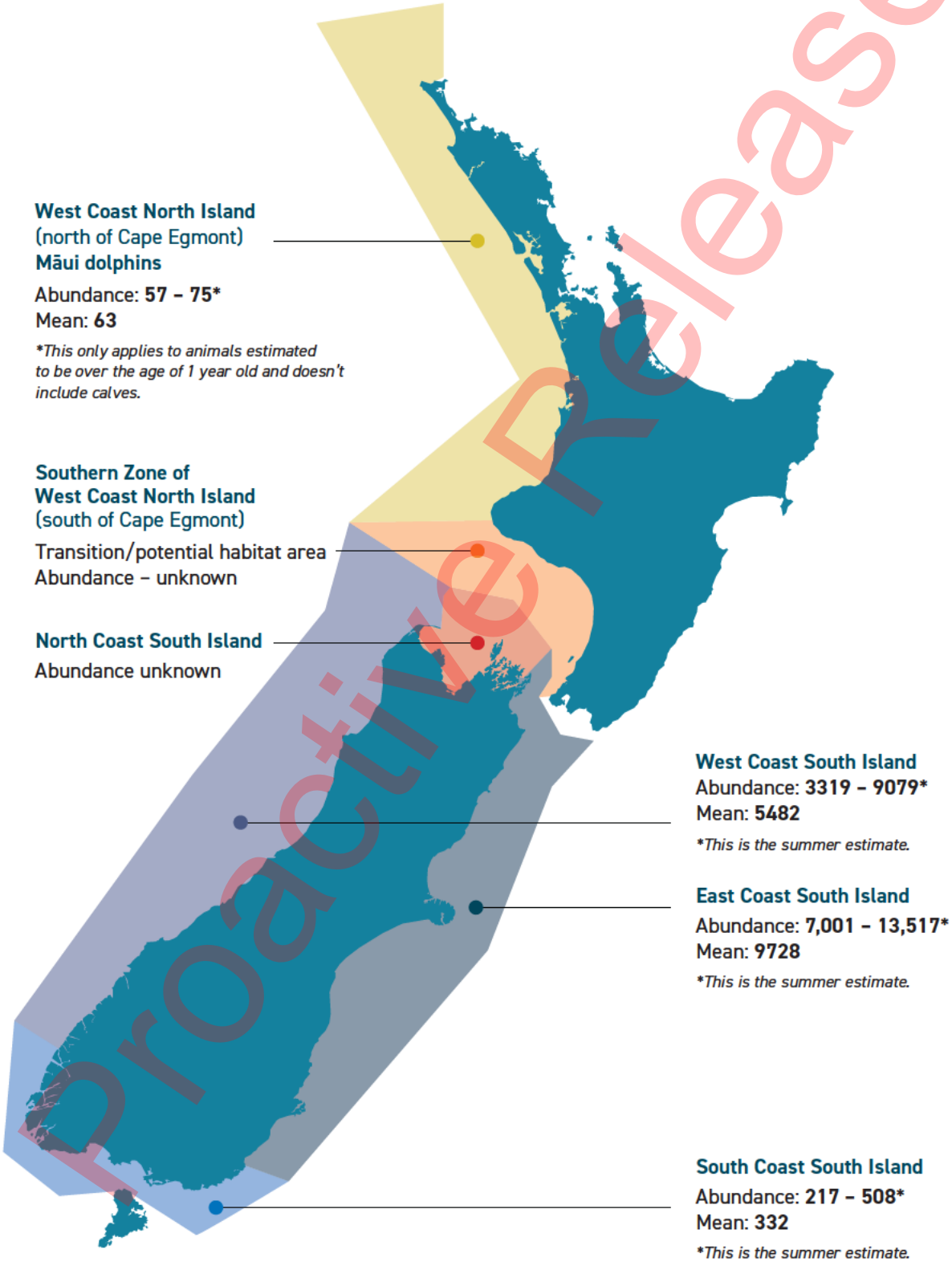
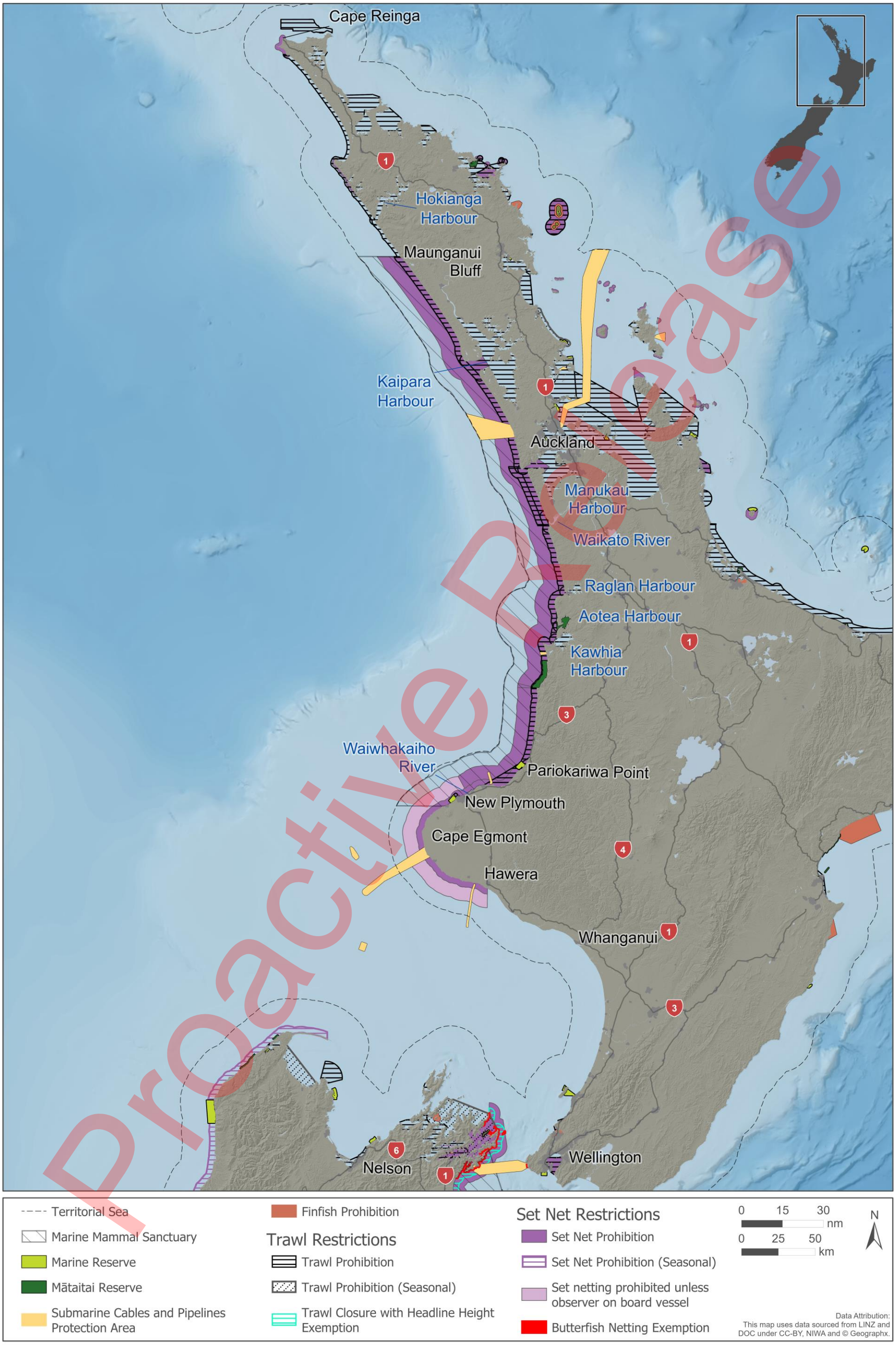
Appendix One: Current net set and trawl restrictions

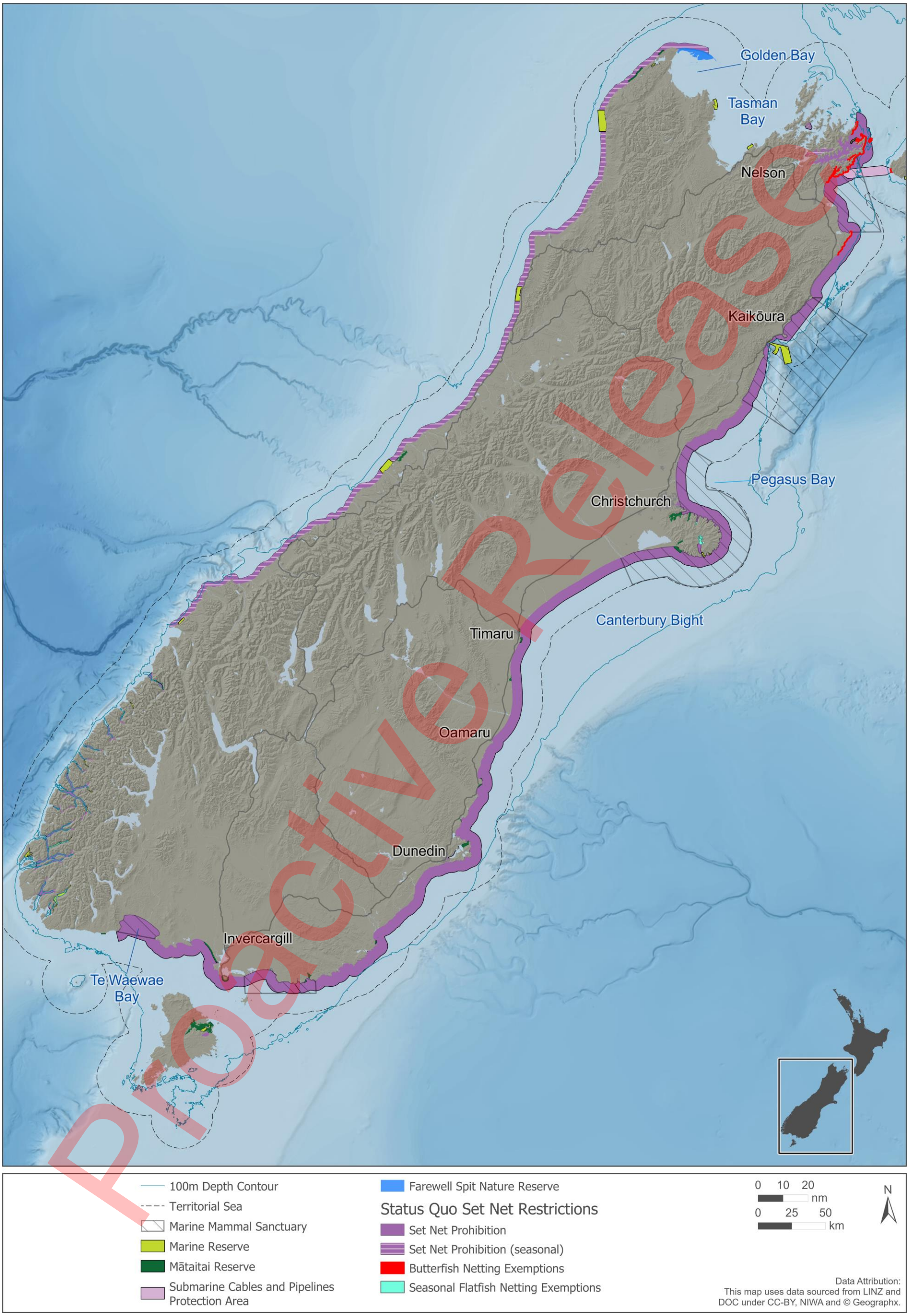
Map 1. Subpopulation map

Hectors and Māui Dolphin Risk Assessment Areas





Map 2. Current set net and trawl restrictions off the west coast North Island



Map 3. Current set net restrictions around the South Island.

Map 4. Current trawl restrictions around the South Island.

Appendix Two: Letter to Hon Eugenie Sage, Minister of Conservation

B19-0533

Hon Eugenie Sage
Minister of Conservation
PARLIAMENT BUILDINGS

Dear Hon Eugenie Sage

Review of the Hector's and Maui Dolphin Threat Management Plan

I have received the attached briefing from Fisheries New Zealand recommending options to manage the effects of fishing-related mortality on Hector's and Māui dolphins as part of a revised Hector's and Māui Dolphin Threat Management Plan (TMP).

I am required to consult with you under section 15(2) of the Fisheries Act 1996 before I decide whether additional measures are necessary.

Fisheries New Zealand has advised me that a precautionary approach should be taken to deliver the TMP's proposed outcomes, goals and objectives. They tell me the approach they have recommend best provides for effective protection for the dolphins where this is required, but also minimises impact on utilisation of fisheries resources to the extent possible.

I understand that your Department suggests that more measures are required in some areas. I would be interested in your thoughts on that, along with any supporting rationale that you might have for that approach.

I am interested in reviewing the measures proposed for non-fishing threats, Toxoplasmosis in particular.

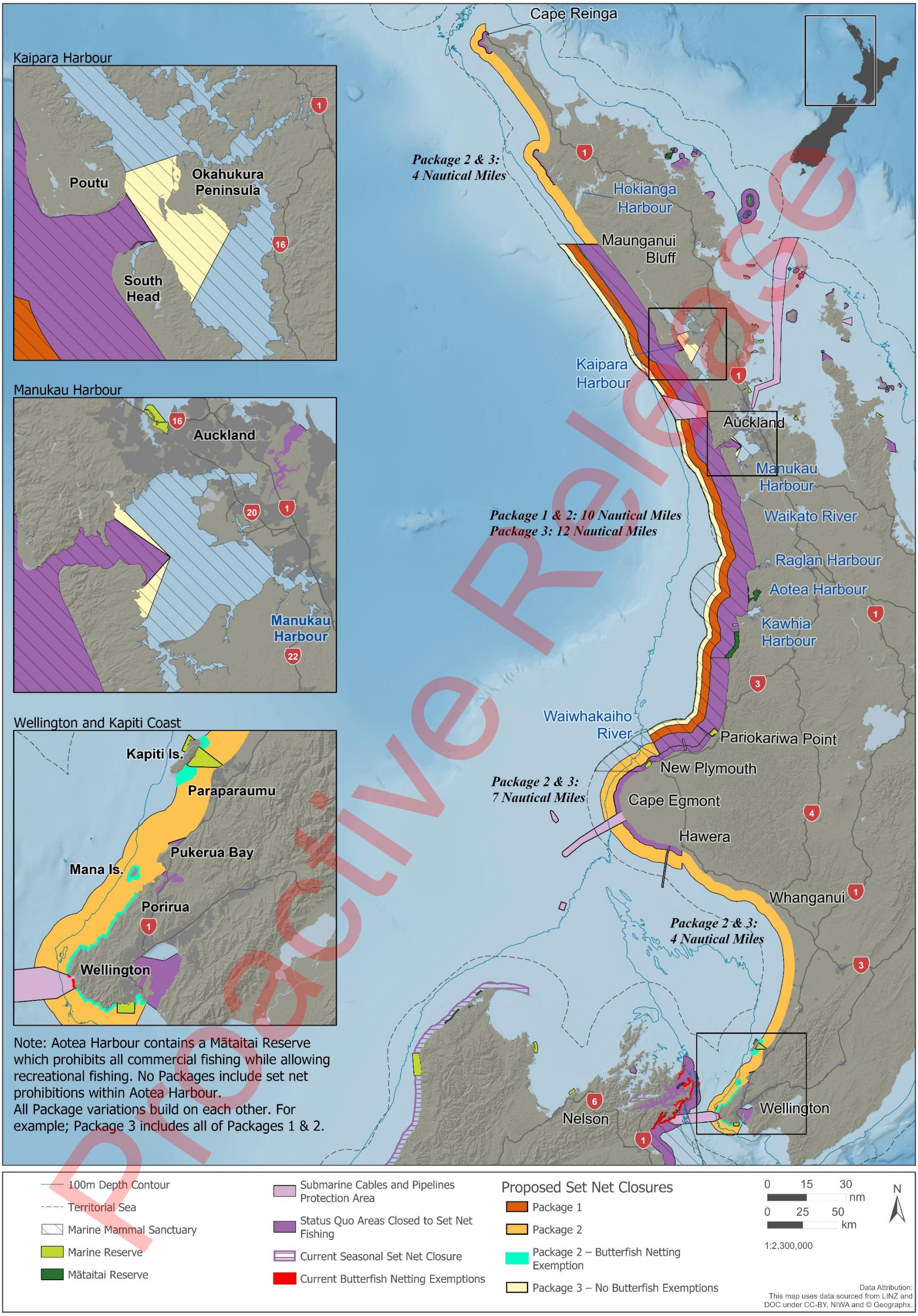
In line with our previous discussions on timetable, I intend to make a decision on measures by 4 November 2019 to allow consideration by Cabinet prior to a joint announcement by the end of the year.

I look forward to any feedback you may have on the fishing measures and also receiving information on your proposals to manage toxoplasmosis.

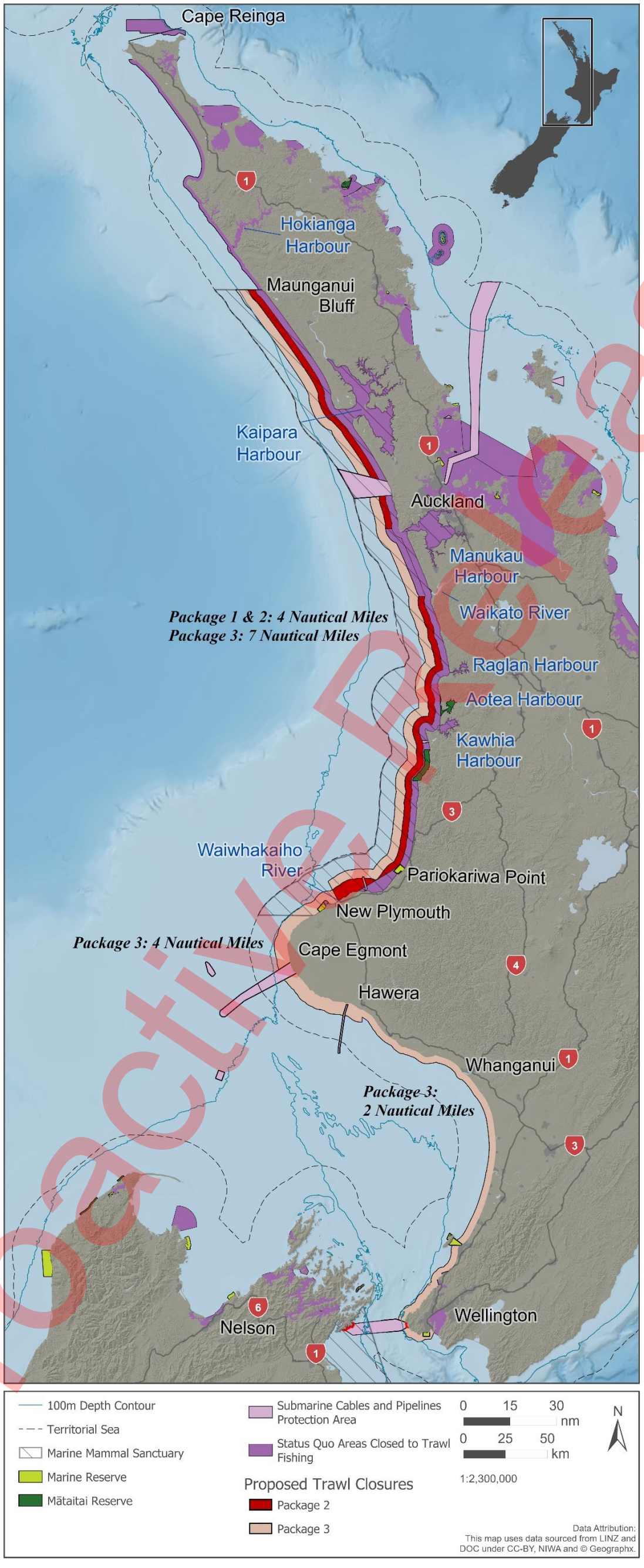
Yours sincerely

Hon Stuart Nash
Minister of Fisheries

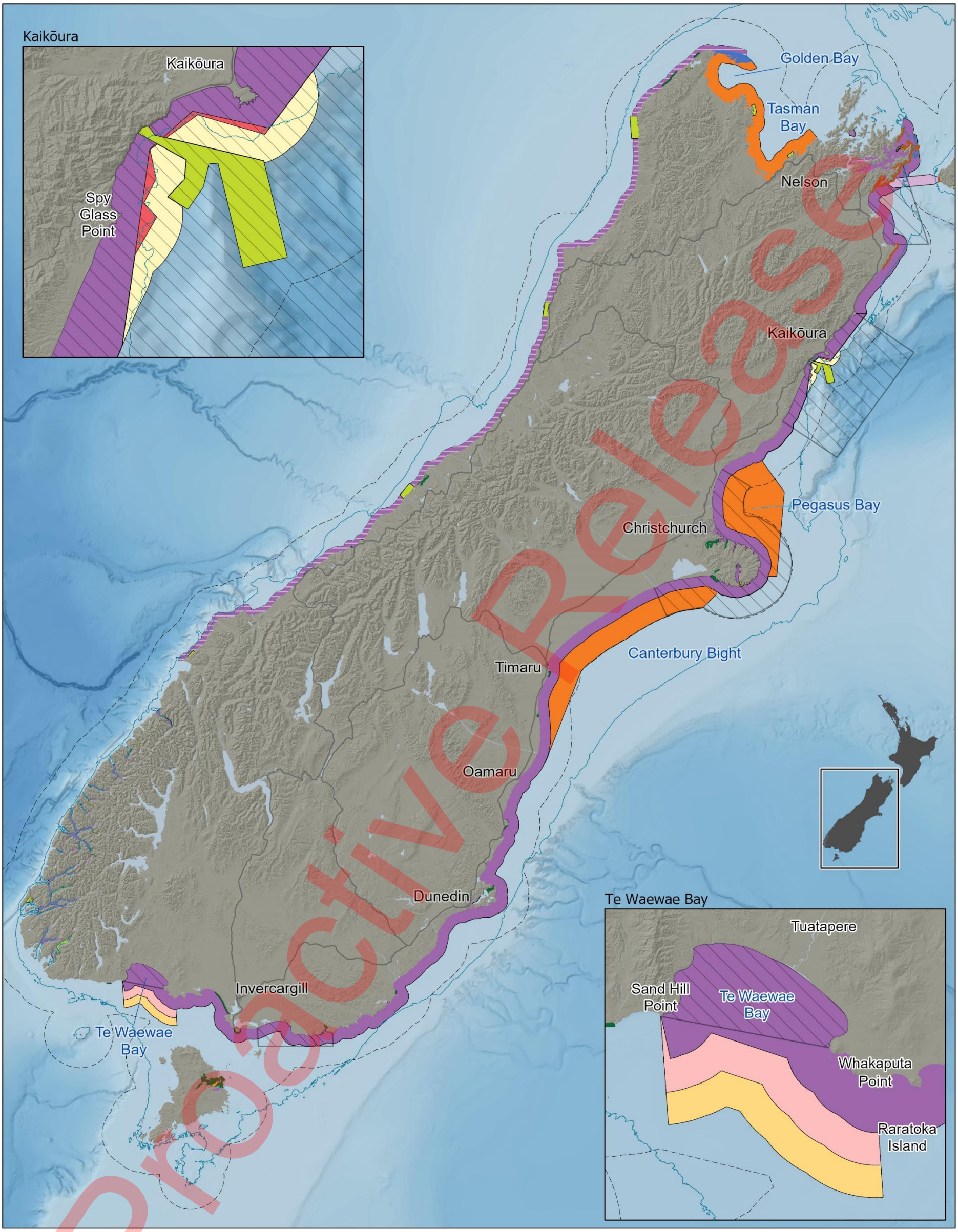
Appendix Three: Revised set-net options and proposed packages



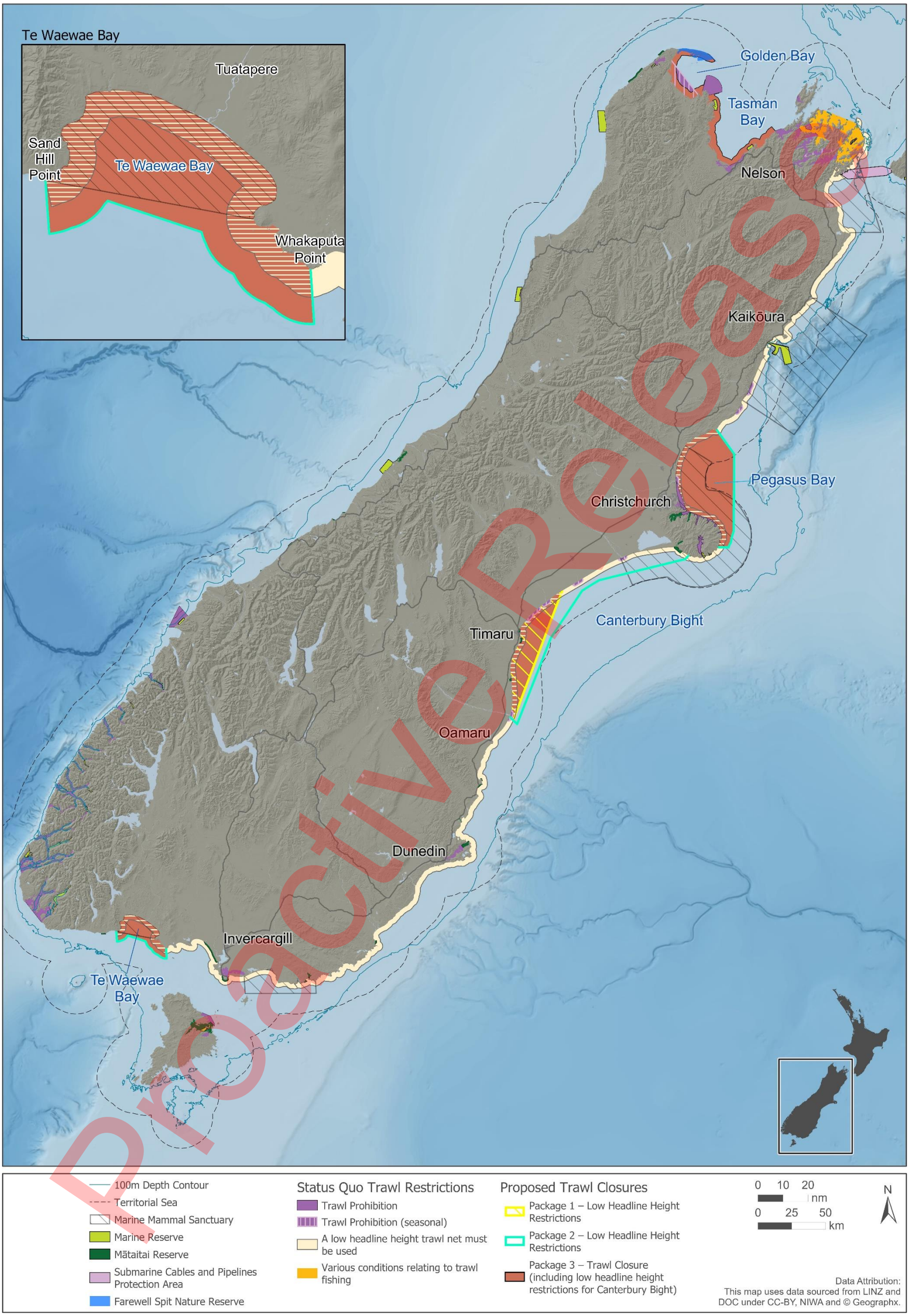
Map 1. Revised set-net options for west coast North Island that form proposed Packages 1, 2 and 3.



Map 2. Revised trawl options for west coast North Island that form proposed Packages 1, 2 and 3.



Map 3. Revised set-net options for the South Island that form proposed Packages 1 and 2



Map 4. Revised trawl options for the South Island that form proposed Packages 1, 2 and 3.

Hector's and Māui Dolphin

Threat Management Plan Review

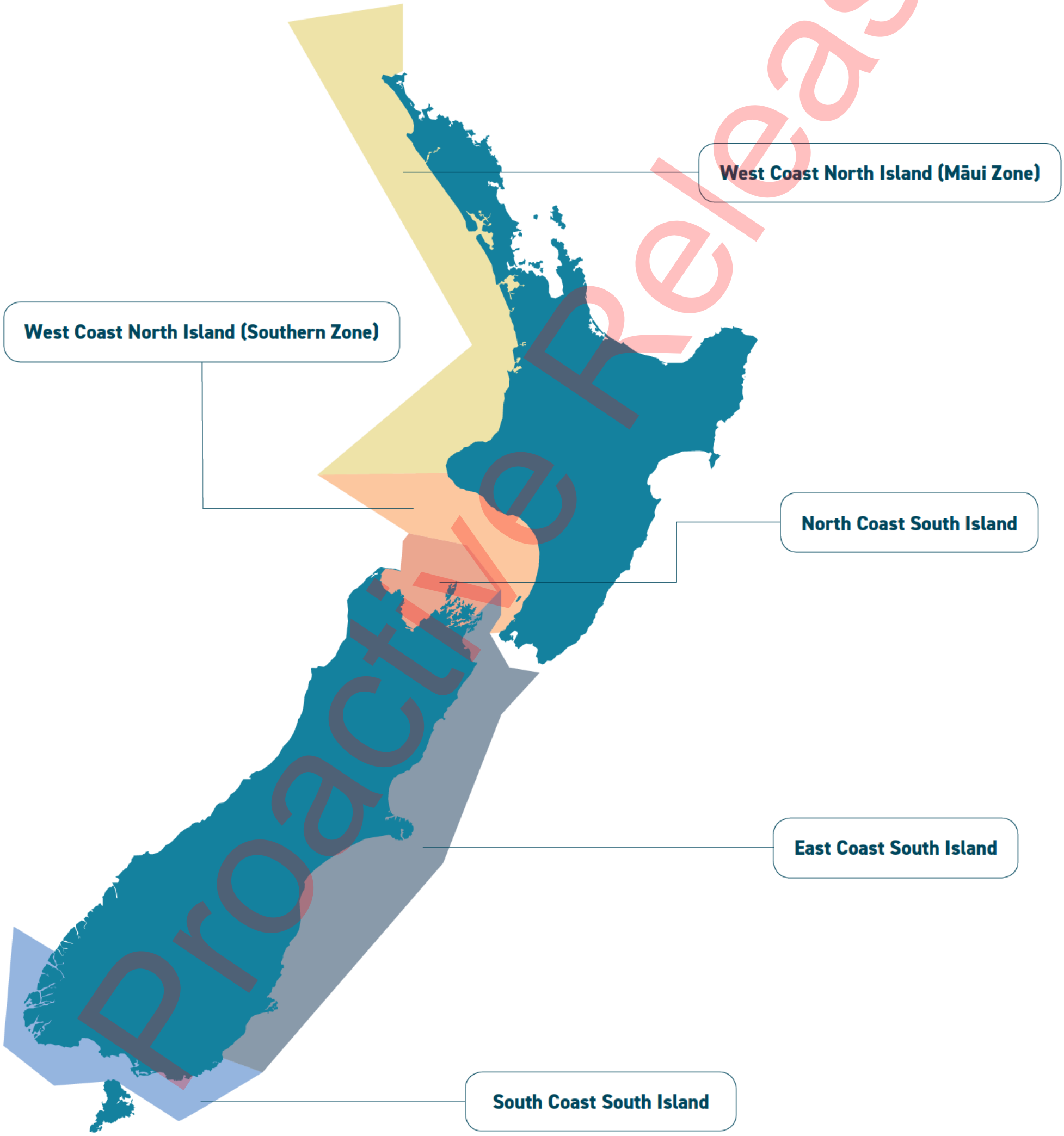


Figure 1:

Proposed packages for the West Coast North Island (Māui Zone)

Summary of packages

Existing measures

- Does not achieve proposed objectives
- $2.4 M in observer monitoring costs (Over 5 years)
- $2.46 M in camera monitoring costs (Over 5 years)[1]

Package 1

- Achieves proposed objectives
- $2.14 M in annual revenue lost (Māui zone only)
- $2.4 M in observer monitoring costs (Over 5 years)
- $2.46 M in camera monitoring costs (Over 5 years)[1]
- Commercial sensitivity
- Commercial sensitivity

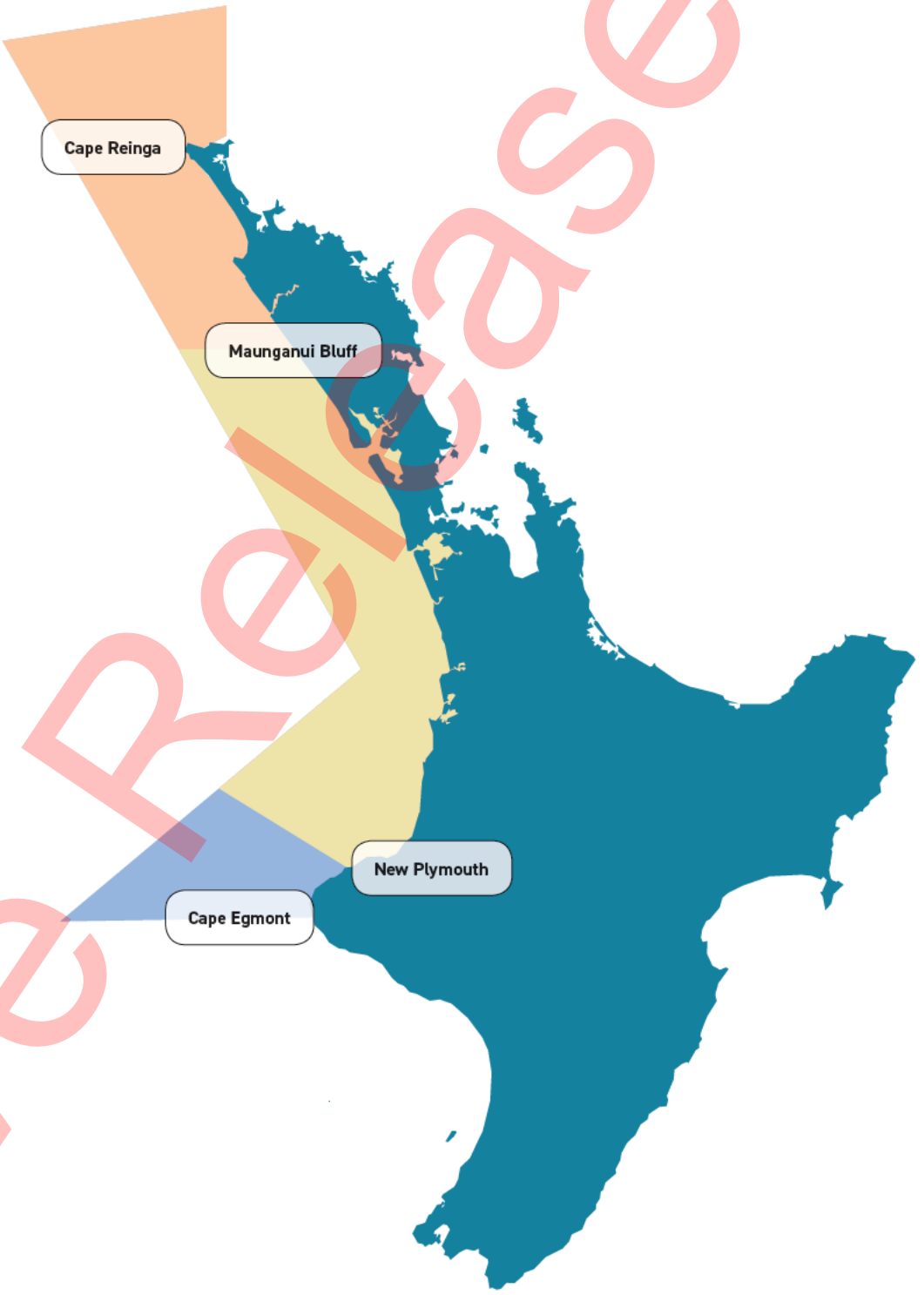
Preferred

Package 2

- Achieves proposed objectives
- $3.4 M in annual revenue lost (Māui + Southern zone combined)
- $1.03 M in observer monitoring costs (Over 5 years)
- $2.04 M in camera monitoring costs (Over 5 years)[1]
- Commercial sensitivity
- Commercial sensitivity

Package 3

- Exceeds proposed objectives significantly
- $8.0 M in annual revenue lost (Māui + Southern zone combined)
- <$0.50 M in observer monitoring costs (Over 5 years)
- <$2 M in camera monitoring costs (Over 5 years)[1]
- Commercial sensitivity
- Commercial sensitivity



Preferred

Area	Method	Existing measures	Package 1	Package 2	Package 3
Cape Reinga to Maunganui Bluff (northern tail of distribution)	Set-net	• No measures	• No new measures proposed	• Area closure out to 4 nm	• Area closure to 4 nm
	Trawl	• Closure out to 1nm offshore	• Retain existing measures	• Retain existing measures	• Retain existing measures
Maunganui Bluff to New Plymouth (Waiwhakaiho River) (core + tail distributions)	Set-net	• Closure out to 7 nm offshore	• Extend area closure to 10 nm	• Extend area closure to 10 nm	• Extend area closure to 12 nm
	Trawl	• Closure varies between 2 and 4 nm offshore	• Extend area closure to 4 nm	• Extend area closure to 4 nm	• Extend area closure to 7 nm
New Plymouth to Cape Egmont (southern tail of distribution)	Set-net	• Closure out to 2 nm offshore • Mandatory observer coverage 2 nm to 7 nm offshore	• Retain existing closure to 2 nm • Continued mandatory observer coverage 2 to 7 nm offshore	• Extend area closure to 7 nm	• Extend area closure to 7 nm
	Trawl	• No measures	• No measures proposed	• No measures proposed	• Area closure to 4 nm
Harbours (distribution uncertain)	Set-net	• Closures at the mouths of the Manukau, Kaipara and Raglan Harbours	• Retain existing measures	• Retain existing measures	• Small extension within Kaipara and Manukau
Monitoring			• Continued mandatory observer coverage on commercial set-net vessels around Taranaki • Targeted observer coverage on trawl vessels between Maunganui Bluff and New Plymouth • Stage One on board cameras on most set-net and trawl vessels in Māui zone (excludes harbours and areas north of fisheries statistical area 046, and vessels >20-21 m in length)	• Targeted observer coverage on trawl vessels between Maunganui Bluff and New Plymouth • Stage One on board cameras on most set-net and trawl vessels in Māui zone (excludes harbours and areas north of fisheries statistical area 046, and vessels >20-21 m in length)	• Targeted observer coverage on trawl vessels between Maunganui Bluff and New Plymouth • Stage One on board cameras on most set-net and trawl vessels in Māui zone (excludes harbours and areas north of fisheries statistical area 046, and vessels >20-21 m in length)

**Number of fishers affected reflects those who are likely to be severely impacted by the proposals.*

[1] *For all packages, camera monitoring costs are the sum of the upfront installation costs and annual ongoing review and storage costs, estimated for a five year period.*

Under all packages proposed Fisheries New Zealand recommends that you:

i. prohibit the use of drift nets by commercial and recreational fishers in all New Zealand waters, and

ii. allow the use of ring nets by commercial fishers in areas where set netting is prohibited.

Figure 2:

Proposed packages for the West Coast North Island (Southern Zone)

Summary of packages

Current management

The status quo does not achieve our objective.

Package 1

- Does not achieve proposed objectives
- $2.14 M in annual revenue lost (Māui + Southern zone combined)
- No fishers affected*
- Commercial sensitivity

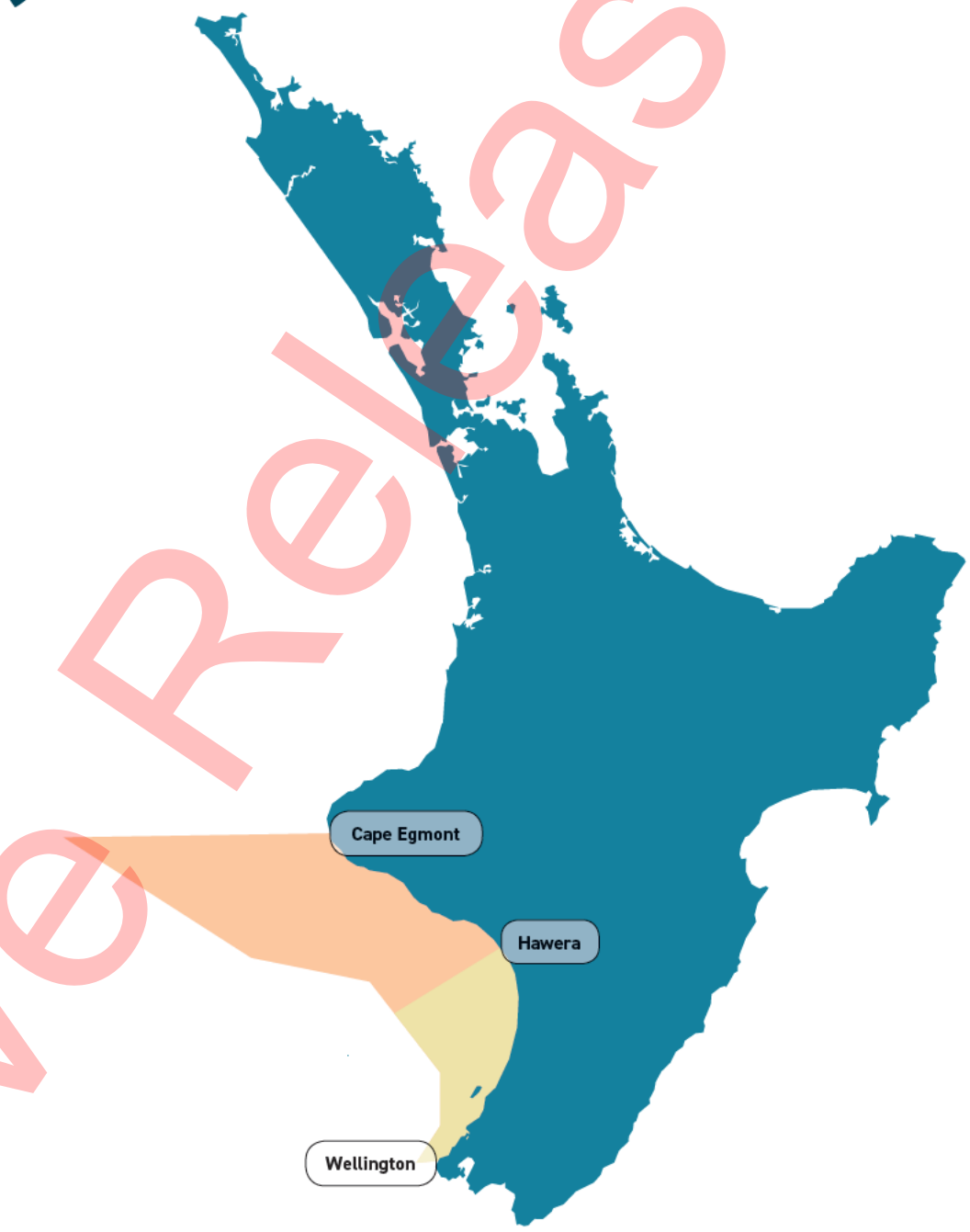
Preferred

Package 2

- Exceeds proposed objectives significantly
- $3.4 M in annual revenue lost (Māui + Southern zone combined)
- Commercial sensitivity
- Commercial sensitivity

Package 3

- Exceeds proposed objectives significantly
- $8.0 M in annual revenue lost (Māui + Southern zone combined)
- Commercial sensitivity
- Commercial sensitivity



Area	Method	Existing measures	Package 1	Package 2 (Preferred)	Package 3
Cape Egmont to Hawera (potential habitat)	Set-net	• Closure to 2nm • Mandatory observer coverage 2 nm to 7 nm offshore	• Retain existing closure to 2 nm • Continued mandatory observer coverage 2 to 7 nm offshore	• Extend area closure to 7 nm	• Extend area closure to 7 nm
	Trawl	• No measures	• No measures proposed	• No measures proposed	• Area closure to 4 nm
Hawera to Wellington (potential habitat)	Set-net	• No measures	• No measures proposed	• Area closure out to 4 nm with butterfish exemption	• Area closure to 4 nm
	Trawl	• No measures	• No measures proposed	• No measures proposed	• Area closure to 2 nm
Monitoring		• N/A	• Continued mandatory observer coverage on commercial set-net vessels around Taranaki • Stage One on board cameras on most set-net and trawl vessels between Cape Egmont and Whanganui only • Proposal to target some observer coverage on set-net vessels south of Whanganui to Wellington – dependent on available resourcing	• Stage One on board cameras on most set-net and trawl vessels between Cape Egmont and Whanganui only • No additional monitoring proposed	• Stage One on board cameras on select set-net and trawl vessels between Cape Egmont and Whanganui only • No additional monitoring proposed

**Number of fishers affected reflects those who are likely to be severely impacted by the proposals. Some fishers may not be significantly affected due to proposed butterfish exemption.*

***Note:** Some observer and on-board camera coverage is captured in the southern habitat zone north of Whanganui. But costs are unable to be differentiated for this area. Overall costs are estimated within the Māui habitat zone*

Under all packages proposed Fisheries New Zealand recommends that you:

i. prohibit the use of drift nets by commercial and recreational fishers in all New Zealand waters, and

ii. allow the use of ring nets by commercial fishers in areas where set netting is prohibited.

Figure 3:

Proposed packages for the East Coast South Island

Summary of packages

Current management

The status quo does not achieve our objective.

Package 1

- Exceeds proposed objectives (except in Kaikōura where the local objective will be met in practice through the use of triggers)
- $1.24 M in annual revenue lost
- $12.2 M (inc. $4.40 M in Kaikōura)[3] in observer monitoring costs (Over 5 years)
- $2.91 M (inc. $0.87 M in Kaikōura) in camera monitoring costs (Over 5 years)
- Commercial sensitivity

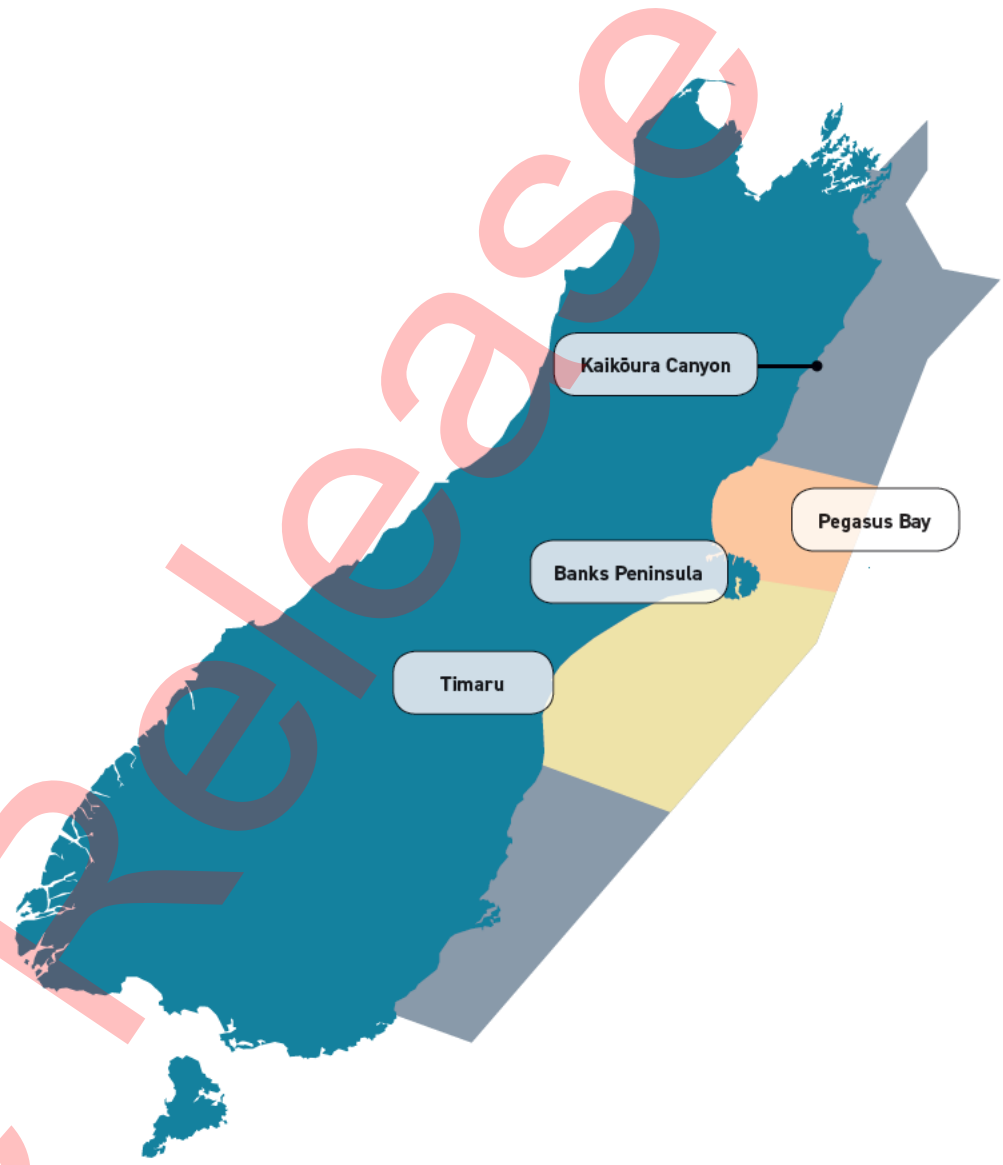
Preferred

Package 2

- Exceeds proposed objectives (except in Kaikōura where the local objective will be met in practice through the use of triggers)
- $1.24 M in annual revenue lost
- $13.45 M (inc. $4.40 M in Kaikōura)[4] in observer monitoring costs (Over 5 years)
- $3.52 M (inc. $0.87 M in Kaikōura)[0] in camera monitoring costs (Over 5 years)
- Commercial sensitivity

Package 3

- Exceeds proposed objectives
- $8.44 M in annual revenue lost
- $4.2 M in observer monitoring costs (Over 5 years)
- $1.59 M in camera monitoring costs (Over 5 years)
- Commercial sensitivity



Preferred

Area	Method	Existing measures	Package 1	Package 2	Package 3
Pegasus Bay	Set-net	• Set-net prohibited out to 4 nm offshore	• Area closure: extend prohibition on all commercial and recreational set-netting to Pegasus Bay		
	Trawl	• Low headline height (1 metre or less) required on trawl vessels operating within 2 nm of shore	• Trigger: more than 10 dolphins captured Protected species risk management plans (PSRMPS), monitoring, individual vessel triggers, research (as outlined in the table 1).	• Gear modification and monitoring: headline height <=1m and tow speed <=2.5 kn and monitoring in Pegasus Bay • Trigger: 10 dolphins captured • Protected species risk management plans (PSRMPS), monitoring, individual vessel triggers, research (as outlined in the table 1).	• Area closure: prohibit trawling in Pegasus Bay
South from Banks Peninsula to Timaru	Set-net	• Set-net prohibited out to 4 nm offshore, except in some harbours and bays where a seasonal set-net restriction is in place	• Area closure: prohibition extended south from Banks Penisula to Timarau.		
	Trawl	• Low headline height (1 metre or less) required on trawl vessels operating within 2 nm of shore	• Gear modification and monitoring: headline height <=1m and tow speed <=2.5 kn and monitoring in area around Timaru • Trigger: 10 dolphins captured • Protected species risk management plans (PSRMPS), monitoring, individual vessel triggers, research (as outlined in the table 1).	• Gear modification and monitoring: headline height <=1m and tow speed <=2.5 kn and monitoring from South Canterbury Bight to Timaru • Trigger: 10 dolphins captured • Protected species risk management plans (PSRMPS), monitoring, individual vessel triggers, research (as outlined in the table 1).	• Area closure: prohibit all trawling in area around Timaru • Gear modification and monitoring: headline height <=1m and tow speed <=2.5 kn and monitoring in South Canterbury Bight • Trigger: 10 dolphins captured • Protected species risk management plans (PSRMPS), monitoring, individual vessel triggers, research (as outlined in the table 1).
Kaikōura Canyon	Set-net	• Set-net prohibited out to 4 nm offshore, except at the head of Kaikōura Canyon where commercial set-netting is only prohibited out to 1nm offshore.	• Area closure: extended to reflect 'Option Kaikōura', not including butterfish area • Monitoring: set-net vessels operating within 7nm between Clarence River and Point Gibson • Trigger: 4 dolphins captured • Protected species risk management plans (PSRMPS), monitoring, individual vessel triggers, research (as outlined in the table 1).		• Extend existing prohibition on all commercial and recreational set-netters out to 4nm.
	Trawl	• Low headline height (1 metre or less) required on trawl vessels within 2 nm of shore	• No measures proposed		
Monitoring		• N/A	• High-activity vessels, contributing to over 90% of the fishing effort will be required to have a camera system or carry an observer. • All setting and hauling events carried out by these vessels will be monitored to independently verify compliance with any required gear modifications.		

** Number of fishers affected reflects those who are likely to be severely impacted by the proposals.*

[2] Effect of low headline height and tow speed restriction on trawl operators is highly uncertain and has not been estimated.

[3] Both observer monitoring cost estimates and camera monitoring cost estimates under Package 1 account for approximately 1475 fishing days per year for high-activity trawl vessels, as well as 833 fishing days per year for the Kaikōura set-net fleet

[4] Both observer monitoring cost estimates and camera monitoring cost estimates under Package 2 account for approximately 1710 fishing days per year for high-activity trawl vessels, as well as 833 fishing days per year for the Kaikōura set-net fleet

Figure 4:

Proposed packages for the South Coast South Island

Summary of packages

Current management

The status quo does not achieve our objective.

Package 1

- Likely achieves proposed objectives
- $0.05 M in annual revenue lost
- $1.6 M in observer monitoring costs (Over 5 years)
- $1.05 M in camera monitoring costs (Over 5 years)
- Commercial sensitivity

Preferred

Package 2

- Likely achieves proposed objectives
- $0.09 M in annual revenue lost
- $1.9 M in observer monitoring costs (Over 5 years)
- $1.18 M in camera monitoring costs (Over 5 years)
- Commercial sensitivity

Package 3

- Likely exceeds proposed objectives
- $1.66 M in annual revenue lost
- Commercial sensitivity

Area	Method	Existing measures	Package 1	Preferred: Package 2	Package 3
South Coast South Island	Set-net	• Set-net prohibited within Te Waewae Bay and out to 4 nm offshore	• Area closure: extend the existing prohibition on all commercial and recreational set-net fishing out to 7 nm offshore.	• Area closure: extend the existing prohibition on all commercial and recreational set-net fishing to 10 nm offshore.	
	Trawl	• Low headline height (1 metre or less) required on trawl vessels operating within 2 nm of shore	• Monitoring: vessels operating within Te Waewae Bay • Trigger: 1 dolphin captured • Protected species risk management plans (PSRMPS), monitoring, individual vessel triggers, research (as outlined in the table 1).	• Gear modification and monitoring: headline height <=1m and tow speed <=2.5 kn and monitoring within Te Waewae Bay and 4 nm offshore • Trigger: 1 dolphin captured • Protected species risk management plans (PSRMPS), monitoring, individual vessel triggers, research (as outlined in the table 1).	• Area closure: prohibit all trawling within Te Waewae Bay and 4nm offshore. • Trigger: 1 dolphin captured • Protected species risk management plans (PSRMPS), monitoring, individual vessel triggers, research (as outlined in the table 1).
Monitoring			• High-activity vessels, contributing to over 90% of the fishing effort will be required to have a camera system or carry an observer. • All setting and hauling events carried out by these vessels will be monitored to independently verify compliance with any required gear modifications.		

**Number of fishers affected reflects those who are likely to be severely impacted by the proposals.*

[5] Some trawl operators may be affected, but the magnitude of this effect is highly uncertain and has not been estimated. It is likely to be low because >90% of fishing effort is undertaken with low headline height already in Te Waewae Bay.

Figure 5:

Proposed packages for the North Coast South Island

Summary of packages

Current management

The status quo does not achieve our objective.

Package 1

- Possibly achieves objective, but this is uncertain
- $0.28 M in annual revenue lost
- Commercial sensitivity

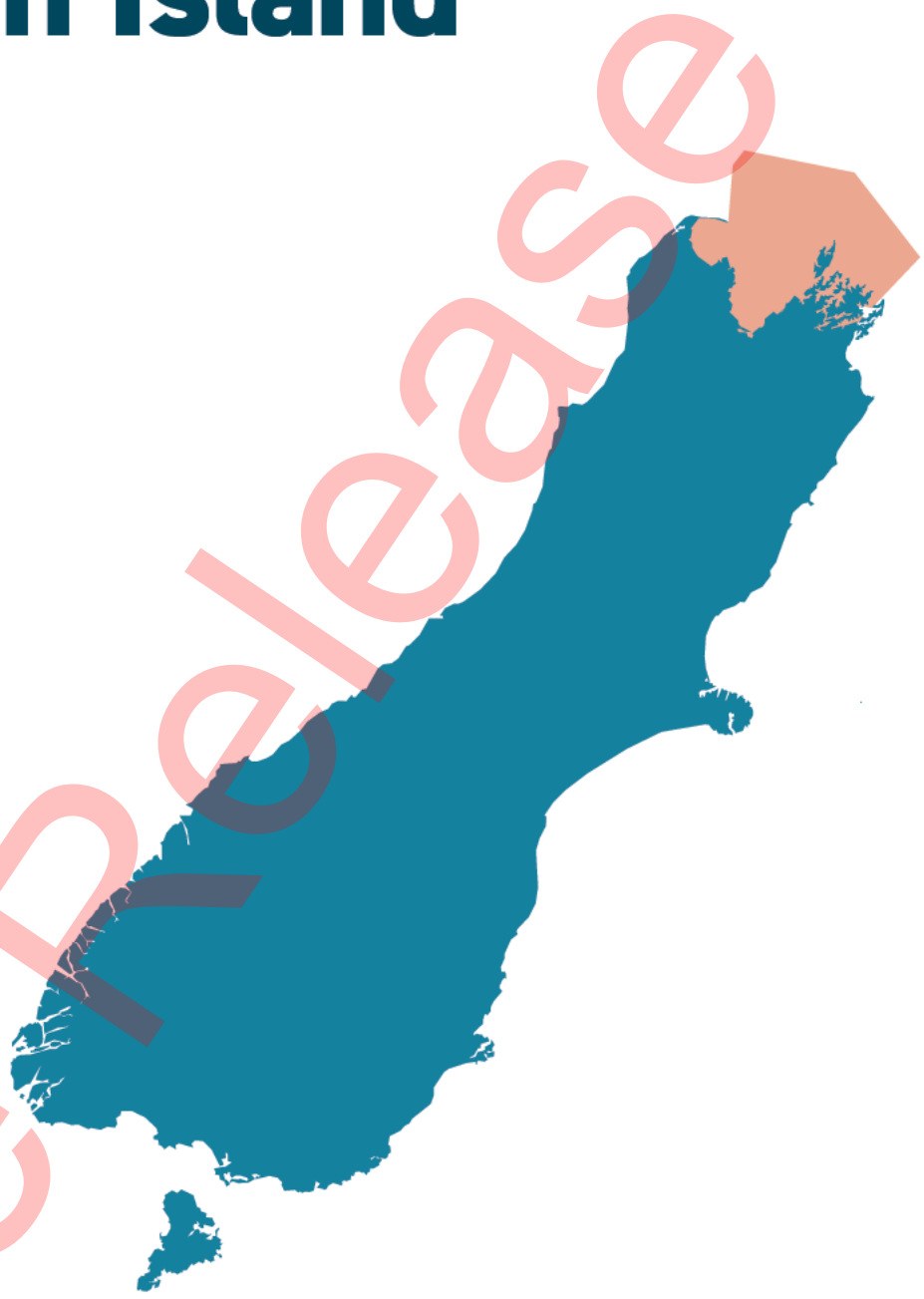
Preferred

Package 2

- Likely achieves proposed objectives
- $0.28 M in annual revenue lost
- $6.95 M in observer monitoring costs (Over 5 years)
- $2.0 M in camera monitoring costs (Over 5 years)
- Commercial sensitivity

Package 3

- Likely achieves proposed objectives
- $1.3 M in annual revenue lost
- $6.55 M in observer monitoring costs (Over 5 years)
- $1.96 M in camera monitoring costs (Over 5 years)
- Commercial sensitivity



Preferred

Area	Method	Existing measures	Package 1	Package 2	Package 3
North Coast South Island	Set-net	• No prohibitions on set-netting	• Area closure: prohibit all commercial and recreational set-netting out to 4 nm offshore		
	Trawl	• Trawling prohibited off Separation Point and subject to a seasonal prohibition within Golden Bay.	• No measures proposed	• Monitoring: vessels operating within Golden and Tasman Bays (inside a line from Farewell Spit to Cape Soucis) • Trigger: 1 dolphin captured • Protected species risk management plans (PSRMPS), monitoring, reporting and captures response, individual vessel triggers, research (as outlined in the table 1).	• Area closure: prohibit trawl out to 2 nm offshore within Golden and Tasman Bay • Monitoring: vessels operating within Golden and Tasman Bays (inside a line from Farewell Spit to Cape Soucis) and beyond 2nm from shore • Trigger: 1 dolphin captured • Protected species risk management plans (PSRMPS), monitoring, individual vessel triggers, research (as outlined in the table 1).
Monitoring			• High-activity vessels, contributing to over 90% of the fishing effort will be required to have a camera system or carry an observer. • All setting and hauling events carried out by these vessels will be monitored to independently verify compliance with any required gear modifications.		

**Number of fishers affected reflects those who are likely to be severely impacted by the proposals.*

1 MEASURES PROPOSED FOR SOUTH ISLAND TRAWL AND KAIKŌURA SET-NET

Fisheries New Zealand proposal

- Fisheries New Zealand supports an innovative approach to managing the effects of fishing-related mortality on South Island Hector's dolphins that would provide for greater collaboration with industry and other stakeholders.
- This approach is consistent with Te Ohu Kaimoana and industry comments in submissions about their willingness to develop such an approach.
- Industry representatives have confirmed this willingness in initial discussions.
- Such an approach is also consistent with the ability to be more flexible around managing risk from trawl fisheries in the South Island, particularly if option two set-net measures are implemented.
- The proposed approach is set out in Table 1 below. Table 1 contains proposals; the detail would be developed with the South Island Stakeholder Advisory Group as outlined under *Implementation*.
- See Part B4 for more analysis on the development of these proposals and Part B9 in relation to the proposed stakeholder group.

Implementation

- If you broadly support the approach, the first implementation step would be to stand up the South Island Stakeholder Advisory Group.
- DOC and Fisheries New Zealand would then work through details of the approach with members of that group.
- We would provide you with a briefing in May 2020 on the final details of the framework proposed (DOC will brief the Minister of Conservation).
- You have two alternative approaches available to implement the final framework:
    - Voluntary (Fisheries New Zealand would work with industry to have voluntary measures in place by 30 June 2020)
    - Mandatory (Fisheries New Zealand would aim to implement regulatory measures by the end of 2020)
- We believe that there is merit in considering a Memorandum of Understanding (MOU) led approach with industry. This approach would be consistent with the concept of fish plans and greater collaboration with the sector on resolving management issues.
- Fisheries New Zealand considers that Fisheries Inshore New Zealand (FINZ), as the main inshore fishing industry representative body, could lead the industry's participation in the MOU. We note that they have been successful in getting fishers to adopt such plans in other trawl and set-net fisheries.
- Performance would be monitored by the South Island Stakeholder Advisory Group and reviewed formally at the end of a year of operation.
- Fisheries New Zealand requests that you indicate a preference for implementation approach.
- If you are interested in exploring a voluntary approach, we will discuss this in confidence with industry representatives to confirm their support. In order to include details of the preferred approach in the paper to Cabinet, we will report back to you no later than 31 October 2019 on industry's final position. If industry is not willing or able to reach agreement, then the other option available to you for Cabinet advice is to regulate.

Table 1: Explanation of fisheries measures proposed.

South Island Stakeholder Advisory Group	• The proposed South Island Stakeholder Advisory Group is described in Part B9.
Protected Species Risk Management Plans (PSRMPs)	• Fisheries New Zealand (FNZ) and DOC will work with industry and through the Protected Species Liaison Officer programme to ensure that all vessels operating in specified areas have Protected Species Risk Management Plans (PSRMPs) on board. • PSRMPs will outline all steps that a specific vessel will take to mitigate captures of dolphins, including any gear restrictions that are required by regulation, and will also outline the steps that vessels will take in the event of a capture.

Gear Modification (trawl vessels only)	• In some areas, trawlers will be permitted to operate only if they meet operating specifications:
	  ○ headline height less than or equal to 1 metre; and,
	  ○ tow speed less than or equal to 2.5 knots.
	• Refer to Part B4 for more detail on the development of these gear modification proposals.
	• FNZ proposes to ensure vessels' adherence to gear modification through monitoring (see *Monitoring* in this table).
	• FNZ proposes to focus on headline height because this can be verified by cameras or observers, and tow speed because this can be verified by global positioning reporting.
	• FNZ does not recommend management of vessel size and/or vessel power at this time for the following reasons:
	  ○ The relationship between vessel size and risk of capture is not well understood, but will be investigated through the research component proposed to complement packages (see *Research* in this table).
	  ○ Restricting headline height and tow speed may be sufficient without controls on vessels size and power also. Again, this will be investigated by the research component proposed to complement packages.
	  ○ International experience suggests that vessel power limitations cannot be easily monitored or enforced.

Monitoring	• High-activity vessels, contributing over 90% of the fishing effort are proposed to have a camera system or carry an observer (either through regulation or MoU, depending on the implementation approach). • Setting and hauling events carried out by these vessels will be monitored to independently verify compliance with any required gear modifications. • Hauling events carried out by these vessels will be monitored to independently verify dolphin captures and to ensure compliance with voluntary reporting, response, and triggers. • Monitoring programmes will also be designed and targeted as necessary to inform research on mitigation techniques and improve risk assessment information (see *Research* in this table). The Monitoring section (Part B8) provides more detail.
Triggers	• Triggers are a tool that elicits a predetermined response to a specific number of deaths being reached. • Triggers are set lower than the population sustainability threshold, providing a stepwise approach that allows risk to be managed to avoid the threshold being breached. • FNZ would develop final triggers in consultation with industry and the South Island Stakeholder Advisory Group. However, FNZ proposed triggers are outlined below.

	Individual Vessel Triggers All individual vessel triggers will result in the requirement for fishers to produce a capture report. A capture report will outline information currently required under legislation, and include details of the incident and additional information useful to determine what additional mitigation could be used. Full details of the information that should be included in a capture report will be developed with input from the South Island Stakeholder Advisory Group. **One capture incident** • Fisher must provide a capture report to FNZ, DOC, and Fisheries Inshore New Zealand (FINZ) within 24 hours of a capture (single or multiple) • Fisher must land dolphin for necropsy (this requires additional collaboration with DOC to implement) **Two capture incidents within a fishing year (same vessel)** • Fisher must immediately stop fishing and return to port • Fisher must provide a capture report to FNZ/DOC/FINZ within 24 hours of capture • Fisher must liaise with FINZ immediately upon returning to port to determine course of action for additional mitigation, but may continue fishing • FINZ must complete a report to FNZ/DOC on incidents within 7 days outlining any additional mitigation avoidance proposed **Three capture incidents within a fishing year (same vessel)** • Fisher must immediately stop fishing and return to port • Fisher must provide a capture report to FNZ/DOC/FINZ within 24 hours of capture • Fisher must liaise with FINZ immediately upon returning to port to determine course of action for additional mitigation • FINZ must complete a report to FNZ/DOC on incidents within 7 days outlining any additional mitigation avoidance proposed • Fisher cannot operate within any low headline height/slow tow speed (or other high fishing mortality likelihood or consequence) area until assessment of incidents complete and additional mitigation determined by DOC, FNZ and FINZ.
	Subpopulation triggers **East coast South Island**: <u>20 dolphins captured</u> • Trigger response: FINZ will provide a report to the South Island Stakeholder Advisory Group within 14 days, and the Group will meet within 30 days to review report provided by FINZ and provide advice to FNZ and DOC. <u>40 dolphins captured</u> • Trigger response: Closure of the fishery. FINZ will provide a report to the South Island Stakeholder Advisory Group within 14 days, and the Group will meet to consider the report, determine appropriate response and possibility of further mitigation, and provide advice to FNZ and DOC. FNZ and DOC will work with industry to determine when fishing may recommence. • FNZ and DOC will update Ministers that a trigger has been reached and with other relevant information. <u>Maximum allowable number captured</u> • Trigger response: Fishery closed • FNZ and DOC will update Ministers that the maximum allowable level of deaths has been reached and with other relevant information. **South coast South Island**: <u>1 dolphin captured</u> • Trigger response: Closure of the fishery. FINZ will provide a report to the South Island Stakeholder Advisory Group within 14 days, and the Group will meet to consider the report, determine appropriate response and possibility of further mitigation, and provide advice to FNZ and DOC. FNZ and DOC will work with industry to determine if fishing can recommence. **North coast South Island**: <u>1 dolphin captured</u> • Trigger response: Closure of the fishery. FINZ will provide a report to the South Island Stakeholder Advisory Group within 14 days, and the Group will meet to consider the report, determine appropriate response and possibility of further mitigation, and provide advice to FNZ and DOC. FNZ and DOC will work with industry to determine when fishing may recommence.
	Local Population Triggers **Kaikōura**: <u>4 dolphins captured</u> • Trigger response: Temporary closure of the set-net fishery. FINZ will provide a report to FNZ and DOC outlining details of captures and further mitigation that can be implemented to allow fishing to recommence. Assessment and decision by FNZ and DOC required within 30 days of trigger. **Pegasus Bay**: <u>10 dolphins captured</u> • Trigger response: Temporary closure. FINZ will provide a report to FNZ and DOC outlining details of captures and further mitigation that can be implemented to allow fishing to recommence. Assessment and decision by FNZ and DOC required within 30 days of trigger **South Canterbury Bight to Timaru**: <u>10 dolphins captured</u> • Trigger response: Temporary closure. FINZ will provide a report to FNZ and DOC outlining details of captures and further mitigation that can be implemented to allow fishing to recommence. Assessment and decision by FNZ and DOC required within 30 days of trigger.
Research	• Research will be undertaken to test the effectiveness of gear modification in mitigating risk to dolphins. Other mitigation techniques would also be tested, such as acoustic pingers. New information gleaned from monitoring would be used to improve risk assessment outputs. • A research proposal for testing mitigation techniques would be developed and presented to the South Island Stakeholder Advisory Group in 2020. • The details of the research component and funding will be determined alongside the South Island Stakeholder Advisory Group, but may involve providing for special permits in gear modification areas.

Appendix Four: Technical Advice Paper and Appendix

Technical advice contents summary

HECTOR'S AND MĀUI DOLPHIN THREAT MANAGEMENT PLAN: TECHNICAL ADVICE

Fisheries New Zealand has provided you with a briefing (B19-0533) that contains our advice on options to manage the effects of fishing-related mortality on Hector's and Māui dolphins as part of a revised Hector's and Māui Dolphin Threat Management Plan (TMP).

This document contains the detailed technical analysis and background information to support the contents of the briefing and your decision-making process where required. Of particular note, it contains a more detailed discussion of submissions and Fisheries New Zealand's responses.

The document is divided into the following parts which broadly mirror the contents of the briefing. To aid in navigation of this paper each part is separated and tabbed. Each part also begins with a contents section. A high-level description of each part and its relevance to decision-making is outlined below.

We consider the sections of most importance to support decision-making are part B1 (statutory considerations and generic issues), B2 (Māori Rights and Interests), B3 (Māui dolphin), B4 (Hector's dolphin) and B6 (Socioeconomic impacts).

PART A: NEW VISION AND GOALS

Part A outlines the proposed vision, goals, population outcomes, and objectives for a revised TMP. This part also sets out your role relative to the role of the Minister of Conservation in relation to decision-making on the TMP.

PART B: MANAGING THE EFFECT OF FISHING-RELATED MORTALITY ON HECTOR'S AND MĀUI DOLPHINS

Part B provides technical advice on whether additional measures under the Fisheries Act 1996 (the Fisheries Act) are required to avoid, remedy or mitigate any adverse effects of fishing on the Hector's and Māui dolphin populations.

PART B1: STATUTORY CONSIDERATIONS

This part contains overarching matters that are relevant to your consideration including legal provisions and case law and generic issues raised by submitters (relevance of population outcomes, breadth of discretion afforded under the Fisheries Act and range of measures available to you.

This section, and B2, have been subject to detailed review by the Crown Law Office.

PART B2: MĀORI RIGHTS AND INTERESTS

Te Ohu Kaimoana and Māori have expressed particular concern about the impact of the proposals on their rights and interests. This part of the technical document outlines in detail your legal obligations, views of submitters and Fisheries New Zealand's response on these matters. It also provides detailed analysis around the rights and interests of Māori to ensure your decisions are consistent with your settlement obligations.

PART B3: WEST COAST NORTH ISLAND – MĀUI DOLPHIN

Part B3 contains analysis on whether additional measures are necessary to achieve proposed fisheries objectives for Māui dolphins and options to achieve those objectives within the context of the purpose, principles and provisions of the Fisheries Act. Key

information and areas of uncertainty are highlighted with respect to our knowledge of the population, and the fisheries-related risks to the dolphins. Proposed options to manage those risks, stakeholder views and estimated socioeconomic impacts are also discussed.

PART B4: SOUTH ISLAND – HECTOR'S DOLPHINS

Part B4 contains analysis on whether additional measures are necessary to achieve proposed fisheries objectives for Hector's dolphins. Proposed options to achieve those objectives, stakeholder views and estimated socioeconomic impacts are also discussed. .

PART B5: OTHER FISHERIES MANAGEMENT PROPOSALS

Part B5 contains analysis on the methods of ring netting and drift netting to resolve long-standing regulatory issues with use of these methods.

PART B6: SOCIOECONOMIC IMPACTS

Part B6 provides you with estimates of the economic impact of consultation options and post-consultation option packages for each subzone under the TMP review. The purpose of the economic impact analysis is to provide you with an understanding of the potential economic costs associated with each of the proposed packages and to illustrate the flow-on effects to the wider economy.

PART B7: TRANSITION ASSISTANCE

Part B7 provides you with advice to support your decision on whether some form of financial assistance or *ex gratia* payment is warranted to support stakeholders impacted by the TMP packages. This includes outlining existing compensation and *ex gratia* policy, a suggested approach, and implications of making such a decision.

PART B8: MONITORING

Part B8 contains analysis on monitoring including cost and implementation considerations for proposed options. Additional monitoring is a key component of Fisheries New Zealand's preferred options, particularly for Hector's dolphins.

PART B9: ENGAGEMENT

Part B9 provides further detail on the establishment of North Island and South Island stakeholder advisory groups to support ongoing performance monitoring of the TMP and trigger response.

HECTOR'S AND MĀUI DOLPHIN THREAT MANAGEMENT PLAN: TECHNICAL ADVICE

Fisheries New Zealand has provided you with a briefing (B19-0533) that contains our advice on options to manage the effects of fishing-related mortality on Hector's and Māui dolphins as part of a revised Hector's and Māui Dolphin Threat Management Plan (TMP).

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We consider the sections of most importance to support decision-making are part B1 (statutory considerations and generic issues), B2 (Māori Rights and Interests), B3 (Māui dolphin) and B4 (Hector's dolphin).

PART A: NEW VISION AND GOALS

Part A outlines the proposed vision, goals, population outcomes, and objectives for a revised TMP. This part also sets out your role relative to the role of the Minister of Conservation in relation to decision-making on the TMP.

PART A: NEW VISION AND GOALS

CONTENTS

1.1 Purpose

Part A of this Technical Advice paper outlines the decision-making roles for the Minister of Conservation and Minister of Fisheries for the review of the Hector's and Māui Dolphin Threat Management Plan (TMP). It outlines the proposed vision, goals, population outcomes, and objectives for the TMP, as well as submission views, and joint agency response and recommendations. Your decisions on these proposals are non-statutory.

1.2 Introduction

1.2.1 Threat Management Plan

In February 2018 you jointly confirmed the requirement for a review of the TMP. You also jointly agreed that the primary goal of the TMP is to achieve subpopulations that are thriving or increasing, supported by an enduring and effective threat management programme. The review of the TMP provides an opportunity to consider whether the current plan and associated measures reflects your view of the acceptable level of risk from human-induced threats to the dolphins.

The new information that has been compiled to support the TMP review includes:

- revised population and subpopulation estimates;
- comprehensive aerial surveys to estimate population size and spatial distribution for Hector's dolphins around the South Island;
- new sightings information;
- updated information from fisheries observers;
- information from the Department of Conservation's (DOC's) necropsy programme; and
- a spatial risk assessment of threats to Hector's and Māui dolphins (the risk assessment).

The discussion document for the Hector's and Māui Dolphin TMP that was released on 17 June for nine weeks included proposed vision, goals, population outcomes, and objectives for the TMP, and outlined the key scientific information to support these proposals.

Fisheries New Zealand and DOC received over 15,200 submissions across 9 key stakeholder groups. This included: 255 from commercial fishers, 65 from tangata whenua, 13,700 from environmentalists (including 13,650 prefilled forms), 14 from independent experts, 200 from recreational fishers, 4 from the petroleum industry, 8 from the seabed mining industry, 3 from local government authorities, and over 1,000 from the general public. There were also 3 petitions from environmental groups handed in to parliament, totalling over 76,000 signatures, and a petition from the Kawhia community with 140 signatures. See Appendix 1 for a summary of submissions.

1.2.2 Ministerial decision-making roles

The Minister of Conservation has specific powers under the Marine Mammals Protection Act 1978 (MMP Act). The MMP Act makes provision "for the protection, conservation, and management of marine mammals within New Zealand and within New Zealand fisheries waters". The Minister of Conservation has the power to define and declare, as well as vary marine mammal sanctuaries (sanctuary).

When varying a sanctuary, the Minister of Conservation may specify activities that may or may not be engaged in within the sanctuary, with the consent of any other Minister of the Crown who has the control of any Crown-owned land, foreshore, seabed, or waters of the sea which is declared to be a marine mammal sanctuary.

The Minister of Fisheries, under the Fisheries Act 1996 (the Fisheries Act) is responsible for ensuring fishing-related mortality of marine mammals or other wildlife is managed. The Minister may, "after consultation with the Minister of Conservation, take such measures he or she considers necessary to avoid, remedy or mitigate the effect of fishing-related mortality on any protected species". This can include setting a limit on fishing-related mortality and prohibiting all or any fishing or fishing methods in an area.

1.2.3 Submission summary

Environmental Defence Society (EDS) disagrees with the using the Fisheries Act to deploy tools to manage fishing effects on dolphins. EDS says that in the past, the use of Fisheries Act provisions for this purpose have been problematic, with several previous attempts to protect the dolphins under them being subject to lengthy legal challenges by the fishing industry.

The joint submission by Sanford, Moana and WWF (referred to as "Option 5") proposes an independent Commissioner for the Marine Environment who would be tasked with overseeing "a review of the governance landscape, spearhead the changes needed to ensure the recovery of these dolphin species (and the health of the marine environment generally) and help transition individuals and communities affected[1]". If this is not possible, then they suggest that the Parliamentary Commissioner for the Environment (PCE) should be undertaking an investigation into "The efficacy of the legal regime provided by existing legislation – particularly the Fisheries Act 1996 and Regulations, the Conservation Act 1987, the Marine Mammals Protection Act 1978 (MMP Act), the Marine and Coastal Area (Takutai Moana) Act 2011, the Crown Minerals Act 1991 and Regulations, among others[2]". In

[1] Page 22.

particular, they think the PCE should scrutinise the management of complex "mountains to the sea" issues such as toxoplasmosis, and consider how "the current legal regime interacts and how to streamline and remove complexity to ensure the clearest process and best outcomes".

Forest and Bird consider there is a greater role for the Resource Management Act 1991 (RMA) to play in how we manage the issues these dolphins face, including fishing. Forest and Bird referenced the Motiti High Court decision, which confirmed that environmental impacts of fishing can be addressed by the RMA provided it is not for a Fisheries Act purpose. This provides an opportunity for the Government to improve the environmental performance of New Zealand fisheries, including securing spatial protection of vulnerable populations of protected wildlife. The Government should use national direction (national standards and national policy statements) under the RMA, in the light of the Motiti decision, to further reduce bycatch and to assist regional implementation of the Motiti decision.

Response and recommendations

Cabinet has already agreed to address the risk from fishing through the Fisheries Act (refer to ENV-19-MIN-0024). Agencies consider the Fisheries Act is the most appropriate tool to manage fisheries-related risk because it is focused on the management of fishing and its impacts. Fisheries New Zealand and MPI are resourced to develop, implement, monitor and enforce fisheries-related measures. The option of managing the risk through the MMP Act is, however, available if the Minister of Conservation wishes to manage more conservatively than the Fisheries Act would allow. This could however lead to duplication in resources and confusion amongst stakeholders about rules and responsibilities.

1.3 Key information

1.3.1 Population status

Hector's and Māui dolphins are found only in New Zealand. Together they are considered to be one of the world's rarest dolphin species. Hector's and Māui dolphins are taonga and are an important part of New Zealand's marine biodiversity and natural capital stock. Human activities have had a major impact on these dolphins.

Māui dolphin, a subspecies of *Cephalorhynchus hectori*, are found only off the west coast of the North Island and are classified as Nationally Critical. The current population estimate for Māui dolphin is between 57 and 75. This estimate is based on a highly reliable genetic census completed in 2016. The available information suggests that over the past several decades the abundance of this subpopulation has declined.

The Hector's dolphin subspecies off the South Island comprise a much larger population than the Māui dolphin subspecies. Hector's dolphins inhabit the waters around most of the South Island. The population is estimated at approximately 15,700 individuals, based on aerial surveys. Genetic evidence supports the presence of distinct subpopulations. The most recent available information[3] shows that, in the

[3] MacKenzie, D. L. and Clement D.M. (2016) Cawthron Institute.

South Island, there are approximately 9,700 dolphins on the east coast, 5,500 on the west coast and 330 on the south coast. The north coast subpopulation is poorly understood. There are no reliable data to estimate population trends for Hector's dolphins at the scale of these subpopulations.

1.3.2 Human-induced threats

A spatial risk assessment has been developed to support consideration of the nature and extent of human-induced mortality to the dolphin populations (refer to Appendix 2 of this technical advice). The risk assessment estimates annual deaths and subpopulation-level risk for three main human-caused lethal threats: commercial set-net fisheries, commercial trawl fisheries, and toxoplasmosis. The rate that dolphins encounter a threat is estimated by the level of spatial overlap between the dolphin distribution and the threat distribution. The probability of death per encounter is estimated from fisheries observer data (for commercial fishery threats) or from cause of death identified by necropsy for beachcast bodies (for non-fisheries causes of death). Estimates of annual deaths for each subspecies from the three main human-caused threats are provided in Table 1.

Table 1 shows the mean (likely to be most accurate) estimate of deaths, as well as the 5th and 95th percentile estimates. What this effectively says is that we are 95 percent confident based on this analysis that the true annual number of deaths caused by a threat is lower than the 95th percentile estimates. The 5th percentile is the lowest estimate of deaths from the analysis, while the 95th percentile is the highest estimate of deaths from the analysis, for each particular threat. The relevance of this confidence interval for management is described in Parts B and C.

Table 1: Mean annual deaths of Māui and Hector's dolphins as published in the *Spatial risk assessment of threats to Hector's and Māui dolphins.*

	Mean annual deaths (5th to 95th percentile estimates)		
	Commercial Set-Net	Inshore Trawl	Toxoplasmosis*
Māui	0.10 (0 – 0.25)	0.02 (0 – 0.05)	1.9 (1.1 – 3.0)
Hector's	44 (21 – 80)	14 (1 – 43)	334 (132 – 625)

* Commercial fisheries deaths (set-net and inshore trawl) are based on fisheries observer data and have been estimated with a high level of certainty. Toxoplasmosis deaths have been estimated from necropsy proportions, which assumed an equal detection probability of toxoplasmosis and other causes of death, resulting in potential bias that may not be reflected in the ranges above.

The risk assessment showed that while fishing-related risks to dolphins have been significantly reduced in many areas where restrictions on fishing activity have been put in place between 2001 and 2013, fishing still poses a risk to Hector's and Māui dolphins in some areas. Toxoplasmosis was estimated to be a significant risk to Māui dolphins and potentially some Hector's dolphin subpopulations.

The uncertainty in the toxoplasmosis deaths (the large range in estimates shown in Table 1) is due to the small number of bodies available for necropsy. The estimation of commercial fishery deaths is independent of the estimation of toxoplasmosis and other non-fishery causes of death. As commercial fishing risk is estimated with high certainty, even if non-fishery related risk estimate changed, this would have negligible effect on the commercial fishery risk estimate. Part B provides further detail on where there may be bias in the risk assessment relating to fisheries risk and provides additional information to support decision-making. Potential bias and

uncertainty related to estimating each fisheries risk and toxoplasmosis risk is further outlined in Appendix 2 of this technical advice.

1.3.3 Submission summary

Submissions are comprehensive and detailed in their critiques of the risk assessment. Broadly speaking, the critiques all refer to the risk assessment inadequately dealing with uncertain information that goes into the model, and thus producing erroneous estimates of risk (again, at both ends of a spectrum in terms of which results might be over or underestimated).

The submissions run the full spectrum of criticism. Some disagree with the application of the risk assessment because they feel it purposefully over-represents toxoplasmosis risk and under-represents commercial fisheries risk. Other submitters disagree with the risk assessment because they feel it purposefully over-represents fisheries risk and under-represents toxoplasmosis risk.

The process for developing and peer reviewing the risk assessment was also a focus of many submissions. Some submissions applauded the efforts of agencies to involve a range of stakeholders in the development and review of the risk assessment. Some submissions suggested that the process for development of the risk assessment was inadequate and did not involve sufficient peer review of methodology or results (including submissions from the fishing industry, environmental NGOs (eNGOs), and university researchers).

1.3.4 Response and recommendations

The risk assessment was commissioned by Fisheries New Zealand in close collaboration with DOC and delivered by a team of independent and academic scientists led by NIWA, with data-sharing and collaboration from a number of New Zealand and overseas academic researchers. Fisheries New Zealand and DOC also commissioned an independent expert review workshop of the draft risk assessment (in July 2018) and incorporated reviewer suggestions to improve the risk assessment prior to its finalisation in early 2019.

Commercial fisheries impact is estimated independently of impact of other human-induced threats. The method by which commercial fisheries impact is estimated was endorsed by all independent reviewers. Changes in the estimate of non-fishing threats would not lead to changes in the estimate of commercial fishing impact. If toxoplasmosis were overestimated, unaccounted for deaths could only be explained by an increase in deaths assigned to causes other than commercial fisheries. If other human-induced impacts are not also managed, fisheries risk will still have been managed to support achieving the population outcome.

Ministers should take into careful consideration uncertainty in information when making decisions. The power of the risk assessment methodology is that it is able to account for most of the uncertainty so that decision-makers can have confidence in the outputs that they base their decisions on. Where the uncertainty is not accounted for by the methodology of the risk assessment, it can be described qualitatively so that decision-makers can still take this uncertainty into account. Important detail for decision-making on uncertainty and fisheries measures is described in relevant sections throughout Part B. Appendix 2 provides a detailed explanation of the nature

and consequences of different kinds of uncertainty and potential bias in the risk assessment.

1.4 Vision and goals

1.4.1 Vision statement

The vision statement is intended to state what success will look like. The vision statement used in previous iterations of the TMP was “Hector’s and Māui dolphins should be managed for their long-term viability and recovery throughout their natural range”.

The proposed new vision statement that you consulted on is:

New Zealand’s Hector’s and Māui dolphin populations are resilient and thriving throughout their natural range.

1.4.2 Long-term and medium-term goals

The goals in the initial TMP were to: ensure that the long-term viability of Hector’s and Māui dolphins is not threatened by human activities; further reduce impacts of human activities as far as possible, taking into account advances in technology and knowledge, and, financial, social and cultural implications.

Below are the new long-term and medium-term goals you consulted on.

Figure 1: Long-term and medium-term goals consulted on.

The new goals were proposed to better reflect the scale of management and the numerous aspects required to generate lasting outcomes to protect the dolphins.

1.4.3 Submission summary

Few submitters fully agreed with the Vision and Goals statements in the consultation document.

Environmental submitters generally wanted a stronger and more defined vision aimed at moving dolphins to being thriving or even to non-threatened status (ECO), along with measurable goals and a timeframe. Several of these submitters (for

example, Whale & Dolphin Conservation, EDS), objected to allowing any dolphin deaths from human activity.

Expert submitters supported the vision and goals but disagreed with the lack of measurable goals with no ability to determine success or failure. Independent experts (and Forest and Bird), highlighted that the goals have to include the connectivity of the recognised subpopulations.

Some fisher submitters and WWF, noted an absence of regard for the proposed TMP's impact on fishers and that it was overly focused on fisheries regulation. The extractive industries saw the vision and goals as being too idealistic and needing to be more focused to be effective.

The general public largely agreed with the vision and goals, but those who disagreed did so mainly because the Vision statement did not go fast or far enough towards protecting dolphins.

Māori supported the protection of Hector's and Māui dolphins and the intent of the vision. Ngāi Tahu and To Korowai supported the vision as proposed. Te Ohu Kaimoana submitted that that the word "thriving" in the proposed vision statement is not measurable and can only be assessed subjectively and suggested wording changes. Ngāti Ruanui sought that "range" was changed to "habitat".

Ngāi Tahu and Te Korowai supported the long-term goal. Te Ohu Kaimoana submitted that the goals were not quantifiable, time-bound or constrained by upper or lower limits.

Te Ohu Kaimoana, Ngāi Tahu and Ngāti Ruanui commented on Goal 3 in relation to understanding how tangata whenua wish to exercise kaitiakitanga of Hector's and Māui dolphins emphasising the importance of implementing this goal. Ngāi Tahu noted this goal must be given the same prioritisation as the other three goals and it required working in a Treaty partnership. Ngāti Ruanui sought that an additional goal be added: To give effect to the Treaty of Waitangi principles. They also suggested that goal 3 should be amended to: Understand how tangata whenua wish to exercise kaitiakitanga and tino rangatiratanga of Hector's and Māui dolphins and to give effect to it.

1.4.4 Response and recommendation

The proposed vision and goals have been developed with input from stakeholder forums and iwi, and are broadly supported in submissions. Submitters noted that the proposed goals will be difficult to measure and are not time-bound. Agencies acknowledge these concerns but consider that additional information is needed to establish goals which can be time-bound and measured. We therefore propose to revise the fourth medium-term goal "Improve knowledge of poorly understood threats" to "Improve knowledge of poorly understood threats to support long and medium-term goals which are effectively targeted, measurable, and time-bound".

In relation to goal 3, agencies agree with the importance of implementing this goal and that it requires working in a Treaty partnership. As part of the next steps in finalising the TMP, agencies will work with tangata whenua, including updating this goal to reflect those discussions.

1.5 Subpopulations

Hector's dolphins (*Cephalorhynchus hectori hectori*) and Māui dolphin (*Cephalorhynchus hectori maui*) were designated subspecies of *Cephalorhynchus hectori* in 2002 in recognition of genetic differences.

For the purposes of the TMP, we propose to manage Hector's and Māui dolphins on the basis of subpopulations. This approach recognises the separate subspecies, as well as distinct biological populations of Hector's dolphins.

We propose to continue to manage at a subpopulation scale, in recognition that:

- there is real genetic contrast between subpopulations and genetic diversity is a consideration to support overall viability of the species;
- nature and level of human activities and other threats varies between areas;
- interests of tangata whenua and local communities differ in how activities and risks are managed at the local level in their particular locations, including at scales that are smaller than the recognised populations.

New information from aerial surveys, genetic analyses, and sightings data, was used in the risk assessment to help estimate the distribution and density of dolphins. The new information provides evidence for managing impacts on dolphins at the level of subpopulations, and it provides updated estimates of population size and trends.

1.6 Population outcomes

Agencies recommend setting population outcomes for the subpopulations of Hector's and Māui dolphins to define the long-term goal ("*Ensure known human-caused threats are managed within levels that allow subpopulations to thrive and recover*").

The following sections present the proposed population outcomes that were consulted on, submission points, and responses to those submissions. Both Ministers are responsible for taking decisions about the population outcomes jointly and will need to decide on population outcomes in the context of their specific statutory considerations provided in Parts B and C[4].

Population outcomes set the level that aim to allow subpopulations to recover to by managing the impacts of human-caused threats to those subpopulations. How to achieve the population outcomes is further defined through objectives in the next section, providing more guidance for reducing the impact of particular threats.

1.6.1 Proposals

Māui dolphins

You consulted on the following population outcome for Māui dolphins:

***Māui dolphins: Human impacts are managed to allow the population to increase to a level at or above 95 percent of the maximum number of dolphins the environment can support*.**

[4] Part C sits with the Minister of Conservation and sets out the proposal for a Toxoplasmosis Action Plan.

A population outcome of 95 percent means the human-induced deaths (both fisheries-related deaths and deaths from toxoplasmosis) need to be as near as practicable to zero.

Hector's dolphins

Agencies consulted on the following population outcome for Hector's dolphins:

Hector's dolphins: Human impacts are managed to allow each subpopulation to increase to a level at or above 90 percent of the maximum number of dolphins the environment can support.

1.6.2 Submission summary

Most submissions supported setting population outcomes in principle; however, many challenged and critiqued the population outcomes that were consulted on. Some submissions did not support setting population outcomes as described in the consultation material, and they challenged the scientific basis for the proposals. Submission points are summarised under the headings below.

Proposed population outcomes are too high or too low

In summary, comments from submitters were conflicting and represented two ends of a spectrum: Some submissions considered that the proposed population outcomes did not go far enough and would not ensure recovery of Hector's and Māui dolphin populations. Other submissions considered that the population outcomes went too far and were overly cautious in allowing for recovery of Hector's and Māui dolphin populations.

Some submissions (fishing industry and Te Ohu Kaimoana in particular), suggest that the population outcomes go too far in that they aim for a higher target than is necessary to ensure recovery of the dolphin populations. These submitters also note that there is no statutory framework for setting the population outcomes, and in particular, that the proposed population outcomes do not align with the Minister of Fisheries' statutory obligations under the Fisheries Act. Comments in relation to the Fisheries Act and proposed fisheries management are discussed further in Part B1.

Agency response

Agencies propose population outcomes as a policy tool for guiding efforts to reduce impacts of human-induced threats on Hector's and Māui dolphins. There is no statutory basis for setting population outcomes. However, in stakeholder and iwi engagement meetings there was a consensus that managing a protected marine mammal population at a level comparable to what is used for harvested fish stocks was not consistent with the aspirations of most New Zealanders. At these meetings, most stakeholders felt that an outcome in the range of 80 percent to 95 percent would appropriately reflect the aspirational goal that all subpopulations are "thriving".

Population outcomes do not provide a target population size or a timeframe for recovery of populations

Many submitters commented that the population outcomes were inadequate because they do not provide a target population size for rebuilding each Hector's and Māui dolphins to, nor do they provide a timeframe for recovery of the dolphin populations.

Agency response

It is not possible to specify population size targets or recovery timeframes, because the maximum number of dolphins the environment can currently support is not known.

Population outcomes are set at the wrong scale

Population outcomes are expressed primarily at the subpopulation scale (such as population recovery objectives are defined separately for four Hector's dolphin subpopulations around the South Island). Some submitters commented that the evidence and/or legislation did not support managing at such small scales, and that managing at the subpopulation scale creates the need for disproportionately more onerous management measures than would be needed to ensure recovery of the species as a whole. Other submitters commented that the population outcomes were defined at scales that were too large, so that the risk assessment did not provide for managing impacts on smaller local populations, which may be important for genetic diversity or culturally important to local communities.

Agency response

The decision to set population objectives at the subpopulation scale is supported by genetic evidence, which indicates that dolphins on different coasts do not mix very often. Where appropriate, management measures have been developed at local scales, for example fishing management measures for Kaikōura. The appropriate scale of fisheries management measures is explained further in Part B1.

Alternatives proposed in submissions

Some submitters suggested alternative targets for the population outcomes. The alternative targets focused on the application of population objectives for fisheries management proposals and are discussed further in Part B1.

1.6.3 Recommendations

In 2018, you and the Minister of Conservation jointly agreed that the primary goal of the TMP is to achieve subpopulations that are thriving or increasing, supported by an enduring and effective threat management programme.

Setting desired population outcomes helps to further define this goal, by setting the level at which management will aim to keep threats below for each population. A range of population outcomes could be chosen.

For Māui dolphins, we recommend setting a very high population outcome at or above 95 percent of the maximum number of dolphins the environment can support, as consulted on. The outcome is comparable to the most precautionary approaches proposed in other jurisdictions, in particular, the standard the United States uses under their Marine Mammal Protection Act.

The Hector's dolphin population is larger than the Māui dolphin population and is therefore expected to be more resilient to threats.

For Hector's dolphins we recommend setting the population outcome to a level at or above 90 percent of the maximum number of dolphins the environment can support.

Further information on population outcomes and recommended management actions to help achieve them under the Fisheries Act, is provided in Part B1.

1.7 Objectives

Agencies consulted on your behalf on objectives for the ongoing engagement and research components of the TMP. Agencies also consulted on objectives for managing threats from fisheries, toxoplasmosis and other non-fishing activities.

We recommend that you both jointly agree on the engagement and research objectives, and so have provided detail on these below.

1.7.1 Engagement objectives

The engagement objectives consulted on were:

- New Zealanders are aware of, and can identify, Hector's and Māui dolphins;
- improved public understanding of the reasons and processes to report sightings;
- improved public understanding of the reasons and processes to report live strandings and beachcast dolphin carcasses; and
- improved public understanding of how threats from activities that can cause human-induced effects of the dolphins are being managed.

The associated engagement performance measures consulted on were:

- high rates of reporting by the public of beachcast dolphin carcasses, and that carcasses are recovered in fresh condition leading to successful necropsy;
- regularly published fisheries compliance statistics, especially when set-netting is involved;
- regular standardised reporting of fisheries capture events;
- regular standardised reporting of sightings;
- stakeholder advisory group operating from 2020; and
- regular engagement with iwi, including through possible tangata whenua advisory group.

The key points of stakeholder feedback received on the engagement objectives are outlined below.

The Biosecurity Special Interest Group submitted that desired behaviour change by pet owners was needed as an additional engagement objective and performance measure. The SPCA supports the engagement objectives, and inclusion of education and advocacy for humanely controlling cat populations.

Environmental groups Forest and Bird and ECO, support the engagement objectives but want more clarity and detail. Our Seas Our Future argued that a higher degree of public engagement is required, and the TMP needs to state how individuals can manage their own activities to reduce threats.

Waikato Regional Council noted that that the proposed engagement performance measure ("high rates of reporting by the public of beachcast dolphin carcasses, and that carcasses are recovered in fresh condition") will be challenging due to the low number of Māui dolphins, the extensive coastline, the west coast's relatively low

human population, and inaccessibility. The Taranaki Regional Council considers a public engagement strategy on toxoplasmosis will also be necessary, and that this will require strong direction and support (including funding) from central government.

Te Korowai o Te Tai o Marokura supported the enhanced engagement objectives. It would like to see more specific engagement through the statutory body (The Kaikōura Marine Guardians) implemented under the Kaikōura (Te Tai o Marokura) Marine Management Act 2014. Ngāi Tahu broadly supported the engagement objectives, but requested further information on the proposed "tangata whenua advisory group", which they supported.

Recommendation

Taking into account feedback from submissions, we propose replacing the engagement performance measure: *"high rates of reporting by the public of beachcast dolphin carcasses, and that carcasses are recovered in fresh condition leading to successful necropsy"* with *"regular standardised reporting of necropsies".*

Some submitters suggested including engagement objectives or performance measures specifically focused on cats and toxoplasmosis (for example, cat owner behaviour change; education and advocacy for humane animal control). We agree these will be an important part of toxoplasmosis threat mitigation, and will be addressed by the Toxoplasmosis Action Plan (in Part C).

1.7.2 Research objectives

The research objectives consulted on were:

- improve information on cause of death of beachcast dolphins;
- improve understanding of diseases impacting Hector's and Māui dolphins;
- improve information on dolphin distribution and movements;
- improve information on distribution of dolphin prey;
- continue monitoring population size, trends and factors important to population growth for Māui and Hector's dolphins;
- improve information on fisheries impacts;
- improve estimation of dolphin subpopulation status and trends; and
- research advisory group operating from 2020.

The key points of stakeholder feedback on the research objectives are outlined below.

Environmental group Forest and Bird supports the research objectives but believed the stakeholder and tangata whenua research development process needs to happen promptly. It suggested three major research priorities: genetic recapture studies to understand Māui and Hector's size, trend, age structure and health; use acoustic studies, public sightings in low density areas, and electronic/GPS tagging to understand habitat use; and improve risk assessment models through better estimates of fishing effort and the estimate of catchability for different fisheries and gear types.

ECO also believed the research objectives need to be broadened to help implementation of the plan. These include: improve information on fishing methods

that do not catch marine mammals; research the indirect effects of fishing on the dolphin's habitat; research and monitoring of any mineral activity that remains adjacent to the dolphin's habitat; and research into the scope, size and threats to the east coast North Island population. Our Seas Our Future submitted the research objectives are unsatisfactory.

Trans-Tasman Resources submitted that the research objectives be expanded to include seabed mining.

SPCA advocated including animal welfare and social science research objectives in the TMP. The Marine Science Society submitted the research objectives were helpful but needed to be clearer so information is sufficient to measure progress.

Ngāti Ruanui supported a national research co-ordination process and recommended that the programme includes the Kaupapa Māori Research and Monitoring Paradigm – undertaken by Māori, for Māori, with Māori. It argued participation of Māori in the entire research process is essential if the confidence of whānau, hapū and iwi in research is to be restored.

Recommendation

Agencies recognise the need to involve Māori, experts and stakeholders in developing a robust research process that informs future decision-making on the management of Hector's and Māui dolphins, and therefore propose the following revised research objectives:

A research advisory group operating from early 2020 that will refine and prioritise research to develop a five-year research plan, which could include the following:

- improve information on cause of death of beachcast dolphins;
- improve understanding of diseases impacting Hector's and Māui dolphins;
- improve information on dolphin distribution and movements;
- improve information on distribution of dolphin prey;
- continue monitoring population size, trends and factors important to population growth for Māui and Hector's dolphins;
- improve information on fisheries impacts;
- improve estimation of dolphin subpopulation status and trends; and
- the research advisory group will report annually to a Stakeholder Advisory Group.

1.7.3 Fisheries management objectives

Government agencies consulted on your behalf on the following fisheries management objectives.

Ensure that dolphin deaths arising from fisheries threats do not:

- exceed population sustainability thresholds set to achieve the applicable population outcome with 95 percent certainty;
- cause localised depletion;
- create substantial barriers to dispersal or connectivity between subpopulations.

You will be making decisions on the final fisheries management objectives for the TMP, in consultation with the Minister of Conservation. We have provided details of

the stakeholder feedback received in Part B of the advice, for the Minister of Fisheries' consideration.

1.7.4 Toxoplasmosis management objectives

The toxoplasmosis management objectives consulted on behalf of the Minister of Conservation were:

- reduce the number of dolphin deaths caused by toxoplasmosis to near zero; and
- improve knowledge on toxoplasmosis to increase ability to take actions to reduce this threat.

The associated performance plan components consulted on were:

- testing all dolphin carcasses for toxoplasmosis, even if it was not the primary cause of death;
- reporting on research results through existing science working groups and provide opportunities for stakeholders to engage; and
- re-evaluating the Toxoplasmosis Action Plan against the above two objectives within five years of the TMP being updated,

The Minister of Conservation will be making decisions on the final toxoplasmosis management objectives and performance measures in the TMP. DOC have therefore provided details of the stakeholder feedback received in Part C of the advice, for the Minister of Conservation's consideration.

1.7.5 Other non-fisheries related threat management objective

The other non-fisheries related threat management objective consulted on behalf of the Minister of Conservation was:

- Ensure adverse effects on dolphins from other human-induced threats are avoided or minimised.

The Minister of Conservation will be making decisions on the final other non-fisheries related threat management plan objective in the TMP. DOC have therefore provided details of the stakeholder feedback received in Part D of the advice, for the Minister of Conservation's consideration.

PART B: MANAGING THE EFFECT OF FISHING-RELATED MORTALITY ON HECTOR'S AND MĀUI DOLPHINS

Part B provides technical advice on whether additional measures under the Fisheries Act 1996 (the Fisheries Act) are required to avoid, remedy or mitigate any adverse effects of fishing on the Hector's and Māui dolphin populations.

PART B: MANAGING THE EFFECT OF FISHING-RELATED MORTALITY ON HECTOR'S AND MĀUI DOLPHINS

Part B presents advice specifically for the Minister of Fisheries. Following from the overarching goals proposed in Part A, Part B of this technical advice focuses on your statutory obligations under the Fisheries Act. Part B details Fisheries New Zealand's assessment of proposed changes to the TMP, including possible measures under the Fisheries Act to avoid, remedy or mitigate the effect of fishing-related mortality on Hector's and Māui dolphins.

PART B1: STATUTORY CONSIDERATIONS

This part contains overarching matters that are relevant to your consideration including legal provisions and case law and generic issues raised by submitters (relevance of population outcomes, breadth of discretion afforded under the Fisheries Act and range of measures available to you. This part also

This section, and B2, have been subject to detailed review by the Crown Law Office.

B1: STATUTORY CONSIDERATIONS

CONTENTS

1.1 Purpose

Part B1 of this technical advice contains overarching matters that are relevant to your consideration, including legal provisions and case law, as well as generic issues raised by submitters (relevance of population outcomes, breadth of discretion afforded under the Act and range of measures available to you).

1.2 Process

The specific legislative provision in relation to managing the effects of fishing-related mortality on protected species is found in section 15 of the Fisheries Act. Any decision you make to implement new or additional measures will be made under section 15(2) of the Fisheries Act.

1.2.1 Consultation

Before doing anything under section 15(2) of the Fisheries Act:

- *Section 12(1)(a) of the Fisheries Act requires you to consult with such persons or organisations as you consider are representative of those classes of persons having an interest in the stock or the effects of fishing on the aquatic environment in the area concerned. This includes Māori, environmental, commercial and recreational interests.*
- *Section 12(1)(b) requires you to provide for the input and participation of tangata whenua having a non-commercial interest in the stock concerned, or an interest in the effects of fishing on the aquatic environment in the area concerns, and have particular regard to kaitiakitanga.*

Public consultation

As noted in Part A, a nine-week consultation period was provided for the review. This included a two week extension given the nature of proposals being consulted on, and high level of public and stakeholder interest.

During that period, Fisheries New Zealand held ten meetings with potentially affected fishers throughout New Zealand. Fisheries New Zealand and the Department of

Conservation (DOC) also held joint meetings with eNGOs. Nine public meetings were also held throughout New Zealand attended by approximately 370 people. The volume and breadth of submissions received is outlined in Part A, and the summary of submissions provided in Appendix 1.

Input and participation of tangata whenua

To give effect to your section 12(1)(b) of the Fisheries Act duty, the Ministry for Primary Industries established Iwi Fisheries Forums as a platform for input and participation. It also helped the Iwi Forums develop Iwi Forum Fisheries Plans to document the objectives of iwi in their exercise of kaitiakitanga. Further details of this requirement are outlined in the Māori rights and interests section (refer to B2).

The views of iwi provided through Iwi Fisheries Forums, and the content of Forum Fisheries Plans are the main ways in which input and participation of tangata whenua is provided for. Input and participation was provided through a series of initial hui between March and May 2018. A working group of Ngāi Tahu representatives engaged on the review of the TMP and met separately with officials in May and November 2018.

Iwi were also invited to participate in North and South Island stakeholder forums to develop the vision, objectives and principles for the review of the TMP. These occurred between June and December 2018.

1.3 Considerations for decision-making

1.3.1 Key legislative provision

Section 15

Section 15(1) of the Fisheries Act relates to your obligations and discretion if a Population Management Plan has been approved under section 14F of the Wildlife Act 1953 or section 3E of the MMP Act. No such plan is in place for Māui or Hector's dolphins.

Section 15(2) of the Fisheries Act allows you, in the absence of a Population Management Plan and after consultation with the Minister of Conservation, to take such measures that you consider are necessary to avoid, remedy, or mitigate the effect of fishing-related mortality on any protected species.

Section 2 of the Fisheries Act defines protected species to mean: any marine wildlife as defined in section 2 of the Wildlife Act that is absolutely protected under section 3 of that Act; and any marine mammal as defined in section 2(1) of the MMP Act. All marine mammals (as defined in the MMP Act) are "protected" for the purposes of section 15 of the Fisheries Act. Therefore, Hectors and Māui dolphins are protected species.

You must consider what is "necessary" in light of the purpose and principles of the Fisheries Act. Such measures may include, but are not limited to, setting a limit on fishing-related mortality. Any sustainability measure set under section 15(2) of the Fisheries Act would be introduced by way of regulation.

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

Case law on section 15(2)

Previous cases provide guidance on how section 15(2) of the Fisheries Act is to be applied. Importantly, these cases recognise the difference between your obligations in relation to a harvestable species and a protected species.

The sea lion case

The first case to consider section 15(2) of the Fisheries Act concerned fishing-related mortality of the New Zealand sea lion associated with squid fishing activity. In that case, the Squid Fishery Management Company Ltd successfully challenged the Minister of Fisheries' determination of the maximum allowable limit on fishing-related mortality (MALFiRM) for sea lions in the SQU6T fishery.[1]

In upholding the challenge, the Court of Appeal made the following key observations:

- *Section 15(2) requires the Minister to make a value judgement as to what measures are "necessary" to avoid, remedy or mitigate the effect of fishing-related mortality on a protected species taking into account the information principles in section 10.*[2]
- *"Fishing-related mortality" refers only to the death of protected species in the course of fishing activity, and what is important is the impact of fishing on the population as a whole. The section does not provide for measures aimed simply at eliminating or reducing individual deaths.*[3]
- *The legislative framework requires the Minister to "form a view as to the extent to which (or perhaps the point at which) utilisation of the [resource] threatened the sustainability of the [protected species] population."*[4]
- *The risk to the protected species on the one hand must be balanced against the advantages of utilisation on the other.*[5]
- *However, the Minister is not required to adopt a "cusp rule". "The point of the exercise is not to arrive at a number of [the protected species] which can be harvested sustainably, and thinking associated with sustainability of a harvestable species is not appropriate. … Optimum usage does not equate to maximum usage."*[6]
- *A precautionary approach, resolving uncertainties against utilisation and in favour of conservation, is available to the Minister.*[7]

Notably, it was the failure to identify the extent to which utilisation of the squid fishery threatened the sustainability of the sea lion population that led to the decision being

[1] *Squid Fishery Management Ltd v Minister of Fisheries and Anor*, unreported, Court of Appeal, CA39/04, 13 July 2004.
[2] At [79]-[80].
[3] At [7].
[4] Ibid.
[5] At [75] and [77].
[6] At [77].
[7] At [79].

set aside. As a consequence, the Court considered the Minister did not understand the "degree of head-room" available between the MALFiRM chosen and the point at which the agreed conservation criteria were not met.[8] Fisheries New Zealand notes that the full range of options available to you is outlined in relation to Māui and Hector's dolphins in Part B3 and Part B4.

Challenge to first threat management plan

The Court of Appeal's judgment was applied by Mallon J in *New Zealand Federation of Commercial Fishermen Inc & Ors v Minister of Fisheries & Anor*,[9] which involved a challenge to measures to protect Hector's and Māui dolphins in accordance with the first TMP.

The challenge was largely unsuccessful, but the Minister was held to have erred in his decisions:

- *to extend the 4 nautical mile set-netting prohibition to 7 nautical miles in the west coast of the North Island; and*
- *not to exempt targeted fishing for butterfish in the east coast of the South Island.*

In both instances, the Minister was shown to have been given inaccurate advice.

Of relevance for present purposes, Mallon J observed that:

- *What measures are necessary under section 15(2) depends on what those measures are to be directed to. "The section does not require that the effect be one that threatens their survival. An effect on dolphins might, for example, be one that slows the rebuilding of dolphin numbers or, for example, which increases population fragmentation in a way that is undesirable for the dolphin species."*[10] *The risk identified by the Minister was a decline in the population or a halt to the growth of the population.*[11]
- *Section 15(2) does not require that the effect on the protected species has already occurred before measures can be taken: "[b]y providing for measures directed to 'avoiding' the effect, the section permits pre-emptory measures, as well as measures to 'remedy' effects that have already occurred. The section therefore requires that there at least be some risk of an effect from fishing-related mortality on the [protected species]."*[12] *Taking a precautionary approach, it was open to the Minister to take the view that "the relatively large and arbitrary further extension [of a closed area]" was "necessary" on the information available.*[13]
- *A balance between utilisation and sustainability must always be struck whether the decision concerns harvestable stock or a protected species. "However,*

[8] At [104]. In that case, the overall conservation management objectives were to ensure the sea lion population remained above 90 percent of its carrying capacity, or else remained above 90 percent of the level it would obtain in the absence of fishery by-catch, 90 percent of the time in 20 and 100 year runs.
[9] Unreported, High Court, Wellington, CIV-2008-485-2016, 23 February 2010.
[10] At [201].
[11] At [205].
[12] At [202].
[13] At [165].

neither s 15(2) nor the purpose provision [s 8] require that the Minister can only make a decision which decreases utilisation if he has information which establishes that this is necessary to ensure that the existing numbers of [a protected species] are not affected. It is not a case of identifying the number of dolphins that can be [sustainably killed] and allowing maximum utilisation up to that point. He can decrease utilisation to avoid an effect if the information about that effect is uncertain (taking into account that uncertain information is not a reason for postponing a measure intended to achieve the purpose of the Fisheries Act).”[14]

- *The Minister is not able to assess whether a measure is “necessary” without an accurate assessment of the risks.*[15]

1.3.2 Other relevant legislative provisions

Purpose of the Fisheries Act 1996

Any measures taken under the Fisheries Act must be consistent with the purpose of the Fisheries Act: to provide for the utilisation of fisheries resources while ensuring sustainability (section 8).

“Fisheries resources” is broadly defined in section 2 of the Fisheries Act as any one or more stocks or species of fish, aquatic life or seaweed, and “ensuring sustainability” and “utilisation” are defined in section 8(2) of the Fisheries Act as:

> **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
>
> **utilisation** means conserving, using, enhancing, and developing fisheries resources to enable people to provide for their social, economic, and cultural well-being.

“Effect” is also defined in section 2 of the Fisheries Act and means the direct or indirect effect of fishing. It includes: Any positive or adverse effect; and any temporary or permanent effect; and any past, present, or future effect; and any cumulative effect which arises over time or in combination with other effects regardless of the scale, intensity, duration, or frequency of the effect. It also includes: any potential effect of high probability; and any potential effect of low probability which has a high potential impact.

The Courts have given further consideration to the purpose of the Fisheries Act. In “the Kahawai case” the Supreme Court held that:[16]

[14] At [204].
[15] At [246].
[16] *New Zealand Recreational Fishing Council Inc v Sanford Ltd* [2009] NZSC 54, [2009] 3 NZLR 438 at [39]. Emphasis added.

> [Section 8] expresses a single statutory purpose by reference to two competing social policies reflected in the Fisheries Act. Those competing policies are "utilisation of fisheries" and "ensuring sustainability". … The statutory purpose is that both policies are to be accommodated as far as is practicable in the administration of fisheries management under the quota management system. But recognising the inherent unlikelihood of those making key regulatory decisions under the Fisheries Act being able to accommodate both policies in full, s 8(1) requires that in the attribution of due weight to each policy that given to utilisation must not be such as to jeopardise sustainability. *Fisheries are to be utilised, but sustainability is to be ensured.*

A balance between utilisation and sustainability must always be struck. In relation to a protected species, the risk to the protected species must be balanced against the advantages of utilisation. But, as set out above in relation to section 15(2) of the Fisheries Act, this does not require you to allow utilisation up to the point it threatens the long-term viability of a protected species and you are entitled to adopt a precautionary approach.

Enabling people to provide for their social, economic and cultural wellbeing is a relevant consideration when setting a sustainability measure (including under section 15(2)) of the Fisheries Act. It is up to you to determine how much weight to give to wellbeing in making your overall decision.

As more restrictive sustainability measures are likely to have a greater impact on utilisation, the selection of the most appropriate suite of measures requires you to weigh the benefits of more effective mitigation against the costs that are likely to be associated with those measures.

Environmental principles

Section 9 of the Fisheries Act contains environmental principles that you must take into account when making a decision under the Fisheries Act relating to the utilisation of fisheries resources or ensuring sustainability. These principles are:

(a) associated or dependent species should be maintained above a level that ensures their long-term viability;
(b) biological diversity of the aquatic environment should be maintained;
(c) habitat of particular significance for fisheries management should be protected.

"Associated or dependent species" is defined in section 2 of the Fisheries Act as any non-harvested species taken or otherwise affected by the taking of any harvested species. "Harvested species" is defined as any fish aquatic life, or seaweed that may for the time being be taken with lawful authority.

We consider that Hector's and Māui dolphins are affected by the taking of harvested species and they are therefore an associated or dependent species as defined in the Fisheries Act.

"Biological diversity" is defined in section 2 of the Fisheries Act as meaning the variability among living organisms, including diversity within species, between species and of ecosystems.

In relation to any decision to avoid, remedy or mitigate the effects of fishing-related mortality on Hector's and Māui dolphins, we consider you should take account the importance of maintaining:

(a) the Hector's dolphin species above a level that ensures their long-term viability; and
(b) the genetic diversity within the species (Hector's and Māui dolphins as subspecies), including the viability of the genetically distinct subpopulations, in the aquatic environment.

Information principles

Under section 10 of the Fisheries Act, decision-makers are required to take into account four information principles. You should take into account the best available information; consider any uncertainty in the information available; be cautious when information is uncertain, unreliable, or inadequate; and not use the absence of, or any uncertainty in, any information as a reason for postponing or failing to take any measure to achieve the purpose of the Fisheries Act.

"Best available information" is defined in section 2 of the Fisheries Act as "the best information that, in the particular circumstances, is available without unreasonable, cost, effort, or time."

As discussed throughout this paper there is limited information on some issues, such as the effectiveness of the mitigation measures that are currently in place. However, we consider that we have used the best available information in developing the advice and uncertainty in the information should not be used as a reason for postponing or failing to take measures to achieve the purpose of the Fisheries Act.

International obligations and Treaty of Waitangi (Fisheries Claim) Settlement Act

Section 5 of the Fisheries Act requires you to act in a manner consistent with:

(a) New Zealand's international obligations relating to fishing; and
(b) the provisions of the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992.

New Zealand is party to a number of relevant international conventions. These conventions generally require States to take measures to protect and preserve the marine environment, and mitigate the effects of fishing-related mortalities on threatened species.

The proposals in this paper are consistent with these obligations. In particular, they are consistent with Article 65 of the United Nations Convention on the Law of the Sea, which provides that a State may prohibit, limit or regulate the exploitation of marine mammals more strictly than marine resources generally; and with Articles 6, 8 and 10 of the Convention on Biodiversity, which commit New Zealand to taking steps to promote the recovery of threatened species.

The proposals in the draft TMP are not inconsistent with the provisions of the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992.

When it comes to commercial fisheries, the interests of Māori must be carefully considered, along with all those having interests in those fisheries, but we do not consider that the lawful imposition of sustainability measures applying to all commercial fishers is in any way contrary to the Settlement Act.

The proposed measures do not directly impact on customary fishing. While some submitters have pointed to the potential impact on pātaka arrangements with commercial fishers, we observe that while the proposed measures may affect the viability of some of the commercial fishers that operate under these arrangements, they do not prohibit the granting of authorisations to commercial fishers to undertake customary fishing.

Requirements under section 11 (Sustainability measures)

A decision under section 15(2) of the Fisheries Act is a sustainability measure for the purposes of the Fisheries Act.[17]

Section 11 of the Fisheries Act sets out various requirements with which you must comply before setting or varying any sustainability measure for a stock or area. Relevant to the proposals in this case:

Section 11(1) of the Fisheries Act requires you to take into account:

- *any effects of fishing on any stock and the aquatic environment; and*
- *any existing controls under the Fisheries Act that apply to the stock or area concerned; and*
- *the natural variability of the stock concerned.*

The specific advice on whether additional measures are necessary for Māui and/or Hector's dolphin includes an outline of existing management controls and also analysis of effects of fishing.

Section 11(2)(a) of the Fisheries Act requires you to have regard to any provisions of any regional policy statement, regional plan, or proposed regional plan under the RMA that apply to the coastal marine area and that you consider to be relevant.

Objectives outlined in the New Zealand coastal policy statements and regional plans 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 following policy statements and regional plans are relevant to the proposals in this final advice:

- *Northland Regional Policy Statement and Coastal Plan;*
- *Auckland Regional Council Policy Statement and Coastal Plan;*
- *Waikato Regional Policy Statement and Coastal Plan;*
- *Taranaki Regional Policy Statement and Coastal Plan;*
- *Horizons Regional Councils One Plan (combining the regional policy statement, regional plan, and coastal plan for Manawatu-Wanganui Region);*
- *Tasman Regional Policy Statement;*
- *Draft Nelson Regional Policy Statement;*

[17] Section 2 defines "sustainability measure" to mean any measure set or varied under Part 3 for the purpose of ensuring sustainability.

- *Canterbury Regional Policy Statement and Coastal Environment Plan and*
- *Southland Regional Policy Statement.*

We consider that the proposals to manage the effects of fishing are consistent with the TMP's intent of avoiding adverse effects on protected species.

Section 11(2)(b) of the Fisheries Act requires you to have regard to any management strategy or management plan under the Conservation Act that apply to the coastal marine area and that you consider to be relevant.

The Northland, Auckland, Waikato, Wanganui, Wellington, Nelson/Marlborough, Canterbury (Waitaha), and Southland Murihiku Conservation Management Strategies are relevant to the areas under consideration.

The Northland, Auckland and Waikato Conservation Management Strategies aim for the population of Māui dolphins to be recovering and effectively protected. Their policy with respect to Māui dolphins is to work with the Ministry for Primary Industries and others to implement the TMP.

The Canterbury (Waitaha) and Southland Murihiku Conservation Management Strategies each has an objective to work with others to manage or avoid threats to marine mammals, particularly Hector's dolphins, to ensure their recovery and protection.

The Wanganui, Wellington, Nelson/Marlborough Conservation Management Strategies do not specifically discuss management of Hector's and Māui dolphins, but do discuss the protection, and management of threats to, threatened and at-risk indigenous fauna (which includes Hector's and/or Māui dolphins).

Section 11(2A) of the Fisheries Act requires you to take into account:

- any conservation services or fisheries services; and
- any relevant fisheries plan approved under this Part; and
- any decisions not to require conservation services or fisheries services.

The options proposed in this paper support objectives outlined in the DOC Marine Mammal Action Plan and Conservation Services Programme, which include (but are not limited to):

- To actively protect marine mammal species and populations, and allow the recovery of those that are threatened with extinction or that have been depleted or otherwise adversely affected by human activities or unusual natural events.
- To manage human interactions with marine mammals in order to minimise adverse effects on their survival, welfare and recovery, and to ensure the appropriate management of both living and dead marine mammals.
- Proven mitigation strategies are in place to avoid or minimise the adverse effects of commercial fishing on protected species across the range of fisheries with known interactions.
- The nature of direct adverse effects of commercial fishing on protected species is described.

- The extent of known direct adverse effects of commercial fishing on protected species is adequately understood.
- The nature and extent of indirect adverse effects of commercial fishing are identified and described for protected species that are at particular risk to such effects.
- Adequate information on population level and susceptibility to fisheries effects exists for protected species populations identified as at medium or higher risk from fisheries.

Fisheries New Zealand supports the Conservation Services Programme in part via the annual fisheries and conservation levies. The levies fund, in part, conservation research related to fisheries (as determined by the Department of Conservation). Some of these levies are used to directly to support research on the Hector's and Māui dolphins, including fisheries-related risks. Priorities are determined on an annual basis.

There are no fisheries plans approved for inshore fisheries that apply to the areas subject to fisheries management proposals in this final advice.

Kaikōura (Te Tai o Marokura) Marine Management Act

Under section 7 of the Kaikōura (Te Tai o Marokura) Marine Management Act, the Kaikōura Marine Guardians may, on request or on their own initiative, provide advice on any biosecurity, conservation, or fisheries matter related to the marine and coastal environment within Te Whata Kai o Rakihouia i Te Tai o Marokura—Kaikōura Marine Area.

If the matter relates exclusively to Te Whata Kai o Rakihouia i Te Tai o Marokura—Kaikōura Marine Area, the person receiving the advice must take the advice into account.

If the matter also relates to any area outside of Te Whata Kai o Rakihouia i Te Tai o Marokura—Kaikōura Marine Area, the person receiving the advice may, but is not required to, take the advice into account.

The proposals that have been developed by Fisheries New Zealand post-consultation that would affect Te Whata Kai o Rakihouia i Te Tai o Marokura—Kaikōura Marine Area specifically take into account the advice received from the Kaikōura Marine Guardians submission. Their advice also forms the basis for the preferred management measures we propose in that area.

1.4 Population outcome

The proposed population outcomes are described in Part A. Along with the fisheries objective it is important to consider these factors in relation to your specific obligations under the Fisheries Act. This is particularly important as some submitters have raised the issue of whether the outcome and objectives are consistent with the Fisheries Act.

Submission comments

FINZ (with support from other fishing industry submitters) and Te Ohu Kaimoana (with support from a large number of iwi) have questioned how far, as Minister, you can go to ensure sustainability without compromising your obligation to also adequately provide for utilisation (so as not to fail to meet the purpose of the Fisheries Act). It is their view that the above population outcomes are well beyond what the Fisheries Act contemplates, and beyond what can be reasonably imposed as restrictions under the Fisheries Act to achieve those outcomes.

1.4.1 Value of considering an outcome

There is no statutory population outcome specified for Māui or Hector's dolphin, nor is there any specific legal requirement to consider one. You have discretion in putting in place measures to manage the effect of fishing-related mortality if you consider it necessary.

The MMP Act allows the Minister of Conservation to approve Population Management Plans (PMP). The MMP Act requires threatened species managed by a PMP to be rebuilt to non-threatened status within a period not exceeding 20 years. There is no PMP for Hector's or Māui dolphins or any other marine mammal because it is not biologically plausible to expect long-lived, slowly reproducing Hector's and Māui dolphins to recover to a non-threatened status within 20 years. Instead, a TMP approach was considered a more direct route to achieving improved management, given available information.

A key driver for revision of the TMP is to make the desired outcomes, goals and objectives of the plan more specific and transparent and therefore more measurable. The previous TMP relied on subjective assessment of Government policies on desired outcomes for protected species to provide context as to whether measures were necessary and whether the management of those threats had been successful.

While you have considerable discretion in the absence of a PMP, agencies consider there is merit in at least having an overall population outcome for the subpopulations in mind so that you can better determine whether it is necessary to manage the effect of fishing on that subpopulation to support that outcome being achieved.

1.4.2 Determining an appropriate outcome

The environmental principles provide broad guidance in determining an appropriate outcome if you consider one useful. They suggest that you should manage the effects of fishing to maintain the population of a non-harvested stock, like dolphins, above a level that ensures their long-term viability. They also suggest that you should maintain biodiversity including genetic diversity within and between species. Given these principles you could consider long-term viability as an effective population bottom line.

Fisheries New Zealand scientific advice suggests that long-term viability equates to approximately 50 percent of the maximum number of dolphins the environment can support. If you were to consider it appropriate to manage fisheries effects to support this population level, the equivalent number of allowable fishing-related mortalities per year is shown in Table 1 below. This number of mortalities is effectively the maximum number of allowable human-induced deaths. However, the Courts have

noted that it is not appropriate to manage the impacts on a protected species the same as you would fishing on a harvested stock. The objective of management is not to maximise use, which is effectively the case if you were to choose this as an appropriate level of fishing-related mortality.

Table 1: Subpopulation size and population outcomes

Subpopulation	Population size	95%	90%	80%	50%	Current mean estimate of fishing deaths
Māui (west coast North Island)	63	0.14	0.28	0.57	1.42	0.10
East coast South Island	9198	23	45.99	91.98	229.95	51.60
South coast South Island	332	0.78	1.57	3.13	7.83	1.19
West coast South Island	5183	12.96	25.92	51.83	129.58	5.09

Note: Annual mean estimate of deaths allowed to achieve different population outcomes (such as, 95, 90, 80 or 50 percent of the number of dolphins the environment could support in the absence of fishing). Estimates are rounded to two decimal places. Shown in reference to the current meant estimate of annual fishing-related deaths for each subpopulation. An estimate of allowable deaths has not been calculated for the north coast South Island, or southern habitat zone of the west coast North Island because the information on population size in those areas is highly uncertain.

Table 1 also outlines other population outcomes up to 95 percent of the maximum number the environment can support, and examples of the range of outcomes you could consider. The higher the outcome, the lower the allowable level of human-induced mortality (including fishing) to achieve it. The lower the level of human-induced mortality allowable, the higher the impacts on use of marine resources with methods that pose a risk of dolphin mortality.

Agencies consulted on a population outcome of 95 percent of the maximum number of dolphins the environment can support for Māui dolphin, and 90 percent of the maximum number for Hector's dolphin. If human-induced mortality is managed to this level, then the Māui population will be expected to recover to and remain at or above a level that is no more than 5 percent lower than what it would be in the absence of human impacts. Hector's dolphins would be expected to maintain a population size that is no more than 10 percent lower than what it would be otherwise.

Agencies consider the proposed population outcome for Māui dolphins is appropriate given:

- The general Government approach of minimising human-induced mortality on protected species (for example, National Plan of Action for Seabirds and the New Zealand Sea Lion Threat Management Plan).
- The desire to be cautious where information on impacts, population size, distribution and trends of protected species remains uncertain.
- The small number of Māui dolphins that remain and the high likelihood of extinction should the population decline; and
- The obligation to maintain biodiversity, including within and between species genetic diversity.

The Hector's dolphin population is able to sustain a higher level of human-induced mortality while ensuring the population outcome can be achieved. However, maintaining biodiversity, preventing subpopulation fragmentation, and eliminating potential barriers to connectivity between subpopulations remain important

considerations for Hector's dolphins. For these reasons, agencies consulted on and propose you agree to a population outcome of 90 percent of the maximum number of dolphins the environment can support.

However, you have wide discretion in terms of:

- the population outcomes, and the supporting fisheries objectives (discussed below) to help to achieve those outcomes, and
- what those desired outcomes and objectives might be.

1.5 Unit of management

Under the Fisheries Act you are required to manage the effect of fishing on a species rather than the effect on an individual of a protected species.

The Hector's dolphin is divided into two subspecies (based on genetic differences), one of which occurs principally in South Island waters (the Hector's dolphin), and the other in the waters of the north-west coast of the North Island (the Māui dolphin).

Hector's dolphins occur around most of the South Island in three recognised subpopulations supported by genetic evidence:

- east coast South Island;
- west coast South Island; and
- south coast South Island.

North coast South Island Hector's dolphins may constitute a fourth subpopulation. Information on this possible subpopulation is limited and highly uncertain. Historically, dolphins in this area have been considered to be transient, or a part of the east coast or west coast subpopulations, but recent evidence suggests there may be a small resident subpopulation. For purposes of the TMP and risk assessment, officials have treated the north coast South Island dolphins as if they are a separate subpopulation as a precautionary measure.

Fisheries New Zealand believes it is appropriate to consider the effects of fishing-related mortality on these dolphins at a subspecies and subpopulation level. The genetic differences between Hector's and Māui dolphins and, to a lesser extent, between subpopulations of Hector's dolphin support management at this level to ensure biodiversity (particularly genetic diversity between and within species) in line with the environmental principles of the Fisheries Act.

Subpopulations and local populations – submission comments

FINZ consider that the TMP and management measures should be either at the species or subspecies level, not the subpopulation, which they consider as arbitrary management units.

Some stakeholders expressed concerns that if fishing effort were highly concentrated in particular locations, then local populations of dolphins may be adversely affected even if impacts are within acceptable limits for the subpopulation as a whole.

To address these concerns, "local populations" were defined at spatial scales comparable to the distances over which individual dolphins are typically known to

range in their lifetimes, and fisheries risk was assessed separately for these populations.

Greenpeace would like to see a move away from the population model which prioritises only high-density areas to ensure we are protecting smaller, vulnerable populations and connectivity by protecting the dolphins' full habitats.

Fisheries New Zealand response

Fisheries New Zealand believes it is appropriate to consider the effects of fishing-related mortality on these dolphins at a subspecies and subpopulation level. The genetic differences between Hector's and Māui dolphins and, to a lesser extent, between subpopulations of Hector's dolphin support management at this level to ensure biodiversity (particularly genetic diversity between and within species) in line with the environmental principles of the Fisheries Act.

To address these concerns about impacts on local populations, "local populations" were defined at spatial scales comparable to the distances over which individual dolphins are typically known to range in their lifetimes, and fisheries risk was assessed separately for these populations. While there is no evidence that local populations are genetically distinct, or otherwise isolated from neighbouring populations currently, they can be subject to localised depletion over time, which would increase fragmentation. We believe it is appropriate to also consider the effect of fishing-related mortality at a local population scale to prevent local depletion occurring.

1.6 Fisheries objectives

The proposed fisheries objectives are described in Part A.

Submission comment

Submitters generally commented on the overarching population outcomes and fisheries objectives together because they are linked, and have a combined impact on the level of fishing effect on the subpopulations, and use of fisheries resources. Part A outlines submission comments on the population outcome. With respect to the fisheries objectives, the primary criticism from submitters (in particular the fishing industry and its representatives), was that managing with 95 percent certainty was overly cautious.

Fisheries New Zealand response

These objectives mean that, with 95 percent confidence, each dolphin subpopulation is able to recover to and/or maintain a level that is no more than 5 percent (Māui dolphin) or 10 percent (Hector's dolphin), lower than it would be in the absence of any fisheries-related mortality. Appendix 2 describes level of certainty in more detail.

From a policy perspective whether measures are necessary is strongly influenced by any population outcome (if any) you consider appropriate to support, and the level of certainty you need as to whether fishing is having an impact on that outcome. The higher the consequence of fishing-related mortality on the population, the more certain you want to be that the effect is managed.

We believe that having a high level of certainty that fishing-related mortality is within desired limits is appropriate to ensure the effects are being effectively managed. However, the level of certainty proposed, in combination with the population outcomes suggested above, is a strongly precautionary approach. This approach will have an impact on the level of use of fisheries resources and impose costs on the fishing sector, associated industries, and communities. As long as you are fully aware of that cost, and having weighed the relevant risks consider that measures are necessary, then this type of precautionary approach is open to you.

The other proposed fisheries objectives relate to preventing localised population decline or fragmentation of the population. Considering the effect of fishing-related mortality on population connectivity is consistent with the environmental principle of maintaining biodiversity, including genetic diversity.

1.7 Impact of non-fisheries related risk

Submission comments

Submissions from the fishing industry in particular raised the issue of impact on the dolphin populations from toxoplasmosis. They considered that this source of mortality should be the focus of measures, particularly for Māui dolphins given the estimated impact and relatively low level of risk from fishing.

ENGOs noted the uncertainty associated with estimates of mortality caused by toxoplasmosis. Most submitted that impact on the population from other risks should not be a reason to not manage fishing to acceptable levels.

Some submitters noted that given lack of current ability to manage impacts from toxoplasmosis on the dolphins, it is even more important to manage those effects we can control, such as fishing.

Fisheries New Zealand response

Under proposed fisheries measures in which the population outcomes are achieved, and in the absence of other human-induced mortality, the population will reach 90 or 95 percent of the maximum number of dolphins the environment can support. However, if non-fisheries human-induced mortality is not managed, then the overall level that the population recovers to will be lower. But with the fisheries objectives we are proposing, the impacted population size will still be no more than 5 or 10 percent lower than what it would be in the absence of fishing. In this way, our ability to determine the success or failure to achieve fisheries-risk reduction objectives is not dependent upon assumptions about other threats, which are often only poorly understood.

Nonetheless, we strongly support the need to manage all human-induced risks to the extent necessary to ensure the population outcomes are met. Otherwise, costs (which have been significant over time) will be borne by the fishing sector without the intended benefits from those cost impacts being realised

1.8 Need to Act

A range of information is available to assist your consideration of whether more measures are necessary to allow the fisheries objectives to be achieved. The

information includes outputs of the quantitative risk assessment and qualitative information on the likelihood of fishing-related mortality and consequences of this mortality.

The spatial risk assessment supports consideration of the nature and extent of human-induced mortality to the dolphin populations, and the effect of various measures to reduce fisheries risk.

Submission comments

As noted in Part A, a large number of submissions were critical of the risk assessment either in terms of the process used to develop it, the methodology underpinning it, uncertainty and potential bias associated with the inputs and outputs, and the level of reliance on the outputs to determine management action.

Fisheries New Zealand response

Key factors in determining whether additional measures are necessary include:

- *The population outcome and objectives*
- *Current population size and trends*
- *Overlap between fishing methods that pose a risk and dolphin distribution*
- *Evidence of deaths from fishing*
- *The extent to which those deaths are impacting on the population*

In general terms the smaller and/or further away the population is from the desired outcome, the more the need for action if fishing is resulting in deaths. The options analysed in Parts B3 and B4 provide both scientific and qualitative best available information on whether additional measures are necessary.

In relation to concerns regarding the risk assessment, the outputs from the risk assessment support consideration of whether additional measures are necessary. Useful results include:

- *An estimate of how likely it is that a dolphin in a defined area will die from various human-induced threats.*
- *The maximum allowable number of dolphin deaths from human induced mortality (and/or fishing) while still allowing the population to reach the desired outcome/objective.*
- *The possible reduction in risk of mortality associated with implementation of different measures.*

As with most information to support fisheries management decision-making, there is uncertainty in the information used to produce the outputs. However, the benefit of using a risk assessment approach is that it is specifically designed to make the uncertainty in the information transparent for decision-makers (through confidence intervals). Where there are areas of uncertainty that cannot be accounted for statistically within the risk assessment they have been incorporated in the analysis of the need for, and nature and extent of, additional measures. Examples include dolphin catchability (differences in trawl gear configuration that are not currently accounted for), and fisheries risk in certain spatial areas (for example, estimates of dolphin catchability, and dolphin presence rely on assumptions that are uncertain).

The methodology was reviewed via the Fisheries New Zealand scientific working group process (endorsed as a model of good practice for peer review by the Prime Ministers Scientific Advisors). Fisheries New Zealand and the Department of Conservation also commissioned an independent expert review workshop of the draft risk assessment (in July 2018) and incorporated reviewer suggestions to improve the risk assessment before its finalisation in early 2019. That review specifically supported the method by which commercial fisheries deaths and uncertainty are estimated in the model.

Further detail on the risk assessment, Māui dolphin demographic models, uncertainty and their limitations are provided in Appendix 2.

1.9 Measures available to manage fisheries impacts

Submission comments

Fisheries Inshore New Zealand (FINZ) consider that the measures contemplated in the consultation paper constitute a simplistic and sub-optimal approach to marine management. Further, they consider the "coercive" actions proposed to be beyond those that can be justified under the Fisheries Act. They consider the consultation paper provided only a series of blunt options for closures to address fisheries risks, and that fisheries representatives were not provided the opportunity to work with officials to develop more pragmatic, but equally effective, measures. Industry considers a discussion-based process would have provided better understanding and the development of options could have been mutually explored.

Te Ohu Kaimoana state that the options for change do not benefit dolphins, but significantly impact fishing communities. Aside from the status quo, the proposed options for further managing fisheries will in their view:

- *have negligible conservation benefit for the dolphins;*
- *go further than required under the Fisheries Act;*
- *have adverse consequences for iwi and the commercial and recreational sectors; and*
- *take a blunt approach to managing a very small risk. Residual fishing risk can be managed in a much more targeted way.*

Fisheries New Zealand response

A range of measures are available under the Fisheries Act once you have determined that further action is necessary to manage the effect of fishing-related mortality on the dolphins. Agencies consider the more significant the impact of fishing-related mortality is on a population, the more certain you will want to be that management measures will be effective.

The best measures to manage this effect are those that incentivise fishers to innovate and avoid capture of the dolphins, while minimising the impact on use. Ideally fishers that create the greatest level of risk should face the highest cost to their operation. This will create the strongest incentive for those fishers to change their practices. This approach will also result in lower costs to the most

innovative/effective operators. However, in some situations the effects on the protected species will be sufficiently adverse to warrant implementation of measures to simply prevent fishing by a certain method in the area where the risk occurs.

Fisheries New Zealand acknowledges that the range of measures proposed in the consultation document was relatively narrow, mostly focused on regulated area closures. We also acknowledge that the consultation process allowed little time for industry and Te Ohu Kaimoana to develop alternative bottom up proposals. However, it is also true that the review of the TMP has been signalled since early 2018 and since that time there has been ample opportunity for the fishing industry to take a lead role in managing impacts.

Historically, area closures have been the primary management tool to reduce the risk of fishing-related mortality to the dolphin populations. There is no known effective gear mitigation that has been scientifically tested, and little other mitigation research, for Hector's and Māui dolphins. Inability to verify captures and ensure integrity of the reporting framework has prevented use of more innovative management approaches.

Research is planned to test new mitigation techniques using Precision Seafood Harvesting gear in the South Island. However, results will not be known for at least 12 months.

The risk assessment provides some quantitative assessment of the effectiveness of measures in avoiding, remedying or mitigating the effects of fishing. Table 2 provides a qualitative assessment of the relative costs and benefits of various management tools to reduce the likelihood of captures. A more detailed analysis on these types of tools (including views of submitters), how they may be applied and their effectiveness is contained (where relevant) in Parts B3 and B4.

Table 2: Overview of possible fishing measures.

Measure	Description	Effectiveness	Incentives	Costs
Area closure	Defined area closed to fishing. Mostly relates to method or methods that pose risk. Can be implemented voluntarily or via regulation.	Most commonly used tool to manage dolphin interactions. Effectiveness depends on extent of area closed relative to risk. If the area is too small, risk will shift outside of closure. Easy to enforce given GPR.	Impacts on all fishers using the method. Does not incentivise individuals to innovate other than use non-prohibited methods.	Can shift the effort/problem. Can impact significantly on efficiency of harvest and in some cases overall use.
Gear modification	Changes to gear to reduce risk of dolphin mortality. Low headline height currently regulated in South Island.	Unknown.	Stronger incentives to innovate at fisher level if outcome rather than specific measure is regulated.	Depends on impact of measure on cost of fishing.
Move-on rule	Fishers required to move to different area if dolphin sighted near fishing activity.	Depends on ability to see dolphins or move before capture (not always possible). Difficult to monitor compliance.	Does not directly encourage innovation.	Depends on nature of the rule. Unlikely to be significant.
Fishing-related mortality limit/trigger (FRML)	Number of deaths before action is taken. Most often closure of a fishery but can be graduated depending on impact of effect on the population. Ideal approach is to have graduated scale of action which goes from focus on individual fisher first followed by collective action if overall trigger breached.	Relies on ability to determine when trigger/FRML is breached and then effectiveness of subsequent management action. If reporting and monitoring robust then very effective.	In principle, most strongly incentivises individuals to innovate to avoid. Can sometimes create race for catch before bycatch limit is reached.	Cost of monitoring and review high. However can be mitigated by taking a risk-based review approach. This would drive costs onto individual fishers causing the impact (such as, greater levels of review).
Acoustic deterrent	Devices produce noise to deter dolphins from entanglement.	No evidence to suggest effective for Māui/Hector's. Little research has been undertaken. Unsure what frequency would work for deterrence. Also dolphins can become habituated or avoid areas of suitable habitat.	Specific measures do not drive innovation.	Variable depending on device used.

Some of these measures can be implemented collaboratively with industry. However, we recommend that where the consequence of fishing-related mortality on the dolphin population is high, measures be implemented via the regulatory framework to provide greater certainty around compliance and ability to enforce penalties if required.

1.10 Option development

The nature and extent of fishing-related threats varies between the subspecies and the subpopulations, as do the impacts on users from the proposed measures. Fisheries New Zealand has analysed at a subspecies and subpopulation level the nature and extent of fishing-related impacts, and options for managing the effects of fishing-related mortality on the dolphins.

A range of options were consulted on. Fisheries New Zealand has refined the options presented to you in this Technical Advice paper based on submissions and further analysis. The range of options are extensive and are outlined in Parts B3 and B4.

From the full range of options available to you, Fisheries New Zealand has produced three different packages of options for each subspecies/subpopulation. Package 1 is weighted more towards providing for use of fisheries resources, relative to reducing fisheries risk to the dolphins. Package 3 is more weighted towards significant reductions in fisheries risk that come at a high impact on use of fisheries resources. The package you choose would depend on your view of the acceptable level of risk of fishing-related mortality relative to the cost of measures necessary to reduce that risk.

Fisheries New Zealand has identified a preferred package within this range (Package 2). We consider this package represents the best balance between protection and use. However, you have discretion to choose a different package of options or amend or tailor these packages as you see fit based on your assessment of the information that is presented.

The packages reflect the different effects of fishing on Māui and Hector's dolphin subpopulations, and between different methods of fishing. The consequence of a death of a Māui dolphin on the population is greater than a death of a Hector's dolphin because the Hector's dolphin population is much larger. The lessor effect provides the opportunity for more innovative measures to be implemented to reduce risk. These approaches include opportunity to rely more on gear modification and limits on fishing-related mortality, which could reduce costs to industry relative to widespread closures. However, effectiveness of this approach does depend on implementation of a comprehensive monitoring programme.

PART B2: MĀORI RIGHTS AND INTERESTS

Te Ohu Kaimoana and Māori have expressed particular concern about the impact of the proposals on their rights and interests. This part of the technical document outlines in detail your legal obligations, views of submitters and Fisheries New Zealand's response on these matters. It also provides detailed analysis around the rights and interests of Māori to ensure your decisions are consistent with your settlement obligations.

B2: MĀORI RIGHTS AND INTERESTS

CONTENTS

1.1 Purpose

Te Ohu Kaimoana and Māori have expressed particular concern about the impact of the proposals for the Hector's and Māui dolphin Threat Management Plan (TMP) on their rights and interests. Part B2 outlines in detail your legal obligations, views of submitters and Fisheries New Zealand's response on these matters.

1.2 Iwi participation in commercial fisheries in the affected areas

Iwi own approximately 12 percent of the quota which is taken in the area covered by the TMP. The quota is held by 51 iwi and is fished by a range of fishers including:

- iwi-owned companies and large iwi enterprises, such as Mōana and Sealord Products Limited,
- smaller regionally-based enterprises, many, which although not Māori owned, are integral to the exercise of Māori customary and commercial rights, and
- local fishers, particularly in near shore and harbour fisheries, who are vital members of largely Māori communities.

In addition, a number of Māori fishers own quota, or purchase annual catch entitlement (ACE), as whānau enterprises, and maintain the mātauranga and tīkanga for their hapū/iwi associated with fishing.

1.2.1 Kaitiakitanga

As noted in Part B1, Section 12(1)(b) of the Fisheries Act requires you to have particular regard to kaitiakitanga when making sustainability decisions. The Fisheries Act defines kaitiakitanga to mean "the exercise of guardianship; and, in relation to any fisheries resources, includes the ethic of stewardship based on the nature of the resources, as exercised by the appropriate tangata whenua in accordance with tikanga Māori", where tikanga Māori refers to Māori customary values and practices.

Section 12(1)(b) therefore requires you to carefully consider the potential effect of any decision on kaitiakitanga and how the use and management practices of Māori can be recognised. You are required to hear and understand the views of tangata whenua on the exercise of kaitiakitanga and allow those views to influence your decision-making. How much weight to give to those views is ultimately a matter within your discretion.

In consultation, tangata whenua and Te Ohu Kaimoana have provided their view on how tangata whenua exercise kaitikaitanga in accordance with tikanga Māori and the relationship of kaitiakitanga to your decisions. Tangata whenua have said that their role as kaitiaki requires them to strike an appropriate balance between the use of a resource, and the impact of use on those that we share the environment with. The additional measures should provide a balanced approach to rebuilding the resource to a level where it will continue to be available for the use of current and future generations. Where populations are dropping, restrictions or rāhui (closures) should be placed on the harvest of a resource, however, those restrictions should not be more than is necessary to maintain the long-term availability of that resource, while enabling people to continue to meet their needs from the use of that resource.

In the context of the Hector's and Māui dolphin populations, this would mean ensuring that there was an appropriate balance between restrictions that were required to preserve the dolphin populations while enabling fishers to exercise the customary and commercial rights associated with the 1992 Fisheries Deed of Settlement. The measures should reflect the balance between the likelihood of an adverse impact actually occurring, and the consequences for the relevant dolphin population if the adverse effect does occur.

If fishing activities could be demonstrably proven to be threatening the viability of the population of Hector's or Māui dolphins then additional measures would be supported. Tangata whenua consider that the proposed management measures are not balanced, and unreasonably restrict the ability of tangata whenua to exercise their fishing rights guaranteed by the 1992 Fisheries Settlement, or to provide for their social, cultural, or economic wellbeing. Tangata whenua have indicated they wish to work with the Crown as kaitiaki to look at a mix of measures that could achieve the protection of the dolphin populations, while maintaining Māori rights and interests in the affected fisheries.

Te Ohu Kaimoana and iwi consider that the measures which have been put in place successively from 2008 have achieved the balance expected by the appropriate exercise of kaitiakitanga. If further restrictions are considered necessary, then Package 1, with targeted transitional assistance to affected fishers is their preferred option. Te Ohu Kaimoana seeks further discussions in good faith with the Crown, fishers and stakeholders to develop a more targeted approach to minimising the residual risk to dolphin populations. These measure would include tailored vessel management plans for each fishery and area, and focus on changing gear methods and fishing practices, spatial restrictions where necessary and improved research.

Te Ohu Kaimoana consider that measures outside of the status quo go beyond the requirements of the Fisheries Act and are therefore not sustainability measures. In their view, such measures are consequently inconsistent with kaitiakianga and the proper exercise of the principles of the Treaty. They consider the proposals do not reasonably balance the benefits of protection against the impact on Māori rights and interests, or actively protect those rights and interests.

1.2.2 Principles of the Treaty of Waitangi

Section 5(b) of the Act requires decision makers to act in a manner consistent with the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992 (Settlement Act). The

Settlement Act is required to be interpreted to best further the agreements in the 1992 Fisheries Deed of Settlement.

Section 10 (a) of the Settlement Act provides that non-commercial fishing rights shall in accordance with the Principles of the Treaty of Waitangi, continue to give rise to Treaty obligations on the Crown.

Decisions on measures to protect dolphins under the Fisheries Act fall solely to the Minister of Fisheries. Any process will need to ensure the Minister has properly discharged his role.

To act consistently with the Principles of the Treaty would mean that the Minister needs to engage with Māori in good faith to inform them of Crown proposals, be well informed on Māori views on the proposed changes, decide what is reasonably required to actively protect Māori interests, and avoid creating new grievances.

1.3 Consultation

As noted in Part B1, iwi were consulted either through Iwi Fisheries Forums, or as participants in meetings held for affected communities, across the area of the TMP.

All iwi representatives supported the protection of dolphin populations in their area, and considered that it was their responsibility as kaitiaki to ensure that measures were in place that would ensure the long-term viability of the dolphin populations.

1.3.1 South Island Iwi

Te Waka a Māui me Ōna Toka (South Island) Iwi Forum (Te Waka a Māui) represents the nine iwi of the South Island. Te Waka a Māui raised their concern that the draft TMP and associated sustainability measures were developed without the input and participation of tangata whenua. Iwi have indicated that representatives were involved in early discussions on research and methodology but had no input into the need for additional measures or their scope. Iwi Forums were updated on the timetable for the review of the Plan but not its contents. They consider that this approach is inconsistent with the requirements of section 12 of the Fisheries Act.

Te Waka a Māui noted that Hector's dolphins are a taonga species and iwi hold them in high regard, but do not support the level of protection proposed in the consultation options. They consider that the levels of protection proposed do not provide an appropriate balance between necessary protection for dolphin populations, and the impact on iwi rights and interests, particularly the rights provided through the full and final settlement of Treaty claims to fisheries embodied in the 1992 Fisheries Settlement.

Te Waka a Māui indicated that the assessment of the social and economic impacts of proposals has been under estimated, particularly the impacts on whānau fishers and the communities they reside in. Iwi are also likely to incur significant losses from the sale of ACE, or the direct value of fishing and processing, with any proposal other than the status quo.

While the proposals in the TMP do not apply to customary fishing, much customary fishing is undertaken off commercial fishing vessels using methods which are

proposed to be banned in some areas. In addition, many commercial fishers are the holders of mātauranga Māori and the tikanga of fishing for their hapū. Te Waka a Māui considers the proposals that would lead to the removal of commercial fishers from the community will have an impact on the exercise of customary fishing rights and the Treaty rights that have been guaranteed in the 1992 Fisheries Deed of Settlement.

Te Waka a Māui was also concerned that there appeared to be little analysis of the likely transfer of effort which might occur under the proposals. Concentration of effort away from dolphin habitat is likely to make it more difficult for tangata whenua to apply for, and be granted, customary area management tools like mātaitai reserves or taiapure. This is because the effort of fishers will now be concentrated in smaller areas and the threshold test on whether a mātaitai reserve will prevent commercial fishing occurring will now be triggered at a different point.

Localised depletion as a result of transfer of effort may also affect customary fishing and require further reduction in commercial fishing, exacerbating the impacts on Māori commercial and customary rights. Te Waka a Māui considers these impacts would impede the ability of the Crown to exercise its duties under section 10 of the Settlement Act.

Submissions were later received directly from Te Rūnanga o Ngāi Tahu and Te Rūnanga o Ngāti Kuia.

Te Rūnanga o Ngāi Tahu

Te Rūnanga agree that Hector's dolphins are a taonga to Ngāi Tahu Whānui, and must be protected to ensure the population is thriving, however the management measures should not be undertaken in a manner which undermines the rights and interests of Ngāi Tahu that have been secured by the 1992 Fisheries Deed of Settlement. The consultation options as presented, unreasonably affect Ngāi Tahu Treaty rights when balanced against the changes in risk to dolphins.

Te Rūnanga consider that different fishing methods and their application in different areas will have different impacts on the dolphin populations. There are fishers whose fishing methods and behaviour have reduced or eliminated risks of capturing dolphins. Te Rūnanga support research on different methods and practices undertaken by fishers and the development of best practice standards to be applied to all fishing that do not require the exclusion of fishing from most areas.

Te Rūnanga share the concerns of Te Waka a Māui that the South Island consultation options will be likely to transfer and concentrate effort in those areas where restrictions are less onerous. They consider that this will result in constraints on the ability of tangata whenua to utilise customary management tools provided in regulation and for the Crown to exercise its duties under section 10 of the Settlement Act.

Te Rūnanga notes the TMP outlines some economic impacts on fishers, but does not address cultural and social impacts, and the flow on effects into the community. These matters are relevant to the Minister making a decision that is consistent with the purpose of the Fisheries Act. Te Rūnanga strongly suggests that further work is undertaken to understand the impact of the consultation options, and to ensure that

decisions do not impinge on or dilute the commercial and customary rights guaranteed under the 1992 Fisheries Deed of Settlement.

Te Rūnanga consider that if decisions adversely affect fishers and quota owners, there should be compensation and transitional assistance to fishers and their communties.

Te Rūnanga o Ngāti Kuia

Te Rūnanga o Ngāti Kuia (Ngāti Kuia) represents one of the iwi with interests in the area of Marlborough were Hector's dolphins are found.

In addition to the matters raised by Te Waka a Māui and Te Rūnanga o Ngāi Tahu, Ngāti Kuia have raised the following concerns.

Ngāti Kuia considers that the proposals in the TMP will have significant effects on customary fishing rights of their iwi. Notably much customary fishing is undertaken by commercial fishers and a number of whanau members are commercial fishers. Some of the proposed options will severely impact whanau commercial fishers and others who fish customarily for iwi. If these fishers leave it will severely impinge on the ability of iwi to exercise customary fishing rights.

Ngāti Kuia consider that there has been no recorded mortality of Hector's dolphins in their area, and that there is no need for further regulation to mitigate risk to the population in their area. The commercial fishers in the area have self-regulated and adopted codes of practice, or voluntary conditions to avoid dolphin capture. These practices should be recognised as the basis for protection of the dolphin population.

Ngāti Kuia consider that the north coast South Island should be monitored and managed as a separate population. The economic impact on Māori and the iwi community has been significantly under estimated. The balance of benefits from protection of dolphins should be carefully balanced in relation to impacts on iwi. Impacts on Treaty rights should be avoided where possible. Where impacts cannot be avoided other options for compensation including access to concessions for ecotourism should be provided.

1.3.2 North Island Tangata whenua

Iwi and hapū were consulted through Iwi Fisheries Forums and through hui held in local communities. There are currently 4 Iwi Fisheries Forums operating on the west coast of the North Island, covering all areas except that between the Waikato River and the Mānukau Harbour.

Te Tai Hauauru represents 16 iwi from Kāpiti to North Taranaki, including areas which will be significantly affected by some of the proposed management measures. Ngā hapū o Te Uru represents the coastal hapū of Ngāti Maniapoto and Waikato. The Mid North Forum represents Ngāti Whātua and Ngā Puhi interests between Auckland and the Hokianga Harbour, and Te Hiku o Te Ika represents the 8 iwi of the Far North from Hokianga to Cape Reinga.

All of the Forums support measures to ensure the viability and rebuilding of the Māui dolphin population. All Forums consider that any responses should balance the goal of protecting the dolphin populations without compromising or impinging on the

customary or commercial rights of iwi which have been secured through the 1992 Fisheries Deed of Settlement and other settlement agreements with the Crown. Iwi have said that they would consider this a contemporary breach of the Treaty of Waitangi and inconsistent with the exercise of the Principles of the Treaty.

Forums generally consider that further restrictions are not needed beyond the area of existing controls for Māui dolphins (the Waiwhakaio River, New Plymouth north to Maunganui Bluff, and with observers on set-net vessels fishing south of New Plymouth to Whānganui. There is a general view that Māui dolphins do not frequent harbours beyond the current closed areas, and any restrictions in these areas would affect both customary and commercial interests of tangata whenua and would breach Treaty agreements with the Crown.

All iwi are open to a holistic approach that would include a mix of modifications of fishing gear, temporal and area restrictions, best practice standards and monitoring, as well as real actions to also address non-fishing mortality.

Te Tai Hauauru Iwi Fisheries Forum (Te Tai Hauauru) was consulted on 21 June 2019. Te Tai Hauauru supports measures to ensure the viability of dolphin populations, but considers that the current TMP has been successful and has resulted in no confirmed fisheries-related mortality in over 15 years, a period longer than the projected requirements for a rebuild of the population under the existing TMP. Some of the proposals would restrict deaths to less than 1 every 100 years. Iwi consider that as the TMP is reviewed every 5 years such a limit is excessive and would adversely affect their Treaty rights. Any anomalous death can be addressed by changes to the TMP if such death occurs, rather than pre-emptive and more restrictive actions now.

Te Tai Hauauru considers the status quo is the only acceptable option unless the proposed measures are modified to remove any impacts on commercial and customary Māori fishing rights.

While the proposals purport to have no effect on customary fishing Te Tai Hauauru consider that this reflects a misunderstanding of how customary fishing rights are exercised. Customary fishing is often undertaken by commercial fishing vessels, including trawlers and set-netters, fishing customary permits. In the case of Taranaki Iwi, the fish is processed and stored on commercial premises for use at major events where fish is required in quantities that cannot be caught quickly by whanau or hapū fishers. Commercial sensitivity , and associated fishers, who will be heavily impacted by some options, are critical to this process. Unnecessary restriction will prevent iwi exercising their customary rights which are guaranteed under the 1992 Fisheries Deed of Settlement.

Members are extremely concerned about the livelihood of local fishers and businesses and this includes Māori fishers. There have already been impacts from previous reviews and it is concerning to see further measures proposed. In addition the iwi sell their ACE to a range of companies to fish in the area. All options except the status quo will have significant effects on the cash flow of iwi, which is used for a range of social, educational and economic development purposes. The value of quota will also be reduced affecting the asset position of iwi, with consequent flow on effects on their operations for iwi members. They consider the social and economic

assessment are deficient in identifying the impacts on customary, commercial, social and cultural interests of tangata whenua and work needs to be done to identify these effects before a decision can be taken.

Te Tai Hauauru confirmed their support for the Te Ohu Kaimoana submission, as representing their views to the Crown. Individual iwi from Taranaki also supported this position in their submissions.

Ngā hapū o Te Uru Fisheries Forum (Ngā hapū) considered that incentives should be provided to help fishermen transition to using other fishing methods in areas of interactions with Māui dolphins. Ngā hapū considers that no sightings of Māui have been observed inside the Raglan Harbour. It supports the status quo, reserving the rights of fishers to continue to use set-nets within the harbour.

Ngā hapū manage a range of gazetted Rōhe Moana, Taiapure or Mātaitai along the west coast that are not acknowledged in the proposal despite being in existence for some years. Ngā hapū consider that such areas have the ability to protect Māui dolphins through the use of bylaws regarding such things as fishing methods within the areas. Where the proposed changes to the controls within the Marine Mammal Sanctuary imposes on these customary tools, management of the Māui dolphin area should be delegated by DOC to the local Mātaitai Committees.

Te Hiku o Te Ika Fisheries Forum were concerned that they had not had input and participation into the proposal, or time to formulate a full response. The Forum was also very concerned over the impacts of proposals on local set-netters (including members of the Forum), their livelihoods, and their ability to continue longstanding practices. They did not have similar concerns regarding trawling in their area and would support closures further to seaward.

They considered that options were excessive considering the lack of information to support the assertion that the dolphins are present or at risk in this area.

Te Hiku considered that there would be major impacts on customary rights, livelihoods and community which needed to be determined before a decision could be made. Any decision needed to balance protection against the need to avoid Treaty breaches by impacting on their fishing rights.

1.3.3 Te Ohu Kaimoana

Te Ohu Kaimoana (Te Ohu) is the statutory trustee whose purpose is to advance the interests of iwi individually and collectively, primarily in the development of fisheries and fisheries related activities to further the agreements made in the 1992 Fisheries Deed of Settlement; and to assist the Crown to discharge its obligations under that Deed and the Treaty of Waitangi.

Te Ohu has made a wide ranging submission. In this section, analysis has focussed on the concerns they have raised in consultation regarding Māori rights and interests secured by the 1992 Deed of Settlement.

Te Ohu consider that the process to consult Māori on the development of the TMP, and the management measures to give effect to the Plan, has been inconsistent with the principles of the Treaty and a meaningful Treaty relationship. As with iwi, Te Ohu

representatives were involved in early discussions on research and methodology but had no input into the need for additional measures or their scope. Te Ohu considers that this approach is inconsistent with the requirements of section 12 of the Fisheries Act, which requires the Minister to consult representatives of Māori, amongst others. In respect of Te Ohu, it considers that consultation with it has not been carried out accordance with a meaningful Treaty relationship and therefore the Principles of the Treaty have not been met.

Te Ohu considers that the proposals are inconsistent with the Principles of the Treaty in that neither party are able to make well informed decisions on the likely impact of proposals on Māori rights and interests. This is because they consider that:

a) Some of the information on dolphin presence is inaccurate and leads to wrong conclusions as to whether a measure is necessary.

b) The demographic model for Māui dolphin suggests the commercial fishing risk to dolphins is already being effectively managed to address any fisher related risk.

c) The TMP only considered the impacts of measures on the dollar value of a reduction of fishing. There is no detailed analysis of the social, cultural and economic impacts on the communities in which fishers reside, the loss to downstream businesses who support the fishing enterprises, the value of employment of those communities and the cultural and social roles of fishers and companies in the community, e.g. as noted by tangata whenua, commercial fishers often hold the communities knowledge of customary fishing practice or support customary activities.

d) The measures do not take into account the exercise of modern day customary fishing.

e) Iwi inshore fisheries quota (Settlement quota) has been allocated on the basis of coast line in in the relevant quota management area (QMA). Under the provisions of the Māori Fisheries Act 2004, settlement quota is not transferable. All options, except the status quo, will either significantly increase catching costs or remove fishing from large areas of QMAs. This will have significant impacts on the value of iwi quota, whose asset value underpins other iwi activities, or reduce the cash flow from ACE sales. The impact of the proposals on iwi Treaty settlement interests has not been evaluated.

f) There is no information or consideration of any transitional assistance to compensate for loss of quota and ACE value or to assist fishers to trial and deploy new low impact harvest methods and technology.

g) There are more effective and targeted ways to reduce the residual risk to dolphin populations. There has been no opportunity for discussions between the Crown, iwi and fishers on other gear controls, fishing practices and area rules which may achieve the same outcomes as the proposed measures, without the degree of impact that is likely from the proposed measures. Managing non-fishing impacts also needs to be included in remedies.

1.4 Fisheries New Zealand response to matters raised in submissions in respect of Treaty Rights

1.4.1 Consultation and Input and Participation

Officials consider that there are two separate consultation requirements inherent in section 12. The Minister must provide for input and participation of tangata whenua into sustainability processes. This duty requires early opportunities for tangata whenua to be involved in the development of the goals and policy associated with a programme that may affect the rights and interest of tangata whenua. Opportunities for input and participation in the formation of the goals of the TMP were provided through engagement with Iwi Fisheries Forums and direct meetings with some affected iwi in 2018 (refer to section 1.2 of Part B1).

Section 12 also requires consultation with affected parties, including Māori. In this circumstance, having considered the issues raised by tangata whenua through their input and participation in the formation of the goals and objectives for the TMP, the Crown is entitled to come to Māori and stakeholders to consult them on proposed measures to achieve those goals and objectives. In doing so the Crown should act in good faith and consider any information it receives during consultation with an open mind and a willingness to amend proposals where the Minister considers the rights and interests of tangata whenua would be unduly affected. Officials have consulted extensively with iwi and stakeholders (refer to section 1.2 of Part B1).

In respect of Te Ohu's submission, consultation in accordance with the Principles of the Treaty does not require separate consultation on the development of the policy and the measures to implement policy. However, the Principles of the Treaty now apply as the proposed TMP has been released and requires the Minister being well informed on Māori views on the proposed changes, deciding what is reasonably required to actively protect Māori interests and to avoid creating new grievances.

Officials have considered the matters raised in submissions and understand the concerns raised by submitters. Officials have sought more information on the social and economic impact of proposals to enable a more informed decision to be made. Advice on those impacts is provided in Part B6.

The proposals have been modified into three packages of measures taking into consideration the matters raised in submissions, and information from the studies commissioned by Fisheries New Zealand.

Package 1 closely resembles a modified Option 2 (i.e. less of an impact on some fisheries) of the discussion documents.

Package 2, the option preferred by officials, represents a significant change which takes into account the matters raised in submission, while still meeting the population objectives with 95 percent certainty.

Package 3 represents a more conservative option which is likely to achieve objectives with more than 95 percent certainty, but would have a more substantial impact on the ability of tangata whenua to exercise customary non-commercial

fishing rights through the Pātaka arrangements Commercial sensitivity [redacted] This package is also more likely to reduce the value of commercial rights derived from the 1992 Fisheries Deed of Settlement. In addition, submitters raised the issue of transitional assistance to affected fishers to change fishing methods and practices to minimise impact on dolphins, or to leave affected fisheries. Officials have provided advice to you on the costs and benefits of this option. Some degree of transitional assistance may be central to actively protecting Māori interests from the impact of packages 2 or 3. Officials consider that, in combination, the process that has been undertaken to develop options and provide advice is consistent with the consultation and input and participation requirements in section 12 of the Fisheries Act, and the principles of the Treaty in respect of informed decision making.

1.4.2 Consideration of Māori Treaty Interests when making decisions under the Fisheries Act 1996

Te Ohu considers that the proposed measures are not consistent with sections 5(b) of the Fisheries Act, 10(a) and (b) of the Settlement Act, or the Principles of the Treaty of Waitangi.

The Settlement Act provides for the allocation of fishing quota to Te Ohu for distribution to iwi, and the making of policy and regulation to recognise and provide for customary food gathering by Māori, and the special relationship between tangata whenua and those places of customary food gathering importance.

Under the Māori Fisheries Act 2004, this quota (Settlement quota) cannot be sold outside iwi without the approval of Te Ohu. The ACE can be sold to any party. The current value of the Settlement to iwi is achieved primarily through the sale of ACE to a range of fishers. Te Ohu contends that the 1992 Fisheries Deed of Settlement should be protected. The Deed and the Settlement Act recognised that the benefits from the 1989 settlement, and the implementation of the 1992 Fisheries Deed of Settlement, constituted a full and final settlement of commercial fishing rights. Te Ohu consider that any reduction in the value of the settlement would not be active protection of Māori rights.

Officials consider that packages 1 and 2 do not make such significant changes to fishing activities that the value of quota would be affected or that reductions in the Total Allowable Commercial Catch (TACC) would occur. Package 2 will increase the certainty that population objectives will be achieved, but will significantly affect a small number of set-net and trawl fishers in some parts of a number of QMAs. The short term impact on catch as a result of the reduction in the numbers of set-net and trawl fishers is unlikely to affect ACE prices. If some of these fishers are assisted to transition to dolphin safe fishing methods, any impact on ACE prices will be further mitigated. This may result in a change in the catch mix and relevant ACE values

Package 3 may make such significant closures of fishing grounds as to make taking the TACC difficult to catch and reduce the value of both quota and ACE in the west coast North Island, including Settlement quota.

Fisheries New Zealand does not consider that lawfully applied sustainability measures that affect commercial fisheries are inconsistent with the Settlement Act or the Deed of Settlement. However, measures should be those that you consider to be

necessary to achieve the management objective and balance the benefits of protection with the least impact on Māori rights and interests in the fishery.

Customary non-commercial fishing has been provided through regulation and the authorisation of pātaka managed by licensed fish receivers, Commercial sensitivity . Customary fishing is not directly affected by any of the packages. Tangata whenua may still authorise customary fishing to be carried out by commercial fishing vessels using any type of fish gear or method. However, practically, most customary fishing for major events is carried out by a small number of commercial fishers who land fish for processing and distribution from Commercial sensitivity .

Tangata whenua have indicated that they have voluntarily ceased to individually use set-nets because of the public concerns over the use of set-nets, and the higher risks associated with recreational use of set-nets. This has emphasised the importance of the continuation of the pātaka as a primary source of fish for customary events. The proposals in Package 2 for the west coast North Island recognise the possible impact on the operation of the pātaka. This option will have some impact on trawl operators, but will enable some to continue their operations. Officials consider that impacts on ACE fishers, while significantly affecting individual families and their communities, will not be so significant as to make the operation of the pātaka unviable.

Transitional assistance to fishers to adopt dolphin safe methods and practices will, if adopted, further support the ability of fishers to undertake customary fishing for tangata whenua.

The west coast North Island packages recognise the concerns raised in submission of the importance of harbour fisheries to the ability of communities to carry out customary fishing and meet subsistence needs. Officials acknowledge that the risk assessment may be overestimating risk from set-net in these areas, and therefore do not recommend extensive closures within the harbours under any of the packages proposed. Consequently officials consider that Māori rights to exercise customary fishing in these areas have been protected.

Some submissions have raised concerns that the transfer of effort to areas which are still open to a variety of fishing methods would increase effort in these areas to the extent that tangata whenua would not be able to successfully apply for customary tools, such as mātaitai reserves.

This is because the effort of fishers will now be concentrated in smaller areas and the threshold test on whether a mātaitai reserve will prevent commercial fishing occurring will now be triggered at a different point.

Officials consider that the reduction in static set-net fishing in the close shore areas, where most customary fishing grounds are located, is more likely to increase the probability that mātaitai reserves will be approved. The transfer of effort to trawling further from the coast and increased longline fishing, if fishers are able to transition to such a method, is likely to mean that commercial fishers are not as reliant on restricted areas to take their ACE and will not be prevented from fishing by localised mātaitai reserves.

1.4.3 Kaitiakitanga

You must have particular regard to kaitiakitanga when making decisions on sustainability measures. Iwi consider that kaitiakitanga requires an appropriate balance between the use of a resource and the effect of use on those that we share the environment with. Restrictions to prevent undue effects on a resource can be valid, but should not be more than is necessary to maintain the long-term viability of that resource, while enabling people to continue to meet their needs from the use of that resource.

Officials have given particular regard to the views expressed in respect of kaitiakitanga. Kaitiakitanga and the principles of the Treaty require a reasonable balance between the benefits to be achieved by a management restriction, and the effect on the Treaty rights of the users of a resource.

Similarly, the Fisheries Act also requires a balance between use of fisheries resources, and protection of the dolphin populations. In deciding where to strike that balance you can take a precautionary approach in favour of the protected species. You can decrease utilisation to avoid an effect if the information about that effect is uncertain (taking into account that uncertain information is not a reason for postponing a measure intended to achieve the purpose of the Fisheries Act).

However, when considering the balance between utilisation and protection in accordance with the Principles of the Treaty, you must also ensure that the decision is informed by a clear understanding of the effects of the decisions on Māori rights and interests and that those rights are actively protected. That consideration should be undertaken in good faith and should explore ways to minimise impacts of decisions on Māori rights and interests.

Officials consider that the risks to the dolphin populations warrant a precautionary approach that reflects both the probability of a death from fishing occurring, and the consequences to the population if a death does occur. The packages reflect varying degrees of a precautionary approach, which is open to you to mitigate the level of risk associated with fishing for each population. Package 3 is the most precautionary, and open to you if you consider the objectives of the TMP are insufficient to achieve the protection you consider necessary to protect the relevant dolphin population. However, Package 3 has significant impacts on the ability of iwi to exercise their customary rights, as well as the wellbeing of Māori communities.

Each package recognises that set-netting is the predominant risk to dolphins. These packages seek to address this risk while minimising effects on other types of fishing. Proposed transitional assistance would assist fishers to continue fishing using dolphin friendly methods. If you consider that the balance between protection for the dolphin population and impact on users of the resource is not appropriate, it is open to you propose other measures to achieve a balance which protects Māori rights while ensuring the long-term viability of the dolphin populations.

PART B3: WEST COAST NORTH ISLAND – MĀUI DOLPHIN

Part B3 contains analysis on whether additional measures are necessary to achieve proposed fisheries objectives for Māui dolphins and options to achieve those objectives within the context of the purpose, principles and provisions of the Fisheries Act. Key information and areas of uncertainty are highlighted with respect to our knowledge of the population, and the fisheries-related risks to the dolphins. Proposed options to manage those risks, stakeholder views and estimated socioeconomic impacts are also discussed.

B3: WEST COAST NORTH ISLAND (MĀUI DOLPHIN)

CONTENTS

1.1 Purpose

Part B3 discusses options to achieve the proposed fisheries population objectives for Māui and Hector's dolphin off the west coast North Island, within the context of the purpose, principles and provisions of the Fisheries Act. It outlines the current state of knowledge of the population, fisheries-related risks to the dolphins, and proposed options to avoid, remedy or mitigate that risk should you consider it necessary.

The west coast North Island chapter considers both the:

1. current resident Māui dolphin population ("Māui habitat zone"), generally residing north of Cape Egmont, Taranaki, and
2. future recovery and natural range of the Māui and/or Hector's dolphins, which includes the "southern habitat zone", south of Cape Egmont to Wellington.

1.2 Introduction

Māui and Hector's dolphin abundance off the west coast North Island is the smallest of all the recognised subpopulations. It is also the subpopulation with the second-lowest commercial fisheries risk (after the west coast South Island; see Figure 1).

This small population means that lower levels of human-induced death have a greater consequence on the Māui dolphin population, and its long-term viability in comparison to the South Island Hector's subpopulations. Furthermore, population models indicate that the Māui dolphin population has declined in recent decades and there is a risk of extinction if the decline continues (although commercial fisheries risk is not the main threat likely to be responsible for this decline, refer to Appendix 2). Nonetheless, in this context there is a narrower scope for considering innovative solutions to manage fishing-related mortality. However, it remains in your discretion what you consider necessary to avoid, remedy or mitigate the effect of fishing-related mortality on these dolphins.

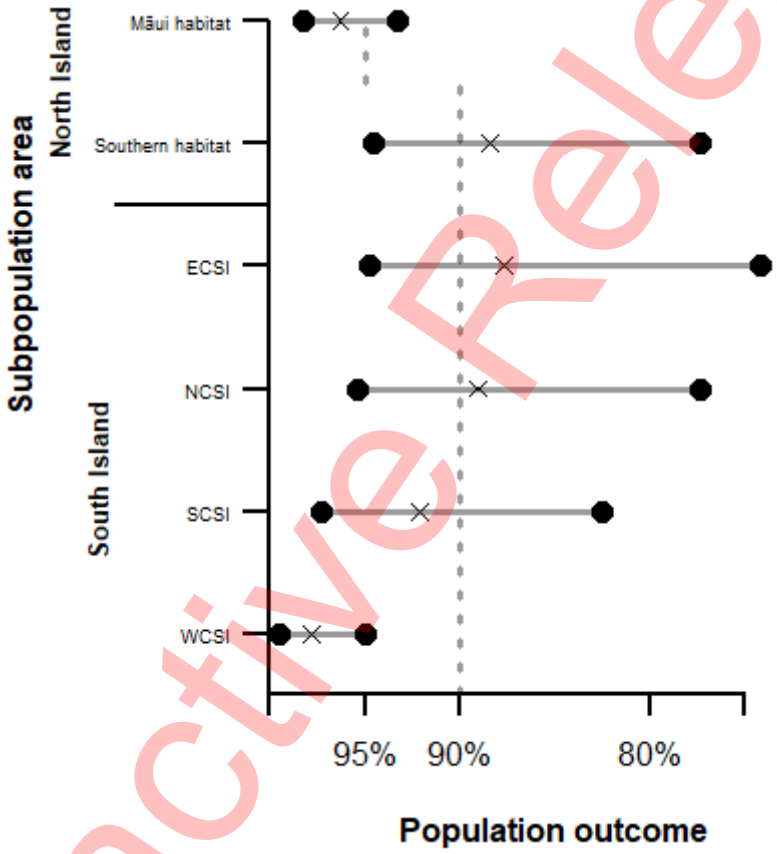
1.3 Objectives

The proposed subpopulation objective for Māui dolphin (Part B1) would mean that, with 95 percent confidence, the subpopulation is able to recover to and/or maintain a level that is no more than 5 percent lower than what it would be in the absence of

fishing, regardless of the extent to which the population is being affected by other threats (for example, disease).

The fisheries subpopulation objective is achieved by ensuring that estimated annual deaths (or risk) from fisheries do not exceed the population sustainability threshold. Achieving the population objective with 95 percent certainty requires that the 95th percentile estimates of risk are less than the population sustainability threshold. Achieving the overarching population outcome will require other human-induced threats to also be managed effectively.

Figure 1: Estimated commercial fisheries risk under the status quo (set-net and trawl combined) in each subpopulation in relation to the proposed fisheries population objectives



Note: 95 percent of un-impacted status with 95 percent certainty for Māui dolphins, and 90 percent of un-impacted status with 95 percent certainty for Māui/Hector's in southern habitat zone. The mean is shown by a cross (x) and the confidence interval by the bar extending either side of the cross. Values to the left of the relevant population outcome (vertical dotted line) suggest that fisheries risk is already estimated to be low enough to support the population outcome being achieved.

Specific to the west coast North Island, Fisheries New Zealand also proposed to:

- *Provide consistency between commercial and recreational set-netting restrictions in acknowledgement of the similar risk factors between fishing types, as well as the potential for recreational gear to be lost and become a drifting risk to dolphins.*

With respect to the southern habitat zone, we proposed to:

- *Introduce management measures along the west coast of the North Island in areas outside the known core range of Māui dolphins, to address risks of Hector's and/or Māui dolphins being caught while moving outside of their core distribution area.*

We propose to achieve this by applying the proposed Hector's dolphin population objective (i.e. 90 percent of un-impacted[1] status with 95 percent certainty).

Pursuant to both the Māui subpopulation and the southern habitat zone, we proposed to:

- *Continue data collection programmes to increase the precision of estimates of fisheries risk.*

1.3.1 Problem definition

For the Māui habitat zone there remains overlap between dolphin distribution and fishing effort (both commercial and recreational). Fisheries risk has declined substantially in recent decades, as a consequence of reduced fishing effort and reduced spatial overlap, reflecting spatial fisheries closures already in place to manage risk to dolphins. What remains is a very low level of residual risk to the Māui dolphin population from fishing.

The risk assessment outputs[2] indicated that, to achieve the fisheries population objective, there needs to be no more than 0.14 human-caused Māui dolphin deaths per year (equivalent to no more than 1 death every 7 years). That is, to achieve the population objective with 95 percent certainty, the 95th percentile estimate of current fisheries deaths must be less than 0.14.

For the Māui habitat zone, the 95th percentile estimate of current fisheries deaths (set-net and trawl combined) is 0.17 (1 death every 5 to 6 years), which exceeds the "allowable" level of mortality. The mean estimate of current fisheries deaths is 0.10 deaths per year (1 death every 10 years).

For the southern habitat zone, the mean (and 95th percentile) estimated fisheries risk score (set-net and trawl combined) is estimated to exceed 1, indicating that the current fisheries risk will prevent the fisheries population objective from being achieved. Approximately 98 percent of that risk comes from set-net. Additionally,

[1] In the consultation document this objective referred to carrying capacity, rather than un-impacted status. The objective has been amended to provide clarity that the proposal is to reduce fisheries risk to allow the population to recover to 95 percent of the maximum population that could be achieved if there was no fishing.

[2] We note the risk assessment outputs have been updated since consultation to reflect current fishing effort patterns. By convention the risk assessment uses a three-year average fishing effort to represent current (status quo) fishing effort, but at the time that the risk assessment was finalised, data were only available up to the end of the 2016/17 fishing year. During consultation it emerged that the non-inclusion of recent fishing effort may produce misleading results for the west coast North Island in particular, due to structural changes in this fishery since voluntary measures were adopted by some fishers beginning in 2015/16. A separate data extract confirmed that fishing effort in the 2017/18 fishing year was midway between the 2015/16 and 2016/17 years, and that the 2014/15 year is an outlier in comparison to later years. On this basis it was determined that inclusion of the 2014/15 year is not indicative of current fishing effort patterns, and a more accurate approximation of the three-year average fishing intensity is obtained by averaging the 2016/17 and 2017/18 fishing years. The 2017/18 season was analysed separately to establish that effort was midway between the previous two years but could not be included in the full analysis because there was not enough time to update the full database and re-run the risk assessment model.

there are no protection measures in place targeted to reduce risk of capture from commercial and recreational fishing. This area also poses the highest level of risk from recreational set-net (more than double all other subpopulations).

1.4 Key information

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

This information is important context for you because changes to the assumed spatial distribution may affect what proportion of the dolphins are already protected from fishing, and affect the estimate of total fisheries risk. We estimate a large proportion of the estimated Māui dolphin distribution is already closed to set-net and trawl fishing (approximately 72 percent and 34 percent, respectively). However, accurately defining current distribution given the very low numbers of dolphins along this coastline is challenging.

1.4.1 Abundance and population trends

Key points

- Māui dolphin demographic models estimate that the population has declined in the past 20 to 30 years.
- The estimated population decline can be explained by a combination of commercial and recreational fisheries impacts, and other non-fishery threats such as disease.
- The most recent abundance of Māui dolphins greater than 1 year of age (from 2015/16) is estimated at 63 (with a 95 percent confidence that the number of dolphins over one year old is between 57 and 75).
- This estimate is higher than the previous abundance estimate from 2011 of 55 individuals greater than 1 year of age (with a 95 percent confidence that the population was between 48 and 69 individuals).
- However, it is not possible to tell between these two surveys whether the population has increased, stabilised, or continues to decline.
- Regardless of recent trends, the Māui dolphin population is very small and remains highly vulnerable to any human-induced mortality.
- While known to be present, there is no estimate of the number of Hector's dolphins residing off the west coast North Island.
- There is no estimate of the number of dolphins residing in the southern habitat zone.

1.4.2 Dolphin distribution off the west coast North Island

Key points

- Information from the spatial habitat model (refer to Appendix 2), dolphin sightings (public and research), beachcast carcasses, and qualitative information are used to infer dolphin distribution and assess risk.
- Two different spatial distribution models were used to estimate and map the density of the dolphins by season (summer and winter) to inform the spatial risk assessment.
- The aerial survey-based and public sightings-based spatial distribution models yielded very similar results, providing greater confidence in their estimates.
- Māui and Hector's dolphins show a strong preference for:
  - high-turbidity water (which generally occurs out to around the 50-metre depth contour in most locations; see Note:), and
  - locations where suitable dolphin prey are available.
- The spatial habitat model is applied separately within two zones:
  - The **Māui habitat zone** extends from Cape Reinga to Cape Egmont. This zone includes the resident population of Māui dolphins and known presence of Hector's dolphins, suggesting successful in-migration from the South Island.
  - The **southern habitat zone** extends from Cape Egmont to Wellington. While there is no evidence of a current resident Māui and/or Hector's population in this area, there are verified sightings, and historical evidence suggests there may have been a small resident population here in the past. The area is important if there is a desire to see Hector's and Māui dolphins re-established throughout their historical range. The area may be important as a transition zone to allow population connectivity with South Island Hector's dolphins.

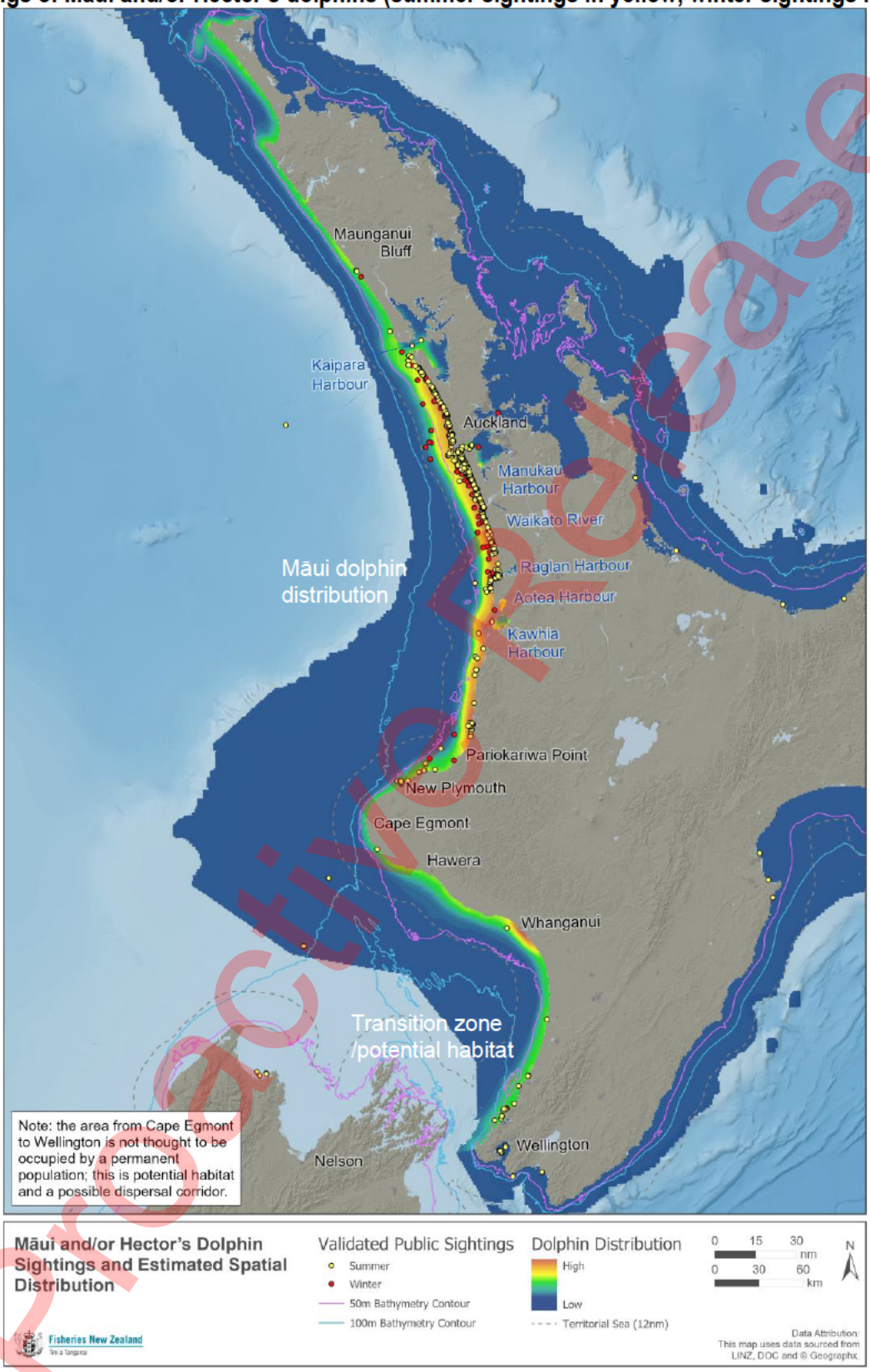
Uncertainty: Distribution and density of Māui and Hector's dolphins

The spatial estimates of Māui dolphin density are most reliable in locations with more dolphins and become more uncertain in locations with very low dolphin densities (Figure 2). Harbour habitats are very different from the open coast, and the presence of dolphins in harbours will be influenced by factors that the spatial habitat model cannot consider (for example, physical barriers like sandbars and mudflats). Consequently, the model uses public sightings-based estimates rather than the habitat model to estimate dolphin presence inside harbours.

Elsewhere, public sightings are used as an independent validation of the habitat model. In general sightings are considered to be an imperfect way of estimating dolphin densities, particularly given the very small numbers of Māui and/or Hector's dolphins in this area and the need to estimate the likelihood of very low-frequency events.

One source of likely bias in the use of sightings information is that sightings will be more prevalent in areas with greater human population and activities. In areas of low density and fewer people on the water, there are likely to be fewer sightings, but this does not mean there are fewer dolphins. For this reason, simple plots showing the locations of validated sightings should be interpreted with appropriate caution (the sightings-based distribution model corrected for this effect). Details on how the risk assessment addresses the use of sightings data and potential bias are discussed in Appendix 2.

Figure 2: Estimated (winter) spatial distribution of Māui dolphins, including validated public sightings of Māui and/or Hector's dolphins (summer sightings in yellow, winter sightings in red)



Note: The 50-metre (purple) and 100-metre (blue) depth contours are also shown.

1.4.3 Alongshore distribution

Key points

Northern tail distribution – Cape Reinga to Maunganui Bluff

- The area north of Maunganui Bluff is referred to as the "northern tail" of the distribution.
- Habitat model predictions consider this area has suitable habitat for Māui dolphins.
- The actual frequency that dolphins may use this area is unknown.
- There have been verified public sightings and beachcast dolphins as far north as Dargaville, and a beachcast Māui or Hector's (subspecies unknown) dolphin was recovered at Ninety Mile Beach in 1981.

Core distribution – Maunganui Bluff to Pariokariwa Point

- Fisheries New Zealand refers to the core Māui dolphin distribution as occurring between Maunganui Bluff and Pariokariwa Point, based on where Māui and/or Hector's are most commonly sighted, and within which live dolphins have been genetically sampled.
- The habitat model predicted greatest density between the Kaipara Harbour and Pariokariwa Point, which is broadly consistent with the spatial distribution of public and research sightings.
- Genetic sampling of *live* Māui and Hector's dolphins off the west coast North Island between the Kaipara Harbour and Raglan:
  - shows the highest frequency of Māui dolphin encounters occurs between the Manukau Harbour and south of Port Waikato;
  - confirms the presence of three *live* Hector's dolphins amongst Māui dolphins, indicating the potential for successful in-migration from the South Island.

Southern tail distribution – Pariokariwa Point to Cape Egmont

- The area from Pariokariwa Point to Cape Egmont is referred to as the "southern tail" of the distribution.
- Verified public sightings and very occasional acoustic detections using underwater detectors deployed by the Department of Conservation confirm the occasional presence of Hector's and/or Māui dolphins in this area, consistent with the predictions of the habitat model.
- A fisher-reported commercial set-net capture of a Māui or Hector's dolphin (subspecies unknown) off Cape Egmont in January 2012.

Southern habitat zone (potential habitat) – Cape Egmont to Wellington

- The spatial habitat model estimates areas within this zone where there is suitable dolphin habitat.
- There is no evidence of a current resident population in this area, but sightings data confirm that Hector's and/or Māui dolphins are present at least intermittently.
- A Hector's dolphin was found beachcast at Opunake, south of Cape Egmont, in April 2012.
- Historical DNA samples confirm Māui dolphins were present in the Taranaki (1989), Whanganui (1921) and Wellington (1873) regions.
- A beachcast Hector's dolphin was found on Peka Peka Beach, Kapiti Coast in 2005, and a live Hector's dolphin was sampled in Evans Bay, Wellington Harbour in 2009.
- The area may provide important connectivity between the South Island Hector's and the Māui populations, as well as recolonisation of historically occupied areas.

Submission comments

Phantom distribution/risk: A number of submissions (from commercial fishers and industry groups, and some tangata whenua) disagree with where the risk assessment estimates dolphin distribution in the Māui habitat and southern habitat zones. The use of the habitat model to infer dolphin distribution produces what they term "phantom distribution", which is (in their view) not supported by any evidence of current presence or studies of movements. Consequently, they consider the results unnecessarily, and excessively, inflate the risk to the dolphins from fishing ("phantom risk"). With respect to alongshore distribution, the areas of most concern in these submissions included north of Maunganui Bluff, around Taranaki, and south of Hawera to Wellington where the risk assessment estimates a "low-density tail" in distribution.

Fisheries New Zealand response

We consider any dolphin (Hector's or Māui) that successfully disperses north, or south, of Cape Egmont important. An in-migrating Hector's dolphin is a positive contribution to the Māui population, as is the Māui dolphin distribution expanding or individual dolphins ranging further.

We recognise that the areas north of Maunganui Bluff, around Taranaki, and south of Hawera to Wellington are outside core dolphin range, but we disagree that the risk assessment model is estimating phantom distribution in these areas. A low, but non-zero, dolphin density (indicative of occasional / rare dolphin presence in these areas) is supported by qualitative information (for example, sightings, beachcast dolphins and acoustic detections) as summarised above. The number of dolphins that may be present, and the frequency of their presence in these areas, is uncertain.

1.4.4 Offshore distribution

Key points

- Knowledge of the offshore distribution of dolphins has historically relied heavily on aerial surveys, or acoustic detection, which is very challenging when populations are very small.
- The dolphin distribution predicted by the habitat model is well-specified and verified by public sightings in the core range out to around 10 to 12 nautical miles offshore.
- Māui and/or Hector's dolphins off the west coast North Island are most prevalent in the area from shore to 4 nautical miles offshore, after which dolphin density steadily declines.
- In summer, dolphin densities are highest in locations closest to shore; in winter the distribution shifts slightly further offshore.
- Dolphin densities beyond 7 nautical miles are very low, but habitat models, validated sightings, and acoustic detections confirm that dolphins venture this far offshore, at least occasionally.

Submission comments

Submissions present a range of views on the offshore range of the Māui dolphins. Some submissions consider they are only found in the nearshore areas, and challenge the authenticity of offshore sightings, particularly beyond 7 nautical miles.

Other industry submissions consider the offshore range may extend out to 10 to 12 nautical miles offshore, but that this only occurs in the area where they are most concentrated (for example, between Kaipara and Raglan).

Most eNGO and general public submissions consider that the 100-metre depth contour best represents the limit of their offshore distribution. Alternatively, some submitters put forward 12 nautical miles as an offshore bound to consider with respect to the dolphins range, and proposed management measures.

Fisheries New Zealand response

Offshore distribution is well verified out to 12 nautical miles offshore. We disagree that the 100-metre depth contour best represents Māui dolphin habitat. Assertions that water depth is a better predictor of dolphin distribution than water turbidity have been conclusively disproven by testing a whole range of variables, within the risk assessment spatial distribution model, to see which variables best fit to the dolphin observations. Turbidity was consistently a much stronger predictive variable than depth.

References to the 100-metre depth contour as a limit for the dolphin distribution are also unsupported by evidence. Outside of areas with elevated turbidity (best approximated by the 50-metre depth contour) distribution models estimate a uniformly low background density, including to depths beyond 100-metre depth. We also note there have been validated sightings beyond the 100-metre depth contour of Māui and/or Hector's dolphin in some areas.

1.4.5 Harbour distribution

Key points

- The spatial habitat model predicts very low dolphin densities (such as rare occurrence) within harbours.
- There are few public sightings of Māui and/or Hector's dolphins within any west coast North Island harbours despite high levels of activity within them. These sightings occurred close to the harbour mouths.
- Māui and/or Hector's dolphins occasionally enter the mouth of the Manukau and Kaipara harbours where set-net closures exist.
- Four dolphin carcasses have been found deeper within west coast North Island harbours:
  - a Māui dolphin was found beachcast in Kawhia Harbour in 2000;
  - a Māui dolphin was washed up in the entrance of the Manukau Harbour as a result of capture in a net in 2002;
  - a Hector's dolphin (2012) and a Māui or Hector's dolphin (1985) have been found beachcast within the Manukau Harbour; and
  - it cannot be determined whether these dolphins died within the harbours or whether their bodies were washed in with the strong tidal currents.
- All research sightings of Māui and/or Hector's dolphins in harbours have occurred within the current set-net ban areas. A single validated public sighting was reported in 2010 just beyond the current set-net ban area in Kaipara Harbour.
- Thirty-eight acoustic detections of Hector's and/or Māui dolphins have been recorded in the Manukau Harbour within the current set-net ban area.
- A single acoustic detection was recorded in the Kaipara Harbour in 2007, approximately 10 kilometres south of the harbour side of the entrance beyond the current set-net prohibitions.

Submission comments

Submissions from the commercial fishing industry and a range of local residents strongly disagree with the assertion that Māui dolphins are found within the harbours. They consider that continuously high human presence in these harbours would make it impossible for dolphins to escape detection. They note the areas where dolphins have been sighted are already closed to set-netting, and consider the upper reaches of the harbour are blocked by sand bars or mudflats, which are exposed at high tide, and would not be preferred habitats of Hector's or Māui dolphins.

Conversely, submissions from the eNGOs and the general public state that given the small number of dolphins, they are unlikely to be seen regularly in the harbours. They consider that even if the dolphins' use of the harbours is infrequent, they are still used, and the areas need protection to enable repopulation.

Fisheries New Zealand response

Dolphins are known to occasionally enter the mouth of the Manukau and Kaipara harbours, but there are few public sighting despite high levels of public presence, and general activity in the harbours. At locations deeper inside the harbours, the distribution model predicts very low dolphin densities (consistent with rare intermittent presence).

The absence of verified sightings deeper in the harbour is sufficient to demonstrate that dolphin presence in the inner portions of west coast North Island harbours is

very low, and possibly zero, as there are a lot of people in these harbours who could see, and report a dolphin. It is also possible that the models are overestimating risk in the upper reaches of the harbours, where no actual sightings have been recorded. This is because these models never predict a "true zero" density (reflecting uncertainty even when the most likely density is zero). A substantial research investment (such as, the deployment of underwater acoustic sensors to detect dolphin presence in harbours) would be required to determine whether or not this risk is real.

1.5 Current fisheries risk

1.5.1 Status quo measures

The restrictions in place to manage the risk of fishing-related mortality to the Māui dolphin population apply to the commercial and recreational set-net and driftnet fisheries, and commercial trawl (shown in Figure 3). There has also been a ramping (since 2014) of targeted observer coverage on the trawl fleet operating between Maunganui Bluff and Pariokariwa Point between 2 and 7 nautical miles offshore.

From 1 November 2019, the measures will include (in most of the estimated Māui habitat zone) monitoring on select set-net and trawl vessels via the *Stage One* on-board camera programme.

Supportive of the status quo

The majority of submissions from the fishing industry and recreational fishers support the status quo on the basis:

- there is no information that warrants an extension of coastal set-net, harbour set-net or trawl prohibition areas;
- they do not believe the dolphins are in the areas they fish outside of the closures (or within the closure areas in some cases);
- the methods they use to fish are being inaccurately assessed as posing a risk to the dolphins (such as, differences in catchability of coastal set-nets, harbour set-nets and various trawl configurations);
- that around Taranaki, or south to Wellington, in the unlikely event a dolphin were to be seen it would likely be a Hector's dolphin, not a Māui dolphin;
- the lack of any sightings or observed interactions (despite high levels of coverage) in recent years shows there are no interactions and/or need for further measures; and
- any extension of the existing closures would cause significant hardship to them, their families, and communities (from an economic and wellbeing perspective).

Oppose the status quo

The majority of non-fishing interests (eNGOs, academia, and the general public) consider the status quo unacceptable (with or without additional monitoring). Their rationale is that:

- the Māui dolphin population is so small that any residual risk from fishing is untenable;
- set-nets pose the greatest threat to Māui dolphins;

- the 2018 and 2019 trawl captures of Hector's dolphins off the east coast of the South Island shows there is a need to act to remove trawl risk;
- the lack of protection measures between the South Island and Māui dolphin population prevents dolphins from recovering and expanding to their natural historical range; and
- given the small population size of Māui dolphins, the only way to help ensure their future survival is to put in place much greater protection measures.

Fisheries New Zealand response

An assessment of risk from the coastal set-net, harbour set-net, and trawl fisheries in the Māui and southern habitat zones is discussed below.

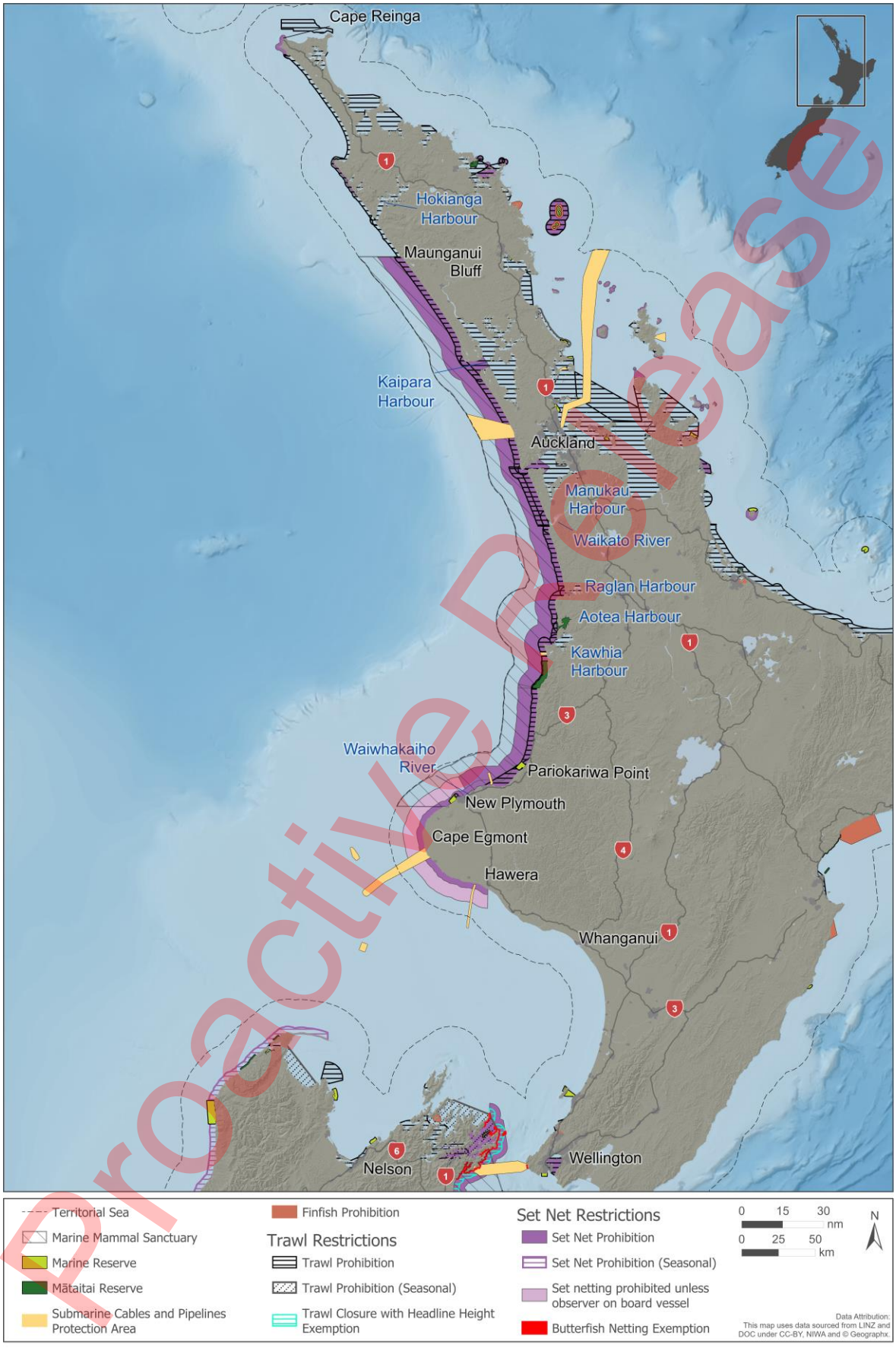


Figure 3: Current restrictions on trawl and set-net fishing off the west coast North Island

1.5.2 The risk from fisheries

Summary of Risk Assessment findings

- The cumulative impact of current human-induced threats to Māui dolphin is likely to result in population decline, posing risk to the population.
- Estimated annual deaths from toxoplasmosis were roughly 20 times greater than those from commercial fisheries, but confidence intervals for this estimate are wide.
- The upper 95th percentile estimate of current fisheries impact is 0.17 deaths per year, which exceeds the proposed "allowable" level of mortality (0.14) for the fisheries population objective to be achieved.
- Commercial set-net, commercial trawl and recreational set-net fisheries were the threats estimated to pose the greatest fisheries-related risk.
- In the Māui habitat zone:
  - commercial set-net fisheries are responsible for 83.5 percent of the current risk;
  - commercial trawling is responsible for 16.5 percent of the current risk; and
  - recreational set-net risk is estimated on a relative scale – a dolphin in the Māui habitat zone is estimated to be four times as likely to die in a recreational set-net compared to a dolphin off the east coast of the South Island.
- In the southern habitat zone:
  - commercial set-net fisheries are responsible for 98.1 percent of the current risk;
  - commercial trawling is responsible for 1.9 percent of the current risk; and
  - recreational set-net risk is estimated on a relative scale – a dolphin in the southern habitat zone is estimated to be 27 times more likely to die in a recreational set-net compared to a dolphin off the east coast of the South Island.

Uncertainty in fisheries risk to the Māui dolphin population

Fisheries risk estimates derived from the risk assessment model may be more uncertain in the following locations:

- *Inside west coast North Island harbours*: The models estimate that dolphins enter the harbours very infrequently, but it is possible that these estimates are wrong, including the possibility that dolphins never penetrate the interior of these harbours.
- *The extreme northern and southern tail of the Māui dolphin distribution*: At least occasional presence of dolphins in the southern extreme is verified by public sightings, acoustic detections, and a historical capture; occasional dolphin presence in the northern extreme is verified by less data (public sightings as far north as Dargaville and a beachcast carcass at Ninety Mile Beach in 1981).
- *The extreme offshore distribution*: the dolphin distribution predicted by the habitat model is well-specified and verified by sightings data out to around 10 to 12 nautical miles offshore. However, at further ranges the habitat model predicts a uniformly low background density that never drops to zero, even at significant distances offshore. It is likely that the model is overestimating the numbers of dolphins present (and thus the residual risk from fishing) at distances beyond 12 nautical miles offshore.

Submission comments

Commercial fishing risk: Te Ohu Kaimoana submit that additional measures to restrict commercial fisheries are shown (within the Māui dolphin demographic model) to have negligible conservation benefit. They say that the model suggested that

removal of all fishing had a negligible effect and did not change population trajectories, and instead other threats (for example, disease) are driving the population trajectories of these dolphins. They propose that additional measures, such as the use of cameras and gear modification, would further reduce risk.

Catchability: A number of submissions from the industry raise the points that set-netting and trawling can have different configurations, and consequently do not all pose the same risk. They ask that we consider the differences in how set-net and trawl gear may be deployed and how that changes the risk posed to dolphins.

A number of industry submissions also emphasised that there has never been a reported capture of a Māui dolphin in a trawl net, and the high levels of observer coverage in the core area over the last four years has result in only one sighting and no interactions. Conversely, submissions from the general public and eNGOs point to the recent captures of Hector's dolphins off the east coast of the South Island as evidence that trawling poses a significant risk to the dolphins. They consider the low population size of Māui dolphins warrants a precautionary approach, and that any trawling in Māui dolphin habitat is unacceptable.

Poor historical observation underestimates fishing threat: The general public, eNGOs, many academics, and other non-fishing interests emphasised that there are no incentives for fishers to self-report mortalities. They consider the observer coverage off the west coast North Island has been insufficient, especially historically, to reveal the true nature of the threat. They also note that the consequence of any human-induced mortality is very high for the population. They ask that you proceed using a precautionary approach in assessing the risk set-net and trawl fisheries pose to the dolphins.

Fisheries New Zealand response

The limitations of the risk assessment with respect to fisheries threats are discussed in Appendix 2. As noted in section Part B1, the intention of the fisheries proposals is to enable fisheries risk to be better estimated, and the proposed fisheries objectives achieved in a more transparent way, regardless of what other threats are also affecting the population. However, the actual population outcome that is ultimately achieved will be dependent on how non-fishing threats are managed. Assertions that low historical observer coverage will cause the risk assessment to underestimate risk are incorrect; low observer coverage results in greater uncertainty, rather than bias; this uncertainty is reflected in the confidence intervals.

Māui dolphin population demographic models and commercial fisheries risk: Two independently commissioned demographic models were used to analyse the nature and potential causes of the long-term population trend. The estimated number of toxoplasmosis deaths corresponds closely to the number of deaths that are "required" to explain the long-term population decline. These otherwise unaccounted-for deaths cannot plausibly be assigned to commercial fisheries, because this would require that on a per-encounter basis, a Māui dolphin is 20 times more likely to die in an encounter with a net than is a Hector's dolphin. There is no plausible mechanism that could explain such a difference in catchability.

It is possible that a combination of non-commercial-fisheries effects (for example, terrestrial run-off, pollution, disease, low prey availability, acoustic disturbance, and recreational fishing deaths prior to 2001) have acted cumulatively to produce the population decline estimated by population models. If this is the case, then one optimistic interpretation is that the total (cumulative) impact may have been reduced when recreational set-net fishing was largely prohibited in 2001, in a way that is not reflected in the population modelling (because recreational set-net risk is unquantified and the modelling treats all non-commercial fisheries risk as constant). The next Māui dolphin genetic census in 2020-21 will provide important new data to inform assessments on population trend.

Catchability: For the purpose of estimating dolphin catchability, the risk assessment treats all commercial set-nets as if they are the same. In reality, harbour set-net fishing (for example, targeting flatfish) is very different from set-net fishing on the open coast (for example, targeting blue warehou, school shark or rig), but observer coverage is insufficient to quantify the effect of this difference on the probability of capturing a dolphin. Consequently, estimates of fisheries risk inside the harbours are more uncertain than estimates of set-net risk on the open coast, in ways that are not reflected in the risk assessment estimates. Qualitative uncertainty in harbours reflects a lack of observer data in harbour set-net fisheries, and uncertainty regarding the frequency with which dolphins may enter harbours.

For trawl, while the use of low speed and low headline height is anecdotally considered to be of lower risk than other gear configurations, this has not been formally tested. The ability to test the effectiveness of low speed and low headline height is limited to areas where there is a greater likelihood of an interaction. Testing the gear off the west coast North Island is unlikely to produce sufficient evidence as to whether it reduces risk. We are proposing to formally test the effectiveness of these gear differences as part of the Hector's dolphin measures in the South Island. If shown to be effective, those lessons could be considered in the context of the west coast North Island.

While trawl risk is low compared to set-net risk, in the context of a very small population the consequence of a trawl capture is very high. If an incident occurred similar to the two multiple-capture events in Pegasus Bay in the South Island, in 2018 and 2019, where three Hector's dolphins were captured in each, the consequence to the Māui dolphin population would be significant. However, the risk of a trawl capture under the current measures is estimated to be approximately one death in 63 years.

Estimating fishing threat: The effect of low observer coverage in the commercial fishery is increased statistical uncertainty (not bias) and is reflected in risk assessment outputs (such as, wider confidence intervals). Catchability can be influenced by a range of factors that are not considered in the model, such as variable fisher behaviour or differences in gear configuration. This will result in greater "noise" within the capture data.

Recreational fisheries risk cannot be quantified without observer data; instead risk from recreational set-nets is estimated on a relative scale. While in most locations recreational fisheries risk has been greatly reduced due to current set-net closures, the southern habitat zone has not.

Table 1: Fisheries-specific risks

Coastal set-net fisheries	Harbour set-net fisheries	Trawl fisheries
• Risk occurs primarily in low dolphin density areas, reflecting the effects of past spatial measures that have excluded commercial (and recreational) set-net fisheries from areas of higher dolphin density. • Cape Reinga to Maunganui Bluff is highlighted by the model as an area of residual risk to the dolphins. • Between Maunganui Bluff and Cape Egmont, the north coast of Cape Egmont is identified as the area having the highest spatial overlap (hence risk) from commercial set-nets. • The highest overlap with recreational set-net (for any subpopulation) is estimated to occur in the southern area from Cape Egmont to Wellington.	• The model predicts very low spatial density of dolphins in harbours, but because of the high intensity of set-net effort identifies harbours as a major component of residual risk. • The highest spatial overlap between commercial set-nets and dolphins in harbours is estimated to occur in Kaipara Harbour. • Fisheries New Zealand notes that because of the uncertainty in the risk assessment model, and its inability to estimate a "true zero" of dolphin density in the model in harbours, it is possible that the estimated risk in the harbours may be an overestimate of the real risk to the dolphins.	• The location of highest estimated overlap was between Port Waikato and to the south of Kawhia, just outside the boundary of the existing trawl fishery closure (two nautical miles). • The estimated risk from trawl (including at the upper 95 percentile) is below the level that would pose a risk to achieving the proposed Māui dolphin population objective, and poses very little risk (<2 percent) to the dolphins that may be present in the southern habitat zone. • However, its contribution to the total risk posed by commercial fisheries (set-net and trawl combined), particularly in the Māui habitat zone, should be considered in determining whether additional measures are necessary.

Submission comments

Dolphins are unlikely to need or occupy some areas: Some industry submissions emphasise that even if an area represents a potential habitat (for example, Cape Reinga to Maunganui Bluff, or south of Cape Egmont to Wellington) and area of risk, it would require many decades of population growth before Māui dolphins would need to expand to new territory. They argue there is no scientific or reasonable expectation that Māui dolphins would require these regions for habitation.

Fisheries New Zealand response

Habitat and risk: In the Māui habitat zone there is a low-probability risk of captures from coastal set-net, including risk to dolphins that may be present only occasionally in low-density tail habitats. However, Māui and/or Hector's dolphins have been documented to occur in the area north of Maunganui Bluff and south of Pariokariwa Point.

In the southern habitat zone, there is a high risk to Māui or Hector's dolphins from coastal set-net – regardless of where they are coming from (north or south) - that may constrain their ability to move in and take up residence in these regions. Both Māui and Hector's dolphins have been documented south of Cape Egmont – either in recent times or historically.

1.6 Assessment of the need for management action

Whether further measures are necessary to manage fishing impacts on Māui and Hector's dolphins off the west coast North Island depends on your assessment of the likelihood of fishing-related mortality occurring, the consequence of mortality to the dolphins, and the impacts of further measures on the use of fisheries resources. It also depends on whether you deem the proposed population outcomes and fisheries objectives appropriate.

Should you choose to apply the proposed population outcomes and fisheries objectives, then we consider there is a need for additional fisheries measures because:

- Set-net and trawling effort, which can result in captures of Māui and Hector's dolphins, overlaps with estimated dolphin distribution, posing a risk of fishing-related death. Estimates of distribution are qualitatively supported by sightings, beachcast dolphins, and acoustic detections. We note that the areas where dolphins are most commonly found have been closed to these methods, leaving the remaining areas of residual risk in the periphery of their distribution.
- While this risk is estimated by the risk assessment (and qualitatively considered) to be low, the consequence of a fishing-related mortality, if one was to occur, is high given the low number of Māui dolphins remaining.
- The risk assessment suggests that for the Māui habitat zone:
    - the combined set-net and trawl deaths are estimated to currently exceed the population sustainability threshold at the 95th percentile (Figure 5 and Table 2); and
    - the 95th percentile estimate of set-net deaths exceeds the population sustainability threshold on its own.
- For the southern habitat zone,
    - the combined set-net and trawl estimated risk score exceeds the population sustainability threshold at both the mean and 95th percentile (Figure 5 and Table 2); and
    - the mean and 95th percentile estimated set-net risk score both exceed the population sustainability threshold.

We recommend that you look at the risk from trawl as part of reducing overall fisheries risk, although in isolation we note that the estimated risk from trawl in both zones is comfortably below the risk assessment thresholds.

The fisheries objective is achieved by ensuring that the 95th percentile estimate of annual deaths (Māui habitat zone), or annual risk score (for the southern habitat zone), from fisheries does not exceed the population sustainability threshold.

Notwithstanding, you can take a different view of the level of risk to Māui dolphins, and dolphins in the southern habitat zone, based on the information presented.

Table 2. Estimates of current fisheries risk (mean estimate of deaths or risk score) in relation to the proposed population sustainability threshold (required to achieve the fisheries population objectives) for the Māui habitat zone and southern habitat zone

	Population sustainability threshold	Estimated fisheries risk		
		Set-net and trawl combined	Set-net	Trawl
Māui habitat zone	0.14 deaths per year	0.10 (0.054 – **0.17**)	0.083 (0.050 – **0.14**)	0.016 (0.0045 – 0.037)
Southern habitat zone	1.00 risk score	**1.16** (0.55 – **2.26**)	**1.13** (0.55 – **2.20**)	0.026 (0.0068 – 0.062)

Note: The 5th and 95th percentiles are shown in brackets. Numbers in bold indicate where the threshold is being breached.

Coastal set-net fisheries

We consider that there is a need for additional management action to address the risk from coastal set-net because:

- Coastal set-net represents the highest risk of fishing related death of all commercial fishing methods.
- The greatest set-net risk to the Māui dolphin population occurs off the coast of New Plymouth, despite the fact that this area has only low-estimated densities of dolphins (such as, intermittent presence). Because set-nets have already been banned in the core of the Māui dolphin habitat, the remaining risk only occurs in marginal habitats.
- In the southern habitat zone, there is no evidence of a resident dolphin population, but the risk assessment indicates that whatever dolphins are present in this area will face more risk from commercial fishing than any other Māui or Hector's dolphin subpopulation.
- Recreational set-net fisheries risk is higher in the southern habitat zone than in any other subpopulation area, reflecting that this is one of only two areas of suitable dolphin habitat in the country where there are no set-net closures in place.

Harbour set-net fisheries

We consider that there is little need for additional fisheries closures in the harbours because:

- the risk assessment indicates that there is residual risk in the harbours, but this is largely because the model will never estimate a true zero density (reflecting uncertainty around the zero);
- sightings and acoustic detections indicate the dolphins may occasionally enter portions of the harbours, but these have occurred primarily in areas that are already closed to set-net fishing;
- there are a lot of people in these harbours who could see and report a dolphin, and so the absence of verified sightings deeper in the harbour is sufficient to demonstrate that dolphin presence in the inner portions of west coast North Island harbours is very low, and possibly zero; and
- there are differences in set-net usage in the harbours versus the coast which is likely to pose a different level of risk than the model estimates. It is qualitatively likely that catchability in harbour set-nets targeting flatfish is lower than catchability in coastal set-nets, due to smaller mesh size and deployment in

shallower water, including locations that drain completely at low tide.

Trawl fishery

We consider that there is a need for additional management measures because:

- trawl activity overlaps with Māui dolphin distribution; and
- Māui dolphins are susceptible to capture in trawl nets.

While trawl risk is low (estimated to be 1 event every 63 years) relative to set-net, in the context of a very small population the consequence of a trawl capture would be very high.[3] The trawl risk is greatest within the area between Maunganui Bluff and Pariokariwa Point.

In the southern zone, trawl represents such a small portion of fisheries risk (<2 percent), there is little point in targeting extensive trawl risk reduction to achieve the population outcome or other fisheries objectives.

1.7 Proposals to reduce fisheries risks

We consulted on a range of options to reduce the risk from set-net and trawl fisheries. Details of those options, submission comments, and analyses are provided in Appendix 3A. A few submissions also provided detailed alternative options or requests for your consideration, including:

- Option 5 presented by Sanford, Moana Fisheries and WWF-New Zealand; and
- requests by commercial butterfish fishers for an exemption to allow them to continue to operate in the southern habitat zone should a set-net ban be put in place.

An assessment of these proposals can be found in Appendix 3B. Taking into account submissions and feedback, revised options for each method have been developed. There are three set-net options and two trawl options (the spatial area of each method option is shown in Figure 4). Figure 5 displays the estimated fisheries risk of each method option.

The options for set-net and trawl are independent of one another. The total amount of risk that would remain is calculated by combining the effects of both a trawl option and a set-net option (a package). You can choose different options for each fishing method. Some of the combinations of options available to you (and their likelihood to achieve the population objectives) are shown in Table 3.

Each method option is designed to successively reduce the risk to the dolphins, which consequently increases the estimated socioeconomic impacts on commercial and non-commercial fishers (refer to Table 4 for socioeconomic estimates).[4]

To assist decision-making, a set of packaged options have been developed for your consideration (denoted as packages, and identified in bold in Table 3). Our preferred

[3] The number of animals dying per trawl event is not well estimated. Evidence suggests that trawl captures may arise from social interactions that often involve more than one dolphin, and that multiple-capture events are more common than would be expected if individuals were captured independently. The risk assessment currently assumes that each capture event kills two dolphins on average, but this multiplier is uncertain.

[4] Proposed set-net closures apply to both commercial and recreational fishers, but quantitative estimates of risk and economic cost refer to commercial set-net fishers only.

package is Package 2, which combines Option 2 for set-net and Option 1 for trawl. However, you have discretion to amend or tailor these packages as you see fit, based on your assessment of the information that has been presented.

These packages do not preclude you from considering the consultation options (including status quo) if you consider measures are necessary (or not) to reduce fisheries risk to an acceptable level.

Each package reflects a different weight between use and sustainability. Package 1 is weighted more towards providing for use of fisheries resources, relative to reducing fisheries risk to the dolphins. Conversely, Package 3 is more strongly weighted towards significant reductions in fisheries risk that come at a high impact/cost on the use of fisheries resources.

Table 3: Matrix of combinations of set-net options and trawl options

	Set-net Status quo	**Set-net Option 1**	**Set-net Option 2**	**Set-net Option 3**
Trawl Status quo	×	× $0.32 million	✓ $1.58 million	✓ $2.34 million
Trawl Option 1	× $1.82 million	✓ **(Māui only) $2.14 million Package 1**	✓ **$3.39 million Package 2**	✓ $4.16 million
Trawl Option 2	✓ (Māui only) $5.66 million	✓ (Māui only) $5.98 million	✓ $7.23 million	✓ **$8.00 million Package 3**

Note: Combinations identify whether the fisheries objectives are likely to be achieved (x = no, ✓ = yes), and the estimated impact on annual revenue. Bolded packages are described in further detail below.

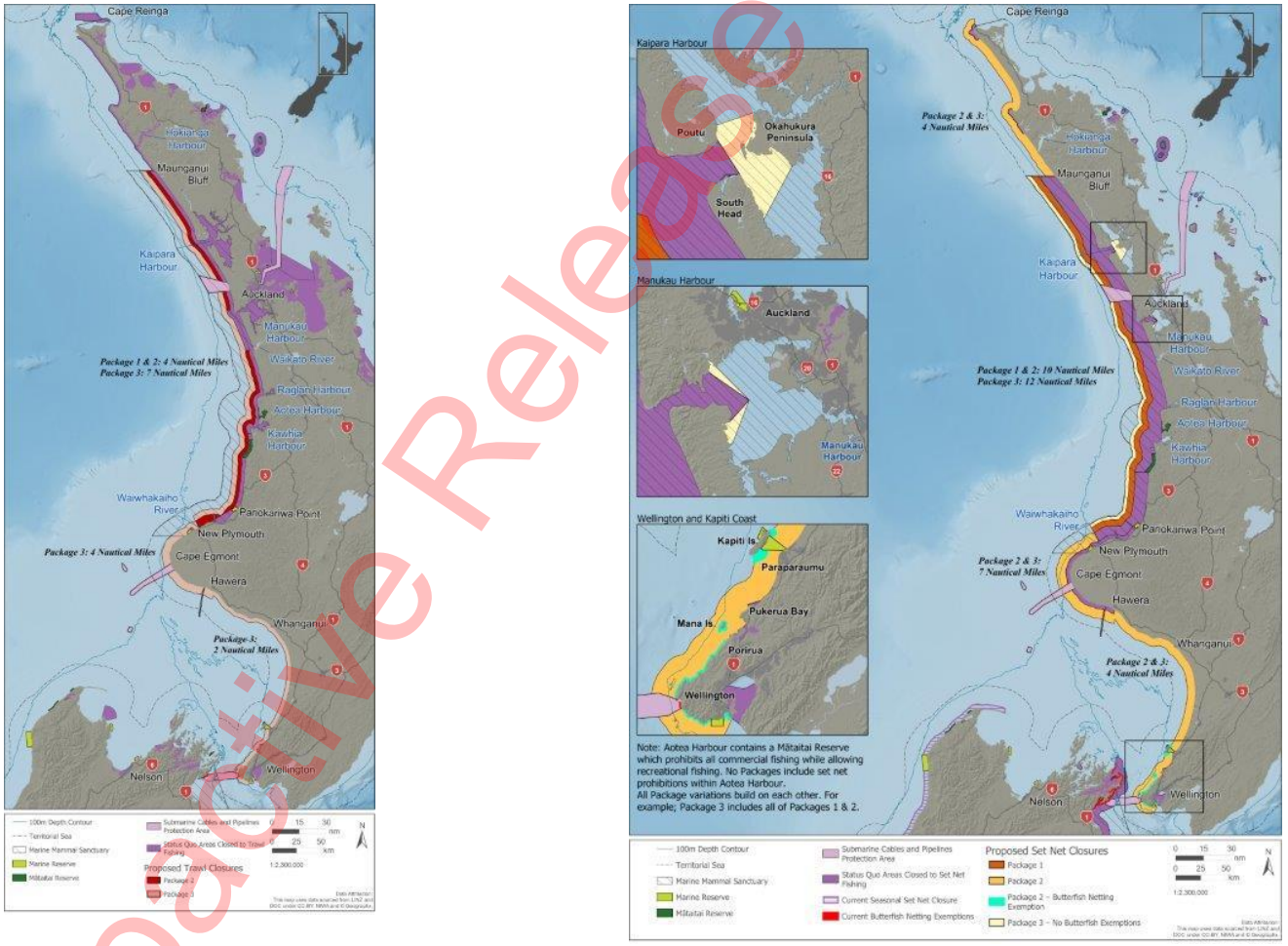
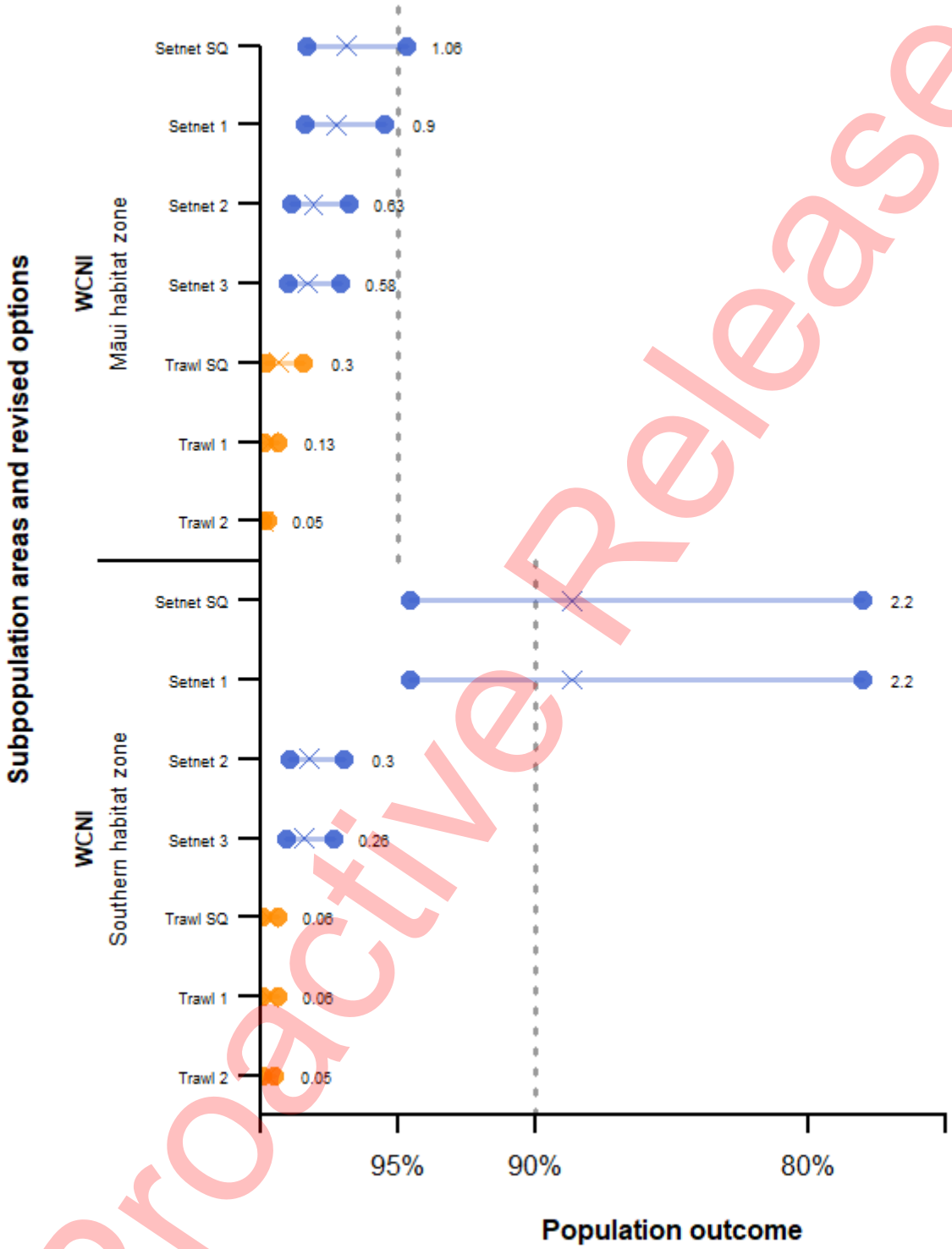


Figure 4: Revised set-net and trawl options that form Packages 1, 2 and 3.

Figure 5. Estimate of risk of each method option (set-net and trawl), including status quo, in the Māui habitat zone and southern habitat zone in relation to the proposed fisheries population objectives



Note: The blue bars represent set-net risk, and the orange bars represent trawl risk. The 95th percentile risk scores are shown to the right of the bars. Risk scores less than one achieve the subpopulation objective. If the combined fisheries risk (summed for trawling and for set-net) sits to the left of the 95 percent population outcome vertical dotted line (Māui) or the 90 percent population outcome vertical dotted line (southern), then the subpopulation objective is achieved. To see if a combined set-net and trawl package will meet the objective, the risk scores need to be added together and be less than 1. Note too that trawl options and set net options can be combined independently; for example set-net option 2 can be combined with trawl option 1, giving you more options as to how the objective can more efficiently be achieved.

Although the risk assessment estimates that harbours are areas where a substantial proportion of the remaining residual set-net risk occurs, we consider these estimates are likely to be biased high, and thereby do not support extensive closures in harbours (as consulted on), particularly given the potential socioeconomic impact to non-commercial and commercial fishers. We instead recommend that priority be given to a comprehensive research project (likely using acoustic technology) to detect whether, or to what degree, dolphins may utilise different portions of the harbours.

1.7.1 Socioeconomic impact of options

A summary of estimated impacts on commercial fishers under each method option is outlined in Table 4. The economic impact tables use average catch data (from the last 10 years) and revenue-based export price estimates for species caught to estimate revenue from the affected areas.

Table 4: Estimated economic impact on commercial set-net and trawl fishers in the Māui and Southern habitat zones (combined) for each method option[5]

Total Economic Impacts ($ millions)	Set-net			Trawl	
	Option 1	Option 2	Option 3	Option 1	Option 2
Commercial sensitivity					
Quota stocks most affected (% of QMA landings[8])	3% SPO8 2% SPO1 2% SCH8	42% SPO8 19% WAR8 9% SPO1 8% SCH8	44% SPO8 20% WAR8 14% SPO1 13% BUT2 8% SCH8	7% GUR1 5% SNA8 4% KAH8 4% TRE7	16% GUR1 15% GUR8 15% SNA8 13%TRE7
Total Annual Revenue Lost[9]	$0.32M	$1.58M	$2.34M	$1.82M	$5.66M
Total Economic Impact – 1 Year	$0.91M	$4.45M	$6.59M	$5.13M	$15.95M
Total Economic Impact – 3 Year	$1.57M- 2.59M	$7.65M- 12.60M	$11.34M- 18.68M	$8.81M- 14.52M	$27.43M- 45.20M
Total Economic Impact – 5 Year	$1.70M- 4.08M	$8.26M- 19.86M	$12.25M- 29.44M	$9.53M- 22.89M	$29.64M- 71.23M

Note: A low and high estimate of the Total Economic Impact are shown for 3 and 5 years. Fishstocks defined: SPO – rig, SCH – school shark, WAR – blue warehou, BUT – butterfish, GUR – gurnard, SNA – snapper, KAH – kahawai, TRE – trevally.

[5] Estimated impact on the number of fishing permit holders, and percent of Quota Management Area (QMA) landings, is based on a three-year data average from 2015/16 to 2017/18. Estimated impact on total annual revenue and total economic value are based on a 10 year data average from 2007/08 to 2016/17.

[6] Where sum of landings in the affected area, for each permit holder, is at least 1 tonne.

[7] Where sum of landings in the affected area, for each permit holder, is at least 1 tonne.

[8] Where landings are greater than 10 tonnes. Some stocks have a much larger portion of QMA landings affected but these represent much smaller tonnages (i.e. they have a small TACC, and are underdeveloped and/or the available biomass is low). These stocks are most commonly incidental bycatch rather than targeted stocks.

[9] Total Annual Revenue estimates have been derived from a 10-year data – 2007 to 2017 to smooth out variations in inter-annual catches that could impact revenue estimates.

The Total Economic Impact is the present value of economic losses and takes into account the direct and indirect impacts to the wider economy. To provide more intuitive estimates as to where the economic impact of each package/option may lie, a low and high estimate range has been provided. The high estimate range assumes no reallocation of resources or labour and represents a "worst-case scenario", while the low estimate allows for resources and labour to reallocate at varying timeframes. A detailed explanation of the methodology has been provided in Part B6.

1.7.2 *Ex gratia* support and transition

Submissions from commercial fishers (and their representatives) commented extensively on the issue of transitional assistance. Many noted that if the proposed fishing restrictions were implemented their commercial fishing operations would become economically unviable. While some submitters requested government assistance to transition to other fishing methods, others indicated that they would likely be unable to continue operating profitably and requested compensation for loss of assets and income if they exited the industry.

Some of the packages are likely, if implemented, to have significant impacts on a range of commercial fishing stakeholders. Details on proposed transitional assistance and estimated costs for affected fishers off the west coast North Island are provided in Part B7.

1.7.3 Package 1: Minimal additions to spatial closures, greater emphasis on monitoring and improving information

Under Package 1 (Table 5), commercial fisheries risk is reduced in the primary core, and tail distribution area of Māui dolphins. It encapsulates nearly all Māui and/or Hector's offshore sightings in that area, and eliminates trawl risk in the location where it is estimated to be highest.

Risk reduction

Māui habitat zone: This package would remove risk from those areas subject to prohibition and reduce the overall risk to the population thereby resulting in a high certainty (95 percent) that the Māui dolphin population will achieve the fisheries objective.

Southern habitat zone: This package does not remove fisheries risk in the southern habitat zone and would not deliver the proposed fisheries objectives for that area.

Table 5: Overview of Package 1

Māui habitat zone	Set-net Option 1	Trawl Option 1
Cape Reinga to Maunganui Bluff *(northern tail of distribution)*	Put in place set-net closure out to 4 nautical miles	Retain current closure out to 1 nautical mile
Maunganui Bluff to New Plymouth *(core + tail distribution)*	Extend existing set-net closures to 10 nautical miles offshore	Extend existing trawl closures to 4 nautical miles offshore
New Plymouth to Cape Egmont *(southern tail of distribution)*	Retain the current closure between 0 and 2 nautical miles offshore	N/A
	Retain the mandatory observer coverage between 2 and 7 nautical miles offshore	
Southern habitat zone		
Cape Egmont to Hawera *(South: potential habitat)*	Retain the current closure between 0 and 2 nautical miles offshore	N/A
	Retain the mandatory observer coverage between 2 and 7 nautical miles offshore	

Submission comments

Submission views are derived from the feedback received on consultation options that are the same or similar to those proposed in this package.

FINZ sees some justification for extending the set-net prohibition area beyond the current 7 nautical mile limit. However, they consider any offshore extension should only apply between Raglan and Kaipara, and out to no more than 12 nautical miles offshore. They see no justification to apply an extension further north or south of those areas given the decrease in dolphin density.

The Raglan trawl fishers currently focus their effort within the 4 nautical mile area because they target gurnard and are largely able to avoid snapper bycatch. These fishers consider that their ability to adapt and fish in deeper waters beyond 4 nautical miles is significantly constrained by the availability of SNA 8 ACE. As such, the extension of a trawl ban under this package would force them out to deeper water and prevent them (in their view) from being able to fish the most available, and productive, gurnard fishing grounds.

The Option 5 partners make different recommendations on spatial changes. Sanford and Moana recommend a restriction of trawling to beyond 4 nautical miles between Maunganui Bluff and New Plymouth as presented here in Package 1 (as well as Package 2). WWF-New Zealand recommends a restriction of trawling to 7 nautical miles (as reflected in Package 3).

Overview

A summary of the package in relation to risk-reduction targets and associated economic impacts and monitoring costs are provided below in Table 6. This package

would also rely on monitoring to detect, and respond if required to, a capture of a Māui dolphin via the:

- mandatory observer coverage on commercial set-net vessels around Taranaki;
- targeted observer coverage on selected trawl vessels operating in the area between Maunganui Bluff and New Plymouth; and
- the *Stage One* on-board camera programme.

Socioeconomic impact

We estimate a loss of Commercial sensitivity trawl vessels due to the economic impacts of the closures. The estimated annual revenue loss is $2.14 million, of which $1.82 million would be primarily felt by those fishers and licensed fish receivers based in Raglan. Approximately $0.32 million would be lost from Commercial sensitivity set-net fishers that operate offshore to 10 nautical miles and are primarily based in New Plymouth Commercial sensitivity

Table 6: Summary of the effectiveness of a combined Package 1 in relation to the population objectives, and associated estimates of economic impacts and monitoring costs

	Population Sustainability Threshold	Deaths or risk score	Population outcome achieved	% of dolphin population protected	Total revenue lost (annual)	Total economic impact (5 years)	Observer Monitoring costs (5 year period)	Camera Monitoring costs (5 year period)
Māui population	0.14 deaths per year	0.081 (0.045-0.14)	Yes	Set-net: 76% (winter) 86% (summer) Trawl: 49% (winter) 73% (summer)	$2.14 million	$11.2-27.0 million	$2.40 million	$2.46 million
Southern habitat zone	1.00 risk score	1.16 (0.55-2.26)	No	Set-net: 6% (summer & winter) Trawl: 2% (summer & winter)			TBC	N/A

Note: Estimates of the deaths and risk score include commercial set-net and trawl combined (the 5th and 95th percentile are shown in brackets).

Monitoring costs

The following estimated monitoring costs are likely to be overestimates if the fishers/vessels most impacted by the package are no longer able to operate, and thus will not be a part of any monitoring programme. All upfront costs associated with

the *Stage One* on-board camera programme are borne by the Crown, as well as the annual costs associated with at least the first year of the programme.

For set-net, the total upfront cost of on-board camera monitoring (purchase and installation of hardware) for 5 vessels is estimated to be around $0.15 million, with the annual costs estimated to be around $0.070 million. The cost of the existing mandatory observer coverage for set-net is estimated to be $0.12 million per year. The observer coverage cost is currently borne by the Crown. We propose this cost be transferred to industry via the cost recover levy process (which are incurred by those that hold quota on the fishstocks harvested by that method in the area) if this coverage is continued.

For trawl, the upfront cost of on-board camera monitoring for 15 trawl vessels is estimated to be around $0.44 million, with the estimated annual costs around $0.306 million.[10] The cost of the targeted observer coverage for trawl (if it were to continue) is estimated to be $0.36 million per year. Trawl observer coverage is currently funded via the cost recovery levy process. We propose those costs continue to be funded in that way.

For the southern habitat zone, given the lack of protection measures under this package, we recommend you consider what, if any, monitoring may be suitable in that zone given the high risk from set-net in particular. We estimate that the costs of extending the camera programme to commercial set-net fishers in the southern habitat zone to outweigh the potential benefits. We estimate start-up costs to be approximately $0.41 million across 14 vessels. Some of the vessels are small, or use tenders to haul their nets, which makes the use of cameras more difficult given currently available technology. Targeting a small level of observer coverage may be a more cost-effective alternative, but ability to implement would need to be prioritised across broader observer coverage demands, and ability of vessels to carry observers.

Fisheries New Zealand assessment

Package 1 will achieve the proposed fishery population objective for the Māui habitat zone, although the upper 95th percentile will sit on the population sustainability threshold and leave little buffer. However, managing to the 95th percentile already provides for a degree of precaution that you may consider adequate.

In the southern habitat zone, this package takes no action to achieve the proposed fisheries objectives for the southern habitat zone. You may consider this appropriate given the uncertainty in whether there are resident dolphins in the area, and/or to what extent dolphins' transit through the region. Further research could be done to try to improve understanding of dolphin use of this habitat. However, that research would likely be both cost and time prohibitive given the low numbers of dolphins that may be present, which means it may not be feasible to obtain statistically meaningful estimates.

[10] Cost estimates for camera monitoring are based on the cost of enabling collection, review and storage of footage. Additional costs are expected to occur, but those are highly dependent on the implementation route chosen (mandatory versus voluntary).

1.7.4 Package 2: Moderate additions to spatial closures, monitoring and improving information in key peripheral areas (*Preferred*)

Under Package 2, fisheries risk (from set-net) is further reduced (in comparison to Package 1; see Figure 5) in the core and estimated alongshore distribution areas of the Māui dolphins. It encapsulates almost all Māui and/or Hector's sightings in the offshore and alongshore areas, and eliminates trawl risk in the location where it is estimated to be highest. Fisheries risk from set-net in the southern habitat zone is significantly reduced, and removes the highest level of recreational set-net risk to any of the subpopulation areas.

Risk reduction

Māui habitat zone: This package would remove the risk to ensure with high certainty (95 percent) that the Māui dolphin population will achieve the population objective.

Southern habitat zone: This package would remove fisheries risk sufficiently to ensure with high certainty (95 percent) that the dolphins present in the southern habitat zone, will achieve fisheries objectives.

Table 7: Overview of Package 2

Māui habitat zone	**Set-net Option 2**	**Trawl Option 1**
Cape Reinga to Maunganui Bluff *(northern tail of distribution)*	Put in place set-net closure out to 4 nautical miles	Retain current closure out to 1 nautical mile
Maunganui Bluff to New Plymouth *(core + tail distributions)*	Extend existing set-net closure out to 10 nautical miles	Extend existing trawl closures out to 4 nautical miles offshore
New Plymouth to Cape Egmont *(southern tail of distribution)*	Extend existing set-net closure out to 7 nautical miles	N/A
Southern habitat zone		
Cape Egmont to Hawera *(South: potential habitat)*	Extend existing set-net closure out to 7 nautical miles	N/A
Hawera to Wellington *(South: potential habitat)*	Put in place set-net closure out to 4 nautical miles with a butterfish exemption	N/A

Submission comments

Submission views are derived from the feedback received on consultation options that are likely to produce similar impacts:

- New Zealand Sport Fishing Council support extension of the present set-net ban down to Wellington;
- New Zealand Fishing Industry Guild signalled their support for Option 2 for set-net, which is equivalent to what is proposed here;
- Option 5 partners recommend a set-net closure around Taranaki (New Plymouth to Cape Egmont) out to 7 nautical miles only if the Government provides a clear

and effective transitional plan for all affected fishers (which for Sanford and Moana includes “release” of SNA 8 quota);
- *Butterfish exemption:* A number of commercial fishers that operate in the southern habitat zone near Kapiti and Wellington proposed that any set-net ban provide butterfish exemptions, like those that have been provided in the South Island.

WWF-New Zealand also recommends a 4 nautical mile closure to set-nets from Cape Egmont to Wellington. Sanford and Moana do not provide comment on the proposed measures south of Cape Egmont as they have focused on the Māui habitat zone where they both fish.

Conversely, commercial fishers based out of Commercial sensitivity (or their industry representatives) highlight the impact of these measures on the viability of their livelihoods. Commercial sensitivity all note the volume of fish they expect to be able to catch, land and/or process can be expected to drop, which will impact on their ability to operate. They note that the successive closures to-date have made adaptation more difficult and that further measures would severely impact their wellbeing and mental health. The trawl fishers Commercial sensitivity are affected the same as in Package 1 above.

The Commercial sensitivity fishers and licensed fisher receiver consider the proposed closures would:
- cause existing quota assets to be devalued as some species are unable to be caught with alternative fishing gear;
- mean existing land-based processing facilities (and equipment) would become worthless as there would be insufficient landed fish to support their continued operation in the region; and
- mean existing set-net vessels (and gear) would become worthless as it is unlikely they would be able to be sold given overall fleet capacity in New Zealand’s fisheries has continued to decline, and further set-net restrictions mean they are unlikely to be purchased.

Te Kahui o Taranaki Trust note that since 2009 Taranaki iwi have operated pātaka systems with the support of the local licensed fish receivers and fishers. These pātaka provide them with fish for hui and tangi. The proposed closures would mean commercial fishers would be unable to fish commercially in the closed areas and may cease their operations entirely, or may consider it uneconomical to travel to those areas to solely harvest for customary purposes. This would, in their view, negatively impact on customary interests.

Te Ohu Kaimoana say such measures will have a negative effect on the ability for kaitiaki to issue customary authorisations for set-netting across the entire west coast of Te Ika a Māui. They say that while the proposed closures do not prevent kaitiaki from issuing customary authorisations for fish caught using set-nets, they believe it would create negative perceptions about customary fishing by those restricted from fishing in the area, and the general public. They consider the proposed closures prejudicial towards legitimate Māori customary practices.

Overview

A summary of the package in relation to risk reduction targets and associated economic impacts and monitoring costs are provided below in Table 8. The package would continue to have a monitoring component to detect, and respond if required to, a capture of a Māui dolphin via:

- targeted observer coverage on select trawl vessels operating in the area between Maunganui Bluff and New Plymouth, and
- the *Stage One* on-board camera programme.

Table 8: Summary of the effectiveness of Package 2 in relation to the population objectives, and associated estimates of economic impacts and monitoring costs

	Population Sustainability Threshold	Deaths or risk score	Population outcome achieved	% of dolphin population protected	Total revenue lost (annual)	Total economic impact (5 years)	Observer Monitoring costs (5 year period)	Camera Monitoring costs (5 year period)
Māui population	0.14 deaths per year	0.058 (0.032-0.10)	Yes	Set-net: 81% (winter) 92% (summer) Trawl: 49% (winter) 73% (summer)	$3.39 million	$17.8-42.7 million	$1.03 million	$2.04 million
Southern habitat zone	1.00 risk score	0.20 (0.11-0.35)	Yes	Set-net: 46% (winter) 77% (summer) Trawl: 2% (summer & winter)			N/A	N/A

Note: Estimates of the deaths and risk score include commercial set-net and trawl combined (the 5th and 95th percentile are shown in brackets).

Butterfish exemption

Under set-net Option 2, we have considered the request from commercial butterfish fishers to provide an exemption to the proposed set-net ban in the southern habitat zone to allow them to continue. We have also undertaken an analysis with respect to recreational butterfish fishers. A detailed assessment of the commercial proposal, including relevant context, and estimated risk is discussed in Appendix 3B.

Butterfish set-netting is considered to pose a lower risk to the Māui and Hector's dolphins than other types of set-netting. Butterfish set-netting occurs mainly around kelp reefs, in areas very close to shore, and outside of what is commonly considered the preferred habitat of the dolphins. However, Hector's dolphins have been sighted in areas of rocky outcrops and kelp beds near Bank's Peninsula.

We ran the risk assessment model to estimate the potential effect of a commercial butterfish set-net exemption (in key areas identified by commercial fishers) on the risk to dolphins that may be present in the area. The butterfish exemption zones produced a negligible change in the risk estimate. A similar assessment could not be undertaken for recreational butterfish set-net activity due to the lack of information available on scale, effort and location.

Despite the low risk from butterfish set-net to the dolphins there was a reported capture of a Hector's dolphin in a recreational butterfish set-net off the east coast of the South Island (in a butterfish exemption area) in February 2015. Therefore, while the risk to dolphins may be low, there is still some risk to them. In general, recreational set-net practices are considered to pose greater risk than commercial because fishing effort, types of gear used and set-net practices are highly variable depending on the experience of the fisher, weather conditions and season.

If you support providing for an exemption under this set-net package (or other option) we recommend that you apply additional criteria (such as, defining exemption areas and offshore boundaries, and a requirement for recreational fishers to stay with their nets) to ensure any residual risk to the dolphins remains low. Further details of such criteria can be found in Appendix 3B.

Socioeconomic impact

Commercial sensitivity

The estimated annual revenue loss is $3.39 million, would be largely felt by those fishers and licensed fish receivers Commercial sensitivity . Approximately $1.80 million of the revenue loss would primarily impact the Commercial sensitivity trawl fishers (as under Package 1 above). The remaining $1.25 million revenue loss would be spread across Commercial sensitivity (~20 percent), Commercial sensitivity (~50 percent) and Commercial sensitivity (~30 percent).

Monitoring costs

The monitoring costs under this package would be much less than that in Package 1, as a consequence of the number of fishers/vessels likely to be impacted.

Under this package, the estimated annual costs associated with camera monitoring of set-net vessels in stage one are approximately $0.058 million. There would no longer be the mandatory observer coverage requirement around Taranaki as the area would be closed.

For trawl, the annual costs associated with camera monitoring are estimated to be less at approximately $0.23 million. The cost of the targeted observer coverage for trawl also reduces to be approximately $0.21 million per year.

As with Package 1, upfront costs associated with the *Stage One* on-board camera programme, and the annual cost for at least the first year, are born by the Crown. However, these costs may be less than Package 1 if some vessels leave the fishery, which would reduce the ongoing annual costs. Hardware and installation costs will already have been incurred.

We consider the extension of protection measures to the southern habitat zone sufficient to reduce risk, and that no additional monitoring would be required at this time.

Fisheries New Zealand assessment

We consider that combined Package 2 best achieves the proposed fisheries objectives for both the Māui and southern habitat zones.

Māui habitat zone: Set-net Option 2 within this package is the minimum extent of set-net closures required to achieve the population objective. This is based on the assumption that the fisheries risk attributed to harbour set-nets is overestimated. The added reduction of trawl risk in the core distribution zone, where dolphin density is higher, provides a further buffer in the risk reduction.

Southern habitat zone: Set-net Option 2 within this package addresses the high set-net risk and reduces that risk by around 90 percent. This package also removes the recreational set-net risk, which is estimated to be the highest across all the subpopulation areas. Providing for butterfish exemption zones in the southern habitat zones for commercial fishers is negligible with respect to risk reduction. While similar assessment was unable to be done for recreational butterfish set-net, we consider its use as likely lower risk than other recreational set-net methods. However, if you are concerned with the risk that would be posed by butterfish set-net (commercial and/or recreational) you may oppose any exemption, or allow under specified conditions. The proposed exemption offsets some of the estimated impacts of the measures.

Because trawl risk is even more negligible, refraining from extending any trawl restrictions in the southern habitat zone is appropriate.

1.7.5 Package 3: Extensive spatial closures, minimal monitoring in areas beyond the closures

Under Package 3, fisheries risk (from set-net) is further reduced in the core offshore distribution area of the Māui dolphins, and into the Manukau and Kaipara harbours. It largely encapsulates all Māui and/or Hector's sightings in the offshore areas and a 2010 sighting within the Kaipara Harbour. It also removes over 80 percent of risk from trawl targeted in the core Māui distribution.

Risk reduction

Māui habitat zone: This package would remove the risk to ensure with high certainty (95 percent) that the Māui dolphin population will achieve the population objective. It takes a very precautionary approach to extend protection measures much further with respect to trawl, despite trawling contributing to only 16 percent of fisheries risk.

Southern habitat zone: This package well exceeds the required fisheries risk reduction required to ensure with high certainty (95 percent) that the dolphins present in the southern habitat zone, will achieve their population objectives. It takes a very precautionary approach to extend protection measures to include trawl, despite trawling contributing less than 2 percent of fisheries risk.

Table 9: Overview of Package 3

Māui habitat zone	**Set-net Option 3**	**Trawl Option 3**
Cape Reinga to Maunganui Bluff *(northern tail of distribution)*	Put in place set-net closure out to 4 nautical miles	Retain current closure out to 1 nautical mile
Maunganui Bluff to New Plymouth *(core + tail distributions)*	Extend existing set-net closure out to 12 nautical miles	Extend existing trawl closures out to 7 nautical miles offshore
New Plymouth to Cape Egmont *(southern tail of distribution)*	Extend existing set-net closure out to 7 nautical miles	Put in place trawl closure out to 4 nautical miles
Harbours	Small extension of existing closures within Kaipara and Manukau harbours	N/A
Southern habitat zone		
Cape Egmont to Hawera *(South: potential habitat)*	Extend existing set-net closure out to 7 nautical miles	Put in place trawl closure out to 4 nautical miles
Hawera to Wellington *(South: potential habitat)*	Put in place set-net closure out to 4 nautical miles	Put in place trawl closure out to 2 nautical miles

Submission comments

Submission views are derived from the feedback received on consultation options that are likely to produce similar impacts:

- some submission considered these options a middle ground that better erred on the side of precaution for the dolphins; and
- some supported these measures if there was financial support given to fishers to adapt to the extended restrictions (for example, gear transition, alternative revenue sources, eco-tourism).

WWF-New Zealand (from Option 5 partners) recommends a trawling restriction to 7 nautical miles between Maunganui Bluff and New Plymouth as proposed under this package. WWF-New Zealand also recommends a 4 nautical miles closure to set-nets from Cape Egmont to Wellington. Sanford and Moana do not provide comment on the proposed measures south of Cape Egmont as they have focused on the Māui habitat zone where they both fish.

Most set-net and trawl fishers that considered themselves to be significantly impacted under measures equivalent to those in Package 2, are likely to be even more impacted under Package 3 making their operations unviable.

Overview

A summary of the package in relation to risk reduction targets and associated economic impacts and monitoring costs are provided below in Table 10. The package would continue to have a monitoring component to detect, and respond if required, to a capture of a Māui dolphin via:

- targeted observer coverage on select trawl vessels operating in the area between Maunganui Bluff and New Plymouth; and
- the *Stage One* on-board camera programme.

Table 10: Summary of the effectiveness of Package 3 in relation to the population objectives, and associated estimates of economic impacts and monitoring costs

	Population Sustainability Threshold	Deaths or risk score	Population outcome achieved	% of dolphin population protected	Total revenue lost (annual)	Total economic impact (5 years)	Observer Monitoring costs (5 year period)	Camera Monitoring costs (5 year period)
Māui population	0.14 deaths per year	0.048 (0.027-0.083)	Yes	Set-net: 84% (winter) 94% (summer) Trawl: 71% (winter) 88% (summer)	$8.00 million	$41.90-100.67 million	<$0.50 million	<$2.00 million
Southern habitat zone	1.00 risk score	0.18 (0.098 - 0.32)	Yes	Set-net: 46% (winter) 77% (summer) Trawl: 23% (winter) 54% (summer)			N/A	N/A

Note: Estimates of the deaths and risk score include commercial set-net and trawl combined (the 5th and 95th percentile are shown in brackets).

We consider monitoring via the *Stage One* on-board camera programme sufficient to detect, and respond if required, to a capture of a Māui dolphin. Observer coverage would be less than that proposed in Packages 1 and 2, and only be used to test the adequacy of the camera programme in its ability to detect protected species bycatch more generally.

Socioeconomic impacts

We estimate a loss of up to Commercial sensitivity due to the economic impacts of the closures. The estimated annual revenue loss is $8 million,

which would be largely felt by those fishers and licensed fish receivers based in Commercial sensitivity .

Monitoring costs

The following monitoring costs are likely to be overestimates if the vessels operating from Commercial sensitivity and Commercial sensi ivity are no longer a part of any monitoring programme[11].

For set-net, the total upfront cost of on-board camera monitoring for 5 vessels is estimated to be around $0.15 million, with the estimated annual costs around $0.056 million. There is no observer coverage costs.

For trawl, the total upfront cost of on-board camera monitoring for 15 trawl vessels is estimated to be around $0.44 million, with the estimated annual costs around $0.23 million. The cost of the targeted observer coverage for trawl is estimated to be less than $0.10 million per year.

As with Package 1, upfront costs and the annual cost associated with the *Stage One* on-board camera programme (both set-net and trawl) are borne by the Crown, as well as the annual costs associated with at least the first year. However, these costs may be less than Package 2 if additional vessels leave the fishery, which would reduce the ongoing annual costs.

We consider the extension of protection measures to the southern habitat zone sufficient to reduce risk, and that no additional monitoring would be required at this time.

Fisheries New Zealand assessment

We consider combined Package 3 goes well beyond what's required to achieve the proposed fisheries objectives for the Māui and southern habitat zones.

This package is appropriate if you consider that even a very low level of residual risk to the dolphins is unacceptable. Within the Māui habitat zone this package would reduce the mean likelihood of a fishing-related mortality to less than one every 20 years, from the current mean estimate of one death every 10 years, and well below the population sustainability threshold of one death every 7 years. The upper 95th percentile estimate would be 1 death every 12 years.

For the southern habitat zone the proposed risk reduction brings both the mean and 95th percentile well below the risk score required to achieve the fisheries population objective.

However, these packages both incur a significant economic impact on regional New Zealand off the west coast North Island.

1.7.6 Response to a fishing-related death

Some submissions (e.g. Option 5) suggested that there needs to be a clearly defined response protocol should a fishing-related death occur. Option 5 suggested an emergency 'trigger' point that provides for direct immediate temporary closure(s).

[11] The vessels operating in Commercial sensitivity sit outside the fishery statistical areas where the *Stage One* on-board camera programme is being rolled out.

Sanford and Moana agree that in the event of a Māui dolphin capture in a fishing net they will immediately cease fishing within a 10 nautical miles radius of the incident for 30 days, and will cooperate with any regulatory investigation and directives.

In the unlikely event of a fishing-related death, Fisheries New Zealand agrees that a clear response protocol needs to be in place. There are two key response protocols required; the immediate period following a capture, and the long-term response.

We propose that in the period immediately following a capture (north of Cape Egmont), the dolphin is retrieved and sent for necropsy and genetic identification, and that all fishers (using set-net or trawl) cease fishing out to 12 nautical miles within the core Māui habitat zone (Maunganui Bluff to New Plymouth), and (if required) the area the incident occurred (if it occurred outside the core area). We propose that genetic identification is a formality only, and that Hector's and Māui dolphins are treated equally in this area, as there is no difference in their susceptibility to capture in set-net or trawl. We would recommend proceeding with more extensive closures, and using the interim period where fishers stop fishing and genetic testing undertaken to consult on broader closures.

If a capture occurred south of Cape Egmont (southern habitat zone), again we recommend that all fishers (using set-net or trawl) cease fishing out to 12 nautical miles within the area the incident occurred (alongshore boundaries to be determined following the incident), while necropsy and genetic identification occurs. This is a precautionary approach while awaiting confirmation whether the dolphin was a Māui or Hector's. If the dolphin(s) is determined to be a Hector's a review of fishing measures is initiated. If the dolphin is identified as a Māui dolphin, a closure is proposed for the whole of the Māui habitat zone (out to 12 nautical miles) and in the area the incident occurred.

You could implement these measures through a voluntary or regulatory approach. Given the consequences of a mortality for the Maui population and the fishing industry in terms of cost, Fisheries New Zealand considers that a regulatory framework is preferred to allow effective implementation, compliance and enforcement

We note that a proposed trigger/fishing-related mortality limit requires 100% monitoring of all methods that may cause a death of a Māui dolphin. The Stage One on-board camera programme may provide for this once there is confidence that the programme is as reliable as the use of an observer to detect a dolphin interaction across methods (including events such as: a dolphin buried under high volumes of catch on deck or landed directly into the vessel hold, or when a dolphin falls from a net before it is retrieved on-board).

Fisheries New Zealand proposes to discuss the protocols with the North Island Stakeholder Advisory Group once the group is stood up in 2020, to confirm an approach and provide you with a final proposal (under a voluntary and/or regulatory framework) by May 2020.

1.8 Conclusion

You are free to choose a mix of method options (including consultation options) to manage the risk of fishing-related mortality on the Māui dolphin population, and within the southern habitat zone. In choosing whether and how to manage risk you should consider the proposed population outcomes, fisheries objectives, uncertainty in information, and the impact on use of fisheries resources from different management measures.

We note the Fisheries Act does not oblige you to reduce the risk of fishing-related mortalities to zero. However, the susceptibility of the Māui dolphin population to fisheries-related impacts suggests you should be cautious when determining the degree of acceptable risk of fishing-related mortality.

If you support the proposed population outcome and associated fisheries objectives, we recommend that you choose Package 2 (set-net Option 2 in combination with trawl Option 1) to best manage risk within the Māui and southern habitat zones to avoid, remedy or mitigate the effect of fishing-related mortality on the dolphins.

Those fishers estimated to be impacted by the measures may be supported by transition support (should you choose to endorse such an approach). Their ability to take up such support will be dependent on their ability to modify their operations (and fish using different gear or elsewhere), or leave the sector.

PART B4: SOUTH ISLAND – HECTOR'S DOLPHINS

Part B4 contains analysis on whether additional measures are necessary to achieve proposed fisheries objectives for Hector's dolphins. Proposed options to achieve those objectives, stakeholder views and estimated socioeconomic impacts are also discussed.

B4: SOUTH ISLAND (HECTOR'S DOLPHINS)

CONTENTS

1.1 Purpose

Part B4 discusses the proposed fisheries subpopulation objectives for South Island Hector's dolphins, and options to achieve those objectives within the purpose, principles and provisions of the Fisheries Act. It outlines the current state of knowledge of the Hector's dolphin subpopulations, fisheries risk, and proposed measures to managing that risk should you consider them necessary.

1.2 Introduction

Hector's dolphins around the South Island comprise a much larger population than the population of Hector's and Māui dolphins off the west coast North Island. While fisheries are understood to have posed a substantial risk to Hector's dolphins in the past, that risk has decreased through time as a result of changing fisheries effort, and the implementation of fisheries restrictions to protect the dolphins. However, some residual risk remains.

As the South Island Hector's dolphin population is much larger than the population of Māui dolphins on the west coast North Island, we consider there is greater scope for considering different approaches to managing risk without compromising the population. The South Island Hector's dolphin population is able to withstand a higher level of mortality, and commercial fisheries impacts are not currently estimated to be high enough to drive the population downward.

1.3 Objectives

The proposed subpopulation objectives for South Island Hector's dolphins (Part B1) would mean that, with 95 percent confidence, each subpopulation is able to recover to and/or maintain a level that is no more than 10 percent lower than what it would be in the absence of any fisheries impact.

In addition, we proposed:

- for each local population, reduce fisheries risks sufficient (with 95 percent certainty) to allow the population to recover to and remain at or above 80 percent of un-impacted status;
- provide consistency between commercial and recreational set-netting restrictions in acknowledgement of the similar risk factors between fishing types, as well as the potential for recreational gear to be lost and become a drifting risk to dolphins;
- continue data collection programmes to increase the precision of estimates of fisheries risk.

Adopting these objectives means that subpopulations of Hector's dolphins around the South Island will be expected to recover to, or remain at or above, 90 percent of their un-impacted status, and in all particular locations, the local population will recover to, or remain at or above, 80 percent of its un-impacted status. Achieving the overarching population outcome will also require other human-induced threats to be managed effectively.

1.4 Problem definition

This section provides an overview of estimated current risk from fisheries and submissions summary for the South Island. Our assessment of fisheries risk and need for management action by subpopulation is provided in Sections 1.7 – 1.9.

1.4.1 Current commercial fisheries risk

The risk assessment estimates that risk remains from commercial set-net and commercial trawl fisheries around parts of the South Island (Figure 1). Set-net fishing is estimated to pose much higher risk than trawling.

Off the west coast of the South Island, risk is estimated to be very low from both fishing methods, reflecting that there is low fishing effort in locations where dolphins occur (maps showing current fishing effort are provided in Appendix 4A). No further management is proposed for the west coast of the South Island as the objectives of the TMP are already being met (Figure 1).

The risk assessments suggest further management action is needed on the east coast, south coast, and north coast of the South Island to meet the proposed objectives of the TMP (Figure 1).

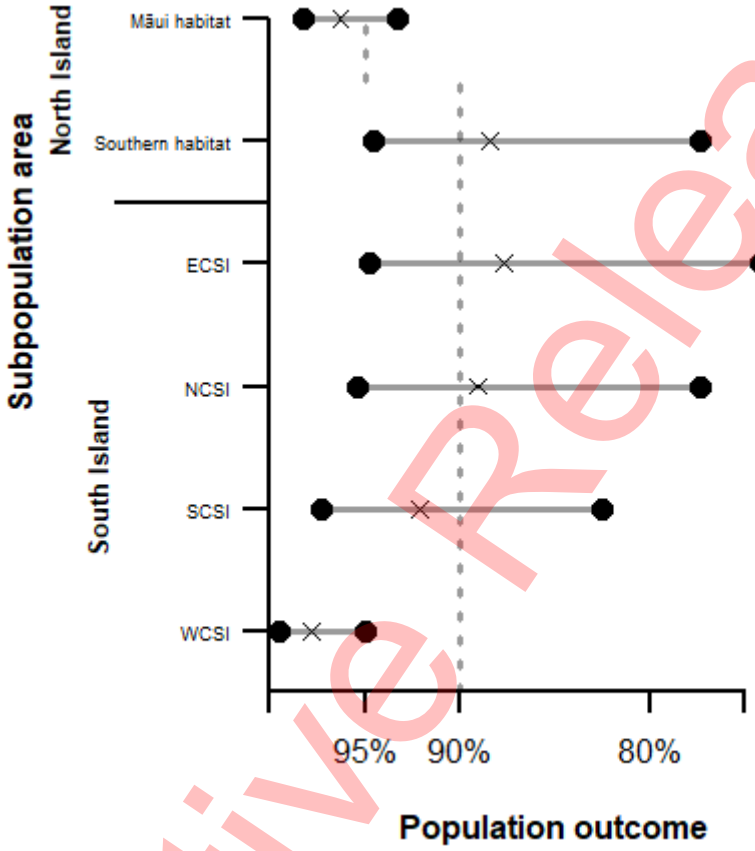
Fisheries risk was specifically assessed for each of five local populations on the east coast South Island: Cloudy-Clifford Bay, Kaikōura, Banks Peninsula (including Pegasus Bay), South Canterbury Bight to Timaru, and Otago Peninsula. The only location where the 95th percentile estimate of local deaths exceeded the local population sustainability threshold (with reference to a population outcome of 80 percent) was around Kaikōura, due to high levels of set-net effort and a relatively small local dolphin population.

The Otago Peninsula and Cloudy-Clifford Bay local populations experience very low fisheries risk, reflecting existing fisheries closures and low levels of fishing intensity.

No further management is proposed for the areas around Otago Peninsula or Cloudy-Clifford Bay.

Figures 2 and 3 show the current commercial fisheries restrictions in place around the South Island.

Figure 1: Estimated commercial fisheries risk under the status quo (set-net and trawl combined) in each subpopulation in relation to the proposed fisheries population objectives



Note: 95 percent of un-impacted status with 95 percent certainty for Māui dolphins, and 90 percent of un-impacted status with 95 percent certainty for the southern habitat zone and for Hector's dolphin subpopulations in the South Island. The mean is shown by a cross (x) and the confidence interval by the bar extending either side of the cross. Bars to the left of the relevant population outcome suggest that fisheries risk is estimated to be low enough to support the population outcome being achieved.

Figure 2: Current restrictions on set-net fishing in the South Island

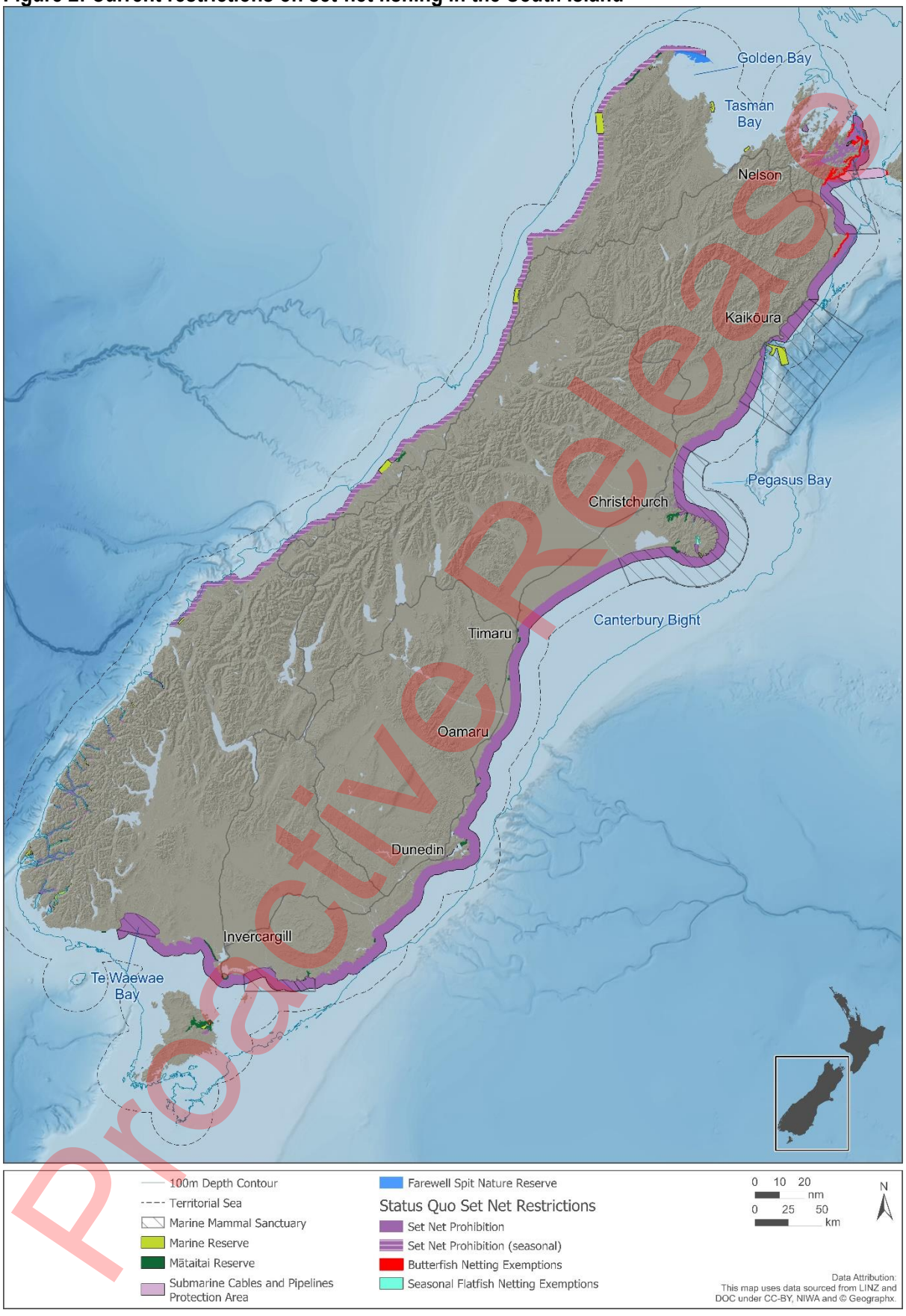
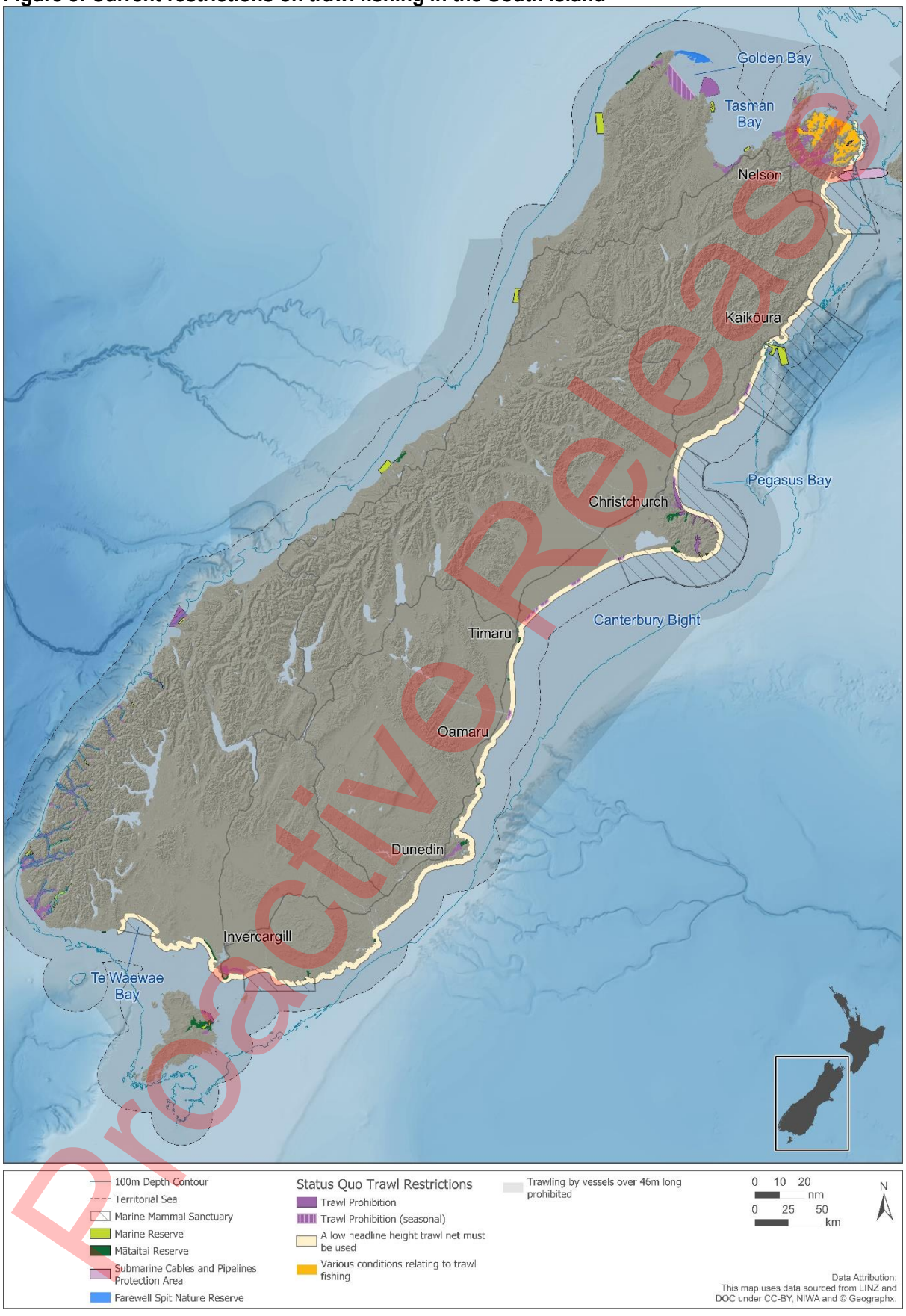


Figure 3: Current restrictions on trawl fishing in the South Island



1.4.2 Current recreational fisheries risk

Recreational fisheries risk cannot be quantified without observer data; instead, risk from recreational set-nets is estimated on a relative scale for different subpopulations. In most locations, recreational fisheries risk has been greatly reduced due to current spatial set-net closures (because recreational fishers tend to operate close inshore). The notable exception is the north coast South Island, where relatively high levels of recreational set-net fishing occurs in both Golden and Tasman Bay. The management measures proposed for each subpopulation are proposed equally for both recreational, and commercial, set-net fishing.

1.4.3 Submission comments

Submitters commented that the risk assessment treats all fishing gear types using the same broadly defined method (so, set-nets or inshore trawls) as if they are the same with respect to how likely they are to catch a dolphin.

Some submissions suggested that dolphin catchability for the Kaikōura-based set-net fleet should be estimated separately due to the unique bathymetry of the area (fishers typically fish at the edge of the Kaikōura Canyon and in greater depths than elsewhere, and it is possible that the likelihood of capturing a dolphin is affected by the depth at which the net is set).

Submissions from commercial fishers (and their representatives) commented that trawlers that tow at a low speed, whilst using a low headline height trawl net pose effectively no risk to dolphins. Kaikōura-based community group, Te Korowai, noted that trawling at a low speed and with a low headline height net has worked well to protect Hector's dolphins. Fishers in Te Waewae Bay, where >90 percent of trawling is conducted with low headline height trawl gear, cited many decades of fishing in close proximity to dolphins that actively interact with their vessels on a regular basis, without a capture. WWF-New Zealand commented that the catchability of dolphins in trawl nets is likely to differ between gear configurations. However, other environmental groups (e.g. Forest and Bird, Māui and Hector's Dolphin Defenders and Sea Shepherd) stated that there was no evidence that low headline height trawl gear helps to protect dolphins.

1.4.4 Fisheries New Zealand response

We acknowledge that the risk assessment treats all fishing practices and gear types relating to a broadly defined method (set-net or trawl) as being equally likely to catch a dolphin. An analysis of the implications of differing catchability within a fishing method, with a particular focus on the South Island trawl fleet, is provided in South Island Appendix 4B. Proposals regarding Kaikōura are analysed in more detail in Appendix 4C.

Key points regarding the risk assessment not accounting for differences in catchability between gear types:

- Differences in catchability of dolphins by vessels operating different practices or gear types within a method have not been scientifically estimated.

- Uncertainty regarding differences in catchability between gear types does not cause estimates of death to be overestimated or underestimated at the level of the South Island.
- However, differences in catchability between different gear types could lead to risk being over- or underestimated at the level of subpopulations of local populations.
- Differences in catchability between different gear types will result in wider confidence intervals around the mean estimates of deaths (but these will already appear in the estimates provided here). It is likely that the wider confidence intervals for trawl relative to set-net is in part a consequence of differences in catchability between different trawl gear configurations.
- If there are real differences in catchability, then confidence intervals (and thus 95th percentile estimates of risk) may be reduced just by improving quality and quantity of data available to the risk assessment.
- As a result, where there are real differences in catchability between gear types, increased monitoring may be effective to meet the fisheries population objective.
- If set-nets set in deeper water around Kaikōura do have lower catchability of dolphins compared to other set-nets, then the risk from set-net fishing in Kaikōura may be overestimated.
- If low headline height and slow tow speed do reduce catchability, then any fisheries management measures that treat all types of trawl vessels equally may unfairly penalise fishers already employing low headline height trawl gear (consistent with existing gear restrictions designed to protect dolphins).
- Although limited to only seven capture events, information on Hector's dolphin captures by trawl vessels for which relevant information is available shows that all captures have occurred when using gear with a headline height of 1.8 metres or greater, and when the vessel was trawling at a speed of 2.5 knots or greater.

1.5 Revisions to proposed management options

In response to submissions and feedback received during consultation, and given the relatively large population size of Hector's dolphins in the South Island, revised options for each fisheries method in this Technical Advice paper reflect a more innovative approach to managing the risk posed by fisheries, and trawling in particular.

The proposals include the opportunity to draw on a broad range of fisheries measures to manage risk and respond to capture events, summarised here and described in detail in Section 1.11, including:

- management oversight by a South Island Stakeholder Advisory Group;
- protected species risk management plans (PSRMPs);
- gear modification (to mitigate risk of capture);
- monitoring;
- reporting and captures response;
- triggers (both for an area and for individual vessels); and
- additional research.

The revised options for each method include trawl gear modification (low headline height and slow tow speed) and deepwater set-netting (Option Kaikōura) to reduce risk.

Where gear modification and Option Kaikōura are proposed, they are complemented with monitoring to ensure the verification of captures, and ongoing evaluation of the effectiveness of these changes in reducing risk, in addition to the use of PSRMPs and triggers.

Triggers, which correspond to a specified number of deaths in a specified area, would elicit a response to ensure that deaths cannot continue to occur and risk breaching the relevant population sustainability threshold. In this way, a stepwise approach to management can provide for the use of fisheries resources while ensuring that fishing-related mortality on dolphins does not prevent the objectives being met. Additional individual vessel triggers would incentivise fishers to develop and implement risk mitigating practices and gear.

A research programme would be designed to investigate the efficacy of mitigation and improve risk estimates. Management would be overseen by the South Island Stakeholder Advisory Group (Part B9).

1.6 Key information

The spatial distribution and density of Hector's dolphins around the South Island was estimated using the same spatial habitat models described for Māui dolphins, except that public and fisheries observer sightings were used only subjectively for independent model validation. Figure shows the estimated distribution of Hector's dolphins, including public sightings. Qualitative uncertainty in the spatial distribution at the subpopulation scale is described in the relevant subpopulation sections.

Dolphin densities are highest in areas close to shore where the water is highly turbid from sediments originating in terrestrial rivers or re-suspended by wave action. In most locations, the offshore limit of higher dolphin-density areas corresponds most closely to the 50-metre depth contour (shown in light purple).

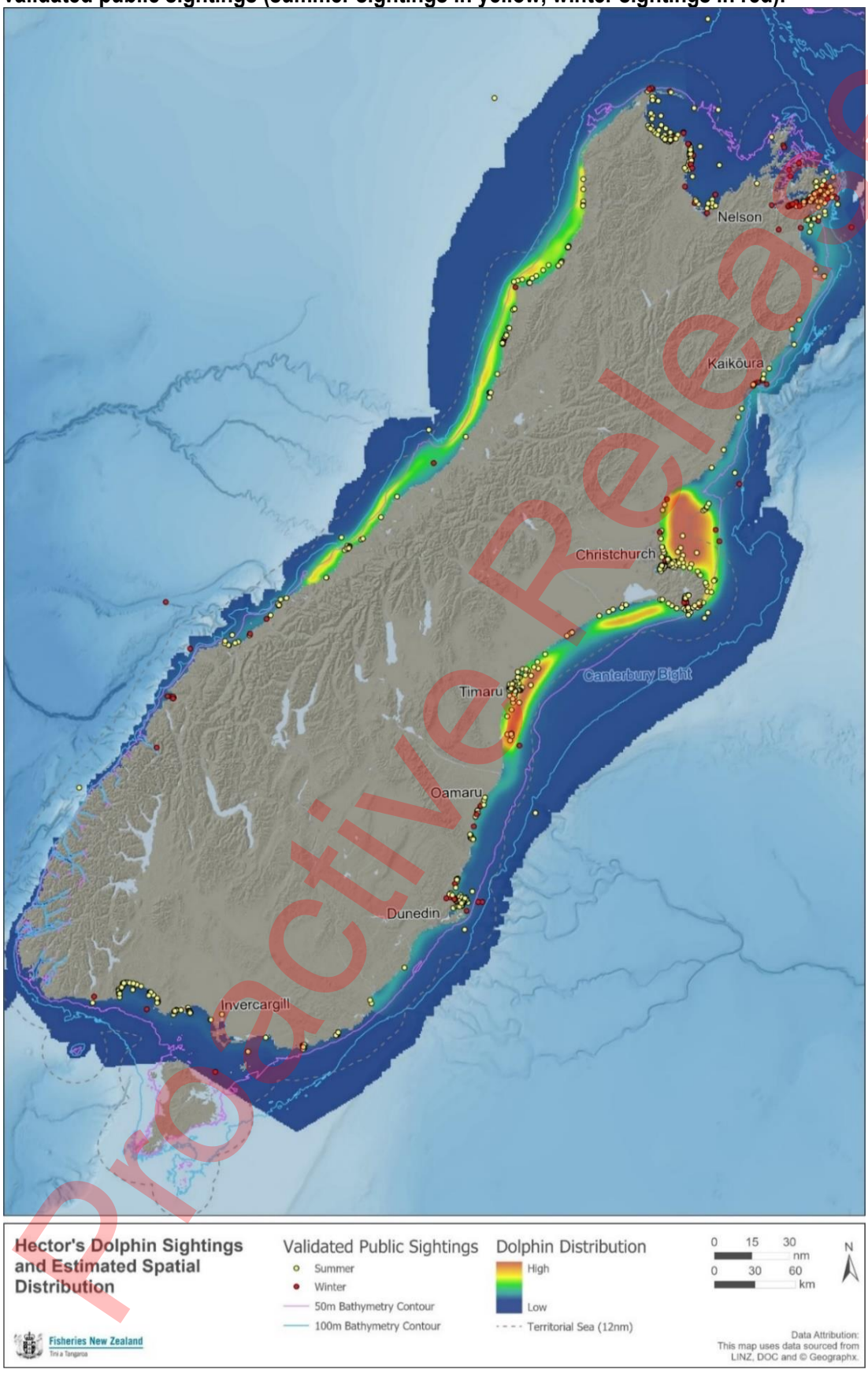
Figure reflects high numbers of dolphins in the east coast and west coast South Island subpopulations, and relatively small subpopulations on the north and south coasts of the South Island.

For the east coast South Island, dolphin densities are highest in Pegasus Bay (north of Banks Peninsula) and in the South Canterbury Bight between Banks Peninsula and Timaru, to variable distances offshore best approximated by the 50-metre depth contour. Lower dolphin densities occur along the coast southward to the Otago Peninsula and northward to Cloudy-Clifford Bay (where densities are moderate).

Spatial patterns of Hector's dolphin density are estimated with high accuracy in the core areas of Hector's dolphin habitat on the east and west coasts of the South Island. Locations where high dolphin densities are predicted in Figure have been validated with reference to independent data (from fisheries observer and public sightings). The captures estimation model also does a good job of predicting the

locations at which historical captures have occurred, and where captures continue to occur in recent years, based on overlap between the spatial distribution of the dolphins and known fishing effort locations.

Figure 4: Estimated (winter) spatial distribution of Hector's dolphins, including validated public sightings (summer sightings in yellow, winter sightings in red).



Note: The 50-metre (purple) and 100-metre (blue) depth contours are also shown.

1.7 East coast South Island

This section outlines the key information, risk from fisheries, assessment of the need for management action, and proposals to reduce fisheries risk for the east coast South Island subpopulation of Hector's dolphins.

Key points

The risk assessment estimates that under current fisheries restrictions, commercial fishing is responsible for approximately 51.6 deaths annually from both set-net and trawl fisheries combined (mean estimate) (Table 1); the upper 95th percentile estimate of current combined fisheries deaths is 93.01, which exceeds the "allowable" level of mortality (45.99) for the subpopulation objective to be achieved.

- Commercial set-net contributes a much greater proportion of the estimated impact than trawl.
- If you choose to manage to the proposed fisheries objective for this subpopulation, then estimated annual deaths at the 95th percentile need to be reduced from 93.01 to below 45.99.
- There is some qualitative uncertainty that you should take into account, primarily that differences in catchability of dolphins between gear types within a defined method (set-net or trawl) is not accounted for in these estimates.
- Qualitative analysis is provided to support your decision-making.

Table 1: East coast South Island population sustainability threshold compared to estimated annual deaths

Population sustainability threshold	Estimated annual deaths	
	Mean estimate	Confidence interval
45.99	51.60 (set-net = 43.01; trawl = 8.59)	26.15 – 93.01[1] (set-net and trawl are shown separately in Figure 5 and Table 3)

1.7.1 Key information

The east coast South Island subpopulation is the largest of the recognised subpopulations. The most recent information on the abundance and distribution of Hector's dolphins[2] estimates approximately 9,700 dolphins off the east coast South Island.

There is no reliable information to estimate the population trend for the Hector's subpopulation off the east coast South Island. The only reliable population monitoring data are from the local population around Banks Peninsula; these data are consistent with a roughly stable population size.

1.7.2 The risk from fisheries

Risk is estimated to be high for this subpopulation mainly because there are locations off the east coast where good dolphin habitat extends further offshore than in other locations, into areas that are not protected by fishery closures first

[1] In practice the mean estimates of death and risk are additive, but adding the 95th percentiles results in a slight overestimate. However, the 'overestimate' effect is not great when combining a higher set-net risk with a much lower trawl risk, and it still provides a useful approximation that if anything will result in more conservative management of fisheries impacts.

[2] MacKenzie, D. L. and Clement D.M. (2016) Cawthron Institute.

established around Banks Peninsula in 1988, and subsequently extended in 2008 (in particular, Pegasus Bay and South Canterbury Bight southward to Timaru).

In particular, the main areas of risk identified for commercial set-net and trawl fisheries are Pegasus Bay (where dolphin density occurs up to 20 nautical miles offshore and beyond current fisheries restrictions), South Canterbury Bight to Timaru (where dolphin densities occur as far as 11 nautical miles offshore and beyond current fisheries restrictions), and near Kaikōura Canyon (where dolphin density is low but set-net effort is extremely high in the area close to shore that was exempted from the 4 nautical mile set-net closure in 2008). Trawl risk is substantially lower than set-net risk, reflecting the dolphins' much lower catchability in trawls.

Recreational set-net fisheries risk is likely to have been historically significant, but largely eliminated with the establishment of a 4 nautical mile recreational set-net ban along the full length of the east coast in 2008.

Uncertainty in fisheries risk

Estimates of fisheries risk for the east coast South Island are generally more certain than elsewhere. This is because the population size, and spatial distribution of the dolphins are well estimated and are informed by abundant aerial survey data and good data layers to estimate dolphin habitat (such as, for water turbidity and dolphin prey distributions), and because fishing effort is reported with high precision.

The main areas of uncertainty that cannot be accounted for in the methodology, but should be taken into account in decision-making are:

- *Potential differences in catchability between different trawl vessels*: As described above, the risk assessment treats all trawl vessels as if they are equally likely to catch a dolphin; however, anecdotal information suggests that vessels operating low headline height and slow tow speed may have lower catchability. If this is true, trawlers operating low headline height and slow tow speed may be unfairly penalised if spatial closures are imposed to reduce risk in locations where low headline height gear is already in use.
- *Potential differences in catchability between different set-net vessels*: As described above, the risk assessment treats all set-netters as if they are equally like to catch a dolphin; however, submissions suggest that nets set in deep water off Kaikōura may have lower catchability. If this is true, the risk from set-net fisheries may be overestimated at the local scale in Kaikōura, and operators setting in deeper water may be unfairly penalised by restrictions imposed to reduce risk.

1.7.3 Assessment of the need for management action

Whether further measures are necessary to manage fisheries impacts on Hector's dolphins off the east coast of the South Island depends on your assessment of the likelihood of fishing-related mortality occurring, the consequence of mortality to the subpopulation, and the potential consequences of further measures on use of fisheries resources. It also depends on whether you deem the proposed population outcome and fisheries objective appropriate.

Should you choose to apply the proposed population outcome and fisheries objectives, then we consider there is a need for additional fisheries measures on the east coast South Island, because:

- the combined set-net and trawl deaths are estimated to currently exceed the population sustainability threshold at both the mean and 95th percentile;
- while estimated trawl deaths are comfortably below the threshold, the 95th percentile estimate of set-net deaths exceeds the threshold on its own, and the mean estimate very nearly exceeds the threshold[3]; and
- commercial fisheries risk is estimated with high certainty at the level of the subpopulation.

Notwithstanding this, you could take a different view on the necessity to act based on the information.

1.7.4 Proposals to reduce risk

Fisheries New Zealand consulted on a range of options to reduce the risk from set-net and trawl fisheries. Details of those options, submission comments, and analyses are provided in Appendix 4C.

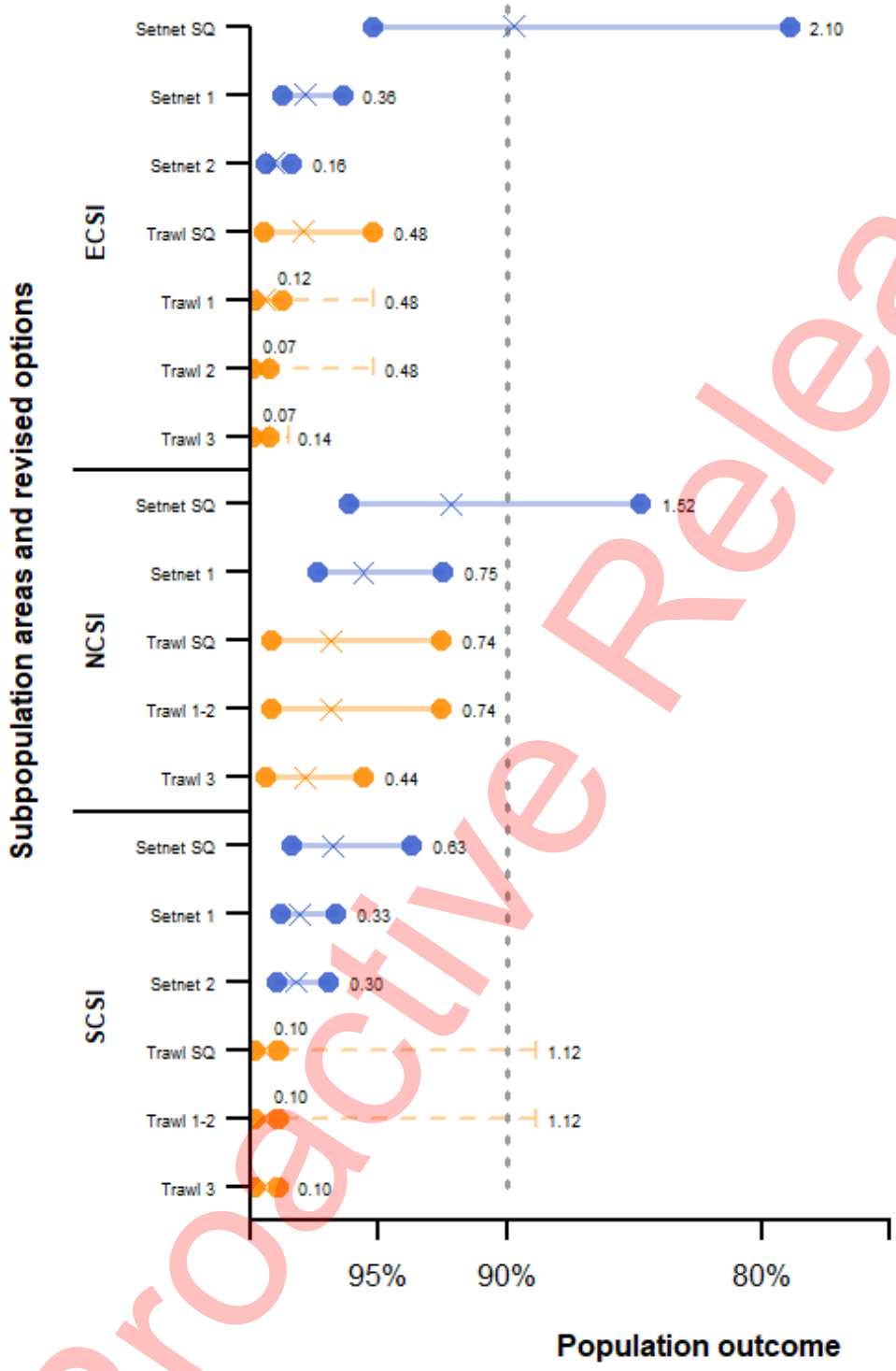
We have revised the options for each method taking account of submissions and feedback. These options are method specific (set-net and trawl) and independent of one another. In response to feedback, the range of trawl options now provide the opportunity to consider a more innovative approach to managing the risk posed by trawling (discussed in Section 1.5). The range of options for set-net provide the opportunity to consider implementing the proposal put forward by the Kaikōura community and Te Korowai (Option Kaikōura).

To assist decision-making, from the full range of options available to you, we have produced three sets of packaged options (which combine revised options for set-net and trawl) for your consideration (denoted as packages). Under all packages for the east coast South Island subpopulation, fisheries risk is reduced by more than enough to achieve the proposed subpopulation objective (Note:). Maps of packages for all of the South Island are shown in Figure and Figure .

Package 1 is weighted more towards providing for use of fisheries resources relative to reducing fisheries risk to the dolphins. Package 3 is weighted more strongly towards significant reductions in fisheries risk that come at a high impact on use of fisheries resources. Notwithstanding the proposed packages, you have discretion to choose different combinations of options than are presented in the proposed packages for each fishing method. The amount of risk remaining under each package can be calculated by combining the estimated deaths from set-net and trawl fisheries, provided in Table 3.

[3] In practice the mean estimates of death and risk are additive, but adding the 95th percentiles results in a slight overestimate. However, the 'overestimate' effect is low when combining packages in which one fishing method has a much higher risk and the second fishing method has a much lower risk. When combining packages in which risk from both methods are comparable, adding the 95th percentile estimates may result in a meaningful overestimate.

Figure 5: Estimates of risk under each method option (set-net and trawl), including status quo, for the South Island subpopulations in relation to the proposed fisheries population objective



Note: The blue bars represent set-net risk, and the orange bars represent trawl risk. Dotted orange bars illustrate uncertainty about the effect of low headline height on trawl catchability: If low headline height has no effect on catchability then the wider range illustrated by the dotted line will be accurate; if low headline height reduces catchability to zero then trawl risk is lower, as shown by the solid orange line. The true value is likely to be somewhere between these extremes. The 95th percentile risk scores are shown to the right of the bars. Risk scores less than one achieve the subpopulation objective. If the combined fisheries risk (summed for trawling and for set-net) sits to the left of the 90 percent population outcome vertical dotted line, then the subpopulation objective is achieved. To see if a combined set-net and trawl package will meet the objective, the risk scores need to be added together and be less than 1. Note too that trawl options and set-net options can be combined independently; for example set-net option 2 can be combined with trawl option 1, giving you more options as to how the objective can more efficiently be achieved.

The status quo is also an option available for your consideration; the proposed packages do not preclude your consideration of the status quo for any subpopulation or fisheries method. Any further management measures will not remove current restrictions.

Estimated socioeconomic impacts and monitoring costs are shown for each package. Parts B6 and B8 provide more detailed analysis of socioeconomic impacts and monitoring, respectively.

1.7.5 Socioeconomic impacts

A summary of estimated impacts on commercial fishers off the east coast South Island with respect to impacted landings and overall revenue is outlined in Table 2 for each revised method option. The economic impact tables utilise average catch data (from the last 10 years) and revenue-based export price estimates for species caught to estimate revenue from the affected areas, as described in Part B6.

Table 2: East coast South Island – estimated economic impacts on commercial set-net and trawl fishers for each method option (units are in millions)

Total Economic Impacts ($millions)	Set-net Option 1	Set-net Option 2	Trawl Options 1 and 2[4]	Trawl Option 3
Commercial sensitivity				
Quota stocks most affected (% of QMA landings)	ELE3 10.1% SPO3 16.5% SCH3 20.8% MOK3 5.9%	SPO3 20.3% ELE3 10.3% SCH3 25.0% MOK3 33.4%	-	ELE3 76% RCO3 13% RSK3 38% GUR3 33% FLA3 25%
Total Annual Revenue Lost	$1.24M	$2.35M	-	$6.09M
Total Economic Impact – 1 Year	$3.51M	$6.62M	-	$17.16M
Total Economic Impact – 3 Year	$6.03M - $9.93M	$11.39M - $18.77M	-	$29.51M - $48.63M
Total Economic Impact – 5 Year	$6.51M - $15.65M	$12.31M - $29.58M	-	$31.89M - $76.63M

[4] Socioeconomic impacts have not been estimated for trawl proposals under Packages 1 and 2 as further discussion with fishers and analysis would be required to understand the ability of fishers to transition to low headline height and slow tow speed. Cost estimates for Package 3 present a maximum cost; cost to fishers under Packages One and Two are likely to be below the estimates provided for Package 3. Monitoring costs are estimated below.

Figure 6: Revised set-net options that form Packages 1, 2, and 3 for the subpopulations

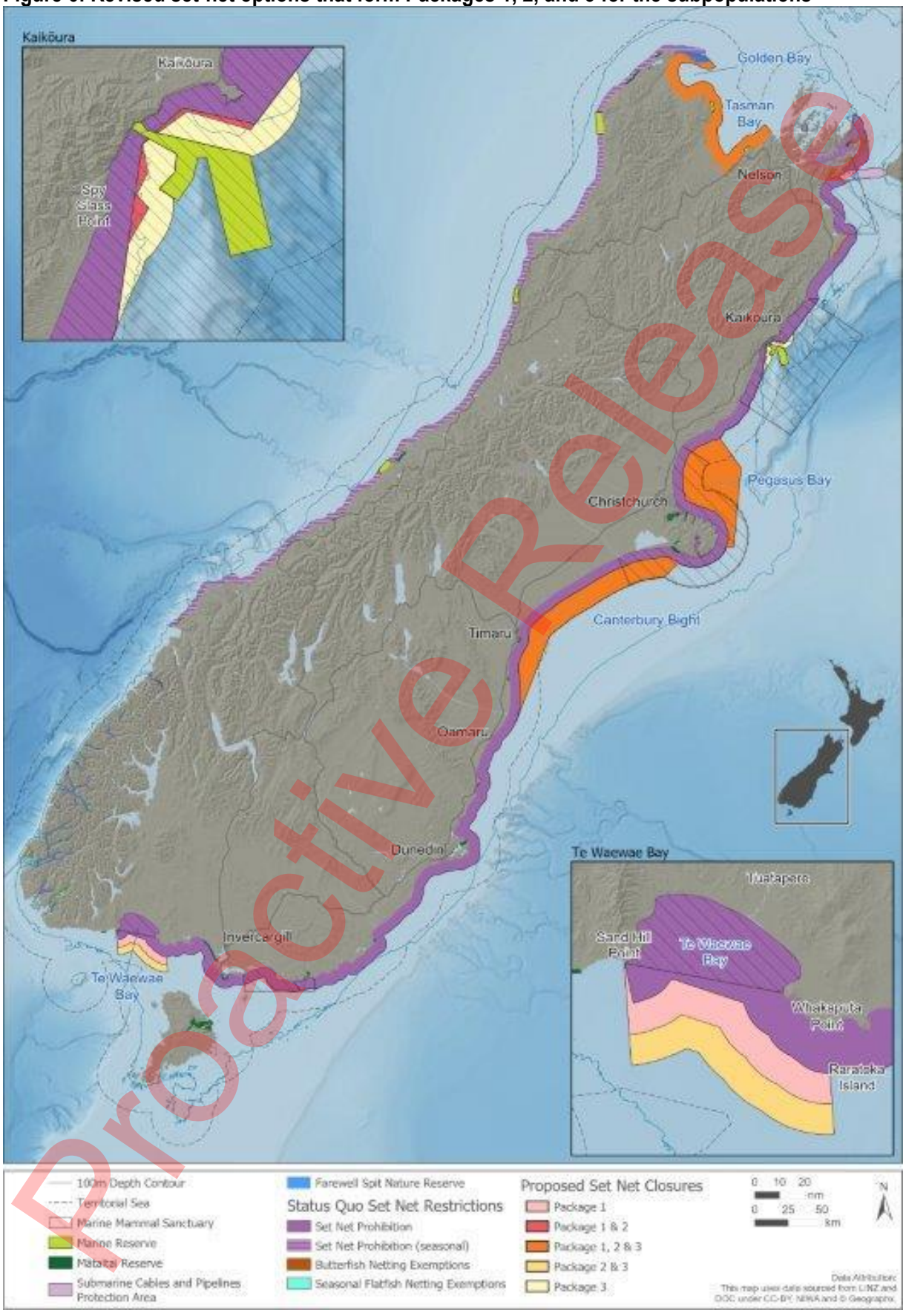
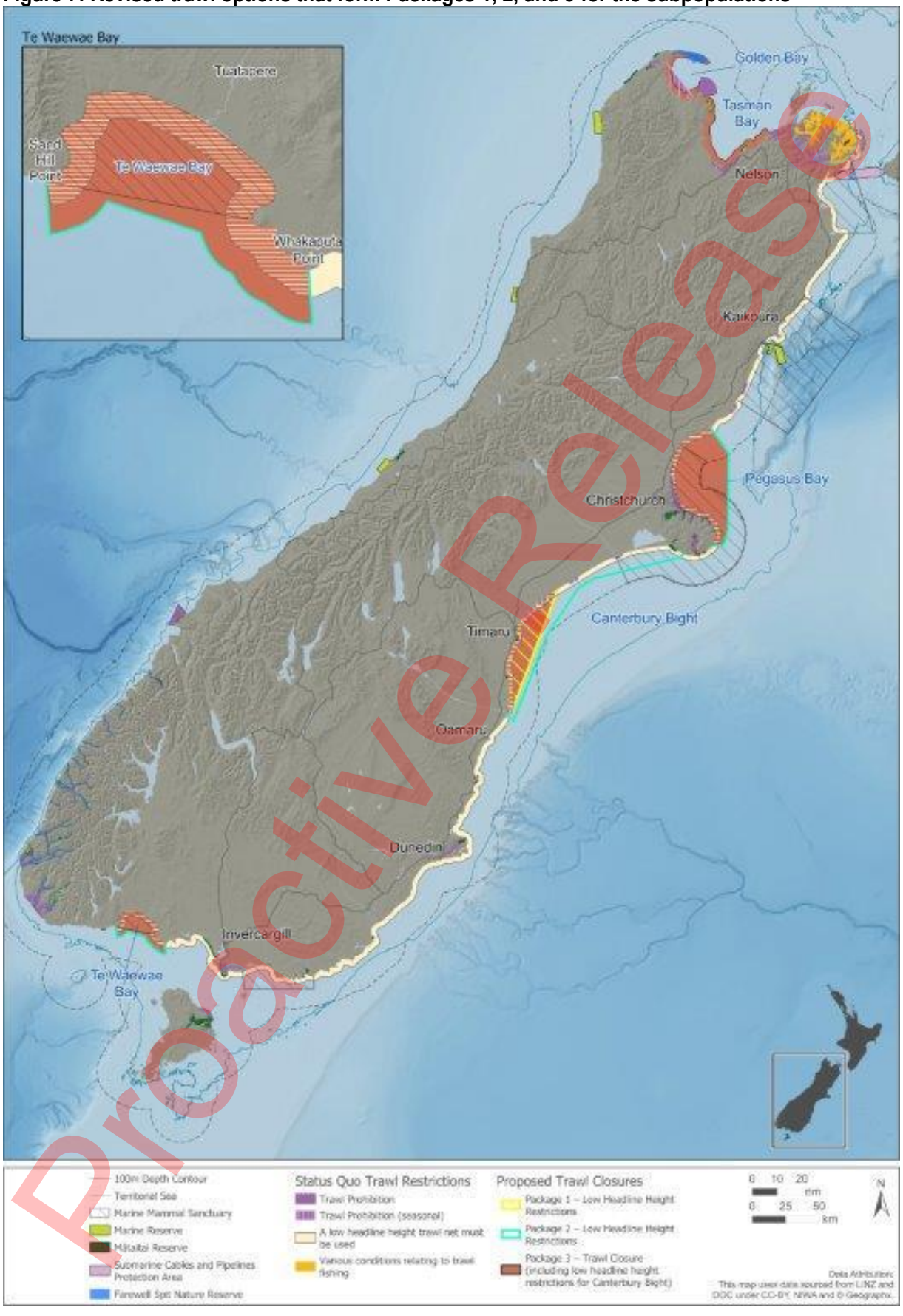


Figure 7: Revised trawl options that form Packages 1, 2, and 3 for the subpopulations



1.7.6 Risk reduction and effort displaced

A summary of estimated risk reduction for each set-net and trawl option is shown in Table , alongside the commercial fishing effort displaced, for each revised method option.

Table 3: The population sustainability threshold, estimated annual deaths, and estimated fishing effort displaced under revised method options for east coast South Island

	Set-net (commercial)			Trawl			
Population sustainability threshold	45.99						
	Status quo	Option		Status quo	Option		
		1	2		1	2	3
5th percentile (estimated annual deaths)	23.90	5.18	2.22	2.25	2.25* - 0.63**	2.25* - 0.34**	0.70* - 0.34**
Mean (estimated annual deaths)	43.01	8.84	3.88	8.59	8.59* - 2.38**	8.59* - 1.29**	2.74* - 1.29**
95th percentile (estimated annual deaths)	74.33	14.96	6.57	18.68	18.68* - 5.16**	18.68* - 2.84**	6.07* - 2.84**
Effort displaced (km set-net or # trawl events)	-	1,556	2,101	-	***	***	***

*assuming low headline height has no effect on dolphin catchability
**assuming low headline height reduced dolphin catchability to zero
***cannot be estimated because it is unknown how many vessels would be displaced by headline height restrictions versus how many could transition to operating a lower headline, nor what risk these vessels pose.

1.7.7 Package 1 – east coast South Island

	Set-net Option 1	Trawl Option 1
Pegasus Bay	**Area closure:** extend prohibition on all commercial and recreational set-netting to Pegasus Bay	**Local trigger**: 10 dolphins captured PSRMPs, monitoring, individual vessel triggers, and research
South from Banks Peninsula to Timaru	**Area closure**: prohibition extended to area from South Canterbury Bight to Timaru	**Gear modification and monitoring**: headline height <=1 m and tow speed <=2.5 knots and monitoring in area around Timaru **Local trigger**: 10 dolphins captured PSRMPs, individual vessel triggers, and research
Kaikōura	**Area closure**: extended to reflect 'Option Kaikōura' for commercial set-net (no change proposed to current 4 nautical miles recreational restriction) **Monitoring**: set-net vessels operating within 7 nautical miles between Clarence River and Point Gibson **Local trigger**: 4 dolphins captured PSRMPs, individual vessel triggers, and research	No change proposed

Under Package 1, we propose:

- All commercial and recreational set-netting be prohibited in Pegasus Bay and South Canterbury Bight to Timaru.
- Adopting the Option Kaikōura proposals (discussed in more detail in Appendix 4C) for set-net, with monitoring and associated triggers (Section 1.11).
- Requiring trawl gear modification near Timaru (as described in Section 1.11).
- Permitting trawling in South Canterbury Bight and in Pegasus Bay.
- Trawl vessels operating in these areas subject to triggers, PSRMPs, monitoring, and research (discussed in more detail in Section 1.11).

Risk reduction

Package 1 reduces estimated fisheries deaths by more than enough to achieve the objective set for the subpopulation. The true estimate of risk reduction is uncertain, because Package 1 allows for trawl vessels operating with gear modification near Timaru.

- If we assume that gear modification does not reduce the catchability of dolphins, then the risk assessment estimates that under Package 1, commercial fishing would be responsible for approximately 17.43 deaths annually (with a confidence interval of 7.43 - 33.64) from both set-net and trawl fisheries combined; the upper 95th percentile estimate of combined fisheries deaths (33.64) is below the "allowable" level of deaths (45.99) for the subpopulation objective to be achieved.
- If we assume that trawl gear modification reduces catchability of dolphins to zero, then the risk assessment estimates that commercial fishing would be responsible for 11.22 deaths annually (with a confidence interval of 5.81 – 20.12) from both set-net and trawl fisheries combined; the 95th percentile estimate of combined fisheries deaths (20.12) is below the "allowable" level of deaths (45.99) for the subpopulation objective to be achieved.

Risk is reduced dramatically in large part because of the restrictions on set-netting. Restricting set-net fishing alone (as proposed under Set-net Option 1) reduces risk enough to meet the subpopulation objective without any further restrictions on trawl fishers required.

Option Kaikōura

Under Packages 1 and 2, we propose the adoption of the spatial set-net closures proposed under Option Kaikōura.

Kaikōura has been identified as the only local population, for which the 95th percentile estimate of fisheries risk means it's not currently meeting the proposed local population objective. Implementing Option Kaikōura would reduce set-net risk, but not by enough to have 95 percent confidence that the local population objective will be achieved. Estimated annual deaths under Option Kaikōura are 7.52 (4.36 – 12.8) with a population sustainability threshold of 7.61 needed to meet the local objective.

If set-netting in deeper water has a lower catchability of dolphins, as has been suggested, then the reduction in risk will be greater than estimated and the residual risk overestimated.

We consider there is strong rationale to support Option Kaikōura, and under Packages 1 and 2, we would increase monitoring to improve risk estimates, investigate the influence of deep-set-nets on catchability, and improve research to better estimate spatial distribution around the Kaikōura Canyon. In addition, we propose a trigger for the Kaikōura set-net fleet, which would allow for further management, as required, to ensure that fisheries deaths do not exceed the population sustainability threshold.

Socioeconomic impacts

We estimate that Commercial sensitivity would have greater than percent of their landings affected by Package 1, with an estimated annual loss in revenue of $1.24 million. Fishers' ability to modify trawl gear as proposed under Package 1 is highly uncertain, therefore, the estimates for Package 3 provide a maximum possible economic impact for trawlers.

Monitoring

<u>Trawl</u>

In the last three complete fishing years (2015/16-2017/18), an average of 34 trawl vessels were active in any one year in the proposed monitoring areas in Pegasus Bay, and South Canterbury to Timaru. Around 20 of the vessels accounted for over 90 percent of the fishing effort (in terms of trawl events). Combined, the high-activity trawl vessels conducted an average of 2,665 events over 1,475 fishing days in any one year.

Monitoring requirements may be met by using observers and/or on-board camera monitoring. Based on the activity in the last three complete fishing years, the estimated monitoring costs under each approach are:

On-board camera monitoring[5]		Observer monitoring[6]
Upfront costs: ***$0.59M***	Annual costs: ***$0.29M***	Annual costs: $***1.56M***
5-yearly estimated cost[7]: $***2.04M***		5-yearly estimated cost: ***$7.80M***

Kaikōura – set-net

In the last three complete fishing years (2015/16-2017/19), an average of 8 vessels were active in any one year the Kaikōura set-net fleet, 4 of which accounted for over 90 percent of the fishing effort (in terms of set-net events). Combined, the high-activity set-net vessels conducted an average of 1,776 events over a total of 833 fishing days in any one year.[8]

Based on the activity in the last three complete fishing years, the estimated monitoring costs under each approach are:

On-board camera monitoring[11]		Observer monitoring
Upfront costs: ***$0.12M***	Annual costs: ***$0.15M***	Annual costs ***$0.88M***
5-yearly estimated cost[14]: $***0.87M***		5-yearly estimated cost: $***4.40M***

To improve risk estimates, long-term high level monitoring coverage is required. Set-net vessels in the Kaikōura fleet range between 9.4 and 14.8 metres in overall length, and are thus able to carry an observer if required. However, given the small size of the fleet, and the high level of fishing activity, camera monitoring is likely to be more cost-effective than observer monitoring, even in the short term.

[5] Cost estimates for camera monitoring are based on the cost of enabling collection, review and storage of footage. Additional costs are expected to occur, but those are highly dependent on the implementation route chosen (mandatory versus voluntary).
[6] There are a number of logistical challenges around achieving high observer coverage levels in inshore fisheries, described in Part B8. Achieving the proposed level of observer coverage may require significant addition resourcing of the Observer Services programme, as well as industry improving the ability of vessels to carry observers.
[7] Five-yearly cost estimate for camera monitoring takes into account the average life-time of the hardware, which is around five years.

1.7.8 Package 2 – east coast South Island

	Set-net Option 1	Trawl Option 2
Pegasus Bay	**Area closure:** extend prohibition on all commercial and recreational set-netting to Pegasus Bay	**Gear modification and monitoring:** headline height <=1 metre and tow speed <=2.5 knots and monitoring in Pegasus Bay **Local trigger**: 10 dolphins captured PSRMPs, monitoring, individual vessel triggers, and research
South from Banks Peninsula to Timaru	**Area closure:** prohibition extended to area from South Canterbury Bight to Timaru	**Gear modification and monitoring**: headline height <=1 metre and tow speed <=2.5 knots and monitoring from South Canterbury Bight to Timaru **Local trigger**: 10 dolphins captured PSRMPs, individual vessel triggers, and research
Kaikōura	**Area closure**: extended to reflect 'Option Kaikōura' for commercial set-net (no change proposed to current 4 nautical miles recreational restriction) **Monitoring**: set-net vessels operating within 7 nautical miles between Clarence River and Point Gibson **Local trigger**: 4 dolphins captured PSRMPs, individual vessel triggers, and research	No change proposed

Under Package 2, we propose the same set-net options as Package 1, with extension of trawl gear modification requirements into Pegasus Bay and South Canterbury Bight (Figures 6 and 7). Trawl vessels operating in the gear modification areas would again be subject to triggers, PSRMPs, and research (discussed in more detail in Section 1.11).

Risk reduction

Package 2 reduces estimated fisheries deaths by more than enough to achieve the objective set for the subpopulation. As under Package 1, the true estimate of risk reduction is uncertain because Package 2 requires gear modification for all trawl vessels operating in Pegasus Bay, South Canterbury Bight, and Timaru:

- If we assume that gear modification does not reduce the catchability of dolphins, then the risk assessment estimates are the same as for Package 1, and low enough for subpopulation objective to be achieved.
- If we assume that trawl gear modification reduces catchability of dolphins to zero, then the risk assessment estimates that commercial fishing would be responsible for 10.13 (5.52 – 17.80) deaths annually from both set-net and trawl combined; the upper 95th percentile estimate of fisheries deaths (17.80) is below the "allowable" level of deaths (45.99) for the subpopulation objective to be achieved.

Risk estimates for Kaikōura are the same as described under Package 1.

Socioeconomic impacts

Estimated socioeconomic impacts are the same as for Package 1. As fishers' ability to modify trawl gear as proposed under Package 2 is highly uncertain, the estimates for Package 3 provide a maximum possible economic impact for trawlers.

Monitoring

In the last three complete fishing years (2015/16-2017/18), an average of 35 trawl vessels were active in any one year in the proposed monitoring areas in Pegasus Bay and South Canterbury to Timaru. Around 22 of the vessels accounted for over 90 percent of the fishing effort (in terms of trawl events). Combined, the high-activity trawl vessels conducted an average of 3,245 events over 1,710 fishing days in any one year.

Based on the activity in the last three complete fishing years, the estimated monitoring costs under each approach are:

On-board camera monitoring[9]		**Observer monitoring**[10]
Upfront costs: ***$0.65M***	Annual costs: ***$0.40M***	Annual costs: $***1.81M***
5-yearly estimated cost[11]: $***2.65M***		5-yearly estimated cost: $***9.05M***

Monitoring costs for Kaikōura set-net vessels are the same as estimated under Package 1.

1.7.9 Package 3 – east coast South Island

	Set-net Option 2	**Trawl Option 3**
Pegasus Bay	**Area closure:** extend prohibition on all commercial and recreational set-netting to Pegasus Bay	**Area closure:** prohibit trawling in Pegasus Bay
South from Banks Peninsula to Timaru	**Area closure:** prohibition extended to area from South Canterbury Bight to Timaru	**Area closure:** prohibit all trawling in area around Timaru **Gear modification and monitoring**: headline height <=1 metre and tow speed <=2.5 knots and monitoring in South Canterbury Bight **Local trigger**: 10 dolphins captured PSRMPs, individual vessel triggers, and research.
Kaikōura	**Area closure**: extend existing prohibition on all commercial and recreational set-netters out to 4 nautical miles	No change proposed

Under Package 3, the proposed set-net restrictions differ from those under Packages 1 and 2 by also including an extension to the prohibitions out to 4 nautical miles around Kaikōura. Package 3 would also prohibit trawling in Pegasus Bay and near Timaru, but permit trawling in South Canterbury Bight with trawl vessels operating in

[9] Cost estimates for camera monitoring are based on the cost of enabling collection, review and storage of footage. Additional costs are expected to occur, but those are highly dependent on the implementation route chosen (mandatory versus voluntary).
[10] There are a number of logistical challenges around achieving high observer coverage levels in inshore fisheries, described in Part B8. Achieving the proposed level of observer coverage may require significant addition resourcing of the Observer Services programme, as well as industry improving the ability of vessels to carry observers.
[11] Five-yearly cost estimate for camera monitoring takes into account the average life-time of the hardware, which is around five years.

this area subject to triggers, PSRMPs, monitoring, and research (discussed in more detail in Section 1.11).

Risk reduction

Package 3 reduces risk further than Packages 1 and 2, and by more than is needed to achieve the population objective. As under Package 2, the true estimate of risk reduction is uncertain because Package 2 requires gear modification for all trawl vessels operating in South Canterbury Bight:

- If we assume that gear modification does not reduce catchability of dolphins, then the risk assessment estimates that commercial fishing would be responsible for 6.62 deaths annually (with a confidence interval of 2.92 – 12.64) from both set-net and trawl fisheries combined; the upper 95th percentile estimate of combined fisheries deaths (12.64) is below the "allowable" level of deaths (45.99) to meet the subpopulation objective.
- If we assume that trawl gear modification reduces catchability of dolphins to zero, then the risk assessment estimates that commercial fishing would be responsible for 5.17 (2.56 – 9.41) deaths annually from both set-net and trawl combined; the upper 95th percentile estimate of fisheries deaths (9.41) is below the "allowable" level of deaths (45.99) to meet the subpopulation objective.

Socioeconomic impacts

We estimate that set-net fishers and trawl fishers will have greater than percent of their landings affected under Package 3. The estimated loss in annual revenue is $8.44 million, the majority of which is incurred by impacted trawl fishers (approximately $6.09 million)

Kaikōura

Package 3 would eliminate the existing exemption allowing set-netting around the head of the Kaikōura Canyon, and prohibit set-netting to 4 nautical miles offshore around Kaikōura. An economic impact assessment commissioned by Fisheries New Zealand at the request of the Kaikōura community estimated that prohibiting set-netting out to 4 nautical miles would result in the likely closure of Commercial sensitivity fishing operations. The report estimates that the loss of these businesses would impact upon Commercial sensitivity families directly involved in the industry, and result in a potential loss of $2.4 million in gross domestic product, including investment into local support services and business as well as fees and charges revenue for Kaikōura District Council. Further information on the report is provided in Part B6: Socioeconomic impacts.

Monitoring

In the last three complete fishing years (2015/16-2017/18), an average of 25 trawl vessels were active in any one year in the proposed monitoring area in South Canterbury to Timaru. Around 15 of the vessels accounted for over 90 percent of the fishing effort (in terms of trawl events). Combined, the high-activity trawl vessels conducted an average of 1,603 events over 793 fishing days in any one year.

Based on the activity in the last three complete fishing years, the estimated monitoring costs under each approach are:

On-board camera monitoring[12]		Observer monitoring[13]
Upfront costs: $***0.44M***	Annual costs: ***$0.23M***	Annual costs $0.***840M***
5-yearly estimated cost[14]: ***$1.59M***		5-yearly estimated cost: $***4.20M***

1.8 South coast South Island

This section outlines the key information, risk from fisheries, assessment of the need for management action, and proposals to reduce fisheries risk for the south coast South Island subpopulation of Hector's dolphins.

Key points

- The risk assessment estimates that under current fisheries restrictions, commercial fishing is responsible for approximately 1.13 deaths annually from both set-net and trawl fisheries combined (mean estimate) (Table 4); the upper 95th percentile estimate of current combined fisheries deaths is 2.20, which exceeds the "allowable" level of deaths (1.57) for the subpopulation objective to be achieved.
- Commercial trawl contributes a greater proportion of the estimated impact.
- If you choose to manage to the proposed fisheries objective for this subpopulation, then estimated deaths at the 95th percentile need to be reduced from 2.20 to below 1.57.
- There is some qualitative uncertainty that you should take into account, primarily that differences in catchability of dolphins between gear types within a defined method (set-net or trawl) is not accounted for in these estimates (described below):
    - The effect of this qualitative uncertainty is that it is possible trawl risk is overestimated. The objective may be able to be met by improving the quality and quantity of data available to the risk assessment through increased monitoring (by cameras or by on-board observers).
- There is also qualitative uncertainty regarding spatial distribution of dolphins that you should take into account (described below).
- Qualitative analysis is provided to account for qualitative uncertainty and support your decision-making.

Table 4: South coast South Island population sustainability threshold compared to estimated annual deaths

Population Sustainability Threshold	Estimated annual deaths	
	Mean estimate	**Confidence Interval**
1.57	1.13 (set-net = 0.46 and trawl = 0.67)	0.45 - 2.20[15] (set-net and trawl are shown separately in Figure 5 and Table 6)

[12] Cost estimates for camera monitoring are based on the cost of enabling collection, review and storage of footage. Additional costs are expected to occur, but those are highly dependent on the implementation route chosen (mandatory versus voluntary).
[13] There are a number of logistical challenges around achieving high observer coverage levels in inshore fisheries, described in Part B8. Achieving the proposed level of observer coverage may require significant addition resourcing of the Observer Services programme, as well as industry improving the ability of vessels to carry observers.
[14] Five-yearly cost estimate for camera monitoring takes into account the average life-time of the hardware, which is around five years.
[15] In practice the mean estimates of death and risk are additive, but adding the 95th percentiles results in a slight overestimate. However, the 'overestimate' effect is not great when combining a higher set-net risk with a much lower trawl risk, and it still provides a useful approximation that if anything will result in more conservative management of fisheries impacts.

1.8.1 Key information

The most recent information on the abundance and distribution of Hector's dolphins[16] estimates approximately 332 dolphins off the south coast (estimated with high confidence by aerial survey in 2018). There are no reliable data to estimate population trend for the Hector's dolphin subpopulation off the south coast South Island.

1.8.2 Risk from fisheries

Risk is concentrated in the area in and around Te Waewae Bay. Proposed management measures focus on Te Waewae Bay.

Trawl risk is estimated to be higher than for set-net, reflecting that there are minimal restrictions in place for trawl fishers. However, this estimate does not account for potential differences trawl catchability (see *Uncertainty* below).

Risk is estimated to be low for commercial set-net, reflecting that most of the area around Te Waewae Bay is closed to set-net fishing already.

Recreational set-net fisheries risk is estimated to be moderate since the imposition of a 4 nautical miles set-net closures in 2008. The risk assessment model estimates that some overlap with recreational set-net fishing still occurs in harbours, but the actual extent to which dolphins may enter harbours is unknown.

Uncertainty in fisheries risk

The main areas of uncertainty affecting estimates of risk on south coast South Island are:

- *Poorly estimated spatial distribution of dolphins*: The spatial habitat model lacked a key data layer (dolphin prey distribution) and estimated an implausible dolphin distribution that did not match with aerial survey results or local knowledge. The risk assessment instead used a distribution that assumed 74 percent of dolphin distribution was concentrated in Te Waewae, as suggested by aerial surveys and local knowledge (more information on spatial distribution is provided in Appendix 4D)
- *Potential differences in catchability between different trawl vessels*: as described above, the risk assessment treats all trawl vessels as if they are equally likely to catch a dolphin. In Te Waewae Bay, this assumption may result in biased (or misleading) estimates because the majority (>90 percent) of trawl effort in this area targets flatfish using low headline height trawl nets designed to avoid fish swimming above the seafloor.[17] If low headline height reduces catchability of dolphins, the risk assessment would overestimate the risk trawling poses to Hector's dolphins in this area.

[16] MacKenzie, D. L. and Clement D.M. (2016) Cawthron Institute.
[17] Based on fishing effort between the 2015/16 and 2017/18 fishing years within 4 nautical miles of the coastline (as per Option 3 in the consultation document).

1.8.3 Assessment of the need for action

Whether further measures are necessary to manage impacts of fishing-related mortality on Hector's dolphins off the south coast of the South Island depends on your assessment of the likelihood of fishing-related mortality occurring, the consequence of mortality to the subpopulation, and the potential consequences of further measures on use of fisheries resources. It also depends on whether you deem the proposed population outcome and fisheries objective appropriate.

Should you choose to apply the proposed population outcome and fisheries objectives, then we consider there is a need for additional management because:

- The combined set-net and trawl deaths are estimated to exceed the population sustainability threshold at the 95th percentile (Table 4). The combined estimated impact is 2.2 deaths a year with a threshold of 1.57.[18] According to these estimates, the subpopulation objective is not met.

However, given the uncertainty around catchability of dolphins from trawl vessels operating low headline height, and the fact that the mean estimate of deaths (1.13) is below the population sustainability threshold, we consider there is scope for considering different approaches to management other than fisheries closures alone.

Notwithstanding this, you could take a different view on the necessity to act based on the information.

1.8.4 Proposals to reduce risk

Fisheries New Zealand consulted on a range of options to reduce the risk from set-net and trawl. Details of those options, submission comments, and analyses are provided in Appendix 4C.

As noted previously, we have revised the options for trawl taking account of submissions and feedback; options for set-net match consultation options 2 and 3 for set-net (option 1 was status quo in consultation). A set of packaged options has been developed for your consideration. For the south coast South Island, Packages 1 and 2 reflect a more innovative approach to managing the risk posed by trawling (described in Section 1.5). Maps of packages for all of the South Island are shown in Figures 6 and 7.

The level of risk reduction achieved under the packages (and therefore ability of the package to meet the objective) is uncertain because the effect of low headline height and slow tow speed on the catchability of dolphins is not known (Figure 5). In practice, the objective would be met under each package through the use of triggers and the management approach described in Section 1.11.

Notwithstanding the proposed packages, you have discretion to choose different combinations of options that are presented in the proposed packages for each

[18] In practice the mean estimates of death and risk are additive, but adding the 95th percentiles results in a slight overestimate. However, the 'overestimate' effect is low when combining packages in which one fishing method has a much higher risk and the second fishing method has a much lower risk. When combining packages in which risk from both methods are comparable, adding the 95th percentile estimates may result in a meaningful overestimate.

fishing method. The amount of risk remaining under each package can be calculated by combining the estimated deaths from each set-net and trawl fishery, provided in Figure 5 and Table 6. The status quo is also an option available for your consideration. Any further management measures will not remove current restrictions.

Estimated socioeconomic impacts and monitoring costs are shown for each package. Parts B6 and B8 provide more detailed analysis of socioeconomic impacts and monitoring.

1.8.5 Socioeconomic impact

A summary of estimated impacts on commercial fishers with respect to impacted landings and overall revenue is outlined in

Table (see Part B6 for more detail).

Table 5: South coast South Island – estimated economic impacts on commercial set-net and trawl fishers for each method option (units are millions) [19]

Total Economic Impacts ($millions)	Set-net Option 1	Set-net Options 2 and 3	Trawl Options 1 and 2*	Trawl Option 3
Commercial sensitivity				
Quota stocks most affected (% of QMA landings)	SCH5 1.0% SPO3 0.3% SPD5 0.1%	SCH5 2.3% SPD5 0.2% SPO3 0.4%	-	FLA3 10.2% STA5 4.0% GUR3 2.6% ELE5 21.0% SPO3 3.7%
Total Annual Revenue Lost	$0.05M	$0.09M	-	$1.57M
Total Economic Impact – 1 Year	$0.15M	$0.25M	-	$4.42M
Total Economic Impact – 3 Year	$0.25M - $0.42M	$0.42M - $0.70M	-	$7.59M - $12.51M
Total Economic Impact – 5 Year	$0.27M - $0.66M	$0.46M - $1.10M	-	$8.21M - $19.72M

*Only affects set-net fishers, except for potential monitoring costs, which are discussed separately in packages analysis and the monitoring section.

[19] The potential for fishers currently operating to a) modify their gear and b) still fully utilise their current ACE packages is uncertain. This is because the ability of fishers to modify their gear is dependent on their financial capability to purchase new gear and retire non-compliant gear, as well as their overall willingness to stay within the fishery/fishing industry altogether. Therefore, the low and high estimates take the stance of fishers not being able/willing to modify their gear and represents what the economic cost "could be" under each package. It is highly likely to be less than these values, provided that current catch is not significantly reduced.

1.8.6 Risk reduction and effort displaced

A summary of estimated risk reduction for each revised set-net and trawl option is shown in Figure 5 and in Table (alongside the commercial fishing effort displaced).

Table 6: The population sustainability threshold, estimated annual deaths, and estimated fishing effort displaced under revised method options for south coast South Island

	Set-net (commercial)			Trawl			
Population sustainability threshold	1.57						
	Status quo	Option		Status quo	Option		
		1	2		1	2	3
5th percentile (estimated annual deaths)	0.26	0.16	0.14	0.19	0.19	0.19* - 0.02**	0.02
Mean (estimated annual deaths)	0.46	0.27	0.25	0.67	0.67	0.67* - 0.07**	0.07
95th percentile (estimated annual deaths)	0.79	0.47	0.43	1.41	1.41	1.41* - 0.15**	0.15
Effort displaced (km set-net or # trawl events)	-	95.24	113.57	-	0	0***	737

*Assuming low headline height has no effect on dolphin catchability.
**Assuming low headline height reduced dolphin catchability to zero.
***Cannot be estimated because it is unknown if vessels currently operating headline height higher than 1 metre could transition to lower headline height, but effort displacement is likely to be close to 0 because greater than 90 percent of vessels already operate low headline height.

1.8.7 Package 1 – south coast South Island

	Set-net Option 1	Trawl Option 1
South Coast South Island	**Area closure**: extend the existing prohibition on all commercial and recreational set-net fishing to 7 nautical miles offshore in the vicinity of Te Waewae Bay.	**Monitoring**: vessels operating within Te Waewae Bay **Trigger**: 1 dolphin killed PSRMPs, individual vessel triggers, and research

Under Package 1, we propose that:

- all commercial and recreational set-netting be prohibited out to 7 nautical miles offshore in the area of Te Waewae Bay; and
- no changes be made to the current set of trawl prohibitions in the area of Te Waewae Bay (low headline height is required out to 2 nautical miles offshore). However, all trawl vessels operating in this area would be subject to triggers, PSRMPs, monitoring, and research (discussed in more detail in Section 1.11).

We recommend set-net closures under Package 1 in recognition of the fact that set-nets are substantially more likely to capture a dolphin than trawl vessels and to support overall risk reduction to help achieve the subpopulation objective. We propose that all trawlers operating within Te Waewae Bay and out to 4 nautical miles

offshore be subject to triggers as described in Section 1.11 to ensure that the subpopulation objective will be met in practice.

Risk reduction

The level of risk reduction required (and achieved) is heavily dependent on assumptions about the efficacy of low headline height in reducing the catchability of dolphins.

Assuming that low headline height does not reduce the catchability of dolphins, Package 1 does not reduce fisheries risk enough to meet the population objective:

- The risk assessment estimates that under Package 1, commercial fishing would be responsible for approximately 0.94 deaths annually (with a confidence interval of 0.35 – 1.88) from both set-net and trawl fisheries combined.
- The upper 95th percentile estimate of combined fisheries deaths (1.88) is higher than the "allowable" level of deaths (1.57) for the subpopulation objective to be achieved.

Alternately, if low headline height reduces catchability to zero, then trawl risk is already very low because more than 90 percent of the fleet currently operates with low headline height. We consider it likely that the true effect is somewhere between these extremes, and notes that further data collection is necessary to scientifically test the effect of low headline height on catchability of dolphins and thus fisheries risk.

Increased monitoring delivered under this package will provide the information required to scientifically estimate the effect of low headline height on dolphin catchability.

Socioeconomic impact

We estimate that no set-net fishers would have greater than [redacted] percent of their landings affected by Package 1. The estimated loss in annual revenue is $0.05 million. Socioeconomic impacts have not been estimated for trawl proposals under Package 1 as no new gear or area restrictions are proposed. Monitoring costs are estimated below.

Monitoring

In the last three complete fishing years (2015/16-2017/18), an average of 17 trawl vessels were active in any one year in the proposed monitoring area, 12 of which accounted for over 90 percent of the fishing effort (in terms of trawl events). Combined, the high-activity trawl vessels conducted an average of 690 events over 301 fishing days.

Based on the activity in the last three complete fishing years, the estimated monitoring costs under each approach are:

On-board camera monitoring[20]		Observer monitoring
Upfront costs: $0.35M	Annual costs: $0.14M	Annual costs$0.***32M***
5-yearly estimated cost[21]: $***1.05***		5-yearly estimated cost: $***1.60M***

On-board camera monitoring is likely to be a more cost-effective long-term option to achieve full coverage. However, the upfront cost is likely to be substantial, and potentially not affordable for vessels that only operate for a few weeks a year. For example, in the 2017/18 fishing year, 3 of the vessels contributing to over 90 percent of the total activity in the area, reported activity in less than 10 fishing days each. However, some low-activity vessels may be able to carry an observer instead, which is likely to be a more affordable option to achieve full coverage on vessels operating for few days each year.

1.8.8 Package 2 – south coast South Island

	Set-net Option 2	Trawl Option 2
South Coast South Island	**Area closure**: extend the existing prohibition on all commercial and recreational set-net fishing to 10 nm offshore in the vicinity of Te Waewae Bay.	**Gear modification and monitoring**: headline height <=1 metre and tow speed <=2.5 knots and monitoring within Te Waewae Bay and 4 nautical miles offshore **Trigger**: 1 dolphin captured PSRMPs, individual vessel triggers, and research

Under Package 2, we propose extending the set-net prohibition out to 10 nautical miles offshore, in recognition of the fact that set-nets are substantially more likely to catch a dolphin. For trawl, we propose gear modification within Te Waewae bay and out to 4 nautical miles offshore, subject to triggers as described in Section 1.11, to ensure that the subpopulation objective will be met in practice.

Risk reduction

Similar to Package 1, whether the subpopulation objective is met under Package 2 depends on to what extent we assume that low headline height reduces risk to dolphins.

Assuming that low headline height does not reduce the catchability of dolphins, Package 2 does not reduce fisheries risk enough to meet the subpopulation objective:

- The risk assessment estimates that under Package 2, commercial fishing would be responsible for approximately 0.92 deaths annually (with a confidence interval of 0.33 - 1.84) from both set-net and trawl fisheries combined.
- The upper 95th percentile estimate of combined fisheries deaths (1.84) is higher than the "allowable" level of deaths (1.57) for the subpopulation objective to be achieved.

However, if we assume that low headline height reduces dolphin catchability to zero, then the combined 95th percentile estimate of deaths from set-net and trawl fall

[20] Cost estimates for camera monitoring are based on the cost of enabling collection, review and storage of footage. Additional costs are expected to occur, but those are highly dependent on the implementation route chosen (mandatory versus voluntary).
[21] 5-yearly cost estimate for camera monitoring takes into account the average life-time of the hardware, which is around five years.

below the population sustainability threshold (0.58 deaths per year). We consider that the true combined impact is probably somewhere between these estimates.

Socioeconomic impacts

We estimate that no set-net fishers would have greater than [redacted] percent of their landings affected by Package 1. The estimated loss in annual revenue from set-net is $0.09 million. Socioeconomic impacts on trawlers cannot be estimated without further information regarding how likely vessels are to be able to modify their gear; however, costs are expected to be minimal as greater than 90 percent of the fleet already operate low headline height.

Monitoring

The monitoring costs for Package 2 are uncertain because a small number of vessels do not currently operate low headline height, and it is not known whether or not these vessels would be able to transition to low headline height and continue operating. Monitoring costs have been estimated assuming that all vessels that are currently trawling will be able to continue trawling under Package 2 proposals, so the estimates are a maximum. Thus, the actual costs may be lower if the vessels that do not currently operate low headline height are unable to transition.

In the last three complete fishing years (2015/16-2017/18), an average of 18 trawl vessels were active in any one year in the proposed monitoring area, 13 of which accounted for over 90 percent of the fishing effort (in terms of trawl events). Combined, the high-activity trawl vessels conducted an average of 872 events over 358 fishing days.

Based on the activity in the last three complete fishing years, the estimated monitoring costs on either approach are:

On-board camera monitoring[22]		**Observer monitoring**
Upfront costs: ***$0.38M***	Annual costs: $***0.16M***	Annual costs: $***0.38M***
5-yearly estimated cost[23]: $***1.18M***		5-yearly estimated cost: $***1.90M***

Unlike the vessels subject to mandatory monitoring in Package 1, the majority of the high-activity vessels in Package 2 operate for over 10 fishing days per year, and are potentially more able to withstand the cost of monitoring. For the vessels that have a lower level of fishing activity, observer monitoring may be more cost-effective, although co-ordinating observer deployment may be challenging due to the dynamic nature of inshore fisheries. This is discussed in further detail in the monitoring chapter.

[22] Cost estimates for camera monitoring are based on the cost of enabling collection, review and storage of footage. Additional costs are expected to occur, but those are highly dependent on the implementation route chosen (mandatory versus voluntary).
[23] Five-yearly cost estimate for camera monitoring takes into account the average life-time of the hardware, which is around five years.

1.8.9 Package 3 – south coast South Island

	Set-net Option 2	Trawl Option 3
South Coast South Island	**Area closure**: extend the existing prohibition on all commercial and recreational set-net fishing to 10 nautical miles offshore in the vicinity of Te Waewae Bay.	**Area closure**: prohibit all trawling within Te Waewae Bay and 4 nautical miles offshore. **Trigger**: 1 dolphin captured PSRMPs, individual vessel triggers, and research

Under Package 3, we propose the same set-net restrictions as for Package 2 and a trawl prohibition within Te Waewae Bay and out to 4 nautical miles offshore.

Risk reduction

Package 3 reduces fisheries deaths by more than is necessary to achieve the objective set for the subpopulation:

- The risk assessment estimates that under Package 3, commercial fishing would be responsible for approximately 0.32 deaths annually (with a confidence interval of 0.16 – 0.58) from both set-net and trawl fisheries combined.
- The upper 95th percentile estimate of combined fisheries deaths (0.58) is below the "allowable" level of deaths (1.57) for the subpopulation objective to be achieved.

Socioeconomic impact

We estimate that [redacted] trawl fishers would have greater than [redacted] percent of their landings affected by Package 3, with an estimated annual revenue loss of $1.57 million for trawl fisheries. The estimated annual revenue loss for set-net fishers is $0.09 million.

1.9 North coast South Island

This section outlines the key information, risk from fisheries, assessment of the need for management action, and proposals to reduce fisheries risk for the north coast South Island subpopulation of Hector's dolphins.

Key points

- The current combined set-net and trawl estimate of risk is 1.10 (0.46 – 2.26) (Table 7)
- If you choose to manage to the proposed fisheries objective for this subpopulation, then estimated risk at the 95th percentile needs to be reduced from 2.26 to below 1.
- Set-net contributes the greatest proportion of the estimated risk.
- There is some qualitative uncertainty that you should take into account, primarily regarding the estimated spatial distribution of dolphins in Golden and Tasman Bays (described below)
- Qualitative analysis is provided to support your decision-making.

Table 7: North coast South Island current estimated commercial fisheries risk score (a risk score greater than 1 indicates deaths from fisheries are too high to achieve proposed objective)

Estimated fisheries risk score	
Mean estimate	**Confidence interval**
1.10 (set-net = 0.78 and trawl = 0.32)	0.46 - 2.26[24] (set-net and trawl are shown separately in Figure 5 and Table)

1.9.1 Key information

Treatment of the north coast South Island subpopulation of Hector's dolphins as a distinct subpopulation is new to this TMP. Previous iterations did not propose management measures for this area.

Evidence is inconclusive as to whether the north coast South Island indeed comprises a distinct subpopulation; however, as outlined previously, we propose to manage it as a distinct subpopulation as a precautionary measure.

Very little is known about this population. Sightings are rare and there is no official estimate of population size (and by extension no information about population trends). Estimates of population size used in the risk assessment are highly uncertain (based only on observations in a single aerial survey stratum during a 2013 winter aerial survey and public sightings).

1.9.2 The risk from fisheries

Despite that there is no accepted population estimate, the risk assessment is still able to calculate risk to the population from fishing. This is because risk estimates are based on the probability of death per individual dolphin. If the true population size is higher than the model assumes, then the number of deaths will be higher, and the population sustainability threshold will also be higher, but risk (which is the ratio between those two numbers) will be unaffected. We have presented the fisheries risk reduction in terms of the risk score (rather than as estimated deaths as for other subpopulations).

Recreational set-net fisheries risk is likely to be significant off the north coast South Island. With the exception of the area between Wellington and Cape Egmont (off the west coast North Island), the north coast South Island is the only remaining area of suitable dolphin habitat where recreational set-net fishing has not been substantially restricted. Because there is no independent observations of recreational set-nets, risk estimates are relative between areas, not absolute. The risk assessment indicates that a dolphin off the north coast South Island area is roughly seven more times likely to die in a recreational set-net than is a dolphin off the east coast South

[24] In practice the mean estimates of death and risk are additive, but adding the 95th percentiles results in a slight overestimate. However, the 'overestimate' effect is low when combining packages in which one fishing method has a much higher risk and the second fishing method has a much lower risk. When combining packages in which risk from both methods are comparable, adding the 95th percentile estimates may result in a meaningful overestimate.

Island. Options that prohibit set-netting (below) can be expected to nearly eliminate the recreational set-net risk.

Uncertainty in fisheries risk

The main area of uncertainty affecting estimates of risk off the north coast South Island are:

- *Poorly estimated distribution of dolphins*: The estimates of risk in this subpopulation are less reliable than estimates from areas with higher dolphin densities. The dolphin distribution predicted by the risk assessment for the north coast South Island is consistent with public sightings, which increases our confidence in it. However, estimates in areas of low relative dolphin density are always more uncertain than they are in areas where dolphins are more abundant. This may mean that risk estimates are biased high or low, though they are unlikely to be very biased because fishing effort is spread out and is not concentrated in particular locations.

Because of the qualitative uncertainty, you may wish to be more or less cautious and this will depend on what balance you deem necessary in providing for utilisation and managing the effects of fishing-related mortality. In practice, it is possible that the level of risk reduction that will be achieved under the recommended risk reduction packages is actually higher than reflected in quantitative risk assessment outputs (Table 9), for the following reasons. Firstly, it is likely that the distribution model overestimates what proportion of the dolphins occur further offshore; if this is the case then protecting the nearshore locations will yield greater benefits than the model estimates. Secondy, these outputs do not reflect the proposed reduction in recreational fisheries risk, which is likely to be substantial (described below).

1.9.3 Assessment of the need for action

Whether further measures are necessary to manage the impacts of fishing-related mortality on Hector's dolphins off the north coast of the South Island depends on your assessment of the likelihood of fishing-related mortality occurring, the consequence of mortality to the subpopulation, and the potential consequences of further measures on use of fisheries resources. It also depends on whether you deem the proposed population outcome and fisheries objective appropriate.

Should you choose to apply the proposed population outcome and fisheries objective, then we consider there is a need for additional fisheries closures because:

- The combined mean and 95th percentile set-net and trawl risk ratio estimates exceed 1.[25]
- While estimated trawl risk is below the threshold (1), the 95th percentile estimate of set-net risk exceeds the threshold on its own.

[25] In practice the mean estimates of death and risk are additive, but adding the 95th percentiles results in a slight overestimate. However, the 'overestimate' effect is low when combining packages in which one fishing method has a much higher risk and the second fishing method has a much lower risk. When combining packages in which risk from both methods are comparable, adding the 95th percentile estimates may result in a meaningful overestimate.

- There is likely to be a significant recreational set-net risk that cannot be quantified.

Notwithstanding this, you could take a different view on the necessity to act based on the information.

1.9.4 Proposals to reduce risk

Fisheries New Zealand consulted on a range of options to reduce the risk from set-net and trawl. A summary of those options, submission comments, and impacts are provided in Appendix 4C.

We have revised the options for trawl vessels taking account of submissions and feedback. Because of the uncertainty regarding spatial distribution of dolphins in Golden and Tasman Bays, trawl Option 2 proposes allowing trawling with monitoring and other measures as described in Section 1.5. The option for set-net is the same as the consultation option 2 for set-net (option 1 was status quo in consultation).

To assist decision-making, sets of packaged options have been developed for your consideration (denoted as packages), which combine the option for set-net and the revised options for trawl. Maps of packages for all of the South Island are shown in Figures 6 and 7.

The level of risk reduction achieved under packages (and therefore ability of the package to meet the objective) is uncertain (Figure 5). Fisheries New Zealand considers that the objective is likely to be met under each package, and proposes triggers and the management approach described in Section 1.11 to ensure that the objective would be met in practice for Packages 2 and 3.

Notwithstanding the proposed packages, you have discretion to choose different combinations of options than are presented in the proposed packages for each fishing method. The amount of risk remaining under each package can be calculated by combining the estimated risk from each set-net and trawl package in Figure 5, or combining the estimated deaths from Table 9 and comparing against the population sustainability threshold.

The status quo is also an option available for your consideration. Any further management measures will not remove current restrictions.

Estimated socioeconomic impacts and monitoring costs are shown for each package. Parts B6 and B8 provide more detailed analysis of socioeconomic impacts and monitoring.

1.9.5 Socioeconomic impacts

A summary of estimated impacts on commercial fishers with respect to affected landings and overall revenue is outlined in Table 8 (see Part B6 for more detail).

Table 8: North coast South Island – estimated economic impacts under revised method options (units are millions)

Total Economic Impacts ($millions)	Set-net Option 1	Trawl Options 1 and 2	Trawl Option 3
Commercial sensitivity			
Quota stocks most affected (% of QMA landings)	SPO7 17% SCH7 2% SNA7 1%	-	FLA7 7% GUR7 5% SNA7 8% SPZ7 21% CAR7 22%
Total Annual Revenue Lost	$0.28M	-	$1.02M
Total Economic Impact - 1 Year	$0.79M	-	$2.89M
Total Economic Impact - 3 Year	$1.37 - $2.25M	-	$4.97 - $8.19M
Total Economic Impact - 5 Year	$1.48 - $3.55M	-	$5.37 - $12.90M

1.9.6 Risk reduction and effort displaced

A summary of estimated risk reduction for each revised set-net and trawl option is shown in Figure 5 and in Table 9 (alongside the commercial fishing effort displaced).

Table 9: Estimates of fisheries risk and effort displaced under revised method options for north coast South Island

		Set-net (commercial)		Trawl			
Population sustainability threshold		1.00					
		Status quo	Option **1**	Status quo	Option		
					1	**2**	**3**
Risk	5th percentile	0.38	0.26	0.08	0.08	0.08	0.06
	Mean	0.78	0.44	0.32	0.32	0.32	0.21
	95th percentile	1.52	0.75	0.74	0.74	0.74	0.44
Effort displaced (km set-net or # trawl events)			200.3		0	0	1324

1.9.7 Package 1 – north coast South Island

	Set-net Option 1	**Trawl Option 1**
North Coast South Island	**Area closure:** prohibit all commercial and recreational set-netting out to 4 nautical miles	No new measures proposed.

Under Package 1, we propose:

- all commercial and recreational set-netting be banned out to 4 nautical miles offshore; and
- no changes made to the current trawl prohibitions in Golden/Tasman Bays.

Package 1 recognises that the trawl fisheries are responsible for a small portion of the current risk, such that risk reduction can be more effectively achieved by implementing set-net closures only.

Risk reduction

Package 1 is not estimated to reduce fisheries risk by enough to achieve the population objective:

- The risk assessment estimates that under Package 1, the commercial fisheries risk score is 0.76 annually (with a confidence interval of 0.34 – 1.49) from both set-net and trawl fisheries combined.
- The upper 95th percentile estimate of combined fisheries risk score (1.49) exceeds 1, indicating that the subpopulation objective is not achieved.

Combining the risk score estimates for trawl and set-net on north coast South Island may result in a meaningful overestimate of risk,[26] and qualitative uncertainty stemming from our estimates of dolphin distribution also affects these estimates.

The effect of qualitative uncertainty is that risk reduction estimates are less reliable for the north coast South Island than in areas where dolphin distribution is more confidently estimated. We expect that risk is sufficiently reduced under Package 1 because, as in all low-density areas, the model estimates that dolphins are spread widely (including a substantial portion of the distribution extending far offshore), whereas sightings and behavioural observations from other subpopulations suggest that dolphins are more likely to be more concentrated in more inshore areas. If dolphins spend more time inshore than the risk assessment estimates, then they will be better protected by the proposed set-net closure, and the risk reduction achieved will be greater than estimated here.

In addition, recreational set-net risk cannot be quantified, but would largely be eliminated under this option. The amount of risk reduction that this would achieve is unknown, as is the number of fishers it would affect, but it is likely that both figures are substantial (because the north coast is one of the last large areas of the South Island coastline where high levels of recreational set-netting occur).

Socioeconomic impacts

We estimate that [redacted] set-net fisher would have greater than [redacted] percent of their landings affected by Package 1, with an estimated annual revenue loss of $0.28 million. Socioeconomic impacts have not been estimated for trawl proposals under Package 1 as no new gear or area restrictions are proposed.

1.9.8 Package 2 – north coast South Island

	Set-net Option 1	Trawl Option 2
North Coast South Island	**Area closure:** prohibit all commercial and recreational set-netting out to 4 nautical miles	**Monitoring**: vessels operating within Golden and Tasman Bays (inside a line from Farewell Spit to Cape Soucis) **Trigger**: 1 dolphin captured PSRMPs, individual vessel triggers, and research.

Package 2 proposes the same set-net option. In terms of trawl options, it differs from Package 1 by proposing that all trawl vessels operating within Golden and Tasman Bays (inside a line from Farewell Spit to Cape Soucis) would be subject to triggers, PSRMPs, monitoring, and research (as discussed in Section 1.11), to ensure that the population objective is achieved in practice.

Risk reduction

As under Package 1, combining the risk score estimates for trawl and set-net off north coast South Island may result in a meaningful overestimate of risk, and

[26] In practice the mean estimates of death and risk are additive, but adding the 95th percentiles results in a slight overestimate. However, the 'overestimate' effect is low when combining packages in which one fishing method has a much higher risk and the second fishing method has a much lower risk. When combining packages in which risk from both methods are comparable, adding the 95th percentile estimates may result in a meaningful overestimate.

qualitative uncertainty stemming from spatial distribution also affects these estimates.

Socioeconomic impacts

The socioeconomic impacts are estimated to be the same as for Package 1.

Monitoring

In the last three complete fishing years (2015/16-2017/18), an average of 29 trawl vessels were active in any one year in the proposed monitoring areas, 15 of which accounted for accounted for over 90 percent of the fishing effort (in terms of trawl events). Combined, the high-activity trawl vessels conducted an average of 3064 events over 1,315 fishing days.

Based on the activity in the last three complete fishing years, the estimated monitoring costs under each approach are:

On-board camera monitoring[27]		Observer monitoring[28]
Upfront costs: ***$0.44M***	Annual costs : ***$0.34M***	Annual costs:$***1.39M***
5-yearly estimated cost[29]: $***2.0M***		5-yearly estimated cost: $***6.95M***

1.9.9 Package 3 – north coast South Island

	Set-net Option 1	Trawl Option 3
North Coast South Island	**Area closure:** prohibit all commercial and recreational set-netting out to 4 nautical miles	**Area closure:** prohibit trawl out to 2 nautical miles within Golden and Tasman Bay **Monitoring**: vessels operating within Golden and Tasman Bays (inside a line from Farewell Spit to Cape Soucis) and beyond 2 nautical miles from shore **Trigger**: 1 dolphin captured PSRMPs, individual vessel triggers, and research

Unlike Packages 1 and 2, Package 3 proposes a spatial closure for all trawl vessels out to 2 nautical miles offshore in Golden and Tasman Bays.

We propose that trawlers operating in Golden and Tasman Bays beyond 2 nautical miles offshore be subject to triggers and the management approach discussed in Section 1.11 to ensure that the population objective is met in practice.

Risk reduction

Package 3 is not estimated to reduce fisheries risk by enough to achieve the subpopulation objective:

[27] Cost estimates for camera monitoring are based on the cost of enabling collection, review and storage of footage. Additional costs are expected to occur, but those are highly dependent on the implementation route chosen (mandatory versus voluntary).
[28] There are a number of logistical challenges around achieving high observer coverage levels in inshore fisheries, described in Part B8. Achieving the proposed level of observer coverage may require significant addition resourcing of the Observer Services programme, as well as industry improving the ability of vessels to carry observers.
[29] 5-yearly cost estimate for camera monitoring takes into account the average life-time of the hardware, which is around five years.

- The risk assessment estimates that under Package 3, the commercial fisheries risk score is 0.65 annually (with a confidence interval of 0.32 – 1.19) from both set-net and trawl fisheries combined.
- The upper 95th percentile estimate of combined fisheries risk (1.19) exceeds 1, indicating that the subpopulation objective is not achieved.

Combining the risk score estimates for trawl and set-net on north coast South Island may result in a meaningful overestimate of risk, and qualitative uncertainty stemming from spatial distribution also affects these estimates as under Packages 1 and 2.

Qualitatively, we expect that a trawl prohibition out to 2 nautical miles offshore will reduce risk, but the magnitude of this reduction is uncertain. Research efforts should be focused on improving distribution information for Hector's dolphins in this area.

Socioeconomic impacts

We estimate that [redacted] set-net fisher and [redacted] trawl fishers will have greater than [redacted] percent of their landings affected by Package 3, with an estimated annual revenue loss of $1.30 million across both methods.

Monitoring

Package 3 proposes monitoring within Golden and Tasman Bays beyond 2 nautical miles from shore.

In the last three complete fishing years (2015/16-2017/18), an average of 27 trawl vessels were active in any one year in the proposed monitoring areas, 14 of which accounted for accounted for over 90 percent of the fishing effort (in terms of trawl events). Combined, the high-activity trawl vessels conducted an average of 2851 events over 1239 fishing days.

Based on the activity in the last three complete fishing years, the estimated monitoring costs under each approach are:

On-board camera monitoring[30]		**Observer monitoring**[31]
Upfront costs: ***$0.41M***	Annual costs: ***$0.31M***	Annual costs: ***$1.31M***
5-yearly estimated cost[32]: $***1.96M***		5-yearly estimated cost: $***6.55M***

[30] Cost estimates for camera monitoring are based on the cost of enabling collection, review and storage of footage. Additional costs are expected to occur, but those are highly dependent on the implementation route chosen (mandatory versus voluntary).
[31] There are a number of logistical challenges around achieving high observer coverage levels in inshore fisheries, described in Part B8. Achieving the proposed level of observer coverage may require significant addition resourcing of the Observer Services programme, as well as industry improving the ability of vessels to carry observers.
[32] 5-yearly cost estimate for camera monitoring takes into account the average life-time of the hardware, which is around five years.

1.10 Preferred package

Our preferred package for each South Island subpopulation is Package 2.

Package 2 seeks to achieve the fisheries population objectives while minimising the impact on use of fisheries resources to the extent possible. Package 2 responds to submissions by taking into account feedback provided by local communities and the fishing industry regarding the potential mitigating effect of low headline height on trawl vessels, and set-netting in deeper water near Kaikōura Canyon.

Under Package 2, a revised approach to managing trawl impacts and set-netting around Kaikōura Canyon is proposed in place of blanket fishing bans in support of industry and community innovation. Package 2 would integrate widespread monitoring and research to test effectiveness of trawl gear modification and deepwater set-netting, as well as improving risk estimates. Captures reporting and response and the use of triggers, including oversight by a South Island Advisory Group, would support management and provide a stepwise approach to ensuring fisheries deaths do not exceed the population sustainability thresholds for each subpopulation.

We consider that the subpopulation objectives will be met under Package 2. The risk assessment estimates support this assumption for east coast South Island. For south coast South Island and north coast South Island, the quantitative estimates do not meet the objectives; however, these estimates are subject to meaningful qualitative uncertainty that we think results in an underestimate in the level of risk reduction that would be achieved. Package 2 also proposes trigger and reporting mechanisms to manage fisheries impacts throughout the fishing year, such that the deaths from fishing do not end up exceeding the population sustainability threshold.

Package 2 also provides for greater collaboration with iwi, industry, and other stakeholders. It aligns with the ‘bottom-up’ approach proposed by numerous submitters requesting to be move involved in management rather than being subjected to blanket fishing bans. Fisheries New Zealand held three meetings with Te Ohu Kaimoana and two meetings with Fisheries Inshore New Zealand to during development of the proposed packages. Both Te Ohu and FINZ have confirmed their willingness to develop such an approach as described in Section 1.11.

Overall, we prefer Package 2 as an innovative approach to managing fisheries risk. Where qualitative uncertainty remains around whether or not risk is sufficiently reduced, this can be managed through the proposed trigger approach, and by increased monitoring to improve our estimation of fisheries risk, especially with regards to the effects of different trawl configurations.

We consider that alongside the substantial economic cost and substantial investment in monitoring described in Package 2 to address fisheries risk, there needs to be a substantial investment in new research to improve our understanding of poorly studied populations, especially in the north coast and south coast of the South Island, and around Kaikōura Canyon.

1.11 Fisheries measures proposed for revised management approach (South Island trawl and Kaikōura set-net)

1.11.1 Fisheries New Zealand proposal

- Fisheries New Zealand supports an innovative approach to managing the effects of fishing-related mortality on South Island Hector's dolphins that would provide for greater collaboration with industry and other stakeholders.
- This approach is consistent with Te Ohu Kaimoana and industry comments in submissions about their willingness to develop such an approach.
- Industry representatives have confirmed this willingness in initial discussions.
- Such an approach is also consistent with the ability to be more flexible around managing risk from trawl fisheries in the South Island, particularly if option two set-net measures are implemented.
- The proposed approach is set out in Table 1 below. Table 1 contains proposals; the detail would be developed with the South Island Stakeholder Advisory Group as outlined under *Implementation*.
- See Part B9 for more information on the proposed South Island Stakeholder Advisory Group.

1.11.2 Implementation

- If you broadly support the approach, the first implementation step would be to stand up the South Island Stakeholder Advisory Group.
- DOC and Fisheries New Zealand would then work through details of the approach with members of that group.
- We would provide you with a briefing in May 2020 on the final details of the framework proposed (DOC will brief the Minister of Conservation).
- You have two alternative approaches available to implement the final framework:
    - Voluntary (Fisheries New Zealand would work with industry to have voluntary measures in place by 30 June 2020)
    - Mandatory (Fisheries New Zealand would aim to implement regulatory measures by the end of 2020)
- We believe that there is merit in considering a Memorandum of Understanding (MOU) led approach with industry. This approach would be consistent with the concept of fish plans and greater collaboration with the sector on resolving management issues.
- Fisheries New Zealand consider that Fisheries Inshore New Zealand (FINZ), as the main inshore fishing industry representative body, could lead the industry's participation in the MOU. We note that they have been successful in getting fishers to adopt such plans in other trawl and set-net fisheries.
- Performance would be monitored by the South Island Stakeholder Advisory Group and reviewed formally at the end of a year of operation.
- Fisheries New Zealand requests that you indicate a preference for implementation approach.
- If you are interested in exploring a voluntary approach in more detail, we will discuss this in confidence with industry representatives to confirm their support.

In order to include details of the preferred approach in the paper to Cabinet, we will report back to you no later than 31 October 2019 on industry's final position. If industry is not willing or able to reach agreement, then the other option available to you for Cabinet advice is to regulate.

Table 1: Explanation of fisheries measures proposed for innovative management approach.

South Island Stakeholder Advisory Group	• The proposed South Island Stakeholder Advisory Group is described in Part B9.
Protected Species Risk Management Plans (PSRMPs)	• Fisheries New Zealand (FNZ) and DOC will work with industry and through the Protected Species Liaison Officer programme to ensure that all vessels operating in specified areas have Protected Species Risk Management Plans (PSRMPs) on board. • PSRMPs will outline all steps that a specific vessel will take to mitigate captures of dolphins, including any gear restrictions that are required by regulation, and will also outline the steps that vessels will take in the event of a capture.

Gear Modification (trawl vessels only)	• In some areas, trawlers will be permitted to operate only if they meet operating specifications:
	  ○ headline height less than or equal to 1 metre; and,
	  ○ tow speed less than or equal to 2.5 knots.
	• Refer to Part B4 for more detail on the development of these gear modification proposals.
	• FNZ proposes to ensure vessels' adherence to gear modification through monitoring (see *Monitoring* in this table).
	• FNZ proposes to focus on headline height because this can be verified by cameras or observers, and tow speed because this can be verified by global positioning reporting.
	• FNZ does not recommend management of vessel size and/or vessel power at this time for the following reasons:
	  ○ The relationship between vessel size and risk of capture is not well understood, but will be investigated through the research component proposed to complement packages (see *Research*).
	  ○ Restricting headline height and tow speed may be sufficient without controls on vessels size and power also. Again, this will be investigated by the research component proposed to complement packages.
	  ○ International experience suggests that vessel power limitations cannot be easily monitored or enforced.

Monitoring	• High-activity vessels, contributing over 90% of the fishing effort are proposed to have a camera system or carry an observer (either through regulation or MoU, depending on the implementation approach). • Setting and hauling events carried out by these vessels will be monitored to independently verify compliance with any required gear modifications. • Hauling events carried out by these vessels will be monitored to independently verify dolphin captures and to ensure compliance with voluntary reporting, response, and triggers. • Monitoring programmes will also be designed and targeted as necessary to inform research on mitigation techniques and improve risk assessment information (see *Research* in this table). The Monitoring section (Part B8) provides more detail.
Triggers	• Triggers are a tool that elicits a predetermined response to a specific number of deaths being reached. • Triggers are set lower than the population sustainability threshold, providing a stepwise approach that allows risk to be managed to avoid the threshold being breached.

	• FNZ would develop final triggers in consultation with industry and the South Island Stakeholder Advisory Group. However, FNZ proposed triggers are outlined below.
	Individual Vessel Triggers All individual vessel triggers will result in the requirement for fishers to produce a capture report. A capture report will outline information currently required under legislation, and include details of the incident and additional information useful to determine what additional mitigation could be used. Full details of the information that should be included in a capture report will be developed with input from the South Island Stakeholder Advisory Group. **One capture incident** • Fisher must provide a capture report to FNZ, DOC, and Fisheries Inshore New Zealand (FINZ) within 24 hours of a capture (single or multiple) • Fisher must land dolphin for necropsy (this requires additional collaboration with DOC to implement) **Two capture incidents within a fishing year (same vessel)** • Fisher must immediately stop fishing and return to port • Fisher must provide a capture report to FNZ/DOC/FINZ within 24 hours of capture • Fisher must liaise with FINZ immediately upon returning to port to determine course of action for additional mitigation, but may continue fishing • FINZ must complete a report to FNZ/DOC on incidents within 7 days outlining any additional mitigation avoidance proposed **Three capture incidents within a fishing year (same vessel)** • Fisher must immediately stop fishing and return to port • Fisher must provide a capture report to FNZ/DOC/FINZ within 24 hours of capture • Fisher must liaise with FINZ immediately upon returning to port to determine course of action for additional mitigation • FINZ must complete a report to FNZ/DOC on incidents within 7 days outlining any additional mitigation avoidance proposed • Fisher cannot operate within any low headline height/slow tow speed (or other high fishing mortality likelihood or consequence) area until assessment of incidents complete and additional mitigation determined by DOC, FNZ and FINZ.
	Subpopulation triggers **East coast South Island**: 20 dolphins captured • Trigger response: FINZ will provide a report to the South Island Stakeholder Advisory Group within 14 days, and the Group will meet within 30 days to review report provided by FINZ and provide advice to FNZ and DOC. 40 dolphins captured • Trigger response: Closure of the fishery. FINZ will provide a report to the South Island Stakeholder Advisory Group within 14 days, and the Group will meet to consider the report, determine appropriate response and possibility of further mitigation, and provide advice to FNZ and DOC. FNZ and DOC will work with industry to determine when fishing may recommence. • FNZ and DOC will update Ministers that a trigger has been reached and with other relevant information. **South coast South Island**: 1 dolphin captured • Trigger response: Closure of the fishery. FINZ will provide a report to the South Island Stakeholder Advisory Group within 14 days, and the Group will meet to consider the report, determine appropriate response and possibility of further mitigation, and provide advice to FNZ and DOC. **North coast South Island**: 1 dolphin captured • Trigger response: Closure of the fishery. FINZ will provide a report to the South Island Stakeholder Advisory Group within 14 days, and the Group will meet to consider the report, determine appropriate response and possibility of further mitigation, and provide advice to FNZ and DOC.

	Local Population Triggers **Kaikōura**: 4 dolphins captured • Trigger response: Temporary closure of the set-net fishery. FINZ will provide a report to FNZ and DOC outlining details of captures and further mitigation that can be implemented to allow fishing to recommence. Assessment and decision by FNZ and DOC required within 30 days of trigger. **Pegasus Bay**: 10 dolphins captured • Trigger response: Temporary closure. FINZ will provide a report to FNZ and DOC outlining details of captures and further mitigation that can be implemented to allow fishing to recommence. Assessment and decision by FNZ and DOC required within 30 days of trigger. **South Canterbury Bight to Timaru**: 10 dolphins captured • Trigger response: Temporary closure. FINZ will provide a report to FNZ and DOC outlining details of captures and further mitigation that can be implemented to allow fishing to recommence. Assessment and decision by FNZ and DOC required within 30 days of trigger.
Research	• Research will be undertaken to test the effectiveness of gear modification in mitigating risk to dolphins. Other mitigation techniques would also be tested, such as acoustic pingers. New information gleaned from monitoring would be used to improve risk assessment outputs. • A research proposal for testing mitigation techniques would be developed and presented to the South Island Stakeholder Advisory Group in 2020. • The details of the research component and funding will be determined alongside the South Island Stakeholder Advisory Group, but may involve providing for special permits in gear modification areas.

PART B5: OTHER FISHERIES MANAGEMENT PROPOSALS

Part B5 contains analysis on the methods of ring netting and drift netting to resolve long-standing regulatory issues with use of these methods.

B5: OTHER FISHERIES MANAGEMENT PROPOSALS

CONTENTS

1.1 Purpose

Part B5 contains analysis and Fisheries New Zealand recommendations on the methods of ring netting and driftnetting to resolve long-standing regulatory issues with use of these methods.

1.2 Proposed amendment to enable ring netting

The legal definition of a set-net in New Zealand is much broader than the common usage of the term. Under the Fisheries (Commercial Fishing) Regulations 2001 and the Fisheries (Amateur Fishing) Regulations 2013, the definition of a set-net is:

> *"a gill net or any other sort of net which acts by enmeshing, entrapping, or entangling any fish".*

Of the activities (that aren't further defined elsewhere) that fall within this definition, passive netting (such as nets that are left submerged for extended periods, and/or unattended) are considered to pose the great risk of fishing-related mortality to Māui and Hector's dolphins.

One example of a netting method that falls under the legal definition of "set-net" is "ring-netting". Ring netting has been described as:

> *"where the boat circles a school of fish with a wall of net… lay the net round in a circle or C shape. The net has a series of floats on 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".*

When ring netting, a fisher is actively involved throughout the fishing activity compared to a "passive" set-net; meaning they are more likely to see and avoid dolphin activity.

Status quo

The use of ring netting has been raised in earlier iterations of the TMP, and is a common fishing method used to target mullet and kahawai in the west coast North Island harbours.

Currently, commercial ring netting is allowed under interim relief for mullet only in the area of the Manukau Harbour that was closed to set-netting in 2008. The initial

prohibition of ring netting in this area was an unintended restriction as a result of the decision to extend the set-net prohibition further into the harbour in 2008[1].

Proposal to allow ring netting

Fisheries New Zealand consulted on whether ring netting should be allowed to operate regardless of whether any area is closed to set-net more generally.

Submission comments

There was a fairly even split in submissions on whether ring netting should be allowed in areas currently prohibited to set-netting. Of the 524 submissions in the long survey, 257 were against the proposal and 267 were in favour. This split in favour and against was also fairly even within each group (tangata whenua, commercial fishers, recreational fishers, general public, environmental interests).

Submissions in support of allowing ring netting considered:

- the method was an example of a dolphin-friendly alternative;
- if a dolphin was caught it could be released without harm;
- it was unlikely to pose a risk, or appears to be low risk, but should be subject to review and regular monitoring to ensure its safety; and
- it an acceptable method if there is no record of a dolphin capture using this method.

Submissions opposing ring netting considered:

- a net is still a net and if a dolphin can only hold its breath for three minutes than that is not enough time to release one if it is caught;
- all nets should be banned;
- we do not know enough about ring netting;
- ring netting is indiscriminate and would remove fish the dolphins feed on; and
- it's too risky for Māui dolphins given their small population.

Effectiveness

Allowing ring netting in areas closed to commercial set-netting is appropriate if you consider the level of risk posed by commercial ring netting to be low and acceptable to the Māui dolphins.

We consider ring netting provides an alternative fishing method that is capable of avoiding, remedying or mitigating the effects of fishing on Māui dolphins. However, we consider the method should only be allowed in set-net closure areas within harbours as opposed to along the coast. Because the method is best for targeting schooling fish such as mullet and kahawai, it is considered best deployed within the harbour environments.

We have insufficient information about the use of ring netting by non-commercial fishers and considers it not necessary to extend its use in areas closed to recreational set-netting. In general, recreational set-net activity is considered higher

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

risk than commercial due to the chance of inexperienced fishers deploying gear. We considered encouraging uptake of ring netting for recreational fishers poses an unknown but unacceptable risk of lost gear that could end up in Māui dolphin habitat.

Socioeconomic impact on fishers

Allowing commercial ring netting in the harbours where set-netting has been prohibited would allow commercial fishers to better use the fisheries resources within the harbours. The allowance would likely provide additional revenue to fishers, but there is insufficient information estimate how much.

Non-commercial fishers are unlikely to be impacted by the allowance of commercial ring netting. However, commercial fishers who choose to harvest by ring net in the current set-net ban areas may remove some of the fishing pressure in the inner harbours and overlap with recreational fishers.

Fisheries New Zealand recommendation

We consider that ring netting would provide an alternative fishing method that is capable of avoiding, remedying or mitigating the effects of fishing on Māui dolphins.

We recommend that you allow for commercial ring netting only within the west coast North Island harbours where set-netting has been prohibited. We do not support the use of ring netting along the coast given the nature of the method and species it's used to target, which are best represented within the harbours.

We do not recommend, at this time, allowing the method for use by recreational fishers in the recreational set-net ban areas. There is very little information to suggest that this is an important or commonly used method by recreational fishers. We caution against enabling its uptake and use in the existing closed areas where the dolphins have been sighted by recreational fishers that are likely to be inexperienced in using this method.

Fisheries New Zealand management and compliance would work with the industry to ensure the regulatory definition of ring netting will enable monitoring and inspection to allow for review of its use, should the risk of the activity be more than negligible.

1.3 Proposed amendment to driftnet regulations

A "driftnet" has been defined as a gillnet or other net that –

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

Status quo

Under the Driftnet Prohibition Act 1991 (administered by MPI) driftnet fishing fitting the description above is prohibited in New Zealand waters.

Following the establishment of the TMP and its review in 2007/08 it was further legislated that driftnets (including nets less than one kilometre) cannot be used for fishing in the Waikato River.

We have identified a gap with the above legislation that there is no prohibition on driftnets less than one kilometre in New Zealand waters outside of the specified area legislated for within the Waikato River.

While not known to be a common activity, we consider that the use of driftnets (including nets less than one kilometre in length) should be explicitly prohibited due to the limited ability to control and mitigate their threat to Hector's and Māui dolphins.

Proposal to prohibit driftnet

Fisheries New Zealand consulted on whether to further specify in the legislation that the use of driftnets (including nets less than one kilometre) cannot be used for fishing either:

a) in the areas subject to set-net prohibitions, or
b) in New Zealand.

Submission comments

There was strong support in submissions to explicitly prohibit driftnet fishing. Of the 532 respondents in the long survey, 507 were in support of a prohibition. A small number of commercial and recreational fishers and the general public opposed such a prohibition.

Submissions in support of prohibiting the use of drift nets considered:

- these types of nets are known to be accidentally lost, resulting in ghost fishing that can pose a huge risk to the dolphins and other marine life;
- the method is indiscriminate and should not be used at all; and
- they thought the method was already banned.

Some submissions considered that the use of drag nets by recreational fishers, in particular, pose a significant risk to the dolphins because they are often lost by inexperienced fishers or when the nets get caught in rips and essentially become "driftnets".

Some commercial fishers (both in support and opposed to the prohibition) considered that a ban should only occur in areas where set-netting is prohibited.

Submissions that opposed such a prohibition considered:

- fishers are with their nets at all times and therefore do not pose a risk; and
- drift nets that are tied to a boat at all time and are 100 percent monitored are a safe, selective and effective manner to catch fish.

Effectiveness

There is minimal driftnet fishing undertaken by commercial fishers. There is no information available to estimate the amount of drift net activity undertaken by recreational fishers; however, anecdotal evidence suggests it would be minimal.

While likely an uncommon activity, the proposed prohibition of driftnets in New Zealand waters would provide for the greatest effectiveness of ensuring a Māui or Hector's dolphin is not entangled in such gear. Prohibiting the method within areas that have a set-net ban would provide a degree of protection, but if nets were lost outside these areas they could travel to areas where the dolphins reside and set-net restrictions are in place.

Socioeconomic impact on fishers

We consider the impact on recreational and commercial fishers to be minimal given there seems to be little use of driftnets in New Zealand.

Submissions that identified as tangata whenua and commented on the proposal also indicated their support for a prohibition. We consider other methods are more commonly used and available to support customary harvest and a prohibition on the recreational and commercial use of driftnets is unlikely to significantly impact on customary interests.

Fisheries New Zealand recommendation

We strongly recommend a prohibition on any driftnet in New Zealand waters, regardless of length (singly or tied together) and irrespective of whether it has attached to or means to be attached to any vessel. The risk of lost nets and their ability to become ghost gear poses a significant risk to many species, but particularly Māui and Hector's dolphins.

Given the likely very low level of use of these nets already in New Zealand waters, we consider a ban would have little impact on providing for use of fisheries resources.

PART B6: SOCIOECONOMIC IMPACTS

Part B6 provides you with estimates of the economic impact of consultation options and post-consultation option packages for each subzone under the TMP review. The purpose of the economic impact analysis is to provide you with an understanding of the potential economic costs associated with each of the proposed packages and to illustrate the flow-on effects to the wider economy.

B6: SOCIOECONOMIC IMPACTS

CONTENTS

1.1 Purpose

Part B6 provides estimates of the economic impact of consultation options and post-consultation option packages for each subzone under the TMP review. Detail is provided of the potential effects on users of fisheries resources as context for your decision-making. This information is summarised in Parts B3 and B4.

1.2 Economic Impact Assessment

1.2.1 Overview

We have estimated the economic impacts of the consultation options and post-consultation packages for each subpopulation under the TMP review. The purpose of the economic impact analysis is to provide you with an understanding of the potential economic costs associated with each of the proposed packages and to illustrate the flow-on effects to the wider economy. Table 1 shows the costs of the proposed packages (post-consultation) for each subpopulation.

Table 1: Estimated costs of the proposed packages for each subpopulation (in $ millions).

Subzone	Package (combined for set-net and trawling)	Total Revenue Lost	Total Economic Impact (1 Year)	Total Economic Impact – 5 Years	
				Low	High
West coast North Island (Māui dolphins, and southern habitat zone)	Package 1	2.14	6.04	11.22	26.97
	Package 2	3.39	9.57	17.79	42.74
	Package 3	8.00	22.55	41.90	100.67
North coast South Island	Package 1	0.28	0.79	1.48	3.55
	Package 2	0.28	0.79	1.48	3.55
	Package 3	1.30	3.68	6.85	16.45
East coast South Island	Package 1	1.24	3.51	6.51	15.65
	Package 2	1.24	3.51	6.51	15.65
	Package 3	8.43	23.79	44.20	106.20
South coast South Island	Package 1	0.05	0.15	0.27	0.66
	Package 2	0.09	0.25	0.46	1.10
	Package 3	1.65	4.66	8.66	20.82
Combined National Total	**Package 1**	**3.72**	**10.49**	**19.49**	**46.82**
	Package 2	**5.00**	**14.12**	**26.24**	**63.04**
	Package 3	**19.39**	**54.68**	**101.60**	**244.14**

It is clear that the proposed packages will directly and significantly impact some fishers and licensed fish receivers, especially in the Māui dolphin area. There will also be many fishers who will be affected by the proposed packages and this will have wider effects on their communities and the wider economy.

1.2.2 Methodology

The Ministry of Fisheries developed an economic impact assessment methodology for the advice provided in 2008 on the TMP. This methodology has been used in subsequent advice to Ministers on the TMP. We have also used this methodology to produce economic estimates of the impacts of proposed closures in the consultation document.

Following consultation and concerns raised about the methodology (particularly the lack of detail presented), Fisheries New Zealand commissioned the New Zealand Institute of Economic Research (NZIER) to:

- review the methodology used to determine whether it was robust; and
- further analysis using an alternative methodology – computable general equilibrium (CGE) model.

CGE models are often used to analyse the economic effects of changes in taxation, trade and environmental policies.

NZIER has confirmed that the original economic impact assessment methodology is still fit for purpose but recommended that some minor adjustment should be made.

Our original methodology has been updated based on the recommendations from NZIER. Updated calculations are provided within the subspecies chapters on the economic impacts of the consultation options and subsequent packages.

1.2.3 Key submission themes

The submissions on the economic impacts of each of the consultation options provide different views and can be broadly summarised into two distinct perspectives.

The first perspective (from eNGOs and concerned citizens):

- The economic costs of the TMP are overstated and, over the medium-to-long term, the fishing industry will change their behaviour to maximise profits where possible. This could include fishing in other areas not within the scope of the options, fishing with dolphin-friendly equipment or picking up a different trade altogether.

- The economic costs of the TMP do not account for intrinsic values pertaining to the Hector's and Māui dolphins commonly implemented in Total Economic Value calculations.

The second perspective (from the fishing industry, Iwi groups, fishing communities and other fishing related businesses):

- The economic costs of the TMP are understated and the impacts on wellbeing and economic viability expected to be severe. Costs and impacts are not presented in detail with focus on effects being felt by families and townships, not just fishers.

- There will be high transaction/transfer costs for each and every measure. Fishers will not be able to fish in other areas (due to specific ACE/quota packages), and the highly specialised skills/qualifications of fishers will make it extremely difficult to retrain and pick up work elsewhere.

- Access to fish for customary purposes will be constrained because of limited access to commercial fishers who can participate in the pātaka system. This is because Iwi partner with the fishing industry take, store and process fish for customary purposes and access will be constrained if there are fewer commercial partners. A number of submissions from both perspectives also argue that we did not attempt to estimate intrinsic cultural values which tangata whenua hold of Hector's and Māui dolphins.

The collated views of submissions regarding the economic impact analysis from submissions are described in Appendix 1.

1.2.4 Fisheries New Zealand response

The key themes put forward by submitters were not a surprise. These views have been expressed consistently since 2008. Our views on these key themes is provided below:

Costs are overstated

There are some submitters who believe the costs to the fishing industry are overstated and that our analysis does not take into account other types of benefits/values associated with protecting the dolphins.

As noted, the NZIER review showed that while a few minor changes were recommended, the methodology was still sound and fit for purpose.

We believe that other types of benefits/values associated with protecting the dolphins could be included in our analysis, however, these values are not available or we have little ability to generate an unbiased figure estimate.

Non-market values are difficult to estimate under normal circumstances, and given that surveying techniques are used to generate these figures, the high-profile nature of the TMP means that most responses will generate very high numbers (for example, dolphins are priceless, they should be protected at all costs) or very low numbers (for example, we should protect dolphins but not at the expense of our fishing communities).

Comparing market and non-market values also creates issues as these are generated in two very different ways. Caution should be used when doing so; however, we believe that there is economic value/benefits from protecting and conserving Māui and Hectors dolphins even if it cannot not be quantified at this time.

Costs are understated

There are some submitters who believe the costs to the fishing industry are understated and our analysis does not take into account the wider economic impacts of the proposed packages.

The results of NZIER's CGE modelling are presented below, to show the estimated impact on the wider New Zealand economy from the proposed packages. We believe that this, combined with the Fisheries New Zealand economic impact assessment, provides a comprehensive picture of the potential economic impacts.

We commissioned case studies on the potential impact for the Kaikōura community of the proposed packages and commissioned Aranovus to interview selected fishers and licensed fish receivers in the Taranaki to understand the impact on them and their communities from the proposed packages.

We wanted to develop an understanding of what the impacts could be on small fishing communities to help inform our advice on the proposed packages. The case study findings are summarised in the next section.

1.3 Additional research and case studies

1.3.1 NZIER's CGE Modelling

The additional independent economic modelling sought by Fisheries New Zealand reinforces the relative economic impacts, while providing more accurate estimates of the potential cost of each of the proposed TMP consultation options by addressing the limitations of the Fisheries New Zealand methodology.

Overall, the CGE model estimates show relatively similar impacts of the proposed TMP consultation options in relation to the economic losses being compounded with each additional closure. The results from the CGE modelling have been split into set-net and trawl for both the North and South Islands (Table 2 and Table 3).

The economic impacts are expected to be higher for trawling options, as the catch value of trawl fishing is larger than the catch of set-net fishing. Tables 2 and 3 report the flow-on effects on the rest of the economy, with supporting industries taking significant losses in the short-term.

Industries which support or supply the trawl and set-net fishing industries with intermediate inputs are likely to be affected as demand for processing, transport, gear and maintenance decrease. Households which rely on incomes from these industries are likely to be negatively affected from decreased income from employment and wages and from decreased returns to capital from closure under the TMP.

Table 2: Macroeconomic impacts from set-net and trawl consultation options in the North Island

North Island ($m)	Option 2		Option 3		Option 4	
	Set-Net	Trawl	Set-Net	Trawl	Set-Net	Trawl
GDP	-2.1	-2.0	-2.9	-8.3	-8.3	-9.9
Household Consumption	-1.6	-2.1	-2.1	-6.0	-4.2	-4.9
Exports Volume	-1.8	-1.9	-2.2	-5.9	-4.2	-5.2
National Output	-2.5	-2.4	-3.5	-10.7	-11.5	-13.4
Employment	-0.6	-0.6	-0.8	-1.9	-1.6	-1.7

Note: Annual changes from 2018 baseline, in $ millions (real terms). Each row represents a distinct indicator about the New Zealand economy. These rows are not additive.
Source: NZIER.

Table 3: Macroeconomic impacts from set-net and trawl consultation options in the South Island

South Island ($m)	Option 2		Option 3		Option 4	
	Set-Net	Trawl	Set-Net	Trawl	Set-Net	Trawl
GDP	-4.1	-5.8	-4.9	-10.1	-1.1	-1.3
Household Consumption	-1.4	-1.7	-1.7	-3.0	-0.5	-0.6
Exports Volume	-1.8	-2.5	-2.2	-4.3	-1.0	-1.1
National Output	-5.9	-7.0	-7.5	-12.0	-1.2	-1.2
Employment	-0.5	-0.6	-0.7	-1.0	-0.2	-0.1

Note: Annual changes from 2018 baseline, in $ millions (real terms). Each row represents a distinct indicator about the New Zealand economy. These rows are not additive.
Source: NZIER.

The impact on GDP related to each of the TMP options proposed is expected to decline over the foreseeable future as the opportunity cost of potential growth is realised.

1.3.2 Kaikōura Regional Impact Case Study

Fisheries New Zealand was approached by the Kaikōura community to undertake a case study of the Kaikōura regional impacts of the consultation options. The report by Phonebox Consulting investigated the potential direct and indirect impacts, including the social impacts on families and the community[1].

The study found that the Kaikōura economy is currently temporarily inflated due to post-earthquake construction and rebuild employment within the region. Kaikōura's GDP of $131 million is heavily reliant on tourism with 3.2 percent being apportioned to the fishing sector, of which inshore set-netting makes up roughly two-thirds. Commercial fishing, therefore, provides industry diversification and economic resilience for the Kaikōura economy, as tourism operates as a seasonal industry.

The combination of seasonal work and a lower wage, compared to national levels, hinders the ability for many locals to find full-time sustainable employment. This is a contributing factor to why Kaikōura possesses a reduced number of residents in the 20 to 40 year-old age bracket. Therefore, the importance of the fishing industry is highlighted in its alleviation of these economic pressures for Kaikōura residents.

Over the past 10 years, the fishing industry has slowly re-established itself as businesses have worked to rebuild and develop new fishing areas since the 2008 set-net and trawl closures and restrictions of the original TMP were introduced (closing off roughly 50 percent of some businesses' fishing areas). The set-net fishing industry currently makes up 1 percent of total employment within Kaikōura.

The importance of the fishing industry to the tourism sector is also highlighted in the report.

The report notes that the Kaikōura set-net fishers use a variety of local businesses and services with the local economy. Average per annum local expenditure can be up to an estimated $820,000, including expenditure on local engineering, maintenance, net making, mechanical, electrical, provision suppliers, and information technology services.

The regional impact study on Kaikōura estimates that extending the ban out to 4 nautical miles include areas with a depth to over 1120 metres, which would mean a loss of fishing areas for 70 to 98 percent of all species targeted. Running a business at less than 30 percent of current fishing area has a high chance of making these businesses non-viable.

[1] Assessment of Potential Impacts from Options Proposed in the Hector's and Maui Dolphin Threat Management Plan (2019) on Kaikoura. Phonebox Consulting.

1.3.3 Aranovus report on Māui dolphin and Taranaki fishers

In 2019, Fisheries New Zealand commissioned a study by Aranovus Limited of the social impacts on a range of commercial fishers who operate on the west coast of the North Island.

Fisheries New Zealand provided the details of fishers who were willing to be contacted by Aranovus. As a result, a total of 13 fishers split between New Plymouth, Raglan and Kawhia were interviewed. The participants included a mix of commercial trawl and set-net fishers.

Interview subjects indicated that, contingent on the options chosen and the nature of their activities they would be impacted to the point their businesses would cease to be economically viable and would no longer be able to operate.

The report notes that there would be impacts on the affected fisher's sense of personal identity, physical wellbeing, mental health and standing in the community. The report noted the mental health aspects of these impacts are particularly concerning.

Views on wellbeing were also gathered though a series of meetings across the country that were specifically set-up for fishers to attend. This was in addition to the submissions from the public consultation provided rich detail on how fishers wellbeing (included identity, sense of security and associated wellness) is constructed and what the proposals would mean.

As a result of the TMP consultation, a number of those in the fishing industry, as well as eNGOs and others expressed wellbeing concerns for fishers via written or verbal feedback.

In response to the concerns raised by fishers, we organised a wellbeing support line and group workshops that are being delivered confidentially by Guard Safety.

PART B7: TRANSITION ASSISTANCE

Part B7 provides you with advice to support your decision on whether some form of financial assistance or *ex gratia* payment is warranted to support stakeholders impacted by the TMP packages. This includes outlining existing compensation and *ex gratia* policy, a suggested approach, and implications of making such a decision.

B7: *EX GRATIA SUPPORT AND TRANSITION*

CONTENTS

1.1 Purpose

Part B7 provides you with advice to support your decision on whether some form of financial assistance or *ex gratia* payment is warranted to support stakeholders impacted by the TMP packages.

1.2 Summary

Some options for restricting fishing in the Hector's and Māui dolphin habitat set out in the TMP are likely, if implemented, to have significant impacts on a range of stakeholders in the fishing sector.

Section 308 of the Fisheries Act says that nothing given effect or authorised by any provision in the Fisheries Act that provides for measures to ensure sustainability[1] (including sustainability measures and specified sections including section 15) shall be regarded as making the Crown liable to pay compensation.[2] Notwithstanding that, many submissions focused on the need to provide some form of transitional financial assistance.

If you determine that some form of financial assistance or *ex gratia* payment[3] is warranted to support a *just transition* then we consider that the focus of such support should be commercial fishers that rely on annual catch entitlement (ACE) holdings and licensed fish receivers who have a history of investment, commitment or dependence on the fishery in a given area, and are significantly and directly affected by the proposed sustainability measures.

There are a number of approaches to providing support; however, we consider that a one-off, unencumbered *ex gratia* payment to displaced fishers that left them with the freedom to choose how they might make best use of it would be best, as this would provide recipients with the greatest flexibility.

[1]Sustainability measure means any measure set or varied under Part 3 for the purpose of ensuring sustainability and relates to the catch limit (including a commercial catch limit) for any stock, the size, sex, or biological state of any fish, aquatic life, or seaweed of any stock that may be taken, the areas from which any fish, aquatic life, or seaweed of any stock may be taken, the fishing methods by which any fish, aquatic life, or seaweed of any stock may be taken or that may be used in any area, and the fishing season for any stock, area, fishing method, or fishing vessels.
[2]There is a compensation regime in Part 9A for aquaculture developments but any such compensation is payable by the aquaculture developer to fishers after MPI has made an Undue Adverse Effects decision. There is nothing about payments by the Crown to fishers for sustainability, industry adjustment payments, or anything else.
[3]An *ex gratia* payment is granted on the basis of a favour and not from legal obligation and may take a number of forms, extending from a one-off financial payment to some form of ongoing transition funding that provides targeted support.

Should fishers choose to remain in the sector, the *ex gratia* payment may assist transaction costs, as fishers choose. Should they choose to exit the sector completely, the Government may additionally offer to buy redundant vessels at market rates and scrap them, or to make up any shortfall as a result of sales being limited to non-commercial fishing purposes.

We propose that any fisher who sold a vessel that remained on the fishing vessel register should not receive any additional assistance. International obliga ions

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Any form of *ex gratia* payment should be carefully thought through:

- To prevent gaming by participants, the Crown must be clear as to who was within any group of persons (or individuals) entitled to the payments under this policy (such as, there is a need to ring-fence it).
- It must be fair to the group of persons (or individuals) who are intended to be covered by the policy;
- It must be constructed in such a way that it avoids, as far as possible, claims of "legitimate expectation" both now and in the future (such as, that going forward the commercial sector has a legitimate expectation that every sustainability measure will be compensated).
- Interna ional obligations

We consider that any *ex gratia* payment made should be a one-off payment that reflects the unique nature of the proposals, with no recourse for additional payments for any other related sustainability measure that may be implemented in the same area in the future.

Submissions from commercial fishers (and their representatives) commented extensively on the issue of transitional assistance. Of the affected parties that submitted, the majority noted that if any of the further proposed fishing restrictions were implemented their commercial fishing operations would become economically unviable. The majority of these submissions observed that they would likely be unable to continue operating profitably, and requested compensation for loss of assets and income if they exited the industry.

Initial analysis suggests that the affected parties in the Māui dolphin habitat, if they were to exit the industry completely, could incur costs estimated to be between Under active consideration (depending on the areas impacted, how many years of estimated loss of income are covered to support fishers transitioning to other methods or occupations). Costs cover one-off costs such as retirement of vessels, gear (including nets), and plant (processing and freezer) facilities.

While analysis has focused primarily on Māui dolphin habitat, we consider the approach could be extended to encompass affected parties in the Hector's dolphin habitat if you consider that support is warranted.

In addition, we consider that it would be reasonable to provide funding for some form of financial and business planning advice in association with any *ex gratia* payment to support fishers in the transitional period.

1.3 Existing compensation policy

As noted above, the Crown is under no obligation to compensate permit holders for implementing a sustainability measure.

An *ex gratia* payment could be paid to an affected party when a sustainability measure is introduced. There is no requirement for this payment to cover the full impact of the measure. A decision to make a payment is therefore made in good faith to support wellbeing outcomes consistent with the Government's "*just transition*" approach.[4]

1.4 MPI *ex gratia* payment policy

MPI has an *ex gratia* payment policy, which sets out MPI's requirements for assessing *ex gratia* compensation claims, where losses have been suffered by persons (either individually or as representatives of entities):

- due to MPI exercising powers under legislation; and/or
- there is no legal requirement to consider compensation for the losses; and
- MPI considers there exists a moral duty to compensate some aspects of the losses.

Currently, the policy is geared towards people and firms involved in biosecurity and food safety.

The policy notes that MPI is not required by law to make *ex gratia* payments. Decisions about whether or not to make *ex gratia* payments are made on a case-by-case basis, with each case being determined on its merits. A payment amount approved by MPI is made on a discretionary and exceptional basis.

MPI's preference is to limit the Crown's fiscal liability to claims made in accordance with the compensation provisions in the Biosecurity Act, or where MPI might be legally liable.

There are limited precedents for when *ex gratia* payments have been paid in a fisheries context. For example, *ex gratia* payments were made to ACE fishers following the Kaikōura earthquake and fishery closures.

Any form of *ex gratia* payment in fisheries need to be carefully considered to ensure it:

[4] *Just transition* is a framework developed by the Ministry of Business Innovation and Employment (MBIE) to encompass a range of interventions needed to secure livelihoods when economies are shifting to sustainable production, primarily avoiding climate change and protecting biodiversity. https://www.mbie.govt.nz/business-and-employment/economic-development/just-transition/

- targets those significantly and adversely impacted by the sustainability measure and prevents gaming;
- considers, where possible, the needs to be fair and reasonable given the impact on the parties involved;
- considers the ability of Government to pay (such as, it must be affordable and this is likely to vary at different times);
- avoids setting precedents or expectations about *ex gratia* payments in the future; and
- International obligations

A decision to make an *ex gratia* payment will likely increase expectations for similar payments in other areas where people may be impacted by a sustainability measure in the future. Trends in management (for example, establishment of marine protected areas and managing for climate change) means that this demand is likely to increase in the future.

We consider that permit holders must consider these increased risks when they make decisions to continue to invest in the sector. This includes not relying on the possibility of future compensation or *ex gratia* payments when making investment decisions today.

1.5 Proposed *ex gratia* payment policy for significantly and directly affected parties

If you determine that some form of financial assistance or *ex gratia* payment is warranted to support a just transition then we consider that the focus of such support should be ACE fishers and licensed fish receivers that are significantly and directly affected by the proposed sustainability measures.

The significantly and directly affected parties in the Hector's and Māui dolphin habitat include ACE fishers who use trawl and set-net methods, and licensed fish receivers who receive fish from these ACE fishers. ACE fishers would be directly affected by the prohibition of their current fishing methods. Licensed fish receivers would be indirectly affected as a consequence.

The effect on both ACE fishers and licensed fish receivers would reflect their exposure to the proposed changes, and the behaviour of ACE fishers in relation to one of three possible scenarios (Table 1). These are whether the ACE fisher decides to:

- exit the sector;
- exit the impacted area; or
- transition to non-prohibited fishing methods in the same area (most likely scenario).

Table 1: Hector's and Māui dolphin possible scenarios

Scenario One – Vessels exit the sector	Scenario Two – Vessels exit the impacted area	Scenario Three – Vessels transition to non-prohibited practice
To ensure no perverse incentive is set under this scenario, ACE fishers could be required to relinquish their vessels by one of three ways as part of the settlement process: 1. sell their vessel and provide proof of this; 2. demonstrate how their vessel would be used for other purposes (for example, recreational fishing charters); or 3. surrender their vessel to the Crown.	Transition costs would be related to the increased operational costs of travelling to fishing grounds further away and new market developments, rather than new gear, methods and crew training. The terms of accepting an *ex gratia* payment should indicate that no other recourse would be available to the impacted party in the future if new fishing methods or practices are not commercially viable in the impacted area in the long-term.	Transition costs would be related to changing methods (new gear and training crew). This cost could potentially be offset by broader benefits attached to licensed fish receivers being able to continue to operate in the impacted area. An offer of an *ex gratia* payment for transition costs under Scenario Three would not include the replacement cost of a vessel, or subsidising the cost of fishing. For the latter, this is not consistent with the New Zealand's commitments under the United Nations Sustainability Development Goals.[5] The terms of accepting an *ex gratia* payment should indicate that no other recourse would be available to the impacted party in the future if new fishing methods or practices are not commercially viable in the impacted area in the long-term.

Consequently, each of the scenarios would result in one or more of the following costs to the affected parties (Table 2):

- loss of sunk costs (for example, investment and operational decisions already made particularly related to vessels, processing plants and ACE);
- loss of future earning capacity (for example, lower yield fishing and/or less supply of fish for processing);
- transition costs[6] (for example, longer fishing expeditions, new gear and methods and crew training); or
- adverse impact on broader wellbeing (for example, way of life and wellbeing derived from identity as a fisher).

[5] Sustainability Development Goal 14.6 aims to "prohibit certain forms of fisheries subsidies which contribute to overcapacity and overfishing, and eliminate subsidies that contribute to Illegal, Unreported and Unregulated fishing (IUU) fishing, and refrain from introducing new such subsidies..." by 2020 (https://sustainabledevelopment.un.org/sdg14).

[6] Transition costs do not encompass potential Research and Development costs as these opportunities would be considered through broader innovation opportunities.

Table 2: Summary of the potential exposure on the impacted parties

Cost category		ACE fishers	Licensed fish receivers
1. **Sunk costs** (fixed costs)	Vessels (including gear)	Trawl & set-net (known)	n/a
	Plant	n/a	Under-utilised plant capacity (dependent on exposure to area) Quota value closely linked to licensed fish receiver business model
	Contracts (already entered into)	Wharf docking arrangements, assured ACE packages	Distribution arrangements
2. **Foreseeable loss** (revenue)	Income/Profit (limit 12 months)	Less productive fishing methods	Less fish being processed
3. **Transition costs** (one-off)	Transition to another area	Longer fishing trips – fuel and crew	Staff lay-off costs borne by business
	Transition to non-prohibited practice	Gear, methods & training (longline estimated at approx. $75,000 per vessel)	Staff lay-off costs borne by business
4. **Broader wellbeing** (non-monetised)	Social & cultural	Loss of livelihood/identity Wellbeing impact of TMP process (stress)	Loss of livelihood/identity Wellbeing impact of TMP process (stress)

We recognise that quota owners may consider that they are affected by the proposals as they have argued that the value of their quota will fall because some fishers may no longer purchase ACE. However, we consider that they should not be included in any proposed support or assistance packages. This is because there are no proposed changes to Total Allowable Commercial Catches (TACCs), and quota holders are still able to provide and lease ACE to fishing activities in areas not impacted by the sustainability measures.

We accept that any proposed changes will also have negative outcomes for those employed by ACE fishers (for example, vessel crew) and licensed fish receivers (for example, fish processors). You may choose to offer some form of support beyond those already available to employees. However, we consider that emergency support measures currently available are best suited to providing support for these employees.

We recommend that criteria to determine who is eligible for support, how much they can receive and the total amount available to the Hector's and Māui Dolphin Threat Management Plan Fund (the Fund) are all determined prior to any claims being considered. This provides certainty to applicants about a fair and reasonable process, limits fund "creep" (the more open-ended a process is and the more complicated its administration then more likely it is to face fund creep), ensures timely processing of applications, and ensures that payments are set within an affordable range.

We consider that any *ex gratia* payment made should be a one-off payment that reflects the unique nature of the proposals, with no recourse for additional payments for any other related sustainability measure that may be implemented in the same area in the future.[7]

[7] It is possible that applicants may decide not to accept an offer of *ex gratia* payment on this basis.

1.6 Proposed *ex gratia* payment process

Potential applicants would make a claim, providing all necessary information. The claim would be assessed against criteria to ensure that any payment is targeted, fair and reasonable.

For a claim to be considered, the applicant must be able to demonstrate a commitment to, and dependence on, a fishery in the impacted area in the last 12 months, and as a result of the proposed measure, would be able to demonstrate that they would incur one or more of the following costs:

- loss of sunk costs (for example, investment and/or operational decisions already made);
- loss of future earning capacity (12 month limit) to support fishers to transition to other fishing methods or activities; or
- transition costs which cannot be adequately recovered through alternative mechanisms (such as the sale of an obsolete asset).

The amount of any *ex gratia* payment considered would reflect the unique circumstances of an applicant as determined by the assessor of the claim. This would be informed by the costs they have demonstrated they would incur.

The administration of the Fund, including the assessment of claims and disbursement of payments, would be done by MPI through its compensation team over a two year period.

Each claim would be assessed on its individual merit. However, decisions on the amount of the payment would be considered collectively by the administrator of the Fund to ensure it is made within the Fund's limit.

Claims would need to be made, and supporting information provided, within six months from the commencement date of the Fund. Each claimant would be informed of the decision within nine months of the commencement date of the Fund. Applicants who may experience financial hardship due to this timeframe would be able to make a case for an earlier decision outside of the collective decision-making process.

Applicants who make a claim would be able to have a decision reviewed by MPI if that review is requested within three months following the notification of the decision by the administrator to the applicant.

We acknowledge that there are a number of different approaches to determining, assessing, and then delivering some form of assistance to those significantly and directly affected by any proposed changes. We recommend that once you have determined which options to progress in the TMP then we should develop a more informed, detailed and tested approach with support and advice from across MPI as well as the commercial sector.

1.7 Funding

Depending on your decisions regarding the scale and scope of *ex gratia* payments, we consider that potential funds of within the range of Under ac ive consideration would be required to support

those significantly and directly affected in the Māui dolphin habitat. This reflects initial high-level modelling that considers the potential vessels and licensed fish receivers in scope and their exposure to the impacted areas. Based on our understanding of preferences expressed by submitters, most of this funding is likely to be used to support exit from the sector.

The following options to funding any *ex gratia* payment have been considered:

- funding through existing baselines;
- funding through already established investment programmes such as Sustainable Food and Fibre Futures (SFF Futures) Fund, Seafood Innovations Limited or the Provincial Growth Fund;
- funding through either Budget 2020; or
- seek tagged contingency funding by a Cabinet recommendation in the Cabinet paper on decisions relating to the TMP (due to the currently level of fiscal uncertainty).

Because of the likely amount of funding to be sought it is extremely unlikely that the funding could be absorbed within current MPI baselines.

While there are a number of established investment programmes that provide funding and support that could potentially be accessed, most focus on innovative approaches rather than simply adopting an already established non-prohibited method or practice. Additionally funds such as SFF Futures and Seafood Innovations require co-funding by applicants and there is uncertainty about whether fishers would want to, or be able to, co-invest. A preference to pursue this type of funding source would likely require special consideration by joint Ministers (such as the Minister of Agriculture and the Minister of Fisheries).

Likewise, the purpose of the Provincial Growth Fund (PGF) is not fully consistent with the purpose of this Fund proposed. Under the PGF, projects must lift the productivity of an area or areas, contribute to PGF objectives, create additional value and avoid duplicating existing efforts, have a link to the priorities and be supported by stakeholders, and be well managed, well-governed and have appropriate trade-offs between risk and reward.

There is some scope under the PGF objectives to seek available funds on the basis that the *ex gratia* payments might "encourage environmental sustainability and help New Zealand meet climate change commitments alongside productive use of land, water and other resources." We consider it unlikely that this type of funding would be a priority for the PGF's Independent Advisory Panel who provides advice on PGF funding. It would also take time for this consideration to be made under existing protocols and preference to pursue this funding source would likely require special consideration by joint Ministers (such as the Minister of Regional Economic Development and the Minister of Fisheries).

We have begun preliminary work on a new initiative funding bid in the Budget 2020 process, however there is no guarantee that this bid would be successful and final decisions are unlikely to be made until late in the first quarter of 2020. Depending on Cabinet decisions around the budget, Ministers may not be able to announce anything around funding as part of the package of measures they are deciding on Under active consideration

Tagged contingency funds are set aside as part of the annual budget package to provide for specific items on which Cabinet is yet to make a final decision. Funding through a tagged contingency fund would enable us to continue to refine the approach and administration of any *ex gratia* payments. You may choose to request an in-principle decision from your Cabinet colleagues subject to funding meeting agreed criteria and associated reporting requirements to be agreed with Treasury.

If you decide to proceed with some form of *ex gratia* payment then we will develop a more informed, detailed approach with support and advice from across MPI as well as other agencies, including Treasury.

1.8 Forms of transitional assistance

1.8.1 Transitioning out of the fishery

Fishers who consider it economically unviable to continue fishing operations if further restrictions in the Hector's and Māui habitat were imposed may opt to transition out of the sector. This would depend on the personal circumstances of each fisher and their consideration of what constitutes an appropriate financial package, for example, to cover loss of assets and future potential income.

To ensure no perverse incentive is set under this scenario, ACE fishers could be required to relinquish their vessels by one of three ways as part of the settlement process:

1) sell their vessel for non-commercial fishing use in New Zealand waters and provide proof of this and retain the proceeds (the Government may choose to make up any shortfall as a result of sales being limited to non-commercial fishing purposes);

2) demonstrate how their vessel would be used for other purposes (for example, recreational fishing charters); or

3) surrender their vessel to the Crown to be scrapped.[8]

Such an approach would also be considered for licensed fish receivers where they are directly and significantly affected, but would permit the sale of assets to other commercial fishing entities.

This is the simplest proposal and closest to the concept of an *ex gratia* payment. The proposal is for a one-off *ex gratia* payment for loss of earnings for a period to enable transition to another occupation or industry and a direction on selling any vessel only to a non-commercial fishing purpose, or otherwise be paid for scrapping.

International obligations

[redacted]

[8] In OECD countries vessel decommissioning schemes generally require that vessels be scrapped, put to non-commercial fishing use, or sold to another country. In practice, most vessels tend to be scrapped as there is limited demand and opportunities for conversion to non-commercial fishing uses; this particular market is relatively small. In addition the export of decommissioned vessels from OECD countries to overseas territories is discouraged as there is potential for vessels to end up in IUU fishing activities.

International obligations

We consider that this approach provides applicants with the greatest flexibility to choose whether they exit the industry or not. We note that there is a risk that applicants may declare they are exiting the sector and receive a full payment only to purchase a new vessel and continue fishing either elsewhere (which has implications for other fishers) or adopt dolphin-friendly methods which may have a range of different effects on the fishery and its composition and lead to unforeseen pressures.

1.8.2 Transitioning to dolphin-friendly fishing methods

International obligations

If the result of such assistance were that the fishers would then have to compete with existing fishers for ACE that is fully caught, such assistance may be interpreted as contributing to overcapacity in the fishery. If the fisheries to be targeted are already fully exploited, then subsidised new entrants will only increase competition for ACE and drive down total profitability from the fishery.

International obligations

However, fishers may choose to transition to alternative methods following a general *ex gratia* payment. Set-net and trawl vessels have the potential to transition to dolphin-friendly fishing methods, which may allow some impacted fishers to continue to operate under the proposed area closures. However, for some smaller (<10 m) set-net vessels, a transition to dolphin-friendly fishing methods would not be practicable or feasible. Likewise, the advanced operational age of some vessels may make the costs of transitioning to alternate fishing methods uneconomical in the long run.

In the North Island, given the size and configuration of the vessels involved, the most suitable dolphin-friendly fishing method able to be utilised by the impacted fleet would be longlining. It may also be possible for some vessels to utilise other, more innovative techniques (for example, use of fish traps or pots, rather than set-nets). However, transitioning fishers and vessels to such fishing methods would likely require a greater level of transitional assistance as the required equipment would be more expensive and fishers would have to be supported as they developed the fishery. Vessels transitioning to longlining may also require additional crew than vessels using the methods of trawling or set-netting (for example, to bait hooks and for the processing of some species prior to landing).

Longline typically results in a lower volume of fish caught per fishing event when compared to trawl, and to a lesser extent set-net, and both the volume and the type of species taken would be much more limited when potting. Therefore, if fishers transitioned to longlining or potting, the annual volume of fish caught is likely to reduce and such a reduction in annual catch volume is likely to impact upon the profitability of continued operations. The need for

[9] Harmful subsidies is a term that refers to those that promote overfishing and illegal fishing that would otherwise not be profitable, such as subsidies that underwrite fuel costs.

additional crew is also likely to impact the profitability of continued operations, as may the possible increased costs of ongoing fishing (such as, the need to purchase bait and replace hooks and line lost during the normal course of fishing operations).

However, any possible reduction in catch volume due to a change in fishing method may be offset by the increased price received for fish caught by longline or pot and/or an increase in the number of available fishing days (longline and potting operations can be conducted across a wider range of marine conditions than is feasible for some trawl vessels).

1.8.3 Transitioning to fishing in other areas

This would allow fishers to continue operating using their current fishing methods, and mitigate some of the risk of set-net and trawl fishing to dolphin interactions. However in transitional assistance to other areas fishers may look to appeal for funding to offset increased costs of current fishing operations (for example, increased cost of fuel). Additionally, if fishers were to move to other inshore areas this may lead to increased fishing pressure in areas where trawl or set-net restrictions are less limiting.

The added costs of continuing current fishing methods away from the areas where they will no longer be permitted will entail ongoing costs. A one-off *ex gratia* payment may be of assistance for a period, but such relocation is likely to be economically unsustainable in the medium to long term. If relocation is economically sustainable now, then an *ex gratia* payment would not be warranted.

This approach is our least preferred. While this payment may be made without reference to what it is used for, it will likely be interpreted as a subsidy to operating costs.

International obligations

[redacted]

1.8.4 West coast North Island Māui dolphin economic impact analysis

Commercial sensitivity

[redacted]

- Commercial sensitivity

- [redacted]

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[redacted]

Commercial sensitivity [redacted]

Commercial sensitivity [redacted] planning. We recommend proposing specific funding streams to support this.

SNA 8 constraints and 28N rights

While not directly relevant to your statutory considerations with respect to managing the impact of fishing on Māui dolphins, the snapper 8 fishstock (SNA 8) and the associated historical preferential access rights (28N rights) was cited extensively in industry submissions as an issue that will have downstream implications if you progress additional spatial closures.

Commercial fishing participants consider the SNA 8 fishstock as a limiting ("choke") stock in west coast North Island trawl and set-net fisheries. They consider the abundance of SNA 8 far exceeds available quota (and subsequent annual catch entitlement, ACE) for a level of catch that does not pose a risk to the sustainability of the fishstock. Fishers have submitted

that they struggle to avoid catching snapper in SNA 8, especially in waters beyond 4 nautical miles from shore.

Many of the submissions from commercial fishers assert that the SNA 8 fishstock abundance has increased in the last decade, but they also note that there is concern that the Total Allowable Catch (TAC) and Total Allowable Commercial Catch (TACC) has not been adjusted accordingly to enable utilisation. Consequently, these commercial ACE fishers and associated licensed fish receivers consider their profitability from this fishstock is limited by required deemed value payments for the landing of unintentionally caught SNA 8. There is further comment from submitters that this limitation on ability to profit from SNA 8 is economically detrimental to ongoing fishing operations given the inability to obtain sufficient SNA 8 ACE as required.

Commercial fishing participants believe that any decisions you make with respect to fishing restrictions for particular methods or areas to mitigate the risk of commercial fishing interactions with Māui dolphin is likely to impact on fishers' behaviour, including:

- ability to continue operating under proposed measures;
- where they shift their effort (if possible); and
- whether they consider they are able to transition, or, actually do transition to alternative fishing methods.

The latter two of the above-mentioned changes in behaviour will likely result in changes to the composition of the species that fishers are likely to catch, including a greater likelihood of catching snapper. The degree to which fishers will be able to acquire sufficient quota or ACE to account for changes in catch composition is unknown, but all fishers will likely struggle to obtain sufficient SNA 8 ACE.

The majority of commercial fishing participants submit that if you decide to enact any more method or area based closures, or if you support transition to alternative fishing methods (such as longlining), addressing the availability for ACE of key stocks like SNA 8 will mitigate economic hindrances to transitioning and provide opportunities to adapt to alternative fishing activities.

The SNA 8 stock is currently scheduled for an updated stock assessment in 2019/20, and a review of the stock is expected in the October 2020 sustainability round. If the 2020 review showed that an increase in the TAC and TACC was warranted then 28N rights would be triggered by any increase in the TACC.

When 28N rights are triggered in a fishery through an increase to the TACC, they are honoured by reallocating quota shares from other quota holders in the fishery (including iwi holders) to the 28N rights holders. Te Ohu Kaimoana considers the reduction in the proportion of quota shares iwi received through the Treaty of Waitangi Fisheries Claims Settlement Act 1992 via the operation of 28N rights is inconsistent with the settlement. They have commenced legal proceedings in respect of two stocks (pāua, PAU 5B, and gemfish, SKI 7) where such rights exist and the TACC was increased. Interim relief was obtained from the High Court (by consent), putting the proposed TACC increases on hold. These proceedings will likely be heard in 2020.

A working group that includes Fisheries New Zealand and representatives of iwi and other stakeholders is currently considering the 28N rights issues.
Other protected species

Longline operations typically pose a greater risk to seabirds than trawl or set-net operations. Although seabird numbers off the west coast of the North Island are relatively low compared to elsewhere in New Zealand, flesh-footed shearwater (identified as being at a High risk from fishing by the Seabird Risk Assessment) are known to breed off the Taranaki coast. Whilst there are processes in place to mitigate the risk of seabirds captures on longline vessels, assisting impacted fishers to transition to using longline operations may increase the risk of seabird captures.

1.9 Select Māui dolphin submissions

Fisheries Inshore New Zealand (FINZ) expressed disappointment that the draft TMP contained no information on what transitional assistance may be available. FINZ viewed the management measures proposed within the draft TMP as exceeding the sustainability thresholds required under the Fisheries Act and therefore consider a negotiated settlement with affected parties necessary should the proposals be progressed. FINZ consider that assistance/compensation should be provided to both fishers and other affected parties such as licensed fish receivers and processors so as to maintain their previous standard of wellbeing and view such actions as consistent with natural justice, the Public Works Act 1981 and a government seeking a fairer and more just society.

Commercial fishers that would be significantly affected by the proposed area closures (both west coast North Island and around the South Island) provided detailed comments on the specifics of transitional assistance. If the proposed closures were implemented, many fishers commented that their operation would become unviable and therefore requested compensation for loss of assets (vessels, quota, fishing gear, shore facilities) and income for both them and their crew. The government-assisted transition from set-netting to longlining was discussed by some fishers (particularly off Taranaki); however, the lack of availability of SNA 8 ACE was recognised by the majority of commercial submitters as an obstacle to such a transition.

Commercial fishing representatives not directly affected by the TMP (for example, the pāua and rock lobster industry councils) supported the further discussion of policy tools, such as adjustment assistance (for affected fishers) and compensation (for quota owners and iwi), to facilitate agreement on management measures.

Commercial sensitivity

Commercial sensitivity

Commercial sensitivity

Tangata whenua

Te Ohu Kaimoana expressed concern over the lack of discussion within the consultation document regarding transitional assistance or compensation. Given the effects the proposed options would have on fishers and communities (particularly whanau Māori), Te Ohu Kaimoana consider they have no alternative but to support the status quo should transitional assistance be unavailable.

Iwi groups from around both islands and individual submitters expressed support for transitional assistance to fishers affected by the proposed area closures and endorsed the submission from Te Ohu Kaimoana.

Option 5

The joint WWF-New Zealand, Sanford and Moana Fisheries submission (Option 5) supported the need for government action to support both affected fishers and the wider community. The Option 5 partners recommend that actions taken to protect dolphins must:

- be coherent with Government policy in other sectors;
- enable the objective of the Wellbeing Budget 2019; and
- protect people and communities near the dolphin habitat.

Option 5 comment that the required transition will be different for each affected person and provide examples of individualised solutions such as resourcing changes to dolphin-safe fishing methods, providing re-training opportunities and income support.

Environmental groups

A variety of eNGOs including ECO, Forest and Bird, and Greenpeace expressed support for assisting affected fishers in transition to dolphin-friendly fishing methods/areas or to other jobs in the fishing industry or alternative industries.

Recreational fishing groups

LegaSea expressed support for a compensation package to be targeted at those “on-the-water” individuals affected by the proposed changes but did not consider the provision of compensation to quota holders justified.

General public

Submissions from the public generally supported the government funded transition of small-scale owner-operated commercial fishing with transition to dolphin-friendly fishing methods.

PART B8: MONITORING

Part B8 contains analysis on monitoring including cost and implementation considerations for proposed options. Additional monitoring is a key component of Fisheries New Zealand's preferred options, particularly for Hector's dolphins.

B8: MONITORING

CONTENTS

1.1 Purpose

Part B8 provides further information to support your view on a preferred approach to implementing additional monitoring of commercial fishing that is proposed under the TMP packages. Information includes stakeholder views, costs, and implementation considerations for an at-sea observer or on-board cameras approach and a mandatory or voluntary implementation model.

1.2 Monitoring coverage

There are two main objectives for monitoring and evaluating the threat and impact of fishing activity to Hector's and Māui dolphins:

- gathering information on the nature and extent of interactions between fishing activity and Hector's and Māui dolphins; and
- assessing compliance with mandatory and voluntary mitigation measures.

This information helps to assess the effectiveness of existing fishing-related management measures, and inform decisions on whether further measures are required to avoid, remedy or mitigate any adverse effects or effect of fishing-related mortality on Hector's and Māui dolphins.

1.2.1 Submission comments

Key themes from submitters are outlined below.

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

- Concerns regarding the currently low level of monitoring coverage, and the likelihood of fishing-related mortalities being underestimated.
- Increasing monitoring coverage, through the use of on-board cameras and/or observers, is the most effective way to fill existing knowledge gaps around the level of impact, and to ensure that the management measures put in place are appropriate and effective.
- In the case of Māui dolphins, monitoring coverage would have to be near 100 percent due to the small size of the population and the low likelihood of encounter, to ensure detection of all interactions given the high consequences to the population.

- Increased monitoring coverage should begin immediately (some submissions note this should remain in place until full-protection measures are put in place out to the 100-metre depth contour).
- On-board cameras should not replace observers. Cameras can be tampered with and footage lost, whereas observers are a more reliable way of verifying interactions, and are able to carry out other tasks such as collecting sighting information.
- Increased monitoring is not a sufficient management measure as it will not prevent dolphin captures. A more meaningful action is required and the threat should be eliminated immediately, not monitored. This was raised particularly in the case of Māui dolphins, where even a single fishing-related death has high consequences for the population.
- Increased observer coverage has been proposed and discussed in the past with little action.
- Although on-board cameras would reduce uncertainty around fishing-related impacts, it would be at a large cost to both the Government and the small-scale fishing fleet. Fishing restrictions must be a cheaper and more effective solution than monitoring.

Industry comments varied but focused mainly on:

- Use of on-board cameras to monitor fishing activity instead of putting closures in place, as the uncertainty is too high and the estimated level of impact negligible.
- The need to resolve a number of policy and operational issues before requiring mandatory on-board cameras for wider purposes than just monitoring protected species interactions.
- Potential to use third-party providers for camera monitoring.
- Who should bear the cost of increased monitoring activity?
- Increased monitoring would satisfy false public perception and give high confidence that no interactions are occurring.
- Cost of on-board cameras is high and unlikely that small operators can afford the technology. Further exploration of affordable systems and new technology must be explored.

Many industry submissions considered that any observer/monitoring costs should be borne by the Crown. Alternative cost models were proposed dependent on whether current, and proposed protection measures, are relaxed to allow fishing in certain areas given all fishing activity is/would be fully monitored.

1.3 Need for increased monitoring

We consider that where management measures do not eliminate risk, monitoring is required to verify the effectiveness of the chosen management action. Independent monitoring of fisheries provides an opportunity to gather reliable, unbiased information about fisheries interactions with Hector's and Māui dolphins. Monitoring also improves our ability to assess performance against the population outcomes and objectives of the TMP. The greater the residual risk, or consequence of a mortality, the greater the need for increased monitoring.

Increased monitoring includes the following benefits:

Reduces uncertainty: Monitoring reduces the uncertainty in the level of risk the activity poses to the population, and identifies the highest-risk areas and activities. Where spatial overlap remains between fishing effort and dolphins, increased monitoring coverage may improve estimates of fisheries catchability. Where overlap with fisheries is already low, capture events are expected to be rare. In these cases, observing the fishery may be useful to verify that captures have or have not occurred, but will not result in improved estimates, due to low statistical power.

Assesses within method catchability: Where different fishing gears (of the same method) or fisheries targeting different fish species can be expected to catch dolphins at different rates, it may be possible with increased monitoring coverage to model the effects of these gears separately. Monitoring of fishing vessels during gear deployments may also improve our understanding of cryptic mortality (such as, carcasses that are lost without being seen even in the presence of a fisheries observer).

Assesses fisher compliance: Fishers are legally required to report all captures of protected species. However, there are incentives for fishers not to report mortalities, including a perceived consequence of additional management measures being imposed that impact on fishing opportunities.

1.4 Types of monitoring available

There are two approaches to improving independent monitoring of fisheries interactions with Hector's and Māui dolphins; at-sea fisheries observers and on-board cameras.

The design of any monitoring programme must maximise the ability to detect a possible interaction. We will collaborate with industry to ensure any monitoring programme will achieve its objectives, and consider the most cost-effective way it can be delivered. We note that given the consequences of any interaction, particularly for Māui dolphins, the level of monitoring coverage required could be substantial and long-term depending on the management measures implemented to prevent or restrict fishing activity.

Observers

Currently, fisheries observers are the primary way of independently monitoring the commercial fishing activity in New Zealand. Approximately 3 percent of the commercial inshore fishing activity is monitored each year using fisheries observers. Fisheries New Zealand has a pool of around 100 observers across the country.

Logistical barriers and cost constraints limit our ability to significantly extend the current level of observer coverage. These constraints are particularly prevalent in the inshore fisheries due to the characteristics of the fleet and their fishing activity, making observer coverage expensive and challenging to co-ordinate. Some of the challenges with the use of observers on inshore vessels include:

- Difficulty placing observers on vessels: Some fishing vessels are too small to be able to accommodate an observer in addition to crew.
- Susceptibility to weather variability: inshore fishing is dependent on weather and sea conditions. Changes to trips at short notice is common, which can be difficult and costly to co-ordinate with the observer programme.
- High number of "at-shore" days: Geographical distribution and weather susceptibility can require some observers to be placed at local ports for several months, so they can be deployed at short notice, increasing the cost per monitored "sea-day".

Inshore observer coverage is expensive ($1059 per day, in comparison to $520 per day for deepwater coverage) for the reasons above. Expansion of the observer programme across the inshore fleet that operates in areas that overlap with Hector's and Māui dolphins distribution could impact on the viability of some individual fishing operations. In addition, there are insufficient numbers of observers available to achieve high coverage levels in inshore fisheries due to the number and distribution of vessels across the country.

On-board cameras

The introduction of on-board cameras is currently underway, with the first stage of the programme commencing 1 November 2019, which will require mandatory use of cameras by selected trawl and set-net vessels operating off the west coast of North Island in Māui dolphin habitat.

Numerous studies, including five trials carried out in New Zealand, have demonstrated the potential use of camera systems to efficiently monitor and accurately identify protected species bycatch on commercial fishing vessels. Although on-board cameras can be challenged by interactions that happen outside of the field of view, or by bycatch species that are released without bringing them on board, this has been addressed by implementing catch handling requirements, or monitoring changes in crew behaviour.

There are many benefits to using on-board camera systems to monitor interactions between fishing vessels and protected species, including:

- Once camera systems are fitted on a vessels, they are always available, there is no need for the fisher to co-ordinate the availability of observer before going fishing.
- It is easy to adjust the rate of review if there is a need for more comprehensive data.
- If camera systems are installed across an entire fleet, it can eliminate many of the logistical challenges of observing a representative sample of fishing activity.
- The granularity of the data collected by camera systems can allow managers to adopt more targeted and efficient management measures[1].
- Subject to legislative constraints, footage can be recorded for all fishing activity. Even if only a fraction is ultimately reviewed, fishers do not know what portion will

[1] For example, in Australia, the granularity of data from camera systems has allowed managers to identify specific boats with high level of bycatch, thereby allowing them to sanction individual vessels rather than implement large-scale closures for the whole fishery.

be subject to review, mitigating the incentive to fish differently when being watched.
- With on-board camera monitoring, multiple camera views and the ability to re-watch events or bring in others for consultation can improve the accuracy an interpretation of fishing events.

On-board cameras can be more reliable, cost-effective, and more easily scaled to cover 100 percent of fishing activity than observer coverage. However, on-board cameras are not the right tool for every fishery, or data requirement. For example, cameras are more effective for fisheries that bring catch on board serially (for example, longline, set-net) than for high-volume batch fisheries (for example, trawl, purse seine), and cameras can't collect biological samples. Accurate identification and distinction between similar looking species can also be challenging.

Some of the logistical challenges with the use of on-board cameras on inshore vessels include:

- the upfront cost of hardware can be quite substantial, especially for small-scale fishers;
- activity that happens outside of the field of view can be a challenge;
- cameras can bring additional labour to at-sea operations, which can slow down catch-handling procedures and create additional operational tasks;
- recording footage of all fishing activity can result in a flood of unprocessed video and data streams for agencies to manage, which can be challenging and costly; and
- managing data ownership and privacy concerns associated with the footage can be a complex issue.

The costs associated with an on-board camera programme can generally be broken down into three main categories, upfront fixed costs (for example, hardware and installation), ongoing annual costs (for example, data review, storage, hardware maintenance) and indirect costs due to changes in fishing practices. Although there are consistencies among certain categories of costs, the overall cost is not uniform across fisheries and fleets. Each of the cost categories can be influenced by a number of drivers, which will differ between programmes (see Table 1).

Table 1: On-board camera cost categories and associated drivers that will influence overall monitoring costs

Cost category	Cost drivers	
Upfront fixed costs		
Hardware $12,000 – $30,000	Technical requirements of programme Complexity of hardware Tech providers chosen Monitoring objectives Vessel size & method used	Recently, streamlined on-camera systems have been developed specifically for use in small-scale fisheries. The systems are priced around $2,500-$5,000, but use in New Zealand context has not been tested.
Installation $3,000-$12,000	Existing infrastructure of vessel Complexity of hardware system Technician contracted	Vessels with little existing infrastructure/wiring will encounter a much higher installation cost in comparison to a vessel with existing camera system or good infrastructure/wiring.
Ongoing annual costs		
Video review Storage	Who reviews the video (internal or external) Monitoring objectives (data fields collected) Percentage of video reviewed Storage length of video collected Characteristics of the fishery (for example, fishing effort, length of fishing events)	
Equipment maintenance	Environmental conditions Hardware protection	
Costs due to changes in fishing practices	Monitoring objectives Programme handling practices requirements Regulations in place Foregone revenue (for example, improved compliance) Operational costs (for example, catch handling, mailing hard drives)	

1.5 Levels and costs of monitoring coverage

The overall cost of monitoring programmes is affected by a number of "cost drivers" (related to the characteristics of a particular fishery and the programme goals), which include:

- Fishery scale: the number of vessels in the fishery;
- Gear type: the gear used and the characteristics of the sets/hauls;
- Effort level: the number of fishing days per year per gear type;
- Geographic dispersion of the fishery: the number of ports in the fishery and their degree of geographic isolation and dispersion;
- Monitoring objectives: protected species interactions, discard compliance, catch identification and quantification; and
- Data requirements/Programme standards: percentage of fishing effort observed, percentage of video data collected, percentage of video data reviewed, and length of time required for video data storage.

The start-up costs of on-board camera programmes are relatively high per vessel because of the initial purchase and installation of hardware. At the current state of development, the costs of on-board camera systems may outweigh the benefits for fisheries with minimal on-the-water reporting and fisheries with few fishing days or low landed value.

However, cost comparisons carried out so far, indicate that on-board camera costs are generally lower than the comparable level of at-sea observer coverage for the same monitoring objectives for medium to large fisheries.

Package 2 (Fisheries New Zealand preferred) monitoring proposals

For each subpopulation a range of monitoring proposals are discussed within the set of packages that have been presented to you for consideration. Table 2 summarises the proposed monitoring programme under Package 2 for the South Island subpopulations, and summarises the differences in costs between using an on-board camera or observer coverage approach, across a five-year period.

Table 2 also shows the number of fishing days that would need to be observed (using an observer approach), which represents around 40 percent of available resourcing across all annual observer coverage requirements (for example, deepwater, highly migratory and other inshore fisheries). In general, inshore fisheries usually uses around 20 percent of available observer resources.

Table 2: Summarised monitoring programme proposed under Package 2 across three South Island subpopulations

	North coast South Island	East coast South Island	South coast South Island	TOTAL (methods combined)
Number of vessels	15 trawl	4 set-net 22 trawl	13 trawl	74
Number of fishing days per year	1315	2593	358	4266
Estimated costs of on-board camera monitoring (5 years)	$1.90 million	$3.52 million	$1.90 million	$7.32 million
Estimated costs of observer monitoring (5 years)	$1.18 million	$13.45 million	$1.18 million	$15.81 million

Note: The estimated costs represent the costs of using either on-board cameras or observers to cover the number of vessels and fishing days each year.

For the west coast North Island there are already monitoring programmes in place (or being implemented), some of which would continue under Package 2. Table 3 provides a summary of the differences in costs between on-board camera monitoring versus observer coverage, across a five-year period. However, these estimates don't take into account the potential loss of some of those vessels should the proposed closures force them to leave the fishery, or transition to alternative gear. Nonetheless, the information shows the cost-effectiveness of using on-board cameras to get much greater coverage across a broader spatial area and many more vessels/methods.

Table 3: West coast North Island estimated monitoring coverage under Package 2

	Observer coverage	On-board cameras
Number of vessels	7 trawl	5 set net 15 trawl
Number of fishing days per year	195	1044
Estimated costs (5 years)	$1.03 million	$2.04 million

The proposed monitoring programmes across these subpopulations of Māui and Hector's dolphins may require a combination of monitoring approaches (for example, observers and/or on-board cameras). Some of those approaches will be more difficult to implement than others, and will strongly depend on the associated costs, where funding comes from, available resourcing, and the voluntary or regulatory framework with which they are implemented.

1.6 Implementation considerations

Observer monitoring

Under section 224 of the Fisheries Act 1996, the chief executive may place an observer on any vessel. Before placing an observer on a vessel, a reasonable notice should be given to the owner, master, operator, or licence holder, of or in respect of the vessel. Carrying an observer is a condition of having a fishing permit. If a vessel refuses to take an observer when requested, a placement notice may be issued which prevents vessels from leaving port without an observer.

As discussed above, achieving high levels of observer coverage in inshore fisheries is costly and logistically challenging. Due to the number and expanse of inshore vessels that operate in areas that overlap with Hector's and Māui dolphins, significant expansion of the observer programme across the inshore fleet is unlikely to be achievable in the short term, as there are insufficient numbers of observers available.

On-board camera monitoring

Mandatory route

Successful introduction of a mandatory on-board camera monitoring requires a number of legislative and regulatory amendments, including;

- simplifying the rules for what fish must be landed and what can be discarded (landings and discards framework);
- developing an offence and penalties regime relating to the landings and discards framework;
- transitional provision, including reallocating catch from other sources of fishing mortality and adjusting deemed values; and
- amending the Fisheries Act 1996 to allow for the use of cameras to monitor activities 'post-fishing', including sorting, processing and discarding.

Until amendments to the Fisheries Act are made, on-board cameras can't be used to monitor activities that occur "post-fishing" (after catch has been brought on board the vessel), including sorting, processing and discarding. These constraints mean that currently, mandatory introduction of on-board cameras has a number of limitations, including:

- Catch verification is likely to be challenging, especially in high-volume fisheries, as sorting and processing cannot be monitored.
- Sorting, processing and discarding cannot be monitored, making catch verification challenging, especially in high-volume fisheries.
- Verification of sub-MLS catch and discards, and the use of move-on rules to minimise this catch, is not possible.
- Detection of protected species interactions that happen outside of monitored areas can be challenging. For example, when catch is released in a batch into a below-deck pound, or in high-volume fisheries where protected species might be hidden in a large bulk of other catch.

In addition, current landings and discards rules, and associated offences and penalties, are inconsistent, ambiguous and uncertain. Not only will the limitation around the scope of what cameras can be used to monitor make the detection and enforcement of offences challenging, but it is also unclear whether detection will meet evidentiary requirements. It can also be expected that more low-level offences will be detected, and the current penalty regime is excessive for this level of offending.

Voluntary route

The legislative limitations outlined above would not apply to voluntary on-board camera monitoring, managed by a third party. However there are a number of matters that would require careful consideration before committing to such an approach, including:

- industry support may be lower if Fisheries New Zealand has access to footage collected;
- Fisheries New Zealand would not hold ownership of the footage collected, or may only have limited or restricted access to it.
- learnings from the programme may be lower if there are significant restrictions to the data access; and
- public confidence in an industry-led programme may be low.

There are a number of ways to mitigate the challenges outlined above. For example, ensuring that a well-defined data-sharing agreement was in place before committing to a voluntary programme will allow Fisheries New Zealand to access the footage and audit the review done by the third party. Fisheries Inshore New Zealand (FINZ) noted in their submission that if cameras would be placed on vessels under a third-party provision, Fisheries New Zealand would be able to view the footage to verify protected species captures, returning it to the third party on completion of the verification task.

Having a well-defined data-sharing agreement between the third party and Fisheries New Zealand is likely to increase public confidence in the programme. The provision

of the programme by an independent (non-industry) third party is also likely to further mitigate public scepticism around an industry-led programme.

Timing of camera implementation

The route chosen for the implementation of camera monitoring must be considered in light of the desired implementation date. Although a mandatory programme might receive higher public support, and allow Fisheries New Zealand to have full ownership of and access to the footage collected, there are a number of legislative changes that would need to be resolved before commencing mandatory implementation.

The Electronic Monitoring regulations (EM regulations) currently provide for implementation of *Stage One* of the on-board camera programme to commence on 1 November 2019, with a "holding position" date of 1 July 2020 set for all other commercial vessels. The regulations will need to be amended before 1 July 2020, whatever option is chosen for the introduction of on-board cameras. Experience shows that a high-profile issue such as camera monitoring, could warrant extended consultation.

Stage One did not go through a public consultation, which was considered justifiable because of the high priority of monitoring Māui dolphin fisheries interactions. A similar justification may be more difficult to apply in the case of targeted monitoring as a part of the management measures under the TMP.

Legislative amendments, including regulatory changes relating to camera placement and landings and returns to sea have not yet been put in place. This could constrain the placement of cameras and review of footage under a mandatory approach.

Under active consideration

[redacted]

PART B9: ENGAGEMENT

Part B9 provides further detail on the establishment of North Island and South Island stakeholder advisory groups to support ongoing performance monitoring of the TMP and trigger response.

B9: ENGAGEMENT

CONTENTS

1.1 Purpose

Part B9 provides further detail on the establishment of North and South Island Stakeholder Advisory Groups (Part A).

1.2 Engagement objectives

The TMP is intended to be to be a living document. As part of the review, Fisheries New Zealand and DOC also proposed engagement objectives and associated performance measures (discussed in Part A) to support information gathering, implementation, and monitoring of a revised TMP.

One of the engagement performance measures is to have a stakeholder advisory group operating from 2020.

1.3 Proposed Stakeholder Advisory Groups

We recommend the establishment of North Island and South Island Stakeholder Advisory Groups made up of scientific experts and interested stakeholders that have knowledge and experience on the range of human-induced threats being managed under the TMP, including fishing and toxoplasmosis.

The groups would be managed by DOC (as the agency responsible for managing protected species), with support and representation from Fisheries New Zealand.

The groups are advisory bodies, not decision-making bodies. The purpose of the groups would be to:

- monitor performance of the TMP;
- produce an annual report to the Minister of Conservation and Minister of Fisheries on performance of the TMP;
- review updates to, and revisions of, the risk assessment to assess progress in reducing the level of risk to the dolphins from human-induced threats, including fisheries and disease;
- review information on new deaths resulting from any threat, including fisheries capture reports;
- review fisheries trigger reports; and
- provide advice to Fisheries New Zealand and DOC on further mitigation or management required where any deaths from human-induced threats may prevent subpopulations from achieving the chosen population outcome.

A group designated with the specific purpose of overseeing management of toxoplasmosis will also be functioning from 2020. The North Island and South Island Stakeholder Advisory Groups proposed here will not replicate or supersede the role of the Toxoplasmosis Advisory Group. The groups would receive updates from the Toxoplasmosis Advisory Group to inform their broader understanding of progress in management of key threats to achieve population outcomes.

1.3.1 Membership

The membership of the groups will be open to all interested organisations. It is expected that the members will be persons who have knowledge and experience of Hector's and Māui dolphins and/or the threats that impact them that need to be addressed to ensure the TMP can deliver on the proposed vision.

The number of members will be limited to ensure the groups are able to function effectively. Final membership details, including optimum number of members, will be decided through further collaboration across government agencies and interested parties.

The groups will include interested parties from:

- DOC;
- Fisheries New Zealand;
- eNGOs;
- tangata whenua;
- Fisheries Inshore New Zealand;
- Te Ohu Kaimoana;
- research organisations;
- recreational fishers;
- tourism operators;
- community organisations (for example, Te Korowai); and
- other government organisations (including local government) as relevant.

Members are expected to contribute in an expert capacity and are not expected necessarily to represent the views, or speak on behalf, of their sector.

Group members will be formally appointed through joint decision by the Ministers of Conservation and Fisheries.

1.3.2 Chair

The Ministers of Conservation and Fisheries will jointly select and appoint an independent chair for each of the groups.

1.3.3 Providing advice

As part of their role, the groups will be charged with providing advice to DOC and Fisheries New Zealand with respect to risk mitigation and potential management in the case of ongoing deaths that may prevent a subpopulation achieving the chosen population outcome.

Where possible, advice from the group, including recommendations, will be arrived at by consensus. Where the group is unable to provide its advice by consensus it will

set out in any report the different views of its members. DOC and Fisheries New Zealand will consider the advice and determine next steps.

Any discussions resulting from these advisory groups will not take the place of direct Treaty partner engagement, wider public engagement, or any statutory requirements as part of implementation of the TMP.

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APPENDIX 1: SUMMARY OF SUBMISSIONS

1.1 Background

This document summarises and provides a record of the public submissions jointly received by Fisheries New Zealand and the Department of Conservation (DOC) in regard to the proposed 2019 Hector's and Māui Dolphins Threat Management Plan (TMP).

Fisheries New Zealand and the DOC held a public and stakeholder consultation on developing an updated Hector and Māui Dolphins TMP for 2019. Consultation with the public was informed and guided by a consultation paper: *Protecting Hector's and Māui Dolphins - Consultation on proposals for an updated Threat Management Plan* – that was published on both organisations' websites. This consultation paper outlining the TMP proposals was published on 17 June on both the Fisheries New Zealand and DOC websites. Submissions closed on Monday 19 August, and late submissions were accepted until Friday 23 August.

1.2 Submissions and submitters

In total, there were 15,263 submissions received on the TMP proposals, including 616 unique submissions from organisations and individuals. The public contributed 13,562 submissions as internet form submissions promoted by environmental groups. A further 1,085 submissions were derived from online surveys hosted on the Fisheries New Zealand and DOC websites. Note that lack of clarity in some submissions does not enable the precise allocation of every submission to a stakeholder group.

Submissions generally reflected the views of tangata whenua Treaty Partners and stakeholders across the following broad interest groups. These included:

1.2.1 Tangata whenua

Iwi, hapu and tangata whenua peak bodies (including Te Ohu Kaimoana and the Iwi Collective Partnership) made 14 submissions. Another 51 submissions were made by people self-identifying as tangata whenua.

1.2.2 Environmental groups

33 separate environmental organisations gave submissions, and encouraged a further 13,562 identical, or near-identical, form submissions from supporters.

1.2.3 Independent experts and academics

The proposed TMP received 14 academic and expert submissions.

1.2.4 Commercial fishers

Submissions from commercial fishing interests came from seven industry peak bodies and a further 248 from fishing companies or individuals concerned with the commercial fishing sector.

1.2.5 Recreational fishers

Recreational fisher peak representational bodies made four submissions on behalf of their numerous constituents. Self-identified recreational fishers provided another 199 submissions.

1.2.6 Mining and seismic interests

Mining, seismic surveying, and oil and gas peak industry bodies made three submissions, as did nine commercial operators and investors in those sectors.

1.2.7 General public

1,020 submissions came from individuals or groups that did not claim or identify themselves with any particular stakeholder group or interest.

1.2.8 Other interests

Tourism operators made a number of submissions, particularly in regard to the Banks Peninsula, Golden Bay and Kaikōura areas. Three regional councils and two New Zealand scientific associations also made submissions.

1.3 General overview of submissions

The number of submissions specific to the TMP indicates that many New Zealanders are strongly engaged with the coastal environment, inshore fishing, and especially how New Zealand provides protection measures for Hector's and Māui dolphins. Submissions specific to the TMP broadly fell into two groups; the first grouping being commercial fishers and others supporting fishing interests, and the second group as academics/independent experts, those with concerns for the environment, and the general public.

Local communities reliant on fishing favoured the least restrictive proposals for future regulation and these submitters questioned the need for any regulatory change, These groups cited the lack of evidence of actual harm from their activities; scientific uncertainty as to why Hector's and Māui dolphins are in decline; and lack of information on these species' territories and movements.

Submissions from environmental groups, academics/independent experts and the general public heavily favoured maximum proposed restrictions (or outright bans) on commercial fishing activities using nets (trawl net or set net), seabed mining, seismic surveying and dolphin-related tourism. Submission views were based on the Government's obligation to maximise protection opportunities of the very low number of remaining Māui dolphins using the regulatory means currently available, and reducing human-influenced deaths to Hector's and Maui dolphins overall.

Key submitters were critical of the lack of research on dolphin distribution and habitat, the impacts of human activities, and the causes of population decline.

Environmental NGOs and academics have questioned the scientific basis of the apparent risks to dolphin mortality from toxoplasmosis. Fishers and extractive industries questioned the reasoning and necessity to reduce the use of net fishing (in all forms) when deaths from fishing with nets appear to be at a very low level, and the proposals for further restrictions on activities in areas where dolphins have not been sighted by fishers, nor deaths occurred.

The Iwi Collective Partnership submitted that fisheries interests had been treated inequitably and the Government and should put the TMP on hold until all threats can be managed fairly. Other Iwi fishing organisations, notably Te Ohu Kaimoana, highlighted the role of customary and commercial fisheries in Treaty of Waitangi settlements, and their traditional guardianship role. Ngāi Tahu noted its expectation that the Crown will honour the Te Tiriti o Waitangi and be guided by the Treaty of Waitangi (Fisheries Settlement) Act 1992 to make fisheries decisions collaboratively with Iwi.

A majority of individuals connected with environmental groups raised issues, or asked for, regulatory change that was outside the scope of the proposals in the consultation document. For example, the great majority of public submissions (initiated by environmental NGOs) asked for the boundaries for permitting fishing and other activities to be set at the 100m depth contour , and/or to cover the entire habitat of Hector's and Māui dolphins, and in some cases mandatory cameras on all fishing vessels.

1.3.1 Vision, Goals and Outcomes

Support for the draft TMP's Visions, Goals and Outcomes was mixed. Few key submitters supported them wholeheartedly. Fisher peak bodies questioned if the vision, goals and outcomes were justified under the Fisheries Act, and noted the Vision had no concern for the economic impact on, or ongoing role, for fishers. Environmental groups and independent experts questioned the lack a time frame and measurable outcomes.

1.3.2 Māui and Hector's dolphin population outcomes

The proposed population outcomes were largely supported by environmental and expert submitters, but questioned by fishers as going beyond what the Fisheries Act can justify.

1.3.3 Fisheries Management Proposals

Submitters were clearly divided between those who fished, and the environmental groups and academics. Fishers did not see a justification for moving beyond the status quo (Option 1), while environmentalists supported the most restrictive options, and often argued for going further. A joint submission by WWF, Sanford and Moana Fisheries (entitled 'Option 5') offered a middle approach with greater monitoring of fishing activity and an obligation to move on when fishers encountered dolphins.

1.3.4 Toxoplasmosis Action Plan Proposal

Submitters held mixed views on the creation of a Toxoplasmosis Action Plan. While a majority of academic, environmental, fishing and other industry submissions generally supported the creation and implementation, the general public were less enthusiastic.

Submissions that did not support this proposal did so for three main reasons: it would be a distraction from more regulation of fishing; distract funding and attention from other research considered to be more important; or it would cause cats to become blamed for dolphin deaths.

1.3.5 Other Non-fishing Threat Management Proposals

Marine mammal sanctuary extensions

Extending Marine Mammal Sanctuaries was universally popular, except by those individuals and organisations whose actions and businesses would be more heavily restricted or prohibited as a result.

Seismic surveying

Outside of the oil and gas industry participants, submitters generally favoured more restrictive regulation, if not outright bans.

Seabed mining

Seabed mining was not supported by submitters in the Tangata whenua, environmental, fishing or general public categories. Seabed mining was supported by the mining industry, arguing it was already heavily regulated under existing legislation and regional council plans, and that it took place in areas not known to be dolphin habitat.

Tourism

Most submitters supported a moratorium on Māui dolphin tourism and public interaction, and greater monitoring and regulation of the tourism operations using Hector's dolphins.

1.3.6 Part A - Vision, Goals and Objectives

Vision and Goals

Few key submitters fully agreed with the Vision and Goals statements in the consultation document.

Environmental submitters generally wanted a stronger and more defined vision aimed at moving dolphins to being thriving or even to non-threatened status (ECO), along with measurable goals and a timeframe. Several of these submitters (WDC, EDS) objected to allowing any dolphin deaths from human activity.

Expert submitters supported the vision and goals but disagreed with the lack of measurable goals with no ability to determine success or failure. Independent experts (and Forest & Bird) highlighted that the goals have to include the connectivity of the recognised sub-populations.

Key fisher submitters and WWF noted an absence of regard for the proposed TMP's impact on fishers and that it was overly focused on fisheries regulation. The extractive industries and Te Ohu Kaimoana saw the vision and goals as being too idealistic and needing to be more focused in order to be effective. Commercial fishers were mainly supportive but their dissent echoed a general scepticism of the overall TMP.

Ngāi Tahu supported the vision and goals as these aligned with their aspirations as kaitiaki to see their natural environment flourish.

The general public largely agreed with the Vision and Goals, but those who disagreed did so mainly because the Vision statement did not go fast or far enough towards protecting dolphins.

Māui and Hector's Dolphin Population Outcomes

Environmentalist NGOs and independent experts largely supported the proposed Population Outcomes but wanted these to have timeframes and ways to measure success or failure. Other submitters noted that the fragmented Hector's populations needed to be managed separately as well as collectively measured as an outcome.

The commercial fishery sector did not support the Population Outcomes, and Fishing Industry New Zealand (FINZ) argued that the outcomes are far beyond what the Fisheries Act can justify as restrictions. The Federation of Commercial Fishermen (FCF) submitted the population outcomes should be 50% of the maximum number the environment can support, and ensure the population remains above a viable level.

Trans-Tasman Resources opposed the Population Outcomes and questioned if they were achievable, given the known and recorded causes of dolphin mortality.

Iwi submitters Ngāi Tahu and Te Ohu Kaimoana agreed with the proposed Population Outcomes but Te Ohu Kaimoana noted that care needs to be taken in translating this to a regulatory approach under the Fisheries Act.

Members of the general public supported the Population Outcomes and generally wanted the TMP to go further in reducing human-caused deaths to zero, particularly bycatch.

Objectives

Few key submitters fully agreed with the TMP's objectives, mainly due to the emphasis on fisheries management (fishers) and lack of clear measurable targets and time-frames (experts, environmentalists).

FINZ opposed the proposed objectives and submitted that the Fisheries Act was being compromised to achieve them as the objectives were far above those allowed for in the Act. FINZ believed a decision-maker was needed to determine the trade-offs. The FCF also disagreed because the TMP did not properly consider all threats and hence all possible solutions. The FCF endorsed the FINZ and Te Ohu Kaimoana submissions' discussion of the objectives.

Te Ohu Kaimoana described the objectives as misleading for suggesting that the 95% population objective can be achieved through fisheries management alone. Recovery to this level will require management of a much broader range of impacts, and the social, cultural and economic impacts need to be understood and assessed. Ngāi Tahu noted the lack of information on the Tangata Whenua Advisory Council proposed as a performance measure.

Environmental group Whale and Dolphin Conservatory (WDC) argued the fisheries management objectives should be improved by changing to 'population recovery from net fishing' and reflected in options that offer full protection. WDC reject the conclusion that toxoplasmosis is the leading cause of dolphin deaths but support research effort

into that disease, sewage systems, and water quality. WWF agreed with the objectives but argued for the necessary research program to build the science for conservation efforts to be effective. Clearer objectives were also needed for the toxoplasmosis research plan. Forest & Bird also agreed with the objectives overall, noting the fisheries management objectives were a step in the right direction, and that toxoplasmosis objective needed to include a clear time-bound goal. In addition, the stakeholder and tangata whenua research development process needs to happen promptly.

The NZ Veterinary Association agreed with the objective of developing a Toxoplasmosis action plan. The Biosecurity Special Interest Group partially agreed with the objectives but noted the objectives under different subheadings throughout the consultation document were somewhat disjointed. It also submitted on the need for an Engagement Objective (and performance measure) for a desired level of behaviour change among pet owners.

Academic submitters did not agree with the proposed objectives. Professor Elizabeth Slooten submitted that the options do not provide an effective path towards sustainable management and will most likely lead to further fragmentation of the populations.

1.3.7 Part B - Fisheries Management Proposals

General overview

A range of themes consistently emerged across some of the key submissions.

Submitters were clearly divided between those who fished, and environmental groups and academics. Fishers did not see justification for moving beyond the status quo (Option 1), while environmentalists supported the most restrictive options, and often argued for going further. A joint submission by WWF, Sanford and Moana Fisheries (entitled 'Option 5') offered a middle approach with greater monitoring of fishing activity and an obligation to move on when fishers encountered dolphins.

Broad support for change, but a strong division on direction and scope of change

Most submitters supported change, but there was a clear divide on what options were supported, and most key submitters put forward alternative proposals.

Industry submissions supported some change to further protect dolphins, but do not support any option other than Option 1 (status quo), broadly citing a lack of evidence on which these options are based; that the additional closures go beyond what is required under the Fisheries Act; and the proposed measures would provide no additional benefit to dolphins, but result in a large number of fishers being forced from their livelihoods, with no prospect of compensation or assistance. Te Ohu Kaimoana noted: *"In our view, the Plan fails to analyse the proposals against the Fisheries Act, so they are not robust."*

Industry submitters, Te Ohu Kaimoana and the Iwi Collective Partnership support a more collaborative, bottom up management approach, working with fishers to improve on-the-water practices and where justified, an assisted transition to more dolphin-friendly alternative methods. Te Ohu Kaimoana also noted: *"A "bottom up" approach*

would not only have generated better information but would also have built greater support for viable solutions."

Environmental submitters and many public submitters were concerned about the state of the Hector's and Māui dolphin populations and wanted substantial regulatory change to support more sustainable outcomes for the species. The Environmental Defence Society argued the goal must be a zero by-catch using a highly precautionary approach. This was best delivered using expanded marine mammal sanctuaries.

With the exception of WWF, environmental NGOs (eNGOs) support Option 4, with additional measures. There is consistent support across these submitters for Option 4 to be extended to include closures to set netting and trawling out to the 100m contour within the full Māui and Hector's dolphin habitat.

Sanford and Moana Fisheries, in partnership with WWF, have proposed 'Option 5', which proposes greater emphasis on real-time monitoring and management, including 'move-on rules'. Regulating existing voluntary set-net restrictions employed by the submitters is also supported by this group.

The New Zealand Sports Fishing Council have submitted in support of Option 2, for both Māui and Hector's dolphins. It noted the TMP consultation process highlighted the need to amend both the Fisheries Act and Resource Management Act to more closely align the two acts and to strengthen the environmental principles and protections. Such amendments would allow central or regional government(s) to more directly regulate fishing activity, and place the burden of proof for consenting onto fishers.

Management goals are not measurable

Some eNGOs consider that the proposed management goals for Hector's and Māui dolphins are immeasurable and there is no analysis of how long it would take to achieve recovery to specific population levels. Their submissions suggest management goals they consider more practical, such as a stated reduction in the level of bycatch and/or a stated and measurable rate of recovery. Zero bycatch was a frequently mentioned goal by the general public.

Some industry submitters were concerned that the draft TMP has not established if the Hector's dolphins are increasing, stable, or declining under current measures, or where they are relative to the proposed population goals. There was also comment that the reference scale should be either at the species or sub-species level, not the sub-population, which they consider as arbitrary management units.

Measures go beyond what is required under the Fisheries Act

Fishing industry submitters and Te Ohu Kaimoana view Option 1 as the only option that is consistent with what is required under the Fisheries Act. These submitters consider that further spatial closures go beyond the thresholds of 'long term viability' and 'biological diversity' set out in the Act. FINZ submitted that: *"the objectives of 95% of population capacity with 95% certainty for Māui dolphins, and 90% capacity and 95% certainty for Hector's dolphins are well beyond what the disciplines of the*

Fisheries Act contemplate, and beyond what can be reasonably imposed as restrictions under the Act."

Lack of discussion on transitional assistance

Most key submitters, including Te Ohu Kaimoana, industry, and eNGOs, expressed disappointed about the lack of discussion on what transitional assistance would be made available for any of the proposed options. Forest & Bird, for example, would support government assistance for fishers whose operations become unviable.

FINZ was disappointed that the draft TMP held no information as to what help might be available to fishers to transition to change fishing methods or to exit the industry. FINZ also noted some 250 fishers will lose their livelihoods—approximately a quarter of New Zealand's inshore coastal fleet - with the loss of millions of dollars of assets and future revenue. Some key industry submitters consider that the lack of transitional assistance would be available, leaves them no alternative but to support Option 1.

Individual trawler owners and small commercial fishing also emphasised the acute economic loss they would suffer from greater restrictions that significantly reduced where and how they could fish.

Concerns and questions about the evaluation of risk

All key submitters were concerned about the sources of information and the assumptions used to evaluate the distribution of dolphins and the risk posed by fisheries. These submissions also called for more research to be undertaken to better understand the distribution and population characteristics of Māui and Hector's dolphin. Industry submitters and Te Ohu Kaimoana were concerned that the modelling approach generated a 'phantom risk', leading to proposals for closures in places that dolphins don't inhabit.

For example, Commercial sensitivity submitted that *"The existing restrictions imposed in 2012 & 2013 were based on the Risk Assessment determining that the fishing was killing 4.7 Māui dolphins per annum. The latest Risk Assessment has determined the mean annual deaths for Māui dolphins to be the following:*

Commercial Set.One dolphin every 10 years, Inshore Trawl.One dolphin every 50 years, Toxoplasmosis. Almost 2 dolphins every year.

The risk to the Māui dolphins from fishing has therefore reduced by almost 50 times or 5,000% since 2012 and it is difficult to comprehend why additional restrictions are being considered when the existing precautionary restrictions were imposed when fishing was determined to be killing 4.7 dolphins per annum."

Forest & Bird and Greenpeace consider that the overlap of dolphin distribution with fisheries effort fails to adequately capture the risk of fishing to smaller, fragmented populations of dolphins, and the closures should extend to include the full range of dolphin habitat. Greenpeace described the distribution model as not fit for purpose and that MPI ignored almost all the recommendations and questions of the International Expert Panel. Most eNGOs point to issues raised by the Independent Expert Panel, and are calling for a MPI response to their concerns.

Inadequate impact analysis

Most key submitters were concerned about the lack of a detailed socio-economic analysis, and queried the assumptions and outcomes of the analysis that was provided.

Fishing industry submitters consider that the impact on commercial fishers was understated in the consultation document. Peak industry body Seafood NZ submitted that *"The consultation paper dispassionately states that hundreds of fishers will be affected (many wiped out) and hundreds of millions of dollars will be lost from regional economies. There is no discussion of the human impacts, compensation, or transitional assistance."* In contrast, eNGOs consider that that the costs of the proposed measures on fishers was overstated, while the benefits of the additional protection of dolphins was understated.

The proposals undermine iwi's ability to enjoy the benefits of coastal fish stocks

Te Ohu Kaimoana and other Iwi submitters consider these rights are guaranteed under the Treaty of Waitangi, and that the proposals will have consequential impacts on Maori customary practices and commercial operations, both of which support Maori identity. For example, Ngāi Tahu's submission was that it "*supports the protection of this taonga. However, this role of protection must also be undertaken in a manner which is consistent with and does not impinge upon Ngāi Tahu rights and interests under the Fisheries Settlement".*

Further monitoring of commercial fishing activity supported by some in the fishing industry

Some industry submitters, including Fisheries Inshore New Zealand, support a cautious increase in monitoring, including the use on-board cameras on trawl and set-net vessels for the purpose of verifying the catch of protected species. The 'Option 5' submission took this issue the furthest with a proposal for 'Real Time Risk Management Measures' using cameras and observers to instantly share sightings to all other vessels, which would be obliged to move to other areas.

The general public and some eNGOs (Greenpeace, WDC) supported the implementation of on-board cameras on all commercial fishing vessels, as soon as possible. Forest & Bird asks that camera monitoring should be independent of Fisheries New Zealand, owners of the camera monitoring company, or the commercial fishing industry.

1.3.8 Part C - Toxoplasmosis Action Plan Proposal

General overview

Submitters held mixed views on the creation of a Toxoplasmosis Action Plan. There was a high level of criticism from academics and environmental NGOS of the evidence for, and the modelling, of the impact from toxoplasmosis. Submissions that did not support the Action Plan did so for three main reasons: it would be a distraction from more regulation of fishing; distract funding and attention from other research considered to be more important; or it would cause cats to be blamed for dolphin deaths.

Support for a Toxoplasmosis Action Plan

Overall, submissions expressed support for developing a Toxoplasmosis Action Plan, and the virus was a major cause of dolphin deaths that needed a government response. While a majority of academic, environmental, fishing and other industry submissions generally supported the creation and implementation, the general public were less enthusiastic. Objections to developing an action plan were based on prioritising research on toxoplasmosis over other areas, plus concerns that toxoplasmosis lessened the focus on reducing threats from fishing and other industries.

Disagreement on the role of toxoplasmosis

Fishers emphasised the role of toxoplasmosis, rather than fishing, as the leading cause of the decline in Māui dolphin numbers. Submissions from academics noted toxoplasmosis' role in the decline in numbers, but emphasised that this should not be a reason to reduce efforts to control deaths from fishing activity. Several academics questioned the evidence and process used in the consultation document to estimate deaths from toxoplasmosis. Environmental groups were almost uniform in their view that the impact of toxoplasmosis should not be justification for not increasing restrictions or bans on fishing, seabed mining and seismic surveying. Greenpeace believed the toxoplasmosis model has *"opened the door for vested fishing interests to abdicate responsibility".*

Responding to toxoplasmosis

There was criticism expressed that Fisheries New Zealand and DOC do not currently have more advanced plans for reducing toxoplasmosis, and also at a lack of detail in the consultation document about the Toxoplasmosis Action Plan, including no commitment to funding. Commercial sensitivity submission noted *"We support the development of the Toxoplasmosis Action Plan but cannot understand why this was not started or completed prior to the review of the TMP. DOC acknowledges the urgency but has sat on their hands and not looked to address this major threat to the dolphins."*

The proposed performance plan included in the consultation document was noted by some submitters as inadequate, especially in relation to re-evaluation of the action plan occurring should there be a certain number of dolphin deaths from toxoplasmosis, given that only a very low number of total deaths can be recovered beachcast carcasses.

There was support for a multi-agency/organisation approach to tackle this issue, and feedback from regional councils' Biosecurity Special Interest Group and the Taranaki Regional Council that national leadership (including adequate funding) is essential. The regional government sector also requested early and on-going engagement and collaboration on toxoplasmosis research and management actions, a public engagement strategy, and an additional engagement objective relating to a desired level of behaviour change among cat owners. There was also support for research to improve understanding on the effects of toxoplasmosis on native species other than Hector's and Māui dolphins.

There was strong support from significant stakeholders (NZ Veterinary Association, regional sector Biosecurity Special Interest Group, Taranaki Regional Council and SPCA) for addressing the toxoplasmosis risk to dolphins via wider cat management initiatives. This included consideration of comprehensive unowned (feral and stray) cat management, legislative change to enforce responsible cat ownership, and ways to improve understanding of, and to build upon, social license to operate in this space. Submissions highlighted the need for collaboration with a wide variety of stakeholders and consideration of animal welfare in any cat management initiatives.

Several submissions suggested that in addition to (or instead of) toxoplasmosis the effects of other infectious diseases and sources of pollution on dolphin mortality, health (especially in relation to immunosuppression) and habitat should be further researched. This included diseases such as brucellosis, and other pollutants such as organic contaminants, PCBs, and endocrine disruptors. Climate change and prey availability were also raised as threats (that could be as significant, or more significant, than toxoplasmosis) and should be further researched and considered under the TMP.

Te Runanga O Ngāi Tahu noted the importance of a 'ki uta ki tai' management approach (that considers the connections from land to sea) with the suggestion that the Toxoplasmosis Action Plan could be an opportunity to use these principles. It supported more research but that funding needs to weighed against other protection measures. The Iwi Collective Partnership and Te Ohu Kaimoana submitted that toxoplasmosis is the dominant threat to Hector's and Māui dolphins and that further fishing restrictions are unjustifiable. Te Runanga o Ngāti Ruanui Trust recommended inclusion of the disease brucellosis (and associated research) in the toxoplasmosis action plan. Te Kotahitanga o Te Atiawa supported the Te Ohu Kaimoana submission and its emphasis on toxoplasmosis.

Submissions from some eNGOs (Sea Shepard, Hector's Protectors, and Our Seas Our Future) and individuals were generally critical of the risk assessment for overstating the significance of toxoplasmosis compared to fishing. These submissions argued fishing remains the most significant threat to Māui and Hector's dolphins and further stressed the need to act on the fishing threat as that would be simpler to manage, relative to managing toxoplasmosis, which they considered a distraction from restricting fishing.

However, submissions from the Environmental Defence Society, Greenpeace, Forest & Bird, Whale and Dolphin Conservation, and other eNGOs and individuals supported the development of a Toxoplasmosis Action Plan, and research to inform action, often emphasising that this reflected the need to better understand and address all threats to the dolphins. These submissions considered more restrictions on fishing were still necessary.

Some scientists (Prof Slooten, Dr William Rayment) and individuals echoed the criticism of some eNGOs at the toxoplasmosis risk assessment, and repeating the view that fishing is by far the greatest threat to Māui and Hector's dolphins. These submitters also noted that the Government has greater means to restrict fishing activity than restricting the impact from toxoplasmosis. Professor Slooten described the comparisons of by-catch deaths with those from toxoplasmosis as faulty, and the argument that toxoplasmosis is a serious threat as being not scientifically defensible.

Other scientists (Prof Stephen Dawson, NZ Marine Science Society) and individuals supported the development of a Toxoplasmosis Action Plan, as this would be necessary for the management of toxoplasmosis and dolphin survival. Increasing fishing restrictions were also supported by these submitters.

Submissions from commercial fishers (Federation of Commercial Fishermen, Te Ohu Kaimoana) believed the toxoplasmosis risk assessment clearly showed toxoplasmosis was the dominant threat and therefore the proposed fisheries restrictions were unjustified. Seafood NZ submitted that action on toxoplasmosis was overdue. FINZ was also disappointed with lack of progress and wanted greater commitment from government to address the issue.

The 'Option 5' joint submission from WWF, Sanford and Moana NZ proposed an agency be established to conduct communications and research about toxoplasmosis.

Recreational fishers held similar views to the commercial fishing sector regarding the relative impact from toxoplasmosis in comparison to fishing. The NZ Sports Fishing Council submitted that toxoplasmosis is probably exaggerated and believed it unmanageable in the medium term. The Marlborough Recreational Fishers Association's submission was that carrying out research was unjustified as toxoplasmosis is unmanageable.

Submissions from industries involved in seismic surveying and seabed mining believed those threats to be insignificant compared to toxoplasmosis. The Petroleum Exploration and Producers Association of New Zealand considered the discussion of the TAP was inadequate, and that any threat from seismic surveying was insignificant compared to toxoplasmosis as there was no evidence of seismic surveying causing deaths.

Submissions from the general public were less supportive. Several members of the public believed the threat from cats carrying the virus was over-stated and did not want cats to be resented for dolphin deaths or for cats to be controlled or regulated.

1.3.9 Part D - Non-fishing Threat Management Proposals

General overview

Submissions on Part 4 – Non-fishing Threat Management Proposals were as equally divided as the previous parts of the consultation. Those submitters involved in activities or working in locations that would be further regulated under the proposals – fishers, seabed mining, oil and gas exploration or production – did not see any justification for further restrictions or greater regulation. These submitters were critical of the use of the precautionary principle as a basis for decision-making on future regulation.

Independent experts and environmental NGOs supported the most restrictive options possible and suggested these should go further or cover greater area, such as the entire dolphin habitat.

Marine mammal sanctuary extensions

Extending Marine Mammal Sanctuaries was universally popular, except by those individuals and organisations whose actions and businesses would be more heavily restricted or prohibited as a result.

Te Runanga o Ngāi Tahu submitted that any extension of Banks Peninsula MMS requires engagement between DOC and local rūnanga, and must not impact on rights and interests of Ngāi Tahu. Ngāti Ruanui's submission noted that the Māui dolphin MMS extension and Taranaki MMS proposal should be integrated, rather than done piecemeal. Nga Hapu o Te uru o Tainui argued that extended MMS area management should be delegated to local Mataitai Committees.

Environmental groups were heavily in favour of expanding the two MMS, and argued for the sanctuary boundaries to include the entirety of dolphin habitat and extend out to the 100m depth. These submitters also wanted complete prohibitions – including for existing permit holders - on seabed mining, seismic surveying, and drilling.

Independent experts and academics were strongly in support for extending the marine mammal sanctuaries, with most suggesting that the ideal boundaries of the sanctuaries are at the 100m depth line.

FINZ and Seafood NZ did not support sanctuary extensions. They argued that dolphins are not present in the proposed Māui MMS extension, while the Banks Peninsula MMS already protects the existing hotspot of dolphin activity. The Rock Lobster Industry Council submission was that proposals to extend the marine mammal sanctuaries are meaningless and should not proceed.

New Zealand Sport Fishing Council Zone 6 (West Coast North Island between Raglan and Cape Egmont) submitted that the MMS needs to be extended to cover the full habitat of Māui dolphins.

The Petroleum Explorers and Producers Association (PEPANZ) did not consider an extension of the Māui MMS to be warranted. The International Association of Geophysical Contractors considered an extension of the MMS to be reasonable but not the preclusion of seismic surveying in those areas because that activity uses low frequency as opposed to the dolphins using high frequency. Effects, if any, would be temporary and transitory.

Peak mining body Straterra also considered extending the Māui MMS as unnecessary as there is no evidence of a resident population. Rio Verde Ltd (mining investor) also did not support extensions. Trans-Tasman Resources (TTR) opposed extending sanctuaries as there was insufficient evidence to support a transition zone in the South Taranaki Bight, or seabed mining restrictions within it. TTR also submitted that there are very few Māui dolphins in the South Taranaki Bight area, including in TTR's permit areas. The amount of overlap between TTR's permit areas and Māui dolphin habitat is very small.

Submissions from the general public strongly supported extending the boundaries of the MMS, and to a greater extent than the options in the consultation document. A

majority of submissions were initiated by the environmental NGOs and these wanted the sanctuaries to expand to the 100m depth and/or the entire dolphin habitat.

Black Cat Cruises and Tourism Industry Aotearoa supported extension of the Banks Peninsula MMS to protect against mining and other non-fishing threats. Abel Tasman Eco Tours submitted that the MMS should go to 100 metre depth contour, and agreed with the Māui tourism moratorium.

Canterbury Regional Council supported extending the Banks Peninsula MMS, and Taranaki Regional Council was generally supportive of extending the North Island MMS, but with concerns regarding how seismic surveying and seabed mining would be regulated. Waikato Regional Council supported extension of the Māui MMS, although it thought a marine reserve may be more appropriate. The Kawhia Community Board supports the status quo in the Kawhia and Aotea harbours.

Seismic surveying

Outside of the oil and gas industry and the commercial fishing sector, submitters generally favoured more restrictive regulation, if not outright bans.

Iwi submitters held mixed views: some (Ngāti Ruanui) wanted a seismic surveying prohibition in their Te Maoanaui a Kupe and its extension to the continental shelf, including for current permit holders, while other iwi were willing to continue surveying but asked for a greater level of management to increase the level of protection for dolphins. Nga Hapu o Te uru o Tainui (Customary Regional Fisheries Forum) submitted that there should be no more permits for seismic surveys within the Māui dolphin habitat. The Iwi Collective Partnership objected to exemptions for existing Crown Minerals Act permit holders.

Environmental groups' submissions were unanimous in their opposition to seismic surveying in the Marine Mammal Sanctuaries, and several (Forest & Bird, WWF, World Animal Protection) proposed a buffer zone extending beyond the options discussed in the TMP. These submitters' seismic survey prohibition would include permits already granted.

Almost all environment NGOs (and SPCA) wanted seismic survey restrictions imposed out to the 100m depth line or beyond, and a complete prohibition on drilling within dolphin habitats, including for existing permit holders (Greenpeace, World Animal Protection, WWF, Māui and Hector's Dolphin Defenders). Whale and Dolphin Conservation submitted that the sanctuaries should extend to the 100m line around both islands, with protection from surveying, drilling and mining. Sea Shepard NZ was silent on seismic surveying and seabed mining. Major environmental groups (Forest & Bird, WWF) argued that the current DOC Code of Conduct (the Code) for marine seismic surveying is ineffective and not fit for purpose.

All academic and independent experts supported prohibiting seismic surveying within marine mammal sanctuaries and/or the 100m depth line, with some (Privacy) asking for a further buffer zone beyond this. Others raised noisy activities such as pile driving that needed to be have a permit regime or be otherwise controlled.

Fisheries Inshore NZ and Seafood NZ supported compliance with the Code in sanctuaries, but not creating a permitting regime or prohibiting seismic surveying. Extension of prohibitions within the Māui sanctuary to 12 nm was considered 'not unreasonable'. The Rock Lobster Industry Council submission was that threats from seismic surveying should be dealt with under the RMA or EEZ Acts.

The New Zealand Sport Fishing Council (Zone 6) supported prohibiting oil exploration and drilling, and seismic testing. Their suggested range is from Maunganui Bluff to New Plymouth, out to 4 nm offshore. They also want no seismic surveying within 20nm of the sanctuary's boundary.

Mining and energy industry submitters (Straterra, PEPANZ, Greymouth Petroleum) supported the current regulations in the Code and other regulatory instruments, and opposed further restrictions (either permitting or prohibitions), arguing that there was a lack of evidence that current practice or regulatory standards caused or contributed to harm to dolphins at any measurable level. These submitters argued that the TMP should focus on actual known threats, not activities that might affect dolphins, and in areas where dolphins are not known to inhabit.

PEPANZ submitted there was no justification for further controls on seismic surveying, given compliance with the Code within sanctuaries is required in the EEZ and under the proposed Taranaki Coastal Plan, but were supportive of making it mandatory to comply with the Code. It also noted that future operations within the territorial seas will only be in the Taranaki Coastal Marine Area. A permitting regime would add unnecessary extra costs and creates uncertainty. These submitters noted that the Taranaki Coastal Plan, the RMA and the EEZ Act meant seismic surveying was already regulated on a case-by-case basis. In addition, a prohibition on seismic surveying or a permitting regime would weaken New Zealand as an investment destination.

The great majority of submitters from the general public supported a total ban on seismic surveying, including for current permit holders under the Crown Minerals Act.

Canterbury Aoraki Conservation Board supported prohibition of seismic surveying within marine mammal sanctuaries, while the Nelson Marlborough Conservation Board wanted a general call for higher levels of protection, while not mentioning seismic activity in particular.

Canterbury Regional Council supported creating a permitting system for seismic surveying, as did the Taranaki Regional Council, albeit if jointly developed with the TRC to ensure alignment. TRC did not support prohibition. Waikato Regional Council supported the seismic options but did not give a preference.

Black Cat Cruises supported the Banks Peninsula MMS being extended to protect against mining and other non-fishing threats, but did not express a preference for any of the seismic or mining options. Abel Tasman Eco Tours submitted that there should be protection (this was unspecified) for dolphins from seismic exploration across the entire habitat, and this should include pile driving activity as well.

Seabed mining

Seabed mining was not supported by submitters in the Tangata whenua, environmental, fishing or general public categories. Seabed mining was supported by the mining industry, arguing it was already heavily regulated under existing legislation and regional council plans, and that it took place in areas not known to be dolphin habitat.

Ngāti Ruanui strongly supported prohibitions on seabed mining in their Te Maoanaui a Kupe. Nga Hapu o Te uru o Tainui Customary Regional Fisheries Forum submitted that there should be no more permits for seabed mining from the Māui dolphin habitat.

Environmental NGOs and the general public were almost universally opposed to seabed mining anywhere in dolphin habitat. Independent experts supported prohibiting seabed mining in sanctuaries and the great majority went further to support prohibition out to the 100m depth at the minimum, and preferably throughout the dolphin habitat. The NZ Marine Science Society supported prohibition of seismic surveying in all sanctuaries and seabed mining in the Māui sanctuary, specifically Option 3 (12nm) for the existing West Coast MMS, and Option 4 (2nm) for the southern extension of the West Coast MMS.

Fisheries Inshore NZ and Seafood NZ did not support additional prohibitions on seabed mining as there are existing permitting and regulatory provisions to manage this. Extension of prohibitions within Māui sanctuary to 12 nm 'is not unreasonable'. The NZ Rock Lobster Industry Council argued that threats from seabed mining should be dealt with under RMA or EEZ Act.

The New Zealand Sport Fishing Council's submission called for an end to consents for seabed mining off the Patea coast. New Zealand Sport Fishing Council (Zone 6) argued the WCNI sanctuary needs to be extended to cover the full habitat of Māui dolphin and prohibit seabed mining, which they suggest as Maunganui Bluff to New Plymouth, out to 4 nm offshore. Seabed mining should become a prohibited activity on the entire habitat on the WCNI.

The major submission received in support of seabed mining was from Trans-Tasman Resources (TTR). This supported the status quo as the preferred option as the current regulatory regime for seabed mining under the RMA and EEZ Act is appropriate in providing a balanced, sustainable management, decision-making process. The proposed TMP had no consideration of the role of regional councils and the interaction with coastal plans.

TTR submitted that the proposed management options are not based on robust scientific data and the TMP process has not appropriately or accurately assessed the potential impacts of seabed mining on Hector's or Māui dolphins. There was no formal quantitative spatial or risk assessment undertaken for seabed mining. In addition, the effects of seabed mining can only be understood following monitoring of the activity. Further research under the TMP should include research on seabed mining and its effects.

Mining peak industry body Straterra submitted that proposals for seabed mining are not supported by the science and would not help meet the TMP objectives. No

evidence was provided that these activities have a detrimental effect (i.e. restrictions have been proposed as a precautionary approach). Therefore, it supported the status quo for regulating seabed mining.

Black Cat Cruises was opposed to seabed mining and wished to see the Banks Peninsula MMS extended to achieve this. Similarly, Abel Tasman Eco Tours Support protection (unspecified) for dolphins, seismic exploration and drilling in entire habitat. Should include pile driving as well.

Canterbury Regional Council supported a prohibition on seabed mining but its final decision would depend on the geographic extent of the prohibition. Waikato Regional Council's submission calls for extending the seabed mining prohibition out to 12nm in order to provide certainty and consistency across an area administered by several council.

Other threats: dolphin watching, vessel traffic, etc.

Several significant environmental NGOs (Forest & Bird, Our Seas Our Future, Whale and Dolphin Conservation) supported a moratorium on Māui dolphin tourism. World Animal Protection and the Māui and Hector's Dolphin Defenders argued that land based viewing should still be permitted. The Dolphin Defenders' submission noted better management of Hector's dolphins tourism is required, especially cruise ships in Akaroa.

There was also strong support from academics and independent experts ([redacted] NZ Marine Sciences Society, and [redacted]) for a moratorium on Māui dolphin tourism activities. The Marine Science Society suggested no new permits for Hector's dolphins in areas where there are concerns about stressors or mortality risks.

Nelson Marlborough Conservation Board wants to extend the current moratorium on new marine mammal watching permits to cover the entire Nelson Marlborough area.

Fisheries Inshore NZ and Seafood NZ called for no watching or swimming permits be issued in Māui dolphin territory (between Maunganui Bluff to Pariokariwa Point), and that vessel speeds in the WCNI MMS be limited to 10 knots. No recreational interactions with dolphins by the public should be allowed. These submitters also argued that Hector's dolphin tourism activities should be excluded from harbours and 2nm outside between November and February to protect calving/nursing. Cameras and positional reporting should be required; and commercial dolphin watching not be allowed within 500m of fishing vessel while fishing. Greater enforcement was needed of the general rules for vessels around dolphins, especially with Māui dolphins.

New Zealand Sport Fishing Council (Zone 6) submitted there should be no swimming, surfing, or tourism activity around Māui dolphins.

Submissions from the general public on dolphin tourism and vessel interaction broadly supported greater scrutiny and enforcement on current permit holders, and a moratorium on new permits. Closer monitoring of the impacts from all such activities was frequently requested.

Black Cat Cruises submitted that the Government should consider the economic impact of Hector's dolphin tourism. Tourism Industry Aotearoa supported Black Cat Cruises' submission and noted the value of Hector's dolphin tourism outlined in the Black Cat submission. Akaroa Dolphins and the Akaroa Marine Protection Society asked for greater enforcement against illegal tourism operators. Abel Tasman Eco Tours supported a moratorium on Māui tourism.

APPENDIX 2: SCIENCE INFORMATION SUPPORTING PROPOSALS

This appendix describes at a high level the science that supports the Hector's and Māui dolphin Threat Management Plan (TMP) final advice.

In particular, this appendix:

- describes the spatial risk assessment and the Māui population demographic models;
- provides a detailed description of the areas of statistical and qualitative uncertainty that influence the results of the scientific analyses; and,
- summarises submissions on the scientific information and responds to them.

1.1 New Information

Since 2008, a range of research projects and analyses have been undertaken to improve our understanding of the threats facing Hector's and Māui dolphins and to inform the review of the TMP to support Ministers' decision-making on the matters outlined in the final advice. A new multi-threat spatial risk assessment combines the results of these research projects and analyses (the inputs), and uses novel methods to estimate impacts on dolphin populations.

The research projects and analyses include:

- new aerial surveys to estimate the spatial distribution and population abundance of Hector's dolphins;
- new genetic analyses to estimate the population size and trend of Māui dolphins;
- updated fishing effort data and observations from fisheries observers, to estimate fisheries capture rates;
- use of fisher survey data to estimate relative levels of recreational set-net fishing effort in different parts of New Zealand;
- new use of public sightings and fisheries observer sightings data to understand the spatial distribution of the dolphins, including in locations outside their normally recognised range;
- acoustic sensor data to detect the presence of dolphins in different parts of the historical range of Māui dolphins;
- updated necropsy information to identify the cause of death of beachcast dolphin carcasses;
- new means of understanding the biology of the dolphins to estimate the response of the dolphin populations to different threat levels;
- a spatial risk assessment that combines all of these new data and methods to estimate impacts on different dolphin subpopulations based on the spatial distribution of the dolphins and the spatial distribution of threats that may affect them;
- Māui dolphin population models that estimate the effects of fisheries and disease (toxoplasmosis) on future population trends.

The risk assessment provides the scientific basis for the proposals and analyses in the final advice. It contributes to the breadth of best available information that Ministers must consider in making statutory decisions.

The process by which the risk assessment was developed is described in Section 1.6 of this Appendix (Key Submission Points and Response) as multiple submissions commented on its development.

1.2 Risk Assessment

1.2.1 Overview

The multi-threat spatial risk assessment developed for the review of the TMP uses new information and applies novel methods to estimate impacts on different dolphin subpopulations.[1]

The risk assessment estimates annual deaths and subpopulation-level risk for three main human-caused lethal threats: commercial set-net fisheries, commercial trawl fisheries, and toxoplasmosis. ("Risk" is a numerical output of the risk assessment, described below.)

The risk assessment also estimates relative exposure levels of the different subpopulations to recreational netting, so it can estimate how likely a dolphin in one location is to die in a recreational net relative to dolphins in other locations, but it cannot provide a quantitative estimate of the actual number deaths from recreational fisheries (this would require observer coverage).

The risk assessment provides some spatial information on the dolphins' relative exposure to threats such as oil spills and noise disturbance, including noise from seismic surveying and vessel traffic. Other activities, including seabed mining, vessel strike, tourism, coastal development, pollution, and climate change effects were limited to a review of the available literature to assess the potential impact on the dolphins.

1.2.2 How it estimates risk for three main threats

The risk assessment estimates:

- the spatial distribution of the dolphins;
- the spatial distribution of the threats that may affect the dolphins;
- the rate that dolphins encounter the threat (by looking at the overlap between the dolphin distribution and threat distribution); and,
- the probability that a dolphin will die when it encounters the threat. The probability of death per encounter is estimated from fisheries observer data (for commercial fishery threats) or from cause of death identified by necropsy of beachcast bodies (for non-fisheries causes of death).

With this information, the risk assessment can estimate the risk that a threat poses in a certain area. It can also estimate current annual deaths caused by a threat, as well

[1] The full scientific documents are available online at: www.fisheries.govt.nz/dolphintmp

as the “allowable” number of deaths that can occur while allowing the dolphin population to achieve a chosen outcome.

The chosen outcome for a population is called the *population outcome.* The population outcome is designated as a percentage of the maximum number of dolphins that the environment can support (proposed to be 95% for the Māui dolphin subspecies and 90% for the Hector’s dolphin subspecies in the TMP consultation).

The advantage of this spatial risk assessment is that managers can estimate how many dolphins are dying from each threat and also where those deaths are occurring, noting that different subpopulations of dolphins will be exposed to different combinations of threats. It is also possible to estimate the cumulative effects of multiple threats affecting the dolphins simultaneously.

1.2.3 Risk assessment outputs

The risk assessment thus produces the following information:

- *Risk:* risk is proportional to the number of estimated annual deaths divided by the population size, or the probability of death per year for an individual dolphin. The risk score is subsequently re-scaled so that any risk score < 1 corresponds to the population outcome being achieved. Overall, the intention of management proposals is to reduce risk to animals to allow the populations to recover to a specific population outcome, i.e. to ensure that the risk score < 1.
- *Annual deaths*: the risk assessment estimates current annual deaths as well what the annual deaths would be under different management measures.
- *Population sustainability threshold*: the population sustainability threshold is the maximum number of dolphin deaths per year that can occur while still allowing that the chosen outcome for the population can be achieved.

Level of certainty

When estimating risk and annual deaths, the risk assessment produces a mean estimate and a confidence interval. The mean estimate is the estimate that is most likely to be accurate (the “best guess”). The confidence intervals provide a maximum (95th percentile) and minimum (5th percentile) estimate of risk or deaths. What the confidence interval effectively says is that we can be 95% confident that the true level of risk or deaths caused by a threat is below the maximum (95th percentile) estimate shown in the confidence interval.

1.2.4 Summary of results

1.2.4.1 Annual deaths

Estimates of annual deaths for each subspecies from the three main human-caused threats are provided in Table 1. Table 1 shows the mean (likely to be most accurate) estimate of deaths, as well as the 5th and 95th percentile estimates.

For the lethal human-caused threats in Table 1, the risk assessment estimates different levels of risk for different subpopulations. Subpopulation results are provided as relevant in sections of the final advice.

Table 1: Estimated annual deaths of Hector's and Māui dolphins from commercial set-net, inshore trawl, and toxoplasmosis as published in the *Spatial risk assessment of threats to Hector's and Māui dolphins*.

	Mean annual mortalities (5th to 95th percentile estimates)		
	Commercial Set-Net	Inshore Trawl	Toxoplasmosis*
Māui	0.10 (0 – 0.25)	0.02 (0 – 0.05)	1.9 (1.1 – 3.0)
Hector's	44 (21 – 80)	14 (1 – 43)	334 (132 – 625)

* It is important to note that commercial fisheries mortalities (set-net and inshore trawl) are based on fisheries observer data and have been estimated with a high level of certainty. Toxoplasmosis deaths have been estimated from necropsy proportions, which assumed an equal detection probability of toxoplasmosis and other causes of death, resulting in potential bias that may not be reflected in the ranges above, descr bed in the detailed uncertainty section below.

1.2.4.2 Relationship between estimates for commercial fisheries deaths and toxoplasmosis deaths

The estimation of commercial fishery deaths is independent of the estimation of toxoplasmosis and other non-fishery causes of death. As commercial fishing risk is estimated with high certainty, even if non-fishery related risk estimates changed, this would have a negligible effect on the commercial fishery risk estimate. If, for example, toxoplasmosis were overestimated, the unaccounted for deaths could only be explained by an increase in deaths assigned to causes other than commercial fisheries, e.g. shark predation, other disease, other natural mortality, or some other combination of non-fishery threats. Potential uncertainty related to estimating each fisheries risk and toxoplasmosis risk is outlined in Section 1.4.

1.2.5 Uncertainty in the risk assessment

All scientific information, and all estimates that use scientific information, are subject to uncertainty. The power of the risk assessment methodology is that it is able to account for most of this uncertainty so that decision makers can have confidence in the outputs that they base their decisions on. Where the uncertainty is not included in the outputs of the risk assessment, it can be described qualitatively so that decision makers can still take this uncertainty into account.

The uncertainty in the risk assessment can be broadly described under two themes: statistical uncertainty and qualitative uncertainty (which may lead to potential bias). These two themes are summarised here, and both statistical and qualitative uncertainty are described in more detail after the next section, so that Ministers can take account of this uncertainty in making decisions.

Statistical uncertainty: Statistical uncertainty is reflected in confidence intervals. Where the risk assessment model relies on uncertain information, it accounts for this by carrying the known uncertainty in the information that goes into the model (for example, uncertainty about the size of the dolphin population) through the analysis and then reflecting this uncertainty in the estimates that come out of the model (for example, in the confidence intervals around the estimated number of dolphin deaths).

Similarly, where the risk assessment relies on scarce information (for example, using a small number of beachcast dolphin carcasses to estimate cause of death), this also produces statistical uncertainty, and is reflected in the confidence intervals.

Model outputs that include statistical uncertainty allow decision-makers to have high confidence in their decisions even where estimates are uncertain because they can choose how certain they need to be that the objective will be achieved. For example, using the upper 95th percentile of estimated deaths rather than the mean ('best guess') estimate means that decision makers can be 95% confident that the true number of deaths is low enough to ensure that the population can achieve the chosen outcome. Because statistical uncertainty is reflected in the confidence intervals, decision makers can choose an appropriate weighting between how much confidence or certainty they want to have in their decisions, and the corresponding social or economic impacts.

Qualitative uncertainty and potential bias: Qualitative uncertainty is not reflected in confidence intervals and needs to be described. Where the model relies on uncertain assumptions that cannot be reflected using confidence intervals, this creates the potential for bias, meaning that the estimates (including confidence intervals) may be biased either too high or too low. In some instances, the likely direction of bias can be predicted, and in other instances it cannot be predicted. Either way, potential bias can be described qualitatively for decision makers to take into account.

Statistical and qualitative uncertainty in the modelling is described in detail after the next section.

1.3 Māui dolphin demographics models

Agencies commissioned two population modelling projects for Māui dolphins because of their conservation status (no similar models have yet been commissioned for Hector's dolphins, because the data were not available). These models use population monitoring data (including the genetic census and mark-recapture data) to estimate how the Māui dolphin population has changed in recent decades and how it is likely to change under different levels of future impact from various threats.

The two Māui dolphin models yield broadly similar results. Both models indicate that commercial fisheries deaths alone (which are estimated with high confidence by the risk assessment) are not sufficient to explain the estimated long-term decline of the Māui dolphin population.

The estimated number of toxoplasmosis deaths corresponds closely to the number of deaths that are 'required' to explain the long-term population trend, as estimated by two independently commissioned Māui dolphin population models. These otherwise unaccounted-for deaths cannot plausibly be assigned to commercial fisheries, because this would require that on a per-encounter basis, a Māui dolphin is twenty times more likely to die in an encounter with a net than is a Hector's dolphin. There is no plausible behavioural or physiological mechanism that could explain such a dramatic difference in catchability; Māui and Hector's dolphins are the same species; a DNA test is required to tell them apart.

Even notwithstanding the implications for catchability, the unaccounted for deaths also cannot be assigned to commercial fishing because commercial fishing effort has

been highly observed in the area of the core dolphin distribution since 2012, with no observed captures.

If toxoplasmosis is not the cause of these unaccounted for deaths, this would imply that other non-commercial-fishery threats are responsible for the historical population decline, or that the environment of the west coast of the North Island is not capable of supporting a larger population size.

One model suggests that unless efforts to reduce toxoplasmosis deaths are effective beginning in the next 5-10 years, reducing commercial fisheries deaths to zero will not be sufficient to avoid the possibility of Māui dolphin extinction.

That model run relied on a simplifying assumption that deaths not attributable to commercial fisheries are all attributable to toxoplasmosis, and that the threat level has been constant over time. However, as noted above, while toxoplasmosis is the largest estimated threat, it is likely that there is actually a suite of non-commercial fishery threats that may affect the dolphins directly, or that may interact to increase the dolphins' susceptibility to toxoplasmosis and other diseases, including: recreational fishing, land-based pollution, habitat effects of terrestrial sedimentation, climate change, and low abundance of suitable dolphin prey. It is also possible that threat levels have been changing in ways that are unquantified in the model.

It is possible that a combination of these non-commercial-fisheries effects have acted cumulatively to produce the population decline estimated by population models. If this is the case then one optimistic interpretation is that the total (cumulative) impact may have been reduced when recreational set net fishing was banned, in a way that is not reflected in the population modelling (because recreational set net risk is unquantified and the modelling treats all non-commercial fisheries risk as constant). This may account for an apparent increase in adult survival rates during this period as estimated by the population models, and the possible (but uncertain) population increase between the 2011 and 2016 genetic censuses, but until another Māui population census is completed in 2021, such conclusions are highly speculative.

1.4 Uncertainty and potential bias

1.4.1 Dolphin population size:

For Hector's dolphins, population size was estimated using comprehensive aerial surveys conducted separately in summer and winter around the entire South Island. The aerial survey design has been reviewed and endorsed by independent reviewers, including the IWC. The data are reliable; the estimates are unbiased; uncertainty is statistical and shown in confidence intervals.

For Māui dolphins, population size is estimated using a genetic census conducted at 5-year intervals (in 2010-11 and again in 2015-16). The data are reliable; the estimates are unbiased; uncertainty is statistical and shown in confidence intervals.

1.4.2 Dolphin spatial distribution:

The risk model uses estimated maps of the dolphin distribution (density in space). The certainty of these estimates varies between locations; spatial uncertainty is not reflected in model outputs so needs to be considered qualitatively.

Spatial distribution models used observations from the Hector's dolphins aerial surveys and compared these with other spatial environmental data layers to identify what environmental characteristics best explain the distribution of the dolphins. It was found that the strongest predictors of dolphin distribution are water turbidity and the presence of suitable dolphin prey. Water turbidity is visible from satellite imagery. Dolphin prey distributions are estimated using data from inshore trawl surveys. Combined, these data layers provide strong predictive power about where dolphins occur; the accuracy of these predictions were validated using fisheries observer sightings data (South Island) and public sightings data (North Island).

Assertions that water depth is a better predictor of dolphin distribution than water turbidity have been conclusively disproven by testing a whole range of variables to see which ones provided the best fit to the dolphin observations. Turbidity was consistently a much stronger predictive variable than was depth. References to the 100 m depth contour as a limit for the dolphin distribution are unsupported by evidence; if the dolphin distribution were expressed in terms of depth rather than turbidity, then the outer limit of higher dolphin density would most closely follow the 50m depth contour, as shown in the spatial distribution figures in the subspecies' chapters (Parts B3 and B4) of the Technical Advice.

Model estimates of dolphin density do not include statistical uncertainty. The reliability of the estimates will be highest in the high-density 'core' of the dolphins' range (where there are more observations from the aerial survey, or more public sightings) and lower in the low-density 'tails' of the dolphins' range. The implications of variable spatial uncertainty are different for each subpopulation and are described separately below.

A popular misconception about the spatial risk assessment is that if the dolphin distribution is uncertain, then the resulting estimate of total fisheries risk will be more uncertain than is represented in model outputs. This is technically correct but the actual effect is minor. Because fishing effort is widely dispersed (with few exceptions), the estimated number of fisheries deaths is not highly sensitive to changing assumptions about the spatial distribution of the dolphins: as the estimated dolphin density 'moves' (in the model), deaths are estimated to occur in different locations, but the total number of deaths remains roughly unchanged. This can be illustrated by the fact that even a spatially 'blind' risk model (i.e. that doesn't use a map) produces similar estimates of total population risk. The maps are important not to estimate the total number of deaths, but rather to estimate where those deaths are occurring, so that spatial fisheries closures are designed effectively to prevent those deaths, without imposing undue hardship on fishers in locations where no deaths are actually occurring.

1.4.3 Fishing effort and captures data

Two commercial fishing methods are known to pose a risk to Hector's and Māui dolphins: set nets, and inshore trawls. The location and intensity of commercial

fishing effort is recorded in standard fisheries databases; locations of each fishing event are recorded with high precision[2]. In previous decades, position reporting was less precise, but this does not affect the estimation of current fisheries risk.

Dolphin captures data are recorded by government fisheries observers. While fishers also self-report captures as required by law, the risk assessment only uses data from observed fishing events, because it is not known what the rate of non-compliance with reporting laws might be. Thus the reliability of the captures data used in the risk assessment is high.

1.4.4 Dolphin catchability

For each fishing method (commercial set nets and inshore trawls), dolphin catchability is estimated by comparing the estimated density of dolphins in the location of each observed fishing event with the total number of observed captures. This estimate is then applied also to fishing events without an observer, to estimate total captures across all commercial fishing events. The effect of low observer coverage is increased statistical uncertainty (not bias) and is reflected in risk assessment outputs (i.e. wider confidence intervals).

In this step the risk assessment applies a simplifying assumption that all commercial fishing events using the same method have a similar probability of capturing a dolphin. In reality, catchability can be influenced by a range of factors that are not considered in the model, such as variable fisher behaviour or differences in gear configuration. This will result in greater 'noise' within the captures data. At the scale of the dolphin population this creates statistical uncertainty, not bias, and this uncertainty is reflected in model outputs (i.e. confidence intervals).

But at smaller scales, failing to account for differences in catchability has major implications for the effective design of risk reduction measures, and for impacts on fishers. If some types of fishing events are more likely to capture dolphins than others within the same method, then the model may over-estimate the risk in some locations and under-estimate the risk in others. Total risk will be estimated accurately, but responsibility to accept risk reduction measures will be unfairly assigned across the whole fleet, rather than targeted at that portion of the fleet where the risk is actually highest.

To address this concern, where observed captures data are inadequate to detect differences in catchability, other qualitative information is considered, and the implications are discussed in the advice for particular subpopulations. Increased fisheries monitoring would be valuable to identify which fishing activity is actually responsible for the majority of fisheries risk, particularly for commercial trawling.

The catchability of dolphins is dramatically higher in commercial set nets than in trawls. The risk assessment estimates that, all other things being equal, one kilometre of set net in a particular location is roughly 20 times more likely to result in a dolphin death than is a single inshore trawl in the same location. For this reason, set net fisheries are estimated to be responsible for 85% of current risk to dolphins, despite the fact that there is more trawl fishing effort occurring, over a larger

[2] The only exception is inside West Coast North Island harbours, where effort is reported at the scale of statistical areas and the finer-scale spatial distr bution of fishing effort was estimated using other methods.

proportion of the dolphin distribution, including in some areas that are already closed to set net fishing.

1.4.5 Fisheries deaths and risk

The risk assessment estimates that a proportion of all fisheries deaths are 'missed' by observers even when observers are present, because the bodies may fall out of the net without being seen (termed 'cryptic mortality'). For set nets, cryptic mortality effectively doubles the risk (i.e. the model assumes that for each observable capture, another cryptic death has occurred).

The number of animals dying per trawl event is not well estimated. Evidence suggests that trawl captures may arise from social interactions that sometimes involve more than one dolphin. The risk assessment currently estimates based on fisher-reported capture events that each capture event kills two dolphins on average, but this multiplier is uncertain.

Deaths are expressed as a number of animals dying per year, at the scale of a subpopulation or local population. In contrast, the fisheries 'risk score' relates to the probability of death per year per individual animal (or alternately, the proportion of animals dying per year), scaled with reference to a population outcome (a policy goal). Using this definition, populations with the same risk score will have the same probability of achieving the desired outcome, even if the population sizes are different.

There is a popular misperception that the risk assessment will over-estimate fisheries risk to very small subpopulations or local populations. This is incorrect. Because the risk assessment estimates deaths based on the probability of death per individual animal, it is not sensitive to uncertainty about how many animals there are. Instead, in an area with a fixed level of fishing intensity, if there are twice as many dolphins, then there will also be twice as many deaths, and the population outcome will be the same. For this the reason the risk assessment can be applied successfully in locations where the local population size is highly uncertain.

1.4.6 Non-fishery threats including toxoplasmosis

Non-fishery deaths including from toxoplasmosis are estimated based on necropsies from beach-cast carcasses. The number of carcasses available is low. Small sample sizes generate statistical uncertainty, not bias; this uncertainty is represented in model outputs (i.e. confidence intervals are wide).

Potential bias is of greater concern than high uncertainty. Model estimates of toxoplasmosis risk may be biased either too high or too low, if beachcast carcasses are a biased indicator of cause of death. Criticisms of how the risk assessment used the necropsy data have implied that potential biases can only cause toxoplasmosis risk to be over-estimated, but this is incorrect. Scientists have identified four potential sources of bias. Of these, the most likely bias relates to the sex of the dolphins: toxoplasmosis is observed to mainly affect reproductive age females (this is true also in humans, in livestock, and in Hawaiian monk seals) but the dolphin risk assessment model treats both sexes equally. This suggests that the true risk from toxoplasmosis will be higher than what the model estimates. Of the other identified sources of potential bias, there is one that would cause the true risk to be higher

than the model estimates and two that would cause the true risk to be lower. Only an investment in further research can resolve these questions.

Relative toxoplasmosis exposure for different dolphin subpopulations was estimated based on spatial overlap with the dolphin distribution. The spatial distribution of toxoplasmosis was estimated based on cat population density, and a hydrological model of run-off carrying disease oocysts to the sea. The toxoplasmosis loading model relies on simplifying structural assumptions. A model applying similar assumptions has been shown to accurately predict toxoplasmosis exposure in California sea otters (for which toxoplasmosis is a major threat).

On this basis toxoplasmosis exposure is estimated to be many times higher for Māui dolphins (due to run-off from the Waikato River and from Manukau Harbour) than it is for Hector's dolphins.

There is a common misperception that if the risk assessment over-estimates the risk from toxoplasmosis then it will under-estimate the risk from commercial fishing. This is incorrect. Fisheries risk is estimated using fisheries observer data. The fisheries observer data are more reliable, and the fisheries risk estimates are more precise, than are the necropsy data on which the toxoplasmosis estimates are based. If toxoplasmosis risk were over-estimated, the unaccounted for deaths could only be explained by an increase in deaths assigned to other causes for which the estimates are uncertain, e.g. shark predation, other disease, or natural mortality. This would not affect the estimates of commercial fisheries risk.

1.4.7 Recreational set net fisheries risk

Recreational fishing is not observed by fisheries observers. Dolphin catchability in recreational set nets may be substantially higher than in commercial set nets, but there is no means of estimating recreational fisheries risk quantitatively inside the risk assessment model.

The relative (not absolute) risk from recreational fishing to each subpopulation can be estimated using data from recreational fisher surveys. In locations where recreational set net fishing is still permitted, it is possible that recreational fishing may account for a significant proportion of unaccounted for deaths; however, since the introduction of set net closures in 2001-2008, the only subpopulations still exposed to substantial recreational set net risk are in the North Coast South Island and within the 'transition zone' habitat in South Taranaki Bight. For other Hector's dolphin subpopulations, and for Māui dolphins, legal recreational fishing risk was has been largely eliminated. Risk from illegal fishing is unknown but is thought to be low in locations where set net fishing is banned.

Necropsy data from beachcast dolphin carcasses may provide a rough indication of the relative magnitude of recreational vs. commercial set net risk in the periods before and after spatial closures were put in place. In the period to 2006 (before most of the set net closures) 35.6% of beachcast carcasses were estimated to have died from net entanglement; more than half of these deaths were female dolphins. After 2007, only 11.2% of beachcast carcasses died from net entanglement and only a quarter of these deaths were females. This threefold reduction cannot be explained solely as a consequence of commercial fisheries risk, which only declined by approximately 30% between these periods. Recreational set net fishing can be

expected to have a disproportionate impact on females, because female dolphins aggregate very close to shore to raise their calves in summer months when most recreational set net activity occurs. It is likely that before set net closures were enacted, recreational set net fisheries were responsible for a substantial but unquantified level of risk to dolphins throughout their range.

Estimates of fisheries deaths and risk from the risk assessment do not include recreational set net risk, but proposed management options will eliminate recreational set netting in areas where it is still allowed.

1.4.8 Subpopulation-specific risk assessment outputs

1.4.8.1 West Coast North Island

Non-commercial-fishery threats

Recreational fisheries risk to Māui dolphins, which is likely to have been a major risk until 2001, has been mostly eliminated under existing measures except in the extreme northern tail of the dolphin distribution (north of Maunganui Bluff).

The risk assessment estimates that toxoplasmosis is the main human threat to Māui dolphins, causing from 1-3 deaths per year. This conclusion is inconsistent with the pre-existing consensus view and is criticised in many submissions, but is robust to plausible uncertainty, because even the lower 5th percentile of the toxoplasmosis estimate is roughly three times higher than the upper 95th percentile of the commercial fisheries risk (0.05 – 0.2 deaths per year). This remained true even under an extreme model sensitivity under which the estimate of shark predation was increased by a factor of ten.

As described above, sources of plausible bias in the estimation of toxoplasmosis risk are as likely to under-estimate as to over-estimate risk, in particular because toxoplasmosis appears to preferentially kill otherwise healthy reproductive-age females.

Commercial fisheries

The key source of uncertainty regarding fisheries risk in the west coast North Island (Māui dolphin) area arises from qualitative uncertainty in the estimation of the spatial distribution of the dolphins, especially in the low-density tails of the species distribution. Because most of the Māui dolphin distribution is already closed to set net fishing, further fisheries reduction can only occur by managing residual risk in low-dolphin-density locations, where the models estimate that dolphins may be present only very occasionally. Estimating rare events is always subject to uncertainty.

Because of its importance in the design of fisheries management measures, scientists spent considerable effort testing and comparing alternate means of estimating the spatial distribution and the implications for management advice. Officials have high confidence in these estimates because two different spatial models using independent data sets (a habitat preference model using the South Island aerial surveys, and a second model using North Island public sightings) produce very similar estimates.

The ‘base case’ (preferred) Māui distribution model uses the habitat preference model for all areas except inside harbours. This decision may produce a spatial bias by predicting that dolphin densities extend further south toward Pariokariwa Point than is estimated by the sightings based model, which estimates higher densities only as far south as Kawhia Harbour. The difference may reflect historical range contraction as the population declined; there is some evidence that historically Māui dolphins were spread evenly throughout the favourable habitat as far south as Pariokariwa Point, but in recent decades their distribution became more concentrated toward the northern end of their historical range. By choosing to use the full historical distribution rather than the more recent distribution, the base case risk model favours decisions that will protect favourable habitat and allow dolphins to recolonise these areas as the population expands. This is a precautionary bias.

Uncertainty relating to spatial distribution is described in Part B3 of the Technical Advice.

1.4.8.2 East Coast South Island

Risk assessment outputs on the east coast South Island are generally more certain than elsewhere. We can have high confidence that these estimates are accurate. This is because the population size and spatial distribution of the dolphins are well estimated, informed by abundant aerial survey data and good data layers for water turbidity and dolphin prey distributions.

Estimates of total commercial fishery deaths at the scale of the east coast South Island are likely to be highly reliable because overlap with fisheries occurs primarily in high-dolphin-density locations where the spatial distribution is well estimated. The estimates themselves are uncertain, but the uncertainty is reflected in the confidence intervals. There is no plausible mechanism by which the estimates are likely to be biased at this scale.

Uncertainty associated with differences in fishing gear affecting dolphin catchability is described in Part B4, and in Appendix 4B, of the Technical Advice.

The dolphin spatial distribution was validated by comparison with independent sightings data recorded by fisheries observers. Both the model and the observer sightings independently agree on the maximum offshore distance where dolphins occur in different locations. The distribution modelling was also shown to accurately predict the way dolphins will respond to water turbidity in real time, i.e. where ocean currents or river outflows produce temporary patterns of muddy water, the observed density of dolphins is higher within those temporary features. That the model can predict dolphin densities in real time, not just over long-term average conditions, gives us greater confidence in its accuracy.

Some critical submitters contend that patterns predicted by the spatial distribution model do not fit their observations or preconceptions. These submissions mostly refer to observations in the extreme inshore zone, and patterns that occur at smaller spatial scales than the model can fit to. For example, the model cannot predict whether dolphins are likely to be more abundant on one side or the other side of Akaroa Harbour, because the distances involved are within a single cell of the model. But patterns at this scale have very little effect on risk modelling, because the coastal zone is already closed to fishing. What matters for estimating fisheries risk is

the overlap with fishing, which depends on how far offshore the dolphins will go in different locations; at this scale the distribution modelling has been shown to be accurate.

Toxoplasmosis

Estimated toxoplasmosis risk to the east coast South Island subpopulation is relatively low (only one fourth as high as for Māui dolphins). The estimated number of toxoplasmosis deaths is still higher than the fisheries deaths, but the confidence intervals overlap, and long term population monitoring in the one location where data are available (around Banks Peninsula) is consistent with a roughly stable population size.

1.4.8.3 South Coast South Island

The risk assessment correctly predicts that the south coast of the South Island is not ideal habitat for Hector's and Māui dolphins. The area supports a small population of roughly 330 animals (estimated with high confidence by aerial survey in 2018). Interestingly, the model estimates that dolphins in this area face higher risk from shark predation than they do elsewhere.

Toxoplasmosis risk is relatively low in this area, similar to east coast South Island.

Recreational set net fisheries risk is estimated to be moderate since the imposition of the 4 nm set net closure.

Estimates of fisheries risk on the south coast South Island are more uncertain than elsewhere, in ways that cannot be reflected statistically in confidence intervals. This is because the dolphin distribution is likely to be poorly estimated in this area (because the model is missing a key spatial data layer relating to dolphin prey). The model predicts that dolphins are spread across the full length of the south coast, but local knowledge and the aerial survey suggest that dolphins are primarily found in Te Waewae Bay, with much lower numbers in other parts of the coast. To address this uncertainty, officials have estimated fisheries risk using different assumptions about the dolphins' distribution (described in Part B4 and Appendix 4D).

Commercial set net fishing effort in this area is spread widely, with no particular locations where overlap with dolphins is higher. Te Waewae Bay is closed to set net fishing.

In contrast, trawl fishing effort on the south coast is concentrated almost exclusively in Te Waewae Bay. If the dolphins are assumed to also occur almost exclusively in Te Waewae Bay, then the overlap with trawl fisheries will be high, and trawl fisheries risk will be high. If the dolphins are spread more widely, then trawl fisheries risk is very low.

Officials consider that the 'true' distribution is between these extremes, i.e. that the dolphins probably spend most of their time in Te Waewae Bay but also spread out more widely on a seasonal basis.

Regardless of the true dolphin distribution, it is possible that model estimates of trawl fishery deaths are biased high, because differences in catchability of dolphins by

trawl vessels operating low headline height and slow tow speed are not accounted for (see Part B4 and Appendix 4B).

That the model treats all inshore trawls as if they are the same means that it is possible that the true fisheries risk in Te Waewae Bay is already low to negligible, and closures in this area would unfairly penalise fishers who have already adopted restrictions to their trawl gear designed to reduce the risk to dolphins. Additional monitoring of the Te Waewae Bay trawl fleet would resolve this question.

1.4.8.4 North Coast South Island

Risk assessment estimates in north coast South Island are more uncertain than elsewhere because very little is known about the dolphins in this area. Sightings are rare and there is no official estimate of population size. Historically dolphins in this area have been considered to be transient, or a part of the east coast South Island or west coast South Island subpopulations, but recent evidence suggests there may be a small resident subpopulation. For purposes of this risk assessment, officials have treated the north coast South Island dolphins as if they are a separate subpopulation, but this is uncertain.

The risk assessment relies on estimated dolphin spatial distribution based on habitat suitability (using water turbidity and prey availability layers). The predicted distribution is consistent with public sightings, which increases our confidence in it, but estimates in areas of low relative dolphin density are always more uncertain than they are in areas where dolphins are more abundant. Essentially the whole of the north coast South Island can be regarded as a 'low density tail' of the spatial distribution relative to the east coast or west coast South Island, where spatial predictions will be more reliable. Further research to better understand the north coast South Island dolphin population is an identified priority under the TMP.

Toxoplasmosis risk to the north coast South Island subpopulation is relatively low. In absolute terms, toxoplasmosis deaths are estimated to be comparable to commercial fisheries deaths in this area, with overlapping confidence intervals.

Recreational set net fisheries risk is likely to be significant here. With the exception of the area between Wellington and Cape Egmont, the north coast South Island is the only remaining area of suitable dolphin habitat where recreational set net fishing has not been substantially restricted. Because there are no fishery observers for recreational set nets, risk estimates are relative between areas, not absolute. The risk assessment indicates that a dolphin in the north coast South Island area is roughly seven more times likely to die in a recreational set net than is a dolphin in the east coast South Island.

Note that because risk assessment estimates are based on the probability of death per individual dolphin, risk estimates do not require reliable estimates of population size. If the true population size is higher than the model believes then then number of deaths will be higher, and the population sustainability threshold will also be higher, but risk (which is proportional to the ratio between those two numbers) will be unaffected. For this reason, risk assessment estimates of fishery deaths expressed in absolute numbers for north coast South Island should be interpreted with caution, but conclusions about necessary levels of risk reduction to achieve population objectives can be considered reliable.

However estimates of commercial fisheries risk in north coast South Island are still somewhat more uncertain than elsewhere, due to uncertainty about the spatial distribution of the dolphins. It is likely that the distribution model over-estimates what proportion of the dolphins occur in far-offshore locations; if this is the case then protecting the nearshore locations will yield greater benefits than the model calculates.

1.5 Submissions Summary

Submissions on the Hector's and Māui dolphin TMP are polarised. In their analyses and critiques, they focus on the scientific framework that has underpinned the proposals in the TMP. The scientific framework includes the risk assessment and the Māui dolphin population models, as well as all the inputs that have gone into them and the outputs that they have produced (including estimates of death from each threat in different locations, which have guided the design of risk management proposals).

The submissions run the full spectrum of criticism from disagreeing with the scientific framework because they feel it purposefully over-represents toxoplasmosis risk and under-represents commercial fisheries risk, to disagreeing with the scientific framework because they feel it purposefully over-represents fisheries risk and under-represents toxoplasmosis risk.

Submissions are comprehensive and detailed in their critiques of the risk assessment. Broadly speaking, the critiques all refer to the risk assessment inadequately dealing with uncertain information that goes into the model, and thus producing erroneous estimates of risk (again, at both ends of a spectrum in terms of which results might be over or underestimated).

In many cases, the submitters appear to misunderstand the scientific methodology and results. Clarification where submitters have misunderstood and/or misinterpreted the scientific information is provided in the submissions response.

In some cases, the critiques in the submissions are fair, and the final advice highlights where this is the case and is transparent about the consequences of different kinds of uncertainty in the risk assessment.

1.5.1.1 In summary:

Some submissions reject the risk assessment (and therefore all analyses based on it) on the basis that it is not scientifically robust due to uncertainty in information that informed the model. Some submissions accepted the risk assessment in principle but still criticise its treatment of uncertainty and therefore the analyses based on it. Some submissions applauded the risk assessment for providing a robust scientific framework that improves our understanding of the threats facing Hector's and Māui dolphins.

Agencies acknowledge that there is some uncertainty associated with the risk assessment (described above). Statistical uncertainty does not undermine the risk assessment; statistical uncertainty is a key component of the risk assessment outputs. Statistical uncertainty results in answers that are less precise, but not less accurate. The statistical uncertainty itself is an important part of the answer. The

purpose of risk assessment is not to conceal uncertainty or limit decision makers to only using highly certain information; rather, risk assessments make the consequences of that uncertainty clear, so that Ministers can make informed decisions based on best available information.

In contrast, systematic bias would produce misleading answers; scientists and officials have worked to eliminate the potential for bias, or to ensure that bias favours precautionary decision-making (in favour of more protection for dolphins), and have outlined potential bias for decision makers' consideration. Decision-makers should keep the distinction between statistical uncertainty and bias in mind when considering the proposals in the final advice.

1.6 Key submission points and response

Comments made in submissions regarding the science were wide-ranging and detailed. They are broadly summarised under headings below.

1.6.1.1 Process for development and review of risk assessment

The process for developing and peer reviewing the risk assessment was a focus of many submissions. Some submissions applauded the efforts of agencies to involve a range of stakeholders in the development and review of the risk assessment. Some submissions suggested that the process for development of the risk assessment was inadequate and did not involve sufficient peer review of methodology or results (including submissions from the fishing industry, ENGOs, and university researchers).

In particular, a number of submissions suggested that some critical review of the risk assessment and subsequent recommendations were ignored. They also suggested that key components of the risk assessment were never critically reviewed, and thus should not be used to inform analyses.

Response

The risk assessment was commissioned by Fisheries New Zealand in close collaboration with the Department of Conservation and delivered by a team of independent and academic scientists led by NIWA, with data-sharing and collaboration from a number of New Zealand and overseas academic researchers. Only one New Zealand university declined the offer to collaborate with this group.

The risk assessment was reviewed via the Aquatic Environment Working Group, hosted by Fisheries New Zealand. The science working group process involves critical review at every stage, including methods design, selection and preparation of input data, analysis, and interpretation of results. The former Prime Minister's chief science advisor, Sir Peter Gluckman, has recognised and endorsed the Fisheries New Zealand science working group process as a model of good practice for peer review. The working group process is superior to normal academic peer review in which science is only subject to professional scrutiny after the analysis is complete and results are finalised.

Fisheries New Zealand science working groups are open to any stakeholder or member of the public who agrees to the standard terms of references. Consistent

members include: government scientists and managers from (at least) Fisheries New Zealand and the Department of Conservation; independent and academic scientists; iwi fisheries representatives; and representatives of stakeholder groups, including the fishing industry and eNGOs. Individual fishers, iwi, or other interested members of the public often attend particular meetings on a case by case basis.

The design, development, and delivery of the TMP risk assessment occurred over 18 months (from late 2017 to early 2019). The process involved multiple technical review meetings by the Aquatic Environment Working Group. In these meetings, the risk assessment's structural assumptions, methods, and input data were each independently reviewed and finalised before the model itself was assembled and run, to minimise the chance that any working group member could seek to bias the risk assessment outputs to achieve a particular outcome.

Independent risk assessment review panel

Fisheries New Zealand and DOC also commissioned an independent expert review workshop of the draft risk assessment (in July 2018) and incorporated reviewer suggestions to improve the risk assessment prior to its finalisation in early 2019. The conclusions and recommendations of the expert review panel have been widely mischaracterised by critics of the risk assessment and in the popular media. Several submissions make reference to the review, and criticise Fisheries New Zealand for failing to implement its recommendations. It is apparent that most if not all of these submissions reflect misinformation about the expert review report.

Most importantly, the expert panel supported the means by which the risk assessment model estimates commercial fisheries risk, and specifically wrote "*the panel is impressed by the representation of commercial fisheries uncertainty"*. The only specific recommendations from the panel about commercial fisheries risk was to adapt the method to better account for capture events in which more than one dolphin is killed, and to re-run the risk assessment at smaller (local) scales: these very useful recommendations were implemented before the risk assessment was finalised. Other recommendations referred only to estimating recreational fisheries risk (this recommendation was also actioned) or illegal fisheries risk (which is a compliance issue and cannot be managed by changing regulations under the TMP).

The panel also supported the approach of the spatial distribution modelling, and only provided recommendations for how to better represent spatial uncertainty (a challenging statistical problem using approaches that have not yet been developed).

Where the panel recommendations are most often referred to in submissions is with regards to the representation of toxoplasmosis risk. The panel recommended that the estimates of toxoplasmosis risk should not be 'over-sold' and suggested that the results be summarised but not presented graphically. But the panel did not recommend any changes to the means by which toxoplasmosis deaths were estimated.

The majority of the risk assessment review comments do not refer to the risk assessment methods or estimates; instead they identify priorities for future research (e.g. population monitoring and modelling) or make suggestions regarding appropriate management objectives. Some of these recommendations were adopted

(for example two separate population models were completed for Māui dolphins). Other recommendations are not possible with available data, and have been identified as priorities for future work.

Some submissions and popular media have criticised the process of the review itself, alleging lack of transparency. These are misinformation. When the expert panel delivered their review comments, the covering email read: “Also thanks for your hospitality and the openness of the meeting; I don’t know many people who would cheerfully put themselves under such scrutiny. It does say something very good about the way you all work.”

International Whaling Commission Scientific Committee review

The risk assessment was submitted to the International Whaling Commission Scientific Committee (IWC SC) in 2019. The IWC SC supported the general framework of the spatial risk assessment and the mathematical basis by which commercial fisheries risk was estimated, but did not seek to review the detailed methods and estimates. Instead the IWC SC recommended that the risk assessment be reviewed independently in the coming year and the review comments considered at the 2020 IWC SC meeting.

1.6.1.2 Estimating dolphin distribution and density

Dolphin distribution and density were estimated by the risk assessment and then used to inform risk estimates for different threats impacting on the dolphin populations.

Submissions suggest that there are fundamental errors in how dolphin distribution was estimated and how these estimates then translate through into risk outputs. Generally speaking, different submitters give conflicting opinions: some submitters suggest that methodological errors in the dolphin distribution modelling resulted in underestimates of fisheries risk, while others suggested that it resulted in overestimates of fisheries risk.

Response

In general, both of these positions will be incorrect. In most locations, changing the assumed distribution of the dolphins (within plausible bounds) will not change the total number of deaths; instead it will change the location in which those deaths are estimated to occur. This has major implications for the design of spatial management measures (and for which fishers are affected) but does not change the conclusion about how much risk is caused by fisheries.

The one area where this may not be true is for Māui dolphins: because a large proportion of the Māui dolphin habitat is already closed to fishing, changing the assumed spatial distribution may affect what proportion of the dolphins are already protected from fishing, and therefore affect the estimate of total fisheries risk.

Criticisms that stood out in submissions were:

- The spatial habitat model is a poor fit to the data.

- *Fisheries New Zealand response*: this is only true of very fine-scale patterns that are too small for the model to estimate (but that do not affect risk) or in the very low-density 'tails' of the dolphin distribution. In the latter instance, these shortfalls are identified in this paper (i.e. north coast South Island, south coast South Island, the extreme northern and south tails of the Māui distribution, and west coast North Island harbours)
- The spatial density estimates are not equally reliable in all locations; fisheries risk is overestimated in areas of low predicted dolphin density.
- *Fisheries New Zealand response*: This is a valid point for Māui dolphins, and is acknowledged in the final advice. For other subpopulations it is true that risk estimates are less certain in low-relative-density areas than in high-density areas, but the direction of any potential bias is unknown.
- Population estimates from the risk assessment do not align with published peer-reviewed population estimates.
- *Fisheries New Zealand response*: The risk assessment does not produce population estimates; it relies on estimates from other published sources as inputs. The assessment used the best available estimates, from comprehensive aerial surveys (South Island) or genetic census (Māui dolphins). The only published population estimates that are inconsistent with these use outdated information. Before the aerial surveys, the population size of Hector's dolphins was incorrectly estimated to be one fifth of its actual size.
- The habitat variables used to predict dolphin distribution were inadequate
- *Fisheries New Zealand response*: Scientists used every available habitat variable, and selected those that provided the best statistical fit to the data. Depth did not provide as much statistical power as turbidity. When choosing between different prey species data layers, scientists compared the distributions with independent sightings data to achieve the best match with spatial patterns, especially in low-density areas, where the design of spatial management measures is most critical.

In summary, agencies consider, and comparison with independent data sets confirms, that the dolphin spatial distribution is well estimated in 'core' population areas of each island. Uncertainty in low-density 'tails' of the distribution is described above, and the implications of this are outlined in detail at the subpopulation level, for decision makers to take into account in their considerations of options.

1.6.1.3 Fisheries risk: Estimating fishing effort and probability of capture in fisheries

Submitters had concerns about how the risk assessment estimated risk from fisheries and whether or not it was capable of estimating fisheries risk accurately. Concerns extended to the information that was input into the risk assessment, including fishing effort and observer coverage, as well as how potential assumptions affected the outputs.

In outlining concerns, submitters provided detailed critiques of the risk assessment methodology.

Additionally, as above, submissions were conflicting in their overall conclusions regarding the estimation of fisheries risk. Some submitters (ENGOs and some researchers) suggested that, for the reasons outlined in their critiques, fisheries risk was underestimated. Some submitters (generally the fishing industry) suggested

that, for the reasons outlined in their critiques, fisheries risk was overestimated (but these criticisms were focused primarily on the Māui dolphin estimates; at the scale of the whole subpopulation, the fishing industry did not appear to dispute the estimates for Hector's dolphins).

Response

The critiques highlight that there is considerable misunderstanding of how the risk assessment works, misinterpretation or representation of its methodology and assumptions, and general misunderstanding regarding fishing effort and observer coverage more broadly. (The previous sections outline the risk assessment methodology, including inputs, and how the risk assessment deals with uncertainty so that decision makers can understand the limitations of the risk assessment estimates and take appropriate caution where information remains uncertain.)

At the scale of whole subspecies, arguments that commercial fisheries risk has been mis-estimated are not supported. Fisheries New Zealand considers that fisheries risk is estimated with high accuracy, and statistical uncertainty has been represented accurately and propagated into confidence intervals (thus giving the Minister the power to choose high confidence in managing impacts of fishing). Qualitative uncertainty has been clearly described in the appropriate sections of this final advice so that decision makers can take appropriate caution on account of that uncertainty.

Where criticisms may have greater merit is at smaller scales, because differences in fishing gear (especially trawl gear configurations) may cause the model to over-estimate risk in some locations and under-estimate it in others. Potential consequences are discussed in the subpopulation-specific fisheries sections.

1.6.1.4 Toxoplasmosis risk: Estimating deaths from toxoplasmosis

Submissions provide conflicting feedback on estimated deaths from toxoplasmosis. Some submitters suggest that the estimates are erroneous because of assumptions made by the model. Some submitters consider that the risk from toxoplasmosis is robust and that the magnitude of the risk from toxoplasmosis should have been given much greater emphasis in the consultation material, especially for Māui dolphins.

Submitters are similarly polarised in their views on the value of attributing attention to the estimate of risk from toxoplasmosis. Some submitters think that toxoplasmosis was only included as a deliberate distraction from the fisheries risk; others think that toxoplasmosis was purposely underrepresented or ignored in the consultation material reflecting a predetermined motive to ban fisheries regardless of the true level of fisheries risk.

Response

The previous sections outline how the number of deaths attributed to toxoplasmosis was estimated and potential sources of bias associated with that estimate. Agencies consider that the estimates constitute best available information; they are uncertain, but the uncertainty is shown, and there is no justifiable logic by which they can only be assumed to be biased high and thereby discounted (as described above, they may be biased high or low).

Further, the estimate for toxoplasmosis risk is separate from the estimate for fisheries risk. The existence of risk from toxoplasmosis does not supersede the need to manage the impacts of fishing. The relative impact of toxoplasmosis and fishing are not uniform in space; in some locations toxoplasmosis is the greater threat, in other locations fisheries may be the greater threat. The impacts of each of these threats must be considered and managed, with reference to subpopulation-specific estimates. Both threats need to be managed if all subpopulations of Hector's and Māui dolphins are expected to thrive.

The risk assessment shows that toxoplasmosis is a substantial threat facing these dolphins and that in the case of Māui dolphins there may be urgency to act quickly. An investment in further research is required to reduce the large uncertainty, to inform the design of effective management responses, and ultimately reduce that risk. Fisheries risk is also still present, regardless of toxoplasmosis.

1.6.1.5 Implications of missing information

Submissions suggest that because estimates of deaths attributable to recreational fisheries and potential illegal fishing were not included in the quantitative analysis of cause of death, this means that risk will be underestimated for fisheries and overestimated for toxoplasmosis. With reference to commercial fisheries risk, this view is incorrect: commercial fisheries risk is estimated using fisheries observer data independently from and unaffected by estimates of death from other threats. With reference to toxoplasmosis, the effect of this omission will be very small because these estimates are based on necropsy results from beachcast dolphin carcasses from 2007 onward only, i.e. five years after extensive recreational set net bans were put in place off the west coast North Island, and a year prior to further recreational set net bans were put in place in the South Island.

These submitters appear to misunderstand how the risk assessment works, but they nonetheless raise a valid point, which is that recreational and illegal set net fisheries risk does not appear in risk assessment outputs. At the scale of each subspecies (Hector's and Māui) this omission will not cause estimates of total fisheries risk to be inaccurate, because recreational set net fishing has been banned since 2001 (off the west coast of the North Island) and 1998 and 2008 (around the South Island) in 'core' high-dolphin-density areas, and estimates of 'current' risk refer to average risk in the past three fishing seasons.

However, in locations where recreational set nets are still permitted, the recreational fishing risk to local dolphin populations may be high. This will be the case in north coast South Island (Golden and Tasman Bay) and in the southern zone of the west coast of the North Island (Cape Egmont to Wellington): in these two areas Ministers should bear in mind that recreational set net risk is not included in the quantitative estimates of fisheries deaths, and may be substantial.

As described above, where the inability to estimate recreational set net risk may produce a substantial bias is in the results of the Māui dolphin population models (not the risk assessment). This is because the population models use the full time series of population monitoring data from the 1990s, i.e. including the time during which recreational set-net impacts may have been high. If recreational set-net risk to Māui dolphins was high up until 2001 and eliminated thereafter, then population projections estimated by these models may be biased in a pessimistic way, because

the models assume that non-commercial-fisheries risk has been constant, and have no way of 'knowing' that a substantial part of that risk may have been eliminated in 2001.

1.6.1.6 Population outcomes do not provide a target population size or a timeframe for recovery of populations

Many submitters commented that the population outcomes were inadequate because they do not provide a target population size for rebuilding each Hector's and Māui dolphins to, nor do they provide a timeframe for recovery of the dolphin populations.

Response

It is not possible to specify population recovery targets or recovery timeframes, because currently there are no reliable estimates of the maximum number of dolphins the environment can support. Published estimates of historical population sizes are not based on observations or data; they are based on back-calculations from population models that were based originally on incorrect estimates of the Hector's dolphin population size. To illustrate, before the aerial surveys were conducted, some scientists estimated that if fisheries impacts were eliminated, the population might eventually recover to its carrying capacity of 15,000 animals. When the aerial surveys revealed that the population size was higher than 15,000 animals already, the published estimate of historical population size was revised upward to 50,000 animals. Empirical estimates of historical population size will require better understanding of historical threat levels; new research to address these questions is planned.

Because fisheries risk is estimated as a function of the probability of death per year per individual animal, it is not necessary to know what the current status of the population is to verify that impacts are low enough to allow recovery. If risk is low enough, then the population will recover to a level consistent with the population objective, at which point it will stop growing as the available habitat or resources to support more dolphins is reduced (i.e. when the environment is effectively 'full').

1.6.1.7 Other submission points

Other concerns raised in submissions included:

- Analysis does not account for shifting fishing effort, meaning that fishing risk will not be reduced because it will just move to another location.
- *Fisheries New Zealand Response*: In some cases, it will be feasible for fishers to move their effort and in some instances it will not be feasible. Spatial closures are designed so that displaced effort can only move from areas of higher dolphin density to areas of lower dolphin density; so if effort is displaced rather than eliminated, then risk will decrease, but how much it decreases by will depend on specific decisions by fishers which may be impossible to predict.
- Lack of information regarding population trajectories under different management options for Hector's and Māui dolphins.
- *Fisheries New Zealand Response*: Two population demographic models were commissioned and published for Māui dolphins. This is the only subpopulation where we have enough data to do population models. The only Hector's dolphin

population that has been monitored over enough time inform population modelling is around Banks Peninsula, but the data are held by academic researchers who declined to participate or share data with the research team working to inform the TMP.

- Separately, scientists produced a generic Hector's dolphin population model that allows us to simulate the effects of different impact levels on population trajectories. Population trajectories produced using this model were not included in the TMP consultation because the 'starting conditions' (current status) of the different dolphin subpopulations are not known. That is, if a subpopulation is already close to the maximum size that the environment will support, then the population will not grow, regardless of how we manage threats, whereas if the population is depleted to a level far below its carrying capacity, then we would expect it to increase quickly if threats are eliminated. But population status for Hector's dolphins is unknown; published population models asserting that Hector's dolphins are depleted are based on outdated estimates of catchability that may not have been updated to accurately reflect the much larger population size revealed by the aerial surveys. New research is planned to resolve these questions.
- Key threats not quantitatively accounted for, e.g. natural predation, climate change, seismic activity, etc.
- *Fisheries New Zealand Response*: Lethal threats were estimated using necropsy data, as described in the previous section. Shark predation is a major cause of death, and was estimated separately for different subpopulations, but managers do not seek to manage sources of natural mortality, which includes predation. Exposure levels to non-lethal threats were estimated spatially wherever possible (including detailed spatial modelling of underwater noise exposure from seismic testing and vessel traffic in west coast North Island) but the effects of different exposure levels on dolphins is unknown. Other threats such as the potential effects of terrestrial run-off, pollution, and climate change were summarised qualitatively.

APPENDIX 3A: WEST COAST NORTH ISLAND CONSULTATION OPTIONS AND SUBMISSION FEEDBACK AND ANALYSIS

1.1 Consultation options: Coastal set net closures and restrictions

Māui habitat zone	**Coastal Set Net Option 1 (*status quo*)**	**Coastal Set Net Option 2**	**Coastal Set Net Option 3**	**Coastal Set Net Option 4**
Cape Reinga to Maunganui Bluff *(northern tail of distribution)*	N/A	Put in place closure out to 4 nautical miles		
Maunganui Bluff to New Plymouth *(core + tail area of distribution)*	Current closure out to 7 nautical miles	Extend closure to 10 nautical miles	Extend closure to 12 Nautical miles	Extend closure to the 100 m depth contour
New Plymouth to Cape Egmont *(southern tail of distribution)*	Current closures out to 2 nautical miles Mandatory observer – commercial only between 2 and 7 nautical miles	Extend closure out to 7 nautical miles		

Southern habitat zone	**Coastal Set Net Option 1 (*status quo*)**	**Coastal Set Net Option 2**	**Coastal Set Net Option 3**	**Coastal Set Net Option 4**
Cape Egmont to Hawera *(South: potential habitat)*	Current closures out to 2 nautical miles Mandatory observer – commercial only between 2 and 7 nautical miles	Extend closure out to 7 nautical miles		
Hawera to Wellington *(South: potential habitat)*	N/A	Put in place closure out to 4 nautical miles		

For the Māui habitat zone, all three coastal set net options on their own are likely to reduce the overall residual risk to the dolphins to achieve the fisheries population objective for the Māui dolphin.

For the southern habitat zone, Options 2, 3 and 4 are the same and would remove the residual risk posed by all fishing activity to achieve the fisheries population objective. It also removes a likely barrier to dispersal or connectivity to the between sub-populations.

A summary of estimated impacts on commercial coastal set net fishers with respect to impacted landings and overall revenue is outlined in Table 1. The economic impact

tables utilise average catch data (from the last 10 years) and revenue-based export price estimates for species caught to estimate revenue from the affected areas.

Table 1: Estimated economic impact on commercial coastal set net fishers in the Māui and Southern habitat zones (combined) for each option[3]. A low and high estimate of the Total Economic Impact are shown for 3 and 5 years.

Main spatial difference of option within core distribution area	Coastal Set Net Option 2 (Offshore to 10 nm)	Coastal Set Net Option 3 (Offshore to 12 nm)	Coastal Set Net Option 4 (Offshore to 100 m depth contour)
Commercial sensitivity			
Quota stocks most affected (% of QMA landings[6])	41% SPO8, 9% SPO1 (*rig*), 22% BUT2 (*butterfish*), 19% WAR8 (*blue warehou*)	43% SPO8, 14% SPO1, 22% BUT2, 20% WAR8	56% WAR8, 45% SPO8, 39% SPO1, 22% BUT2, 16% SCH8 (*school shark*)
Estimate of total annual revenue	↓$1.69 mil	↓$1.90 mil	↓$2.90 mil
Total Economic Impact Year 1	↓$4.76 mil	↓$5.35 mil	↓$8.17 mil
Total Economic Impact 3 years	↓$8.18–13.49 mil	↓$9.19–15.15 mil	↓$14.05–23.16 mil
Total Economic Impact 5 years	↓$8.84–21.25 mil	↓$9.93–23.87 mil	↓$15.19–36.50 mil

[3] Estimated impact on the number of fishing permit holders, and percent of Quota Management Area (QMA) landings, is based on a three year data average from 2015/16 to 2017/18. Estimated impact on total annual revenue and total economic value are based on a 10 year data average from 2007/08 to 2016/17.
[4] Where sum of landings in the affected area, for each permit holder, is at least 1 tonne.
[5] Where sum of landings in the affected area, for each permit holder, is at least 1 tonne.
[6] Where landings are greater than 10 tonnes. Some stocks have a much larger portion of QMA landings affected but these represent much smaller tonnages.

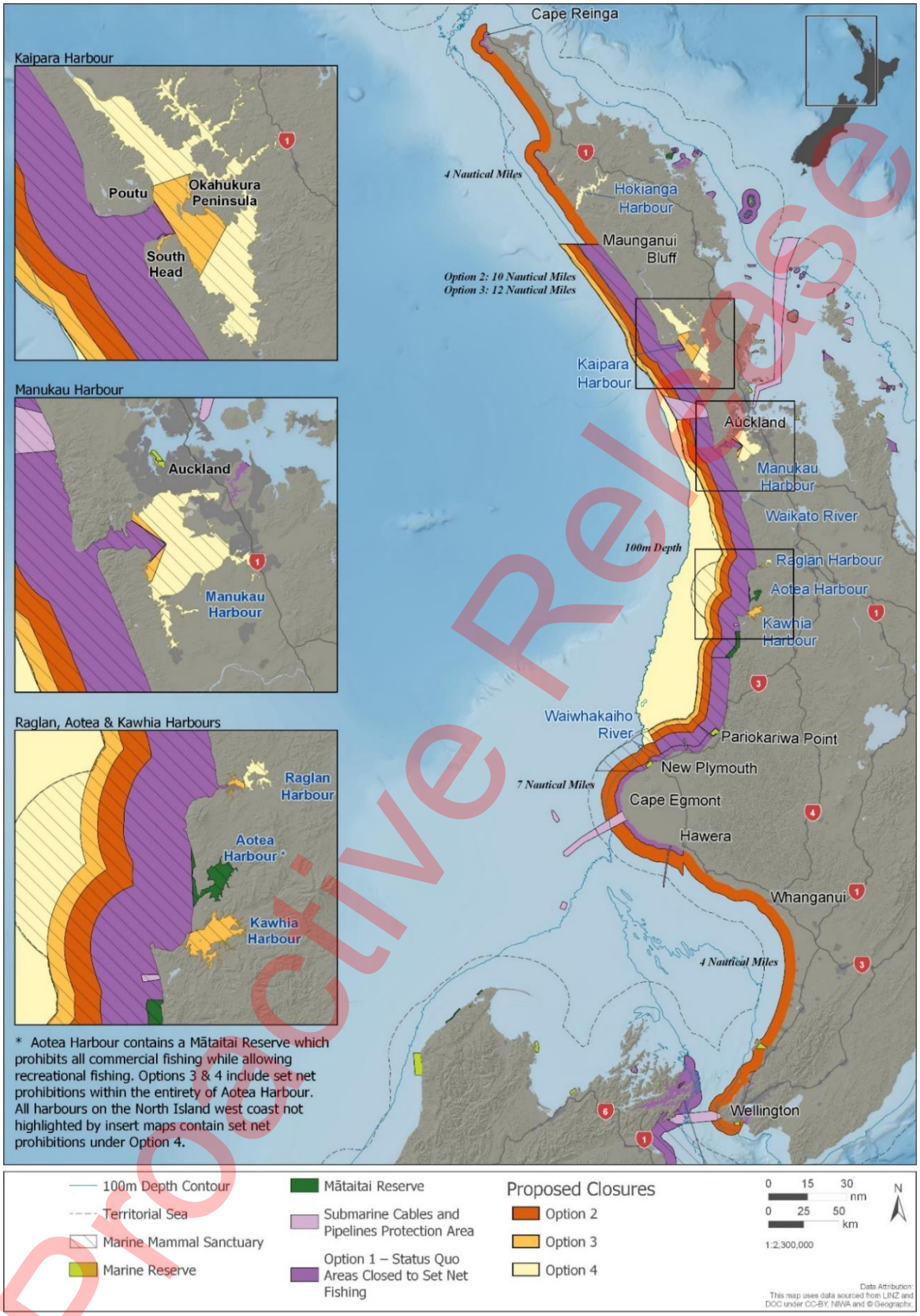


Figure 1: Proposed boundaries of commercial and recreational set net closures off the west coast of the North Island under the consultation options. Options are additive (i.e. Option 4 includes those areas identified under Option 2 and 3).

1.1.1.1 Coastal set net Option 1 (Status quo)

Submission comments

Overarching submission comments with respect to the *status quo* are summarised in Part B3.

Socio-economic impact on fishers

The primary socio-economic impacts associated with Option 1 are the costs associated with monitoring that will affect commercial set net fishers. Option 1 has the least amount of impact on annual fishing revenue received by ACE fishers and quota holders. There are no new impacts on recreational or customary fishers under this option.

Monitoring coverage

Fisheries New Zealand notes that the implementation of cameras on set net and trawl vessels off the west coast would not be complemented by 100% observer coverage. The existing observer coverage covers only a portion of set net fishing events across the Māui dolphin distribution.

The *Stage One* camera programme only covers selected set net and trawl vessels operating north of Whanganui, and will thus not deliver 100% certainty over fishery interactions with Māui dolphins. Although the camera programme will significantly improve the chance of observing any interaction with a Māui or Hector's dolphin, there remains a risk that a fishing-related mortality could be missed.

Estimated cost of observer programme between the Waiwhakaiho River and Hawera

The Government currently funds the mandatory observer coverage requirement around Taranaki. Fisheries New Zealand proposes that if you retain this mandatory observer coverage requirement, the costs are transferred to industry under the cost-recovery levy model as other observer coverage costs are charged.

Coverage Area	Number of vessels	Estimated effort monitored	Up-front costs	Annual costs
New Plymouth to Hawera: 2nm to 7nm	1	100% 117 days	N/A	$0.12 million

Fisheries New Zealand estimates the cost of the observer programme over a five year period to be approximately $0.62 million, but with a much narrower coverage area compared to the *Stage One* camera programme.

Fisheries New Zealand considers that the observer coverage component (as it relates to monitoring dolphin interactions) could be reduced, or possible removed, once there is confidence that the cameras can consistently detect interactions to the same level of accuracy as observers. This would require a regulatory change to remove the current mandatory observer coverage requirement around Taranaki.

Estimated cost of camera programme - Stage One[7]

Coverage Area	Number of vessels	Estimated effort monitored	Up-front costs	Annual costs
Fisheries Statistical Areas: 040, 041, 042, 045, 046	5	100% 429 days (449 events)	$0.15 million	$0.070 million

The estimated cost of enabling collection, review and storage of footage from set-netters in *Stage One* programme over a five year period is estimated to be approximately $0.50 million; substantially less than the current observer coverage costs and achieves higher levels of monitoring coverage, with four additional vessels and approximately 3.5 times the current monitored effort.

1.1.1.2 Coastal set net Option 2

Effectiveness

Māui habitat zone: Option 2 would reduce commercial fisheries risk sufficiently to achieve the proposed Māui population objective. Added to the existing closures, the measures under Option 2 would provide protection across approximately 81-92% of the estimated Māui dolphin distribution (based on differences in winter vs summer distribution).

Southern habitat zone: Options 2 provides more than enough reduction in residual risk to the dolphins from set net to achieve the population objective, and remove a potential barrier to dispersal or connectivity between sub-populations. The option removes the highest residual risk from recreational set net across all Hector's and Māui dolphin subpopulations. Approximately 46-77% of estimated dolphin distribution would be provided protection from set net (based on differences in winter vs summer distribution).

Submission comments

Commercial set net fishers impacted by the proposed closures believe the viability of their businesses would be at risk. The greatest concern relates to those that fish north of Maunganui Bluff, around Taranaki (between New Plymouth and Hawera), and along the Kāpiti coast to Wellington.

"Option 5 partners": Between New Plymouth and Cape Egmont, WWF recommends a four nautical mile closure to set nets (**only** if there is a clear transition plan for the affected fishers in this area). WWF also support a four nautical mile closure from Cape Egmont to Hawera, and from Hawera to Wellington. Sanford and Moana do not provide comment on the proposed measures south of Cape Egmont as they have focused on the Māui dolphin habitat where they both fish.

Between New Plymouth and Cape Egmont, Sanford Ltd. and Moana New Zealand, alone, recommend closure of set net out to seven nautical miles, but **only** if the Government "releases" snapper 8 (SNA 8) quota. The fishing partners commit to assisting in the transition process. WWF-New Zealand recommends a set net closure

[7] Cost estimates for camera monitoring are based on the cost of enabling collection, review and storage of footage. The estimated costs do not reflect the total cost associated with stage one cameras, as there are additional costs associated with the mandatory implementation of the programme under a crown funding (e.g. programme set-up, capital charge, depreciation).

to seven nautical miles, and that the Government provides a clear and effective transitional plan for all affected commercial set net fishers.

Butterfish exemption: A number of commercial fishers that operate in the southern habitat zone near Kāpiti and Wellington note that the proposed set net ban out to four nautical miles will significantly impact on their butterfish harvest, and put some of their operations at risk of survival. These fishers propose that you provide for an exemption to allow butterfish set netting to continue, similar to the exemption that exists for commercial butterfish fishers at the top of the east coast of the South Island. Their proposal is discussed in further detail in Section X for your consideration.

The NZ Council of Outdoor Recreational Associations submitted generically on dolphin management relative to recreational set netting for butterfish and moki. They consider there are few dolphins – if any – caught in recreational set nets. They also consider the nets are set in areas of rock and kelp, which is not dolphin habitat.

Socio-economic impact on fishers

Taranaki Industry

More detail on the potential impact of Option 2 came in submissions from the Taranaki fishing industry. Commercial sensitivity

Commercial sensitivity

Commercial sensitivity The loss of their business would have downstream effects on the local economy including restaurants, retailers, engineer and refrigeration specialists, fuel suppliers, freighting companies, and other suppliers.

Commercial sensitivity

Commercial sensitivity

These operators stress that the closures would significantly impact on their livelihoods, well-being and mental health. Most have only ever been involved in the fishing industry and the ability to transition to other methods is constrained by a number of factors (including available ACE for key species, quota holdings, current vessel configuration, and land-based storage facilities and equipment).

They consider Option 2 would:

- cause existing quota assets to be devalued as some species are unable to be caught with alternative fishing gear,

- mean existing land-based processing facilities (and equipment) would become worthless as there would insufficient landed fish to support their continued operation in the region, and
- mean existing set net vessels (and gear) unlikely to be able to be sold given overall fleet capacity in New Zealand's fisheries has continued to decline, and further set net restrictions mean they are unlikely to be purchased.

Butterfish fishers – Kāpiti to Wellington
Seven fishers that target butterfish along the Kāpiti and Wellington coast note that the proposed closures would significantly impact the viability of their businesses. The majority of these fishers note that they target butterfish seasonally to supplement their fishing income from other species and methods. Commercial sensitivity

Most of these submissions noted that there are limited opportunities to transfer their effort elsewhere to target the species due to the habitat where they are found (i.e. the rocky reefs that fringe this area of the coast). These are not fish that can simply be caught further offshore. Some of these fishers noted that they operate up to one nautical mile off the coast, while others noted their operations are much closer to shore in waters up to 8 metres in depth.

Monitoring coverage
Economic costs (currently borne by the Crown) associated with the mandatory observer coverage requirement around Taranaki would no longer be incurred because the area would be closed.

If those fishers significantly impacted by Option 2 chose to leave the industry, or transition to other gear, the annual costs associated with on-board cameras will be reduced, and are likely to be less than the estimated costs outlined in Option 1. As with Option 1 these costs will be borne by the Crown for at least the first year.

Non-commercial impact
A number of submissions note that there will be impacts on tangata whenua in terms of:

- those that fish recreationally,
- those who have commercial interests, and
- for iwi that have arrangements with commercial fishers to harvest on their behalf under customary permits (i.e. pātaka kai).

Te Kahui o Taranaki Trust note that since 2009 Taranaki iwi have operated pātaka systems with the support of Commercial sensitiv ty. They believe the proposals place the viability of these pātaka at risk by closing the main commercial fishing grounds. Since the pātaka were established, over 49 tonnes of fish has been harvested by commercial fishers (under customary permit) and distributed to around 2000 hui and tangi.

The proposed closures under Option 2 mean commercial fishers would be unable to fish commercially in the closed areas and may cease their operations entirely, or may

consider it uneconomical to travel to those areas to solely harvest for customary purposes. This would negatively impact on customary interests.

Te Ohu Kaimoana say the proposed measures will have a negative effect on the ability for kaitiaki to issue customary authorisations for set netting across the entire west coast of Te Ika a Māui. They say that while the proposed options do not prevent kaitiaki from issuing customary authorisations for fish caught using set nets, they believe it would create negative perceptions about customary fishing by those restricted from fishing in the area, and the general public. They consider the proposed closures prejudicial towards legitimate Māori customary practices.

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

Recreational set net fishers will be significantly affected within the proposed closure extensions in the areas to the north of Maunganui Bluff and to the south of Hawera where there are currently no restrictions on set netting.

North of Maunganui Bluff a number of areas in Ahipara Bay and Ninety Mile beach are popular for fishing. Methods vary and the degree to which set nets are used is unknown. Lining and the use of drag nets are likely more common methods among non-commercial fishers here.

Recreational fishers are considered unlikely to fish in the areas where the restrictions extend further offshore (anywhere beyond two nautical miles) as most are unlikely to be equipped to set net at those distances. Alternatively, for both recreational and customary interests, fishers may:

- incur additional costs if they choose to travel to other areas that remain open to the use of set net,
- switch to alternative fishing methods, and/or
- be displaced out of the fishery all together.

1.1.1.3 Coastal set net Option 3

Effectiveness

Māui habitat zone: Option 3 would reduce commercial fisheries risk sufficiently to achieve the proposed Māui population outcome, and provides a relatively small increase in risk reduction compared to Option 2. The option provides protection further offshore to cover all but one verified public-sighting off the coast near Manukau.

Southern habitat zone: Option 3 provides an equivalent reduction in risk as Option 2.

Submission comments

A small proportion of submissions (mostly from the general public) considered Option 3 a middle ground that better erred on the side of precaution for the dolphins than Option 2. Others supported Option 3 if there was financial support given to fishers to adapt to the extended restrictions.

Socio-economic impact on fishers

The estimated impact is a reduction in annual revenue of approximately $1.90 million; a difference of $207,000 compared to Option 2 that would be exclusively incurred by those fishers that operate offshore between Maunganui Bluff and New Plymouth.

Commercial sensitivity

Most coastal set net fishers consider the impacts of Option 2 to be significant enough to impact their ability to continue in business. Consequently, they note that Option 3 would firmly remove them from operations.

Monitoring coverage

Under Option 3, the only monitoring coverage of coastal set net fishers would be that captured by *Stage One* on-board cameras. However, Fisheries New Zealand estimates that the closures will likely result in some of the operators exiting the industry due to the low economic viability of their operation. This would likely result in a reduction in the number of set net vessels covered in stage one.

Non-commercial impact

The impact on non-commercial fishers is the same as discussed in Option 2.

1.1.1.4 Coastal set net Option 4

Effectiveness

Māui habitat zone: Option 4 would reduce commercial fisheries risk sufficiently to achieve the proposed Māui population outcome, but provides a small difference in risk reduction compared to Option 3.

Southern habitat zone: Option 4 provides an equivalent reduction in risk as Option 2.

Submission comments

The majority of submissions from eNGOs and the general public provided support for Option 4, or an extension of Option 4 to include a full set net prohibition out to the 100 m depth contour throughout the west coast of the North Island.

The submissions highlighted the:

- critically endangered status of the Māui dolphin, and their view on the need to use a precautionary approach to management,
- need to remove set nets, which represents 84% of commercial fisheries risk, and
- protection measures called for by the International Whaling Commission and the International Union for Conservation of Nature

"Option 5" submission: The joint Sanford Ltd, Moana Fisheries Ltd and WWF New Zealand submission notes that since October 2017 Sanford and Moana have stopped set net fishing between Maunganui Bluff and New Plymouth offshore to the 100 m depth contour. The companies also ceased all catch contracts with coastal set net fishers operating, north of New Plymouth out to the 100 m depth contour.

Sanford notes that their decision to observe the 100 m depth contour as a boundary was a precautionary approach, and if future data indicates this is unnecessary this boundary will be re-examined. WWF New Zealand asks that this voluntary measure

that Sanford and Moana have taken be made into regulation so as to apply to all fishers. WWF New Zealand also recommends the restriction be reviewed in 18 months in light of any new information provided by the Real Time Risk Reduction Measures proposed (discussed in Appendix 3b).

Socio-economic impact on fishers

Option 4 would have the greatest impact on coastal commercial set net fishers. The further offshore extension would result in a reduction in annual revenue of approximately $2.90 million; a difference of $1.00 million compared to Option 3 (and $1.21 million more than Option 2).

The revenue loss would be exclusively incurred by those fishers that operate offshore between Maunganui Bluff and New Plymouth Commercial sensitivity

Monitoring coverage

Fisheries New Zealand estimates there would be little need for monitoring coverage on coastal set net vessels in the Māui habitat zone under this option. The vessels expected to be included under *Stage One* are unlikely to continue to operate under this Option. Or if they operate it is likely to be in other areas.

Non-commercial

The impact on non-commercial fishers is the same as discussed in Option 2.

1.1.2 Consultation Options: Harbour Set Net Closures

Location	Harbour Set Net Option 1 and 2 (status quo)	Harbour Set Net Option 3	Harbour Set Net Option 4
Harbours	Existing closures in the entrances of the Kaipara, Manukau, Raglan, and Kawhia harbours.	Extension to closures (partial) within Kaipara, Manukau and Raglan harbours. Full closures of Kawhia harbour, Aotea (to recreational set net) (refer to map)	Full closure of all harbours: Herekino, Whangape, Hokianga, Kaipara, Manukau, Raglan, Aotea and Kawhia

A summary of estimated impacts on commercial harbour set net fishers with respect to impacted landings and overall revenue is outlined in Table 2.

Table 2. Estimated economic impact on commercial harbour set net fishers in the Māui habitat zone for each option.[8] A low and high estimate of the Total Economic Impact are shown for 3 and 5 years.

	Harbour Set Net Option 3	Harbour Set Net Option 4
Commercial sensitivity		
Quota stocks most affected (% of QMA landings[11])	15% PAR9 (*parore*) , 8% FLA1 (*flatfish*), 5% GMU1 (*grey mullet*)	65% PAR9 (*parore*), 34% FLA1, 25% GMU1
Total Annual Revenue Loss	↓$0.49 mil	↓$2.69 mil
Total Economic Impact – 1 Year	↓$1.39 mil	↓$7.59 mil
Total Economic Impact – 3 Year	↓$2.39–3.93 mil	↓$13.05–21.51 mil
Total Economic Impact – 5 Year	↓$2.58–6.20 mil	↓$14.11–33.90 mil

[8] Estimated impact on the number of fishing permit holders, and percent of Quota Management Area (QMA) landings, is based on a three year data average from 2015/16 to 2017/18. Estimated impact on total annual revenue and total economic value are based on a 10 year data average from 2007/08 to 2016/17.
[9] Where sum of landings in the affected area, for each permit holder, is at least 1 tonne.
[10] Where sum of landings in the affected area, for each permit holder, is at least 1 tonne.
[11] Where landings are greater than 10 tonnes. Some stocks have a much larger portion of QMA landings affected but these represent much smaller tonnages.

1.1.2.1 Harbour set net Option 1 (status quo) and Option 2

Effectiveness

Option 1 and 2 do not remove the fisheries risk to Māui or Hector's captures from set nets within the west coast North Island harbours. Submission comments

Submission comments with respect to the *status quo* are summarised in Part B3.

Socio-economic impact on fishers

There would be no new impact on customary, or recreational fishers.

1.1.2.2 Harbour set net Option 3

Effectiveness

Option 3 for harbour set net is insufficient on its own to reduce commercial fisheries risk to achieve the proposed Māui population outcome. The option provides protection further within the Kaipara to cover a 2010 verified public-sighting.

Submission comments

Most submissions from those involved in fishing in the harbours opposed any extension to the existing closure.

Commercial fishers that would be affected by the extension of closures into the Manukau and Kaipara felt the Government was steadily chipping away at their ability to make a living with little new information to support the proposed extensions. They question whether a single sighting is sufficient to warrant the scale of the extensions.

The Kawhia community was strongly opposed to a closure of the Kawhia and Aotea harbour. Fisheries New Zealand received a petition with 140 signatures from the community noting:

- the lack of consultation with the Kawhia community,
- a unanimous view of a community meeting that no changes be made to the existing regulations,
- that if implemented the government would be in breach of Crown Treaty of Waitangi obligations to preserve Maori traditional customary rights,
- the Crown failed to consult effectively with iwi, and
- that a set net ban within inner Kawhia harbour will severely harm the local economy.

A couple of Kawhia fishers noted that if their harbour was closed they would likely have to transfer their effort to Raglan harbour, which could cause new problems. They cited increased competition for space and increased fishing pressure in Raglan.

Socio-economic impact on fishers

This option would have a moderate impact on commercial harbour set net fishers. The further closures would result in a reduction in annual revenue of approximately $0.49 million. While the majority of this loss is likely to be derived from the extension in Manukau and Kaipara, the loss revenue is likely to be most felt by the commercial operators in Kawhia.

Non-commercial
Tangata whenua within Kawhia and Aotea harbours will be most impacted under this option, particularly as they operate as recreational fishers.

Recreational fishing would be prohibited in Kawhia harbour and Aotea harbour, and would limit any ability for recreational fishers to set net. They would have to travel to Raglan harbour, which is likely to increase overall pressure in that area.

While customary fishing could continue, Te Ohu Kaimoana note (as discussed for coastal set net) there would be negative perceptions about customary fishing continuing by those restricted from fishing in the area, and the general public. They consider the proposed closures prejudicial towards legitimate Māori customary practices.

1.1.2.3 Harbour set net Option 4

Effectiveness
The removal of set net activity in all the west coast North Island harbours is estimated to be sufficient to achieve the overall fisheries objective.

Submission comments
The majority of submissions received in support of a complete ban on set net and trawl activity out to the 100 m depth contour were also in support of a complete ban on set net activity in all west coast North Island harbours.

Conversely, most submissions received on behalf of commercial and recreational fishers argue that the removal of set net activity in the harbours is not necessary, and that existing restrictions could be removed in some cases.

Commercial fishers in the harbours note that much of their catch can only be harvested at an economic scale using set nets. They state there simply aren't alternatives for them to harvest species like flounder, and mullet at scale.

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

The full closures of the harbours would result in a reduction in annual revenue of approximately $2.69 million. While the majority of this loss comes from the ban in Manukau and Kaipara, the loss revenue would significantly impact the few commercial fishers that operate in the other five harbours. Commercial sensitivity

Commercial harbour fishers submit that the closure of the harbours are likely to put many of them out of business. They note they are small operations that largely supply the local market (e.g. Auckland Fish Market, local supermarkets and restaurants, and their own fish and chip shops). They consider the loss of these fisheries leaves them with little alternative as other areas in the Hauraki Gulf are already subject to high

degrees of fishing pressure. They note that shifting their effort would increase competition with other commercial and recreational fishers, likely resulting in conflict. They also consider the removal of fish in these other areas would be unsustainable and cause localised depletion.

A number of commercial operators noted that they have been investing in gear to support the new electronic reporting requirements, which has been a significant financial cost and to remove them from the area means these costs were for nothing.

As with Option 3, the effects on tangata whenua are likely to be significant and restrict them to other methods when they recreationally fish, or incur negative perceptions about exercising their customary right using an otherwise prohibited method.

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

Fisheries New Zealand notes that drag netting, while an available alternative for recreational fishers is a prohibited method in the harbours for commercial fishers. A number of commercial fishers also raised concerns about the use of drag nets by recreational fishers. They consider these nets are easily lost, particularly by those recreational fishers that are inexperienced, and can get caught in rips. When the nets are lost they pose a risk as ghost fishing gear to a range of marine life, including Māui and/or Hector's dolphins that may enter the harbours, or are near the harbour entrances.

1.1.3 Consultation Options: Trawl closures

Māui habitat zone	Trawl Option 1 (*status quo*)	Trawl Option 2	Trawl Option 3	Trawl Option 4
Cape Reinga to Maunganui Bluff *(northern tail of distribution)*	Existing closure to 1 nautical mile	Existing closure to 1 nautical mile	Extend closure to 2 nautical miles	
Maunganui Bluff to New Plymouth *(core + tail of distribution)*	Closure varies between 2 and 4 nautical miles	Extend closure to 4 nautical miles	Extend closure to 10 nautical miles	Extend closure to the 100 m depth contour
New Plymouth to Cape Egmont *(southern tail of distribution)*	N/A	N/A	Put in place closure to 4 nautical miles	

Southern habitat zone	Trawl Option 1 (*status quo*)	Trawl Option 2	Trawl Option 3	Trawl Option 4
Cape Egmont to Hawera *(South: potential habitat)*	N/A	N/A	Put in place closure to 4 nautical miles	
Hawera to Wellington *(South: potential habitat)*	N/A	N/A	Put in place closure to 4 nautical miles	

For the Māui habitat zone, only trawl Option 3 and 4 are likely to reduce the overall residual risk to the dolphins to achieve the fisheries population objective for the Māui dolphin.

For the southern habitat zone, Options 3 and 4 are the same. Because the residual risk from trawl is so low in this area, the options would not (on their own) achieve the fisheries population objective.

A summary of estimated impacts of each option on commercial trawl fishers is outlined in Table 3

Table 3. Estimated economic impact on commercial trawl fishers. Estimated economic impact on trawl fishers in the Māui and Southern habitat zones (combined) for each option.[12] A low and high estimate of the Total Economic Impact are shown for 3 and 5 years.

Main spatial difference of option within core distribution area	**Trawl Option 2 (Out to 4 nm)**	**Trawl Option 3 (Out to 10 nm)**	**Trawl Option 4 (Out to 100m depth contour)**
Commercial sensitivity			
Quota stocks most affected (% of QMA landings[15])	7% GUR1 (*gurnard*); 5% SNA8 (*snapper*), 4% TRE7 (*trevally*) and KAH8 (*kahawai*)	25% TRE7, 27% SNA8, 20% GUR8 and 25% GUR1	45% GUR8, 42% SNA8, 36% TRE7, 34% KAH8, and 32% GUR1
Total Annual Revenue Loss[16]	↓$1.9 mil	↓$8.8 mil	↓$12.5 mil
Total Economic Impact – 1 Year	↓$5.4 mil	↓$24.8 mil	↓$35.2 mil
Total Economic Impact – 3 Year	↓$9.3–15.3 mil	↓$42.7–70.3 mil	↓$60.6–99.8 mil
Total Economic Impact – 5 Year	↓$10.0–24.1 mil	↓$46.1–110.8 mil	↓$65.5–157.3 mil

[12] Estimated impact on the number of fishing permit holders, and percent of Quota Management Area (QMA) landings, is based on a three year data average from 2015/16 to 2017/18. Estimated impact on total annual revenue and total economic value are based on a 10 year data average from 2007/08 to 2016/17.
[13] Where sum of landings in the affected area, for each permit holder, is at least 1 tonne.
[14] Where sum of landings in the affected area, for each permit holder, is at least 1 tonne.
[15] Where landings are greater than 10 tonnes. Some stocks have a much larger portion of QMA landings affected but these represent much smaller tonnages.
[16] Total Annual Revenue estimates have been derived from a 10-year data – 2007 to 2017 to smooth out variations in inter-annual catches that could impact revenue estimates.

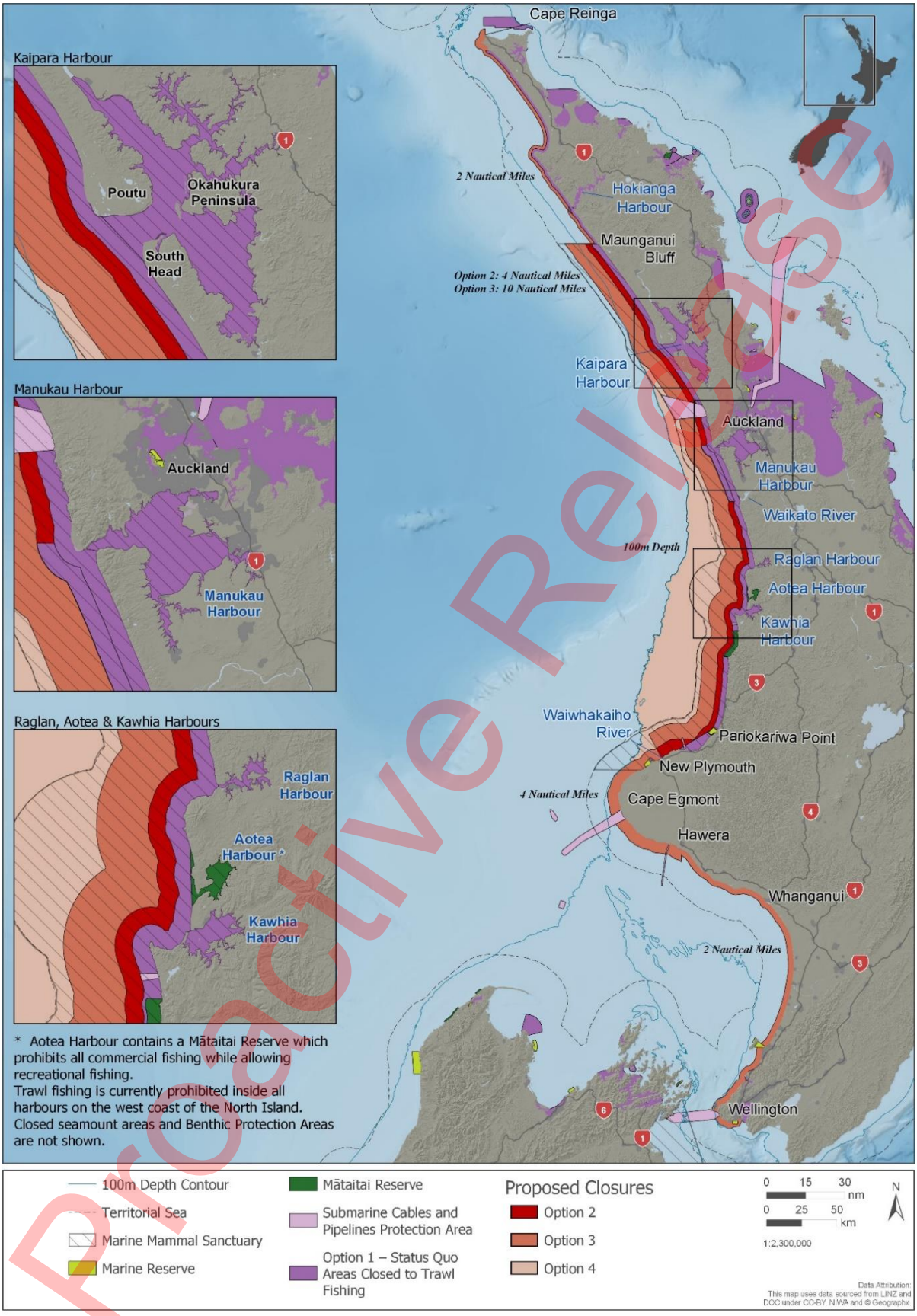


Figure 2. Proposed boundaries of commercial trawl restrictions off the west coast of the North Island under the consultation options.

1.1.3.1 *Trawl Option 1 (Status quo)*

Effectiveness

Māui habitat zone: Trawl Option 1 (refer Figure 2) does not remove any residual risk from trawling to the Māui dolphin population. The existing trawl closures cover approximately 34% of the estimated Māui dolphin distribution.

Southern habitat zone: Trawl Option 1 does not remove any residual risk from trawling. Only 2% of estimated (potential) dolphin distribution has any protection from trawling.

Socio-economic impact on fishers

The primary socio-economic impacts associated with Option 1 are the costs associated with monitoring that will affect trawl fishers. Option 1 has the least amount of impact on annual fishing revenue received by ACE fishers and quota holders. There are no new impacts on recreational or customary fishers under this option.

Monitoring costs

As noted under Option 1 for coastal set net, the implementation of cameras on set net and trawl vessels off the west coast would not be complemented by 100% observer coverage. The existing observer coverage in place covers only a portion of trawl fishing events across the Māui dolphin distribution.

The *Stage One* camera programme only applies to selected trawl vessels and will not deliver 100% certainty over fishery interactions with Māui dolphins. Although the camera programme will significantly improve the chance of observing any interaction with a Māui or Hector's dolphin, there remains a risk that a fishing-related mortality could be missed.

Option 1 monitoring costs will be in part funded by Government (up-front costs associated with the *Stage One* camera programme, and the annual costs for at least the first year) and observer coverage (if continued) would be funded via the cost recovery levy process, which are incurred by those that hold quota on the fishstocks in the area.

Estimated cost of Stage One on-board camera programme[17]

Coverage Area	Number of vessels	Estimated effort monitored	Up-front costs	Annual costs
Fisheries Statistical Areas: 040, 041, 042, 045, 046	15	100% 1157 days (2686 events)	$0.443 million	$0.306 million

Estimated cost of observer programme within core distribution

Observer coverage would provide much narrower coverage area compared to the camera programme.

Coverage Area	Number of vessels	Estimated effort monitored	Up-front costs	Annual costs

[17] Cost estimates for camera monitoring are based on the cost of enabling collection, review and storage of footage. The estimated costs do not reflect the total cost associated with stage one cameras, as there are additional costs associated with the mandatory implementation of the programme under crown funding (e.g. programme set-up, capital charge, depreciation).

Maunganui Bluff to Pariokariwa Point: offshore to 7nm	7	100% 337 days (997 events)	N/A	$0.357 million

1.1.3.2 Trawl Option 2

Effectiveness

Māui habitat zone: Option 2 is insufficient on its own to reduce commercial fisheries risk to achieve the proposed Māui population outcome.

Southern habitat zone: The overall risk from trawl is negligible (< 2 percent) as a portion of combined fisheries risk (set net and trawl), and on its own this option is insufficient to achieve the proposed population outcome for the southern habitat zone. Approximately 23-54% of estimated dolphin distribution would be protected from trawl (based on differences in winter vs summer distribution).

Submission comments

Option 2 for trawl was supported by some submissions including the New Zealand Sport Fishing Council. They considered trawl risk should be further reduced in the 'core' Māui dolphin area given the high consequence to the population should a death occur.

Conversely, the commercial fishers most directly impacted by the proposal that fish out of Raglan considered any further trawl restriction (Option 2 or beyond) would force them out to deeper water and prevent them from being able to target the most available and productive gurnard fishing grounds. As noted under Option 1, they consider that their operations pose little to no risk to the dolphins and further restrictions are not required.

Fisheries Inshore New Zealand considers that mitigation options, rather than closures, could be used to further reduce risk from trawl. They suggest that the use of the PSH gear, a dolphin deterrent device, and lesser powered vessels would provide suitable mitigation.

Socio-economic impact on fishers

Commercial sensitivity are expected to have more than 10% of their annual landings impacted by the closure, four of those significantly (≥25% of annual landings). The majority of the operators most significantly impacted fish out of Commercial sensitivity They note that show the closure go ahead their ability to adapt and fish beyond four nautical miles is significantly constrained by available ACE for SNA8. They currently focus their effort within the four nautical mile area because they target gurnard and are largely able to avoid snapper bycatch.

Commercial sensitivity

a revenue of over $2.4 million being lost. sensitivity

Monitoring coverage

Economic costs currently associated with the targeted observer coverage between Maunganui Bluff and Pariokariwa Point would likely reduce under Option 2, Commercial sensitivity These costs are recovered by the cost recovery levy process and incurred by those quota holders for relevant fishstocks in the area.

If those fishers significantly impacted by Option 2 chose to leave the industry, or transition to other gear, the estimated annual costs associated with *Stage One* cameras will be reduced, and are likely to be lower than those outlined in Option 1. However, the initial up-front hardware and installation costs will already have been incurred and borne by Government.

1.1.3.3 Trawl Option 3

Effectiveness

Māui habitat zone: Option 3 would reduce commercial fisheries risk sufficiently to achieve the proposed Māui population outcome.

Southern habitat zone: Option 3 provides the same reduction in residual risk to the dolphins as outlined in Option 2.

Submission comments

The few submissions that supported Option 3 provided little comment with respect to the rationale for the extended closures for trawling.

Socio-economic impact on fishers

Fisheries Inshore New Zealand considers that if the closures extend further beyond four nautical miles between Maunganui Bluff and New Plymouth (i.e Option 2) than the value of revenue lost to New Zealand will increase significantly as large catches of snapper, gurnard, trevally and john dory are lost. Commercial sensitivity

1.1.3.4 Trawl Option 4

Effectiveness

Māui habitat zone: Option 4 would reduce commercial fisheries risk sufficiently to achieve the proposed Māui population outcome. However, the reduction in residual risk gained from this proposed extension (in comparison to Option 3) is negligible.

Southern habitat zone: Option 3 provides the same reduction in residual risk to the dolphins as outlined in Option 2.

Submission comments

The majority of submissions received in support of Option 4 expressed a desire to see the proposed measures taken even further to include a full trawl prohibition out to the 100 m depth contour through the west coast of the North Island.

There was no support for Option 4 from commercial fishing interests.

Jack mackerel fishery: The Deepwater Group Ltd noted the proposed closures would overlap with large jack mackerel effort in fisheries statistical area 041, northwest of New Plymouth and south of Kawhia. This area is the only place with the 100 m depth contour extends beyond the regulatory closures for large trawlers (>46 m length overall). These closures restrict vessels of this size to operate beyond 20 nautical miles. The Deepwater Group Ltd does not accept that trawling by these vessels poses any risk to Hector's and Māui dolphins. They note that from 2008-09 to 2017-18 there was 43% observer coverage on all tows in the areas proposed to be closed under Option 4, and in the last six years it has been 74%. In that time there has never been a single sighting or capture of a Māui or Hector's dolphin. The option would have a significant impact on the property rights of commercial fishing and treaty settlement quota owners, as well as flow on to the vessel operators.

The Deepwater Group and Fisheries Inshore New Zealand also highlight the use of dolphin deterrent devices that have reduced common dolphin captures from over 102 per year down to virtually zero. Fisheries Inshore New Zealand suggests that initial trials show they are equally effective for Māui and Hector's dolphins.

Non-commercial fishing interests gave limited support for such an extensive ban on trawling. Those that did support Option 4 considered the overall risk to Māui dolphins too great, and the impacts of trawl on other parts of the ecosystem (e.g. benthic impacts, fish stocks as a prey for the dolphins) needed to be addressed to support the dolphin population.

Other non-fishing interests also opposed Option 4, but on the basis that it did not go far enough to protect the dolphins. The majority of public and form submissions, all ENGO petitions, most ENGOs, and a few academics all sought protection measures that extended out to the 100 m depth contour along the entire west coast.

Socio-economic impact on fishers

Option 4 would have the greatest economic impact on annual revenue of trawl fishers and associated direct/indirect losses to those supported by the fishery, and represents the greatest economic impact to the commercial fishery overall (e.g. compared to Option 4 for coastal and harbour set net combined).

The most significant catch values impacted within the inshore trawl fishery are SNA8 and TRE7 (~$8.3 million in annual revenue). Notwithstanding, the proposed closure would also impact approximately 5% of the deepwater jack mackerel landings (JMA7) or $0.64 million. Fisheries Inshore New Zealand estimates that revenue losses over $11 million would be incurred and economic losses over of $30 million incurred.

APPENDIX 3B: WEST COAST NORTH ISLAND - ALTERNATIVE MANAGEMENT OPTIONS PROPOSED IN SUBMISSIONS

1.1 "Option 5" – Sanford Ltd/Moana New Zealand/WWF-New Zealand

The Option 5 partners put forward a range of proposals within their submission to address the risk of a fishing-related mortality to Māui dolphins. The following summarises key points of their submission under three categories: risk removal, real-time risk reduction, and dolphin-safe gear.

1.1.1 Method prohibition – risk removal

Harbours: The partners agree to a partial extension of set net closures in the Kaipara and Manukau harbours. This is equivalent to a scaled back consultation Option 3 for harbour set net, and is also reflected in Set Net Package 3 above.

WWF-New Zealand alone recommends the commercial set net closure in Aotea Harbour (due to the mātaitai reserve in place) be extended to include the recreational fishing sector.

Coastal set net: Sanford and Moana have already committed to coastal set net restrictions between Maunganui Bluff and New Plymouth out to the 100 m depth contour. They have:

- stopped coastal set netting in the area since October 2017,
- stopped all catch contracts with coastal set netters,
- stopped accepting fish from vessels engaging in coastal set netting,
- supported several fishers to transition away from coastal set netting (by providing them additional catching rights in key choke species), and
- have given advice and support to fishers.

WWF-New Zealand recommends making these restrictions a regulation. This is equivalent to part of Option 4 for coastal set net with respect to the 'core + tail distribution' area of Māui dolphins.

Taranaki set net: Sanford and Moana alone recommend a closure of set net between New Plymouth and Cape Egmont out to seven nautical miles, but **only** if the Government releases snapper 8 (SNA 8) quota. The fishing partners commit to assisting in the transition process.

WWF-New Zealand recommends closures to seven nautical miles for set nets and that the Government provides a clear and effective transitional plan for all affected commercial set net fishers.

This set net prohibition area (out to seven nautical mile) is equivalent to the area proposed in Set Net Package 2 and 3 above.

Southern habitat zone set net: WWF alone recommends a four nautical mile closure to set nets:

- Cape Egmont to Hawera, and

- from Hawera to Wellington.

Sanford and Moana do not provide comment on the proposed measures south of Cape Egmont as they have focused on the Māui dolphin habitat where they both fish.

Trawling: Sanford and Moana recommend a restriction of trawling to beyond four nautical miles between Maunganui Bluff and New Plymouth (equivalent to Trawl Package 2 discussed above). Conversely, WWF-New Zealand recommends a trawling restriction to beyond seven nautical miles (a more conservative offshore boundary than what was consulted on, and equivalent to what is proposed in Trawl Package 3 above).

Under all risk removal proposals the partners recommend a defined trigger for review of spatial protection in the case of any new significant data (as informed by a risk assessment by the regulator) or by 18 months, whichever comes first.

1.1.2 Real Time Risk Reduction Management Measures

These measures include:

- Ongoing/introduced 100% VMS coverage and 100% observation (via e-monitoring or human observation),
- A real-time sightings notification system to be developed by January 2020 so that the fleet receives real time notifications of sightings as they occur (from any credible source),
- Development of a "move-on" rule in the event
    - a Māui or Hector's dolphin is seen/detected by a fisher, observer or other credible source, and/or
    - the fisher receives that information directly or via a notification from the real-time sightings notification system.
- Emergency trigger points in the event of a capture that results in an immediate temporary closure.

The Option 5 partners have agreed on a protocol should a capture occur. The proposed protocol would require all Sanford and Moana vessels to immediately cease fishing within a 10 nautical miles radius of the incident for 30 days, and cooperate with the regulator's investigation of the incident. They recommend a trigger be developed for urgent review of the spatial protections in the case of any significant new data.

1.1.3 Dolphin-safe gear modifications and other innovation

Moana and Sanford note they are transitioning away from conventional trawl, and are committed to investing in dolphin avoidance and/or mitigation measures to confidently avoid harm to dolphins. They state the work being undertaken is being reviewed by an independent science management panel, and that MPI is involved in appointing in the panel.

The Option 5 partners also note they are engaged and working collaboratively on a range of innovative tools, such as:

- Real-time underwater cameras,
- Dolphin dissuader and dolphin interactive devices,

- Non-invasive tagging programs
- Satellite tracking, and
- Aerial drone technology and thermal imagery.

1.1.4 Fisheries New Zealand response

Risk removal: Fisheries New Zealand has noted within the consultation options analyses how the Option 5 risk removal components align or otherwise. Portions of their proposal align with parts of:

- Consultation Option 4 coastal set net between Maunganui Bluff to New Plymouth,
- Consultation Option 2, 3 and 4 for coastal set net between New Plymouth to Cape Egmont (if transitional support is provided),
    - Set Net Package 2 and 3
- Option 3 harbour set net
    - Set Net Package 3, and
- Option 2 for trawl
    - Trawl Package 1 and 2.

We acknowledge that the Option 5 partners have worked collaboratively to identify some middle ground where action could be taken to protect the dolphins, while enabling some commercial fishing to continue.

Real time risk reduction management measures: The proposed development of real time risk reduction management measures has potential. We note the suggestion of a "move on" rule should a dolphin be seen/detected. This voluntary move-on rule would be agreed to by industry. Move-on rules currently apply elsewhere in fisheries management responses (e.g. snapper 1). Fisheries New Zealand considers that voluntary move-on rules are a good code of practice, but monitoring its effectiveness with respect to dolphin avoidance is likely to require observer coverage rather than the use of on-board cameras. There are other practical constraints that also need to be acknowledged:

- Resource constraints would prevent deployment of observers across all set net and trawl vessels operating in the estimated Māui dolphin distribution area.
- Since 2014, even with the high levels of observer coverage on trawl vessels in the area where a Māui dolphin would most likely be seen, there has only been one sighting of a Māui or Hector's dolphin. That sighting occurred while the vessel was in transit in an area closed to fishing.

Further work would be required to assess appropriate "trigger" levels and response should a capture occur. We note that a proposed trigger mechanism would require 100% monitoring of all methods that may cause a death of a Māui dolphin. The *Stage One* on-board camera programme may provide for this once there is confidence that the programme is as reliable as the use of an observer to detect a dolphin interaction across methods.

Setting a regulatory trigger (i.e. a fishing-related mortality limit) would require statutory consultation to identify the bounds a trigger would apply to, the duration of a subsequent closure, where a closure may apply, and to whom. A voluntary trigger would also require further discussions with stakeholders, but could be developed

outside of the regulatory framework. However, with a proposed population sustainability threshold of only 0.14 dolphin deaths per year, by the time a death is observed the PST is already exceeded on a multi-year basis, and it is not clear what subsequent action would occur.

Dolphin-safe gear modifications and other innovative tools: Testing the effectiveness of dolphin-safe gear in Māui dolphin habitat is generally not supported given it is a critically endangered population with very low numbers. Fisheries New Zealand also notes that testing "effectiveness" of such gear would likely be both cost and time prohibitive in the Māui dolphin zone. The low likelihood of a trawl interaction and/or a sighting in this area means it would not be feasible to obtain statistically meaningful estimates of the effect of any such measures based on observations in the Māui habitat zone, noting that even under status quo management, the risk assessment currently estimates less than one observable trawl capture event per 100 years.

- a gear modification sufficiently reduced risk, or
- a lack of interaction is simply due to the fact the likelihood of interaction is so low to begin with.

Nonetheless, proposed gear modification that may reduce risk could be tested within areas of the South Island where the likelihood of an interaction with a Hector's dolphin is much greater (e.g. Pegasus Bay, Timaru, or Te WaeWae Bay). Such research may enable transfer of those lessons to the west coast of the North Island if shown to be effective.

Fisheries New Zealand has not yet been approached to assist in appointing an independent science management panel to review dolphin avoidance and/or mitigation measures. We look forward to working collaboratively with Option 5 partners, tangata whenua and other stakeholders in identifying and reviewing the effectiveness of any tools that could be used to reduce fisheries risk to the dolphins.

Fisheries New Zealand is very keen to explore the use of aerial drone technology and thermal imagery, for example, to help improve our understanding of the Māui dolphin population and its distribution and habitat use. By improving our knowledge on the spatial distribution of the dolphins, and how that changes between seasons, or to improve information on population size and calving rates (in between the 5 yearly genetic census), we can improve our assessment of where risk occurs and refine management measures accordingly.

1.2 Butterfish exemption from proposed coastal set net restrictions

1.2.1 Proposal

As discussed under package proposals (Part B3), a number of commercial fishers that operate in the southern habitat zone near Kāpiti and Wellington highlighted that the proposed set net ban out to four nautical miles between Hawera and Wellington would significantly impact on their commercial operations.

They have asked that you consider an exemption to allow butterfish fishing with set net to continue in the southern area from Hawera to Wellington.

1.2.2 Rationale

The submissions provide a range of information for you to consider in deciding whether to provide for an exemption to allow butterfish set netting to continue. The fishers consider that given previous Ministers have exempt targeted fishing for butterfish at the top of the east coast of the South Island (following legal challenge) that the same rationale should be applied here.

The fishers all note that they have never seen a Māui or Hector's dolphin in the areas they fish (some having fished in the area for 40+ years). They fish in areas close to shore where the water is clear and the habitat is rocky reef as opposed to turbid waters Hector's and Māui dolphins seem to prefer.

They also describe their use of set nets as different from offshore set netting. The nets are smaller (<100 m in length), most commonly attended, and/or regularly set and pulled within an hour or two. A number of the commercial fishers note that their fishery is largely seasonal and generally occurs in winter, or between June and October.

1.2.3 Previous High Court decisions

In 2008, the Minister's initial decision not to exempt targeted commercial butterfish from a defined area in the top of the east coast of the South Island was legally challenged. The High Court referred the decision back to the Minister for reconsideration based on a view that the Minister was given inaccurate advice. The advice was "*in attributing mortality risks for Hector's dolphins from recreational set netting for butterfish and moki with risks associated with targeted fishing for butterfish in the fishery at the top of the east coast of the South Island"* (para 278 of the High Court decision).

The judgement identified that the advice given to the Minister did not make it clear that:

a. "*commercial targeting of butterfish occurred close to shore (in the kelp areas) and not in open waters"* (para 239 of the High Court decision), and
b. "*the known entanglements* [of Hector's dolphins] *were from recreational set netting"* (para 239 of the High Court decision).

The High Court considered that the inaccuracy of the advice was compounded by the attribution of risks associated with recreational set netting for butterfish and moki to potential commercial butterfish fishing effort. This was considered inaccurate because the commercial and recreational fisheries do not necessarily present the same risk to the Hector's dolphin population

The High Court found that advice provided to the Minister regarding the size of commercial butterfish *nets "may have erroneously reinforced the identified risk to dolphins from fishing for butterfish where the effort is significant (if limits on size/number of nets were not adhered to"* (para 240 of the High Court decision).

The subsequent Minister (Heatley) reconsidered the initial decision and decided that there was an acceptable level of risk in terms of mortality from butterfish fishing by commercial fishers in that area given the type of fishing gear they use (short nets less than 60 metres in length), the size of the area (fishing close to shore, within 200 metres) and the numbers of Hector's dolphins. Minister Heatley also subsequently

requested advice on whether the same exemption should be provided to recreational butterfish fishers.

The subsequent Minister (Carter) decided to allow recreational fishing using set nets in the defined area, subject to the following conditions:

- recreational fishers stay with their net at all times while it is set,
- recreational set net fishing is restricted to between 1 January and 30 April, and
- recreational fishers must not set nets more than 200 m from the mean high-water mark.

The Minister considered recreational set nets pose a different risk to the dolphins when compared to commercial set nets. Particularly with respect to fishing effort, type of gear used and set practices that are highly variable depending on the experience of the fisher, weather and season. The Minister also considered it not practical to implement monitoring on the recreational sector as it may be for the commercial sector.

1.2.4 Risk from allowing butterfish set netting to continue

Butterfish set netting is considered to pose a lower risk to the Māui and Hector's dolphins than other types of set netting. Butterfish set netting occurs mainly around kelp reefs, in areas close to shore, and outside of what is commonly considered preferred habitat of the dolphins. However, Hector's dolphins have been sighted in areas of rocky outcrops and kelp beds near Bank's Peninsula.

Fisheries New Zealand re-ran the risk assessment model to estimate the potential effect of a butterfish set net exemption (in key areas identified by commercial fishers) on the risk to dolphins that may be present in the area. The butterfish exemption zones produced a negligible change in the risk estimate. A similar assessment has not been undertaken for recreational butterfish set net activity due to the lack of information available on scale, effort and location.

However, Fisheries New Zealand notes that where the exemption has been applied in the South Island to allow commercial and recreational butterfish set netting to continue there has been a reported Hector's dolphin death. The capture of a Hector's dolphin in a recreational butterfish set net was reported to the Department of Conservation in February 2015. The recreational fisher reported the incident, noting that despite following the rules, and staying with his net, the incident had occurred. Therefore while the risk to dolphins may be low, there is some risk.

In general, Fisheries New Zealand notes that recreational and commercial butterfish set netting (like most set netting) can pose a different type of risk. This is largely because of variations in fishing effort, types of gear used and set net practices are highly variable depending on the experience of the fisher, environmental conditions, and season. In general, recreational set net practices are considered to pose greater risk than commercial because of this variability.

To mitigate the risks posed by commercial and recreational butterfish set net fishers in the top of the South Island where exemptions have been applied, a number of rules were put in place. For recreational fishers they must follow the following conditions:

- Recreational set net fishing is restricted to between 1 January and 30 April.
- Fishers must stay with their nets at all times once the net is set.
- Fishers must not set nets more than 200 metres from the high-water mark.

For commercial butterfish fishers they must follow the following conditions:

- Fishers must not set nets more than 200 metres from the mean high-water mark.

1.2.5 Fisheries New Zealand recommendation

If you decide to progress a set net ban in the Southern habitat zone, you are being asked to consider whether to provide an exemption to enable butterfish set netting to continue within the set net ban area.

In reaching that determination you should consider the likelihood of a fishing-related mortality occurring from butterfish set netting, the consequence of mortality to the Māui and/or Hector's dolphins that may be present in the southern habitat zone, and whether that risk is acceptable.

Based on the nature of the commercial butterfish set net operations and their locations, Fisheries New Zealand recommends you provide for an exemption to allow them to continue to operate. Although a similar quantitative risk assessment was not able to be completed for recreational butterfish set net activity, we consider an exemption should also be extended to the recreational butterfish fishers.

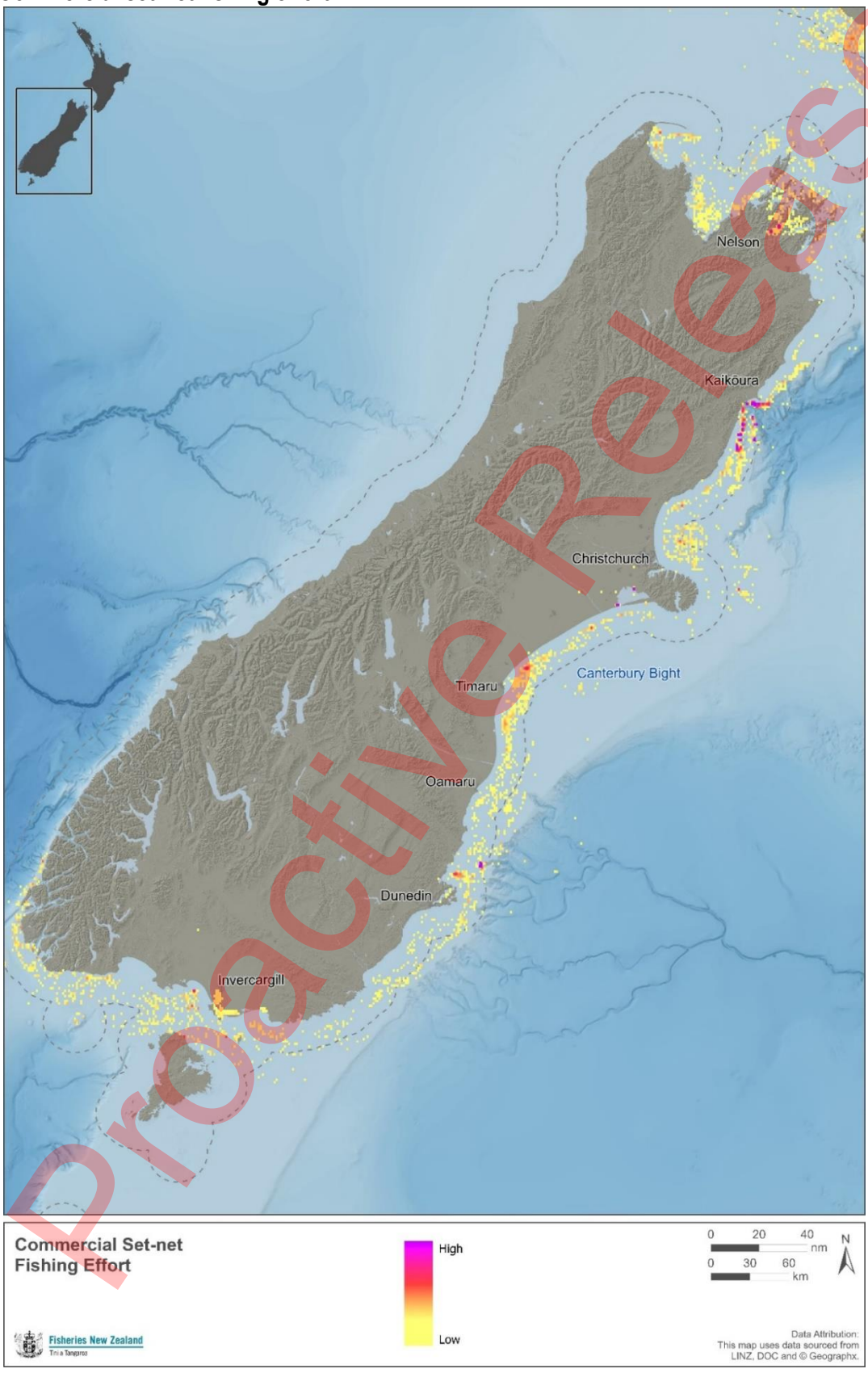
Fisheries New Zealand recommends that you apply additional criteria on each sector to ensure the residual risk to the dolphins remains very low. For both sectors we recommend that the butterfish exemption areas be constrained to within 200 m of the mean high-water mark. This constraint helps ensure that activity is constrained to those kelp and rocky reef areas where butterfish reside.

Fisheries New Zealand considers that the recreational sector poses a greater level of risk than commercial due to the much greater variability in fisher experience. We therefore recommend you carry over the condition in place on recreational butterfish fishers at the top of the South Island that they be required to stay with their set net once set.

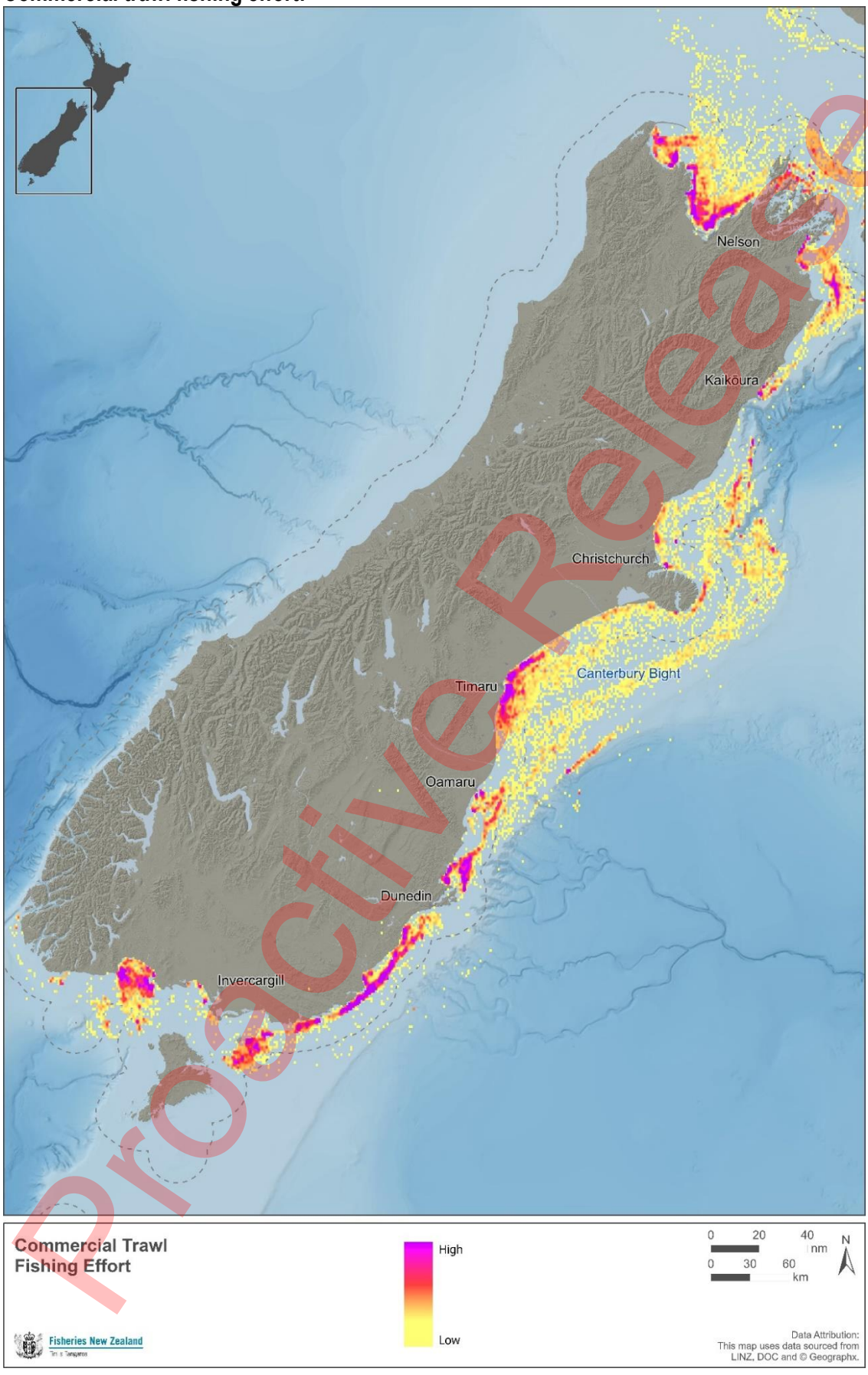
Fisheries New Zealand notes that you could apply a seasonal constraint on when fishers are allowed to operate if you consider the residual risk needs to be further reduced. The commercial fishers noted that butterfish is largely a winter fishery with most harvest occurring between June and October. However, seasonal variation and importance for recreational fishers is unknown.

APPENDIX 4A: SOUTH ISLAND – CURRENT COMMERCIAL FISHERY RESTRICTIONS AND EFFORT

Commercial set-net fishing effort:



Commercial trawl fishing effort:



APPENDIX 4B: ANALYSIS OF POTENTIAL INFLUENCE OF LOW HEADLINE HEIGHT AND TOW SPEED ON TRAWL CATCHABILITY OF DOLPHINS

1.1 Differences in catchability between gear types

When estimating the probability that a dolphin encountering fishing gear will be captured or killed, the risk assessment model treats all fishing gear types using the same broadly defined method (i.e. set-nets or inshore trawls) as if they are the same, because at present there are not enough observer data to distinguish between them. However, gear configuration and fisher behaviour typically vary between operators, and it is likely that dolphin catchability will also vary between gear types within a broadly defined fishing method.

At the scale of the whole South Island, our inability to estimate differences in dolphin catchability between different gear types results in wider confidence intervals (i.e. greater statistical uncertainty but not bias). This means that not taking into account differences in dolphin catchability between different gear types will not cause the risk assessment to over- or under-estimate the number of fisheries deaths in the South Island as a whole, but the confidence intervals around model estimates of catchability, captures, and risk will be wider than they would be otherwise.

Specifically this means that where significant differences exist between gear configurations affecting dolphin catchability, the 95th percentile estimates of fisheries risk will be increased, reflecting the increased statistical uncertainty. Because we propose under the fisheries objective to manage at the 95% confidence level, this means that where estimates of catchability are uncertain and include different gear types within a fishing method, in some instances the risk management objective may be achieved (i.e. the 95th percentile estimates of risk may be reduced) just by improving the quality and quantity of data available to the risk assessment. This is most likely to be the case for trawl fisheries, especially where gear restrictions are already in place to reduce the likelihood of a dolphin capture. In these instances increased monitoring (by cameras or by human observers) may be effective to meet the objective.

1.1.1 Trawl

The inshore trawl fleet active around the South Island is highly diverse and utilises a wide variety of trawl net configurations and operational practices. Smaller and less powerful vessels tend to use low headline height[18] (1 metre or less) trawl nets and tow at a slow speed (less than 2.5 knot) and frequently target species such as flatfish. Larger and more powerful vessels target a wider variety of species and tend to use higher headline height nets and tow at a faster speed. However, the above generalisations should not be regarded as universal, with the majority of trawl vessels capable of adjusting headline height and other gear characteristics, so as to maximise catches of the desired target species.

As put forward by submitters, anecdotal information suggests that trawling at a slow speed and with a low headline height trawl net may pose less of a risk to dolphins

[18] The headline height is defined as the vertical distance between the groundline and the headline.

than trawling at greater speeds or with a higher headline. This is because dolphins may be less likely to enter a low headline height trawl net and/or may find it easier to exit again from slower moving nets. On this basis, since 2008, trawlers utilising a low headline trawl net have been exempted from regulations prohibiting trawling within 2 nm of the coast between Cape Jackson in the Marlborough Sounds and Sandhill Point east of Fiordland. However, the actual risk mitigation effect of low headline height and slow tow speed has not been scientifically estimated.

Although limited to only seven capture events, information on Hector's dolphin captures by trawl vessels for which relevant information is available shows that all captures have occurred when using gear with a headline height of 1.8 m or greater and when the vessel was trawling at a speed of 2.5 knots or greater (Table 1). Therefore, the information available to Fisheries New Zealand lends support to the hypothesis that low headline trawl gear towed at a slower speed poses less of a risk to Hector's dolphins (but increased data collection is needed to test this hypothesis scientifically).

Table 1: Trawl captures of Hector's dolphins for which relevant information on headline height, tow speed and vessel power is available.

Year	Location	Number of individuals	Tow speed (knots)	Headline height (m)	Vessel power (kw)
1997	Canterbury Bight	1	2.5	1.8	84
1998	Canterbury Bight	1	2.5	1.8	66
2006	Marlborough	3	3.4	4	267
2016	Canterbury Bight	1	3.4	5	400
2018	Pegasus Bay	3	3	1.8	376
2018	Canterbury Bight	1	3.4	5	400
2019	Pegasus Bay	3	3	1.8	376

Any risk management package that treats all types of trawls equally may unfairly penalise fishers already employing low-headline height trawl gear consistent with existing gear restrictions designed to protect dolphins. Given the diversity of gear configurations that exists within the inshore South Island trawl fleet, an alternative to blanket trawl prohibitions would be to extend the low headline height trawl net requirement further offshore.

Regulating tow speed may also be a mechanism for mitigating the risk trawling poses to Hector's dolphins. In particular, with the roll-out of global positioning

reporting (GPR) across trawl vessels in the South Island, tow speed could be regulated and monitored.

Vessel power and vessel size have also been suggested as contributing factors that could be regulated to mitigate risk to dolphins. However, information to support extending regulations to these further input controls is less reliable; while headline height can be tied down with precision and monitored by cameras and observers, and tow speed can be monitored through GPR, information from overseas fisheries suggests that vessel power is difficult to monitor and enforce, and there are numerous ways for vessels to get around this regulation. In terms of vessel size, it is not clear that this is necessary as an additional control if headline height and tow speed are already regulated. Further information is necessary to understand this relationship and determine whether additional controls beyond headline height and tow speed are beneficial in terms of mitigating risk.

Given the wide confidence intervals associated with estimates of trawl death around the South Island, improving information on differing catchability between vessels operating different gear types would likely reduce 95th percentile estimates of death without any further fisheries restrictions required.

Additionally, given the almost certain difference in dolphin catchability between trawlers using different gear types, it is likely that further trawl risk reduction can be achieved through the use of headline height and tow speed restrictions.

However, as noted by several environmental groups, there is no scientific evidence to show that low headline height trawl gear poses less of a threat to Hector's dolphins (or other cetaceans) than other trawl gear configurations. Should the low headline height trawl net requirement be extended further offshore (or tow speed regulated), additional monitoring accompanied by a targeted research programme would be required to better estimate the actual level of risk reduction achieved. Additional focused compliance activity would also be required to ensure that fishers are operating in accordance with the regulations.

APPENDIX 4C: CONSULTATION OPTIONS AND SUBMISSIONS SUMMARY

1.1 East Coast South Island

1.1.1 Consultation options for set-net and trawl fisheries off the east coast South Island:

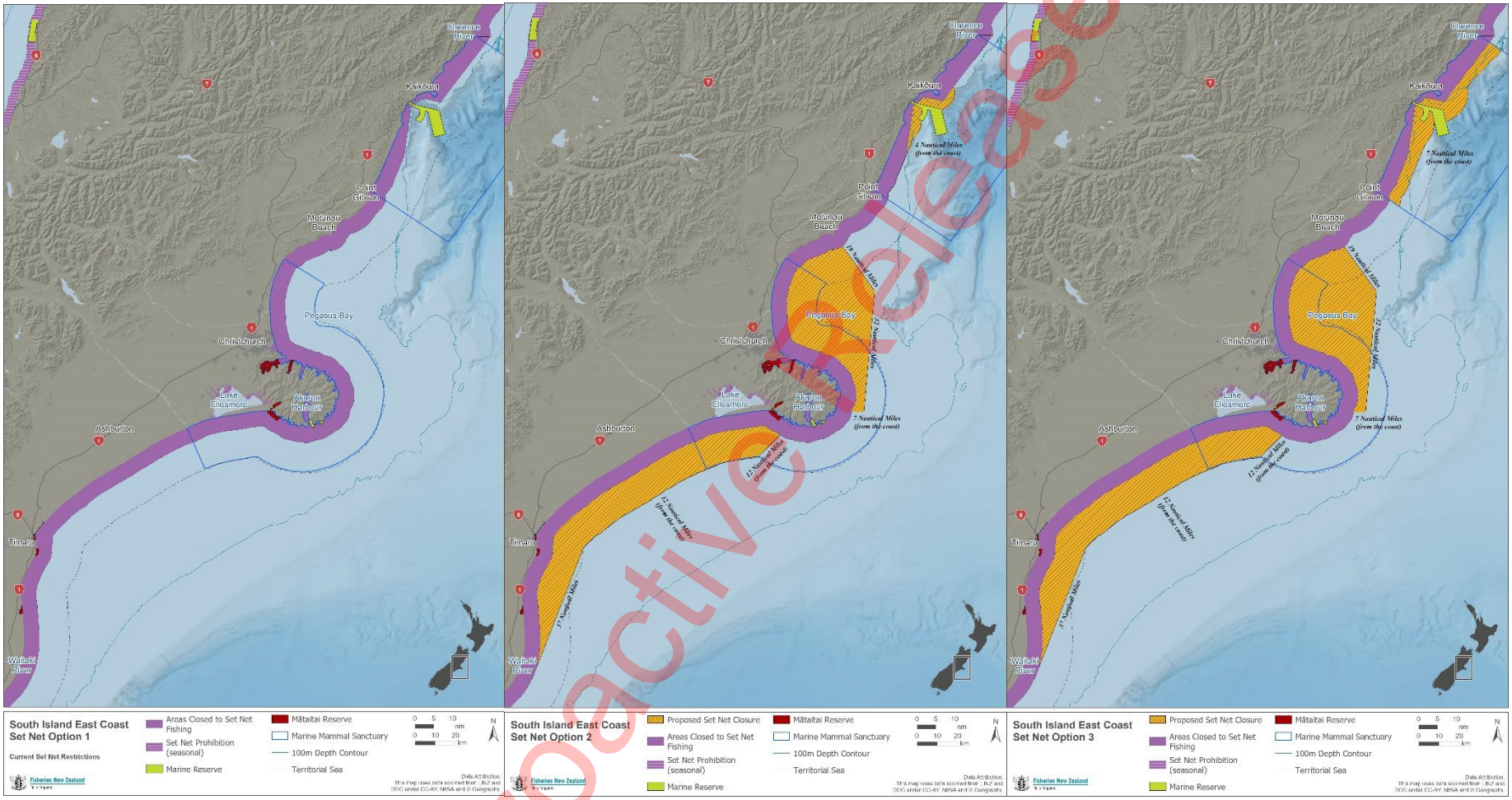
Method	Area	Option 1 (Status quo)	Option 2	Option 3
Set-net	Pegasus Bay	Closure out to 4nm	Entire Bay ↑	(Same as Option 2)
	South from Banks Peninsula to Timaru	Closure out to 4nm	Closure from South of Banks Peninsula to Waitaki River ↑	(Same as Option 2)
	Kaikōura	Closure out to 4nm, with existing exemption in Kaikōura Canyon	Full closure out to 4nm, (no exemption for Kaikōura Canyon) ↑	Extend full closure out to 7nm ↑
Trawl	Pegasus Bay	Low headline height exemption out to 2nm	Entire Bay ↑	(Same as Option 2)
	South from Banks Peninsula to Timaru	Low headline height exemption out to 2nm	Closure out to 5nm approx. from South Canterbury – Timaru ↑	Larger area between Banks Peninsula and TImaru ↑
	Kaikōura	Low headline height exemption out to 2nm	No Change	No Change

Estimated economic impact on commercial set-net and trawl fishers off the east coast South Island for each option are shown below (units are millions).[19] A low and high estimate of the Total Economic Impact are shown for 3 and 5 years:

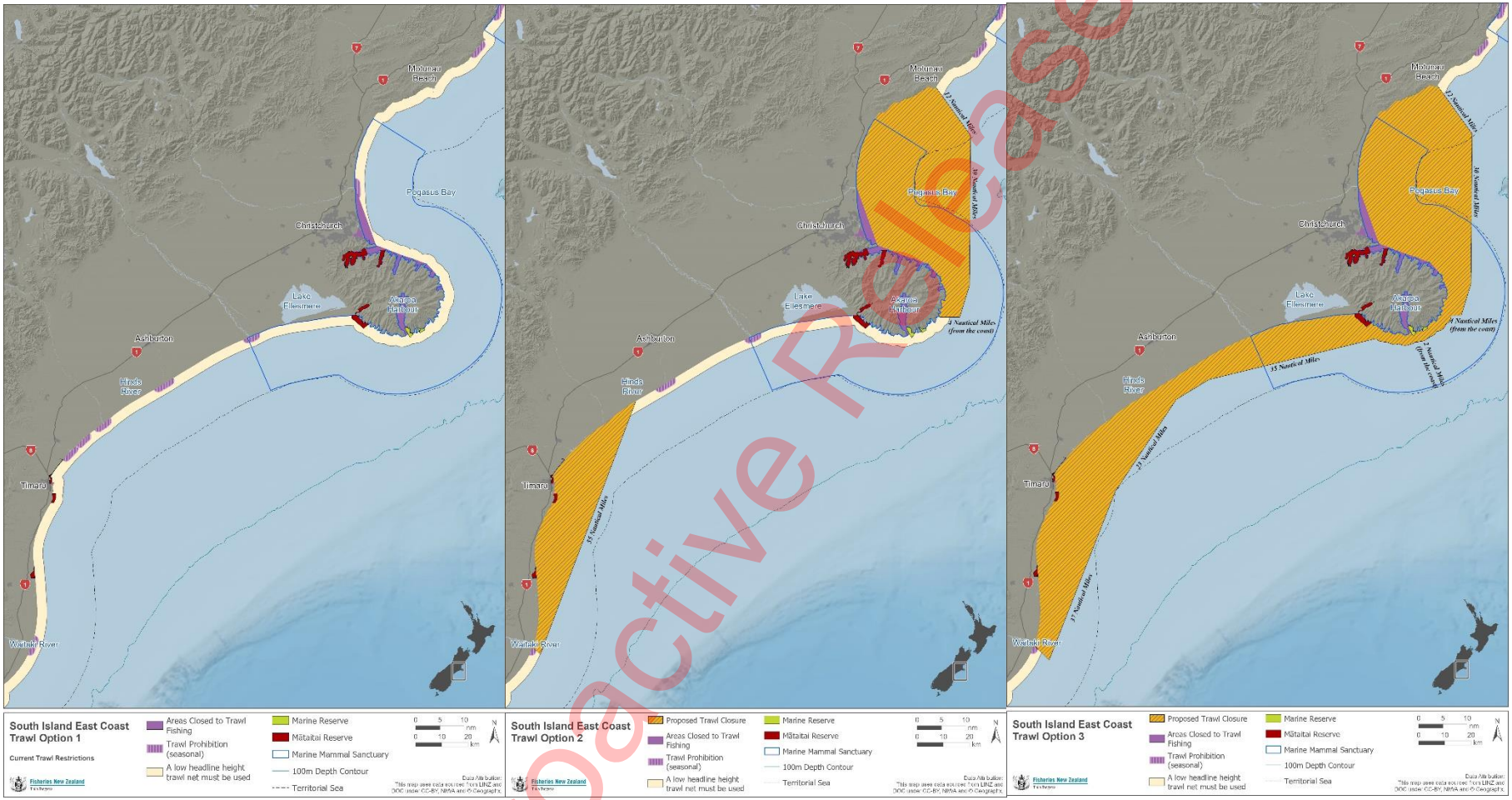
Total Economic Impacts (millions)	Set-net option 2	Set-net option 3	Trawl option 2	Trawl option 3
Commercial sensitivity				
Quota stocks most affected (% of QMA landings[22])	SPO3 20%, ELE3 10%, SCH3 25%, MOK3 34%	SPO3 21%, ELE3 10%, SCH3 29%, MOK3 49%, HPB3 14%	ELE3 32%, RCO3 9%, RSK3 20%, GUR3 16%, FLA3 13%	ELE3 76%, RCO3 13%, RSK3 38%, GUR3 33%, FLA3 25%
Total Annual Revenue Lost	$2.35	$3.11	$4.50	$6.09
Total Economic Impact - 1 Year	$6.62	$8.77	$12.69	$17.16
Total Economic Impact - 3 Year	$11.39 - $18.77	$15.08 - $24.85	$21.82 - $35.96	$29.51 - $48.63
Total Economic Impact - 5 Year	$12.31 - $29.58	$16.30 - $39.17	$23.58 - $56.67	$31.89 - $76.63

[19] Estimated impact on the number of fishing permit holders, and percent of Quota Management Area (QMA) landings, is based on a three year data average from 2015/16 to 2017/18. Estimated impact on total annual revenue and total economic value are based on a 10 year data average from 2007/08 to 2016/17.
[20] Where sum of landings in the affected area, for each permit holder, is at least 1 tonne.
[21] Where sum of landings in the affected area, for each permit holder, is at least 1 tonne.
[22] Where landings are greater than 10 tonnes. Some stocks have a much larger portion of QMA landings affected but these represent much smaller tonnages.

Maps showing set-net consultation options 1, 2, and 3 for east coast South Island:



Maps showing trawl consultation options 1, 2, and 3 for east coast South Island:



1.1.2 Submissions Summary

Response from Te Waka a Māui me Ōna Toka (South Island) Iwi Forum

Input was sought from the Te Waka a Māui me Ōna Toka (South Island) Iwi Forum on the matters above and response proposed. The forum raised the lack of iwi input into development of the draft TMP. They noted dolphins are taonga species and iwi hold them in high regard, but do not support their protection at all costs.

Key issues raised included:

- The potential impact on the 1992 Settlement, and duty of Crown to protect that Settlement (s 5 and s 88);
- Potential effects on family and whanau from fishing restrictions
- Reminder to Crown of customary fishing rights;
- Concerns that the approach proposed could a shift of fishing effort into other areas will impact on stocks and on customary management areas.

Submissions were later received from Te Runanga o Ngāi Tahu and Te Runanga o Ngāti.

Fisheries Inshore New Zealand (FINZ) submitted in support of the status quo, and do not support any of the additional protection measures proposed under Option 2 and 3. This position is supported by Te Ohu Kaimoana and most individual commercial fishing stakeholders who commented on the east coast South Island proposals, as they endorsed the Fisheries Inshore New Zealand submission. FINZ (and submitters endorsing their submission) consider that the closures proposed under Option 2 and 3 have effects far in excess of the mortality limit needed to achieve the draft TMP objectives. They also consider that the objectives themselves are inappropriate, and propose an 80% population objective to be achieved with 80% certainty (see Part B1 for a discussion on fisheries objectives). They note that in some instances, the status quo already achieves the objectives.

Fisheries Inshore New Zealand believe that the combined impact of the South Island proposals would see Kaikōura and Timaru cease to have a coastal fishing sector and put 15 set-net vessels and their crews out of business on the east coast South Island.

Most environmental NGOs support the extension of proposals in Option 3 to include closures to set-net and trawl fishing out to the 100m depth contour. This position was supported by a large number of public submissions. These submitters also noted concerns about the lack of additional protection proposed for the Otago-Catlin coast, asserting that this could mean continued declines and further subpopulation fragmentation, posing a risk to the Hector's dolphin population as a whole. This view was also supported by some independent dolphin scientists.

Fisheries Inshore New Zealand and Te Ohu Kaimona suggest that the modelling of fisheries risk is unreliable, and propose an approach to verify the impacts of risk using on-board cameras and working with fishers to mitigate risk using a broader range of measures. This includes the use of Dolphin Dissuasive Devices in areas of residual risk.

A key theme that emerged in industry submissions and through meetings with fishers was anecdotal evidence that smaller, slower trawlers pose much less risk of capturing a dolphin than larger, faster trawlers. Some of these fishers were open to increased monitoring to allow for the evaluation of the efficacy of these measures at reducing the risk of catching dolphins.

Sanford considers that electronic cameras should be placed on all set-net and trawl fishing vessels as soon as possible within the core Hector's dolphin habitat. Sanford acknowledges that there is a core area where Hector's dolphin live currently, and fringe areas where dolphin spread out to on the East Coast of the South Island. From 2015, Sanford has required Timaru based set-netters landing to them to have cameras on vessels when fishing, and they are willing to voluntarily provide access to all footage for review in the absence of regulation.

Te Ohu Kaimoana recommends extending observer coverage to areas of high dolphin density to help increase certainty around fisheries risk. Te Ohu Kaimoana states that they would support additional measures if fishing activities could be demonstratively proven to be the major threat to Hector's dolphins.

Te Korowai submitted an alternative option for Kaikōura with community support (see *Community Management Proposal: 'Option Kaikōura'*).

Fisheries New Zealand response to submissions

Submission comments concerning population outcomes and fisheries objectives are addressed in Part B1. Submission comments outlining concerns with science and scientific process are addressed in Part A and Appendix 2. Input regarding customary fishing rights is addressed in Part B2.

Where the risk assessment estimates that proposed fisheries restrictions go further than may be necessary to achieve proposed objectives, Fisheries New Zealand notes that there is no statutory basis for objectives and you have discretion in determining what measures you deem necessary (Part B1).

Fisheries New Zealand acknowledges anecdotal information that suggests trawlers operating with low headline height and slow tow speed may pose lower risk to dolphins. There is precedent for allowing trawl vessels operating low headline height to operate in areas where trawling has otherwise been prohibited to mitigate risk to dolphins.

Fisheries New Zealand also notes that there is no scientific evidence to estimate the extent to which low headline height and slow trawl speed may mitigate risk. However, monitoring and research could provide the information necessary to quantify any such effect.

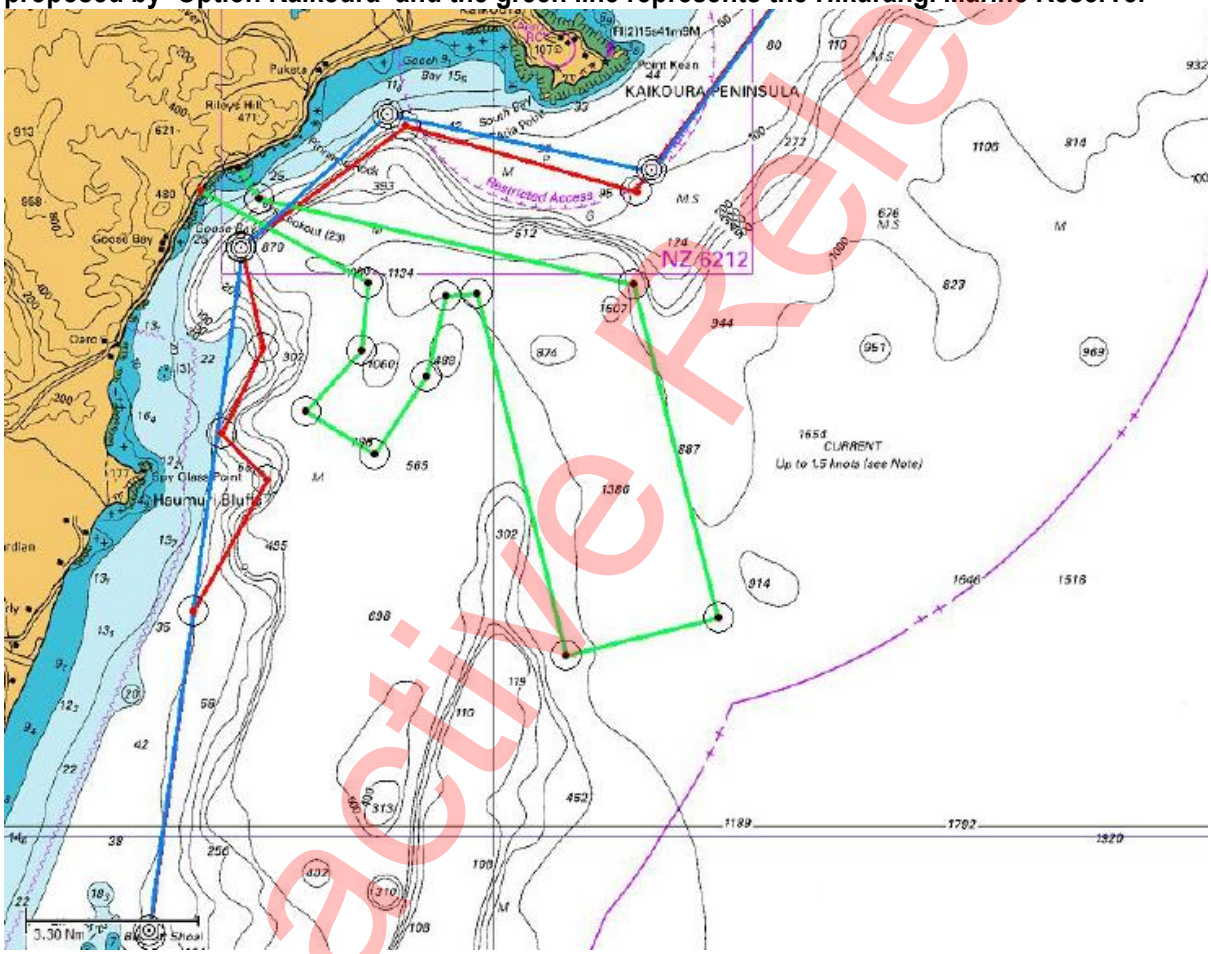
1.1.3 Community Management Proposal: 'Option Kaikōura'

'Option Kaikōura' was developed by Te Korowai in conjunction with the Kaikōura based set-net fleet so as to recognise the area's unique coastal and marine environment, biological diversity and cultural heritage. Te Korowai consider that 'Option Kaikōura' best supports the purpose of the Kaikōura (Te Tai o Marokura) Marine Management Act 2014.

‘Option Kaikōura’ would expand the boundary of the exclusion zone for the current Kaikōura set-net ban whilst recognising the specific bathymetry of the coastline. The set-net prohibition would be extended by between 0.2 nm and 1 nm offshore around the head of the Kaikōura canyon so that the exclusion zone follows the approximate 100 m depth contour (Figure 1). North and south of the Kaikōura canyon, ‘Option Kaikōura’ would prohibit set netting within 2 nm of the coast (status quo).

‘Option Kaikōura’ would also prohibit set-netting from all areas where Hector’s dolphin deaths have previously been reported.

Figure 1: Proposed changes to set net prohibition boundaries and accompanying bathymetry. The blue line depicts the current set net prohibition, the red line represents the prohibition proposed by ‘Option Kaikōura’ and the green line represents the Hikurangi Marine Reserve.



The set net prohibition boundaries proposed by ‘Option Kaikōura’ were based upon Hector’s dolphin distribution data as presented within the Threat Management Plan supporting information, local research[23] and data provided by local tourist operator Dolphin Encounter (private records of 23,000 trips over 11 years). The data provided by Te Korowai indicates that Hector’s dolphins rarely move into deeper water with

[23] Weir. J. S. & Sagnol. O. 2015. Distr bution and abundance of Hector’s dolphins (*Cephalorhynchus hectori*) off Kaikoura, New Zealand. New Zealand Journal of Marine and Freshwater Research 49(3): 376-389.

very few sightings (only 44 out of 1,600 over 11 years) outside the set-net prohibition area proposed by 'Option Kaikōura' (Figure 2).

Figure 2: Hector's dolphin sightings between 2008 and 2019 as provided by Dolphin Encounter within the Te Korowai submission. Orange circles represent dolphin sightings outside the set-net prohibition area proposed by 'Option Kaikōura'.

Te Korowai estimate that 'Option Kaikōura' will result in a 15-20% loss of revenue for those operators affected by the proposals. However, unlike options to prohibit set-netting to 4 nm or beyond, Te Korowai believe that set-netting will continue to be viable in Kaikōura under 'Option Kaikōura'. Therefore, Te Korowai are of the opinion that 'Option Kaikōura' provides the greatest benefit to the wider Kaikōura community by expanding current protection for dolphins whilst supporting greater resilience in a local economy still adapting to the effects of 2016 earthquake.

In addition to the spatial closures discussed above, Te Korowai also commented on the need to protect the Kaikōura from increased trawl effort displaced from

elsewhere, additional research on dolphin mitigation measures and the need to address the risk posed by toxoplasmosis.

Fisheries New Zealand analysis of 'Option Kaikōura'

Fisheries New Zealand considers 'Option Kaikōura' a feasible and credible alternative that will reduce the risk set-netting poses to Hector's dolphins in the Kaikōura area whilst managing the effect of area closures on fishing operations and the community.

The Hector's dolphin sightings database underpinning 'Option Kaikōura' is long running (11 years) and can be considered reliable given that it has been collected by individuals who are likely to be capable of positively identifying Hector's dolphins. Based on this distribution data, the extension of the set-net prohibition proposed by 'Option Kaikōura' would reduce the risk set-netting operations would pose to Hector's dolphins by requiring fishers to fish only in to deeper waters where dolphins are less prevalent and where nets may be beyond the depths at which dolphins typically forage (this latter effect is uncertain).

Current estimates of set-net risk around Kaikōura indicate that risk has decreased substantially through time and that current estimated impacts would result in the local population stabilising at around 70% of un-impacted status. This estimate is premised on the assumption that dolphin catchability is unaffected by depth; the actual effect of depth on dolphin catchability is unknown.

The risk assessment estimates that management as proposed under 'Option Kaikōura' would reduce risk enough to achieve the local population objective at the mean estimates of deaths, but not at the 95th percentile estimates. This analysis assumes that all set-nets along the east coast of the South Island are equally likely to catch a dolphin. Given that this is unlikely to be true due to the area's bathymetry and the depths fished, the actual risk reduction achieved through 'Option Kaikōura' may be greater than that estimated through the risk assessment, but this cannot be quantified at present. Additional monitoring would be required to better estimate the actual level of risk reduction achieved under 'Option Kaikōura'.

Whilst set-netting in Kaikōura does generally occur in deeper water,[24] additional monitoring would be required to ascertain whether there is a true difference in dolphin catchability between the Kaikōura based set-net fleet and set-netters based elsewhere.

[24] Data recorded by Fisheries New Zealand observers on set net vessels since (for which data at fishing depth is available) shows that the average depth fished in Ka koura is 180 m compared with 71 m for the rest of the South Island. However, given the low number of observed set net fishing events (353 for Kaikoura but none since 2014/15 and 621 for the rest of the east coast of the South Island), these figures should be regarded as indicative only.

1.3 South Coast South Island

1.3.1 Consultation options for set-net and trawl fisheries off the south coast South Island:

	Set net (commercial and recreational)	Trawl
Option 1 (status quo)	Commercial and recreational set-netting is prohibited within 4 nm of the coastline (and the whole of Te Waewae Bay) along the south coast of the South Island between Slope Point in the Catlins and Sandhill Point east of Fiordland. This prohibition does not generally apply to harbours, estuaries, river mouths, lagoons and inlets.	Trawling is prohibited within 2 nm of the coastline along the south coast of the South Island between Slope Point in the Catlins and Sandhill Point east of Fiordland. However, vessels utilising a low (1 m or less) headline height trawl net have been exempted from this prohibition.
Option 2	Prohibit all set netting with 7 nm of the coast in the area of Te Waewae Bay (in addition to current status quo restrictions)	Prohibit all trawling (including that using a low headline height trawl net) within Te Waewae bay and 2 nm outwards (in addition to current status quo restrictions)
Option 3	Prohibit all set netting with 10 nm of the coast in the area of Te Waewae Bay (in addition to current status quo restrictions)	Prohibit all trawling (including that using a low headline height trawl net) within Te Waewae bay and 4 nm outwards (in addition to current status quo restrictions)

Estimated economic impact on commercial set-net and trawl fishers off the south coast South Island for each option are shown below (units are millions).[25] A low and high estimate of the Total Economic Impact are shown for 3 and 5 years:

Total Economic Impacts ($millions)	Set-Net option 2	Set-Net option 3	Trawl option 2	Trawl option 3
Commercial sensitivity				
Quota stocks most affected (% of QMA landings)	SCH5 1.0% SPO3 0.3% SPD5 0.1%	SCH5 2.3% SPD5 0.2% SPO3 0.4%	FLA3 8% STA5 3% ELE5 18% GUR3 2% SPO3 3%	FLA3 10% STA5 4% ELE5 21% GUR3 3% SPO3 4%
Total Annual Revenue Lost	$0.05	$0.09	$1.28	$1.57
Total Economic Impact - 1 Year	$0.15	$0.25	$3.62	$4.42
Total Economic Impact - 3 Year	$0.25 - $0.42	$0.43 - $0.70	$6.22 - $10.26	$7.59 - $12.51
Total Economic Impact - 5 Year	$0.27 - $0.66	$0.46 - $1.10	$6.73 - $16.17	$8.21 - $19.72

[25] Estimated impact on the number of fishing permit holders, and percent of Quota Management Area (QMA) landings, is based on a three year data average from 2015/16 to 2017/18. Estimated impact on total annual revenue and total economic value are based on a 10 year data average from 2007/08 to 2016/17.

1.3.2 Submissions summary

Fisheries Inshore New Zealand (FINZ) commented that, whilst the proposals would have little effect on the Southland set-net fleet, trawlers in the area would be significantly impacted by the proposed options. FINZ estimated that the proposed closures would result in a loss of $5.6 million to the local economy and the loss of 25 jobs. Given that vessels active within Te Waewae Bay typically operate low headline height trawl nets (which FINZ consider to pose effectively no risk to dolphins), FINZ did not consider any further area restrictions necessary. FINZ also noted that the spatial habitat model failed to provide a credible dolphin distribution for the south coast of the South Island.

The New Zealand Federation of Commercial Fishermen commented that Hector's dolphin distribution data for Te Waewae Bay are highly uncertain and therefore should not be used to inform further spatial closures that would effectively close the fishery.

The New Zealand Fishing Industry Guild commented that fisheries-related deaths along the south coast of the South Island are within the range to sustain population recovery and therefore did not consider further fisheries restrictions warranted.

Southern Inshore Fisheries Management stated that the proposed options for further spatial closures in Te Waewae bay are unwarranted and would cause a significant economic impact.

WWF noted that the fisheries impact on the south coast South Island population needs to be reduced.

1.3.3 Fisheries New Zealand response

Set-net

Fisheries New Zealand analysis of commercial set-net catch effort data shows that the Southland set-net fleet conduct a relatively small proportion of their annual effort in the area immediately adjacent to or offshore from Te Waewae Bay. Therefore, increasing the extent of the set-net prohibition around Te Waewae Bay would provide a mechanism for reducing the risk fisheries pose to Hector's dolphin whilst limiting the effect such closures have on fishers.

However as dolphin distribution is believed to be spatially concentrated within those areas of Te Waewae Bay already closed to set-netting,[26] the risk reduction achieved through further set-net prohibitions would be relatively low compared to the risk still potentially posed by trawl (depending on to what extent low headline height affects catchability).

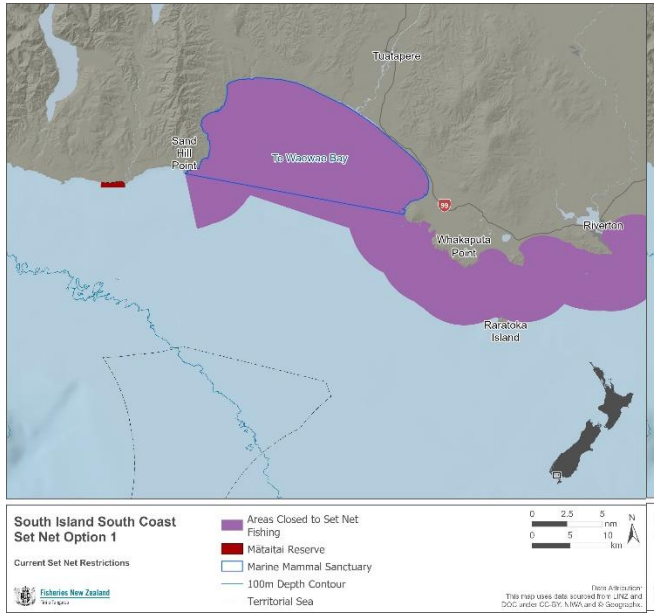
Trawl

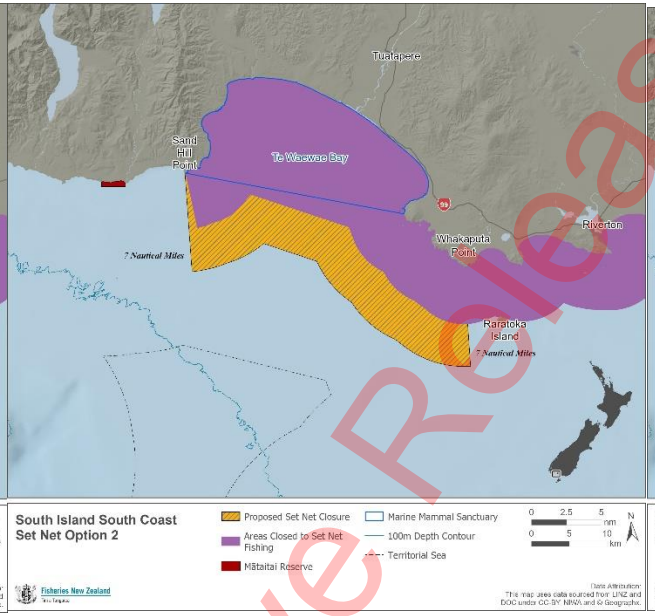
[26] Under the most plausible representation of dolphin distribution (Scenario B), 75% of the south coast South Island dolphin population is estimated to occur in Te Waewae Bay.

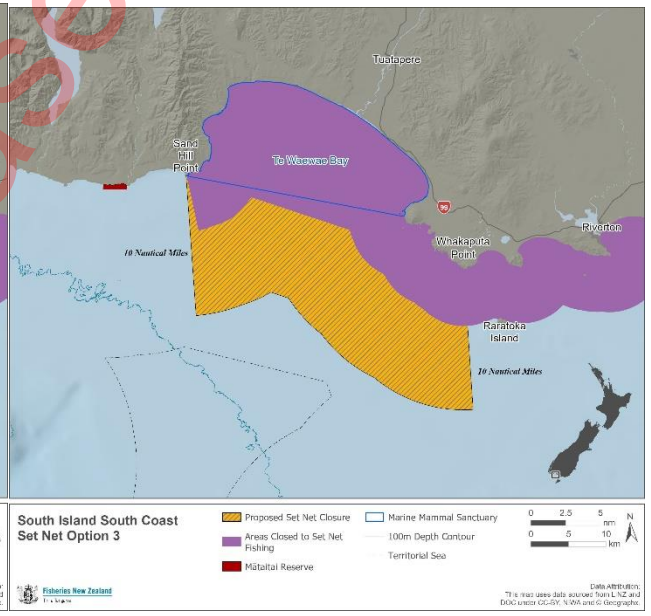
Te Waewae Bay is an important fishing ground for many inshore fishing vessels which operate from Southland, Otago, and Timaru ports. Collectively, over 2,100 fishing events (tows) were conducted within Te Waewae Bay and 4 nm outwards between the 2015/16 and 2017/18 fishing years. Of these 2,100 tows, over 90% targeted flatfish using low headline height trawl nets.

Fisheries New Zealand acknowledges anecdotal information that suggests that trawl vessels operating low headline height may be less likely to capture a dolphin than other trawl vessels, and proposes revised fisheries management options to reflect this feedback.

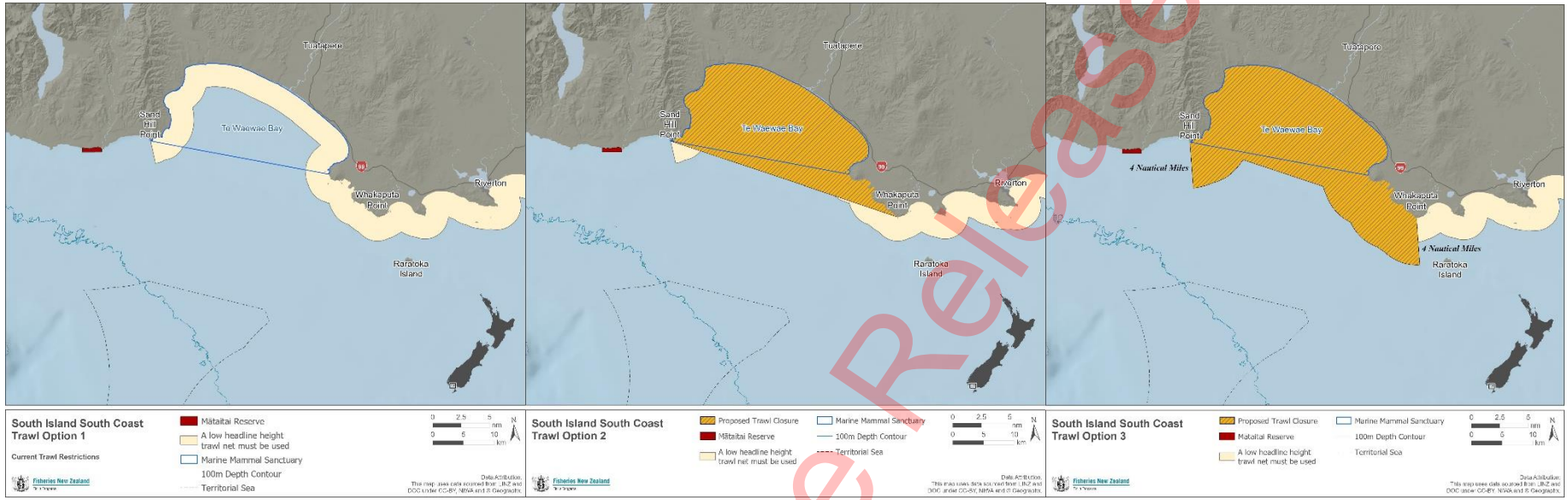
Maps showing set-net consultation options 1, 2, and 3 for south coast South Island:







Maps showing trawl consultation options 1, 2, and 3 for south coast South Island:



1.4 North Coast South Island

1.4.1 Consultation options for set-net and trawl fisheries off the north coast South Island:

	Set-net (commercial and recreational)	Trawl
Option 1 (status quo)	No set-net prohibitions	Seasonal trawl prohibition in limited area of Golden Bay. Permanent prohibition at Separation Point.
Option 2	**Area closure** from 0 – 4 nm offshore	
Option 3		**Area closure** from 0 – 2 nm (including retaining status quo restrictions)

Estimated economic impact on commercial set-net and trawl fishers off the north coast South Island for each option are shown below (units are millions).[27] A low and high estimate of the Total Economic Impact are shown for 3 and 5 years:

Total Economic Impacts ($millions)	Set-Net option 2	Set-Net option 3	Trawl option 2	Trawl option 3
Commercial sensitivity				
Quota stocks most affected (% of QMA landings)	SPO7 17% SCH7 2% SNA7 1%	SPO7 17% SCH7 2% SNA7 1%	-	FLA7 7% GUR7 5% SNA7 8% SPZ7 21% CAR7 22%
Total Annual Revenue Lost	$0.28	$0.28	$0.00	$1.02
Total Economic Impact - 1 Year	$0.79	$0.79	$0.00	$2.89
Total Economic Impact - 3 Year	$1.37 - $2.25	$1.37 - $2.25	$0.00	$4.97 - $8.19
Total Economic Impact - 5 Year	$1.48 - $3.55	$1.48 - $3.55	$0.00	$5.37 - $12.90

[27] Estimated impact on the number of fishing permit holders, and percent of Quota Management Area (QMA) landings, is based on a three year data average from 2015/16 to 2017/18. Estimated impact on total annual revenue and total economic value are based on a 10 year data average from 2007/08 to 2016/17.

1.4.2 Submission summary

Te Ohu Kaimoana consider that the set-net and trawl interactions with dolphins across the top of the South Island do not pose a material risk of catch, as reflected by the lack of proposals to have observer coverage on fishing vessels in this area.

Environmental Defence Society (EDS) identifies Golden and Tasman Bays as key habitat for Hector's dolphins and recommends no set-netting or trawling. They support prohibiting recreational set-netting given the high level of unquantifiable recreational set-netting in this area.

Fisheries Inshore New Zealand (FINZ) agree that the north coast South Island may be appropriate for subpopulation management but notes that migration between the West Coast and Golden Tasman Bays may be a natural occurrence, suggesting that the north coast South Island subpopulation may only be an extension of the West Coast subpopulation.

FINZ further suggest that current fisheries restrictions were not taken account of in proposals despite that they already provide some level of protection.

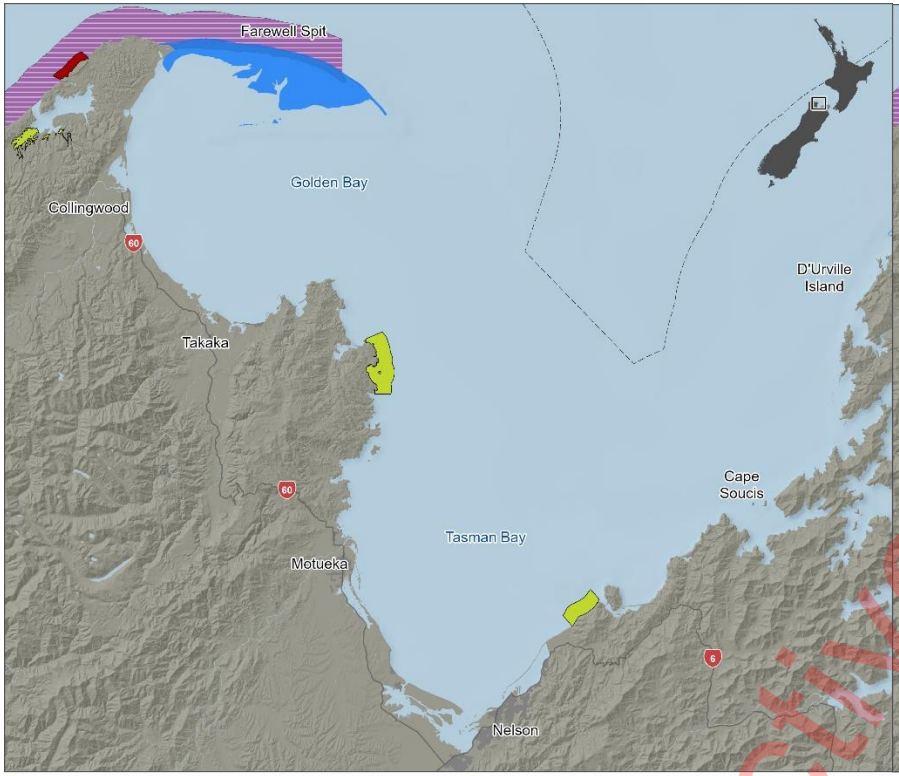
Greenpeace and New Zealand Marine Sciences Society note that no further protection has been proposed for Hector's dolphins in the Marlborough Sounds.

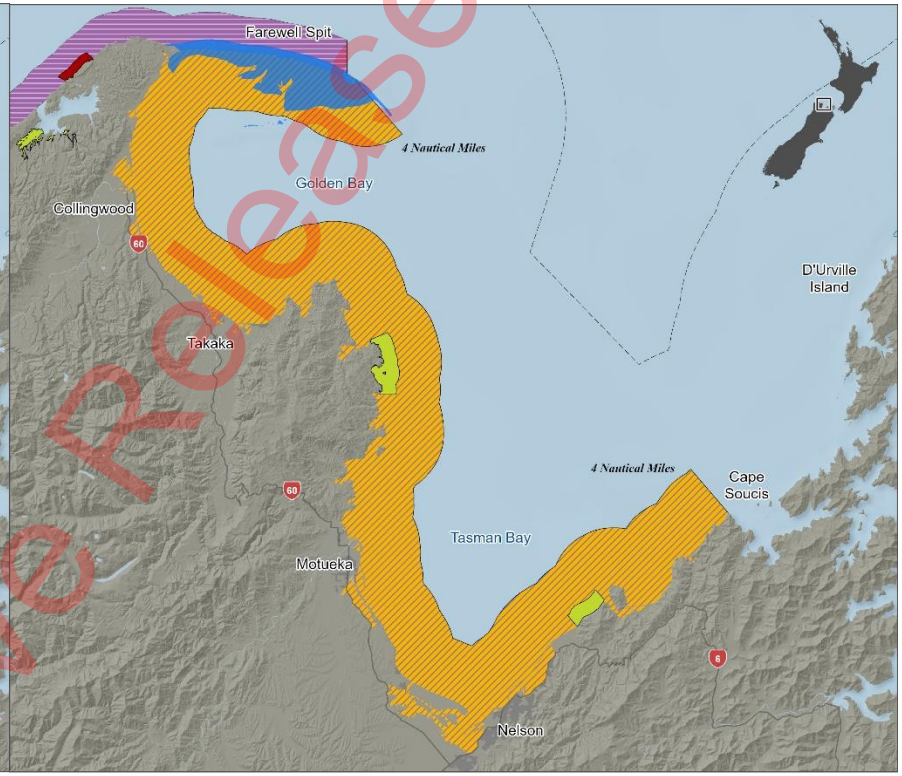
1.4.3 Fisheries New Zealand response

Fisheries New Zealand acknowledges the uncertainty regarding whether or not Hector's dolphins in Golden and Tasman Bays indeed comprise a subpopulation. However, as a precautionary measure and to meet the fisheries objectives in terms of avoiding localised depletion and fragmentation of populations, further management is proposed for this area.

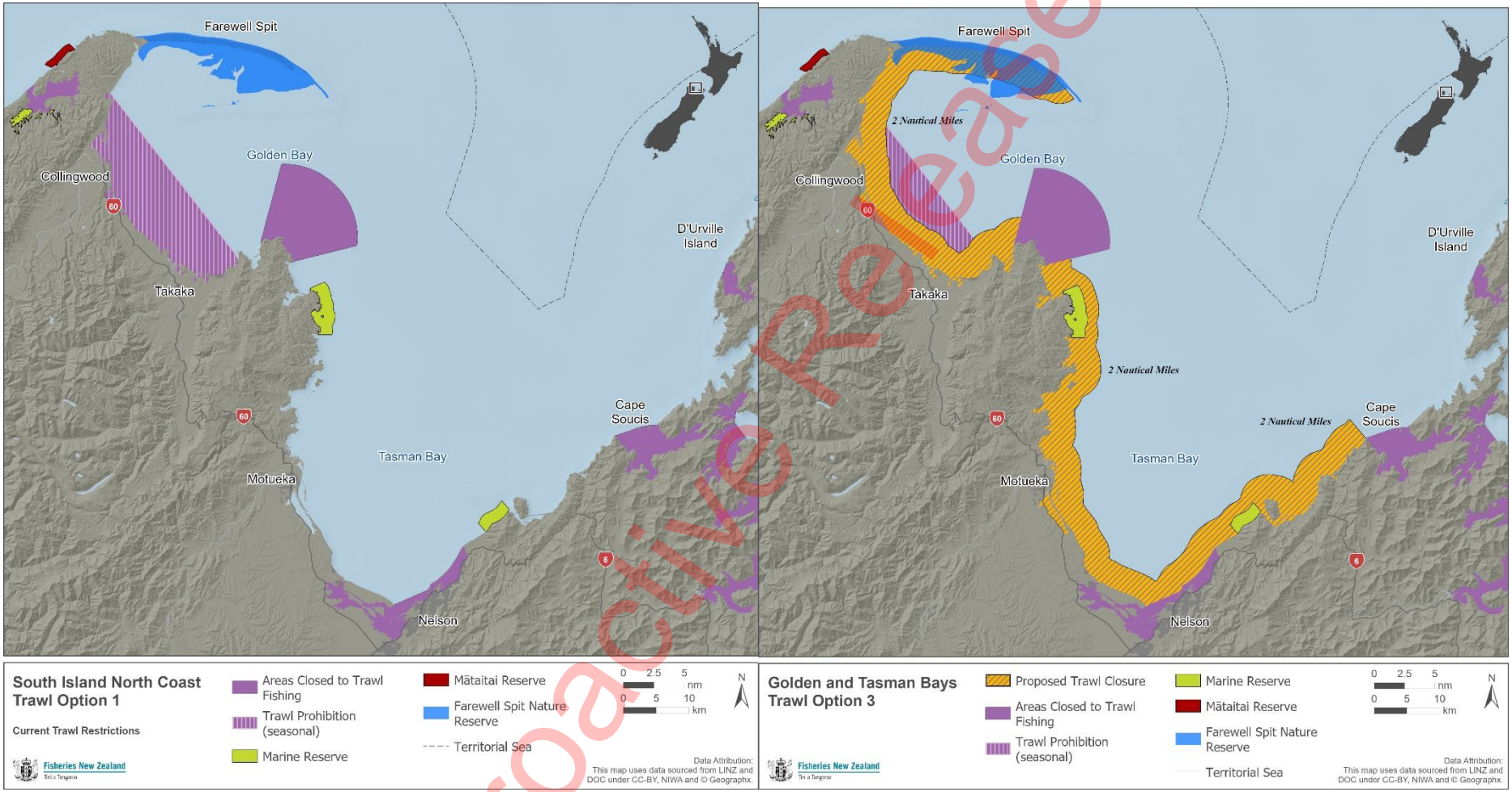
The risk assessment showed that the Marlborough Sounds local population experiences very low fisheries risk, reflecting existing closures and low levels of fishing intensity. No further management is proposed for this area.

Maps showing set-net consultation options for north coast South Island:





Maps showing trawl consultation options for north coast South Island:



APPENDIX 4D: SPATIAL DISTRIBUTION OF DOLPHINS ON SOUTH COAST SOUTH ISLAND

The spatial habitat model lacks some key data (dolphin prey distribution) for the south coast South Island and the relative dolphin density is lower than elsewhere. As a result, the habitat model appears to spread the dolphins along the south coast of the South Island more widely in space than is plausible. That is, the model predicts that dolphins are spread across the full length of the south coast. However, local knowledge and aerial survey results suggest that dolphins are spatially concentrated in Te Waewae Bay, with only very low numbers in other parts of the coast.

Such qualitative uncertainty regarding the spatial distribution of dolphins can have a major implications for the accuracy of estimates of the risk fishing poses to Hector's dolphins, especially if fishing effort is similarly concentrated in particular areas. This is not the case for set-net fishing along the south coast of the South Island as set netting in this area is widely dispersed, and Te Waewae Bay (where dolphins are primarily found) is closed to set-net fishing.

However, trawl fishing along the south coast of the South Island is highly concentrated in Te Waewae Bay. Therefore, if we assume low dolphin distribution in Te Waewae Bay (as predicted by the risk assessment) but the reality is that the dolphins are concentrated in Te Waewae Bay (as indicated by aerial surveys), then the risk assessment outputs will overestimate risk from set net fisheries and underestimate risk from trawl fisheries.

To address this qualitative uncertainty and potential for bias, the fisheries risk estimation was re-scaled spatially to reflect a range of scenarios to test how changes in dolphin distribution would change fisheries risk estimates:

- Scenario A: using the same habitat model as applied for all Hector's dolphins, 20 percent of dolphins along the south coast of the South Island are in (or directly offshore from) Te Waewae Bay;
- Scenario B: using the 2016 aerial survey, 74 percent of dolphins along the south coast of the South Island are in (or directly offshore from) Te Waewae Bay; and
- Scenario C: using the 2018 aerial survey, 99 percent of dolphins along the south coast of the South Island are in (or directly offshore from) Te Waewae Bay.

Aerial surveys and local knowledge both suggest that the true annual dolphin distribution lies in the middle (for example, Scenario B). As in other locations, it is also likely that Hector's display some seasonal variation in distribution, but the extent of this is unknown for the south coast South Island. Given the local anecdotal information and the aerial surveys, Fisheries New Zealand recommends using the risk outputs that are based on Scenario B. The final proposed packages are assessed assuming Scenario B.