



Ministry of  
**Fisheries**  
Te Tautiaki i nga tini a Tangaroa

## INITIAL POSITION PAPER

### RECONSIDERATION OF AMATEUR SET NET REGULATIONS TO MANAGE FISHING-RELATED THREATS TO HECTOR'S DOLPHINS WITHIN THE DEFINED AREA OF THE ECSI





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# Reconsideration of amateur set net ban for the defined area of the ECSI

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## Executive Summary

1. The Minister of Fisheries recently decided to remove the ban on commercial butterfish fishing using set nets in a defined area at the top of the East Coast of the South Island.
2. The Minister has asked the Ministry to provide advice to him on whether amateur set netting should also be allowed in this defined area.
3. The IPP contains a range of options and an analysis by MFish on the costs and benefits of those options.
4. The table below outlines the options the Ministry considers are available to avoid remedy or mitigate the effects of fishing on Hector's dolphins by amateur fishing using set nets within the defined area.

Option	Description
Option one	Do not provide for exemption – Status quo
Option two	Remove amateur set net ban in the defined area
Option three	Remove ban with additional measures to mitigate effects on Hector's dolphins

5. The Ministry is seeking submissions on the proposed reconsideration of the amateur set net ban for the defined area of the ECSI to manage fishing-related threats to Hector's dolphins in this paper. Submissions should be received by **Friday, 22<sup>nd</sup> July 2011** and can be sent to Trudie Macfarlane, Ministry of Fisheries, PO Box 1020, Wellington 6140 or to [hectors.dolphin@fish.govt.nz](mailto:hectors.dolphin@fish.govt.nz).

## Purpose and Scope

6. The purpose of this paper is to seek comment from interested parties to inform the Minister's reconsideration of the prohibition on amateur set netting for butterfish in the defined area of the East Coast, South Island (ECSI) shown in Figure 1. This paper considers whether the prohibition is necessary to avoid, remedy, or mitigate the effect of fishing related mortality on the ECSI Hector's dolphin population from amateur set netting fishing for butterfish.
7. The scope of this paper is limited solely to reconsideration of the amateur regulations that ban set netting for butterfish within the defined area of the ECSI. A wider review of measures linked to the Hector's and Maui's Dolphins Threat Management Plan (TMP) will be undertaken in 2013 if warranted by newly available information.

## Background

8. Hector's dolphins are endemic to New Zealand and are some of the world's rarest dolphin species. They are classified as "endangered" and "nationally endangered" by the IUCN<sup>1</sup> and the Department of Conservation (DOC) (Baker *et al.* 2010) respectively.

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<sup>1</sup> <http://www.iucnredlist.org/>

9. Under section 15(2) of the Fisheries Act 1996 (the Act) the Minister of Fisheries (the Minister) can impose such measures as he or she considers are necessary to avoid, remedy or mitigate the effect of fishing-related mortality on protected species. Dolphins are identified as marine mammals under the Marine Mammals Protection Act 1978. Hence under this Act Hector's dolphins are classified as protected species.

10. The Hector's and Maui's Dolphin Threat Management Plan (TMP) was developed by the Ministry and DOC in 2008. The TMP is designed to manage the risks of human induced mortality to Hector's and Maui's dolphins. The goals of the TMP are:

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

11. As a result of the information provided through the TMP a previous Minister of Fisheries made decisions to impose measures to avoid, remedy or mitigate the effect of fishing-related mortality on Hector's and Maui's dolphins in July 2008. Commercial and amateur regulations to give effect to these decisions came into force on 1 October 2008.

12. The measures that were introduced included restrictions to a number of commercial trawl, drift net and, recreational, set net fisheries in specified areas covering the dolphins known habitat range including a ban on both commercial and amateur set nets in specific areas of the ECSI.

13. In February 2011 the Minister decided to provide an exemption to the general ECSI set net ban to allow commercial set netting for butterfish in a defined area of the ECSI. The review was in response to matters referred back to the Minister for reconsideration as part of a judicial review.

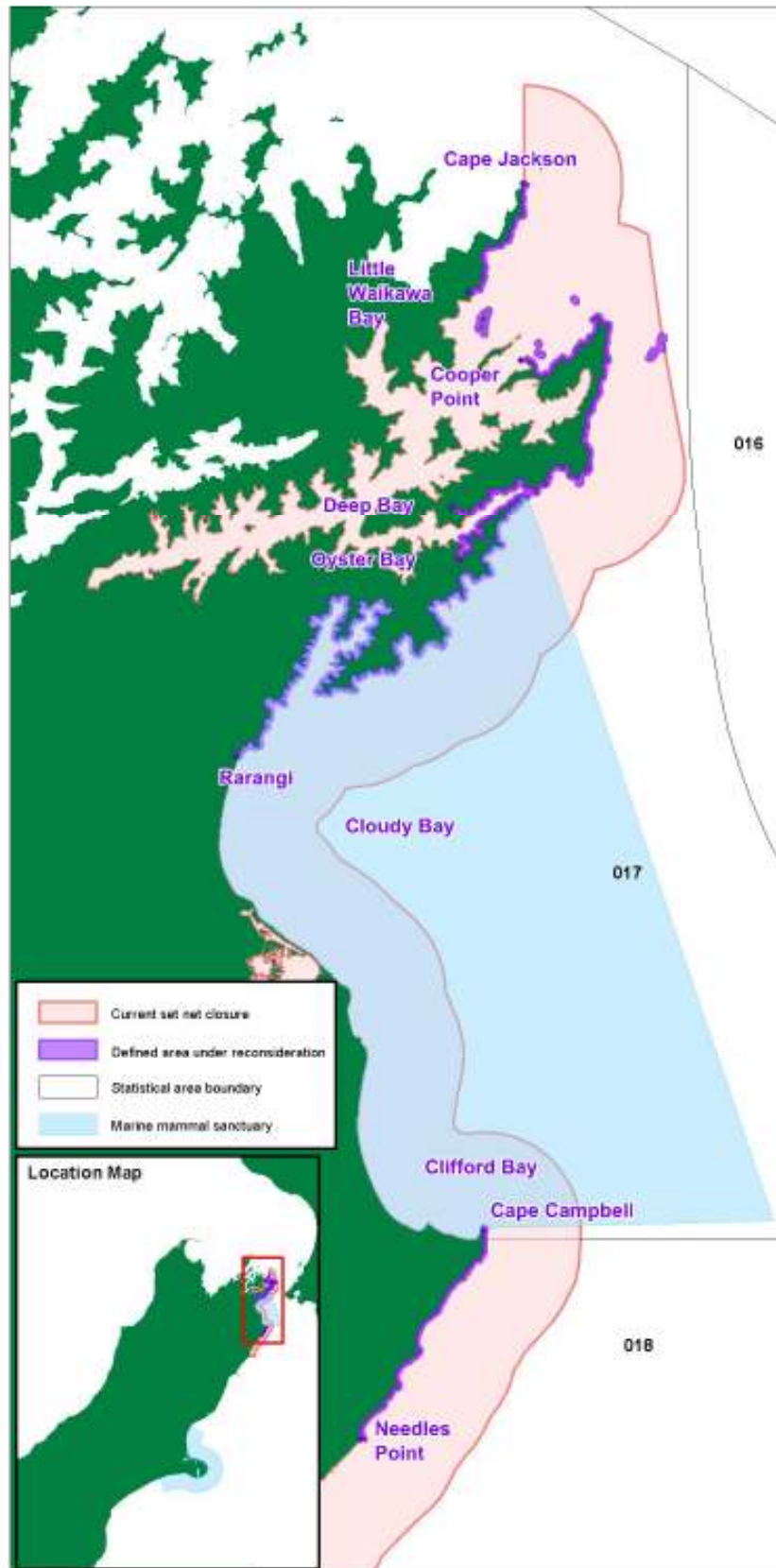
14. As a result of this decision the Minister asked that the Ministry prepare advice on whether to allow amateur set netting for butterfish within the same area.

#### Area under consideration

15. The area under consideration in this paper is the same area the Minister recently opened to commercial set netting for butterfish. We refer to this area as the "defined area." This defined area extends 200m from shore in the following areas:

- a. Needles Point to Cape Campbell;
- b. Rarangi to Oyster Bay;
- c. Deep Bay to Cooper Point on Arapawa Island;
- d. Little Waikawa Bay to Cape Jackson; and
- e. All of Motuara Island, the Twin Islands, Motungarara Island, the Brothers Islands and White Rocks.

16. The map below (Figure 1) illustrates the current area closed to set netting and the defined area under consideration. The area shaded in red shows the existing set net closure which extends out to 200m. The defined area of coastline under consideration is highlighted in purple. This area would also extend out to 200m.



**Figure 1: Map showing defined area under reconsideration**

### Species Specific Considerations

17. The Ministry considers it is appropriate to consider the effects of fishing on Hector's dolphins at a regional level. This approach recognises that there are distinct populations of Hector's dolphins. This approach therefore maintains the genetic diversity within and across populations of Hector's dolphins.

18. Fishing is the greatest cause of human-induced mortality on Hector's dolphins where cause of death is known (noting that cause of death has been established in only 40% of reported mortalities). Fishing-related threats include entanglements in set nets, trawl nets, drift nets and cray pot lines. Non-fishing related threats include disease, pollution, boat strike, tourism and entanglement in marine debris. Information on reported Hector's and Maui's dolphin mortalities from 1921 onwards (including cause where it can be determined) is collected and held by DOC in the DOC incident database. This information is summarised in appendix 1.

Key biological characteristics of Hector's dolphins make them susceptible to the effects of human-induced mortality, including fishing-related mortality. These characteristics are that Hector's dolphins:

- a. are relatively short lived (about 20 years);
- b. have a low reproduction rate (a female has a single calf every 2-3 years);
- c. become sexually mature at a relatively late age (about 7-9 years);
- d. favour shallow waters less than 100 m deep (Dawson 2009, Encyclopaedia of Marine Mammals) and have a localised inshore distribution (i.e. an overlap with many human coastal activities);
- e. have small population sizes which compound the potential impact of human-induced mortalities.

### **Assessment of the effect**

19. The following sections assess the effect of fishing related mortality from amateur set net fishing for butterfish in the defined area of the ECSI. The assessment of the effect of fishing-related mortality is based on the following factors:

- a. Biology of Hector's dolphins, including:
  - i. abundance and trends;
  - ii. distribution;
  - iii. vulnerability of the population to human-induced impacts;
  - iv. known susceptibility of the population to fishing.
- b. Assessment of the effect of amateur set net fishing, including:
  - v. characterisation of the fishery;
  - vi. overall assessment of need for restrictions on amateur set netting in the defined area.

### Abundance and Trends

20. The ECSI Hector's dolphin population area extends from Cape Farewell (near Golden Bay) to Slope Point (south of Waikawa Harbour on the Catlins Coast). Survey (e.g. Dawson *et al.* 2004, Du Fresne *et al.* 2001, Bejder & Dawson 2001, Clement *et al.* 2001) and genetic (Pilcher & Baker 2000, Pilcher 2002) research suggests the population is divided into larger concentrations connected by stretches of coastline containing small groups of

dolphins. Surveys suggest the largest densities of Hector's dolphins are in (from north to south):

- a. Cloudy and Clifford Bays;
- b. Kaikoura;
- c. Pegasus Bay;
- d. around Banks Peninsula and north and south of the peninsula; and
- e. between Timaru and Oamaru.

21. Smaller numbers are present in Queen Charlotte Sound (north) and Porpoise Bay (south). Hector's dolphins that have been sighted in the Queen Charlotte Sound may travel through the defined area.

22. Dawson et al (2004) estimated the ECSI population at 1791 individuals. A subsequent three year study of Hector's dolphins in Clifford and Cloudy Bays out to the 100m depth contour was undertaken from mid-2006 to mid-2009. The study estimated the maximum abundance (during summer) for the survey area at 951 (95% c.i.: 573 – 1577) and the minimum abundance (during winter) at 188 (95% c.i.: 100 – 355) (Du Fresne & Mattlin 2009).

23. This study could indicate a greater abundance of Hector's dolphins in the ECSI population than previously estimated. If the maximum abundance during summer from Du Fresne & Mattlin (2009) is used to replace the previous estimate for the Clifford and Cloudy Bays area (from Dawson *et al.* 2004), the combined estimate of abundance for the ECSI becomes 2,653. A potential reason for the difference between the two surveys is that Dawson *et al.* did not survey as far offshore as Du Fresne & Mattlin (4nm versus 100m depth contour, which can extend out to 18nm in the survey area). Also, the lack of recent surveys in the remainder of the ECSI makes it difficult to determine whether this recent research represents an increase in the size of the total population or some movement within the sub-population.

24. Information suggests abundance is smaller now than in the past:

- a. A series of modelling work suggests that abundance of the ECSI Hector's dolphin population has declined:
  - i. Martin *et al* (1999) estimated that abundance in 1970 equalled a carrying capacity at between 4340 and 5045 animals<sup>2</sup>
  - ii. Burkhart & Slooten (2003) built on Martien *et al* (1999) and estimated that 1970s abundance was 4783
  - iii. Slooten (2007) built on Burkhart & Slooten (2003) and Martien *et al* (1999) and estimated that 1970s abundance was over 10,000 animals.
- b. Pilcher & Baker (2000) and Pilcher (2002) detected a decline in the genetic diversity of the ECSI population that is more consistent with a decline in abundance that with other factors like sex bias or loss of sub populations.<sup>3</sup>
- c. Pilcher (2002) detected genetically different subgroups in the ECSI population and evidence that some of these subgroups (e.g. Pegasus Bay and Timaru) have experienced greater loss of genetic diversity (which is most likely equivalent to abundance) than other subgroups.

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<sup>2</sup> This estimate includes the smaller south coast South Island population

<sup>3</sup> Researchers examined DNA from museum specimens and living dolphins.

25. The Ministry intends to commission an aerial survey of the Hector's dolphin population on the ECSI shortly. Final results from this survey should be available in late 2012 and will be used to update the estimates of total abundance and distribution from Cape Campbell to Nugget Point.

#### Information on distribution of dolphins in the defined area

26. There is no specific information available on the distribution of dolphins in the defined area. Approximately 90 hours of at-sea observer coverage of commercial set net fisheries has been achieved in the defined area since October 2008. No sightings of Hector's dolphins occurred during this coverage. Observers covered nine fishing days in November and December 2008, which included a total of 103 commercial sets totalling 5,112m of net (the length of nets used varied between 30 and 60m) and comprised approximately 3.6% of the total number of fishing days that targeted butterfish in 2008/9.

27. Such a short period of observation is insufficient to prove whether Hector's dolphins are present or absent from the defined area. However it is possible that Hector's dolphins do frequent the defined area as the three year study conducted by Du Fresne & Mattlin (2009) shows Hector's dolphins have a widespread distribution in nearby Clifford and Cloudy bays. Photographs of Hector's dolphins in Bank's Peninsula (refer appendix 3) suggest Hector's dolphins use habitats similar to those in the defined area (that is, areas close to rocky coasts where seaweed is present).

#### Vulnerability of the population to human-induced impacts

28. Potential Biological Removal (PBR) analysis indicates a rebuild of the ECSI population to its optimum sustainable population (OSP) is threatened by relatively low levels of human-induced mortality. The PBR, which is the maximum number of dolphins, not including natural mortalities, which may be removed from a marine mammal stock while allowing that stock to reach or maintain its OSP with high probability, has been estimated for the ECSI stock at 2-13 human induced mortalities annually. (The PBR analysis is described in appendix 4.)

29. The 2-13 human-induced deaths includes fishing-related mortality from commercial and amateur set nets, boat strike, other fishing activity such as trawling and other human interactions. Therefore, when considering the effects of amateur set netting in relation to the PBR analysis, all human-induced effects on the population must be considered.

30. The PBR analysis assumes a population target size of OSP. While OSP is recognised as a good target population size because it results in the maximum productivity of a population, OSP is not a legislated target. Instead, the Fisheries Act 1996 states generally that, in relation to utilisation of fisheries resources or ensuring sustainability, the Minister shall take into account that "associated and dependent species should be maintained above a level that ensures their long-term viability" (s9(a)). More specifically, the Act states that the Minister may take such measures as he or she considers are necessary to avoid, remedy, or mitigate the effect of fishing-related mortality on any protected species, and such measures may include setting a limit on fishing-related mortality (s15(2)).

#### Known susceptibility of the population to fishing-related mortality

31. Hector's dolphins are known to be susceptible to entanglement in set nets because:

- a. Dolphin distribution overlaps with set net fisheries;
- b. Dolphins are not always able to identify and avoid monofilament nets;

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

32. Reported Hector's dolphin mortalities (including cause where it can be determined) on the ECSI are recorded in the DOC incident database since 1948. This information is summarised in appendix 2.

33. For the ECSI Hector's dolphin population, there have been 89 known fishing-related mortalities out of a total of 275 reported mortalities since 1948. Of these known fishing-related mortalities, 12 have been attributed to amateur set nets. In addition, a further 45 mortalities indicate possible or probable entanglement in a fishing net (commercial or non-commercial) as the cause of death.

34. The Ministry considers that reported mortalities only provide an indication of the nature of the threats to dolphins, not the extent. This is due to:

- a. the lack of independent monitoring, including low observer coverage of inshore commercial fisheries;
- b. no formal monitoring of amateur activity;
- c. poor incentives to voluntarily report incidents;
- d. cause of death is only established for 111 out of the known 275 reported mortalities in the DOC incident database for the ECSI;
- e. anecdotal information that indicates actual fishing-related mortalities are higher than reported (Cawthorn 1998, Dawson 1991, Russell 1991).

35. Three fishing-related dolphin mortalities have been observed from commercial set netting between May 2009 and January 2010, using relatively low levels of observer coverage (approximately 15.8% of total set net effort in the ECSI area in the 2009 calendar year based on number of fishing days). The mortalities occurred outside the areas closed to commercial set netting offshore of Kaikoura and Timaru.

36. This level of mortality exceeds the lower bound of the PBR. As the observer coverage only looks at commercial fishing-related mortality (not all human induced mortalities) and the level of observer coverage in ECSI commercial set net fisheries was low during the 2009 calendar year (approximately 15.8%), there is a risk that the actual level of mortalities on the ECSI Hector's dolphins population may be greater.

#### *Characterization of the amateur set net fishery*

37. The amount of amateur set net activity in the defined area of the ECSI is unknown because amateur fishing effort is not monitored by the Ministry. Correspondence between amateur fishers and the Ministry when the set net ban within the defined area was proposed for introduction indicates some interest in fishing for butterfish in the defined area.

38. Amateur set netting usually targets:

- a. Butterfish over kelp/reef areas close inshore;
- b. Flatfish in inner harbours and bays;
- c. Herring and cod in inner harbour areas;
- d. Small sharks on open beach areas in summer; and
- e. Moki on open mud and sandy substrates adjacent to submerged rocks and cliff faces.

39. A range of other species are taken as by-catch particularly where nets are left out for longer periods of time and depending on the skill of the amateur fisher.<sup>4</sup> Butterfish and moki are sometimes fished for by amateur fishers using the same net, with one part of the net set in a kelp/reef area to catch butterfish and part of the net extending into sandy/muddy areas to catch moki.

40. Amateur fishers are not required to report information on their fishing activity. This creates uncertainty around the level of set net activity occurring and the types of gear used. Gear usage (type and operation) is constrained by the amateur fishing regulations. The following rules apply for amateur set netting under amateur fishing regulations:

- a. Set nets must not exceed 60m in length
- b. Nets must not be set within 60m of another net
- c. The use of stakes to secure nets is prohibited
- d. A minimum net mesh size of 108mm is required when taking butterfish
- e. Each set net must have a surface buoy permanently and legibly marked with the fisher's initials and surname.
- f. Nets must not be set in a way that causes fish to be stranded by the falling tides
- g. Any net or nets used either individually or jointly must not extend more than a quarter of the way across a bay, channel, river, stream or sound.

### Risks posed by Amateur Set Netting

41. Surveys suggest that Hector's dolphins are most abundant close to shore inside 4nm, and that the dolphins are generally closer to shore in summer (eg, Dawson & Slooten 1988, Bejder and Dawson 2001). The summer inshore movement of Hector's dolphin coincides with a typical peak in amateur set net effort and is therefore likely to be the time of year where the likelihood of mortality from amateur set net fishing is greatest.

42. The DOC incident database shows 12 Hector's dolphin mortalities on the ECSI have been attributed to amateur set nets (see appendix 2).

43. Ministry of Agriculture and Fisheries (MAF) interviews with amateur fishers between 1984 – 1988 show six recorded individual Hector's dolphin mortalities from amateur butterfish/moki set nets around Banks Peninsula (DOC and MAF 1994).<sup>5</sup> Whilst these mortalities did not occur in the defined area it provides an indication of the nature of the threat to the ECSI Hector's dolphin population from interactions with amateur set nets. Interviews with the fishers show that the six mortalities occurred where the net was set either around rocks, below a cliff or stretched across the edge of rocks to a sandy/mud bottom, habitats where fishing for butterfish and moki typically occurs. In four of these cases either the gear was poorly constructed or the net was set incorrectly which increased the risk of dolphin mortality.

44. There are currently no restrictions on the length of time an amateur set net can be set. Nets can be left unattended for lengthy periods of time. This is sometimes due to poor weather conditions restricting the fisher from going back to retrieve their net and can result in the net being left out overnight or longer in more extreme cases. Leaving nets set for lengthy periods of time increases the risk of Hector's dolphin entanglement.

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<sup>4</sup> The defined area has a small overlap with the new Marlborough Sounds Blue Cod Regulations operating from 1 April 2011. Blue cod is taken as by-catch from set netting and any changes to the amateur set net ban within the defined area may have a small impact on rates of incidental mortality of blue cod. The effects of lifting the amateur set net ban on the blue cod fishery will be assessed as part of a review of the Marlborough Sounds Blue Cod Regulations in October 2011.

<sup>5</sup> It is unknown whether these mortalities represent six of the 12 mortalities reported in the DOC database since 1948

45. Amateur fishers tend to be more mobile, especially during holiday periods. Non-local fishers do not necessarily have the knowledge of resident Hector's dolphin populations and where they frequent to avoid interactions. This can also increase of risk of dolphin mortality.

### **Overall assessment of need for restrictions on amateur set netting in the defined area**

46. In considering the need for management action the Minister will decide whether the likelihood and consequence of mortality of Hector's dolphins resulting from amateur set netting for butterfish in the defined area is sufficient to warrant continuation of existing management measures. In reaching this decision the Minister must consider the impact of amateur fishing activity in the defined area in the context of ongoing impacts on the ECSI population from fishing activity and other human induced mortality elsewhere on the population.

47. The Ministry considers the likelihood of mortality on Hector's dolphins from amateur set net fishing in the defined area to be highly uncertain because:

- a. the defined area is a small area of the ECSI
- b. no Hector's dolphins have been observed by observers on commercial vessels in the defined area
- c. survey and observation within the defined area has been very low and may not be sufficient to confirm presence or absence of Hector's dolphins
- d. a large population of Hector's dolphin is known to be present in the Cloudy and Clifford bays which are in between the two portions of the defined area
- e. there have been no recorded Hector's dolphin mortalities as a consequence of amateur set netting in the defined area
- f. the amount of amateur effort, type of gear used and set net practices are unknown and likely to be highly variable depending on experience of fisher, weather conditions and season.

48. However, the Ministry notes the following, in considering the likelihood of dolphin mortalities occurring:

- a. fishing is the greatest known cause of human induced mortality on Hector's dolphins where cause of death is known
- b. amateur set netting is known to be responsible for 12 mortalities on the ECSI population between 1948 and 2010
- c. MAF interviews with amateur fishers in Bank's peninsula found that set netting for moki and butterfish were responsible for 6 Hector's dolphin mortalities between 1984 -1988
- d. amateur set nets can be poorly constructed and set incorrectly. Some of the mortalities from the Bank's Peninsula interviews were the result of poorly constructed or set nets
- e. amateur set nets can be left unattended for lengthy periods of time (sometimes due to weather), which increases the risk of mortality
- f. peak recreational effort co-incides with the peak inshore distribution of dolphins.

49. Overall MFish consider the estimate of likelihood of mortality from recreational set nets in the defined area is likely to be low-medium. However, this estimate is highly uncertain. The Minister is entitled to take a cautious approach when dealing with uncertain information in relation to interactions between fishing and protected species.

50. The consequence of any mortality to the Hector's dolphin population on the ECSI depends on the following aspects:

- a. current and desired population levels
- b. the level of mortality occurring in the defined area
- c. the level of mortality impacting on the population elsewhere from fishing and other effects.

51. It is not possible to estimate the amount of mortality that may occur from amateur set net fishing in the defined area. There is not enough information on dolphin distribution in the area, amateur fishing effort and interaction rates to allow a determination to be made.

52. Three mortalities from commercial fishing operations were observed during 2009-10 (from Kaikoura and Timaru). The level of observer coverage was insufficient to allow total mortality from commercial fishing operations to be estimated. There has been limited (focused on Kaikoura) coverage of commercial vessels since that time with no further mortalities observed.

53. PBR information indicates that depending on inputs used the population can sustain between 2 -13 mortalities per year without slowing or preventing the population from reaching OSP. The level of observed mortalities therefore exceeded the lower bound of the PBR, at least in the 2009-10 year. As noted, the Minister is not required to rebuild a population to OSP (see paragraph 29).

54. There is no information available to indicate whether the level of mortality recorded in 2009-10 represents a one-off or an ongoing trend.

55. In February 2011 the Minister decided that commercial set netting for butterfish in the defined area would not significantly increase fishing related mortality on the ECSI Hector's dolphin population. The Minister considered that the increased risk from commercial set netting in the defined area was acceptable. This decision has therefore introduced an added, albeit small, risk to the ECSI Hector's dolphin population that needs to be considered when assessing the cumulative risks on the ECSI dolphin population.

56. MFish consider the consequence of fishing related mortality on the Hector's population from fishing in the defined area is likely to be medium due to the level of mortality impacting on the population from other parts of the ECSI. This means that although the number of mortalities occurring in the defined area from amateur set netting might be low the consequence of those mortalities to the overall population may be medium. However, this analysis is highly uncertain.

57. Overall, there is considerable uncertainty on whether the level of risk (likelihood and consequence of mortality to the ECSI Hector's dolphin population) from fishing in the defined area is sufficient to warrant management action. However, in summary we note the following points:

- a. Data from 2009-10 showed that mortalities impacting on the ECSI population at least at the lower bound of the PBR
- b. overall risk (likelihood and consequence) may have increased since that time due to allowing commercial fishing in the defined area using set nets (although likely only marginally)
- c. allowing amateur fishing using set nets will increase risk further (probably by a greater level than by allowing commercial fishing, but still by a marginal

amount given the size of the area proposed and uncertain dolphin distribution).

## Summary of Options

58. This section outlines options in relation to allowing amateur set netting for butterfish in the defined area at the top of the ECSI. The Ministry considers the following options to be available:

Option	Description
Option one	Do not provide for exemption – Status quo
Option two	Remove amateur set net ban in the defined area
Option three	Remove ban with additional measures to mitigate effects on Hector's dolphins

59. The option chosen will depend on whether the Minister considers that measures are necessary to avoid, remedy or mitigate the effect of set net butterfish fishing on the Hector's dolphin population in the defined area. Implicit in the Minister's decision is a careful consideration of the extent to which the sustainability of the ECSI Hector's dolphin population is threatened from fishing in this area.

### Option one

60. Option one maintains the status quo which prohibits amateur set netting in the defined area. This option takes a precautionary approach to managing the effect of fishing on the ECSI Hector's dolphin population. This option recognises the increased risk posed by amateur set net activity and the inability of the Ministry to monitor and therefore respond to interactions with Hector's dolphins. This option would provide the greatest level of protection to dolphins at the expense of allowing amateur fishers to use set nets in the defined area. There is no information to indicate the cost of excluding amateur fishers from this area. The level of amateur interest in the defined area (prior to the ban) is unknown. The Ministry has received correspondence from a number of amateur fishers from Port Underwood in particular expressing dismay at not being able to use traditional set net methods in the defined area. The Ministry notes that amateur fishers can utilise fisheries resources in the area by diving and line fishing. However, line fishing, in particular, is not an effective method to target butterfish and diving is not a useable method for all fishers.

### Option two

61. Option two would allow amateur set netting for butterfish within the defined area. Current amateur set net rules which include the rules summarised in paragraph 40 would apply. The benefits of allowing amateur set netting in the defined area are unquantifiable and uncertain because, as noted above, the level of interest in butterfish set netting in that area is unknown. The cost of allowing amateur set netting is an increased likelihood of dolphin mortality. The extent of this increase in mortality is discussed in the previous section, but is likely to be low. The consequence of any Hector's dolphin mortalities in the defined area as a result of amateur set netting is dependent on the number of mortalities occurring elsewhere on the ECSI but could be significant given that in some years dolphin mortalities have exceeded the lower bounds of the PBR.

### Option three

62. Option three allows for amateur set netting of butterfish within the defined area with additional measures to mitigate the effects of fishing-related mortality on Hector's dolphins. Such measures would be in addition to the current amateur set netting rules as provided in the amateur fishing regulations. There are a range of measures that the Minister could choose to impose if he considers the risk associated with amateur set netting is significant enough to require additional measures to mitigate this risk. Suggested measures are:

- a. Require fisher to stay with their net while it is set
- and/or**
- b. Ban amateur set netting over the summer months (Dec – Feb)

#### *Fishers required to stay with their nets*

63. Requiring the fisher to stay with or in close proximity of their net while it is set would be an appropriate measure to mitigate the effects of fishing related mortality. The benefit of having such a measure in place is that if dolphins are spotted in the area where the net is set the fisher is present and able to pull their net in before a dolphin can become entangled. The length of time the net is set is also likely to be reduced given the fisher is required to stay with their net. This measure can result in added safety risks to the fisher chooses to set their net in poor weather conditions and are required the fisher to stay out on the water for long periods of time. This option will also require additional enforcement effort to ensure compliance.

#### *Amateur set net ban over summer months*

64. A ban on set net activity over summer months from the beginning of December to the end of February recognises that fishing-related mortality of Hector's dolphins increases in the summer. This is due to the summer movement of Hector's dolphins inshore coinciding with peaks in amateur set net activity. This measure therefore bans set netting at the time of year when Hector's dolphins are most at risk of interactions with set nets. The cost of imposing this measure would be on amateur fishers by restricting set net activity in the defined area to only 9 months of the year. This may result in significant costs to amateur fishers given that the ban would coincide with the traditional holiday period when recreational effort is traditionally at its highest.

## Appendices

### Appendix 1: DOC incident database mortality records for Hector's and Maui's dolphin mortalities reported between 1921 and 2010<sup>6</sup>.

Description of incident	Incidents	Specifics
<b>Known entanglement</b> - animal was known (from incident report) to have been entangled and died.	115	Commercial set net 45 Recreational set net 21 Unknown 24 Trawl 19 Cray 3 Known set net bycatch 3
<b>Not assessed</b> - carcass was not necropsied or recovered, or the cause of death was not assessed (typical of historical mortalities)	91	
<b>Not determinable</b> - carcass too decomposed for necropsy	85	
<b>Possible entanglement</b> - net marks on the body and a mention of the net marks in the incident report; or the pathology report lists probable entanglement as cause of death	54	
<b>Unknown</b> - cause of death unexplained or not definitive (eg, "open" diagnosis in pathology report)	40	
<b>Natural</b> - cause of death deemed to be from natural causes	27	
<b>Probable entanglement</b> - net marks on the body and one other definite indication of capture such as mutilation; or the pathology report lists probable entanglement as cause of death	21	
<b>Not available</b> - necropsy or incident report not available	19	
<b>Possible human interaction</b> - no signs of net entanglement but indications of other types of human interaction such as marks that resemble knife wounds	10	
<b>Trauma - unknown cause</b>	11	
<b>Human interaction</b> - no sign of net entanglement but definite signs of other types of human interaction such as high degree of mutilation	9	
<b>Harpooned</b>	4	
<b>To be confirmed</b>	3	
<b>Boat strike</b>	1	
<b>Possible maternal separation</b>	1	
<b>Probable septicaemia</b>	1	
<b>Reported by-catch but necropsy records saltwater drowning</b>	1	
<b>Euthanased</b>	1	
<b>No details available</b>	1	
<b>Sum</b>	<b>495</b>	

<sup>6</sup> This summary does not include 9 reported incidents of entanglement but where the dolphin was released and 2 releases following strandings as survival after these incidents is unknown. 4 recent additional incidents have been recorded that do not appear in the table above.

**Appendix 2:** Reported ECSI Hector's dolphin mortalities between 1948 and 2010. Source is the DOC incident database.

Description of Incident	Mortalities	Specifics
<b>Known entanglement</b> - animal was known (from incident report) to have been entangled and died.	89	Commercial set net 44 Recreational set net 12 Trawl 15 Cray pot 3 Unknown set net 15
<b>Not assessed</b> - carcass was not necropsied or recovered, or the cause of death was not assessed (typical of historical mortalities).	39	
<b>Possible entanglement</b> - net marks on the body and a mention of the net marks in the incident report; or the pathology report lists probable entanglement as cause of death.	34	
<b>Not determinable</b> - carcass too decomposed for necropsy.	37	
<b>Unknown</b> - cause of death unexplained or not definitive (e.g., "open" diagnosis in pathology report).	20	
<b>Natural</b> - cause of death deemed to be from natural causes.	12	
<b>Probable entanglement</b> - net marks on the body and one other definite indication of capture such as mutilation; or the pathology report lists probable entanglement as cause of death.	11	
<b>Human interaction</b> - no sign of net entanglement but definite signs of other types of human interaction such as high degree of mutilation.	8	
<b>Not available</b> - necropsy or incident report not available.	7	
<b>Possible human interaction</b> - no signs of net entanglement but indications of other types of human interaction such as marks that resemble knife wounds.	6	
<b>Trauma unknown cause</b> - as read from pathology report - trauma, with an unknown cause (ie, could be natural or human induced).	6	
<b>Boat strike</b>	1	
<b>Harpooned</b>	1	
<b>Possible maternal separation</b>	1	
<b>Probable septicaemia</b>	1	
<b>To be confirmed</b> - incident or necropsy report pending.	2	
<b>Total</b>	<b>275</b>	

**Appendix 3:** Hector's dolphins near rocky coast of Bank's Peninsula. Photo supplied by Dr. L Sooten



#### Appendix 4: Potential Biological Removal (PBR)

1. The Potential Biological Removal (PBR) level is the maximum number of animals, not including natural mortalities, which may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population (Wade 1998). The PBR is calculated by the following formula:

$$\text{PBR} = N_{\text{MIN}} \frac{1}{2} R_{\text{MAX}} F_{\text{R}}$$

- Where:
- i.  $N_{\text{MIN}}$  = the minimum population estimate of the stock;
  - ii.  $\frac{1}{2} R_{\text{MAX}}$  = one-half the maximum theoretical or estimated net productivity rate of the stock at a small population size; and
  - iii.  $F_{\text{R}}$  = a recovery factor between 0.1 and 1.0

2. The term Optimum Sustainable Population means, with respect to any population stock, the number of animals that will result in the maximum productivity (Maximum Net Productivity Level – MNPL) of the species, population, subpopulation or stock in question, keeping in mind the carrying capacity of the habitat and the health of the ecosystem of which they form a constituent part. For marine mammals, this level is thought to be between 50% and 85% of carrying capacity (K) and is more likely to be at the lower end of that range (Taylor & DeMaster 1993).
3. The minimum population estimate of the stock ( $N_{\text{MIN}}$ ) is defined as the 20th percentile of a log-normal distribution based on an estimate of the number of animals in the stock. This is equivalent to the lower limit of a 60% 2-tailed confidence interval (Barlow *et al.* 1995).
4. The default maximum theoretical productivity rate is 0.04 for cetaceans. This value is used as a default in the absence of species specific information. When data are available on the productivity rate, they should be used.
5. The recovery factor is intended to compensate for uncertainty and possible unknown estimation errors. A recovery factor of 0.1 often is the default used for endangered stocks of marine mammals. A recovery factor of 0.5 has been suggested for stocks of indeterminate status (Wade & Angliss 1997).
6. The MNPL goal of the PBR approach was developed to achieve the goals given in the US Marine Mammal Protection Act, i.e., to maintain the population above its maximum net productivity level. This level will be at 50% – 85% of carrying capacity.
7. The Recovery-Rate goal allows a population known to be at a low level relative to its pre-exploitation level to recover at a rate close to its maximum as possible. In this case, a recovery factor ( $F_{\text{R}}$ ) of 0.15 will achieve the goal of not delaying the time to recovery by more than 10% with 95% probability.
8. Earlier studies suggested an  $R_{\text{MAX}}$  of about 1.8. The Hector's dolphin Technical Working Group meeting of 31 August 2006 suggested that an  $R_{\text{MAX}}$  of 3.4% is appropriate based on the modelling work of Davies and Gilbert (2003).

9. As applied here, values calculated by the PBR approach should be seen as indicative only and should not be taken as absolute values of maximum allowable Hector's dolphin human caused mortality.

## References

- Baker, A. N.; Smith, A. H. and Pichler F. B. 2002. Geographic Variation in Hector's dolphin – recognition of new subspecies of *Cephalorhynchus hectori* Van Beneden 1881. *Journal of the Royal Society of New Zealand* 32 (4): 713-727.
- Barlow, J., S.L. Swartz, T.C. Eagle and P. Wade. 1995. U.S. marine mammal stock assessments: Guidelines for preparation, background, and a summary of the 1995 assessments. NOAA Technical Memorandum NMFS-OPR-95-6. September 1995.
- Bejder, L. and Dawson, S. 2001. Abundance, residency, and habitat utilisation of Hector's dolphins (*Cephalorhynchus hectori*) in Porpoise Bay, New Zealand. *New Zealand Journal of Marine and Freshwater Research* 35: 277- 287.
- Burkhart, S. M. and E. Sooten. 2003. Population viability analysis for Hector's dolphin (*Cephalorhynchus hectori*): a stochastic population model for local populations. *New Zealand Journal of Marine and Freshwater Research*. 37: 553-566.
- Cawthorn, M. W., 1988. Recent observations of Hector's dolphin *Cephalorhynchus hectori* in New Zealand Waters. Report of the International Whaling Commission (special issue 9): 303-314.
- Childerhouse, S., Rayment, W., Webster, T., Scali, S., Du Fresne, S., 2008. Offshore aerial survey of Maui's dolphin distribution 2008. Department of Conservation (unpublished), Auckland, New Zealand. 6pp.
- Clement, D.; Sooten, E.; Dawson, S.M.; DuFresne, S. 2001: Line-transect survey of Hector's dolphin abundance between Farewell Spit and Motunau. DOC Science Internal Series 22. Department of Conservation, Wellington. 15 p.
- Davies, N.M. and D.J. Gilbert. 2003. A risk analysis of an endangered dolphin subspecies using a temporal-spatial age-structured model. Final report for MFish Research Project MOF2002/03D, Objectives 1, 2, & 3 (revised). November 2003.
- Dawson, S. M. and Sooten, E. 1988. Hector's dolphin, *Cephalorhynchus hectori*; distribution and abundance. Report of the International Whaling Commission (Special Issue 9): 315-324.
- Dawson, S., E. Sooten, S. DuFresne, P. Wade and D. Clement. 2004. Small-boat surveys for coastal dolphins: line-transect surveys for Hector's dolphin (*Cephalorhynchus hectori*). *Fishery Bulletin*. 102 (3): 441-451.
- Du Fresne, S., 2010. Distribution of Maui's dolphin (*Cephalorhynchus hectori maui*) 2000-2009. Department of Conservation (unpublished), Auckland, New Zealand.
- Du Fresne, S., Mattlin, R., (2009). Distribution and abundance of Hector's dolphin (*Cephalorhynchus hectori*) in Clifford and Cloudy Bays. Final Report for NIWA project CBF07401. Marine Wildlife Research Ltd. 28p.
- DuFresne, S., Dawson, S. and Sooten, E. 2001. Line-transect survey of Hector's dolphin abundance between Timaru and Long Point, and effect of attraction to survey vessel. Published client report on contract 3074, funded by Conservation Services Levy. Department of Conservation, Wellington. 19 p.
- DOC and MAF, 1994. Review of the Banks Peninsula Marine Mammal Sanctuary, a paper for public comment, June 1994. Published jointly by Department of Conservation and Ministry of Agriculture and Fisheries, report held by DOC. Canterbury Conservancy Miscellaneous report Series No.3.
- Ferreira, S.M.; Roberts, C.C. 2003: Distribution and abundance of Maui's dolphins (*Cephalorhynchus hectori maui*) along the North Island west coast, New Zealand. DOC Science Internal Series 93. Department of Conservation, Wellington. 19 p.
- Hamner *et al.*, 2010 Estimating the abundance and effective population size of Maui's dolphins using microsatellite genotypes: 2010-11. Draft report, Year 1 interim report 29 June 2010.
- Martien, K. K., Taylor, B. L., Sooten, E., Dawson, S. M. 1999. A sensitivity analysis to guide research and management for Hector's dolphin. *Biological Conservation* 90: 183-191.
- Pichler, F. B., 2002. Genetic assessment of population boundaries and gene exchange in Hector's dolphin. Department of Conservation Science Internal Series 44. Department of Conservation, Wellington 37 pp.

- Pichler, F. B. and Baker, C. S. 2000. Loss of genetic diversity in the endemic Hector's dolphin due to fisheries-related mortality. *Proceedings of the Royal Society of London Series B* 267: 97-102.
- Pichler, F. B., Dawson, S. M., Slooten, E. and Baker, C. S. 1998. Geographic isolation of Hector's dolphin populations described by mitochondrial DNA sequences. *Conservation Biology* 12(3): 676-682.
- Pichler, F.B., Robineau, D., Goodall, R.N.P, Meyer, M. A., Olavarria C., and Baker C. S. 2001. Origin and radiation of Southern Hemisphere coastal dolphins (genus *Cephalorhynchus*). *Molecular Ecology* 10, 2215-2223.
- Rayment, W., Du Fresne, S., 2007. Offshore aerial survey of Maui's dolphin distribution 2007. Department of Conservation (unpublished), Auckland, New Zealand. 6pp.
- Rayment, W., S. Dawson, E. Slooten and S. Childerhouse. 2006. Offshore distribution of Hector's dolphin at Banks Peninsula. DOC Research & Development Series 232. Department of Conservation, Wellington. 23 pp.
- Russell, K. 1999. The North Island Hector's dolphin: a species in need of conservation. Unpublished MSc. thesis, University of Auckland, Auckland, New Zealand.
- Russell, K., 2002. Distribution of Public Sightings of Hector's Dolphins in North Island Coastal Waters. Report prepared for Ministry of Fisheries. 16pp.
- Russell, K., 2008. Distribution of Maui's Dolphin sightings 2002-2007. Report for the Marine Conservation Unit, Department of Conservation, January 2008. DOCDM418409.
- Scali, S., Dawson, S., Slooten, E., 2007. Habitat utilization of Maui's dolphin (*Cephalorhynchus hectori maui*). Final Progress Report (unpublished), held by Department of Conservation, DOCDM 176479.
- Scali, S., Dawson, S., Slooten, E., 2008. Habitat utilisation of Maui's dolphin (*Cephalorhynchus hectori maui*). Final Progress Report (unpublished), held by Department of Conservation, DOCDM 379814.
- Slooten, E. 2007. Conservation Management in the face of uncertainty: Effectiveness of four options for managing Hector's Dolphin bycatch. Presented at NZ Marine Sciences Society Conference, International Marine Mammal Conference (San Diego) and IUCN workshop to review red list of threatened marine mammal species.
- Slooten, E., Dawson, S.M., Rayment, W.J., 2004. Aerial surveys for Hector's dolphins: abundance of Hector's dolphins off the South Island west coast, New Zealand. *Marine Mammal Science*. 20 (3): 477-490.
- Slooten, E., Dawson, S.M., Rayment, W.J., Childerhouse S.J., 2005. Distribution of Maui's dolphin, *Cephalorhynchus hectori maui*. New Zealand Fisheries Assessment Report 2005/28. 21 p.
- Slooten, E., Dawson, S.M., Rayment, W.J., Childerhouse S.J., 2006. A new abundance estimate for Maui's dolphin: What does it mean for managing this critically endangered species? *Biological Conservation*. 128 (4): 576.
- Speedie, C.D., 2003. The value of public sightings recording schemes in relation to the basking shark in the United Kingdom. *Cybium* 27(4): 255-259.
- Stanley, M., 2009. Maui's Winter Offshore Aerial Survey June/July 2009. Unpublished report DOCDM 495949. Department of Conservation, Auckland, New Zealand. 10pp.
- Taylor, B.L. and D.P. DeMaster. 1993. Implications of non-linear density dependence. *Marine Mammal Science* 9: 360-371.
- Wade, P.R., 1998. Calculating limits to the allowable human-caused mortality of cetaceans and pinnipeds. *Marine Mammal Science* 14(1): 1-37.
- Wade, P.R., Angliss, R.P., 1997. Report of the GAMMS workshop: April 3-5, 1996, Seattle, Washington, NOAA Technical Memorandum NMFS-OPR-12.
- WWF, 2010. WWF-New Zealand Updated Information on the WWF Maui's Dolphin Sighting Network to Inform Conservation Management Decisions. Letter to Ministry of Fisheries, 21 June 2010.