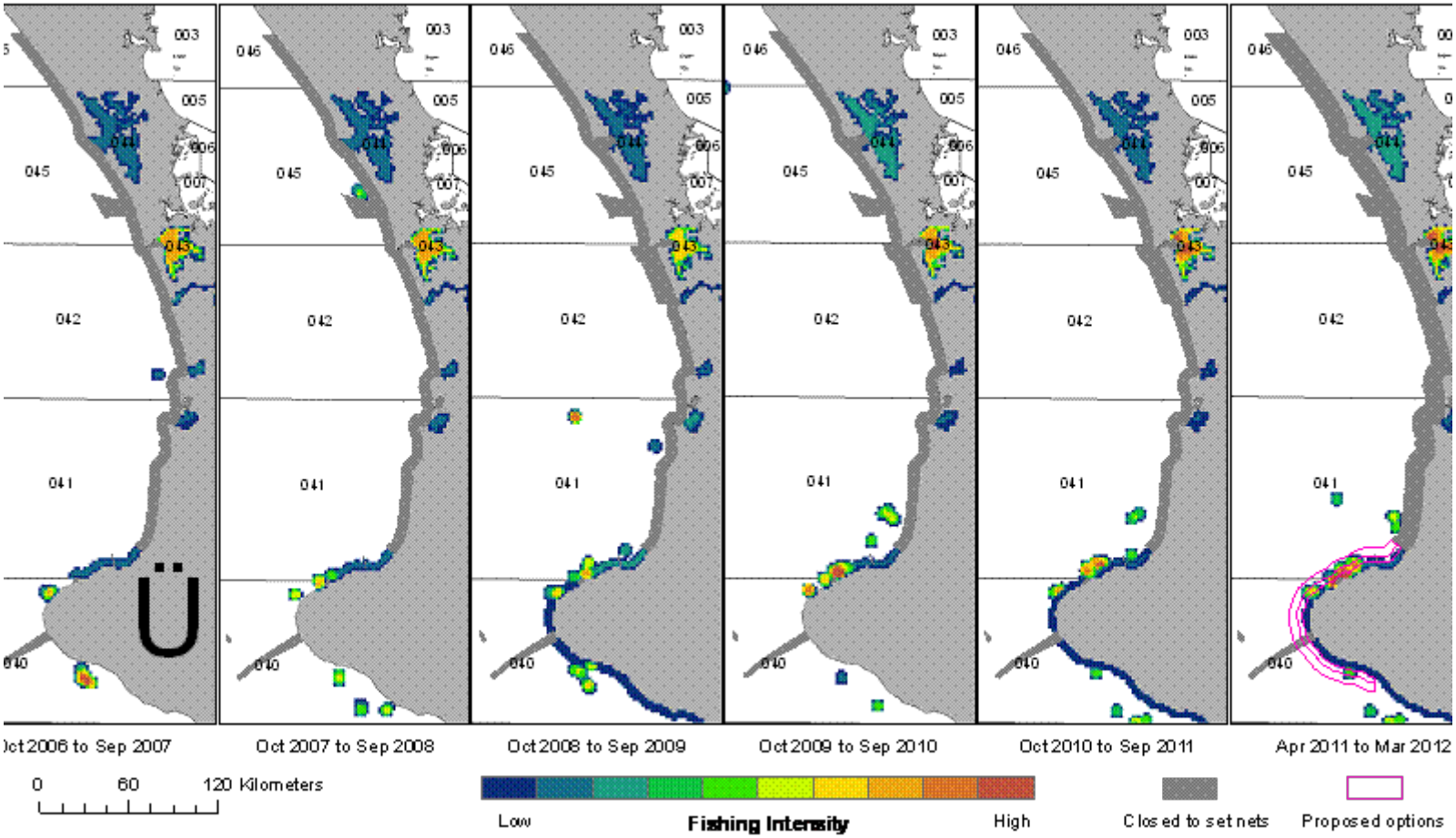


Figure 11.8. Relative intensity of fishing effort in the trevally set net fishery. 61% of the effort in this fishery reports by statistical area rather than by coordinates of start of each fishing event and this effort is assigned to areas within the statistical area where this fishery is thought to occur. In particular boats less than 6 m in length are assumed to operate within 2 nautical miles of open coast in accordance within safety requirements.

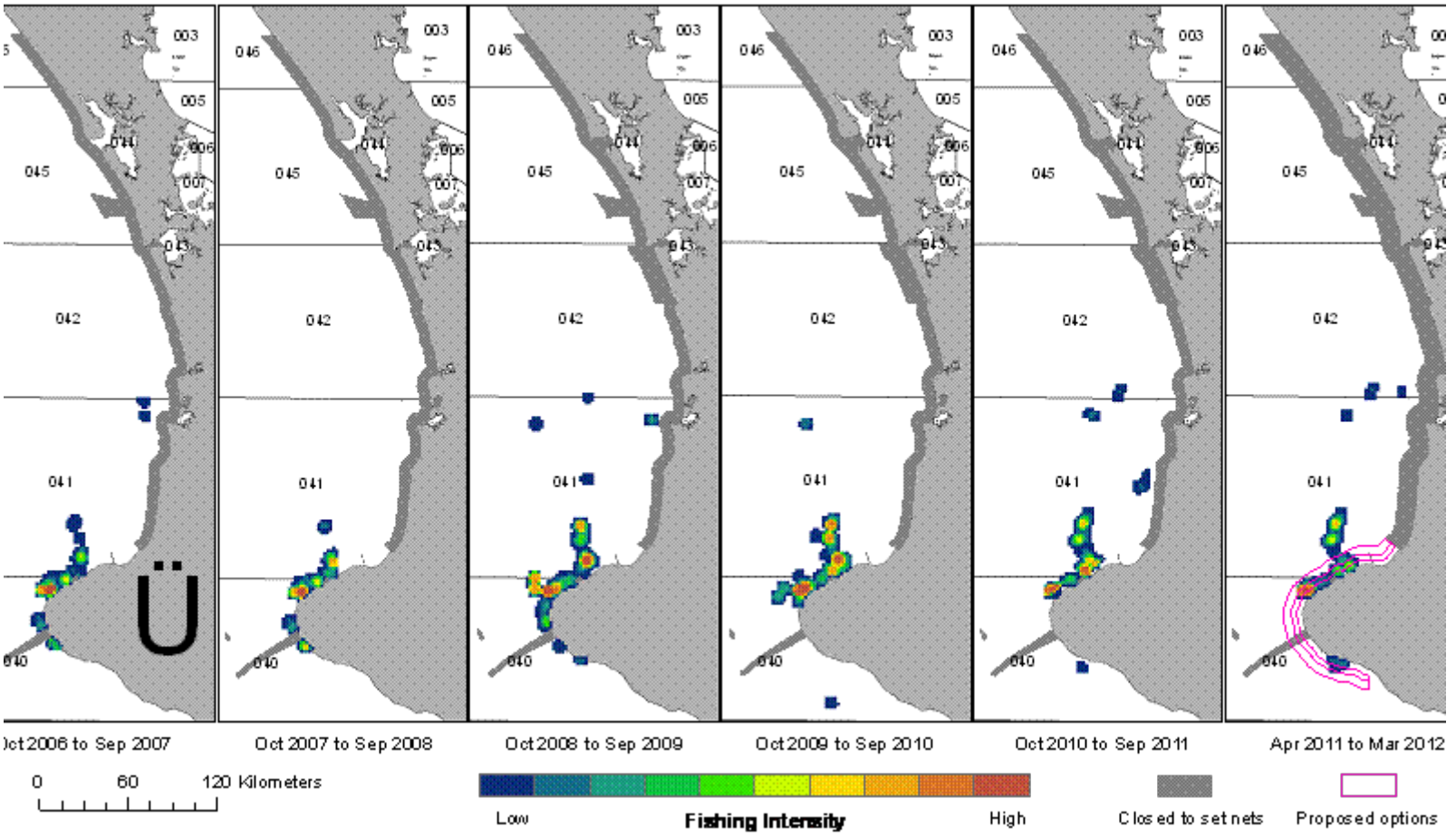


Figure 11.9. Relative intensity of fishing effort in the warehou set net fishery. 0% of the effort in this fishery reports by statistical area rather than by coordinates of start of each fishing event and this effort is assigned to areas within the statistical area where this fishery is thought to occur. In particular boats less than 6 m in length are assumed to operate within 2 nautical miles of open coast in accordance within safety requirements.

11.2 WCNI TRAWL FISHERY

MPI has assessed the commercial trawl fishery off the WCNI based on estimated catch effort and landings data. This fishery is smaller in terms of number of fishers and vessels compared to the set net fishery (106 fishers for the set net fishery versus 28 fishers for the trawl fishery and 133 vessels for the set net fishery versus 39 vessels for the trawl fishery) in the inshore statistical reporting areas 40 – 46 (Figures 11.10 and 11.11). But it is important to note that there is no trawling activity on the harbours, hence no data for the statistical areas 43 and 44.

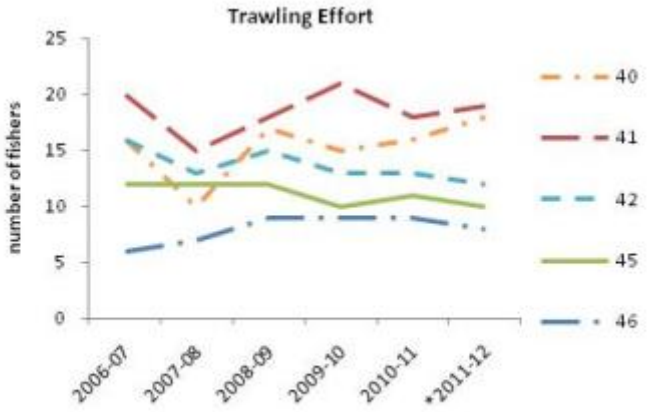


Figure 11.10. Number of commercial trawl fishers operating in each of statistical reporting areas 40 to 42, 45 and 46 since 2006/07. Note: numbers not additive as a single fisher may operate across more than one statistical reporting area.

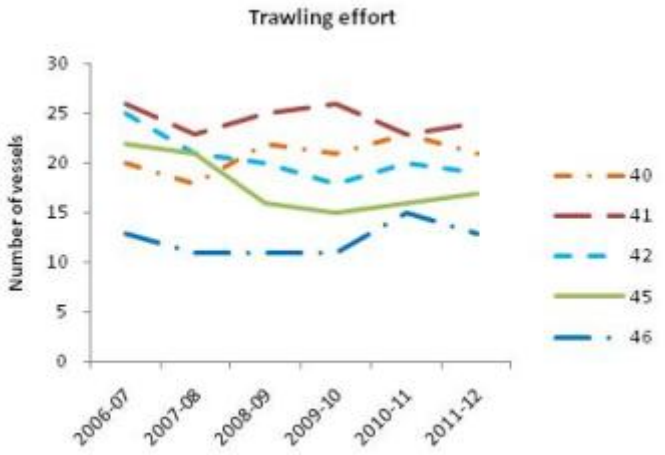


Figure 11.11. Number of commercial trawl vessels operating in each of statistical reporting areas 40 to 42, 45 and 46 since 2006/07. Note: numbers not additive as a single vessel may operate across more than one statistical reporting area.

Landings and estimated values for the most commonly caught species in statistical areas 40, 41, 42, 45 and 46 over the last three fishing years are shown in Tables 11.7, 11.8, 11.9, 11.10 and 11.11 respectively.

Table 11.7. Characterisation of the most commonly caught species in statistical reporting area 40 using catch effort and landings data for the last three fishing years. Value is calculated using MPI estimated fish prices (Appendix 4).

Statistic Area 40				
Fishery		2008/09	2009/10	2010/11
Gurnard	Landings (tonnes)	34	34	35
	Value ($)	$96 900	$96 900	$99 750
Snapper	Landings (tonnes)	28	23	51
	Value ($)	$196 000	$161 000	$357 000
Trevally	Landings (tonnes)	48	46	143
	Value ($)	$57 600	$ 55 200	$171 600
Tarakihi	Landings (tonnes)	14	13	17
	Value ($)	$56 000	$52 000	$68 000

Table 11.8. Characterisation of the most commonly caught species in statistical reporting area 41 using catch effort and landings data for the last three fishing years. Value is calculated using MPI estimated fish prices (Appendix 4).

Statistic Area 41				
Fishery		2008/09	2009/10	2010/11
Gurnard	Landings (tonnes)	233	249	162
	Value ($)	$664 050	$709 650	$461 700
Snapper	Landings (tonnes)	290	197	238
	Value ($)	$2 030 000	$1 379 000	$1 666 000
Trevally	Landings (tonnes)	470	194	403
	Value ($)	$564 000	$232 800	$483 600
Tarakihi	Landings (tonnes)	89	226	101
	Value ($)	$356 000	$904 000	$404 000

Table 11.9. Characterisation of the most commonly caught species in statistical reporting area 42 using catch effort and landings data for the last three fishing years. Value is calculated using MPI estimated fish prices (Appendix 4).

Statistic Area 42				
Fishery		2008/09	2009/10	2010/11
Gurnard	Landings (tonnes)	81	69	66
	Value ($)	$230 850	$196 650	$188 100
Snapper	Landings (tonnes)	215	171	199
	Value ($)	$1 505 000	$1 197 000	$1 393 000
Trevally	Landings (tonnes)	372	318	272
	Value ($)	$446 400	$381 600	$326 400
Tarakihi	Landings (tonnes)	29	31	17
	Value ($)	$116 000	$124 000	$68 000

Table 11.10. Characterisation of the most commonly caught species in statistical reporting area 5 using catch effort and landings data for the last three fishing years. Value is calculated using MPI estimated fish prices (Appendix 4).

Statistic Area 45				
Fishery		2008/09	2009/10	2010/11
Gurnard	Landings (tonnes)	84	103	86
	Value ($)	$239 400	$293 550	$245 100
Snapper	Landings (tonnes)	293	328	233
	Value ($)	$2 051 000	$2 296 000	$1 631 000
Trevally	Landings (tonnes)	522	391	438
	Value ($)	$626 400	$469 200	$525 600
Tarakihi	Landings (tonnes)	76	51	73
	Value ($)	$304 000	$204 000	$292 000

Table 11.11. Characterisation of the most commonly caught species in statistical reporting area 46 using catch effort and landings data for the last three fishing years. Value is calculated using MPI estimated fish prices (Appendix 4).

Statistic Area 46				
Fishery		2008/09	2009/10	2010/11
Gurnard	Landings (tonnes)	39	61	64
	Value ($)	$111 150	$173 850	$182 400
Snapper	Landings (tonnes)	120	121	118
	Value ($)	$840 000	$847 000	$826 000
Trevally	Landings (tonnes)	228	263	224
	Value ($)	$273 600	$315 600	$268 800
Tarakihi	Landings (tonnes)	54	39	44
	Value ($)	$216 000	$156 000	$176 000

The relative intensity of fishing effort in the gurnard, snapper and trevally trawl fisheries in the statistical reporting areas 40-42, 45 and 46 between the 2007-08 and 2010-11 fishing years can be found in the Figures 8 to 10 respectively.

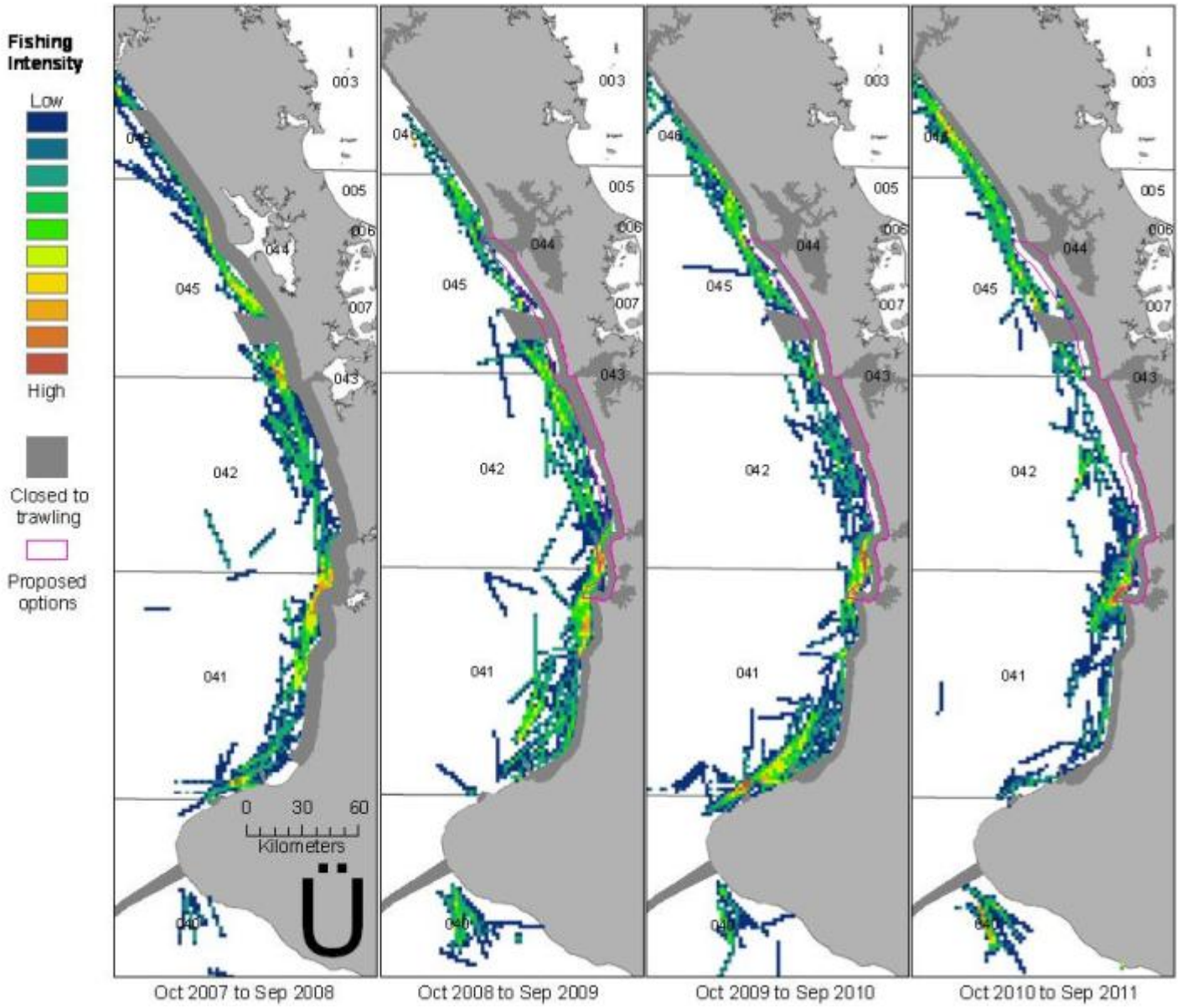


Figure 11.12. Relative intensity of fishing effort in the gurnard trawl fishery.

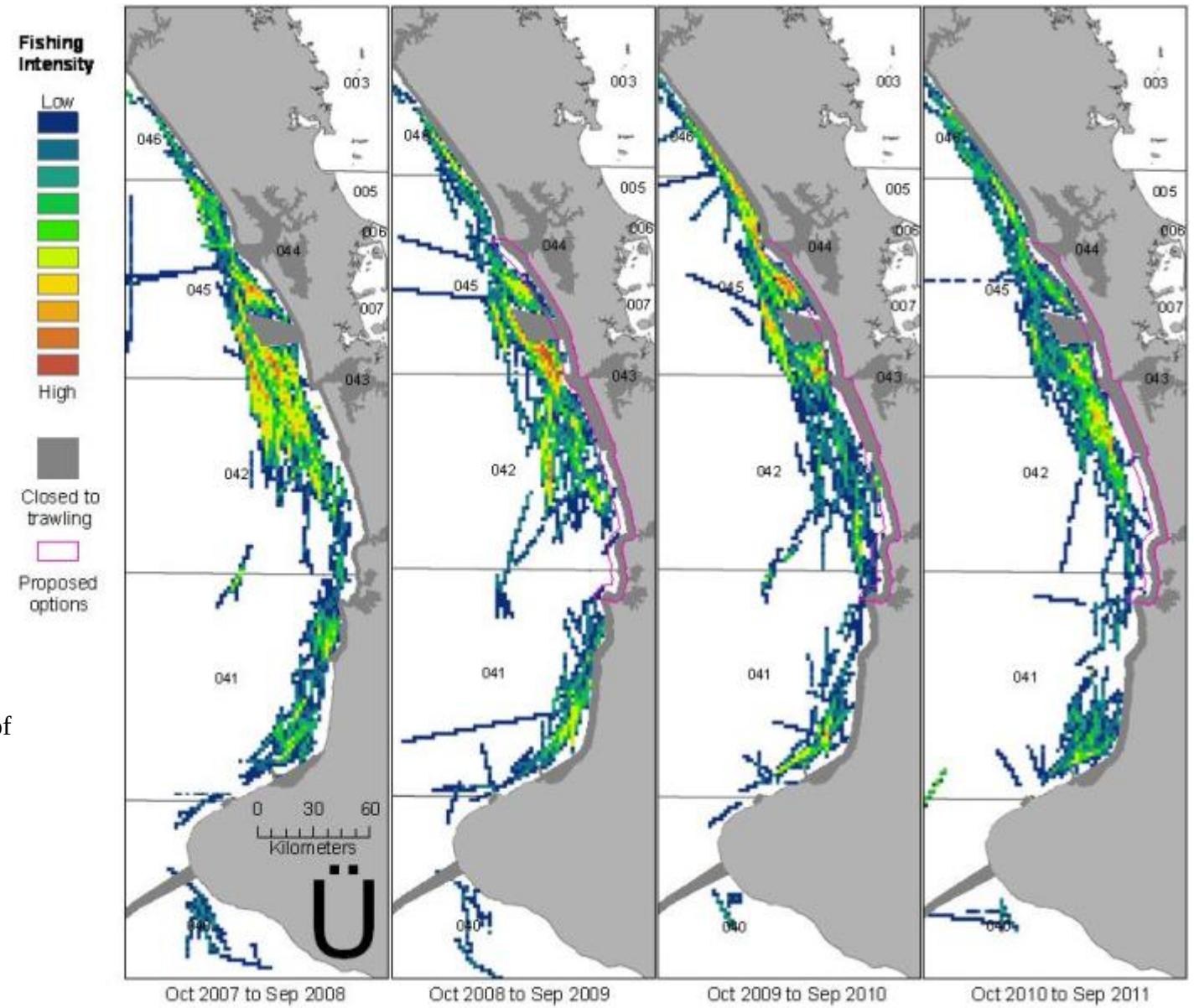


Figure 11.13. Relative intensity of fishing effort in the snapper trawl fishery.

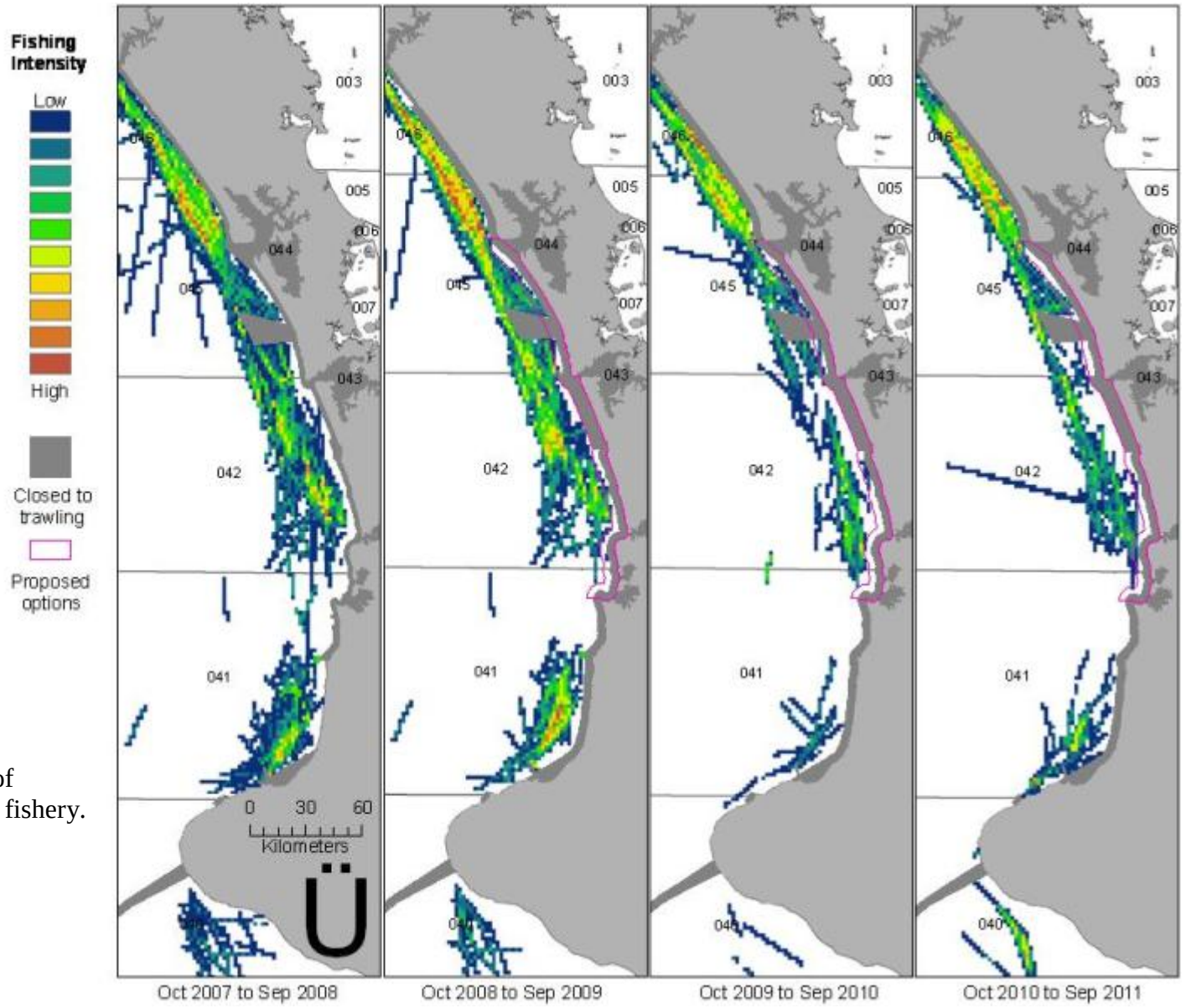


Figure 11.14. Relative intensity of fishing effort in the trevally trawl fishery.

12.0 Appendix 4: Economic Impacts Analysis of Fishing-Related Options

12.1 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 ban 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, and; • pay for observer services costs with Crown-funding. 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 ban 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, and; • require observer services costs to be cost-recovered from industry beginning 1 October 2013.
Option 3	• 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.

Commercial and Amateur Set Netting (Harbours)	
Option 1	*Status quo*: Keep existing management.
Option 2	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 3	• 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.

Commercial Trawling	
Option 1	*Status quo*: Keep existing management.
Option 2	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 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.

This analysis will provide the long term economic impact estimates using the two different methodologies. These are described in more detail in sections 12.3.2 and 12.3.3.

12.2 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	$4.40/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

12.3 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.

12.3.1 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.

12.3.2 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[168] confirms the general observation that the average age of those employed in fishing is relatively high, so

[168] Penny et al (2007): http://www.fish.govt.nz/ en-nz/Consultations/Archive/2008/Hectors+dolphins/Socio+economic.htm

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 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.

12.3.3 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[169] 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.

[169] http://www.treasury.govt.nz/publications/guidance/planning/costbenefitanalysis/primer

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.

12.3.4 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 MPI's consultation paper (Section 6). 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 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.

12.4 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 June 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 to a circle of 2 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).

    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 2 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 2 km cell resolution on the New Zealand Transverse Mercator (NZTM) 2000 coordinate system.

12.5 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, 2 and 3; ACE and quota prices for the set net species targeted from Pariokariwa Point to Hawera are required for these calculations. Table 3 presents the average ACE transfer price (2010/11 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	2010-11 ACE price ($/tonnes)	Average quota price since 2001 ($/tonnes)
Blue Warehou (WAR8)	$319.20	$2,591.00
School Shark (SCH8)	$1,142.20	$14,769.60
Rig (SPO8)	$488.60	$13,456.40
Trevally (TRE7)	$309.40	$5,276.26
Northern Spiny Dogfish	N/A	N/A
Snapper (SNA8)	$4,707.30	$48,790.70
Kahawai (KAH8)	$289.20	$3,010.29
Spiny Dogfish (SPD8)	$38.40	$351.42
Gurnard (GUR8)	$307.50	$2,738.25
Blue Mackerel (EMA7)	$136.00	$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 3 year average of the last three completed fishing years, the last completed fishing year (1 October 2010 to 30 September 2011) and the 12 months from 1 April 2011 to 30 March 2012. These percentages are presented in Table 4.

Table 4. Percentage of set net landings from Pariokariwa Point to Hawera displaced under each management option.

Species	Option 1 and 2			Option 3		
	3 Year Average	2010-11 Fishing Year	April 2011 to March 2012	3 Year Average	2010-11 Fishing Year	April 2011 to March 2012
Blue Warehou	15.97%	23.17%	23.27%	43.47%	47.51%	48.18%
School Shark	2.78%	2.77%	3.16%	7.37%	6.52%	7.36%
Rig	8.48%	9.25%	11.00%	15.56%	15.26%	17.25%
Trevally	0.36%	0.31%	0.63%	0.77%	0.67%	1.13%
Northern Spiny Dogfish	3.54%	4.31%	6.31%	9.71%	9.75%	13.25%
Snapper	0.30%	0.32%	0.61%	0.72%	0.65%	1.12%
Kahawai	1.09%	0.91%	0.89%	2.18%	1.33%	1.62%
Spiny Dogfish	2.00%	1.43%	1.63%	4.52%	2.95%	2.91%
Gurnard	0.60%	0.88%	1.48%	1.43%	1.74%	2.75%
Blue Mackerel	0.02%	0.10%	0.15%	0.09%	0.23%	0.32%

MPI will provide economic impact estimates below using the April 2011 to March 2012 (last 12 months) percentage figures, the 2010/11 fishing year percentage figures, and the three year average percentage figures to show the difference these assumptions make to the economic impact numbers.

12.5.1 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 0 and 2 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.

Tables 5, 6 and 7 present MPI estimates of landed revenues for set netters. These tables use impacts from Table 4 and the price estimates from Table 1. Table 5 is calculated using the three year average data, Table 6 uses the 2010/11 fishing year data and Table 7 uses data from 1 April 2011 to 31 March 2012.

Table 5. Estimates of the Economic Impact (three year average data).

Species	3 Year Average Catch (tonnes)	Total Revenue from Catch	Total Revenue + 10% (bycatch)	Loss of Revenue between 0-2nm
Blue Warehou	132.64	$266,602.77	$293,263.05	$46,821.93
School Shark	545.58	$1,254,830.47	$1,380,313.52	$38,366.61
Rig	228.62	$1,005,925.94	$1,106,518.53	$93,849.35
Trevally	1,958.55	$2,350,261.70	$2,585,287.87	$9,248.41
Northern Spiny Dogfish	35.54	$35,540.23	$39,094.25	$1,384.18
Snapper	1,308.13	$9,156,887.92	$10,072,576.71	$29,991.21
Kahawai	432.39	$345,914.60	$380,506.06	$4,147.59
Spiny Dogfish	198.90	$198,897.88	$218,787.67	$4,369.01
Gurnard	230.65	$657,350.69	$723,085.75	$4,343.89
Blue Mackerel	2,945.07	$2,945,074.10	$3,239,581.51	$762.51
TOTAL	8,016.07	$18,217,286.29	$20,039,014.92	$233,284.71

Table 6. Estimates of the Economic Impact (2010/11 Fishing Year data).

Species	2010-11 Fishing Year Catch (tonnes)	Total Revenue from Catch	Total Revenue + 10% (bycatch)	Loss of Revenue between 0-2nm
Blue Warehou	92.5	$185,865.22	$204,451.74	$47,362.20
School Shark	589.27	$1,355,319.57	$1,490,851.53	$41,229.07
Rig	216.5	$952,529.69	$1,047,782.66	$96,952.27
Trevally	1,906.29	$2,287,549.89	$2,516,304.88	$7,832.12
Northern Spiny Dogfish	39.4	$39,440.01	$43,384.01	$1,870.46
Snapper	1,298.20	$9,087,416.80	$9,996,158.48	$31,548.68
Kahawai	459.17	$367,334.38	$404,067.82	$3,664.58
Spiny Dogfish	233.38	$233,384.80	$256,723.28	$3,678.64
Gurnard	179.31	$511,047.01	$562,151.71	$4,943.91
Blue Mackerel	2,018.15	$2,018,145.74	$2,219,960.31	$2,288.04
TOTAL	7,032.17	$17,038,033.11	$18,741,836.43	$241,369.98

Table 7. Estimates of the Economic Impact (April 2011 to March 2012 data).

Species	April 2011 to March 2012 Catch (tonnes)	Total Revenue from Catch	Total Revenue + 10% (bycatch)	Loss of Revenue between 0-2nm
Blue Warehou	91.7	$184,317.30	$202,749.03	$47,171.11
School Shark	454.64	$1,045,679.38	$1,150,247.32	$36,376.60
Rig	208.9	$919,088.15	$1,010,996.96	$111,197.52
Trevally	1,810.35	$2,172,414.91	$2,389,656.40	$15,004.64
Northern Spiny Dogfish	42.2	$42,225.33	$46,447.86	$2,933.13
Snapper	1,179.27	$8,254,901.41	$9,080,391.55	$55,170.86
Kahawai	539.97	$431,975.02	$475,172.52	$4,215.13
Spiny Dogfish	244.47	$244,465.30	$268,911.83	$4,396.44
Gurnard	163.64	$466,365.36	$513,001.90	$7,607.81
Blue Mackerel	1,783.13	$1,783,126.71	$1,961,439.38	$2,950.97
TOTAL	6,518.27	$15,544,558.88	$17,099,014.77	$287,024.20

Table 5 shows the annual lost revenue between 0 to 2 nautical miles is just over $0.23 million, Table 6 shows the annual lost revenue between 0 to 2 nautical miles is just over $0.24 million and Table 7 shows the annual lost revenue between 0 to 2 nautical miles of just under $0.29 million.

Tables 8, 9 and 10 apply the ratios in Table 2 to revenue estimates in Tables 5, 6, and 7 to derive the estimated annual value added changes for set net harvesters in the area from Pariokariwa Point to Hawera.

Tables 8, 9 and 10 also present the MPI estimates of banning set netting between 0 to 2 nm from shore. Tables 8, 9 and 10 are computed by applying the factors from section 12.3.2 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 0 and 2 nautical miles from shore in the area from Pariokariwa Point to Hawera (3 year average data) – MPI Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$58,321.18	$207,465.94	$265,787.11
Processing income lost	$107,310.97	$198,160.79	$305,471.76
Indirect income lost	$130,639.44	$179,131.17	$309,770.60
Induced income lost	$95,646.73	$0.00	$95,646.73
Quota value	$0.00	$786,789.17	$786,789.17
TOTAL	$391,918.31	$1,371,547.06	$1,763,465.37

The estimated loss of annual value added is $0.39 million and the estimated loss of future capitalised value is $1.37 million. The total estimated economic impact is just under $1.76 million.

Table 9. Estimated annual income effects and Present Value of banning set netting between 0 and 2 nautical miles from shore in the area from Pariokariwa Point to Hawera (2010/11 Fishing Year data) – MPI Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$60,342.49	$214,020.03	$274,362.52
Processing income lost	$111,030.19	$204,498.44	$315,528.63
Indirect income lost	$135,167.19	$185,212.29	$320,379.48
Induced income lost	$98,961.69	$0.00	$98,961.69
Quota value	$0.00	$816,891.33	$816,891.33
TOTAL	$405,501.56	$1,420,622.08	$1,826,123.64

The estimated loss of annual value added is $0.41 million and the estimated loss of future capitalised value is $1.42 million. The total estimated economic impact is just under $1.83 million.

Table 10. Estimated annual income effects and Present Value of banning set netting between 0 and 2 nautical miles from shore in the area from Pariokariwa Point to Hawera (April 2011 to March 2012 data) – MPI Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$71,756.05	$247,250.81	$319,006.86
Processing income lost	$132,031.13	$237,136.63	$369,167.76
Indirect income lost	$160,733.55	$218,794.44	$379,527.99
Induced income lost	$117,679.92	$0.00	$117,679.92
Quota value	$0.00	$1,011,288.18	$1,011,288.18
TOTAL	$482,200.65	$1,714,470.05	$2,196,670.71

The estimated loss of annual value added is $0.48 million and the estimated loss of future capitalised value is $1.71 million. The total estimated economic impact is just under $2.20 million.

Tables 11, 12, and 13 show the estimates of the present value of banning set netting between 0 to 2 nautical miles from shore using Treasury's Present Value methodology.

Table 11. Estimated annual income effects and Present Value of banning set netting between 0 and 2 nautical miles from shore in the area from Pariokariwa Point to Hawera (3 year average data) – Treasury's Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$58,321.18	$554,842.23	$613,163.41
Processing income lost	$107,310.97	$1,020,909.71	$1,128,220.67
Indirect income lost	$130,639.44	$1,242,846.60	$1,373,486.04
Induced income lost	$95,646.73	$0.00	$95,646.73
Quota value	$0.00	$786,789.17	$786,789.17
TOTAL	$391,918.31	$3,605,387.71	$3,997,306.02

The estimated loss of annual value added is $0.39 million and the estimated loss of future capitalised value is $3.61 million. The total estimated economic impact is just over $4.00 million.

Table 12. Estimated annual income effects and Present Value of banning set netting between 0 and 2 nautical miles from shore in the area from Pariokariwa Point to Hawera (2010/11 Fishing Year data) – Treasury's Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$60,342.49	$574,072.16	$634,414.66
Processing income lost	$111,030.19	$1,056,292.78	$1,167,322.97
Indirect income lost	$135,167.19	$1,285,921.64	$1,421,088.83
Induced income lost	$98,961.69	$0.00	$98,961.69
Quota value	$0.00	$816,891.33	$816,891.33
TOTAL	$405,501.56	$3,733,177.91	$4,138,679.47

The estimated loss of annual value added is $0.41 million and the estimated loss of future capitalised value is $3.73 million. The total estimated economic impact is just under $4.14 million.

Table 13. Estimated annual income effects and Present Value of banning set netting between 0 and 2 nautical miles from shore in the area from Pariokariwa Point to Hawera (April 2011 to March 2012 data) – Treasury's Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$71,756.05	$682,655.75	$754,411.80
Processing income lost	$132,031.13	$1,256,086.58	$1,388,117.72
Indirect income lost	$160,733.55	$1,529,148.88	$1,689,882.44
Induced income lost	$117,679.92	$0.00	$117,679.92
Quota value	$0.00	$1,011,288.18	$1,011,288.18
TOTAL	$482,200.65	$4,479,179.40	$4,961,380.06

The estimated loss of annual value added is $0.48 million and the estimated loss of future capitalised value is $4.48 million. The total estimated economic impact is just over $4.96 million.

Banning set nets from 0-2 nm from shore in the area from Pariokariwa Point to Hawera would have an estimated impact of between $1.83 million to $4.96 million on the wider New Zealand economy.

12.5.2 Option 3 - Ban set nets between 0 and 4 nautical miles offshore from Pariokariwa Point to Hawera

Option 3 (ban set nets between 0 and 4 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 0 and 4 nautical miles from Pariokariwa Point to Hawera for the last 12 months (1 April 2011 to 30 March 2012) and the 3 year average. These percentages are presented above in Table 4.

Tables 14, 15, and 16 present MPI estimates of landed revenues for set netters. These tables use impacts from Table 4 and the price estimates from Table 1. Table 14 is calculated using the three year average data, Table 15 uses the 2010/11 fishing year data and Table 16 uses data from 1 April 2011 to 31 March 2012.

Table 14. Estimates of the Economic Impact (three year average data).

Species	3 Year Average Catch (tonnes)	Total Revenue from Catch	Total Revenue + 10% (bycatch)	Loss of Revenue between 0-4nm
Blue Warehou	132.64	$266,602.77	$293,263.05	$127,487.33
School Shark	545.58	$1,254,830.47	$1,380,313.52	$101,748.70
Rig	228.62	$1,005,925.94	$1,106,518.53	$172,169.42
Trevally	1,958.55	$2,350,261.70	$2,585,287.87	$20,011.57
Northern Spiny Dogfish	35.54	$35,540.23	$39,094.25	$3,796.91
Snapper	1,308.13	$9,156,887.92	$10,072,576.71	$72,205.76
Kahawai	432.39	$345,914.60	$380,506.06	$8,285.50
Spiny Dogfish	198.90	$198,897.88	$218,787.67	$9,899.99
Gurnard	230.65	$657,350.69	$723,085.75	$10,318.94
Blue Mackerel	2,945.07	$2,945,074.10	$3,239,581.51	$2,856.84
TOTAL	8,016.07	$18,217,286.29	$20,039,014.92	$528,780.96

Table 15. Estimates of the Economic Impact (2010/11 Fishing Year data).

Species	2010-11 Fishing Year Catch (tonnes)	Total Revenue from Catch	Total Revenue + 10% (bycatch)	Loss of Revenue between 0-4nm
Blue Warehou	92.5	$185,865.22	$204,451.74	$97,140.90
School Shark	589.27	$1,355,319.57	$1,490,851.53	$97,173.15
Rig	216.5	$952,529.69	$1,047,782.66	$159,844.33
Trevally	1,906.29	$2,287,549.89	$2,516,304.88	$16,958.32
Northern Spiny Dogfish	39.4	$39,440.01	$43,384.01	$4,228.57
Snapper	1,298.20	$9,087,416.80	$9,996,158.48	$64,649.86
Kahawai	459.17	$367,334.38	$404,067.82	$5,367.61
Spiny Dogfish	233.38	$233,384.80	$256,723.28	$7,573.63
Gurnard	179.31	$511,047.01	$562,151.71	$9,779.39
Blue Mackerel	2,018.15	$2,018,145.74	$2,219,960.31	$5,050.56
TOTAL	7,032.17	$17,038,033.11	$18,741,836.43	$467,766.32

Table 16. Estimates of the Economic Impact (April 2011 to March 2012 data).

Species	April 2011 to Mar 2012 Catch (tonnes)	Total Revenue from Catch	Total Revenue + 10% (bycatch)	Loss of Revenue between 0-4nm
Blue Warehou	91.7	$184,317.30	$202,749.03	$97,694.52
School Shark	454.64	$1,045,679.38	$1,150,247.32	$84,643.63
Rig	208.9	$919,088.15	$1,010,996.96	$174,432.62
Trevally	1,810.35	$2,172,414.91	$2,389,656.40	$26,976.73
Northern Spiny Dogfish	42.2	$42,225.33	$46,447.86	$6,154.93
Snapper	1,179.27	$8,254,901.41	$9,080,391.55	$101,485.26
Kahawai	539.97	$431,975.02	$475,172.52	$7,719.41
Spiny Dogfish	244.47	$244,465.30	$268,911.83	$7,819.74
Gurnard	163.64	$466,365.36	$513,001.90	$14,091.39
Blue Mackerel	1,783.13	$1,783,126.71	$1,961,439.38	$6,322.13
TOTAL	6,518.27	$15,544,558.88	$17,099,014.77	$527,340.35

Table 14 shows the annual lost revenue between 0 and 4 nautical miles is just under $0.53 million, Table 15 shows the annual lost revenue between 0 and 4 nautical miles of just under $0.47 million and Table 16 6hows the annual lost revenue between 0 and 4 nautical miles of just under $0.53 million.

Tables 17, 18, and 19 applies the ratios in Table 2 to revenue estimates in Tables 15, 16 and 17 to derive the estimated annual value added changes for set net harvesters in the area from Pariokariwa Point to Hawera.

Tables 17, 18, and 19 present the MPI estimates of banning set netting between 0 and 4 nm from shore. Tables 17, 18, and 19 are computed by applying the factors from section 12.3.2 to the annual income data in the Table and using the ACE and quota values in Table 3.

Table 17. Estimated annual income effects and Present Value of banning set netting between 0 and 4 nautical miles from shore in the area from Pariokariwa Point to Hawera (3 year average data) – MPI Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$132,195.24	$458,494.08	$590,689.32
Processing income lost	$243,239.24	$439,363.00	$682,602.25
Indirect income lost	$296,117.34	$403,679.58	$699,796.92
Induced income lost	$216,800.19	$0.00	$216,800.19
Quota value	$0.00	$1,802,479.55	$1,802,479.55
TOTAL	$888,352.02	$3,104,016.22	$3,992,368.23

The estimated loss of annual value added is $0.89 million and the estimated loss of future capitalised value is $3.10 million. The total estimated economic impact is just over $3.99 million.

Table 18. Estimated annual income effects and Present Value of banning set netting between 0 and 4 nautical miles from shore in the area from Pariokariwa Point to Hawera (2010/11 Fishing Year data) – MPI Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$116,941.58	$402,997.34	$519,938.92
Processing income lost	$215,172.51	$386,505.80	$601,678.31
Indirect income lost	$261,949.14	$356,581.60	$618,530.74
Induced income lost	$191,784.19	$0.00	$191,784.19
Quota value	$0.00	$1,636,492.00	$1,636,492.00
TOTAL	$785,847.42	$2,782,576.73	$3,568,424.15

The estimated loss of annual value added is $0.79 million and the estimated loss of future capitalised value is $2.78 million. The total estimated economic impact is just over $3.57 million.

Table 19. Estimated annual income effects and Present Value of banning set netting between 0 and 4 nautical miles from shore in the area from Pariokariwa Point to Hawera (April 2011 to March 2012 data) – MPI Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$131,835.09	$444,277.72	$576,112.81
Processing income lost	$242,576.56	$427,359.97	$669,936.53
Indirect income lost	$295,310.60	$399,986.35	$695,296.95
Induced income lost	$216,209.54	$0.00	$216,209.54
Quota value	$0.00	$1,890,957.08	$1,890,957.08
TOTAL	$885,931.79	$3,162,581.12	$4,048,512.91

The estimated loss of annual value added is $0.89 million and the estimated loss of future capitalised value is $3.16 million. The total estimated economic impact is just under $4.05 million.

Tables 20, 21, and 22 show the estimates of the present value of banning set netting between 0 to 4 nautical miles from shore using Treasury's Present Value methodology.

Table 20. Estimated annual income effects and Present Value of banning set netting between 0 and 4 nautical miles from shore in the area from Pariokariwa Point to Hawera (3 year average data) – Treasury's Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$132,195.24	$1,257,647.84	$1,389,843.09
Processing income lost	$243,239.24	$2,314,072.03	$2,557,311.28
Indirect income lost	$296,117.34	$2,817,131.17	$3,113,248.51
Induced income lost	$216,800.19	$0.00	$216,800.19
Quota value	$0.00	$1,802,479.55	$1,802,479.55
TOTAL	$888,352.02	$8,191,330.60	$9,079,682.62

The estimated loss of annual value added is $0.89 million and the estimated loss of future capitalised value is $8.19 million. The total estimated economic impact is just over $9.08 million.

Table 21. Estimated annual income effects and Present Value of banning set netting between 0 and 4 nautical miles from shore in the area from Pariokariwa Point to Hawera (2010/11 Fishing Year data) – Treasury's Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$116,941.58	$1,112,531.18	$1,229,472.76
Processing income lost	$215,172.51	$2,047,057.37	$2,262,229.88
Indirect income lost	$261,949.14	$2,492,069.84	$2,754,018.98
Induced income lost	$191,784.19	$0.00	$191,784.19
Quota value	$0.00	$1,636,492.00	$1,636,492.00
TOTAL	$785,847.42	$7,288,150.39	$8,073,997.81

The estimated loss of annual value added is $0.79 million and the estimated loss of future capitalised value is $7.29 million. The total estimated economic impact is just under $8.08 million.

Table 22. Estimated annual income effects and Present Value of banning set netting between 0 and 4 nautical miles from shore in the area from Pariokariwa Point to Hawera (April 2011 to March 2012 data) – Treasury's Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$131,835.09	$1,254,221.51	$1,386,056.60
Processing income lost	$242,576.56	$2,307,767.59	$2,550,344.15
Indirect income lost	$295,310.60	$2,809,456.19	$3,104,766.79
Induced income lost	$216,209.54	$0.00	$216,209.54
Quota value	$0.00	$1,890,957.08	$1,890,957.08
TOTAL	$885,931.79	$8,262,402.37	$9,148,334.16

The estimated loss of annual value added is $0.89 million and the estimated loss of future capitalised value is $8.26 million. The total estimated economic impact is just under $9.15 million.

Banning set nets between 0 and 4 nautical miles from shore in the area from Pariokariwa Point to Hawera would have an estimated impact of between $3.57 million to $9.15 million on the wider New Zealand economy.

12.5.3 Summary of economic impacts

Table 23 summarises the economic impacts of the proposed options for the set net activity from Pariokariwa Point to Hawera 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 23. Total Estimated Economic Impacts for each Option.

	MPI Methodology			Treasury Methodology		
Set Net Ban	3 Year Average	2010/11 Fishing Year	April 2011 to March 2012 Year	3 Year Average	2010/11 Fishing Year	April 2011 to March 2012 Year
Option 1 and 2 (0 - 2 nautical miles)	$1.97 million	$1.83 million	$2.20 million	$4.47 million	$4.14 million	$4.96 million
Option 3 (0 - 4 nautical miles)	$3.98 million	$3.57 million	$4.05 million	$9.06 million	$8.08 million	$9.15 million

12.6 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 ban in the entrance of the Manukau Harbour) 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 24 presents the average ACE transfer price (2010/11 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 24. ACE and Quota prices for set net species (Manukau Harbour).

Species	2010/11 ACE price ($/tonnes)	Average quota price since Oct 01 ($/tonnes)
Grey Mullet (GMU1)	$523.40	$4,136.82
Yellow-eyed Mullet (YEM9)	$176.40	$2,626.32
School Shark (SCH1)	$1,399.00	$16,934.20
Trevally (TRE7)	$309.40	$5,276.26
Flatfish (FLA1)	$361.20	$2,765.88
Rig (SPO1)	$554.40	$5,370.87
Kahawai (KAH8)	$289.20	$3,010.29
Parore (PAR9)	$296.90	$2,448.98

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 2010 to 30 September 2011) and the last 3 completed fishing year's average. These percentages are presented in Table 25.

Table 25. Percentage of set net landings from the Manukau Harbour.

	Manukau Harbour	
Species	3 Year Average	2010-11 Fishing Year
Grey Mullet	10.02%	6.12%
Yellow-eyed Mullet	56.45%	65.14%
School Shark	0.06%	0.08%
Trevally	1.01%	1.56%
Flatfish	9.30%	15.01%
Rig	17.70%	22.72%
Kahawai	2.91%	3.43%
Parore	10.67%	21.15%

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 last completed fishing year (2010/11 fishing year) percentage figures and the three year average percentage figure to show the difference these assumption make to the economic impact numbers

12.6.1 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.

Tables 26 and 27 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 25 and the price estimates from Table 1. Table 26 is calculated using the three year average data. Table 27 uses the 2010/11 fishing year data.

Table 26. Estimates of the Economic Impact (three year average data).

Species	3 Year Average Catch (tonnes)	Total Revenue from Catch	Total Revenue + 10% (bycatch)	Loss of Revenue extending set net ban
Rig	306.31	$1,347,752.27	$1,482,527.49	$263 690
TOTAL	306.31	$1,347,752.27	$1,482,527.49	$263 690

Table 27. Estimates of the Economic Impact (2010/11 Fishing Year data).

Species	2010-11 Fishing Year Catch (tonnes)	Total Revenue from Catch	Total Revenue + 10% (bycatch)	Loss of Revenue extending set net ban
Rig	315.72	$1,389,180.28	$1,528,098.31	$347,246.71
TOTAL	315.72	$1,389,180.28	$1,528,098.31	**$347,246.71**

Table 26 shows the annual lost revenue is just under $0.26 million. Table 27 shows the annual lost revenue is just under $0.35 million.

Tables 28 and 29 applies the ratios in Table 2 to revenue estimates in Tables 26 and 27 to derive the estimated annual value added changes for set net harvesters.

Tables 28 and 29 present the MPI estimates of extending the set net ban in the Manukau Harbour. Table 28 and 29 are computed by applying the factors from section 12.3.2 to the annual income data in the table and using the ACE and quota values in Table 24.

Table 28. Estimated annual income effects and Present Value of extending the set net ban in the Manukau harbour (3 year average data) – MPI Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$65,922.42	$284,305.43	$350,227.85
Processing income lost	$121,297.26	$265,487.57	$386,784.83
Indirect income lost	$147,666.23	$212,438.00	$360,104.23
Induced income lost	$108,112.77	$0.00	$108,112.77
Quota value	$0.00	$292,612.20	$292,612.20
TOTAL	$442,998.68	$1,054,843.20	$1,497,841.87

The estimated loss of annual value added is $0.44 million and the estimated loss of future capitalised value is $1.05 million. The total estimated economic impact is just over $1.50 million.

Table 29. Estimated annual income effects and Present Value of extending the set net ban in the Manukau harbour (2010/11 Fishing Year data) – MPI Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$86,811.68	$374,395.09	$461,206.77
Processing income lost	$159,733.49	$349,614.31	$509,347.79
Indirect income lost	$194,458.16	$279,754.58	$474,212.74
Induced income lost	$142,371.15	$0.00	$142,371.15
Quota value	$0.00	$385,334.08	$385,334.08
TOTAL	$583,374.48	$1,389,098.06	$1,972,472.54

The estimated loss of annual value added is $0.58 million and the estimated loss of future capitalised value is $1.39 million. The total estimated economic impact is just over $1.97 million.

Tables 30 and 31 show the estimates of the present value of extending the set net ban in the Manukau harbour using Treasury's Present Value methodology.

Table 30. Estimated annual income effects and Present Value of banning set netting in the Manukau harbour (3 year average data) – Treasury's Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$65,922.42	$627,157.16	$693,079.58
Processing income lost	$121,297.26	$1,153,969.18	$1,275,266.43
Indirect income lost	$147,666.23	$1,404,832.04	$1,552,498.27
Induced income lost	$108,112.77	$0.00	$108,112.77
Quota value	$0.00	$292,612.20	$292,612.20
TOTAL	$442,998.68	$3,478,570.58	$3,921,569.25

The estimated loss of annual value added is $0.44 million and the estimated loss of future capitalised value is $3.48 million. The total estimated economic impact is just over $3.92 million.

Table 31. Estimated annual income effects and Present Value of extending the set net ban in the Manukau harbour (2010/11 Fishing Year data) – Treasury's Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$86,811.68	$825,888.44	$912,700.11
Processing income lost	$159,733.49	$1,519,634.72	$1,679,368.21
Indirect income lost	$194,458.16	$1,849,990.10	$2,044,448.25
Induced income lost	$142,371.15	$0.00	$142,371.15
Quota value	$0.00	$385,334.08	$385,334.08
TOTAL	$583,374.48	$4,580,847.33	$5,164,221.81

The estimated loss of annual value added is $0.58 million and the estimated loss of future capitalised value is $4.58 million. The total estimated economic impact is just over $5.16 million.

Extending the set net ban further into the Manukau Harbour would have an estimated impact of between $1.5 million to $5.16 million on the wider New Zealand economy.

12.6.2 Summary of economic impacts

Table 32 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 32. Total Estimated Economic Impacts of Option 3.

	MPI Methodology		Treasury Methodology	
Set Net Ban	3 Year Average	2010/11 Fishing Year	3 Year Average	2010/11 Fishing Year
Manukau Harbour	$1.50 million	$1.97 million	$3.92 million	$5.16 million

12.7 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.[170] Estimates of the cost of monitoring coverage can be found in section 6.0.

To estimate the impacts of Option 3 (ban trawling out to 4 nm from shore between Kaipara Harbour and Kawhia) on commercial trawl fishers; ACE and quota prices for the trawl species targeted in the three ranges are required for these calculations. Table 33 presents the

[170] 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).

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 33. 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)	$901.40	$10,929.30
School Shark (SCH1)	$1,399.00	$16,934.20
Rig (SPO1)	$554.40	$5,370.87
Trevally (TRE7)	$309.40	$5,276.26
Snapper (SNA8)	$4,707.30	$48,790.70
Kahawai (KAH8)	$289.20	$3,010.29
Tarakihi (TAR1)	$1,486.50	$17,711.70
Gurnard (GUR1)	$266.60	$1,560.26
Flatfish (FLA1)	$361.20	$2,765.88

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 has calculated the percentage of each species landed from the Kaipara Harbour to Kawhia area between 2 and 4 nautical miles offshore for the last completed fishing year (1 October 2010 and 30 September 2011) and the last 3 completed fishing year's average. These percentages are presented in Tables 34.

Table 34. Percentage of trawl landings between 2 to 4 nautical miles offshore from Kaipara Harbour to Kawhia.

	Kaipara Harbour to Kawhia (Option 3)	
Species	3 Year Average	2010-11 Fishing Year
John Dory	0.78%	0.93%
School Shark	0.73%	0.59%
Rig	0.24%	0.26%
Trevally	1.36%	1.46%
Snapper	1.69%	1.75%
Kahawai	1.11%	1.17%
Tarakihi	0.20%	0.20%
Gurnard	1.06%	0.93%
Flatfish	0.16%	0.19%

MPI will provide economic impact estimates below using the last completed fishing year (2010/11 fishing year) percentage figures and the three year average percentage figures to show the difference these assumptions make to the economic impact numbers.

12.7.1 Option 3 - Ban trawling out to 4 nautical miles from Kaipara Harbour to Albatross Point (Kawhia)

Option 3 (ban trawling out to 4 nm 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.

Tables 35 and 36 present MPI estimates of landed revenues for trawl fishers. These tables use impacts from Table 34 and the price estimates from Table 1. Table 35 is calculated using the three year average data. Table 36 uses the 2010/11 fishing year data.

Table 35. Estimates of the Economic Impact (three year average data).

Species	3 Year Average Catch (tonnes)	Total Revenue from Catch	Total Revenue + 10% (bycatch)	Loss of Revenue between 2–4 nm
John Dory	385.31	$2,889,834.05	$3,178,817.46	$24, 804.32
School Shark	697.9	$1,605,131.92	$1,765,645.12	$12, 820.81
Rig	306.31	$1,347,752.27	$1,482,527.49	$3,600.90
Trevally	1,958.55	$2,350,261.70	$2,585,287.87	$35, 145.34
Snapper	1,308.13	$9,156,887.92	$10,072,576.71	$169, 974.31
Kahawai	432.39	$345,914.60	$380,506.06	$4, 214.97
Tarakihi	1,362.00	$5,448,005.39	$5,992,805.93	$12, 082.57
Gurnard	1,063.61	$3,031,282.51	$3,334,410.76	$35, 414.18
Flatfish	589.6	$1,768,761.50	$1,945,637.65	$3, 067.13
TOTAL	8,103.77	$27,943,831.85	$30,738,215.04	$301, 124.54

Table 36. Estimates of the Economic Impact (2010/11 Fishing Year data).

Species	2010-11 Fishing Year Catch (tonnes)	Total Revenue from Catch	Total Revenue + 10% (bycatch)	Loss of Revenue between 2–4 nm
John Dory	381.24	$2,859,303.98	$3,145,234.37	$29, 128.27
School Shark	793.68	$1,825,470.52	$2,008,017.57	$11, 814.44
Rig	315.7	$1,389,180.28	$1,528,098.31	$3, 910.14
Trevally	1,906.29	$2,287,549.89	$2,516,304.88	$36, 622.81
Snapper	1,298.20	$9,087,416.80	$9,996,158.48	$174, 748.34
Kahawai	459.17	$367,334.38	$404,067.82	$4, 717.37
Tarakihi	1,357.7	$5,430,957.88	$5,974,053.67	$11, 977.45
Gurnard	1,047.40	$2,985,090.40	$3,283,599.44	$30, 521.47
Flatfish	497.7	$1,493,016.38	$1,642,318.02	$3, 171.36
TOTAL	8,057.12	$27,725,320.50	$30,497,852.55	$306, 611.66

Table 35 shows the annual lost revenue is just over $0.30 million. Table 36 shows the annual lost revenue is just under $0.31 million.

Tables 37 and 38 applies the ratios in Table 5 to revenue estimates in Tables 35 and 36 to derive the estimated annual value added changes for trawl fishers.

Tables 37 and 38 present the MPI estimates of banning trawling between 2 and 4 nm from Kaipara Harbour to Kawhia. Tables 37 and 38 are computed by applying the factors from section 12.3.2 to the annual income data in the table and using the ACE and quota values in Table 33.

Table 37. Estimated annual income effects and Present Value of banning trawling between 2 and 4 nautical miles from Kaipara Harbour to Kawhia (3 year average data) – MPI Methodology

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$75,281.14	$179,641.50	$254,922.64
Processing income lost	$138,517.29	$182,323.08	$320,840.37
Indirect income lost	$168,629.74	$213,591.78	$382,221.52
Induced income lost	$123,461.06	$0.00	$123,461.06
Quota value	$0.00	$1,423,437.83	$1,423,437.83
TOTAL	$505,889.23	$1,998,994.19	$2,504,883.42

The estimated loss of annual value added is $0.51 million and the estimated loss of future capitalised value is $2.00 million. The total estimated economic impact is just under $2.50 million.

Table 38. Estimated annual income effects and Present Value of banning trawling between 2 and 4 nautical miles from Kaipara Harbour to Kawhia (2010/11 Fishing Year data) – MPI Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$76,652.91	$182,088.67	$258,741.58
Processing income lost	$141,041.36	$184,956.82	$325,998.18
Indirect income lost	$171,702.53	$217,318.61	$389,021.14
Induced income lost	$125,710.78	$0.00	$125,710.78
Quota value	$0.00	$1,457,877.06	$1,457,877.06
TOTAL	$515,107.58	$2,042,241.16	$2,557,348.75

The estimated loss of annual value added is $0.52 million and the estimated loss of future capitalised value is $2.04 million. The total estimated economic impact is just under $2.56 million.

Tables 39 and 40 show the estimates of the present value of extending the trawl ban from 2 to 4 nautical miles between Kaipara Harbour and Kawhia using Treasury's Present Value methodology.

Table 39. Estimated annual income effects and Present Value of banning trawling between 2 and 4 nautical miles from Kaipara Harbour to Kawhia (3 year average data) – Treasury's Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$75,281.14	$716,191.88	$791,473.01
Processing income lost	$138,517.29	$1,317,793.05	$1,456,310.34
Indirect income lost	$168,629.74	$1,604,269.80	$1,772,899.54
Induced income lost	$123,461.06	$0.00	$123,461.06
Quota value	$0.00	$1,423,437.83	$1,423,437.83
TOTAL	$505,889.23	$5,061,692.56	$5,567,581.79

The estimated loss of annual value added is $0.51 million and the estimated loss of future capitalised value is $5.06 million. The total estimated economic impact is just over $5.57 million.

Table 40. Estimated annual income effects and Present Value of banning trawling between 2 and 4 nautical miles from Kaipara Harbour to Kawhia (2010/11 Fishing Year data) – Treasury's Methodology.

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$76,652.91	$729,242.38	$805,895.30
Processing income lost	$141,041.36	$1,341,805.98	$1,482,847.34
Indirect income lost	$171,702.53	$1,633,502.93	$1,805,205.46
Induced income lost	$125,710.78	$0.00	$125,710.78
Quota value	$0.00	$1,457,877.06	$1,457,877.06
TOTAL	$515,107.58	$5,162,428.36	$5,677,535.94

The estimated loss of annual value added is $0.52 million and the estimated loss of future capitalised value is $5.16 million. The total estimated economic impact is just under $5.68 million.

12.7.2 Summary of economic impacts

Table 41 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 41. Total Estimated Economic Impacts of Option 3.

	MPI Methodology		Treasury Methodology	
Trawling Ban	3 Year Average	2010/11 Fishing Year	3 Year Average	2010/11 Fishing Year
Kaipara Harbour to Kawhia from 2 to 4 nautical miles	$2.50 million	$2.56 million	$5.57 million	$5.68 million

13.0 Appendix 5: References

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