1 November 2005

Minister of Fisheries

FINAL ADVICE PAPER

OPERATIONAL PLAN TO MANAGE THE INCIDENTAL CAPTURE OF NEW ZEALAND SEA LIONS IN THE SOUTHERN SQUID TRAWL (SQU 6T) FISHERY FOR THE 2005-06 FISHING YEAR

Executive Summary

1   This paper provides you with the Ministry of Fisheries' final advice and recommendations on a proposed management regime to address fishing interactions between New Zealand (or Hooker's) sea lions and the southern squid trawl fishery during the 2005-06 fishing year. This regime will be implemented under an operational plan pursuant to s 15(2) of the Fisheries Act 1996.

2   The proposed regime continues to adopt an interim management objective to ensure that fishing-related mortality does not prevent the sea lion population from increasing to at least 90% of carrying capacity, *K*, if the population is depleted.

3   The Ministry of Fisheries has consulted on the proposed management regime with relevant stakeholders. Submissions were received from the Squid Fishery Management Company, Seafood Industry Council, Dr Elizabeth Slooten, World Wildlife Fund New Zealand, and the Royal Forest and Bird Protection Society.

4   Stakeholder submissions raise a wide variety of comments on the proposed regime including overall management objectives for the New Zealand sea lion population, the modelling approach to assess the effects of fishing on this population, an annual fishing-related mortality limit of sea lions for the 2005-06 fishing year, and various operational procedures to estimate sea lion mortalities against this limit.

5   The final advice paper considers the submissions in light of your statutory obligations under the Fisheries Act 1996, and in particular s 15(2). Section 15(2) requires that you, in the absence of a Population Management Plan for the New Zealand sea lion, and after consultation with the Minister of Conservation, may take such measures as are considered necessary to avoid, remedy or mitigate the effect of fishing-related mortality on any protected species - this may include setting a limit on fishing related mortality.

6   In light of submissions and after considering your statutory obligations under the Fisheries Act 1996, the Ministry of Fisheries recommends the following key elements of the proposed management regime for the 2005-06 southern squid trawl fishery:

a)   a fishing-related mortality limit of 97 New Zealand sea lions, based on the adaptable bycatch control rule, Rule 4

b)   a monitoring and reporting procedures to estimate the total number of sea lion catches against the mortality limit using a pre-determined strike rate of 5.3%

c)   a 20% discount factor of the proposed strike rate applying to tows that deploy an approved sea lion exclusion device

d)   procedures to close the fishery in the event the mortality limit is reached.

Introduction

7   Each year the Ministry of Fisheries (MFish) undertake a process to develop and implement a management regime to address fishing interactions between New Zealand (or Hooker's) sea lions and the southern squid trawl fishery (SQU 6T). This regime is implemented under an operational plan pursuant to s 15(2) of the Fisheries Act 1996 (the Act).

8   The New Zealand sea lion is a protected species under the Marine Mammals Protection Act 1978. The species has been declared as a *"threatened species"* under s 2(3) of this Act. Under this classification, the New Zealand sea lion is considered not immediately threatened with extinction, but is potentially vulnerable to population decline.

9   This paper provides MFish's final advice and recommendations on a proposed management regime to avoid, remedy and mitigate sea lion interactions within the SQU 6T fishery during the 2005-06 fishing year.   The proposed regime is similar to that adopted in previous years, and primarily focuses on a fishing-related mortality limit to constrain the number of sea lion mortalities attributable to the SQU 6T fishery to a biologically acceptable level.

10   An Initial Position Paper (IPP) outlining options and preliminary recommendations for the 2005-06 SQU 6T fishery was sent to stakeholders for comment. A copy of the IPP is attached.

11   Details of the proposed management regime are outlined in the accompanying 2005-06 SQU 6T operational plan, and are to be read in conjunction with this final advice paper.

Structure Of This Document

12   The final advice paper begins with a summary of the main elements of the proposed management regime for the 2005-06 SQU 6T fishery. This is followed by an overview of submissions received from stakeholders on the IPP organised by topic area, followed by the MFish response to these submissions. The paper concludes with final recommendations on key elements of the proposed 2005-06 operational plan.

Initial Position Paper Advice

13   The IPP recommended the following four principal management measures to address the incidental bycatch of sea lions within the SQU 6T fishery for the 2005-06 fishing year:

    a)   application of a fishing-related mortality limit (FRML) of 96 sea lions (now amended to 97 sea lions) based on the adaptive bycatch control rule, Rule 4

    b)   application of a pre-determined strike rate of 5.3% to estimate and monitor the total number of sea lions caught by the fleet against the FRML

    c)   application of a 20% discount factor to the proposed strike rate for vessels that use an approved Sea Lion Exclusion Device (SLED)

    d)   procedures to close the SQU 6T fishery if the FRML is reached.

14   The IPP was developed with input from the Department of Conservation.

The fishing-related mortality limit

15   The FRML is the measure of maximum allowable sea lion mortalities directly attributable to the SQU 6T fishery. A spectrum of possible FRMLs for the 2005-06 SQU 6T season has been assessed using the Breen and Kim Model (2004).   This model provides an age-structured population simulation model for the New Zealand sea lion population, and incorporates the most recent (2004-05) pup production estimates for the Auckland Islands to calculate population size.

16   The spectrum of available FRMLs is generated using a series of bycatch control rules evaluated using the Breen and Kim Model. The bycatch control rules and associated FRMLs have been considered through MFish's Aquatic Environment Working Group (AEWG) process. The IPP discussed several bycatch control rules and associated FRMLs ranging from no fishing to unrestricted fishing.

17   A decision is required to set an appropriate FRML for the 2005-06 SQU 6T fishery in accordance with s 15(2) of the Act. MFish's preliminary recommendation is to continue to adopt an adaptive approach using bycatch control rule 'Rule 4', which provides a FRML of 96 sea lions. The proposed FRML has been subsequently amended to 97 sea lions after the identification of a minor calculation error following the release of the IPP.   The proposed FRML and supporting rationale are discussed in the IPP (paragraphs 75-82).

Arrangements to monitor the fishing-related mortality limit

18   A separate decision is necessary to estimate total sea lion mortalities that accrue as a result of fishing for comparison purposes against the FRML. Proposed arrangements to estimate and monitor sea lion mortalities are discussed in the IPP (paragraphs 89-99).

19   MFish's preliminary recommendation is to continue to apply a pre-determined strike rate of 5.3% to estimate the total number of sea lion mortalities within the SQU 6T fishery (ie, 5.3 estimated sea lion mortalities per 100 tows). The proposed strike rate remains unchanged from that used for the 2004-05 SQU 6T fishery, and is based on average strike rates from the last seven years where observer coverage of tows not using SLEDs exceeded 20% of tows undertaken in the fishery (ie, 1996-97 through 2002-03).

20   The IPP acknowledged that MFish received a report from the Squid Fishery Management Company just prior to consultation that provides an alternative method to estimate sea lion bycatch in the SQU 6T fishery. The report is discussed later in this document.

Use of Sea Lion Exclusion Devices and justification for a discount factor

21   In recent years, the industry has developed and used SLEDs when fishing in the SQU 6T fishery to potentially reduce sea lion mortalities. The IPP noted (paragraphs 100-115) that the efficacy of SLEDs to reduce sea lion deaths remains uncertain, although it is likely that some sea lions accidentally caught within trawl nets will escape and survive when SLEDs are deployed.

22   MFish's preliminary recommendation is to continue to offer the industry a 20% discount factor to the proposed strike rate to vessels that use SLEDs within the 2005-06 SQU 6T fishery. The proposed discount factor would effectively provide a lower strike rate of 4.24% (ie, 4.24 estimated sea lion mortalities per 100 tows) to those tows where a SLED is used. The use of SLEDs invariably has the potential to increase utilisation of the SQU 6T fishstock by enabling more tows to be taken before the FRML is reached.

23   The use of SLEDs in the 2005-06 fishery, including efforts by industry over the past 12 months to improve SLED efficacy, is discussed later in this document.

Consultation

24   Interested parties were invited to provide written comments on the proposed management regime for the 2005-06 SQU 6T fishery as outlined in the IPP. Consultation commenced on 1 August 2005 and the deadline for submissions was initially scheduled for 19 August 2005. This deadline was extended to 24 August 2005 to provide stakeholders with more time to provide comments on the IPP.

25   The IPP was sent to the following organisations. A copy of the IPP was also posted on MFish's external website.

NIWA	Environmental and Conservation Organisations of NZ
Dr Padraig Duignan	Royal Forest and Bird Protection Society of NZ
Greenpeace New Zealand	Te Ohu Kai Moana
Seafood Consortium	New Zealand Seafood Industry Council
World Wildlife Fund (NZ)	Cawthorn Associates
Dr Elizabeth Slooten	Sealord Group Ltd
Dr David Fletcher	Independent Fisheries Ltd
Sanford Limited	Squid Fishery Management Co Ltd
Ngai Tahu	Te Rununga o Ngai Tahu

26   The following organisations provided written comments on the IPP:

   a)   **Seafood Industry Council** (SeaFIC)

   b)   **Squid Fishery Management Company** (SFMC)

   c)   **Dr Elisabeth Slooten, Otago University**

   d)   **World Wildlife Fund** (WWF)

   e)   **Royal Forest and Bird Protection Society** (RFB).

27   Copies of all submissions are attached.

28   Summarised stakeholder submissions and MFish responses are organised under the following topic areas:

   - Species management objectives;
   - The Breen and Kim Model;
   - The fishing-related mortality limit (FRML);
   - Strike rate;
   - Sled discount;
   - Observer coverage and reporting requirements; and,
   - Other issues

Species Management Objectives

Submissions

29   **RFB** states the IPP is a major step backward in protecting sea lions, as the proposed bycatch limit is the second highest ever recommended.

30   **SeaFIC** highlights that all decisions made under s 15(2) must be assessed against the dual purpose of the Act, and the environmental (s 9) and information principles (s 10). It notes the 2004 Court of Appeal ruling made it clear that matters such as the protection of individual sea lions and political acceptability were irrelevant considerations.

31   SeaFIC agrees that MFish has no ability through managing fishing interactions within the SQU 6T fishery to move the New Zealand sea lion from a threatened to non-threatened status within a 20-year timeframe by increasing the number of breeding locations. Accordingly, SeaFIC supports the interim management objective agreed through MFish's AEWG process in 2003, but notes this objective is very conservative.

32   **SFMC** represents shareholders holding about 98.5% (SQU 1T) and 99.7% (SQU 6T) of the quota in New Zealand's squid trawl fishery areas. SFMC contends the Breen and Kim Model is the best available information, and this suggests the sea lion population may be near to carrying capacity, *K*. It notes the Act requires decisions under s 15(2) to be assessed against the duel purpose of the Act, and the environmental (s 9) and information (s 10) principles. Decision-making must include an obligation to take into account the best available information.

33   SFMC notes that while the Minister has discretion to impose interim management measures in the absence of a Population Management Plan (PMP) under s 15(2), the Minister should only take action where fishing-related mortality is having an adverse effect on a protected species population. Whether or not there is an 'adverse effect' on the protected population will be guided by criteria under the Marine Mammals Protection Act 1978 for 'threatened species' or other specific management objectives.

34   In relation to sea lions, both the AEWG and MFish have adopted a more specific interim objective to manage the fishing-sea lion interactions within the SQU 6T fishery. SFMC contends that fishing cannot be said to be having an adverse effect on the sea lion population if best available information demonstrates the interim objective is being met without additional management intervention.   Under this scenario, it would be scientifically and legally unjustifiable for the Minister to impose a FRML under s 15(2).

35   **WWF** notes its disappointment and frustration over the lack of progress to develop an overarching sea lion management plan and the ensuing need to continue with an interim operational plan to control sea lion interactions in the SQU 6T fishery. It notes the operational plan is an inadequate tool and urges government to develop and implement sea lion recovery and population plans in time for the 2006-07 fishing year. WWF considers the proposed operational plan should adopt, and be monitored for delivery against, the following overall goal and medium term objective for the recovery of the New Zealand sea lion as presented at the AEWG on 24 March 2003.

   a)   Overall goal: Self sustaining populations of New Zealand sea lions are occurring throughout their natural range - attainment of the long-term goal would result in an increase in both the total number of sea lions, and the distribution and number of breeding colonies throughout New Zealand. This would remove the vulnerability of

this species and ensure the total population's ability to withstand the effects of human activities or stochastic events.

b) Medium term objective: The New Zealand sea lion population has five sea lion management clusters throughout New Zealand - this goal recognises the key factor contributing to sea lion vulnerability is their geographically restricted range and seeks to remove this characteristic of the population and, consequently, the threatened species status as defined by the IUCN.

36   **Dr Slooten** submits that earlier technical groups have discussed management goals in terms of the sea lion population reaching levels close to carrying capacity in order to increase the probability of establishing new breeding colonies. Dr Slooten considers the proposed decision rules take several steps back from these goals. Dr. Slooten's concerns are that:

a) such a slow rate of recovery does not seem to match the management goals laid down in the Marine Mammals Protection Act 1978

b) it is more sensible to compare the different management strategies in terms of the number of years taken for the population to recover (eg, to 90%, or 95%, of K)

c) clarification of the time period over which the Breen and Kim Model would provide for an increase in the sea lion population to more than 90% of the carrying capacity K.

37   Dr. Slooten expresses surprise that MFish would recommend a decision that contradicts the management goal stated in the Marine Mammals Protection Act 1978 (as stated in paragraph 31 of the IPP).

MFish discussion

38   MFish concurs with industry that your decisions under s 15(2) of the Act must take into account the dual purpose of the Act to enable utilisation of fisheries resources while ensuring sustainability (*refer s 8*).   These decisions must also take into account the environmental and information principles of the Act (*refer ss 9 and 10*).

39   Accordingly, you have an obligation under the Act to take into account the best available information when making decisions to manage the effects of the SQU 6T fishery on the New Zealand sea lion population. In doing so, you should:

• consider any uncertainty in the information available

• be cautious when information is uncertain, unreliable, or inadequate

• not use the absence of, or uncertainty, in any information as a reason for postponing or failing to take any measure to achieve the purpose of the Act.

40   The Court of Appeal[1] (2004) gives further guidance when making decisions under the Act in respect to managing fishing interactions on protected species. The Court noted it is inappropriate to consider the incidental bycatch of sea lions in the SQU 6T fishery in the same manner that one

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[1] Squid Fishery Management Company Ltd. v Minister of Fisheries; Court of Appeal 2004 (CA39/04).

considers the harvesting of a fishstock (where the Act requires most stocks to be managed at, or above, a level that can produce the maximum sustainable yield). As such, there is no requirement for you to provide for the utilisation of the SQU 6T fishery to the extent that the long-term viability of the New Zealand sea lion is compromised.

41   Consistent with the Court of Appeal's findings, s 15 of the Act provides the specific facility for you to fulfil your obligations with respect to managing the effect of fishing-related mortality on marine mammals or other wildlife. In particular, in the absence of a PMP, you may, after consultation with the Minister of Conservation, take such measures as you consider are necessary to avoid, remedy, or mitigate the effect of fishing-related mortality on any protected species. These measures may include setting a limit on fishing-related mortality (ie, FRML).

42   Therefore, when making a decision under s 15(2) of the Act, you are required to form a view on the extent to which utilisation of the squid resource threatens the sustainability (or long-term viability) of the sea lion population. MFish contends the proposed management regime (as set out in the operational plan) is consistent with the Act's purpose and principles, and appropriately reflects your obligations to manage fishing interactions within the SQU 6T fishery on a protected species. MFish notes your statutory obligations under the Act have been explained in the IPP.

43   The proposed management regime for the 2005-06 SQU 6T fishery will continue to be driven by an interim management objective previously adopted by MFish to manage sea lion bycatch interactions in the 2003-04 and 2004-05 fisheries. This objective (discussed in paragraphs 31 to 37 in the IPP) is given below and was accepted by a Technical Working Group[2] of AEWG in 2003 to assess the efficacy of alternative management strategies to manage the fishing interactions within the fishery in the absence of a PMP.

> *To ensure the sea lion population remained above 90% of its carrying capacity, K, or else remained above 90% of the level it would obtain in the absence of fishery bycatch, 90% of the time and in 20- or 100-year runs.*

44   The above objective is intended to ensure that fishing-related mortality does not prevent the sea lion population from increasing to at least 90% of carrying capacity, *K*, if the population is depleted. The objective uses carrying capacity, *K*, as an explicit reference point in determining the status of the New Zealand sea lion population. While there are numerous definitions of 'carrying capacity', the term can be simply viewed as the number of individuals in a population that the resources of a habitat can support.

45   Given a PMP has yet to be approved for the New Zealand sea lion, MFish contends the interim management objective continues to provide an appropriate framework to consider management measures to address sea lion bycatch in the SQU 6T fishery at this time. MFish notes that industry continues to support this objective as an interim management goal.

46   MFish disagrees with industry submissions that the interim management objective can be achieved without the need to impose additional management measures (ie, a FRML). MFish contends there is considerable uncertainty regarding the relationship between current sea lion population size and carrying capacity, *K*; and therefore, it is unknown whether the population is at, or close to, this reference point at this time. The best available information indicates that pup

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[2] The Technical Working Group comprised of MFish, Department of Conservation, squid industry representatives, and environmental groups was established in early 2003 within MFish's Aquatic Environment Working Group.

production on the Auckland Islands has declined in recent years (ie, by a much as 15% in the past three years and is the lowest estimate recorded since systematic estimates began (see Table 1)). The Department of Conservation attributes the decrease in pup production to a reduction in the number of breeding female animals on the Auckland Islands. A decrease in both the Auckland Islands' pup and adult population is of concern, as virtually all of the breeding population of this species occurs on the Auckland Islands. The decline in pup production suggests the species estimate is currently below 12 000 animals, which is the second lowest estimate in the last ten years.

Table 1: **Total pup production from the Auckland Islands 1992–2005 (using Department of Conservation data. These estimates do not include an estimate of pup production from Campbell Island).**

Season	Annual pup production			% Annual change in no. pups born	% Mortality rate up to peak of pupping
	total	alive	Dead		
92/93	2 389	2 304	85		
94/95	2 518	2 206	312	5.4%	12.4%
95/96	2 685	2 389	296	6.6%	11.0%
96/97	2 975	2 729	246	10.8%	8.3%
97/98	3 021	2 350	671	1.5%	22.2%
98/99	2 867	2 572	295	-5.1%	10.3%
99/00	2 856	2 689	167	-0.4%	5.8%
00/01	2 859	2 468	391	0.1%	13.7%
01/02	2 282	1 826	456	-20.2%	20.0%
02/03	2 518	2 078	438	10.3%	17.4%
03/04	2 515	2 347	168	-0.001%	6.6%
04/05	2 148	2 032	114	- 14.6%	5.3%

47   MFish considers that unconstrained fishing effort within the fishery is likely to confer significant risk to the sea lion population given the uncertainty on the relationship between population size and carrying capacity, *K*. As such, there is a very real risk that an uncontrolled level of sea lion mortality caused by fishing could prevent the population to achieve at least 90% of *K* over a reasonable timeframe. MFish contends that unconstrained sea lion bycatch is inconsistent with the intent of s 15(2) of the Act that requires you to take such steps as considered necessary to avoid, remedy, or mitigate the effects of fishing-related mortality on any protected species. This issue is discussed in more detail under the *Fishing-Related Mortality Level* section.

48   MFish disagrees with RFB and WWF that the proposed operational plan is inadequate to address sea lion interactions in the SQU 6T fishery. The proposed plan will require the fishing industry to operate in a manner consistent with the interim management objective. This objective provides you with an appropriate framework in the absence of a PMP to balance the social, cultural, and economic benefits of trawl fishing around the Auckland Islands against the need to manage the fishery's interactions with the New Zealand sea lion, including recognising its protected status.

49   MFish notes WWF's concerns about the lack of progress by government to develop a PMP for the New Zealand sea lion. MFish encourages stakeholders to continue to engage with the Department of Conservation to develop the PMP.

50   Dr. Slooten's concerns regarding management goals for the sea lion population reaching carrying capacity to establish new breeding colonies may be valid. However, goals to establish new breeding colonies fall within the scope of the Department of Conservation and are beyond the statutory requirements for MFish's management of the sea lion interactions in the SQU 6T fishery.

The obligations under s 15(2) of the Act do not specifically require you to meet the criterion for determining a 'maximum allowable level of fishing-related mortality' (MALFiRM) for a species gazetted as 'threatened' under a PMP (as required under the Marine Mammals Protection Act 1978). Dr Slooten's concerns are best progressed through the development of the PMP.

The Breen and Kim Model

Submissions

51   **RFB** states the Breen and Kim Model is not the best available information on the New Zealand sea lion population, and requires further work and analysis. In particular, RFB note:

a)   There has been no response to the Goodman review (2003) of the model, which noted that "exclusive reliance on these modelling results to justify an option of an alternative management regime….described in the report would not constitute a management procedure that is "robust" in the sense of Wade (1998)".

b)   Goodman noted that Wade's analysis was robust for several reasons including that "the decision rule was tuned to perform adequately when implemented with very sketchy data". MFish should have put forward the previous "Wade rule" as an option for estimating bycatch.

c)   Goodman raised four principle concerns over the model that have yet to be answered. These include: changes in the four sub-populations of sea lions; that the available data only cover the period of bycatch and there is little signal to reveal density dependence to determine z, $Rmax$ and K; the parameter estimation process in the model; failure to track sex in the model.

52   **SFMC** states the Breen and Kim Model provides the best available information in terms of the performance of the respective bycatch control rule alternatives that take into account the interim management objective. SFMC notes the model is very conservative, as it does not include pup estimates from Campbell Island.

53   **Dr Slooten** submits the Breen and Kim Model is inconsistent with achieving the statutory goal of population recovery, and does not include any performance criteria relevant to that statutory goal. In addition, Dr Slooten submits that:

a)   data on survival rates and reproductive rates are not well known for sea lions

b)   reliable abundance estimates for NZ sea lion are only available for the period since 1994-95

c)   Dr. Wilkinson's estimates that some 400 sea lions would have been caught in 2001 if the fishery had not been closed when the MALFiRM was reached appear to have not been used in the model.

MFish discussion

54   MFish contends the Breen and Kim Model provides the best available information to assess the incidental capture of sea lions within SQU 6T fishery under a range of bycatch level scenarios. This model was developed under the scrutiny of the AEWG in 2003 and was independently reviewed by Dr Goodman in 2003.

55   Dr Goodman's review[3] considered the Breen and Kim Model to be "cutting edge" and represents "the wave of the future in population management" given its ability to incorporate the available biological information on the New Zealand sea lion population and dynamics. The Breen and Kim Model uses the best available data, and models a range of parameters to represent the current state of knowledge of sea lion biology and demography as accurately as possible. Previously, MFish employed the more conservative 'Wade Model' to set bycatch limits within the SQU 6T fishery to reflect the paucity of biological and population information at that time. In the absence of such information, Goodman considered the Wade Model to be more protective and designed to perform adequately with very little or sketchy data.

56   However, given the availability of information that now exists on the New Zealand sea lion population, MFish contends the Breen and Kim Model provides the best method to assess the effects of fishing within the SQU 6T fishery. In addition, MFish notes that AEWG considers the Breen and Kim Model to be the best available tool to evaluate the performance of alternative management strategies for the sea lion-SQU6T interactions.

57   MFish does not agree with RFB that there has been no response to Dr Goodman's review of the Breen and Kim Model. The review did not raise any significant concerns about the model's scientific approach, and was considered to provide a realistic model of the New Zealand sea lion population, as well as providing a good scientific basis for decision-making in managing the fishing interactions. Some grounds were identified for cautious acceptance of the model, but these concerns can be considered in light of s 10 of the Act, as you must proceed with caution where information is uncertain. The AEWG has reviewed the most recent simulation runs of various bycatch control alternatives against the Breen and Kim Model to provide updated FRMLs. This working group did not raise any major concerns to suggest that an alternative approach is required at this time.

58   MFish notes industry's assertion that the non-inclusion of the Campbell Island pup estimate within the Breen and Kim Model provides overly conservative FRML estimates. The extent and quality of information about the Campbell Island pup population is too limited for use in this model. The interaction or flux of sea lions between Campbell and Auckland Islands is unknown. In addition, it is unlikely that sea lions from Campbell Island are taken in the SQU 6T fishery because trawl fishing is conducted almost exclusively around the Auckland Islands. MFish notes the Department of Conservation has recently revised its estimate of pup production on Campbell Island from 358 to 385 pups (2002-03) following the identification of a drafting error. This amendment has no bearing on the range of FRMLs calculated and evaluated using the Breen and Kim Model.

59   Dr. Slooten's interpretation of the performance criteria to establish sea lion population recovery appears to be different than the interim management objective established by the AEWG and implemented by MFish to support the statutory requirements necessary to maintain the viability of the sea lion population. As noted above, AEWG considers the Breen and Kim Model is an appropriate tool to evaluate alternative management strategies within the fishery.

60   Dr. Slooten commented that the relatively short-time series of sea lion abundance and the fishery capacity in 2001 undermines the efficacy of the model. The Breen and Kim Model uses pup production as an indication of population size, which currently is the best indicator of population size fluctuations.

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[3] Review of Breen & Kim Model For Aukland [*sic*] Islands Hooker Sea lion Population interaction With Squid Trawl Fishery. Dr Goodman, dated 9 February 2003.

Bycatch Control Rules

Submissions

61   **Dr Slooten** submits there are problems with the following two management decision rules:

a)   That Rule 1 ('unconstrained' fishing) is derived from mean fishing effort in 1998-2003 and, as such, is an unsatisfactory and misleading way to estimate 'unconstrained' fishing effort. It would be more appropriate to specify a number of tows that would be allowed in years in which fishing effort is deemed 'unconstrained.'

b)   That Rule 4, the adaptive rule, was rejected by the US National Marine Fisheries Service (NMFS) more than 10 years ago and is contrary to allowing the population recover as quickly as possible to levels as close as possible to *K*, in order to allow the species to recover to a non-threatened status.

MFish discussion

62   MFish acknowledges Dr. Slooten's concern regarding unconstrained fishing. The Breen and Kim Model describes Rule 1 as not completely unconstrained fishing. The fishery will always be constrained by the presence (or absence) of squid in commercial quantities. Squid are not present on the Auckland Islands shelf in commercial quantities year round.

63   Dr. Slooten's concern regarding Rule 4 is about the speed of sea lion population recovery. However, you have an obligation under s 8 of the Act to provide for the utilisation of fisheries resources while ensuring sustainability. Therefore, Dr. Slooten's concerns are more appropriate addressed within the context of a PMP for sea lions. In the interim, the proposed FRML (based on Rule 4) is intended to react rapidly to a decline (or increase) in pup production, while still meeting the interim management objective proposed by the AEWG. This is discussed below.

The Fishing-Related Mortality Limit (FRML)

Submissions

64   **RFB** opposes an increase in the sea lion bycatch limit over levels set in the late 1990s. It considers the IPP fails to include other fisheries that catch sea lions and this additional catch needs to be managed as part of any operational plan.

65   RFB considers the Breen and Kim Model is driven by ten years of pup monitoring results and three years of key biological information. RFB notes that using these data, it is impossible to know what *K* is, and rejects any suggestion the model indicates the current sea lion population is at or near *K*. RFB submits that pup numbers at the Auckland Islands have declined 15% this year, which is well below peak pup numbers in 1997-98 and is the lowest ever recorded since the current counts began in 1992-93. This is a 30% decline in pup numbers in 12 years. Given the disease events in previous years, RFB agrees with the Department of Conservation that the population is likely to continue to decline over the next 5-10 years.

66   RFB contends the MALFIRM should enable the species to move to a non-threatened state in the quickest time possible, if not within 20 years required by the Marine Mammals Protection Act 1978 (s 3F). The only option to achieve this objective is close to zero mortality. It believes the

estimates of economic loss to the industry of fishing closure are just speculation, and should not be taken seriously given the highly variable nature of any squid fishery. A comparison of Rule 310 to the 1988 to 2003 fishing effort fails to acknowledge this variability, and the poor nature of many squid fishing years since the peak in catches in 1993. In addition, in two years when the fishery was closed (ie, 1996 and 1997) the number of tows well exceeded the average number by 15% and 40%, respectively.

67   **SeaFIC** considers the Breen and Kim Model indicates there is a very high likelihood the sea lion population is at a very high level, and demonstrates that incidental captures of sea lions in the SQU 6T fishery have a negligible effect on the dynamics of the sea lion population. The model shows unequivocally the highly conservative objective adopted can be met when incidental captures are limited by decision Rule 392 (the 'Cusp Rule') and very nearly by unconstrained fishing.

68   SeaFIC considers the IPP failed to provide the full range of potential options in a balanced manner by ignoring the options of no catch and unconstrained fishing. Instead, the IPP provided information on Rules 305, 310 (the analogue of the previously used PBR rule), 320, 4, and the Cusp Rule; and these options were designed to move the decision-maker towards the lower, conservative end of the potential spectrum of possibilities even when all the rules presented met the agreed interim objective.

69   SeaFIC does not agree with the IPP's recommendation of Rule 4. It considers the only logical starting point for decision-making is the Cusp Rule, which would meet the interim management objective and provide greatest expression to the purpose of the Act. SeaFIC considers the use of SLEDs within the fishery enables unconstrained fishing to best meet the purpose of the Act. If MFish does not take new SLED design into account, then SeaFIC contends the only logical choice is the adoption of the Cusp Rule in setting a FRML.

70   **SFMC** contends there is no scientific or legal justification to impose a FRML in the 2005-06 season. This position is made on the following grounds:

   a)   even with no limit on fishing, the population remains at or increases through time to attain over 90% K, with high certainty, so that the primary management objective for the protected species is satisfied

   b)   placing no limit on fishing effectively meets all three of MFish's approved AEWG sea lion management objectives/criteria (with a failure of 0.54% on *crit100*, which is inconsequential, particularly in light of the exclusion of the Campbell Islands data)

   c)   the best available information unequivocally demonstrates that fishing-related mortality is not having an adverse effect on the sea lion population in terms of accepted management intervention objectives, so that the Minister has no discretion to set a FRML under s 15(2)

   d)   in the absence of any credible evidence of the adverse effects of fishing-related mortality on the sea lion population, the Minister is obliged to exercise his discretion to maximise utilisation in accordance with the purpose of the Act

   e)   not placing a limit on fishing-related mortality meets the dual purposes of the Act, by providing for utilisation, where the science demonstrates there are no sustainability issues

f)   imposing a FRML under s 15(2) for some wider societal (ie, reasons other than to avoid, remedy or mitigate the adverse effects of fishing–related mortality on sea lions) is inconsistent with the scheme and purpose of the Act

g)   the Breen and Kim analysis of the effects of no limit on fishing on the sea lion population produces conservative results, because it is based on sea lion pup count data for the Auckland Islands only, and excludes the estimated 358 [*sic*] additional pups on Campbell Island

h)   Rule 1 will not result in current mean fishing effort increasing in any material way. Additional trawl vessels will not come to New Zealand for the short squid season. Vessels need a year round catch plan, of which squid is only a part. Also, in addition to squid quota they need bycatch quota. This is not available for additional vessels. Neither bycatch quota or quota for a wider year round catch plan is available for trawl vessels

i)   the actual level of sea lion bycatch under the Rule 1 scenario of no limit on fishing, is unlikely to ever approach the modelled level of mortality based on current fishing effort. The use of SLED initiatives makes this even less possible

j)   The best available information relating to SLEDs demonstrates that escape is 100% and survivability is over 40%, so that actual mortality from fishing with the use of SLEDs will never come close to the modelled level of mortality

k)   if the use of the SLED were to be incorporated into the Breen and Kim Model with the very conservative escape survival rate of 20% (and without science or data to encourage further innovation and development of SLEDs) then unconstrained fishing would pass all the tests and there would be no need to set a FRML.

71   SFMC considers the management of the SQU 6T fishery should focus on mitigating all sea lion captures by continuing to develop, refine, test and evaluate SLEDs, and any other mitigation devices. Accordingly, SFMC supports Rule 1 (no limit on fishing).

72   **WWF** believes the current operational plan provides advice contrary to a precautionary approach and fails to afford sufficient protection to the New Zealand sea lion as a threatened endemic species. It considers the direction of the overall goal and medium-term objective requires the plan to adopt a truly precautionary approach and, therefore, it urges MFish to adopt Rule 310.

73   **Dr Slooten** notes recent population surveys indicate a decrease in the number of pups and breeding females, which would seem to represent the situation outlined in section 54 of the IPP, where "the sustainability objective for the sea lion/SQU 6T interaction is threatened." Dr Slooten is surprised to see there has been little, if any, response to this objective in terms of setting bycatch limits.

MFish discussion

74   The IPP outlines a spectrum of FRMLs for the 2005-06 fishing year under five bycatch control rules using the Breen and Kim Model (see Table 2). While the choice of bycatch control rules remain the same from those considered in the previous 2004-05 fishery, the range of respective FRMLs derived from each rule has changed as a direct consequence of updated Auckland Islands pup production estimates (based on the 2004-05 summer).

Table 2: **Calculation of estimated FRMLs under five bycatch controls, the performance of which were evaluated using the Breen and Kim Model (using latest pup production estimates). Estimated FRMLs are rounded where appropriate.**

Rule	Estimated FRML (rounded)
Rule 305	30 sea lions
Rule 310	60 sea lions
Rule 320	120 sea lions
Rule 4	97 sea lions
Cusp Rule	555 sea lions

75   Three specific criteria were defined by the AEWG in 2003 to evaluate, in modelling terms, how each bycatch control rule met the interim management objective. The criteria are as follows:

- (*crit100*) For each of 100 years of each of 5000 runs, i.e., for half a million model years for each rule tested, the model checked whether the mature sea lion population was above 90% of carrying capacity, and if it was not, whether it was above 90% of the comparable population when no fishing occurred (the no-fishing situation was called Rule 0 or Rule 300, and effort was constrained to its long-term average). A "pass" mark was 90% "yes", or 450 000.
- (*crit20*) For the first 20 years of each run only, i.e., 100 000 years for each rule tested, the model checked whether the mature population was above 90% of carrying capacity, and if it was not, whether it was above 90% of the comparable number under Rule 0. A "pass" mark was 90% "yes", or 90 000.
- (*N/K*) For the second 50 years of each run, the model calculated the average ratio of numbers to *K*, and then averaged these across all 5 000 runs. A "pass" mark was a mean of 0.90.

76   The above criteria relate to the certainty that the sea lion population would attain the target management levels of greater than 90% of *K,* or to within 10% of the population level that would have been attained in the absence of fishing. All FRMLs presented in Table 2 satisfy the three criteria noted above.

77   In addition to the five bycatch control rules listed in Table 2, the IPP included references to two additional rules (Rule 0 ('no fishing') and Rule 1 ('unconstrained fishing') to illustrate the full continuum of possible bycatch harvest rules that could apply under this year's operational plan. MFish notes that Rule 1 did not satisfy the specified criteria used to evaluate each rule against the interim management objective.

78   The submissions from stakeholders provide divergent views on preferred choice of bycatch control rule to set a FRML for the 2005-06 SQU 6T season. SFMC and SeaFIC support either Rule 1 (ie, unconstrained fishing) or the Cusp Rule (ie, a 555 sea lion mortality limit). The industry's position is made on the assertion that the sea lion population is presently at, or close to, carrying capacity, *K*, and that fishing interactions within the SQU 6T fishery have negligible effect on

population size. Both rules would allow for greatest utilisation of the squid resource. Conversely, RFB and WWF support a conservative FRML to limit sea lion mortalities to a low level.

79   As presented earlier, the Breen and Kim Model is used to evaluate alternative harvest strategies in light of the interim management objective, and is considered to provide the best available information. The model does not in itself specify a singular or optimal level of sea lion bycatch, but rather illustrates that a spectrum of alternative rules can be used to generate a maximum sea lion mortality limit while meeting the interim management objective. The choice of rule, and whether it meets the objective, cannot be established in isolation when setting a FRML, but must be considered in light of all other relevant information and the degree of uncertainty associated with this information.

80   MFish disagrees with SFMC that the use of a formal limit to constrain fishing-related mortalities in the SQU 6T fishery is unnecessary. Industry's position is made on the view that the model alone suggests the SQU 6T fleet does not have an adverse effect on the sea lion population, since unconstrained fishing fails just one of the three evaluation criteria by a small amount. However, unconstrained fishing does indeed fail the assessment criteria in which to set appropriate FRMLs using best available information. For this reason, a failure to meet the criteria for acceptance as a management strategy, for any one of the performance criteria, indicates a failure by the rule to attain pre-defined goals for management, using a realistic representation of sea lion biology and population dynamics.

81   As noted earlier, there is uncertainty regarding the relationship between current sea lion population size and carrying capacity, K, which provides a reference point under the interim management objective. As such, the effect of unconstrained fishing on the sea lion population is uncertain, particularly given the Department of Conservation's concerns that the recent reduction in pup production at the Auckland Islands indicates an overall decrease in the total sea lion population size. As noted earlier, MFish considers that unconstrained fishing (ie, unlimited sea lion bycatch) is not consistent with the intent of s 15(2) of the Act that requires you to take such steps as considered necessary to avoid, remedy, or mitigate the effects of fishing-related mortality on the New Zealand sea lion population.

82   The industry asserts that unconstrained fishing would fulfil the requirements of the interim management objective if the Breen and Kim Model incorporated the survival of some sea lions through the use of SLEDs. MFish is not in a position to assess this assertion as an alternative Rule 1 (ie, unconstrained fishing modified by the potential effects of SLEDs) has not been evaluated by the Breen and Kim Model. Nevertheless, the option of allowing unconstrained fishing but requiring all vessels to use SLEDs is available to you in setting an FRML for the 2005-06 fishing year. However, MFish does not recommend this option as the implications of a high FRML on the sea lion population have not yet been evaluated by the Breen and Kim Model.

83   In the event unconstrained fishing is unacceptable, industry's alternative approach is to adopt the Cusp Rule to set a FRML. This rule provides a mortality limit of 555 sea lions. Adopting the Cusp Rule does not imply that this many sea lions will be caught in any specific year given the inherent variability in squid availability and sea lion interactions. SFMC further submits that such a FRML is unlikely to be reached given the proposed widespread use of SLEDs in the upcoming season.

84   MFish considers there is significant risk in adopting the Cusp Rule to set a FRML for the 2005-06 fishery. This rule represents the theoretical maximum number of animals that could be taken in any one-year and still just meet the interim management objective. The risk associated

with managing fishing interactions at the theoretical maximum is unacceptable given the degree of uncertainty inherent with the Breen and Kim Model to evaluate such an approach against the interim management objective. This risk arises given the uncertainty surrounding the various data inputs and assumptions on which the Breen and Kim Model simulates the fishing effects on the sea lion population, the uncertainty about the status of the population in relation to carrying capacity, K, as well as the uncertainty on the proposed arrangements to estimate sea lion deaths against the FRML. While the model comprises the best available information to assess fishing effects on the sea lion population, the Act's information principles requires you to act cautious when information is uncertain. Nevertheless, MFish acknowledges the Cusp Rule can be used to assess the degree of headroom available when determining a limit on fishing-related mortality.

85   In addition, the following considerations drawn from the Court of Appeal decision (paragraph 77) remain relevant to determine the appropriateness of using the Cusp Rule to set a FRML for the SQU 6T fishery:

- *"The point of the exercise is not to arrive at a number of sea lions which can be harvested sustainably"*.

- *"We are not aware of a simple method by which risk on the one hand can be balanced against utilisation advantages on the other"*.

- *"A precautionary approach to the required balancing exercise is open to the Minister"*.

86   MFish notes that RFB and WWF support a very conservative or zero FRML to ensure the sea lion population will move as quickly as possible to a non-threatened state. As noted above, you have an obligation under s 8 of the Act to provide for the utilisation of fisheries resources while ensuring sustainability. This obligation effectively prevents you from implementing a zero FRML given the best available information on fishing interactions within the SQU 6T fishery. Mortality limits in the range of those generated by bycatch control rule 310 or below offer significantly lower utilisation opportunities compared to mortality limits generated by Rule 4 and the Cusp Rule.

87   MFish contends the adaptive approach of Rule 4 continues to be the strategy best suited to optimise use of the squid fishery, while recognising information uncertainty and the sustainability objective of the sea lion population. Rule 4 affords greater responsiveness in adjusting the bycatch limit in circumstances such as the recent decline in pup production, when compared with the other bycatch control rules. MFish acknowledges the rationale for Rule 4 is predicated in part on its responsiveness to pup production over time ie, higher FRMLs are generated with increasing pup population and lower FRMLs are generated under decreasing pup production. MFish remains of the view that the responsiveness offered by Rule 4 to changing circumstances in the Auckland Islands' sea lion population is the best available tool to guide decisions under s 15(2) of the Act.

88   Rule 4 is just one of a family of possible rules that takes a responsive approach to pup count information. MFish notes the Breen and Kim Model provides a range of FRMLs under different bycatch control rules that are available to you to manage sea lion-fishing interactions in the 2005-06 SQU 6T fishery. MFish considers that information about the trade-off between sea lion mortalities and fishing opportunities as provided in Table 3 is relevant to your consideration of a FRML.

Table 3:   Rule performance against key indicators, from the base case projections from Breen and Kim, 2003.

Performance Indices	Harvest control rules						
	0	1	305	310	320	4	Cusp
Crit20 [a]	N/a	97,781	100,000	100,000	99,989	99,997	98,115
Crit100 [b]	N/a	447,570	500,000	499,052	487,109	489,846	450,003
Nmat/K [c]	98.20%	91.70%	96.40%	95%	93.40%	93.50%	91.8%
Lost fishing effort [d]	100%	0%	56.20%	31.50%	11.40%	12.20%	0%
Seasons closed	100%	0%	77%	52%	23%	24%	0.4%
Maximum bycatch (100 yr runs)	0	545	39	77	151	169	542
Mean annual bycatch	0	99	31	53	76	75	98

[a] pass level for this index is 90,000 out of 100 000 projection-run years
[b] pass level for this index is 450,000 out of 500 000 projection-run years
[c] pass level for this index is 90% of K
[d] based on average annual fishing effort (2,871 tows) conducted during the years 1988-2003

89   The headroom between a given FRML and that prescribed by the Cusp Rule can be compared with the expected gains in fishing effort, as an indication of the trade-off. Evaluation of the performance of alternative harvest control rules illustrates that Rule 4 is expected to result in median lost fishing effort of only 12.2%, compared to a projected loss of 31.5% under rule 310. Thus, while there are substantial increases in fishing opportunities gained in moving from the FRML established under rule 310 compared with that under rule 4, the incremental gains in fishing opportunities become progressively smaller as the FRML increases. MFish believes this to be a relevant consideration in your obligation to avoid, remedy or mitigate the effect of fishing-related mortality on sea lions.

90   In light of submissions and taking into account the information principles of the Act, MFish continues to support the adoption of Rule 4 to set a FRML for the 2005-06 SQU 6T fishery. This rule meets the interim sea lion management objective, and is consistent with your obligations to take such measures as you consider necessary to avoid, remedy or mitigate effects of fishing-related mortalities. Applying this approach, Rule 4 provides a FRML of 97 animals.

91   MFish notes Dr. Slooten's concerns regarding the decrease in pup production and breeding females as an indicator of sustainability concerns for the sea lion population. The Rule 4 is best suited to these concerns given its sensitivity to changes in population size. As such, the proposed FRML for the 2005-06 year is 20% less than last year in response to the most recent decrease in pup production.

Strike rate

Submissions

92   **SeaFIC** considers an adaptive in-season monitoring system is workable in the SQU 6T fishery, but supports the continued use of the default strike rate of 5.3%.

93   **SFMC** supports a 5.3% strike rate, but believes a strike rate is unnecessary as unconstrained fishing using SLEDs would pass all the tests as described above.

94   **WWF** considers the use of an extrapolated strike rate to estimate mortalities against the FRML is an unsafe method because of the observed variation in the strike rate, particularly over recent years. It notes when dealing with the fisheries incidental mortality of a threatened species, the degree of uncertainty posed by this method presents an unacceptable risk to achieving the agreed management target of moving the population close to carrying capacity, K. Nevertheless,

WWF welcomes the joint work undertaken by government and the SFMC during 2004-05 to further investigate the effectiveness of SLEDS and looks forward to the results this process may deliver on sea lion strike rate and SLED efficacy.

95   **Dr Slooten** asserts a strike rate of 5.3% is inappropriate, given the relationship between strike rate and observer coverage, with a much higher strike rate calculated when observer coverage was at, or near, 100%.

MFish discussion

96   MFish notes industry's support to use the proposed pre-determined strike rate of 5.3% to estimate sea lion mortalities against the FRML for the 2005-06 SQU 6T fishery. The strike rate remains unchanged to that used in last year's fishery to estimate sea lion bycatch.

97   MFish is aware of industry's recent initiatives to develop a more robust method to estimate strike rate using a modelling approach. An initial report[4] on this method has been recently considered by the AEWG. The working group saw merit to develop a model to estimate strike rate and survivability based on real-time data from the fishery. However, some AEWG members expressed a view that the model should be subjected to further evaluation during the upcoming season. This would allow for additional review and refinement prior to adoption as an alternative monitoring procedure. MFish encourages the industry to continue to develop the model and looks forward to considering any new information derived from this approach.

98   MFish acknowledges WWF's concerns about the risk in adopting a pre-determined strike rate to manage fisheries interactions concerning a protected species. MFish accepts there is uncertainty surrounding the proposed pre-determined strike rate to truly represent sea lion interactions in the SQU 6T fishery in any given season. This is reflected in the variability of past observed strike rates within the fishery (as illustrated in Table 6 in the IPP). MFish recommends you take into account that uncertainty when applying a pre-determined strike rate to estimate sea lion mortality attributable to the 2005-06 SQU 6T fishery.

99   MFish also acknowledges Dr. Slooten's comments regarding the appropriateness of the strike rate. The strike rate is calculated as a function of the effort expended in the fishery and projects increasing strikes as the number of tows increases. The use of 'open' SLED escape hatches within nets in recent years prevents the collection of quantitative information on sea lion capture rates. MFish notes that initiatives by industry to provide more statistically robust estimates of strike rate may be forthcoming to consider a revised strike rate in future years.

SLED discount factor

Submissions

100   **RFB** notes the results of autopsied sea lions ejected by SLEDs prevent the application of a discount factor given the uncertainty about the type of SLEDs used (both design and type of gear used). It considers the recent assessment by the Department of Conservation that the bar width within the SLED device deployed last season was too wide brings into doubt the efficacy of the SLEDs in general. SLEDs are not 100% effective in ejecting sea lions, and this is compounded by the changing design of the SLED and the number of designs used each season.

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[4] Estimating sea lion bycatch in the SQU 6T and SQU 1T fisheries. Breen, Kim and Starr. NIWA Client Report: WLG2005-37. Prepared for Squid Fishery Management Company. 23 pages.

101   **SeaFIC** considers the proposed 20% discount factor for vessels deploying SLEDS is unduly conservative. It believes the proposed discount factor, if it is intended to be a reflection of actual survival probability, is implausible given the low speeds used when towing for squid (ie, 3-4 knots) and the consequent low probability that serious damage would result to escaping animals. A more appropriate discount factor would now be of the order of 40-80%.

102   **SFMC** considers that issues associated with assessing a discount factor for SLEDs relate to escape, survivability (including the best available information, future research including criteria and autopsy protocols) and monitoring.   It agrees with the work commissioned by MFish (and presented to the AEWG) that concludes that the probability of escape is near to 1. This means that a SLED will almost certainly eject sea lions.

103   SFMC notes the probability of survival of ejected sea lions is the major point of difference between industry and MFish. The major problem in assessing this factor is uncertainty as to where in the net the sea lions sustain the trauma identified in animals returned for autopsy. SFMC believes most of the trauma observed in the autopsied sea lions occurs because they are trapped and drowned in the cover nets, but acknowledges there is currently insufficient scientific information to reach a conclusive view. What it does mean, however, is that MFish estimates of survivability for ejected sea lions are at best highly conservative. It believes the IPP fails to provide rationale on how the proposed 20% discount factor has been established.

104   SFMC notes it has reviewed the Department's autopsy results and compiled the following table of trauma condition of ejected sea lions:

level of trauma	2000-1		2001-2		2002-3	
	number	%	number	%	number	%
Severe/moderate	2	40%	4	66.7%	2	66.7%
Mild/none	3	60%	2	33.3%	1	33.3%

105   SFMC contends the above table demonstrates an average survivability percentage of sea lions escaping through SLEDs of 42.2% over the three years, or 33.3% for the last two years (when cover nests were tied down). Based on this information, the proposed discount factor is unjustifiable. SFMC considers the Department of Conservation's pathology results were very conservative in terms of conclusions as to survivability and, therefore, there is uncertainty as to whether the sea lions sustained the trauma as a result of the SLED or as a result of thrashing around in the cover net. SFMC supports a discount factor of at least 40%.

106   SFMC confirms the industry will use a standardised SLED (Model 13/3) device across the entire fleet, with cover nets open. This device will include a smaller bar spacing of 23cm (down from 28 cm) to reduce the chances of captured sea lions passing through the SLED grid and into the cod-end of the net. SFMC will audit the grids to ensure they meet the necessary specifications.

107   **WWF** continues to oppose the use of a discount factor on grounds that scientific criteria set by MFish have not been satisfied. In addition, last year's indication of SLED performance raises serious questions about the efficacy of this mitigation device to eject sea lions. It contends that

industry should undertake a timed, peer-reviewed programme of staged SLED trials to assess strike rate and effectiveness at releasing sea lions in a good state of health. It suggests this work should follow good process, and that trials and outcomes are reviewed by the AEWG (including MFish and Department of Conservation officials), and any additional specialists as required.

108   **Dr Slooten** submits the concept of a discount factor needs a lot more justification than is provided in the IPP.

MFish discussion

109   There is continuing disagreement among stakeholders on the justification for a SLED discount factor for the 2005-06 SQU 6T season, and what that factor should be. MFish considers the rationale for continuing to provide a 20% discount factor for vessels using SLEDs is carefully explained in the IPP (paragraphs 100-110).

110   MFish continues to support the application of a discount factor to acknowledge that some sea lions caught and ejected from trawl nets by SLEDs are likely to survive in the long-term. A discount factor also serves to provide an incentive for vessels to deploy SLEDs by offering a lower strike rate (ie, 4.24%). MFish acknowledges industry's commitment to ensure that all vessels operating in the 2005-06 SQU 6T fishery will deploy SLEDs, and this reflects a strong commitment to maximise the levels of utilisation possible within the squid fishery, given the possible constraints placed on it by a FRML.

111   However, MFish disagrees with industry that SLEDs are 100% effective in ejecting sea lions out of trawl nets. The information from the 2004-05 SQU 6T fishery clearly demonstrates that SLEDs are not 100% successful in ejecting animals from nets. Fisheries observers recorded at least eight sea lions caught by vessels using SLEDs at time of capture, and at least five of these animals (5/8) were found in the cod-end section of the net. As such, these five animals were: (a) not ejected from the SLED, and (b) passed through the SLED grid and into the cod-end. The failure of SLEDs to eject sea lions from nets is alarming, as the tows concerned were given a 20% discount factor off the pre-determined 5.3% strike rate.

112   The IPP discusses possible factors to explain SLED failure as noted above. Regardless of reason, in these particular instances where captured sea lions were caught and retained within the trawl net, the SLED device clearly failed to successfully eject animals out of the net. Information being progressed through the independently chaired SLED working group provides a platform to generate and discuss ways to improve upon the current (Mark 13/3) SLED design and its implementation. MFish supports the proactive approach by industry to improve SLED efficacy by adopting a 23 cm bar spacing in an effort to overcome the potential issue of sea lions passing through the SLED grid. MFish encourages all parties to constructively engage with industry on the SLED working group to progress initiatives to improve SLED efficacy.

113   Industry supports a higher discount factor and provides information in support of this approach. This information includes survival prognosis of sea lions captured within cover nets and retained for autopsy between 2000 and 2003 that indicates a discount factor of around 40%. Similar information was submitted in response to last year's IPP. MFish again contends there is significant uncertainty in the available information on survival prognoses of animals ejected from SLEDs. The number of autopsied animals from which to estimate survival prognoses is very small, and not scientifically or statistically robust. Information in industry submissions still does not address uncertainty in available information, nor contribute to SLED efficacy understanding beyond that currently held.

114   MFish disagrees there is insufficient rationale to base a discount factor at 20%. The proposed discount factor remains unchanged for that adopted in the last SQU 6T season, and there is no additional quantitative information on which to base an alternative rate. The proposed discount factor is based on the AEWG's view that for purposes of determining SLED efficacy to eject sea lions in viable condition, there was some certainty that a proportion had a high likelihood of survival. The AEWG did not agree, however, that the available information constituted sufficient certainty that a proportion of sea lions were exiting from SLEDs in viable condition to enable a discount for SLED use to be recommended, for reasons relating to sample size and deficiencies in the sampling regime.

115   The decision to grant a discount factor to the pre-determined strike rate for the 2005-06 season requires balancing the uncertainty on whether SLEDs improve the long-term survivability of captured sea lions against the need to provide a genuine incentive for vessels to deploy SLEDs. MFish reiterates that you must take into account the uncertainty of information and proceed with caution in determining whether a discount factor should apply to the strike rate and the nature of that discount for the 2005-06 fishing year, and that uncertainty in information should not be a reason to postpone or fail to take any measure to achieve the purpose of the Act.

116   MFish considers a 20% discount factor continues to be appropriate at this time given uncertainty in both the proportion of sea lions ejected from nets by SLEDs and the likelihood of long-term survival of ejected animals. The proposed discount factor acknowledges problems with SLED design in the 2004-05 SQU 6T fishery.

Observer coverage and reporting requirements

Submissions

117   **RFB** supports 100 % observer coverage in the SQU 6T fishery. Any vessel wishing to fish within this fishery must carry an observer.

118   **SFMC** considers the FRML monitoring requirements detailed in the IPP are deficient and unworkable. SFMC agrees there should be a minimum of 30% of the tows in SQU 6T covered by observers.

119   **WWF** considers an observer-based approach with strict monitoring of sea lion mortalities is the only valid approach to assess whether the fishery has reached the proposed FRML. It supports a monitoring regime based on at least 50% observer coverage at any time.

120   WWF believes that sea lion captures in non-SQU 6T fisheries should be assessed and included in the estimation of sea lion mortalities against the FRML. It considers the bycatch in these fisheries is likely to be higher than the reported 1.58 annual average as observer coverage of those fleets is insufficient to allow extrapolation and estimation of a total bycatch figure.

MFish discussion

121   MFish notes SFMC's statement that the proposed monitoring requirements as outlined in the IPP (paragraphs 111-115) are unworkable. SFMC's submission did not provide additional information to explain this assertion. The proposed monitoring requirements are effectively the same as that adopted in the last SQU 6T operational plan, and will enable MFish to monitor estimated sea lion catch against the FRML.

122   The proposed monitoring requirements have been amended to impose greater responsibility on industry to inform MFish well before fishing commences on the number of vessels that are likely to operate within the SQU 6T fishery.   More timely information on vessel participation within the fishery will assist MFish to rationalise available observer coverage against available risks and spread across fisheries, and ensure the necessary level of coverage within the SQU6T fishery.   MFish intends to more closely work with the SFMC prior to the commencement of the 2005-06 season to ensure there is no misunderstanding with any of the operational requirements prescribed in the proposed operational plan.

123   MFish acknowledges that a high level of observer coverage would substantially enhance information on SLED use and sea lion bycatch.   However, MFish considers that concurrent needs for observer coverage for other fisheries, and limited observer resources restrict the coverage available for the SQU 6T fishery to about 30%.   This estimate is based on the number of vessels likely to participate in the 2005-06 fishery, the FRML, and the period of time squid are generally available to fishers. Past experience in assigning observers to the SQU 6T fishery has demonstrated that vessels often leave port without definitive expectations of where or how long they may be fishing in the combined SQU 6T and SQU 1T fisheries.

124   MFish acknowledges that additional sea lion mortalities do occur in other fisheries, as explained in paragraph 74 of the IPP. MFish notes uncertainty in the level of sea lion bycatch in other fisheries, and the impracticality of including this mortality as part of the Breen and Kim Model. This information on additional mortality is a consideration you should include in your decision on a FRML based on the range of mortality limits modelled as satisfying the interim management objective.

Other issues

Submissions

125   **RFB** considers both MFish and industry must promote the use of jiggers to catch squid. RFB consider the bycatch of sea lions, fur seals and seabirds could be avoided if jiggers are used to catch squid around the Auckland Islands, and would be consistent with MFish's obligations under the Act.

MFish discussion

126   MFish acknowledges that jigging may offer a more selective fishing method than trawling, and might thereby reduce sea lion bycatch.   Vessels are presently permitted to use jig-fishing methods in the Auckland Island squid fishery, even if the trawl fishery is closed due to excessive sea lion bycatch. Despite the ability to use jig-fishing methods both in SQU 6J and SQU 1J, squid jigging has declined significantly since the mid-1990s. MFish has been advised that rough ocean conditions in squid fishing grounds around the Auckland Islands can be difficult and hazardous for squid jigging operations.   MFish considers it is inappropriate to require jig methods as part of the operational plan in the absence of further information concerning both the efficacy and safety of this method to catch squid around the Auckland Islands.

Consultation with the Department of Conservation

127   Under s 15(2) of the Act, you are required to consult with the Minister of Conservation on the proposed management regime for the 2005-06 SQU 6T fishery.   The Department of Conservation is an active participant in the working group discussions pertaining to sea lions,

provides the pup count estimates used to generate FRML estimates, and possesses significant expertise in the biology and scientific understanding of the New Zealand sea lion population.

128   As a consequence of these relationships, the Department is afforded the opportunity to provide critical review and comment on MFish's advice leading to the implementation of a SQU 6T operational plan. This communication also allows Department officials to better advise their Minister on the operational plan.

Summary

129   MFish has proposed a management regime to address the New Zealand sea lion-trawl interactions in the SQU 6T fishery during the 2005-06 fishing year. Stakeholders have been given an opportunity to provide written comments on an IPP describing this regime.

130   Submissions were received from the Squid Fishery Management Company, Seafood Industry Council, Dr Elizabeth Slooten, World Wildlife Fund New Zealand, and Royal Forest and Bird Protection Society. These parties have provided a wide range of comments on the proposed management regime. MFish has evaluated and responded to the submissions in this FAP in arriving at the recommendations provided to you.

131   Under s 15(2) of the Act you are required to take such measures as you consider are necessary to avoid, remedy or mitigate the effect of fishing-related mortality on any protected species, and such measures may include setting a limit on fishing-related mortality. The proposed management regime is similar to that used in previous years, and continues to primarily focus on the use of a FRML to constrain sea lion mortalities to a biologically acceptable level. A spectrum of FRMLs is available to you (as evaluated using the Breen and Kim Model) based on bycatch control Rules 305, 310, 320, 4 and the Cusp Rule. These rules satisfy the interim management objective, as do a wide range of other rules in between

132   After considering submissions from stakeholders, MFish recommends a FRML of 97 sea lions. The proposed FRML, based on an adaptive bycatch control rule, Rule 4, is considered the best tool at this time to give effect to the purpose and principles of the Act. This approach offers an appropriate balance to meet the dual obligation in the Act, but also recognises information uncertainty and the Court of Appeal determination that sea lions cannot be managed like a harvestable stock. Rule 4 reflects the uncertainly about the relationship between sea lion population size and carrying capacity, K, and acknowledges the decline in both pup and overall population size in recent years.

133   Proposed procedures to monitor sea lion bycatch against the FRML include the use of a pre-determined strike rate of 5.3% and an associated 20% discount factor when SLEDs are deployed.
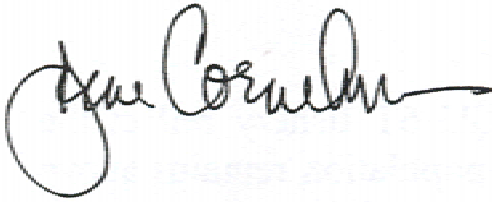
Recommendations

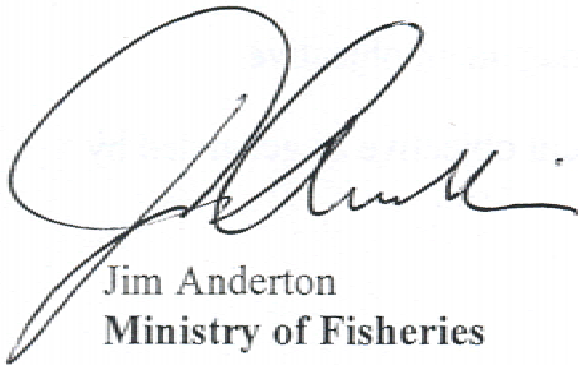134   The Ministry of Fisheries (MFish) recommends that you:

    a)   **Note** the proposed management interventions for the SQU 6T fishery reflect the interim management objective to ensure that the sea lion population remains above 90% of its carrying capacity, *K*, or else remains above 90% of the level it would obtain in the absence of fishery bycatch, 90% of the time in 20- and 100-year runs.

    b)   **Note** the Breen and Kim Model suggests that unconstrained fishing does not meet the interim management objective, and that the maximum fishing-related mortality limit (FRML) that meets the objective is the Cusp Rule.

    c)   Taking into account the balance between sustainability and utilisation offered by different approaches, **consider** the range:

        i)   of bycatch control rules that meet the interim management objective

        ii)   of actual FRMLs that meet the interim management objective as generated by the bycatch control rules

        iii)   of possible pre-determined strike rates, and

        iv)   of possible discount factors.

    d)   **Agree**, under s 15(2) of the Fisheries Act 1996, to establish a management regime prescribing a FRML of 97 New Zealand sea lions for the 2005-06 fishing year, based on the adaptable bycatch control rule, Rule 4.

    e)   **Agree** to establish a monitoring and reporting regime to estimate the total number of New Zealand sea lion catches against the FRML using a pre-determined strike rate of 5.3% (ie, 5.3 estimated sea lion mortalities per 100 tows).

    f)   **Agree** to apply a 20% discount factor to tows undertaken by vessels employing a sea lion exclusion device (SLED) design established by the Squid Fishery Management Company, and approved by MFish.

    g)   **Note** that vessels intending to fish for squid in SQU 6T may be required to carry an observer to document SLED design and use as a condition for the 20% discount factor.

h)   **Agree** to close the fishery under s 15(5) of the Fisheries Act 1996 in the event the FRML is reached.

Jim Cornelius
for Chief Executive
Ministry of Fisheries

APPROVED / ~~APPROVED AS AMENDED / NOT APPROVED~~

Jim Anderton
Ministry of Fisheries

22 / 10 /2005

Encl