Ministry of Fisheries
Te Tautiaki i nga tini a Tangaroa

New Zealand Government

Proposals for managing the fishing-related mortality of seabirds

Draft for public consultation

Proposals for managing the fishing-related mortality of seabirds:

1. Seabird standard

2. Revised NPOA Seabirds management framework

27 November 2007

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Purpose

1 The purpose of this document is to consult on proposals for managing the fishing-related mortality of seabirds, including a seabird standard and a revised NPOA Seabirds management framework.

Submissions

2 The Ministry of Fisheries and Department of Conservation request that you provide written comments on the proposals contained in this document by 18 February 2008. Please send submissions to:

3 Tracey Steel, Ministry of Fisheries, PO Box 1020, Wellington. Or e-mail them to tracey.steel@fish.govt.nz.

Letter from the Minister of Fisheries

Dear Stakeholder

The purpose of this letter is to outline proposals for managing the fishing-related mortality of seabirds.

As Minister of Fisheries, I am responsible for managing the impacts of fishing on seabirds. More specifically, Section 15 of the Fisheries Act 1996 empowers me to takes such measures as I consider necessary to avoid, remedy or mitigate the effects of fishing-related mortality on any protected species, including protected species of seabirds such as albatrosses and petrels.

The consultation documents that accompany this letter set out a strategic framework for managing seabird-fishery interactions, in line with a shift towards Objectives Based Fisheries Management (OBFM) signalled in the Ministry of Fisheries' Statement of Intent. The proposed framework consists of the following elements:

1. The seabird standard
2. A revised National Plan of Action for Seabirds (NPOA Seabirds) management framework; and
3. Fisheries Plans

The principal role of the seabird standard is to set out more explicitly the point at which I consider it necessary to take steps to avoid, remedy or mitigate the effects of fishing-related mortality on seabirds. The seabird standard is not analogous to the use of a fishing-related mortality (FRML) such as for managing sea lion-fishery interaction in the squid 6T fishery, because it will not contain automatic sanctions and penalties such as the closure of a fishery. However, it will provide greater certainty about the level of performance that I expect to see and when additional management measures may be required.

The second element, the revised NPOA Seabirds management framework, provides an allocation framework between fisheries for the limit set by the seabird standard and offers a robust risk assessment process to determine what measures are necessary in each fishery to ensure as far as possible that this is not exceeded.

The seabird standard and revised NPOA Seabirds management framework also contain minimum requirements for monitoring fishing-related mortality of seabirds. These requirements will give comfort to government that each fishery is achieving fishing-related mortality objectives.

The final element in the OBFM framework relating to fishing-related mortality of seabirds is the development of fisheries plans as the principal vehicle for managing New Zealand's fisheries. Each fisheries plan will be required to meet seabird fishing-related mortality objectives driven by the seabird standard and in accordance with the allocation and risk assessment framework described in the NPOA Seabirds.

There is a lot of information contained within the proposed management framework and this is reflected in the twelve-week consultation period. I look forward to receiving your constructive feedback and will listen to your views carefully before making a decision on the final version of these documents.

I remain concerned at the level of incidental mortality that government observers are reporting, such as the recent catch of a large number of critically endangered Chatham Albatross. As you may be aware, the Ministry of Fisheries has recently completed a consultation on best practice mitigation measures for all trawl and longline vessels. The purpose of the best practice proposals is to manage the immediate and ongoing risk of vessels that do not fish using effective mitigation measures and to ensure as far as possible that there are no more incidents similar to those that occurred on the Chatham Rise and, previously, in the Kermadecs.

The proposals are targeted at those operators who choose not to deploy effective mitigation measures and who are letting the large number of fishermen down who operate using best practice and who are committed to reducing seabird fishing-related mortality. I will do my best to ensure that any measures do not penalise good operators, however, they also may need to make changes to their fishing practices for the time being.

In the longer term, I expect all fisheries to meet the objectives driven by the seabird standard. This will likely require many fishermen to take steps over and above the best practice measures that are currently being consulted on. The revised NPOA management framework sets out how this will happen.

I would like to finish by reiterating the importance that I place on avoiding, remedying or mitigating the effects of fishing related mortality on seabirds. This is a challenge that we must meet and which I regard as one of the most pressing issues facing the sustainability of the fishing industry today.

Yours sincerely

Jim Anderton
Minister of Fisheries

Background to the seabird standard and NPOA seabirds management framework consultation documents

Purpose

1 The purpose of this document is to outline how MFish and DoC intend to manage the incidental mortality of seabirds from fishing activity, through a seabird standard, revised NPOA framework and fisheries plans.

2 Further details on the proposed process can be found in the accompanying documents:

i) Seabird Standard consultation document

ii) Revised NPOA management framework consultation document

iii) Fisheries Plan final document[1]

Background

Why is seabird incidental mortality a problem?

3 New Zealand is an important breeding ground for approximately eighty seabird species and has the greatest variety of albatross and petrel species in the world. As well as being a significant and unique part of the ecosystem, many species of albatross and petrel are considered to be *taonga* by tangata whenua and hold iconic status in the minds of the public of New Zealand.

4 Seabird species globally are facing a number of threats to their long term viability, both at the sites where they breed and while they are foraging at sea. One of the key threats is the incidental mortality of seabirds in the course of fishing activity.

5 In longline fisheries, the baited hooks float on, or just below, the surface for a short time before they start sinking, where they can be attacked by foraging seabirds which become hooked and drown. In some target fisheries the hooks can remain within reach of diving seabirds for a considerable length of time.

6 In trawl fisheries, contact with the warp cables causes significant levels of seabird mortality as seabirds forage on offal and discards from the vessel. Mortalities can also occur when birds dive into the trawl net or become entangled in the meshes when they are trying to seize fish. In set-net fisheries, seabirds become entangled in the net while diving for food.

7 Several population characteristics of albatrosses and petrels make them susceptible to long-term population decline from fishing-related mortalities. Albatrosses and petrels typically have an extended maturity time (3-15 years), low productivity (maximum of one nestling per year), and take a long time to form pairbonds if one partner is killed. If the death of a breeding individual occurs, the chick almost always dies and the remaining partner may take several years to start nesting again with a new partner.

[1] Available from MFish's website (www.fish.govt.nz)

8 The intrinsic rate of population increase for these species is very low (around 1% per year), meaning that birds may not be able to reproduce sufficiently rapidly to compensate for fishing related removals at the population level. As a result, decreases in population sizes and an associated increase in threat status are likely to occur.

9 Although information on the population-level impacts of fishing on some seabird species is very uncertain, the best available information suggests that current levels of incidental mortality in New Zealand may be having an adverse effect on at least four species of endemic seabird, with this number potentially being as high as eight or more species[2].

Legislative obligations

10 There are two key pieces of legislation in New Zealand that are relevant to the impact of fishing activity on seabirds. These are the Wildlife Act 1953 and the Fisheries Act 1996. A number of international obligations are also relevant.

11 The Fisheries Act requires the adverse effects of fishing on the aquatic environment to be avoided, remedied or mitigated. The Act also contains specific provisions relating to managing the effects of fishing on protected species.

12 The Wildlife Act absolutely protects all but seven seabird species and partially protects two other species[3]. However, the Wildlife Act recognises and allows for the fact that fishing activity can result in the death of protected seabirds.

13 The principal international obligations stem from the Convention on Biological Diversity (CBD), the Convention on Migratory Species (CMS), the Agreement for the Conservation of Albatrosses and Petrels (ACAP) and the FAO International Plan of Action for Reducing the Incidental Catch of Seabirds in Longline Fisheries (IPOA Seabirds). In addition, New Zealand has international obligations stemming from vessels fishing under the auspices of Regional Fishery Management Organisations (RFMOs) and the Antarctic Treaty system.

14 A more detailed description of New Zealand's domestic and international legislative obligations relating to impacts of fishing on seabirds can be found in Appendix A.

Policy frameworks

National Plan of Action to reduce the Incidental Catch of Seabirds in New Zealand Fisheries (NPOA Seabirds)

15 The NPOA Seabirds sets out a long term, strategic approach to reducing the incidental catch of seabirds that includes goals, objectives, management measures and supporting services such as monitoring and research.

[2] See the seabird standard consultation document for more details.

[3] Black-backed gull *Larus dominicanus* - not protected; black shag *Phalacrocorax carbo* and sea hawk *Catharacta lonnbergi* - partially protected; and mutton bird *Puffinus griseus*, grey-faced petrel *Pterodroma maroptera*, little shag *Phalacrocorax melanoleucos brevirostris* and pied shag *Phalacrocorax varius* - may be hunted or killed subject to Minister's notification.

16 In 2005, the Minister of Fisheries directed officials to review the NPOA Seabirds to increase the effectiveness of the strategy, with a particular focus on the management framework.

17 A revised NPOA Seabirds management framework consultation document accompanies this paper.

Seabird standard

18 In 2005, the Ministry of Fisheries launched its Strategy for Managing the Environmental Effects of Fishing (SMEEF). The SMEEF set out how MFish proposed to meet its environmental obligations under the Fisheries Act and other international legislation, as well as delivering on the key environmental policy objectives set by its Statement of Intent.

19 The SMEEF proposed the development of a set of standards for defining acceptable limits of the effects of fishing on the aquatic environment, including the effects of fishing on seabirds.

20 A proposed seabird standard consultation document accompanies this paper.

Fisheries Plans

21 MFish announced its intention to move towards Objectives Based Fisheries Management in its 2007 Statement of Intent, and to implement this approach through the use of Fisheries Plans.

22 Fisheries Plans set out what objectives, management measures and services will be required for each stock or grouping of fish stocks. MFish has proposed that New Zealand's fisheries be divided into approximately 26 fisheries plans, based on stakeholder groupings, fishing method and area.

23 Fisheries plans will set a number of objectives relating to obligations under the Fisheries Act and MFish's purpose statement[4]. As part of this process, fisheries plans will be required to set an objective relating to seabird incidental mortality. The Fisheries Plan process will therefore be integrated with the both the seabird standard and with the NPOA Seabirds to manage the incidental mortality of seabirds.

24 More information on fisheries plans can be found in the document entitled "Fisheries plans final" on the MFish website.

Key components for managing the incidental mortality of seabirds

25 Managing the incidental mortality of seabirds can be split into the following two main areas:

i) Defining outcomes for managing the incidental mortality of seabirds: The seabird standard

ii) Managing to meet outcomes: The revised NPOA Seabirds management framework

[4] MFish's purpose statement is "The value New Zealanders obtain through the sustainable use of fisheries resources and protection of the aquatic environment is maximised"

Defining outcomes for managing the incidental mortality of seabirds: The seabird standard

26 To date, outcomes for managing the incidental mortality of seabirds have been largely driven out of achieving the two goals contained in the NPOA Seabirds. These goals are:

a) To ensure that the long-term viability of protected seabird species is not threatened by their incidental catch in New Zealand fisheries waters or by New Zealand flagged vessels on the high seas; and

b) To further reduce incidental catch of protected species as far as possible, taking into account advances in technology, knowledge and financial implications.

27 The first goal relates to the Minister of Fisheries' obligation under the Fisheries Act to take into account the environmental principles under Section 9, including that associated or dependent species (including seabirds) should be maintained above a level that ensures their long-term viability.

28 The second goal promotes and encourages the reduction of incidental mortality beyond the level that is necessary to ensure the long term viability of seabirds. This goal relates to the Minister of Fisheries' powers under section 15 of the Fisheries Act that allow him to take such measures as he considers necessary to avoid remedy or mitigate the effects of fishing on seabirds, and that this may require taking steps in addition to merely ensuring that seabird species are maintained above long term viability.

29 The second goal also encourages voluntary action to reduce seabird incidental mortality beyond that required by government, recognising that the majority of seabird species are protected under the Wildlife Act.

30 Although the two goals of the NPOA are consistent with the Minister's obligations under the Fisheries Act, they do not provide any further guidance on government's expectations in relation to what measures the Minister considers are necessary, given the wide discretion open to the Minister under Section 15 of the Act.

31 The principal role of the seabird standard is to set out more explicitly the point at which the Minister considers it necessary to avoid, remedy or mitigate the effects of fishing on seabirds and, hence, provide certainty about the level of utilisation that can be provided for under the provisions of the Act.

32 The seabird standard also contains minimum requirements for monitoring that the standard is being met. Setting a required level of certainty will give comfort to government that the seabird standard is not being exceeded, particularly as observer coverage has historically been low in a large number of fisheries.

33 It should be noted that the seabird standard is not a statutory instrument such as a MALFiRM or FRML and does not contain automatic sanctions or penalties if it is exceeded, such as the closure of a fishery.

34 The seabird standard consultation document that accompanies this paper sets out in more detail proposals for setting and monitoring a maximum allowable seabird incidental mortality limit.

Managing to meet outcomes: The revised NPOA Seabirds management framework

35 As well as setting the two overarching goals described above, the NPOA Seabirds contains the primary framework for managing the impacts of fishing on seabirds.

36 The revised NPOA Seabirds management framework is designed to complement the development of a seabird standard and the introduction of fisheries plans, as well as to solve some of the problems associated with the original NPOA Seabirds.

37 For example, the seabird standard will now be the principal determinant of the level at which seabird incidental mortality objectives will be set and fisheries plans will be the main vehicle through which management measures are implemented.

38 The key components of the revised NPOA Seabirds management framework are:

i) Seabird incidental mortality objectives for fisheries will be based on the need to meet the seabird standard and will be set at a fishery-plan level

ii) Management measures will be implemented based on a risk assessment to determine what, if any, measures are required to meet objectives and whether a voluntary or mandatory approach is appropriate

iii) Minimum requirements for monitoring will be introduced to ensure that seabird incidental mortality objectives are met

iv) A transparent process will be followed for fisheries that do not meet seabird incidental mortality objectives

Summary of process for managing seabird incidental mortality

Defining outcomes for managing the incidental mortality of seabirds
Legislative obligations: International - including commitment to achieve favourable conservation status for albatrosses and petrels Fisheries Act 1996 - including obligation to avoid, remedy or mitigate adverse effects of fishing Wildlife Act 1953 – including giving absolute protection to seabirds and requiring reporting of deaths and injuries
Goals of the NPOA Seabirds: Goal 1 - Ensure that long term viability of protected seabird species is not threatened by fishing Goal 2 - Further reduce incidental mortality as far as possible, taking into account technology, knowledge and financial implications
Seabird standard: Sets out more explicitly government's expectations of progress against the two goals of the NPOA and defines the point at which the Minister considers effects of fishing on seabirds becomes unacceptable (i.e adverse) based on his legislative obligations.
Managing to meet outcomes – the NPOA Seabirds management framework
Fisheries plan objectives: Seabird incidental mortality objectives for fisheries will be based on the need to meet the seabird standard and will be set at a fishery-plan level
Implementation of management measures: Management measures will be implemented based on a risk assessment to determine what, if any, measures are required to meet objectives and whether a voluntary or mandatory approach is appropriate
Monitoring requirements: Minimum requirements for monitoring will be introduced to ensure that seabird incidental mortality objectives are met
Additional measures where objectives are not being met: A transparent process will be followed for fisheries that do not meet seabird incidental mortality objectives

APPENDIX A: legislative obligations

The Wildlife Act 1953

39 The Wildlife Act absolutely protects all but seven seabird species and partially protects two other species. However, the Act recognises and allows for the fact that fishing activity can result in the death of protected seabirds.

40 The following sections of the Wildlife Act are relevant:

i) Section 63A deals with the taking of absolutely or partially protected marine wildlife, stating that an offence is committed if anybody kills, attempts to kill, possesses or sells such listed wildlife.

ii) Section 67 sets penalties at a maximum of 6 months imprisonment, or a fine of $250,000 or less.

iii) Section 68B outlines a series of defences available for people who capture or kill marine wildlife, including a defence for killing wildlife in the course of fishing, provided it is reported within 48 hours of returning to port.

41 The Wildlife Act also provides for a Population Management Plan to be developed for any species of marine wildlife, including the aim of ensuring that fishing related mortality does not prevent the threatened species from achieving non-threatened status within 20 years.

The Fisheries Act 1996

42 Under section 8 of the Fisheries Act, the purpose of the Act is stated to be, to provide for the utilisation of fisheries resources while ensuring sustainability.

a) "Ensuring sustainability" means maintaining the potential of fisheries resources to meet the reasonably foreseeable needs of future generations; and avoiding, remedying, or mitigating any adverse effects of fishing on the aquatic environment.

b) "Utilisation" means conserving, using, enhancing, and developing fisheries resources to enable people to provide for their social, economic, and cultural wellbeing.

43 Other sections of the Fisheries Act are also relevant:

a) Section 9 of the Act contains two relevant environmental principles that must be taken into account when exercising or performing functions, duties, or powers under the Act:

i) Associated or dependent species should be maintained above a level that ensures their long-term viability; and

ii) Biological diversity of the aquatic environment should be maintained.

b) Section 10 of the Act contains a set of information principles that must be taken into account when exercising or performing functions, duties, or powers under the Act:

   i) Decisions should be based on the best available information;

   ii) Decision makers should consider any uncertainty in the information available in any case;

   iii) Decision makers should be cautious when information is uncertain, unreliable, or inadequate; and

   iv) The absence of, or any uncertainty in, any information should not be used as a reason for postponing or failing to take any measure to achieve the purpose of this Act

c) Section 15 of the Act relates specifically to protected species such as seabirds. Amongst other things, this section empowers the Minister of Fisheries, after consultation with the Minister of Conservation, to take such measures as he or she considers necessary to avoid, remedy or mitigate the effects of fishing-related mortality on any protected species. Such measures may include setting a limit on fishing-related mortality

International obligations

44 The principal international obligations stem from the Convention on Migratory Species (CMS), the Agreement for the Conservation of Albatrosses and Petrels (ACAP) and the FAO International Plan of Action for Reducing the Incidental Catch of Seabirds in Longline Fisheries (IPOA Seabirds). In addition, New Zealand has international obligations stemming from vessels fishing under the auspices of Regional Fishery Management Organisations (RFMOs) and the Antarctic Treaty system.

45 At the present time neither the CMS or ACAP agreements have led to any specific actions to reduce seabird incidental mortality, but the ACAP agreement has committed New Zealand to the goal of achieving a favourable conservation status for albatrosses and petrels, including the requirement to assess and mitigate against fishing related mortality of ACAP listed species.

46 In response to the IPOA Seabirds, New Zealand has developed a National Plan of Action to Reduce the Incidental Catch of Seabirds in New Zealand Fisheries (NPOA Seabirds), covering all fishing methods where seabird mortalities occur, including trawling.

SEABIRD STANDARD – CONSULTATION DOCUMENT

Purpose

1 The purpose of this document is to:

i) outline how MFish intends to set and monitor a maximum allowable level of seabird fishing-related mortality, through the application of a seabird standard; and

ii) consult on a range of options for the level at which the seabird standard will be set

Scope

2 The scope of this document is limited to the direct effects of fishing on seabirds and will initially apply to commercial fisheries within New Zealand's territorial sea and EEZ. However, it may be applied to other groups of fishers over time, such as high seas and non-commercial fisheries.

Desired outcomes

3 The effects of fishing-related mortality on all protected species of seabird are avoided, remedied or mitigated.

4 MFish fisheries plan managers and stakeholders will have greater certainty over government's expectations for managing the fishing-related mortality of seabirds, including the level of fishing-related mortality that must not be exceeded and minimum standards for monitoring and reporting of fishing-related mortality.

5 Over time, advances in technology and knowledge will lead to decreases in the maximum level of acceptable fishing-related mortality.

Executive summary

6 The legislative context for the seabird standard is as follows:

a) Standards define limits on the effects that fishing may have on the aquatic environment

b) The seabird standard sets out more explicitly the point at which the Minister considers it necessary to avoid, remedy or mitigate the effects of fishing-related mortality on protected species of seabirds, consistent with Section 15 of the Fisheries Act

c) When setting the seabird standard the Minister will need to take into account the uncertainty associated with information on the effects of fishing on seabirds, consistent with Section 10 of the Fisheries Act

d) The seabird standard is not a statutory limit on fishing related mortality such as a MALFiRM[5] or FRML[6] and will not result in automatic management action such as the closure of a fishery if it is exceeded

7 The key elements of the seabird standard are as follows:

a) The seabird standard will be set for all seabird species collectively

b) Monitoring of the seabird standard will be required to demonstrate high statistical certainty that it has not been exceeded

c) A suite of indicators will be used to monitor the effectiveness of the standard

d) The seabird standard will be reviewed every three years, or when significant new information becomes available

8 The Minister has considerable discretion over the most appropriate level at which to set the seabird standard. The following options are those recommended by MFish, however, they do not cover the full spectrum of options open to the Minister. These options describe the New Zealand-wide maximum allowable fishing-related mortality of birds across all seabird species over a 12 month period:

i) Option 1: 2,000 seabirds

ii) Option 2: 1,500 seabirds

iii) Option 3: 1,000 seabirds

iv) Option 4: 500 seabirds

[5] A Maximum Allowable Limit on Fishing Related Mortality (MALFiRM) can be set under a Population Management Plan (PMP) under the Wildlife Act 1953 or the Marine Mammal Protection Act 1978. The Minister of Fisheries is obliged to take all reasonable steps to ensure that a MALFiRM is not exceeded, including closing areas to fishing.

[6] In the absence of a Population Management Plan, a limit on fishing-related mortality (FRML) may be set by the Ministry of Fisheries under Section 15(2) of the Fisheries Act. The Minister of Fisheries may take all reasonable steps to ensure that an FRML is not exceeded, including closing areas to fishing. The New Zealand sea lion is currently managed under an FRML in the squid 6T fishery.

9 The key issues relating to options for the most appropriate level at which the seabird standard should be set are as follows:

a) The best available information on the effects of fishing-related mortality on seabird populations is currently the calculation of Potential Biological Removals (PBR)

b) PBR values range from 20 individuals per year for the most vulnerable species up to 110,000 individuals for the most abundant species. Seven species have PBR values of 100 or less[7]

c) Information on the species composition of incidentally caught seabirds is poor, making the setting of an appropriate multi-species maximum allowable level of fishing-related mortality difficult

d) The best available information on species composition is very uncertain but suggests that two thirds of seabirds caught may be from species that are of relatively low abundance and relatively high vulnerability

e) Additional mortalities are likely to be occurring over and above those that will be measured against the seabird standard, including warp strikes, unobserved longline mortalities and out of zone mortalities

f) The Minister needs to consider the PBR modelling objectives, uncertainty over species catch composition and the potential magnitude of unobserved and unrecorded fishing-related mortality when setting the seabird standard, along with potential socio-economic impacts

g) The most appropriate level to set the seabird standard will depend on the Minister's approach to risk and uncertainty. Higher levels of allowable fishing-related mortality represent more risk and lower levels represent less risk. Lower levels are likely to have greater socio-economic implications

h) Based on the range of options recommended by MFish, overall reductions in seabird fishing-related mortality of between 63-91% from 2003-04 levels will be required to meet the seabird standard

i) New information is likely to be available over the next 5 years on the effects of fishing on seabirds and higher levels of observer coverage may help to reduce uncertainty over seabird species catch composition

[7] Buller's albatross (100), Southern Royal albatross (100), Northern Giant petrel (90), Northern Royal albatross (70), Chatham albatross (60), Westland petrel (30) and Black petrel (20)

Part 1: Legislative context for the seabird standard

What are standards?

10 In 2005, the Ministry of Fisheries launched its Strategy for Managing the Environmental Effects of Fishing (SMEEF). The SMEEF set out how MFish proposed to meet its environmental obligations under the Fisheries Act and other international legislation, as well as delivering on the policy objectives set by its Statement of Intent.

11 The SMEEF proposed the development of a set of standards for defining limits on the effect that fishing may have on the aquatic environment. The exact form that a standard will take, and the approach to defining limits of the effects of fishing on the environment, will vary depending on the element of the aquatic environment in question (e.g. seabirds, benthic impact, target fish stocks) and the nature of the available information.

12 Parts 2 and 3 of this document describe how MFish proposes to advise the Minister on setting and monitoring a maximum allowable level of fishing-related mortality, or standard, for seabirds.

How do standards relate to the Minister's obligations under the Fisheries Act?

13 Section 15 of the Fisheries Act relates to fishing-related mortality of species that are listed as protected under the Wildlife Act 1953 and the Marine Mammal Protection Act 1978, which includes all but seven species of seabird.

14 Under Section 15, the Minister is able to take such measures as he or she considers necessary to avoid, remedy or mitigate the effects of fishing related mortality on a protected species. Under this section, the Minister has considerable discretion to determine what level of impact, or effect, is acceptable for a protected species, and therefore what measures may be necessary to avoid, remedy or mitigate this effect.

15 The principal role of the seabird standard, then, is to set out more explicitly the point at which the Minister considers it necessary to avoid, remedy or mitigate the effects of fishing related mortality on seabirds and, hence, provide certainty about the level of utilisation that can be provided for under the provisions of the Act.

16 When considering what level of effect is acceptable, the Minister will need to take into account a range of environmental, social and economic factors. For example, the Minister may wish to take into account the objectives of the legislation that affords the species its protection. In the case of seabirds, the broad concept contained in the Wildlife Act is that fishing will not reasonably prevent the species from attaining non-threatened status.

17 While not mandatory under the Fisheries Act, the concept of rebuilding populations to achieve non-threatened status is open to the Minister when

considering what effects of fishing are acceptable. Such a rebuild objective may also be appropriate if the Minister felt that it reflected the cultural values associated with seabirds, such as the taonga status given to many species of seabirds by tangata whenua.

18 Although Section 15 provides discretion for the Minister to take measures to limit the effects of fishing on seabirds, he must still consider what is 'necessary' in light of the purpose and principles of the Act.

19 The purpose of the Fisheries Act is to "provide for the utilisation of fisheries resources while ensuring sustainability". Under the Act:

a) 'Utilisation' is defined as "conserving, using, enhancing, and developing fisheries resources to enable people to provide for their social, economic, and cultural wellbeing".

b) 'Ensuring sustainability' is defined as "maintaining the potential for fisheries resources to meet the reasonably foreseeable needs of future generations; and avoiding, remedying, or mitigating any adverse effects of fishing on the aquatic environment".

20 Put simply, the intent of the purpose statement is that utilisation should be allowed to the extent that it is sustainable, and this concept frames the overarching goal against which all decisions under the Act must be measured.

21 When considering what steps are necessary, therefore, the Minister must weigh up the utilisation impacts of avoiding, remedying and mitigating the effects of fishing on seabirds, particularly where he is contemplating determining that even small effects of fishing are undesirable.

22 As well as the purpose of the Act, the Minister is required to take into account the environmental principles under Section 9 of the Act.

23 The most relevant environmental principle is that associated or dependent species (including seabirds) should be maintained above a level that ensures their long-term viability. Long term viability is defined as 'a low risk of collapse of the stock or species, and the stock or species has the potential to recover to a higher biomass level'.

24 The extent to which the long term viability of seabirds is threatened can be ascertained in part by the species' threat status ranking, as this is a reflection of the risk of a species of seabird becoming extinct. For example, according to the IUCN redlist, the threat status of New Zealand seabird species varies from "critically endangered" through to "least concern".

25 Where fishing related mortality is likely to cause an increase in severity of the threat status of a species, or prevent a species with an already existing high threat status from recovering, this may be considered by the Minister to be posing an unacceptable risk to the long term viability of that species.

26 A second environmental principle is also relevant to seabirds, namely, that biological diversity of the aquatic environment should be maintained.

"Biological diversity" means the variability among living organisms, and can be considered at a number of different levels, such as the existence of sub-populations or sub-species, or the genetic diversity within a population. If fishing-related mortality contributed to reductions in numbers of breeding sites, or decreases in the size of a sub-population, this could be considered by the Minister to be contrary to this environmental principle.

27 However, the Minister is not constrained by the objectives contained within the environmental principles and may consider that additional steps are necessary over and above those required to meet them. Similarly, he is not required to weigh up the utilisation and sustainability dimensions for protected species in the same manner as would be the case for harvestable species such as commercial fish stocks[8].

28 In summary, when considering the most appropriate level to set the seabird standard, the Minister may take into account a wide range of factors including the biological implications of different levels of fishing-related mortality, societal values and likely utilisation impacts.

Setting the seabird standard

29 When setting the seabird standard, the Minister will not only need to turn his mind to what effects of fishing he considers to be unacceptable in theory, but also to the practicalities of determining a limit (as the main component of the standard) on fishing related mortality to achieve this outcome, given that perfect information on the impacts of fishing on seabirds is not available.

30 When making decisions in relation to utilisation of fisheries resources or ensuring sustainability, section 10 of the Fisheries Act specifies a set of information principles that the Minister must take into account. These principles are that:

a) Decisions should be based on the best available information. The Act defines best available information as information that, in the particular circumstances, is available without unreasonable cost, effort, or time;

b) Decision makers should consider any uncertainty in the information available in any case;

c) Decision makers should be cautious when information is uncertain, unreliable, or inadequate; and.

d) The absence of, or any uncertainty in, any information should not be used as a reason for postponing or failing to take any measure to achieve the purpose of the Act.

31 Because much information on the effects of fishing on seabirds is uncertain, the Minister must weigh up the competing risks of unnecessarily constraining

[8] For example, the Court of Appeal (Squid Fishery Management Company 2004) noted that "The point of the exercise is not to arrive at a number of sea lions [i.e. 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"

utilisation on the one hand (or at least increasing costs), versus the risk of placing sustainability objectives in jeopardy, on the other.

32 The recommended options contained in this paper for the most appropriate level at which to set the seabird standard provide the Minister with a continuum where, at the one end, risk to sustainability objectives is given the greater weight and at the other end, risk to utilisation is given the greater weight. The Minister will need to determine the most appropriate balance between the two.

Taking measures under the Fisheries Act to meet the seabird standard

33 Although the seabird standard is consistent with the purpose of the Act, and is an expression of the Minister's interpretation of Section 15, it is not a statutory instrument such as a MALFiRM or FRML. Furthermore, it does not contain sanctions or penalties if it is exceeded and does not direct measures that are required to meet it.

34 Rather, MFish considers that the seabird standard will provide guidance on whether measures are necessary to avoid, remedy or mitigate the effects of fishing-related mortality on seabirds. When considering implementing measures, the Minister is required to make decisions based directly on his statutory obligations under the Act, taking into account information specific to the decision, including the views of stakeholders though the consultation process, before making a decision on required measures.

35 Specific measures will involve consideration of a much more detailed set of information about costs and benefits of the proposed measures, depending on the circumstance of the fishery that the measures will apply to.

36 The Minister may consider that a fishery will not be required to put in place measures to meet the seabird standard, if doing so would not best meet the purpose of the Act, due to the utilisation impacts of doing so. Similarly, the Minister may consider that a fishery should be allowed some time to move towards the seabird standard.

37 The NPOA Seabirds consultation document sets out in more detail how MFish and the Minister intend to implement the seabird standard through management measures at a method-specific or fishery-specific level.

Part 2: Outline of the seabird standard

The seabird standard will be set for all seabird species collectively

38 Consistent with Section 15 of the Fisheries Act, one of the desired outcomes of the seabird standard is that the effects of fishing-related mortality on all protected species of seabird are avoided, remedied or mitigated.

39 In theory this outcome could be achieved by setting and monitoring a separate standard, or limit, for each individual species of seabird.

40 However, there are a number of barriers to this approach, including the high number of species, difficulties in identification at sea, low knowledge of fishing-related mortality levels and poor understanding of the effects of fishing on seabirds. These factors are discussed briefly in the following paragraphs.

41 Around 140 taxa of seabirds breed in New Zealand waters or visit on a regular basis during migrations, including petrels, albatrosses, shags, penguins, terns, skuas, gulls and gannets. These species range in IUCN threat ranking from critically endangered (e.g. Chatham Albatross), to least concern (e.g. Flesh-footed shearwaters). All except six species are fully protected under the Wildlife Act[9] and all seabird species fall under the sustainability obligations of the Fisheries Act.

42 Since 1996, at least 34 taxa have been confirmed as caught in New Zealand fisheries (Table 1), although other species may have been caught but not observed or reported.

43 The reason for suspecting that other species may have been caught but not recorded is that observer coverage is restricted to around nine fishery/areas (Baird 2005, MacKenzie and Fletcher 2004). Furthermore, most observer effort is deployed to sample fish catch, meaning that even within these fisheries, sampling of seabird captures is unrepresentative, patchy and incomplete. Consequently there is no reliable information about the catch of each species of seabird.

44 Additionally, for many species there are limited data relating to the level of fishing-related removals that may be able to be sustained by the species without having a detrimental effect.

45 MFish therefore considers that setting and monitoring a standard for each individual species of seabird is not feasible at the present time and, instead, proposes that setting and monitoring a multi-species standard is more pragmatic.

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[9] Seabird species exempt from protection under the Wildlife Act 1953 are: Sea hawk (*Catharacta lonnbergi*), black shag (*Phalacrocorax carbo*) (schedule 2), grey-faced petrel (*Pterodroma macroptera*), little shag (*Phalacrocorax brevirostris*), pied shag (*Phalacrocorax varius*) (schedule 3), and black-backed gull (*Larus dominicanus*) (schedule 5).

46 Nevertheless, the multi-species standard will still need to ensure that the effects of fishing-related mortality on individual species of seabirds are avoided, remedied or mitigated. Consideration will therefore need to be given to the best available information on individual species' ability to withstand fisheries removals, on seabird species catch composition, on any unobserved mortalities and any uncertainty associated with this information when setting the overall standard.

47 Part three of this document discusses these issues at length and proposes options for setting the maximum allowable level of seabird fishing-related mortality.

Monitoring of the seabird standard will be required to demonstrate high statistical certainty that it has not been exceeded

48 Along with setting a maximum allowable level of seabird fishing-related mortality, the seabird standard will also set minimum requirements for monitoring that this level is not being exceeded.

49 Setting a required level of certainty will give comfort to government that the seabird standard is not being exceeded, particularly as observer coverage has historically been low in a large number of fisheries.

50 Consistent with its use in fisheries management and risk assessment methodologies, a limit such as the seabird standard can be thought of as an event that should be avoided with high probability. Figures of 90% or 95% certainty are commonplace, both for demonstrating statistical certainty and for the setting of management objectives for protected species such as the New Zealand sea lion.

51 Some management regimes, however, use a straight average (i.e. 50% certainty). For example, monitoring against the Fishing Related Mortality Limit (FRML) for the New Zealand sea lion in squid 6T. MFish considers that this level of uncertainty is undesirable and is a potential cause for concern where the consequences of failing to meet a management objective are severe. 50% certainty is more appropriate for situations that should be achieved on average, such as a target biomass for a fish species, rather than for a limit such as the seabird standard.

52 MFish therefore proposes that the level of statistical certainty to demonstrate that the seabird standard has not been exceeded should be set between 70% and 90%, depending on the level that the Ministry of Fisheries sets the seabird standard. MFish is proposing two values because the ability to demonstrate a 90% level of certainty of meeting a very low seabird standard may require either the achievement of seabird fishing-related mortality of much less than the seabird standard, or very high observer coverage. However, options that allow for a higher seabird standard could more easily be demonstrated to have been met with 90% certainty.

53 Specifically, MFish proposes that a seabird standard set at 1,000 or less will require 70% statistical certainty that it has not been exceeded and a seabird

standard set at over 1,00 will require 90% statistical certainty that it has not been exceeded.

54 MFish considers that this strikes the most appropriate balance between certainty to government and potential cost to industry for greater levels of observer coverage.

A suite of indicators will be used to measure the effectiveness of the standard

55 As noted above, the seabird standard will be set for all seabird species collectively, but will need to ensure that the effects of fishing on individual species of seabirds are avoided, remedied or mitigated. To assist in measuring against this goal, a suite of indicators will be used to measure the effectiveness of the seabird standard.

56 The indicators can be used when assessing whether the standard has been exceeded, and if so, why it has been exceeded. The indicators can also assist when considering making adjustments to the level at which the standard is set and in considering management responses where the standard has not been met.

57 The following indicators are proposed:

i) The estimated total captures of seabirds by fishery, by method and across all methods collectively

ii) The estimated catch rate and total captures of seabirds by vessel

iii) The cause of capture (e.g. net entanglement or trawl warps)

iv) The rate of seabird warp strike (for trawl only)

v) Potential Biological Removal (PBR) figures for a suite of fisheries-affected species.

vi) Species composition of seabird catch

vii) The number of individuals recorded as taken from each species, by threat ranking

viii) Total estimated catch of individual species, where available

58 In terms of setting the seabird standard at a level that the Minister considers is necessary to avoid, remedy or mitigate the effects of fishing related mortality on individual species of seabirds, new information on species composition of mortalities will be an increasingly valuable indicator, particularly where observer coverage is high enough.

59 This indicator is important as catching a higher than predicted proportion of individuals of threatened seabird species may lead to risk to these species' long-term viability even if the overall standard is met. This concept is discussed in more detail in the next section.

60 Where available, warp-strike data will assist with information relating to the efficacy of mitigation measures and offal management strategies. Furthermore, as noted later in this paper, warp strikes are a significant source of uncertainty and risk due to the high number of seabirds that suffer mortalities that are not recorded against the seabird standard.

61 Other indicators relating to the nature and extent of fishing-related mortality between vessels and fisheries will allow useful comparisons of performance and identify problem areas for future reductions in fishing-related mortality.

The seabird standard will be reviewed every three years, or when significant new information becomes available

62 One of the desired outcomes of the seabird standard is that MFish fisheries plan managers and stakeholders will have greater certainty over government's expectations for managing the fishing-related mortality of seabirds, including the level of fishing-related mortality that must not be exceeded.

63 To create certainty, it is important that the seabird standard remain static over time. Competing against this is the need to ensure that the standard reflects the best available information on the effects of fishing on seabirds.

64 MFish considers that, on balance, the standard should be reviewed every three years, including an assessment of the allocation of the standard between methods, the monitoring and reporting requirements and, of course, the overall maximum allowable level of seabird fishing-related mortality set by the standard.

65 However, should significant new information become available shortly after a three year review, MFish considers it more consistent with the Fisheries Act to incorporate the information sooner than the three year review period.

Part 3: Options for setting the seabird standard

Information to set the seabird standard

66 Because the Minister is required to consider the effects of fishing on *all* protected species of seabirds, options for setting a *multi-species* seabird standard will be characterised by the extent to which they are likely to avoid, remedy or mitigate the effects of fishing related mortality on *individual species* of seabirds.

67 To achieve this outcome, information is required about:

i) The effects of fishing related mortality on each species of seabird; and

ii) The proportion of total fishing-related mortality each species represents; and

iii) Unobserved and unrecorded fishing-related mortality that may affect the integrity and assessment of the seabird standard

68 Unfortunately, information is limited for all of these important areas, meaning that consideration of uncertainty and risk will be a central component of any decision about the most appropriate level to set the seabird standard.

69 The best available information to determine an appropriate seabird standard is set out below, along with a discussion of the uncertainty surrounding this information, and steps that are, or could be, taken to reduce this uncertainty.

The effects of fishing related mortality on each species of seabird

70 Population modelling can be used to calculate the level of human induced mortality (e.g. from fishing) that can be sustained by a species before it affects the species ability to maintain its population numbers or recover to healthy levels following declines.

71 To this end, MFish has commissioned research[10] to indicate the number of Potential Biological Removals (PBR) that a range of breeding species of seabirds from New Zealand may be able to sustain, aside from natural mortality, without substantially delaying their recovery towards healthy levels.

72 The species used in the PBR modelling were selected to provide information across a range of species groups including several foraging guilds (foraging strategies), geographical regions, taxon groups and levels of threat status.

73 This PBR analysis showed that for the most critically endangered New Zealand breeding species of seabird, only very few removals can be incurred each year. For example:

i) Taiko – zero individuals

[10] Dillingham, Fletcher and MacKenzie. Unpublished report to the Ministry of Fisheries, 2006. Available on request.

ii) Black Petrel – 20 individuals

iii) Westland Petrel – 30 individuals

iv) Chatham Albatross – 60 individuals.

74 However, the PBR analysis also estimated that for species that are numerous and widespread, up to several hundred removals could be sustained each year. In the case of the Sooty Shearwater, this number is as high as 110,000.

75 PBR modelling currently represents the best available information on seabird species' ability to withstand fisheries removals, and limited information exists on the effects of fishing-related mortality if PBR values are exceeded. MFish and DoC are currently in the process of gathering better information upon which to consider the effects of fishing-related mortality on seabirds.

76 For example, population estimates are a key piece of information for assessing the risk of fishing-related mortality to seabird population viability and research to reduce uncertainties in population estimates is underway for a representative suite of populations taken from those listed in Table 1. Research into the overlap of species foraging ranges with New Zealand fishing effort is also underway.

77 Within a short period of time (approximately 5 years), a much higher quality of information will be available about population sizes and the interaction with fishing zones, which will allow refinement of the management and monitoring of fisheries interactions with vulnerable seabird populations.

78 More information on the PBR approach and the results of the modelling on New Zealand species can be found in Appendix A.

The proportion of total fishing-related mortality each species represents

79 Understanding how much fishing-related mortality an individual species can sustain is of limited benefit when setting a multi-species limit unless the proportion of total fishing-related mortality that each species is likely to represent can be determined.

80 Unfortunately data from which to assess species composition are currently sparse and observer data that has been collected from six main target fisheries has only been analysed to indicate the estimated total multi-species level of mortality of seabirds per annum, but not to a species level.

81 Whilst observers return some birds landed on deck for identification at necropsy, the relationship between birds killed of a particular species and birds returned for necropsy is not known.

82 There is currently, therefore, no scientifically robust methodology for establishing catch composition, and it is not prudent to place too much reliance on the species composition of fishing-related mortality from birds that have been returned for necropsy. For example, for every 100 birds killed, one cannot reliably estimate how many of those will be white chinned petrels.

83 Nevertheless, some insight can still be gained from the proportion of birds of each species that have been returned for necropsy and it is currently the best available information on catch composition. Between 1996 and 2007, nearly 4,000 individual birds were identified covering 34 species of mainly albatrosses and petrels.

84 The birds returned for necropsy are dominated by just four species, which make up three quarters of all birds returned. These four species are white-chinned petrel (24%), white-capped albatross (21%) sooty shearwater (18%) and grey petrel (14%).

85 There are also small but significant numbers of other birds that are returned regularly such as Salvin's albatross (6.1%) Buller's albatross (4.6%), Antipodean albatross (3.3%) and Campbell albatross (2.3%). More information on the catch composition of autopsied birds can be found in Tables 2 and 4.

86 The most critically endangered species are unlikely to be observed, reported and returned for necropsy as their catch will be a rare event. To illustrate this point, the Taiko, which only has around 15 breeding pairs, has never been recorded in fishing-related mortality data, but it is known that species in the same genus are caught in New Zealand fisheries.

87 It cannot be stressed enough that our understanding of catch composition is very poor. However, achieving good information on catch composition across all fisheries will require a very high level of accuracy in monitoring, which would come at a high cost to the fishing industry to pay for observer coverage.

88 Further research costs would also be required for data to be stored and analysed, and for a more extensive seabird carcass identification programme. Appendix B sets out in more detail some advantages that greater observer coverage would bring in understanding catch composition.

89 Without better information, the Minister will need to consider the level of risk surrounding poor information in this area and the possibility that the true catch composition of vulnerable seabird species may be higher or lower than is currently thought.

Unobserved and unrecorded fishing-related mortality

90 The number of individual seabirds counted against the seabird standard is likely to be a considerable underestimation of the total number of seabirds that are killed by fishing operations in any year. This is because:

i) not all seabirds killed on observed vessels are recovered and recorded; and

ii) all New Zealand seabirds are migratory and may be killed in fishing operations outside of New Zealand waters; and

iii) seabird fishing-related mortality is not evenly distributed and seabird species composition varies from year to year

91 In longline fisheries an unknown proportion of birds are hooked and drowned but are not being recovered and observed. Similarly, trawl warp-strikes by seabirds may cause a considerable number of mortalities, but only a very small proportion of those birds are landed on vessels. Finally, some birds suffer injuries from fishing nets that later prove fatal.

92 Warp strikes occur at different rates depending on several factors, including offal discharge, mitigation device used and fishery (Table 6 and 7), but are known to be significant in number. For example, during the trial of mitigation devices in the 2005-06 squid fishery, although there was high variance, when the mean rate of 0.56 heavy warp strikes per fifteen minute observation period[11] is scaled up to the average trawl duration[12], warp strikes could be occurring nearly 100 times more often than birds are actually recovered from the warps.

93 Reducing uncertainty over the level of unobserved mortalities is difficult. For trawl vessels, this uncertainty is most likely to be reduced through decreases in the occurrence of warp strikes, rather than through attempting to quantify the mortalities associated with warp strikes.

94 Mortalities of seabirds in fishing operations also occurs outside of the New Zealand Exclusive Economic Zone, and may be having an effect on New Zealand's breeding species. This may mean that for some species, New Zealand fishing mortality may still contribute to declines in breeding populations, even if PBR levels appear not to be being exceeded.

95 Currently there is no reliable information about the catch composition and magnitude of seabird fishing-related mortality in the majority of fisheries outside New Zealand waters. However, there is information to show that New Zealand birds spend time in areas that overlap with fisheries where there is likely to be a high risk of capture due to the non-use or partial use of seabird mitigation measures. For example, southern hemisphere regional fisheries management organisations (RFMOs) and South American and Southern African countries' EEZ's.

96 If information becomes available that indicates a disproportionately high number of some species are being killed in fishing operations outside of New Zealand, fishing-related mortality levels for New Zealand fisheries may need to be lower than otherwise would be the case to ensure that the effects of fishing on these species are avoided.

97 Finally, there are examples of individual trips where large numbers of a single species have been caught. For example, for an observed trip targeting swordfish in the Kermadec Island zone it is estimated that 51 Antipodean Albatrosses were caught. The combined PBR for the two Antipodean Albatross populations is 110. On another occasion, over 300 white-chinned

[11] A fleet scale experimental comparison of devices used for reducing the incidental capture of seabirds on trawl warps. Edward R. Abraham1, David A. J. Middleton, Susan M. Waugh, Johanna P. Pierre, Nathan Walker, Caren Schrōder. Submitted to the Canadian Journal of Fisheries and Aquatic Sciences, 31 May, 2007.

[12] 5.58 hours, MFish unpublished data from SQU6T trawl fishery 2005-06

petrels were caught by one longline vessel. Unobserved vessels may also be having similar levels of fishing-related mortality of rarer seabird species.

98 It is not known how many unobserved incidents are having a significant impact on vulnerable species and are not being monitored against the seabird standard.

99 All of the above factors mean that some allowance may need to be given to the impact that unobserved and unrecorded fishing-related mortality is having when setting the seabird standard, as this will be additional to that recorded against the standard.

Using the available information to set the seabird standard

100 One of the desired outcomes of the seabird standard is that the effects of fishing related mortality on all protected species of seabird are avoided, remedied or mitigated.

101 As discussed in part one of this paper, the Minister has considerable discretion to determine what level of impact, or effect, is acceptable for a protected species, however, he must still consider what is 'necessary' in light of the purpose and principles of the Act.

102 Because uncertainty abounds in all of the relevant information, the Minister must also take into account the information principles contained in Section 10 of the Act. In particular, he will need to determine how cautious he needs to be to avoid, remedy or mitigate the effects of fishing related mortality on seabirds, and weigh this against his obligations to provide for utilisation.

103 Setting the seabird standard at the most appropriate level will therefore involve an assessment of:

i) The point at which the Minister considers that the effects of fishing related mortality need to be avoided, remedied or mitigated, and how this compares to the PBR modelling objectives;

ii) The uncertainty surrounding information on species catch composition, including the implications if vulnerable species are caught in greater proportion than currently thought; and

iii) The possible scale and impact of unobserved and unrecorded mortality that will not be counted against the seabird standard and may cause additional pressures on the species' populations

iv) Meeting the overall purpose of the Act, including weighing up the socio-economic implications of achieving different levels of reductions in fishing-related mortality

104 These issues are set out in more detail below.

The point at which the Minister considers that the effects of fishing related mortality need to be avoided, remedied or mitigated, and how

this compares to the PBR modelling objectives

105 The PBR analysis is valuable because it gives some indication of the risk to different species of seabird from fishing-related mortality. However, although it is the best available information from which to assess the effects of fishing, it is not directly analogous to the Minister's obligations under the Fisheries Act and does not provide full information to enable the Minister to meet his obligations.

106 The Minister has wide discretion to determine how cautious to be when taking measures to avoid, remedy or mitigate the effects of fishing on seabirds. Although, at one end of the spectrum it is not appropriate for the Minister to set a standard that allows the maximum number of mortalities that is only just sustainable, the Minister is also not obliged to exercise the same degree of caution as that implicit in the PBR modelling.

107 For example, the PBR modelling involves estimating the number of individuals that can be removed from a population without substantially delaying its recovery. The PBR approach is cautious in that better information may reveal that removals above the PBR level may not result in a decreasing population size or reduced population recovery potential.

108 The Minister will therefore need to consider whether the outcome expressed in the PBR modelling meets, or exceeds, his assessment of what he considers is necessary to avoid, remedy or mitigate the effects of fishing on seabirds, when selecting the most appropriate option for setting the seabird standard.

109 Because more sophisticated models are not currently available for New Zealand species, however, it is not possible to determine the impact of fishing-related mortality on seabird species, should the Minister decide to allow removals greater than the PBR values.

110 When considering the appropriateness of the outcomes sought by the PBR modelling, the Minister may take into account a range of factors including the protected status, high levels of endemism and high numbers of threatened species present amongst those species where fishing-related mortality is occurring.

111 For some species, the level of New Zealand fishing-related mortality will have a significant impact on their global threat status and, ultimately, their long term viability. For example, New Zealand is the sole breeding ground for nine species of albatross, fourteen species of petrel, four species of penguin, nine species of shag, one gull and one tern species.

The uncertainty surrounding information on species catch composition, including the implications if vulnerable species are caught in greater proportion than currently thought

112 Because the seabird standard is a multi-species limit, the importance of species catch composition is very significant. Setting the standard at a level that

ensures the sustainability of individual seabird species will depend on how many individuals of each species are likely to make up the multi-species total.

113 The importance of species catch composition to the setting of the standard can be illustrated with the following two theoretical examples (using PBR values as an indicator of vulnerability).

114 In theory, at one extreme, species catch composition could exactly match the composition of seabirds in existence in New Zealand, or match their PBR ratios. If this were the case, super-abundant species such as sooty shearwater would make up the vast majority of all fishing-related mortality and very rare and vulnerable species such as the Antipodean albatross would be caught in very small numbers, if at all.

115 If this were the case, the seabird standard could be set very high – perhaps at the same level as the sum of all the PBRs of each seabird species, at over 130,000.

116 At the other theoretical extreme, catch composition could be represented super-proportionately by rare and vulnerable species, with super-abundant species being significantly under-represented. If this were the case, the multi-species seabird standard would need to be set at, or close to, zero if the Minister did not want to exceed PBR values. This is because some species have such low PBR values that even very low levels of fishing-related mortality (less than 100) could cause the PBRs of the most vulnerable species to be exceeded.

117 In reality, the species catch composition will lie somewhere between these two extremes, with a mixture of high vulnerability and low vulnerability species being caught.

118 As noted above, currently the best available information on catch composition stems from the proportion of birds of each species that have been returned for necropsy. However, this data is not sampled in a scientifically robust manner and actual catch composition on the water could vary significantly from catch composition of autopsied birds.

119 Whilst the catch composition from necropsy data is unreliable due to the sampling, it does offer a *plausible* catch composition that can illustrate what level the seabird standard would need to be set at if the species catch composition was similar to the catch composition of autopsied birds. The implications if vulnerable species make up a greater proportion than in the necropsy data need to be considered.

120 Using necropsy ratios (Table 4), highly abundant species only contributed 31% of the catch over the last ten years. Therefore, most of the fishing-related mortality is coming from those species with lower PBR levels that are more vulnerable to fishing-related mortality

121 Based on the necropsy ratios, the species most at risk from fishing is the Southern Buller's albatross. This is because it has a low PBR value (100

individuals per year) but contributes moderately to catch composition (4.6% of all birds autopsied).

122 As an example, using these data as a guide, the multi-species seabird standard could be set at around 2,000 birds if the PBR for Southern Buller's albatross were not to be exceeded. Based on the necropsy ratios, one would expect 92 of those 2,000 birds to be Southern Buller's albatross.

123 Other species of seabirds appear to be less at risk. Based on the necropsy ratios, the PBRs of all species except for Southern Buller's albatross would not be exceeded if the seabird standard was set at around 2,000 birds. Based on the necropsy ratios, therefore, Southern Buller's albatross represent a constraint on the maximum that the multi-species standard could be set at as that species will be the first to exceed its PBR value.

124 However, because many species have such low PBRs (two species have PBRs of less than 50 and seven species have PBRs of 100 or less), if actual catch composition of these more vulnerable species differed from the necropsy ratios by even a relatively small amount, these species would also exceed their PBR values and would also become a constraint on the level that the seabird standard could be set at.

125 Because the necropsy catch composition data may not be representative of the actual catch composition, it is not possible to conclude that a seabird standard of 2000 birds would ensure that the PBR values for each species of seabird would not be exceeded. If vulnerable species constituted a greater proportion than currently thought, a seabird standard set at this level would mean that some species could still exceed their PBR values.

126 The catch composition of the more rare and vulnerable species are particularly sensitive to captures of large numbers of these species, as they can substantially change the proportion of these species in the necropsy data. For example, recently a single vessel on a single trip targeting swordfish and bigeye tuna in the Kermadec Fisheries Management Area caught 51 Antipodean albatross (*Diomedea antipodensis*)[13]. This species is listed by the IUCN as vulnerable and has a PBR value of just 110 birds per year.

127 Similarly, over the course of four days, a vessel fishing for ling and bluenose using the method of bottom longlining on the Chatham Rise, caught 26 seabirds, including 12 critically endangered Chatham Albatross. This species has a PBR value of just 60 birds per year.

128 It should also be noted that PBR values have not been calculated for all species of seabird meaning that no assessment can be made as to whether these other species are likely be caught in numbers that exceed their PBRs.

[13] There is scientific debate as to whether Antipodean albatross (*Diomedea antipodensis*) is actually a single species with two populations (the international and IUCN perspective), or two species (the Department of Conservation perspective): Antipodean albatross (*Diomedea antipodensis*) restricted to the Antipodes Islands and Gibson's albatross (*Diomedea gibsoni*) restricted to the Auckland Islands.

129 The Minister will therefore need to consider the risk caused by uncertainty over species catch composition. The higher the level that the seabird standard is set at, the greater the risk that the more vulnerable species will be caught in numbers that exceed their PBR values.

130 This risk can be reduced in the future by gathering robust data on species catch composition through very high levels of observer coverage. The higher the level that the seabird standard is set at, the more important and valuable gathering of catch composition data will become to ensure that individual species are not being affected.

The possible scale and impact of unobserved and unrecorded mortality that will not be counted against the seabird standard and may cause additional pressures on the species' populations

131 As noted above, the number of individual seabirds counted against the multi-species seabird standard is likely to be a considerable underestimate of the total number of seabirds killed by fishing operations in any year.

132 The Minister will need to consider how much to allow for unobserved and unreported mortalities when setting the seabird standard. Whilst MFish cannot make an accurate assessment of unobserved and unreported mortalities, for some species of seabirds, particularly those vulnerable species with low PBR values, the combination of warp strikes, unobserved longline mortalities and out of zone mortalities is likely to be significant.

133 For example, observer data[14] suggests that the South African offshore demersal trawl fishery could be killing up to several thousand white capped albatrosses per year, although the reliability of this estimate is very poor and actual mortalities may be much lower.

Meeting the overall purpose of the Act, including weighing up the socio-economic implications of achieving different levels of reductions in fishing-related mortality

134 The above information can be used to generate options for setting the seabird standard. However, the primary difference between the options is the approach that the Minister may wish to take where information is uncertain - lower options represent a more cautious approach to risk to seabird populations.

135 Lower options are also likely to have a higher cost to the fishing industry in the form of additional mitigation measures, more significant behavioural changes or changes to fishing strategies, higher capital outlay on vessel modifications and potentially lower fishing efficiency.

[14] A global assessment of the impact of fisheries-related mortality on shy and white-capped albatrosses: Conservation implications. G. Barry Baker, Michael C. Double, Rosemary Gales, Geoffrey N. Tuck, Cathryn L. Abbott, Peter G. Ryan, Samantha L. Petersen, Christopher J.R. Robertson, Rachael Alderman. In press.

136 When considering more cautious options, the Minister will need to weigh up the potential benefits against the potential additional costs that may result from the need to achieve greater reductions in fishing-related mortality, in order to best meet the purpose of the Act.

137 There is limited information relating to the socio-economic costs of achieving the various options for setting the seabird standard. Stakeholders are therefore encouraged to provide their own assessment of potential impacts as part of this consultation process.

138 However, the broad socio-economic context of achieving the seabird standard can be considered by comparing current levels of fishing-related mortality with the maximum levels that would be allowed under the seabird standard.

139 Current levels of seabird fishing-related mortality across New Zealand's fisheries are estimated using data gathered from fishing vessels that carry observers.

140 For the 2004-05 fishing year, the percentage of observed effort was 18.9% for surface longline, 4% for bottom longline, 6% for trawl and 0% for set net fisheries.

141 Three approaches have been used to estimate total seabird mortalities in the past few years, and these are explained in more detail in Appendix C.

142 The most recent approach uses a predictive modelling technique to extrapolate catches across all areas and seasons for the three principal methods of fishing for which observer data exist[15] (trawl, surface longline and bottom longline). Estimates of fishing-related mortality are also split between small and large vessels (divided at 28 m in length).

143 Using this approach, a total estimated capture figure for 2003-04 for all trawl and longline fisheries was 5,500 birds. However, there was high uncertainty associated with this estimate, largely because inshore trawl and longline fisheries have received very little observer coverage in the past.

144 The uncertainty is such that, based on the 95% credibility intervals, the modelling suggests that some 3,000 – 11 500 individual seabirds may be landed on fishing vessels each year (MacKenzie and Fletcher 2005). Improved observer monitoring would be required to enable a more accurate examination of seabird mortalities in New Zealand's principal fisheries.

145 The estimated mortality does not include individuals injured or killed but not recovered on vessels, such as through warp strikes or those that fall off of longline hooks. However, it does provide an indicator of the levels of reduction that would be required from current reported levels to the required reported levels under the seabird standard.

[15] MacKenzie and Fletcher 2005. Characterisation of seabird captures in NZ fisheries. Final Report for the Ministry of Fisheries project ENV2004-04. Unpublished report, Ministry of Fisheries. Available on request.

146 Due to the difficulties with achieving observer coverage in set net fisheries, there are no estimates for fishing-related mortality from the very large amount of set net effort in the New Zealand EEZ[16]. However, limited coverage of set net vessels has been achieved in the waters around the South Island in recent years (2005-06 and 2006-07) and the seabird mortality rate from 2006-07 was found to be 1.78 seabirds per million metre hours of set net effort.

147 The following species were observed caught: seagulls, petrels (including cape pigeons), shags (including pied shags), sooty shearwaters and yellow-eyed penguins. Previous researchers such as Taylor (1992) reported significant catches of similar species, along with Hutton's shearwaters, fluttering shearwaters and a range of diving petrels.

148 While it is not possible to estimate the magnitude of the total seabird fishing-related mortality from set net fisheries in any area from the currently available information, there is sufficient information to indicate that the large amount of set net effort could be resulting in high levels of seabird mortality.

149 Because exact estimates are not available for current levels of fishing-related mortality for any of the main methods of fishing, it is difficult to understand the magnitude of reductions required in all fisheries to meet the various options proposed for the seabird standard.

150 Based on fishing-related mortality estimates for 2003/04 from Mackenzie and Fletcher (2005)[17] and based on the range of options recommended by MFish and presented in table 8, overall reductions of between 63% and 91% may be required to achieve the seabird standard. For individual fisheries this figure may be lower or higher.

151 For fisheries where good data exists, required reductions are easier to calculate, particularly if current versus required rates of capture are considered. Estimates of levels of fishing-related mortality in these fisheries are also likely to be more up to date. More information on these fisheries can be found in table 12.

152 For fisheries that have received little or no observer coverage in the past, the required reductions may be either very large or very small depending on current catch. Most fishers consider that catch in their fishery is at the lower end of the estimates, but this is only anecdotal.

153 One further difficulty is that because all estimates of seabird fishing-related mortality are out of date, considerable progress may have been made in some fisheries to reduce mortalities from these reported levels.

154 MFish considers that reductions of the magnitude required to meet the recommended options for the seabird standard are achievable, and have been

[16] In 2004-05, 27, 150 km of set net was set for 269, 816 hours

[17] MacKenzie and Fletcher 2005. Characterisation of seabird captures in NZ fisheries. Final Report for the Ministry of Fisheries project ENV2004-04. Unpublished report, Ministry of Fisheries. Available on request.

demonstrated in a number of fisheries both within and outside of New Zealand.

155 For example, Appendix D contains four case-studies where reductions in seabird fishing-related mortality of over 90% have been achieved over 1 – 2 year periods, for both trawl and longline fisheries. These were the Falkland Islands trawl fishery, the Australian Eastern Billfish and Tuna longline fishery, the CCAMLR demersal longline fishery for *Dissostichus* spp. and the New Zealand ling autoline fishery. In the case of CCAMLR fisheries, excluding the French EEZ, a reduction of 99% has been achieved over a 10 year period[18].

156 However, MFish recognises that no two fisheries are the same and that some fisheries in New Zealand may take more or less time to achieve the desired reductions.

157 The purpose of the examples is to demonstrate that significant reductions have been achieved across a wide range of different fisheries once a concerted effort to do so was initiated.

Recommended options

158 Based on the available biological and socio-economic information, and taking into account uncertainty, MFish considers that the following options best meet the Minister's obligations to avoid, remedy or mitigate the effects of fishing related mortality on seabirds. These options describe the maximum allowable level of fishing-related mortality across all seabird species and all fisheries over a 12 month period:

i) Option 1: 2,000 seabirds

ii) Option 2: 1,500 seabirds

iii) Option 3: 1,000 seabirds

iv) Option 4: 500 seabirds

159 Higher limits place less weight on achieving PBR modelling outcomes and take a less cautious approach to uncertainties over catch composition and unrecorded mortalities. Higher limits also place a greater weight on providing for utilisation.

160 Lower limits place more weight on achieving PBR modelling outcomes and take a more cautious approach to uncertainties over catch composition and unrecorded mortalities. Lower limits also place less weight on providing for utilisation.

161 These options are characterised in more detail below, along with a discussion on setting the standard outside of this recommended range.

[18] In the CCAMLR Convention Area, excluding the French EEZ, catches of over 6000 seabirds were estimated in 1997, and captures of less than 50 birds per annum have been sustained for the period from 2003 to 2006. Two birds were estimated caught in 2006.

Option 1: 2,000 seabirds

162 This option is likely to result in a significant reduction in risk to many species of seabirds, but stops short of taking a cautious approach to ensuring sustainability.

163 This option places a lower weight on the cautious outcomes built in to the PBR model, particularly as there is a risk that the PBRs for the most vulnerable species may be exceeded.

164 For example, with current estimates of species catch composition (4.6% of which are Southern Buller's albatross), the PBR value for Southern Buller's albatross would almost be reached (92 birds caught compared to a PBR of 100).

165 Southern Buller's albatross and a range of other species would be vulnerable to their PBRs being exceeded if the proportion of their fishing-related mortality compared to other species proved to be higher than is currently thought to be the case. However, if current catch composition proved to be correct, they would be caught in numbers lower than their PBR values.

166 This option also places a lower weight on the potential effects of unobserved mortalities through warp strikes, unobserved longline mortalities and mortalities outside of the New Zealand EEZ. Additional mortalities to those recorded against the seabird standard will almost certainly be occurring and options that do not allow for this mortality are inherently more risky than options that do allow for additional mortalities.

167 This option will have the least socio-economic impact on fishers. However, it will still require overall reductions in levels of fishing-related mortality of around 63% from 2003-04 levels.

168 If this option is preferred by the Minister, risks can be reduced by significantly increasing observer coverage to gain a better understanding of catch composition and by acting on new information on the effects of fishing on seabirds that may become available over the next few years.

Option 2: 1,500 seabirds

169 This option is likely to result in a significant reduction in risk to most species of seabirds, particularly if catch composition of seabirds caught is similar to the necropsy data.

170 For example, if current catch composition proved to be correct, the PBR values for all species would not be exceeded.

171 However, there is still a risk that PBRs for the most vulnerable species may be exceeded as catch composition is unlikely to be the same as currently thought, due to reasons mentioned above.

172 Overall, therefore, this option places some weight on achieving the precautionary outcomes derived from the PBR modelling, as most, or possibly all, species are likely to be caught in numbers less than their PBRs.

173 However, this option places a low weight on the consequences of unobserved mortalities through warp strikes, unobserved longline mortalities and mortalities outside of the New Zealand EEZ which will increase the risk that the PBR for some rare and vulnerable species will be exceeded.

174 This option will require overall reductions in levels of fishing-related mortality of around 73% from 2003-04 levels.

175 At this level of fishing-related mortality, better information on catch composition, gained through higher levels of observer coverage, would be extremely beneficial to ensure the sustainability of the most vulnerable species.

Option 3: 1,000 seabirds

176 This option is likely to result in a very significant reduction in risk to all species of seabirds, particularly if catch composition of seabirds caught is similar to the necropsy data.

177 For example, if the current catch composition were similar to the necropsy data, the PBRs for every species would not be exceeded. If the catch ratios differed from current estimates, most species are still likely to be caught in numbers less than their PBR values, though the risk is greater for the most vulnerable species with low PBR values.

178 This option therefore places considerable weight on achieving the cautious outcomes sought by the PBR modelling. However, this is balanced somewhat by the fact that only a small allowance has been made for unobserved and out of zone mortalities for some vulnerable species.

179 By way of example, if current catch composition data are used, and the multi-species bycatch limit was set at 1,000 birds, out of zone and unrecorded (e.g. warp strike) mortalities could be around 17 for black petrels, 29 for Westland petrels, 54 for Southern Buller's albatross and 77 for Antipodean albatross, before the PBRs for these species would be exceeded.

180 This option will require overall reductions in levels of fishing-related mortality of around 82% from 2003-04 levels.

Option 4: 500 seabirds

181 This option seeks to reduce seabird fishing-related mortality down to very low levels. It places the greatest weight on acting cautiously where information is uncertain and is likely to successfully mitigate against risk on most, if not all species.

182 The PBRs for all but the most vulnerable species are extremely unlikely to be exceeded, and for the most vulnerable, they would not be exceeded if current species catch composition proved to be similar to actual catch composition

183 This option also places greater weight on allowing for unobserved and out of zone mortalities. For example, for each species, allowances for out of zone or unobserved mortalities would be greater than that anticipated from mortalities counted towards the seabird standard.

184 This option will have the greatest socio-economic impact on fishers and will require overall reductions in levels of fishing-related mortality of around 91% from 2003-04 levels.

Other available options

185 Whilst MFish recommends that the Minister select the seabird standard from within the options described above, they do not cover the full spectrum available. The Minister may wish to choose limits higher or lower than these, should he wish to take a more risky or more cautious approach than that recommended by MFish.

186 Limits above 2,000 seabirds carry an increasingly high level of risk to some seabird species. The further above 2,000 that the standard is set at, the greater the risk and the greater the number of seabird species potentially affected by fishing-related mortality. However the relationship is not linear and the recommended upper limit of 2,000 seabirds is somewhat arbitrary.

187 Limits below 500 carry an increasingly low level of risk to seabird species, but increasingly high potential utilisation costs.

188 To illustrate the costs and benefits associated with limits outside of the recommended range, a standard set at a level equivalent to the most recent estimates of mortality (from 2003/04) and a standard set below 500 seabirds can be examined.

189 A seabird standard set at the same level as the most recent estimates of mortality would not require any reductions in fishing-related mortality and would therefore not result in any decrease in risk to any species of seabird.

190 Based on the species composition from the necropsy data, using the mean estimate of 5,467 seabirds killed, the PBR values for three species of seabird would be exceeded. Using the upper estimate of 11,500 birds killed, the PBR values for seven species would be exceeded. Even using the mean estimate, several more species would also exceed their PBR values if currently estimated catch composition proved to be inaccurate.

191 Of more concern, the PBR values for the most vulnerable species could be exceeded many times over. For example, catch levels would be 150% higher than PBR values for Southern Buller's Albatross, with a number of other species having their PBR values exceeded, especially if catch composition differed from current estimates.

192 Finally, these figures do not include the impact that unobserved and unreported fishing-related mortality may be having on seabird populations, such as from warp strikes, unobserved longline mortalities and from out of zone mortalities, meaning that PBR values may be exceeded by even greater amounts than that described above.

193 A seabird standard set above 2,000 birds therefore places minimal weight on the impact that unobserved and unreported fishing-related mortality may be having on seabird populations, such as from warp strikes, unobserved longline mortalities and from out of zone mortalities, as risks to some species would already be apparent, even without adding mortality that is unobserved and unrecorded.

194 At the other end of the spectrum, limits below 500 are likely to involve higher costs to industry because very severe reductions in fishing-related mortality would be required over a very short period of time. A standard set below 500 would also represent a very cautious approach based on currently available information.

195 In reality, a seabird standard of anything above zero will carry a small, perhaps minimal, risk to the most vulnerable populations, as out of zone mortalities will still be occurring and will not be influenced by the seabird standard.

196 However, MFish considers that the rapid changes required to achieve very low fishing-related mortality levels across all fisheries may not initially be possible, or may carry a high foregone utilisation cost if area, season or other temporal closures are necessary to avoid risk.

197 Setting a very low standard now will likely require the Minister to allow fishers more time to achieve the standard. A more cautious approach than that recommended by MFish may be better achieved by gathering very good information over the next three years on species catch composition and levels of fishing-related mortality, to review the level at which the standard is set, and progress towards it, at that point in time.

Tables

Table 1. Seabird taxa caught in New Zealand waters. * =Endemic species marked + = species not protected in New Zealand

MFish code	Common name	Scientific name	IUCN status
XAN & XAU	Antipodean albatross	*Diomedea antipodensis*	Vulnerable
XBM	Southern Buller's albatross*	*Thalassarche bulleri*	Vulnerable
XBP	Black petrel*	*Procellaria parkinsoni*	Vulnerable
XBS	Buller's shearwater*	*Puffinus bulleri*	Vulnerable
XCC	Cape petrel	*Daption capense*	Least concern
XCI	Chatham albatross*	*Thalassarche eremita*	Critically endangered
XCM	Campbell albatross*	*Thalassarche impavida*	Vulnerable
XDP	Common Diving-petrel	*Pelecanoides urinatrix*	Least concern
XFL	Fluttering shearwater*	*Puffinus gavia*	Least concern
XFP	Fairy prion	*Pachyptila turtur*	Least concern
XFS	Flesh-footed shearwater	*Puffinus carneipes*	Least concern
XFT	Black-bellied Storm petrel	*Fregetta tropica*	Least concern
XGB	Grey-backed Storm petrel	*Garrodia nereis*	Least concern
XGF	Grey-faced petrel	*Pterodroma macroptera*	Least concern
XGP	Grey petrel	*Procellaria cinerea*	Near threatened
XKM	Black-browed Albatross	*Thalassarche melanophrys*	Endangered
XLM	Light-mantled sooty albatross	*Phoebetria palpebrata*	Near threatened
XNB	Pacific (or Northern Buller's) albatross*	*Thalassarche bulleri platei*	Vulnerable
XNP	Northern Giant-petrel	*Macronectes halli*	Near threatened
XNR	Northern Royal albatross*	*Diomedea sanfordi*	Endangered
XPR	Antarctic prion	*Pachyptila desolata*	Least concern
XPS	Pied shag	*Phalacrocorax varius*	Least concern
XPV	Broad-billed prion	*Pachyptila vittata*	Least concern
XRA	Southern Royal albatross*	*Diomedea epomophora*	Vulnerable
XSA	Salvin's Albatross*	*Thalassarche salvini*	Vulnerable
XSH	Sooty shearwater	*Puffinus griseus*	Near threatened
XSP	Southern Giant petrel	*Macronectes giganteus*	Vulnerable
XTS	Short-tailed shearwater	*Puffinus tenuirostris*	Least concern
XWA	Wandering Albatross	Diomedea exulans	Vulnerable
XWC	White-chinned petrel	*Procellaria aequinoctialis*	Vulnerable
XWF	White-faced Storm petrel	*Pelagodroma marina*	Least concern
XWH	White-headed petrel	*Pterodroma lessonii*	Least concern
XWM	White-capped albatross*	*Thalassarche steadi*	Vulnerable
XWP	Westland petrel*	*Procellaria westlandica*	Vulnerable
XYP	Yellow-eyed penguin*	*Megadyptes antipodes*	Endangered

Table 2. Captures observed in New Zealand waters by MFish observers (1996 – 2007) by target fish species for the fishing event and where seabird species identification has been confirmed by experts ashore.

Bird species code	ALB	ASQ	BAR	BIG	BNS	HAK	HOK	JMA	JMD	JMM	LIN	NOS	NTU	OEO	ORH	PTO	RCO	SBW	SCI	SNA	SQI	SQU	SSO	STN	SWA	SWO	WAR	WWA	Total
XAN & XAU	6			1									2									1		123					133
XBM	5	1	2	2		6	43	1	1		2								2			23		95					183
XBP				9																2									11
XBS																				2									2
XCC,XCA, XCP					1		11				15							1	1										29
XCI						1					11				2				1					1					16
XCM	12			1			9															2		67					91
XDP							1				4			1								2							8
XFL																				2									2
XFP							4	2																					6
XFS				19															5	16				1					41
XFT							1																						1
XGB																		1				1							2
XGF	15			2											1														18
XGP	5			2	1		3				362				1	2		4		11				150					541
XKM & XSM	1		1	1			8				2								1					24					38
XLM																								39					39
XNB			3								1				1				1										6
XNP						1	6				3													6				1	17
XNR			1												1									2					4
XPR															1							1							2
XPS																				1									1
XPV											1																		1
XRA							3					1			1							4		7					16
XSA				5		4	56	1			135				1		1	1	14			14		11	1				244
XSH	6	12	15		1		269	12	2		93				1				9			280			2				702
XSP											4													2					6

Table 2 continued. Captures observed in New Zealand waters by MFish observers (1996 – 2007) by target fish species for the fishing event and where seabird species identification has been confirmed by experts ashore.

Bird species code	ALB	ASQ	BAR	BIG	BNS	HAK	HOK	JMA	JMD	JMM	LIN	NOS	NTU	OEO	ORH	PTO	RCO	SBW	SCI	SNA	SQI	SQU	SSO	STN	SWA	SWO	WAR	WWA	Total
XTS							33																						33
XWA																								2					2
XWC	2			4			39	2			745								2			127		33			1		955
XWF											2																		2
XWH	2																												2
XWM		2	8			3	71	5		2	2	1			1				8		1	659	1	53	14		1	2	834
XWP	1						1																	2					4
Total	55	15	30	46	3	15	558	23	3	2	1382	2	2	1	11	2	1	7	44	34	1	1116	1	618	17		2	3	3994

Table 4. Calculation of seabird species catch composition based on Table 2 applied to the total seabird fishing-related mortality for trawl and longline fishing in 2003-04 by MacKenzie and Fletcher 2005. The shaded cells indicate where the estimated catch exceeds the PBR for that species.

	Species code	1996-2007 Captures	Percent of total	PBR	Composition applied to 2003-04 estimate lower 95%	median	upper 95%
Antipodean albatross*	XAN & XAU	133	3.3%	110	101	183	386
Southern Buller's albatross*	XBM	183	4.6%	100	139	252	531
Black petrel*	XBP	11	0.3%	20	8	15	32
Buller's shearwater*	XBS	2	0.1%	6400	2	3	6
Cape petrel	XCC, XCA, XCP	29	0.7%		22	40	84
Chatham albatross*	XCI	16	0.4%	60	12	22	46
Campbell albatross*	XCM	91	2.3%	150	69	125	264
Common Diving-petrel	XDP	8	0.2%		6	11	23
Fluttering shearwater*	XFL	2	0.1%		2	3	6
Fairy prion	XFP	6	0.2%		5	8	17
Flesh-footed shearwater	XFS	41	1.0%	1400	31	56	119
Black-bellied Storm-petrel	XFT	1	0.0%		1	1	3
Grey-backed Storm-petrel	XGB	2	0.1%		2	3	6
Grey-faced petrel	XGF	18	0.5%	9100	14	25	52
Grey petrel	XGP	541	13.6%	1500	412	745	1571
Black-browed Albatross	XKM	38	1.0%		29	52	110
Light-mantled sooty albatross	XLM	39	1.0%	240	30	54	113
Northern Buller's albatross*	XNB	6	0.2%	150	5	8	17
Northern Giant petrel	XNP	17	0.4%	90	13	23	49
Northern Royal albatross*	XNR	4	0.1%	70	3	6	12
Antarctic prion	XPR	2	0.1%		2	3	6
Pied shag	XPS	1	0.0%	150	1	1	3
Broad-billed prion	XPV	1	0.0%		1	1	3
Southern Royal albatross*	XRA	16	0.4%	100	12	22	46
Salvin's Albatross*	XSA	244	6.1%	260	186	336	709
Sooty shearwater	XSH	702	17.6%	110000	534	967	2038
Southern Giant petrel	XSP	6	0.2%		5	8	17
Short-tailed shearwater	XTS	33	0.8%		25	45	96
Wandering Albatross	XAS	2	0.1%		2	3	6
White-chinned petrel	XWC	955	23.9%		727	1316	2773
White-faced Storm-petrel	XWF	2	0.1%		2	3	6
White-headed petrel	XWH	2	0.1%		2	3	6
White-capped albatross*	XWM	834	20.9%	1900	635	1149	2422
Westland petrel*	XWP	4	0.1%	30	3	6	12
	Total	3992			3039	5500	11592

Table 5: PBR rates calculated for 22 species of seabirds vulnerable to fishing-related mortality in New Zealand fisheries. From Dillingham, Fletcher and MacKenzie. Unpublished report to the Ministry of Fisheries, 2006. BP_{NZ} = New Zealand breeding population, BP_W = world breeding population, Conservation status = IUCN redlist status for the species, α = age of first reproduction, *s* = annual adult survival, λmax = maximum annual growth rate, *f* = recovery factor (between 0.1 and 1), h = removal rate, ρ= proportion of the removal rate if f=1 and there is no uncertainty in N, N_{NZ} = conservative estimate of population size for New Zealand breeding populations, N_W = conservative estimate of population size for world populations, PBR_{NZ} = Potential Biological Removals for New Zealand breeding populations, PBR_W Potential Biological Removals for world breeding populations.* values estimated from parameters of closely-related species. ^{U} = research programmes underway currently to estimate population size. $^+$ = population studies conducted in the last 5 years to estimate population sizes.

Common name	BP_{NZ}	BP_W	Conservation status	α	s	λ_{max}	f	h(%)	ρ(%)	N_{NZ}	N_W	PBR_{NZ}	PBR_W
Sooty Shearwater	5,000,000	7,000,000	Near threatened	7	0.93	1.08	0.3	0.77	19.7	14,000,000	20,000,000	110,000	150,000
Grey-faced Petrel	250,000	250,000	Least concern	7*	0.94	1.07	0.5	1.21	32.8	750,000	750,000	9,100	9,100
Buller's Shearwater	200,000	200,000	Vulnerable	7*	0.93*	1.08	0.1	0.26	6.6	2,500,000	2,500,000	6,400	6,400
White-capped Albatross	75,000	75,000	Near threatened	10*	0.95	1.05	0.3	0.53	19.7	360,000	360,000	1900	1,900
White-chinned Petrel	210,000	2,500,000	Vulnerable	6.5	0.93*	1.08	0.1	0.27	6.6	590,000	7,000,000	1,600	19,000
Grey Petrel	50,000	100,000	Near threatened	7	0.94*	1.07	0.3	0.73	19.7	200,000	400,000	1,500	2,900
Flesh-footed Shearwater	38,000	220,000	Least concern	7*	0.93*	1.08	0.5	1.28	32.8	110,000	660,000	1,400	8,500
Hutton's Shearwater	110,000	110,000	Endangered	5	0.93	1.10	0.1	0.33	6.6	300,000	300,000	990	990
Salvin's Albatross	32,000	32,000	Vulnerable	10*	0.95*	1.05	0.1	0.18	6.6	150,000	150,000	260	260
Light-mantled Sooty Albatross	6,800	22,000	Near threatened	7	0.97	1.06	0.3	0.56	19.7	43,000	140,000	240	780
Campbell Albatross	26,000	26,000	Vulnerable	10	0.95	1.05	0.1	0.18	6.6	130,000	130,000	230	230
Northern Buller's Albatross	18,000	18,000	Vulnerable	10*	0.95	1.05	0.1	0.18	6.6	87,000	87,000	150	150
Pied Shag	7,500	7,500	Vulnerable	3*	0.88*	1.19	0.1	0.61	6.6	25,000	25,000	150	150
Southern Royal Albatross	7,800	7,800	Vulnerable	8*	0.95*	1.06	0.1	0.21	6.6	50,000	50,000	100	100
Southern Buller's Albatross	12,000	12,000	Vulnerable	10*	0.95	1.05	0.1	0.18	6.6	58,000	58,000	100	100
Northern Giant Petrel	2,600	12,000	Near threatened	6	0.92	1.09	0.3	0.91	19.7	9,800	45,000	90	410
Northern Royal Albatross	5,200	5,200	Endangered	8	0.95	1.06	0.1	0.21	6.6	34,000	34,000	70	70
Gibson's Wandering Albatross	6,200	6,200	Vulnerable	10	0.97	1.04	0.1	0.15	6.6	40,000	40,000	60	60
Chatham Albatross	4,600	4,600	Crit. Endangered	7	0.87	1.10	0.1	0.32	6.6	19,000	19,000	60	60
Antipodean Albatross	5,100	5,100	Vulnerable	10	0.97	1.04	0.1	0.15	6.6	33,000	33,000	50	50
Westland Petrel	2,000	2,000	Vulnerable	12	0.93	1.05	0.1	0.17	6.6	20,000	20,000	30	30
Black Petrel	2,600	2,600	Vulnerable	7	0.94	1.07	0.1	0.24	6.6	10,000	10,000	20	20
Taiko	15	15	Crit. Endangered	7*	0.93*	1.08	0.1	0.26	6.6	120	120	0	0

Table 6. Variation in warp strike rate between different fisheries sampled during the 2005 calendar year. From Abraham 2006.

Fishery	Strike rate (per hour trawling)
HOK	14.0 (10.6-17.8)
SQU	5.0 (5.1-5.9)
HAK	3.5 (2.1-4.9)
LIN	2.1 (0.0-6.4)
BAR	1.4 (0.3-2.6)
SBW	1.0 (0.3-2.0)
JMA	1.0 (0.3-1.9)
SSO	0.9 (0.0-2.0)
SWA	0.8 (0.0-2.4)
OEO	0.7 (0.0-1.7)
ORH	0.0 (0.0-0.0)

Table 7. Average heavy warp strikes per fifteen minute observation period during the trial of mitigation devices in the 2005-06 squid fishery, from Abraham et al. (in prep).

	Treatment	Trawl warp strikes per 15 minute observation period	
		With discharge	Without discharge
Large birds	No mitigation	0.62	0
	Bird baffler	0.80	0
	Warp scarer	0.48	0
	Tori line	0.06	0
Small birds	No mitigation	0.67	0.01
	Bird baffler	0.52	0
	Warp scarer	0.32	0
	Tori line	0.14	0

Table 8. Options for setting the seabird standard. Percent reduction is calculated from the total estimates generated by Fletcher and MacKenzie 2005.

2003-04 estimated fishing-related mortality	**5,467**[19]	**Options for overall seabird standard**	**2000**	**1500**	**1000**	**500**
		% reduction in mortality required	63.4	72.7	81.7	90.9

[19] Mean incidental mortality excluding set net (MacKenzie and Fletcher 2005)

Table 10. Fishing effort and estimated total seabird captures for trawl and longline fisheries in New Zealand waters in 2004-05, calculated using ratio estimation and a random effects model (from Baird and Smith 2007).

Target fishery	Effort	% observed	Area	Estimated captures (ratio estimator and bootstrapped CV in %)	Random effects model (confidence interval)
Hoki trawl	3939 tows	26	WCSI	27 (44)	45 (39)
	5536 tows	15	CHAT	144 (21)	194 (35)
	1508 tows	7	SUBA	15 (96)	54 (129)
	2884 tows	3	COOK	182 (46)	
	292 tows	19	PUYS	26 (46)	
Squid Trawl	2693 tows	30	SQU6T	591 (9.6)	414 (15)
	5861 tows	26.9	STEW	863 (8.6)	877 (12)
	292 tows	21.2	PUYS	33 (36)	Not estimated
Ling Autoline (Bottom Longline)	16 245.8 thousand hooks	9	LIN 4, 5 + 6	280 (29)	Not estimated
Snapper (bottom longline)	11 391.1 thousand hooks	2	Area 1	587 (42)	Not estimated
Chartered Tuna (Surface Longline)	642.1 thousand hooks	87	Areas 1, 2, 3 and 4	40 (7)	Not estimated
Domestic tuna (Surface Longline)	3000.4 thousand hooks	5	Area 1 and 4	194 (34)	Not estimated
Other trawl fisheries	53142 tows	Not estimated	All areas	Not estimated	Not estimated
Other bottom longline fisheries	14 254.5 thousand hooks	Not estimated	All areas	Not estimated	Not estimated
Other surface longline fisheries	104.7 thousand hooks	Not estimated	All areas	Not estimated	Not estimated

Table 11. Fishing effort, observation rate and estimated total seabird captures by fishing method and vessel length for trawl and longline fisheries in New Zealand waters in 2004-05, as calculated using a predictive modelling technique (from MacKenzie and Fletcher, 2005).

Method (vessel length)	Effort	% observed	Target species	Predicted seabird mortalities (95% credibility interval)
Trawl (<28 m)	76 065 tows	0	HOK	1 (0, 8)
			JMA	0 (0, 0)
			ORH	0 (0, 3)
			SCI	7 (4, 18)
			SQU	1 (0, 7)
			Other	59 (24, 238)
Trawl (>28 m)	66 097 tows	10	HOK	914 (753, 1108)
			JMA	6 (1, 14)
			ORH	60 (37, 94)
			SBW	6 (2, 14)
			SCI	86 (49, 146)
			SQU	1246 (1073, 1444)
			Other	264 (199, 355)
Surface Longline (<28 m)	5007 sets	2	BIG	1434 (270, 3164)
			STN	130 (26, 582)
			ALB	24 (3, 130)
			Other	58 (8, 126)
Surface Longline (>28 m)	571 sets	82	BIG	122 (18, 529)
			STN	79 (70, 97)
			ALB	20 (5, 52)
			Other	3 (0, 52)
Bottom Longline (<28 m)	17 342 sets	1	LIN	19 (2, 121)
			SNA	247 (51, 1685)
			Other	54 (3, 585)
Bottom Longline (>28 m)	6164 sets	12	LIN	543 (425, 694)
			SNA	-
			Other	84 (16, 326)
Setnet fisheries				Not estimated

Table 12. Seabird fishing-related mortality rates from fisheries where total estimates were possible from 2004-05, from Baird and Smith 2007.

Method	Fishery	Area	Effort	Observer coverage (%)	Estimated numbers of seabirds caught	Seabird mortality rate
Trawl (effort, tows; incidental mortality rate per 00 tows)	Hoki	CHAT	5536	15	194	3.5
		COOK	2884	3	182	6.3
		PUYS	292	19	26	8.9
		SUBA	1508	7	54	3.6
		WCSI	3939	26	45	1.1
	Squid	PUYS	292	22	33	11.3
		SQU 6T	2693	30	414	15.4
		SSTEW	5861	27	877	15.0
Bottom longline (effort, 000 hooks; incidental mortality rate per 000 hooks)	Snapper	1	11291.1	2	587	0.052
	Ling autoline	4	10456.9	5	83	0.008
		5	3312.1	7	184	0.056
		6	2476.8	30	13	0.005
Surface longline (effort, 000 hooks; incidental mortality rate per 000 hooks)	Chartered tuna	1	137.6	85	9	0.065
		3	504.5	88	31	0.061
	Domestic tuna	1	2493.5	5	155	0.062
		4	513.9	3	39	0.076

Appendix A: PBR modelling

198 Population modelling approaches may be used to describe the level of human induced mortality that may reduce a species ability to maintain its population numbers or recover in number following declines. MFish has commissioned research to estimate the Potential Biological Removals (PBR) that breeding species of seabirds from New Zealand may sustain, before the populations suffer reduced population recovery potential. This approach indicates, for each separate seabird taxon included in the model, how many individuals can be removed from the population, aside from natural mortality, such as through fishing-related mortality. The mortalities include those that occur inside as well as outside the New Zealand Exclusive Economic Zone.

199 This PBR analysis shows that for the most critically endangered New Zealand breeding species of seabird, only very few removals can be sustained (0 individual (Taiko), 20 individuals (Black Petrel), 30 individuals (Westland Petrel), or 60 individuals (Chatham Albatross). Other species, which are numerous and widespread such as the Sooty Shearwater could sustain up to several hundred individuals killed in fisheries on a global scale (PBR_W = 150 000, Table 3). This type of modelling is considered highly precautionary, in that the PBR number for each species provides a high level of confidence that removals at that level will not result in a decreasing population size or reduced population recovery potential. Removals at or below this PBR level for a species could therefore be considered to not detrimentally affect the seabird species.

200 This approach is not intended to be used to define targets against which to measure seabird fishing-related mortality, rather as an indicator of the overall performance of New Zealand fisheries, at achieving the outcomes of the PBR approach. The PBR numbers give an indication of the vulnerability of each population to fisheries removals, rather than defining the allowable take for a species. The species used in the PBR modelling were selected to provide information across a range of species groups including several foraging guilds, geographical regions, taxon groups, and levels of threat status. As indicated in Table 4, the species shown in the PBR tables does not constitute the full set of species that have been identified in fishing-related mortality in New Zealand waters.

201 The PBR approach contains a number of assumptions, and has typically been used in situations where data on either fisheries catches of protected species or their biology are limited. Alternative modelling approaches could be used to examine the rate of removals that populations could sustain, but at present none is available for these New Zealand seabird species. These generally require a more detailed level of information about species. With provision of more accurate information about seabird populations through time, modelling approaches can be adapted and results updated.

202 The PBR approach involves multiplying three critical factors for any population, which produces an index against which to measure whether the

population would recover to, or remain at or above the maximum net productivity level in the absence of human-induced mortality. The three factors are 1) a conservative estimate of the total population size N_{MIN}, 2) a recovery factor attributed between 0.1 and 1, and 3) the maximum theoretical or estimated net productivity rate for the stock at small population size, R_{MAX}.

203 The context for the development of PBR approach was in the risk-averse setting of the US Marine-Mammals Protection Act of 1972. The population estimates (N_{MIN}) used in the Dillingham and Fletcher model use the current published annual number of breeding pairs (Brooke 2004). Many of these are imprecise, and some are old (over 20 years old). R_{MAX} values for seabirds are largely unavailable, however in seabirds, some population parameters that contribute to this metric are very well known compared to other types of animal (e.g. adult annual survival rates for some species).

204 The Dillingham and Fletcher model uses values of maximum annual growth rate, λ_{MAX} , derived from adult annual survival (*s*) and age at first breeding parameters (α), as $R_{MAX} = \lambda_{MAX}-1$. Estimates for *s*, α and λ (annual growth rate) are known for some seabird species breeding in New Zealand and where they are unknown, parameter estimates were borrowed from closely-related species or populations.

205 The recovery factor (*f*) is qualitatively assigned to a population, depending on its ability to respond to pressure – for the model described here, *f* values of 0.1 were applied to most albatrosses which have low productivity, and values of between 0.3 and 0.5 to the species known to breed at an earlier age, more frequently, or have lower annual adult survival (higher productivity species).

206 Population estimates are a key piece of information for assessing the risk of fishing-related mortality to seabird population viability. Research to reduce these uncertainties in population estimate is underway for a suite of populations representing those listed in Table 1. Of the 23 taxa listed in this table, new research on population parameter estimation is underway for 21 taxa (either recently commissioned or completed within the last 5 years).

207 Research into the overlap of species foraging ranges with New Zealand fisheries activity is underway or available for 14 taxa. Therefore, within a short period of time (1 – 5 years), a much higher quality of information will be available about population sizes and the interaction with fishing zones, which will allow refinement of the management of fisheries interactions with vulnerable populations.

Appendix B: Observer coverage

208 In 2005, researchers commented that "regardless of the exact model structure used on the observed data[20], in order to generalise the results of the model to unobserved events, the data collected on fishing-related mortality from observed vessels must be representative of the fishing-related mortality on unobserved vessels. Given the nature in which observers have been allocated to vessels in the past, and the very low levels of observer coverage of small vessels (<28m), caution should be exercised when interpreting the estimated level of fishing-related mortality from currently collected scientific observer data, regardless of the statistical method employed to provide that estimate. At present it may only be possible to reliably estimate seabird fishing-related mortality in a small number of fisheries. Such estimates may be of limited value for managing and mitigating seabird fishing-related mortality, as 'problem' fisheries would be difficult to identify without the context provided by having reliable estimates from the majority of fisheries"[21].

209 Understanding which individuals in a population are caught in fishing operations (sex, age-class) and the nature and extent of these interactions is vital to allowing appropriate and targeted management activity. Currently only a small proportion of vessels, fleets, and target fisheries have observer coverage at a level that permits estimation of seabird captures, with all species confounded and almost no information on age and sex.

210 Further observer coverage will reduce uncertainty in the estimates of total seabirds caught and composition of species, and will also provide solid information into the proximate causes of captures in relation to fishing practice.

211 Currently the seabird species composition of catch is very poorly known. Further investment in observer coverage, retention of carcasses and expert identification of bycaught seabirds would be necessary to increase the certainty on the effects of fishing on individual species of seabirds, under a multi-species approach to setting and monitoring the seabird standard.

212 In order to reduce the uncertainty around these estimates of total numbers of seabirds caught within New Zealand's EEZ, increases in the coverage and representation of observer monitoring would be required to enable a more accurate examination of seabird mortalities in New Zealand's principal fisheries.

213 Further investment in observer coverage, retention of carcasses and necropsy identification of seabirds would be necessary to allow estimations to be done and reduce the uncertainty of any fishery effect on individual seabird species.

[20] "Data" refers to the number of birds landed on deck from fishing vessels, as recorded by observers, across all fisheries in any given year.
[21] MacKenzie and Fletcher 2005.Characterisation of seabird captures in NZ fisheries. Final Research Report to the Ministry of Fisheries. Project ENV2004-04. Unpublished report, Ministry of Fisheries. P 10.

214 Higher levels of observer coverage would also be of benefit for the monitoring of compliance with required mitigation measures, as well as assisting with research into new methods of avoiding seabird capture through changes in fishing practice or deployment of mitigation devices.

Appendix C: estimating seabird fishing-related mortality

215 Three approaches have been used in estimating total seabird mortalities in the past few years.

216 The first approach used the observed ratio of seabirds caught relative to fishing effort, to estimate fisheries captures of seabirds by target fishery. This approach assumes that unobserved effort was identical to observed effort. Data were considered adequate under this approach to estimate removals for some areas in the Hoki Trawl, Squid Trawl, Joint-venture Tuna and Ling Autoline fleets in 2004-05[22]. Currently, several assumptions are violated in this approach, as it is unknown for the unobserved part of the fishing fleet which mitigation measures or practices are used to avoid seabird captures, hence estimation based on the relatively low proportion of the fleet may be inaccurate. Under-reporting of seabird captures on vessels not carrying observers is a known problem. Currently, there is no requirement for unobserved vessels to provide information about mitigation and offal discharge practices.

217 The second approach used an alternative random-effects model on the same data as approach A and showed similar results[23]. The observed and estimated captures were only for a proportion of the total trawl and longline effort (Table 10). This approach does not assume that unobserved effort was identical to the observed effort, but requires further data (especially co-variates for vessel type and fishing practice). Total seabird removals for the nine fishery areas and target stocks where estimates were produced was in the order of 3000 birds, but note that this number of birds were estimated for only a small proportion of the effort undertaken in 2004-05.

218 The third approach uses a predictive modelling technique to extrapolate catches across all areas and seasons for three principal methods of fishing for which observer data exist[24.] This analysis included trawl, surface longline and bottom longline methods. This approach estimated the predicted catches of seabirds for each area, for small and large vessels (divided at 28 m in length). The large confidence intervals on most of the estimates indicate low statistical confidence in the estimates. However this analysis demonstrated that fishing mortalities in these fisheries are potentially very large, or conversely, may be very small. This approach led to an estimated total capture figure for all seabirds of the order of 5500 for 2003-04 in trawl and longline fisheries, but note that there was high uncertainty associated with this estimate (95% credibility interval of between 3039 – 11 592 total seabirds) (Table 11).

[22] Baird and Smith 2007. Incidental capture of seabird species in commercial fisheries in New Zealand waters, 2003-04 and 2004-05. New Zealand Aquatic Environment and Biodiversity Report, in press.
[23] Baird and Smith 2007. Incidental capture of seabird species in commercial fisheries in New Zealand waters, 2003-04 and 2004-05. New Zealand Aquatic Environment and Biodiversity Report, in press
[24] MacKenzie and Fletcher 2005. Characterisation of seabird captures in NZ fisheries. Final Report for the Ministry of Fisheries project ENV2004-04. . Unpublished report, Ministry of Fisheries.

Appendix D: Examples of reductions in seabird fishing-related mortality

Examples of reductions from around the world

Falkland Islands trawl fishery

219 In 2004, regulations for the use of tori-lines were put in place for the Falkland Islands trawl fishery, following observations of high rates of mortality of seabirds, principally Black-browed Albatrosses. The use of tori-lines was widespread throughout the fleet fishing for squid and finfish in the year after their introduction, and resulted in an approximately 90% reduction in seabird mortality.[25]

220 Of the eleven birds recorded as killed following the introduction of tori-lines, seven were caught during the period when the net was being shot, tori-lines were not yet deployed and birds were foraging on offal behind the vessel.

221 Further reductions are likely to be achieved once offal management measures are put into place.

Australian Eastern Tuna and Billfish Fishery

222 In Australia, the Eastern Tuna and Billfish Fishery (ETBF), interacts with seabirds, principally Flesh-footed shearwaters. With the implementation of the original Threat Abatement Plan (TAP) in 1998, a large proportion of the longline fleet on the east coast began to set their lines during the night to avoid interactions with albatross species, dramatically reducing the catch of albatross but increasing the catch of Flesh-footed shearwaters.

223 Through a number of at-sea trials with a variety of mitigation measures, the catch of shearwaters has been consistently reduced and has reached a level under the 0.05 seabirds/1000 hooks set as the performance indicator under the TAP[26]. Figure 3 shows the magnitude of this reduction.

224 The figure of 0.05 seabirds/1000 hooks was set in the Australian TAP as a figure biologically referenced on a number of Flesh-footed shearwaters that could be removed from the main population at Lord Howe Island annually without causing population decline or reduced recovery[27].

[25] Reid et al. Consequences of the introduction of Tori Lines in relation to seabird mortality in the Falklands Islands trawl fishery, 2004/05. Falklands Conservation unpublished report.

[26] CCSBT-ERS/0602/National Reports-Australia. National Report to ERSWG 6 – Australia Taiwan, 23 - 25 February 2006

[27] Baker and Wise 2005 The impact of pelagic longline fishing on the flesh-footed shearwater *Puffinus carneipes* in Eastern Australia. Biological Conservation 126: 306-316.

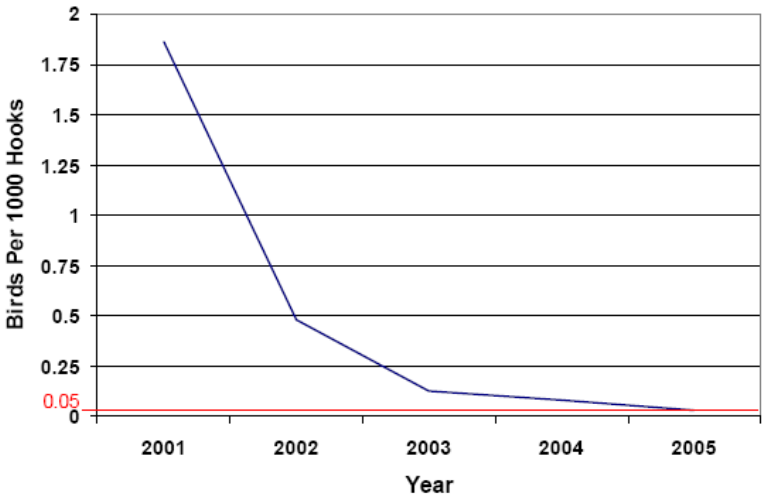

Figure 3: Seabird capture rates in the Australian EBTF with red line at 0.05 birds / 000 hooks indicating the level of seabird interaction considered to not cause adverse effect.

CCAMLR demersal longline fishery

225 In this fishery, seabird fishing-related mortality was not estimated prior to 1997, and first estimates were that around 6000 birds were being killed per year for all areas excluding the French EEZ.

226 This figure has dropped rapidly and successively throughout a period of 10 years, to below 300 total estimated birds from 2001 onwards. In 2003 and 2004, around 50 birds were estimated captured, and in 2006, two birds were estimated caught (in convention areas excluding the French EEZ) (Figure 4).

227 Similar decreases in bird captures have been recorded in the French EEZ area of the CCAMLR convention area, from the time that seabird mortality rates were estimated in 2002 (around 16,000 birds) to 2005 (1,400 birds). Continued reductions of captures in the French EEZ are anticipated with new line-weighting regimes.

228 Across the CCAMLR longline fisheries, these reductions in catch have resulted from a series of management measures including tori-lines, seasonal closures, line-weighting regimes, prohibition on offal or rubbish discarding, thawed baits, high levels of observer coverage, strict compliance checking and a detailed risk-assessment and research programme into effective mitigation measures.

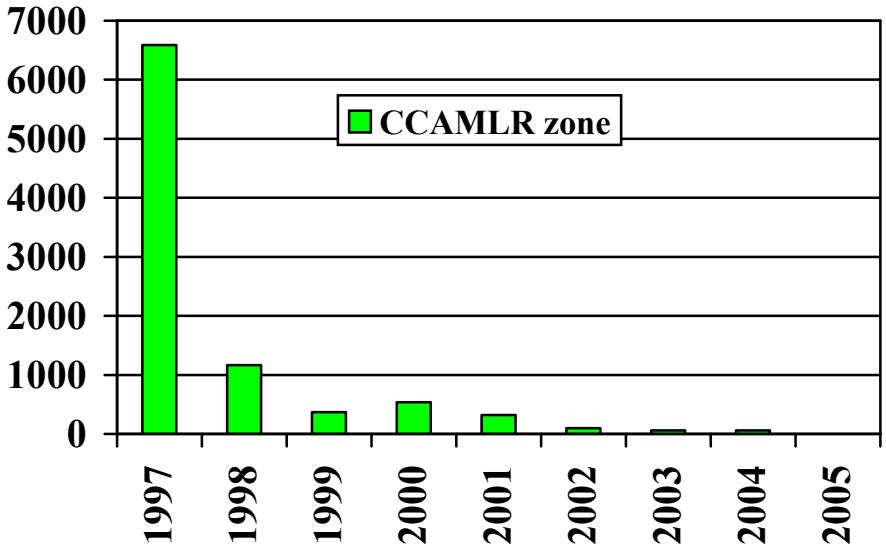

Figure 4: Seabird captures in the demersal longline fishery for *Dissostichus* spp. in the CCAMLR convention area during 1997 to 2006 (Excluding the French EEZ).

Examples of reductions from New Zealand fisheries

New Zealand ling autoline fishery

229 The large catch of white-chinned petrels in the 2000-01 New Zealand ling autoline fishery was followed by a period of intensive research on line weighting. Continued reductions in catch have been recorded since that period. Current rates of capture are around 0.017 birds / 000 hooks (Figure 5). Prior to 2000-01, low observer coverage had not provided an accurate picture of seabird fishing-related mortality in the Ling Autoline fishery.

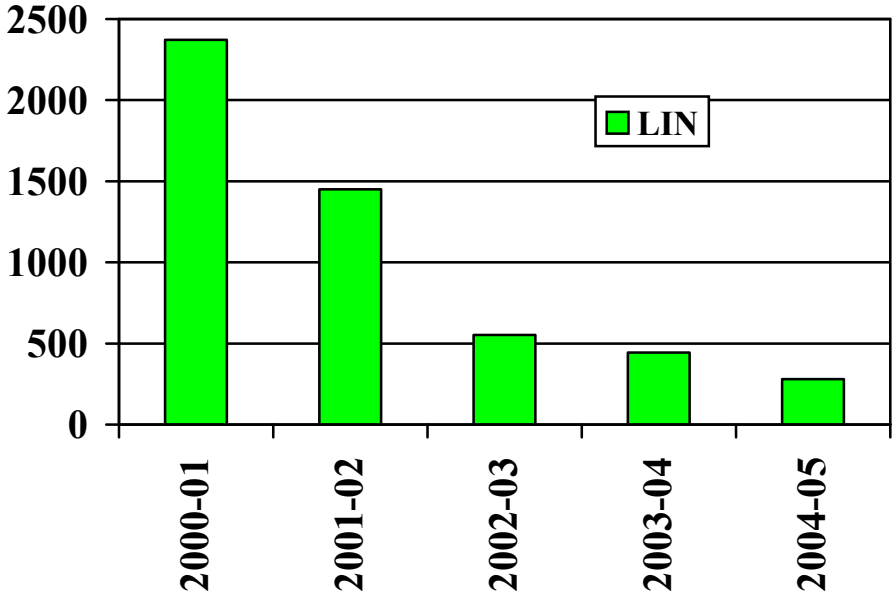

Figure 5. Seabird catch estimated in the New Zealand Ling Autoline fleet during 2000-01 to 2004-05.

Vessels in the New Zealand squid fishery

230 Overall reductions in fishing-related mortality in the New Zealand squid trawl fishery are not yet known and are likely to be hampered by some vessels not yet consistently implementing effective mitigation measures. However, research studies show that management of offal and discards can dramatically reduce seabird fishing-related mortality and warp strikes in trawl fisheries.

231 Removal of offal in modelled results showed a decrease in landed birds from 21 per 100 tows to 2 per 100 tows, noting that these figures include birds recovered after captures on the trawl warps only[28].

232 Table 9 shows that with offal discharge, 50% of the observed fleet managed to catch 0 birds per 100 tows. If 70 % of the fleet are included, the average rate of capture is 4.7 birds per 100 tows. If offal discharge is eliminated, the rates of bird capture are roughly 1/4 to 1/3 of those with offal discharge.

Table 9: For the SQU fishery in 2005, average capture rates for birds in the presence or absence of offal discharge were:

Percentile of fleet	With offal discharge (birds per 100 tows)	Without offal discharge (birds per 100 tows)
50%	0	0
60%	4.7	1.8
70%	8.0	3.0
80%	14.7	3.9
90%	20.0	5.9

[28] Abraham, E., 2006. Warp strike summary: preliminary analysis of observer warp strike data collected during the 2005 calendar year. Unpublished report, Ministry of Fisheries. Available on request. Presented to AEWG on 1st of August 2006.

REVISED NPOA SEABIRDS MANAGEMENT FRAMEWORK – CONSULTATION DOCUMENT

Purpose

1 The purpose of this document is to set out a proposal for a revised NPOA Seabirds management framework, consistent with the seabird standard and fisheries plan framework.

Scope

2 The scope of this document is limited to the elements of the NPOA Seabirds that relate to assessing fisheries for seabird incidental mortality risk, and the implementation and monitoring of measures to mitigate this risk.

3 The revised framework will initially apply to commercial fisheries within New Zealand's EEZ. However, a similar approach may be rolled out to high seas and non-commercial fisheries in the future.

4 The remaining elements of the NPOA Seabirds fall outside the scope of this consultation document and will not be revised at the present time.

Desired outcomes

5 The NPOA Seabirds management framework will provide a robust mechanism for achieving the goals of the NPOA and for meeting the seabird standard.

6 MFish fisheries plan managers will have a clear, consistent and effective process for determining seabird incidental mortality objectives and for implementing and monitoring measures to meet those objectives.

7 Stakeholders will have a clear understanding of how seabird incidental mortality will be addressed, including when and why government will intervene to implement management measures such as mitigation measures and monitoring services.

Executive summary

8 The proposed NPOA Seabirds management framework is split into three areas:

i) Setting objectives for managing the incidental mortality of seabirds

ii) Implementing management measures to meet objectives

iii) Monitoring whether management measures are achieving objectives

9 The key elements in relation to setting objectives are as follows:

a) The seabird standard will be the principal determinant of the level at which seabird incidental mortality objectives will be set

b) Seabird incidental mortality objectives will be implemented over a two-year period, primarily through the fisheries plan process

c) The incidental mortality limit set by the seabird standard will be allocated between each of the four main fishing methods, in the following proportion:

i)	Trawl	30%
ii)	Surface longline	30%
iii)	Bottom longline	30%
iv)	Set net	10%

d) A maximum allowable rate of capture will be calculated for each of these methods by dividing the allocated share of the seabird standard by the total expected effort for that method across the year

e) Each fisheries plan will be required to set an objective of meeting or bettering this maximum allowable rate of capture, averaged across all the vessels in the fishery

f) If a fishery cannot reasonably meet the required incidental mortality objective straight away, the Minister[29] may agree to an interim incidental mortality objective

10 The key elements in relation to implementing management measures are as follows:

a) A risk assessment process to determine whether management measures are likely to be required to meet objectives

b) A robust process for determining what measures are necessary to meet objectives

c) An assessment of whether a voluntary approach is likely to be adequate and effective before voluntary measures are preferred over a regulatory framework

11 The key elements in relation to monitoring whether the management measures are achieving objectives are as follows:

a) MFish fisheries plan managers will need to demonstrate that they have met seabird incidental mortality objectives with a high level of statistical confidence and that their monitoring programme is representative of fishing effort in their fishery

b) Reporting against the objectives will be required every six months, with the assessment period being the most recent 12 month period that data is available

[29] Throughout this document, the term "Minister" refers to the Minister of Fisheries and the term "Ministers" refers to the Minister of Fisheries and the Minister of Conservation.

c) A transparent process for managing fisheries that do not meet seabird incidental mortality objectives

Part 1: Rationale for a revised NPOA Seabirds management framework

Background

12 In April 2004 the Minister of Fisheries and Minister of Conservation launched the National Plan of Action to reduce the Incidental Catch of Seabirds in New Zealand Fisheries (NPOA Seabirds).

13 The NPOA Seabirds set out a long term, strategic approach to reducing the incidental catch of seabirds that integrated and built on New Zealand's existing legal and policy framework for addressing this issue.

14 The NPOA divided fisheries into groups based on the level of interaction they were considered to have with seabirds, and set out a package of management measures for each group founded largely on the basis that fishers should have the first opportunity to manage their own impacts of fishing under a largely voluntary framework.

15 However, during the 2005 squid season, observers reported widespread non-compliance with voluntary Codes of Practice, coincident with a high number of recorded occurrences of seabird incidental mortality.

16 In response, the Minister of Fisheries introduced regulations to reduce seabird incidental mortality in trawl fisheries and directed officials to review the NPOA Seabirds to reduce the likelihood of such failures occurring in the future.

17 The initial focus of the review was the management framework used to assess fisheries for risk of incidental mortality and the implementation of measures to mitigate this risk.

18 The NPOA Seabirds now forms part of a broader framework for managing the impacts of fishing on seabirds that includes the seabird standard and fisheries plans.

Problems with the original NPOA Seabirds management framework

19 When it was launched in April 2004, the overall philosophy of the NPOA was to allow fishers the first opportunity to take responsibility for managing their seabird incidental mortality. Fisheries were divided up by target fish stocks and fishing method (e.g. snapper longline) and placed into groups based on the level of interaction they were considered to have with seabirds.

20 Those fisheries with recognised seabird interactions were required to determine the levels of incidental mortality reduction that they considered to be achievable and to implement a voluntary Code of Practice to achieve that end.

21 However, as noted in the above section, following widespread non-compliance with voluntary Codes of Practice in the squid fishery, the Minister of Fisheries

directed officials to review the NPOA Seabirds to reduce the likelihood of such failures occurring in the future.

22 MFish and DoC consider that the principal reason why the NPOA is vulnerable to failure is because the central premise that regulatory controls will only be introduced when a voluntary approach is considered to be inadequate[30] is not being implemented in a sufficiently robust manner. For example, stakeholders do not have clear guidance on when government will intervene.

23 Furthermore, the current approach does not provide certainty to government, to Ministers or to stakeholders that voluntary measures to manage seabird incidental mortality will be implemented adequately and effectively.

24 Some of the problems associated with the existing framework are that:

i) Fishers are being asked to determine what steps they consider are necessary to meet the Minister's obligations to avoid, remedy or mitigate the effects of fishing and often have little information to guide them;

ii) Fisheries often lack the internal governance arrangements, and fishers the collective will, to implement and monitor an effective voluntary management framework; and

iii) Government and Ministers have no pre-identified process for intervening in a timely fashion if voluntary measures fail to be effectively implemented and stakeholders have no clear and transparent guidance as to when such an intervention might happen.

25 An additional problem is that some fishers did not understand why their fishery was required to develop voluntary Codes of Practice or did not consider it necessary to do so.

Development of the seabird standard and fisheries plans

26 Subsequent to the review of the NPOA Seabirds being requested, MFish has made some significant changes to the way that fisheries in New Zealand are managed. The most significant changes are the development of standards and the introduction of fisheries plans.

27 Both of these initiatives impact on the way that seabird incidental mortality objectives are set, implemented and monitored and the revised NPOA Seabirds management framework has been developed to complement these changes, as well as to solve some of the problems associated with the original NPOA Seabirds.

[30] Or where research identified that a particular mitigation measure had significant benefits that warranted its implementation on a mandatory rather than voluntary basis

Revised NPOA Seabirds management framework

28 In developing a revised NPOA framework, MFish and DoC consider that the following components are required to address the shortcomings of the existing NPOA Seabirds management framework:

i) Clear objectives for the management of seabird incidental mortality, including clarity over which fishers are required to meet the objectives, and when by

ii) A risk assessment process to determine whether management measures are required to meet objectives

iii) A robust process for determining what measures are necessary to meet the management objectives

iv) An assessment of whether a voluntary approach is likely to be adequate and effective before voluntary measures are preferred over a regulatory framework

v) An effective monitoring and reporting framework for measuring the success of management measures

vi) A transparent process for managing fisheries that do not meet seabird incidental mortality objectives

Exceptional circumstances

29 The existence of a management framework and clear objectives to manage the incidental mortality of seabirds cannot fetter the ability of the Minister to act if he or she considers that additional measures are required to meet the purpose of the Act.

30 Whilst the seabird standard and NPOA/fisheries plan process will be the primary management frameworks for meeting the Minister's obligations towards seabirds, there may be exceptional circumstances where intervention is necessary outside of these frameworks.

31 For example, large catches of vulnerable seabird species, or new fishing practices considered to be of high risk may require more urgent action than is provided for under the proposed management regime.

Part 2: Setting objectives for managing the incidental mortality of seabirds

32 The key elements in relation to setting objectives are as follows:

a) The seabird standard will be the principal determinant of the level at which seabird incidental mortality objectives will be set

b) Seabird incidental mortality objectives will be implemented over a two-year period, primarily through the fisheries plan process

c) The incidental mortality limit set by the seabird standard will be allocated between each of the four main fishing methods, in the following proportion:

i)	Trawl	30%
ii)	Surface longline	30%
iii)	Bottom longline	30%
iv)	Set net	10%

d) A maximum allowable rate of capture will be calculated for each of these methods by dividing the allocated share of the seabird standard by the total expected effort for that method across the year

e) Each fisheries plan will be required to set an objective of meeting or bettering this maximum allowable rate of capture, averaged across all the vessels in the fishery

f) If a fishery cannot reasonably meet the required incidental mortality objective straight away, the Minister may agree to an interim incidental mortality objective

33 These elements are explained in more detail below.

The seabird standard will be the principal determinant of the level at which seabird incidental mortality objectives will be set

34 The goals of the NPOA Seabirds establish the NPOA as a long term strategy to reduce the impacts of fishing on seabirds. However, they do not easily translate into concrete objectives against which to assess risk and implement management measures.

35 In contrast, the purpose of the seabird standard is to allow the Minister of Fisheries to set out more explicitly government's expectations of progress against the two goals of the NPOA Seabirds and when he considers it necessary to avoid, remedy or mitigate the effects of fishing related mortality on protected species of seabirds.

36 The seabird standard will therefore be the principal determinant of the level at which seabird incidental mortality objectives will be set.

Seabird incidental mortality objectives will be implemented over a

two-year period, primarily through the fisheries plan process

37 Fisheries plans set out what objectives, management measures and services will be required for a stock or grouping of fish stocks. As part of this process, fisheries plans will be required to set an objective of reducing or maintaining seabird incidental mortality at or below a certain level.

38 MFish anticipates that seabird incidental mortality objectives contained within fisheries plans will be implemented across all relevant fisheries within two years. However, if a fisheries plan is unlikely to set objectives and identify management measures within a two year period, a dedicated process for implementing seabird objectives may be required.

39 The shift to managing the incidental mortality of seabirds through fisheries plans will replace the current system of managing using target fish stock and method (e.g. snapper longline), as described in the original NPOA, and will ensure that all fishers understand their obligations to reduce incidental mortality to clearly described levels.

The incidental mortality limit set by the seabird standard will be allocated between each of the four main fishing methods

40 Setting a single, overarching, seabird standard will not provide sufficient clarity over expected performance in reducing incidental mortality by different components of the New Zealand fishing fleet. MFish and DoC therefore propose to allocate the maximum allowable incidental mortality set by the seabird standard between fishing methods that are known or considered likely to catch seabirds.

41 While there are a number of alternative methodologies for determining which fisheries are at risk of catching seabirds, such as area fished, vessel type, target fish stock and fishing method, fishing method has been shown to be the factor that explains the most variation between vessels in seabird captures. It is also simple to implement and monitor.

42 Observer data reveals that seabird incidental mortality has occurred while fishing for 28 different fish stocks using the methods of surface longline, bottom longline and trawl. In addition, there have been confirmed records of seabird captures in set-net fisheries, but rates of capture and the extent of the problem is uncertain. More detailed information can be found in table 2 of the accompanying seabird standard consultation document.

43 Based on observer data, MFish and DoC consider that the incidental mortality limit set by the seabird standard should be allocated between the following methods:

i) Trawl (BT, BPT, MW, MPT)

ii) Surface longline (SLL)

iii) Bottom longline (BLL)

iv) Set net (SN, PSN)

44 Small numbers of seabirds may be taken by other methods, but MFish and DoC consider that these catches are probably negligible relative to the four methods identified above[31]. However, information to date is very limited in many fisheries and the NPOA could be extended to encompass other fishing methods subsequently considered to pose a substantive risk. Observer data and non-fish incidental catch returns will be periodically reviewed to determine if other methods should be included within the seabird standard.

45 As with allocation of the Total Allowable Catch for fish-stocks, the exact proportion that the incidental mortality limit set by the seabird standard is allocated between methods is a matter of judgement by Ministers, and there is no right or wrong answer. The overall principles of maximising value, or perhaps wellbeing, and concepts of equity and fairness are relevant considerations.

46 There are many different methodologies potentially available. One approach is to allocate the maximum allowable incidental mortality between fishing methods in the same proportion as current seabird mortality is thought to be occurring, thereby requiring the same levels of reduction for each method.

47 However, MFish and DoC consider that this approach is inappropriate as it favours those methods with the worst track records and does not reward those that have already invested time and effort to reduce seabird incidental mortality.

48 One way to take into account improvements made by some fishers is to allocate based on 'pre-mitigation' levels. Some fisheries would then find that they had already made substantial progress in reaching the level required for their method, whereas others may still be catching at pre-mitigation levels and would have more work to do.

49 In principle, MFish and DoC consider that this may be the best approach as it is likely that socio-economic costs associated with reducing incidental mortality from pre-mitigation levels would be low initially, as simple measures are put into place, and may increase as greater reductions are required.

50 However, pre-mitigation levels of incidental mortality are difficult to estimate due to historically poor observer coverage and mitigation measures being introduced over time, making 'base year' estimates difficult to establish.

[31] Baited pots are known to catch diving seabirds in some overseas fisheries, but this is not thought to be a big problem in New Zealand pot fisheries. Troll fisheries for tuna may catch some seabirds, but the threat is likely to be small compared with that posed by surface longlines, since troll-caught birds tend to be entangled and released alive rather than hooked and drowned. Similarly, dredge and Danish seines have warps that might strike and injure seabirds foraging around the vessel, but the threat is thought to be negligible relative to that posed by trawl warps. Other methods such as beach seine, purse seine, lampara net, and fyke net are not currently thought to pose a substantial risk.

51 It is also likely to be too complicated to take an approach that directly estimated the socio-economic costs of achieving reductions across methods, in order to allocate on a 'least cost' basis.

52 MFish and DoC therefore propose that, as a starting point for deliberations, an arbitrary, and equal, allocation between the main three methods be applied. However, as set net fishing is not currently known to have the same impact, a smaller share has been apportioned to this method.

53 Allocation of the incidental mortality limit set by the seabird standard between methods is therefore proposed as follows:

i)	Trawl	30%
ii)	Surface longline	30%
iii)	Bottom longline	30%
iv)	Set net	10%

54 This suggested allocation may be adjusted by Ministers, both initially, and in the future, as more information becomes available on the socio-economic implications of achieving the required reductions in incidental mortality. Stakeholders are encouraged to submit their views on this subject.

55 While this section describes how the seabird standard will be allocated between methods, ultimately, the seabird standard will be applied to the setting of objectives at a fishery-specific level and the sections below on rates of capture explain how this will happen.

A maximum allowable rate of capture will be calculated for each of these methods by dividing the allocated share of the seabird standard by the total expected effort for that method across the year

and

Each fisheries plan will be required to set an objective of meeting or bettering this maximum allowable rate of capture, averaged across all the vessels in the fishery

56 As noted above, setting an overall seabird standard, or even a standard for each method, will not provide sufficient guidance to MFish fisheries plan managers as to the most appropriate level to set the seabird incidental mortality objective for their fishery. This is because there will be a number of fisheries using the same method, all 'contributing' mortalities towards the allocated incidental mortality limit for that particular method.

57 To overcome this problem, MFish and DoC propose to calculate a maximum allowable rate of capture, by dividing the maximum allowable incidental mortality allocated to each method by the expected total effort for that method.

58 MFish and DoC consider that there are some well established standardised units of measurement, or metrics, of seabird incidental mortality that could be used. For bottom and surface longlines these are birds landed per 1,000 hooks. For trawl vessels, these are birds landed per 100 tows. For set nets the most appropriate metric is soak time per hour per kilometre.

59 Expressing the standard as a rate of capture for each method, as well as a maximum level of incidental mortality, will allow the performance of each fisheries plan to be monitored against the seabird standard.

60 Approached this way, if all fisheries of a particular method do not exceed the maximum allowable rate of capture, and total effort for the method is similar to previous levels, the overall seabird standard for that particular method will not be exceeded.

61 Expressing the standard using a rate does carry some disadvantages. The main disadvantage is that a rate of capture is not directly linked to total removals of seabirds. Because the allowable rate of capture is derived from expected levels of effort, increases in effort above expected levels can lead to the maximum allowable incidental mortality being exceeded, even if the rate that vessels are achieving does not exceed the allowable rate of capture.

62 To overcome this problem, if there is a significant increase in effort that leads to the maximum allowable incidental mortality for a method being exceeded, despite the allowable rate being met, the allowable rate of capture may be reduced for the following season, to ensure that the maximum allowable incidental mortality is not exceeded as a result of increased effort.

63 The proposed approach can be illustrated using the following theoretical example:

Seabird standard	1,000 birds
Allocation to trawl method	300 birds
Estimated total annual effort across all trawl fisheries	121,900 tows
Maximum allowable rate of capture for each trawl fishery	300/1,219 = 0.25 birds per 100 tows

64 Rather than the maximum allowable rate applying to individual vessels, all vessels within each fishery plan will collectively be required to meet, or better, the maximum allowable rate of capture.

65 MFish fisheries plan managers will therefore be required to set an objective, averaged across all of the vessels in their fishery, of not exceeding the maximum allowable rate of capture for the method used in their fishery.

66 MFish fisheries plan managers will, however, have the option of setting objectives that are at a finer scale than that prescribed by the NPOA, such as

by dividing fishing activity into vessel type, fishery complex, area or season, if they consider it beneficial to do so and provided that they still meet the overall objective.

67 One additional advantage of expressing the standard as a maximum rate of capture is that it will help managers of fisheries plans to better understand the most appropriate options available to them when considering what measures to put in place for their fishery to meet the objective.

68 This is because scientific assessments of measures to reduce seabird incidental mortality typically measure effectiveness through comparisons of rates of capture. For example, a recent study on warp strike mitigation[32] used the metric of number of warp strikes per hour for each mitigation type and for a control sample of no mitigation. Other studies have looked at differences between the numbers of birds caught per thousand hooks or between the numbers of birds landed per 100 tows.

[32] A fleet scale experimental comparison of devices used for reducing the incidental capture of seabirds on trawl warps. Edward R. Abraham1, David A. J. Middleton, Susan M. Waugh, Johanna P. Pierre, Nathan Walker, Caren Schrōder. Submitted to the Canadian Journal of Fisheries and Aquatic Sciences, 31 May, 2007.

Table 1: options for the overall seabird standard expressed in terms of rate of seabird captures per unit of fishing effort, with the overall seabird standard divided between trawl (30%), bottom longline (30%), surface longline (30%), and set net (10%). Percent reduction is calculated from the total estimates generated by Fletcher and MacKenzie 2005. Options are those recommended by MFish in the seabird standard consultation document.

Method	2003-04	5,467[33]	Options for overall seabird standard	2000	1,500	1000	500
Trawl	estimated mortality	2650	Allocation of seabird standard to trawl	600	450	300	150
	effort, 00 tows	1,219	% reduction in mortality required	77.4	83.0	88.7	94.3
	catch rate, per 00 tows	2.17	required catch rate (per 00 tows)	0.492	0.369	0.246	0.123
Bottom longline	estimated mortality	947	Allocation of standard to bottom longline	600	450	300	150
	effort, 000 hooks	43,447	% reduction in mortality required	36.6	52.5	68.3	84.2
	catch rate, per 000 hooks	0.022	required catch rate (per 000 hooks)	0.0138	0.0104	0.0069	0.0035
Surface longline	estimated mortality	1870	Allocation of standard to surface longline	600	450	300	150
	effort, 000 hooks	7,384	% reduction in mortality required	67.9	75.9	84.0	92.0
	catch rate, per 000 hooks	0.253	required catch rate (per 000 hooks)	0.0813	0.0609	0.0406	0.0203
Set net	estimated mortality	?	Allocation of standard to set net	200	150	100	50
	effort, 000 km hours	7,355,213	% reduction in mortality required	?	?	?	?
	catch rate, per thousand kilometre hours	?	req'd catch rate (per thousand kilometre hours)	0.000027	0.000020	0.000014	0.000007

[33] Mean incidental mortality excluding set net (MacKenzie and Fletcher 2005)

If a fishery cannot reasonably meet the required incidental mortality objective straight away, the Minister may agree to an interim incidental mortality objective

69 It may not be possible for all fisheries to meet the seabird standard straight away. In these circumstances, the MFish fisheries plan manager will be given the opportunity to propose a timeline for meeting the standard, including setting out what level of incidental mortality they consider to be feasible for the intervening years.

70 The Minister will consider this information and make the final decision on whether to adopt the proposed timeline and agree to an interim incidental mortality objective, or whether to propose stricter measures on the fishery, to meet the standard over a shorter timeframe than that proposed.

71 When determining whether to allow some time for a fishery plan to meet the standard, and how much time to allow, the Minister will need to carefully consider the socio-economic costs and weigh this against the risk of higher than desired mortalities.

72 Allowing a dialogue with the Minister on way and rate of moving towards and achieving the standard recognises that each fishery is likely to catch different quantities and different species of seabirds. Furthermore, some methods will have higher costs associated with achieving a reduction in incidental mortality than others, because of differences in technology and knowledge relating to reducing seabird mortalities.

73 As with other decisions under the act, the Minister must take into account all available information relating to the impact of fishing on the aquatic environment, the utilisation implications as well as any relevant societal or cultural considerations and these may best be considered when proposing measures at a fishery-specific level, as well as when setting the overall standard.

74 It should also be noted that, in line with the second goal of the NPOA, stakeholders will be encouraged to set an objective that reduces seabird incidental mortality as low as possible given current technology, knowledge and financial implications, and may set an objective that exceeds the requirements of the seabird standard.

Part 3: Implementing management measures to meet the objectives

75 The key elements in relation to implementing management measures are as follows:

a) A risk assessment process to determine whether management measures are likely to be required to meet objectives

b) A robust process for determining what measures are necessary to meet objectives

c) An assessment of whether a voluntary approach is likely to be adequate and effective before voluntary measures are preferred over a regulatory framework

Risk assessment to determine whether management measures are likely to be required to meet objectives

76 Some fisheries may already by operating in a manner that will allow them to meet seabird incidental mortality objectives, either through the use of existing mitigation measures, or due to the characteristics of the fishing operation. For these fisheries, no additional mitigation measures will be required.

77 Where historical data exists on rates of seabird incidental mortality, these will be used directly to assess whether additional management measures are likely to be required to meet fisheries plan objectives. Where no or limited data are available it may be possible to use data from another fishery that uses a similar fishing method.

78 Where no data are available to make a robust assessment, a precautionary approach is likely to be required, with measures proposed for the fishery until such time as better information becomes available.

79 MFish and DoC propose that, for each fisheries plan, government develop an initial assessment of whether or not additional management measures are likely to be required in a fishery. Stakeholders will then have the opportunity to comment on the presented material and put forward any alternative views for consideration by government.

80 New and emerging fisheries, including new fishing practices, such as the recent increase in activity for targeting swordfish, will need to be identified as soon as possible and a risk assessment process conducted.

A robust process for determining what measures are necessary to meet objectives

81 MFish and DoC consider that, in the past, the role of government in assessing what management measures may be required has been too limited, leading to uncertainty for all stakeholders as to whether measures proposed by industry were likely to be effective and sufficient.

82 MFish and DoC therefore propose that government develop an initial assessment of the available measures and their potential to reduce incidental mortality for each fishery to a level that will meet the seabird incidental mortality objective, based on

currently available information from New Zealand and, where appropriate, internationally.

83 This initial assessment, along with background materials, will then be presented to stakeholders, who will have the opportunity to comment on the presented material, discuss the proposals with the relevant experts and propose an appropriate suite of measures for their fishery, if they choose to do so.

84 MFish and DoC will then provide advice to Ministers on whether the measures proposed in the fisheries plan are likely to be sufficient to meet the objectives, taking into account the views of stakeholders.

85 The Minister of Fisheries will then form an initial view on the measures that are required for the fishery, subject to consultation with stakeholders. While this initial view will be founded on the risk of a fishery not meeting seabird incidental mortality objectives, the final decision will ultimately be based on the Minister's obligations set out under the Fisheries Act.

86 In some circumstances the Minister may consider that measures are required but that they may be implemented under a voluntary framework. This is discussed in the next section.

Assessment of whether a voluntary approach is likely to be adequate and effective

87 MFish and DoC consider that voluntary measures should only be preferred over a regulatory framework where there is a high likelihood that the measures will be successfully implemented across the fleet of vessels covered by a fisheries plan.

88 One of the main determinants of success or failure of voluntary implementation of measures is the level of governance that exists within the fishery, including within commercial stakeholder organisations.

89 MFish therefore proposes to set clear guidelines, in the form of a standard, as to the required levels of governance that fishers will need to demonstrate before a voluntary approach will be considered. This governance standard will cover such things as membership, remit and mandate of commercial stakeholder organisations, as well as proposed auditing and compliance regimes.

90 In the interim period before a governance standard is developed, decisions on whether stakeholders will be allowed to implement management measures under a voluntary regime will be, by necessity, a matter of judgement by the Minister, taking into account the views of stakeholders.

91 While this approach is a significant shift away from the original NPOA, where fishers were always given the first opportunity to implement voluntary incidental mortality reduction measures, it remains consistent with the premise that voluntary measures will be preferred over regulations where they are likely to be adequate to meet objectives for managing seabird incidental mortality.

Part 4: Monitoring whether the management measures are achieving the objectives

92 The key elements in relation to monitoring whether the management measures are achieving objectives are as follows:

a) MFish fisheries plan managers will need to demonstrate that they have met seabird incidental mortality objectives with a high level of statistical confidence

b) Reporting against the objectives will be required every six months, with the assessment period being the most recent 12 month period that data is available

c) A transparent process for managing fisheries that do not meet seabird incidental mortality objectives

MFish fisheries plan managers will need to demonstrate that they have met seabird incidental mortality objectives with a high level of statistical confidence

93 Monitoring of the seabird standard requires that incidental mortality be monitored such that it can be demonstrated with high certainty that the standard has not been exceeded.

94 The draft seabird standard proposes that the required level of statistical certainty for the overall standard will be either 70% or 90%, depending on the level that the Minister chooses to set the standard at. MFish and DoC propose to apply this required level of certainty to each fisheries plan. However, fisheries managers will have the flexibility to determine the optimal level of observer coverage for their fishery to demonstrate this required level of certainty.

95 Higher levels of observer coverage are less likely to result in large variations in estimates of seabird incidental mortality. Managers will be able to balance the cost of extra observer coverage with the benefits of increased likelihood of demonstrating that they have achieved incidental mortality objectives.

96 For example, if a fishery is able to achieve seabird incidental mortality rates that are well below that required by the objectives, they would not have to be very precisely estimated to show that the rate set by the objectives is unlikely to have been exceeded, and relatively low observer coverage would probably be required to do so.

97 Conversely, if a fishery is only likely to be able to achieve seabird incidental mortality rates only slightly lower than that required by the objectives, they would need to be estimated much more precisely to show that the rate set by the objectives is unlikely to have been exceeded, and higher observer coverage would be required to do so.

98 To illustrate this point, Figure 1 shows a simple example of how an estimated bycatch rate and its C.V. (described on the x axis) together determine the statistical certainty that a particular objective has been met (the percentage appearing above each error bar).

99 A bycatch rate substantially lower than the objective (like the first data point in Figure 1) need not be very well estimated (the C.V. of 90% indicates substantial uncertainty) to give good (in this case 100%) statistical certainty that the objective has not been exceeded.

100 Conversely, a bycatch rate only a little lower than the objective (like the third data point) must be very precisely estimated (the 20% C.V.) to give good statistical certainty (in this case 95.2%) that the rate set by the objective has not been exceeded.

101 Both of these examples, therefore, easily satisfy the requirement to demonstrate with 70% or 90% certainty that the rate set by the objective has not been exceeded.

102 Figure 2 shows that good C.V.s generally require high levels of observer coverage. This graph shows the C.V.s for seabird bycatch estimates in all the major observed trawl and longline fisheries between 2000/2001 and 2004/2005. These data clearly show that low levels of observer coverage are much more likely to result in bycatch estimates with large uncertainty (high C.V.s) than higher levels of coverage.

103 Observing 10% or less of fishing activity usually leads to C.V.s of more than 30%, and frequently 100% or more. Only if the estimated bycatch rate is very low indeed can these highly uncertain estimates give the statistical certainty that the objective has not been exceeded (such as the first data point in figure 1).

104 Conversely, observing more than 30% of fishing activity generally leads to C.V.s of 10–25% and estimated bycatch rates quite close to the objective would provide the necessary statistical certainty (such as the third data point in figure 1).

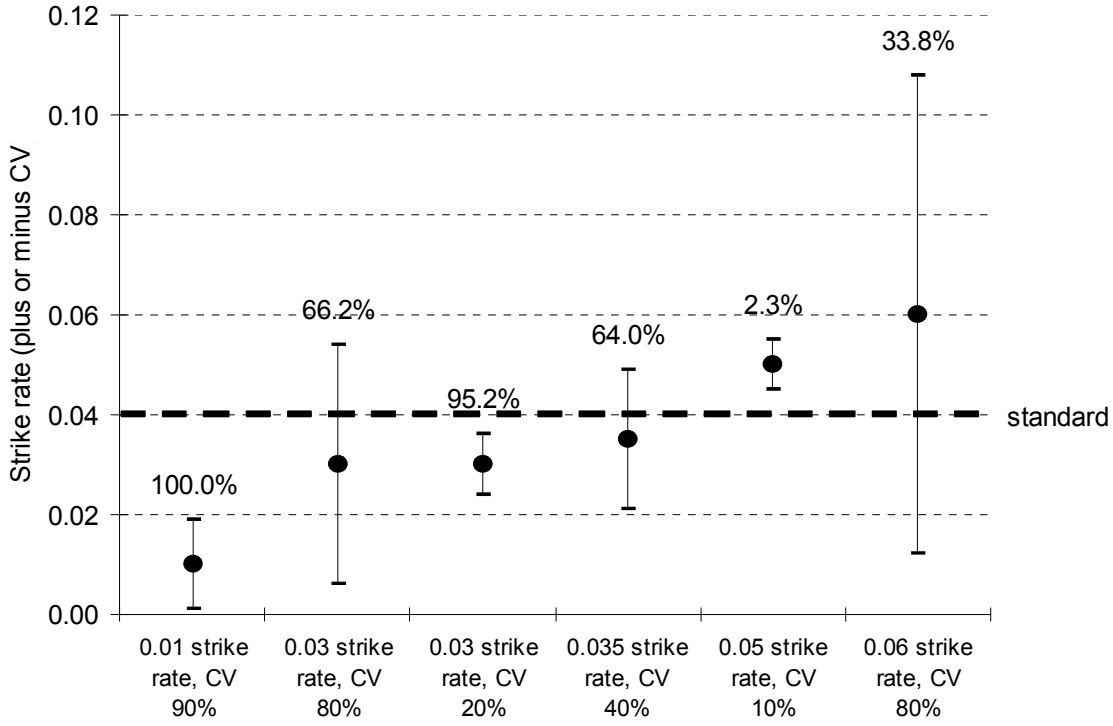

Figure 1: Relationship between mean strike rate (dots), the CV of mean strike rate (error bars show plus or minus 1CV), and the statistical certainty that the seabird incidental mortality objective (or standard) was not exceeded (numbers above each record). In this simple example, the rate set by the objective is

0.04 (heavy dashed line) and uncertainty in estimated strike rates is assumed normally distributed.

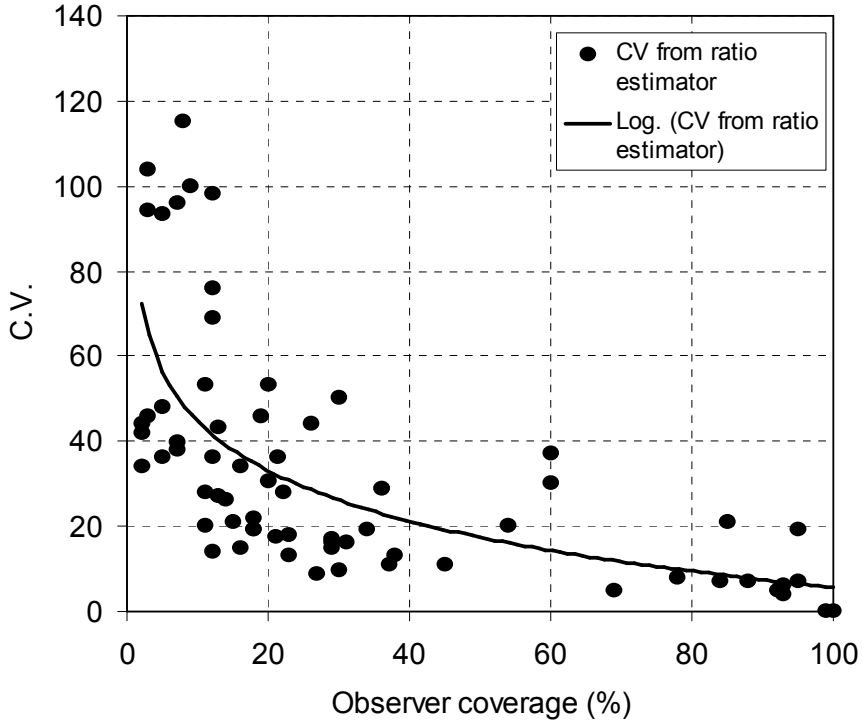

Figure 2: Relationship between observer coverage (percentage of trawl tows or hooks observed) and the uncertainty in the resulting estimates of seabird bycatch (measured as the coefficient of variation, C.V.). Data are for 2000/01 to 2004/05 using ratio estimators only, and were taken from Baird 2004a, 2004b, 2005 and Baird & Smith 2007.

Reporting against the objectives will be required every six months, with the assessment period being the most recent 12 month period that data is available

105 Having a 'rolling' 12 month assessment period that is reported every six months will ensure that there is a shorter time delay between the performance of the fishery being assessed and any additional management actions that may be required being taken. An example of the proposed reporting requirements is given in Table 3.

Table 3. Suggested reporting timeline and components of performance assessment against seabird objectives.

Report due date	Reporting period	Assessment of performance in relation to these factors
31 December 08	1 Oct 07 – 31 Sept 08	• Rate of seabird captures per unit effort • % of effort covered by observers • Representativeness of observer coverage of fleet • Number of seabirds reported • Species composition of seabirds caught • Mitigation measures deployed • Compliance with any mitigation regulations
30 June 09	1 Apr 08 – 31 Mar 09	
31 December 09	1 Oct 08 – 31 Sept 09	

106 To achieve this reporting timeframe, more detailed and frequent analyses will be required by MFish of observer data than is currently the case. Currently, estimates of captures are calculated once annually, and delivered about nine to twelve months after

the end of the fishing year. Some increase in resources will therefore be required to enable more timely monitoring of performance against the objectives.

A transparent process for managing fisheries that do not meet seabird incidental mortality objectives

107 When the fisheries plan objective has been assessed and is not being met, MFish and DoC will undertake an analysis as to why this occurred, before any action is taken. While this assessment will be led by government, stakeholders will have the opportunity to input into the process, including making recommendations for the most appropriate course of action.

108 The following table provides guidance on likely next steps, following an analysis of the causes of higher than allowable incidental mortality:

Likely cause	**Likely outcome**
Voluntary governance arrangements not effective	Improve governance arrangements or introduce regulatory framework
Mitigation measures not effective	Introduce additional mitigation measures, assess effectiveness of different mitigation measures
Very low observer coverage	Greater levels of observer coverage and possibly additional mitigation measures
Small number of vessels with very high incidental mortality	Assess voluntary and regulatory options for addressing problem, consider longer term changes e.g. to vessel setup, fishing method

109 Observer coverage as a likely cause provides a useful example of the type of analysis that MFish and DoC would undertake in the event of a fisheries plan failing to meet objectives. For example, with higher levels of observer coverage, and therefore high certainty, estimated mean strike rates in excess of the standard indicate a prima facie case that the standard has been exceeded and management action, such as additional mitigation measures, is likely.

110 However, if an estimated mean strike rate higher than the standard had very poor precision, better observer coverage *might* have demonstrated that the standard was unlikely to have been exceeded and better observer coverage may be an option for the following season.

111 The timeframe for implementing any necessary additional management measures will vary depending on the required course of action. MFish anticipates that in most cases the analysis will be complete within 3 months of data becoming available and a decision by the Minister is likely to occur within 6 months.

Ministry of Fisheries
Te Tautiaki i nga tini a Tangaroa

101-103 The Terrace
PO Box 1020, Wellington
New Zealand

www.fish.govt.nz