19 October 2004

Minister of Fisheries

FINAL ADVICE PAPER

OPERATIONAL PLAN TO MANAGE THE INCIDENTAL CAPTURE OF NEW ZEALAND SEA LIONS IN THE SQU6T FISHERY FOR THE 2004–2005 FISHING YEAR

Introduction

1 This paper provides the final advice and recommendations on the proposed management process that the Ministry of Fisheries (MFish) will implement under an operational plan to address New Zealand sea lion interactions in the southern squid trawl fishery (SQU6T) during the 2004-05 fishing year.

2 The final advice has been developed following consideration of procedures for establishing an acceptable level of incidental sea lion fishing-related mortality, consistent with your powers under s 15(2) of the Fisheries Act 1996. The process for developing the operational plan is similar to that used in previous years, relying on a fishing-related mortality limit to limit New Zealand sea lion mortalities in the SQU6T fishery.

3 Previous operational plans use the term "Maximum Allowable Level of Fishing Related Mortality (MALFiRM)" to describe the limit on fishing related mortality MFish enforces under s 15(5)(b) of the Fisheries Act 1996 (the Act). This has created confusion because a MALFiRM proper is an output of a Population Management Plan (PMP) the Minister must enforce under s 15(5)(a) of the Act. In the absence of a PMP, references to MALFiRM for actions under s 15(5)(b) are inaccurate. The terminology adopted in this advice paper is fishing-related mortality limit (FRML).

4 An Initial Position Paper (IPP) outlining options and recommendations for the Operational Plan to Manage the Incidental Capture of New Zealand Sea Lions in the SQU6T Fishery for the 2004-05 fishing year (the "Operational Plan") was sent to stakeholders on 3 September 2004. Stakeholders were asked to provide their comments on the proposed FRML for the 2004-05 SQU6T fishery and the options proposed to estimate and monitor the total number of sea lion mortalities against this FRML.

5 The complete details of the proposed management process are outlined in the accompanying 2004-05 SQU6T Operational Plan. This final advice paper is to be read in conjunction with this 2004-05 Operational Plan.

6 If you agree with the proposed management process, please forward the 2004-05 Operational Plan to the Minister of Conservation for consultation. A letter is attached for your signature. Once this consultation is completed, you are able to approve the Operational Plan by signing the back page.

Structure of this Document

7 This paper begins with a review of the pertinent issues identified in the IPP. This is followed by an overview of submissions received from stakeholders on the IPP organized by topic area, followed by the MFish response to these comments. The paper concludes with a summary of key elements of the proposed Operational Plan.

Initial Position Paper Advice

8 The Initial Position Paper outlining options and recommendations for the 2004-05 Operational Plan was released for consultation on 3 September 2004. The complete IPP is appended to this paper for reference. The IPP addressed three principal management issues bearing on the 2004-05 SQU6T sea lion Operational Plan:

a) The proposed FRML for the 2004-05 SQU6T season;

b) Operational procedures to estimate and monitor the total number of sea lions caught by the fleet against the FRML, including reporting requirements;

c) Closure procedures to be used by the Minister of Fisheries if the FRML is reached.

The FRML level

9 Possible FRMLs were derived from harvest control rules considered through the MFish Aquatic Environment Working Group (AEWG) process. The harvest control rules were an extension of the sea lion population model process developed by Breen and Kim (2004). The model uses 2004 pup production data provided by the Department of Conservation as the proxy for population size. Several harvest control rules ranging from no fishing to unrestricted fishing (no sea lion mortality limit) were discussed. MFish's preliminary FRML recommendation was the adoption of rule 4, offering a FRML of 115 sea lions.

Arrangements to monitor the FRML

10 The FRML is the measure of maximum allowable sea lion mortalities attributed to unintentional bycatch in the SQU6T fishery. A separate decision is necessary concerning how to determine sea lion mortalities that will be counted against the FRML. Monitoring sea lion mortalities against the FRML involves estimating sea lion deaths that accrue as a result of fishing. Proposed arrangements to monitor mortalities are discussed in the IPP (paragraphs 81-85).

11 MFish proposed the use of a predetermined strike rate of 5.3% (discussed in paragraphs 86-93 of the IPP) to estimate the total number of sea lion mortalities within SQU6T. The proposed pre-determined strike rate is based on an average of the actual strike rate from the latest seven years where observer coverage exceeded 20% of tows undertaken in the SQU6T fishery.

Justification for a SLED discount factor

12 The industry may employ Sea Lion Exclusion Devices (SLEDs) when fishing in SQU6T to potentially mitigate sea lion mortalities. As noted in paragraphs 94-100 of the IPP, the efficacy of SLEDs in reducing sea lion deaths remains uncertain, although some sea lions appear to survive ejection.

13 The potential to increase utilisation of the SQU6T fish stock through SLED use has inspired consideration of a strike rate discount factor applicable to vessels employing this technology. Key to this logic, however, is accurate estimation of sea lion survival from SLED-equipped trawl nets. The scientific criteria established by MFish and endorsed by the AEWG, are that an animal must be noted to have been successfully ejected using video monitoring and also exhibit necropsy pathologies that do not compromise its long term survival[1]. Over time, the survival criteria have been reassessed periodically as researchers have obtained more information concerning the efficacy of SLEDs through filmed observation of sea lions encountering SLEDs, as well as necropsy reports from sea lions retrieved from both SLED and non-SLED squid trawl nets operating in SQU6T. However, as at August 2004, the scientific criteria described above to establish SLED survivability have not been satisfied, such that statistically reliable conclusions on SLED efficacy cannot be made.

14 MFish acknowledges that in the absence of a sound scientific basis to determine the survival rate of sea lions ejected by SLEDs, it is still required to use the best available information under s10 of the Fisheries Act 1996 in formulating management actions. Such information may be drawn from injury diagnosis provided in the sea lion autopsy reports, supplemented with factors thought to further influence survival beyond the condition of the sea lion at the time drowning occurred. Discussion of the survival prognosis available from autopsy results is presented in the IPP at paragraphs 101-105. Although not current, the information referred to in the IPP continues to be the best available information on the survival rate of sea lions ejected by SLEDs.

15 MFish proposed that a discount factor of 20% be applied to the predetermined strike rate of SLED equipped vessels, providing certain criteria are met. The preferred criteria for estimating sea lion survival and the consideration of an appropriate discount factor (as confirmation of SLED efficacy) have not yet been satisfied. The best available information indicates that some animals survive ejection (refer to paragraphs 98-99 of the IPP). The proposed discount factor acknowledges uncertainty arising from other factors bearing on SLED survival not directly evident from the autopsy prognosis. These factors include the low sample size, the consciousness of the animal at the time of capture in the cover net, the animal's vulnerability after escaping the net, undetected injury that may threaten long term survivability, and the changing design of the SLED in use over time. The 20% discount factor proposed achieves a balance between recognising the likelihood of a modest level of survival, but withholds scientific endorsement of SLED efficacy until more statistically valid information becomes available.

Consultation

16 Interested parties were encouraged to provide written comments on the 2004-05 Operational Plan proposed in the IPP. This consultation was undertaken between 3 and 17 September 2004. Individuals from the following organisations were contacted, in addition to MFish and Department of Conservation personnel. A copy of the IPP was also posted on the MFish external website.

[1] See paragraphs 58-61 of the 2001-02 SQU6T sea lion Operational Plan, available on request from MFish.

NIWA	Environmental and Conservation Organisations of NZ
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

17 The time period allowed for consultation was coordinated with stakeholders in order to obtain your decision in a timely fashion recognising the start of the 1 October 2004 fishing year was fast approaching.

18 Written comments were received from the Seafood Industry Council (SeaFIC), the Squid Fishery Management Company (SFMC), Te Ohu Kai Moana (TOKM), Dr Elisabeth Slooten (Otago University), World Wildlife Fund (WWF), and the Royal Forest and Bird Protection Society (RFB). Copies of the complete submissions are available from MFish. Summarised stakeholder submissions and MFish responses are organized in the following topic areas;

- Management objectives
- The Breen-Kim model
- The fishing-related mortality limit (FRML)
- Strike rate
- Sled discount
- Observer coverage and reporting requirements
- Economic considerations
- Other issues

Management Objectives

Submissions

19 SeaFIC notes that clear management objectives need to be specified to set a FRML. SeaFIC supports paragraph 23 of the IPP that outlines the interim management objective agreed through the Ministry's AEWG process in 2003. Although supporting the interim objective for the purpose of deriving a FRML, SeaFIC notes that the objective is very conservative and serves as a very rigorous test of rebuilding. They support the objective because it allows for agreement among the various interests and is amenable to technical evaluation (in the form of the Breen-Kim modelling work) that is compatible with s10 of the Fisheries Act (1996).

20 SFMC notes that as with any fisheries management decision made under the Fisheries Act, decisions under s 15(2) must be assessed against the purpose of the Act in section 8 (to provide for utilisation while ensuring sustainability), the environmental principles (section 9) and the information principles (section 10), which includes the obligation to take into account the best available information. They note paragraph 79 of the Court of Appeal judgment[2] which makes it clear the Minister is to form a view as to the extent to which (or perhaps the point at which) utilisation of the squid resource threatened the sustainability of the sea lion population. The

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

SFMC also notes that the Court of Appeal considered the protection of sea lions as individuals and the political acceptability of an increased FRML were irrelevant considerations.

21 SFMC supports the management objective described by MFish in paragraph 23 of the IPP. They note that the management objective is very conservative.

22 Te Ohu Kai Moana supports the SFMC submission to the IPP.

23 Dr Slooten submits that there is a clear contradiction between the management objective given in paragraph 20 of the IPP and the interim performance criteria in paragraph 23. She notes that recovery rates and delays in recovery rates will allow you to determine whether statutory obligations are being met. She suggests that statistics on recovery rates and delays in recovery rates are included in the FAP.

24 The World Wildlife Fund New Zealand notes that the New Zealand sea lion is classified as threatened on the grounds of the limited number of current breeding sites. To move the species towards a non-threatened status, as required under the Marine Mammals Protection Act 1978, any sea lion/squid fishery interaction management regime initially needs to assure recovery of the population to close to carrying capacity (K) to facilitate establishment of further breeding colonies. WWF welcomes the adoption by the AEWG of the interim population management measure "to manage fisheries interaction with New Zealand sea lions such that the population could reach 90% of K with a high probability". They note, however, that the perception as to where the sea lion population is relative to K differs strongly among stakeholders.

25 WWF believes the operational plan, as the de facto management plan for the species must adopt and be monitored for delivery against the overall goal and medium term objectives for recovery of the New Zealand sea lion as presented by the MFish AEWG on 24 March 2003. These were as follows:

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 5 sea lion management clusters throughout New Zealand.* This goal recognises that 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 (the World Conservation Union).

26 Under this direction the operational plan must demand a truly precautionary approach to the management of sea lion deaths in fisheries. WWF believes that 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.

27 RFB contends that the IPP is a major step backward in the protection of sea lions, in particular the decisions to:

a) increase the allowable by-kill of sea lions in the squid fishery;

b) set a fixed by-kill rate and not monitor what the real underlying rate is;

c) set a discount rate without monitoring whether SLEDs are used, the type of SLEDs used or reporting on their effectiveness;

d) not considering alternative methods of catching squid, ie jigging;

e) does not meet the legal tests in the Purposes and Principles of the Fisheries Act 1996, international obligations and the relevant High Court and Court of Appeal decisions.

MFish discussion

28 MFish notes Dr Slooten's concern that there is a contradiction between the management objective given in paragraph 20 and the interim performance criteria in paragraph 23 of the IPP. MFish advises that when managing the sea lion-SQU6T interaction, it is your responsibility to fulfill your obligations with respect to managing the effect of fishing related mortality on any protected species under s 15 of the Fisheries Act 1996. The Minister is not specifically required to meet the criterion for determining a MALFiRM for a species that is gazetted as "threatened" under a population management plan pursuant to the Marine Mammals Protection Act 1978. The interim management criteria outlined in paragraph 23 of the IPP provide a framework to assess the impact of the SQU6T fishery on the sea lion population.

29 MFish does not agree with the WWF submission that measures taken under s 15(2) in the SQU6T sea lion operational plan constitute a de facto management plan for the species. In the absence of a PMP the Minister of Fisheries may implement such measures as he considers are necessary to avoid, remedy, or mitigate the effects of fishing on the population, but he still has to give effect to the purpose of the Fisheries Act. Key to the Fisheries Act is balancing use of the fishery (the squid resource) against sustainability of the sea lion population, as required under s 8 of the Act.

30 MFish also notes the assertion from RFB that the IPP is a step backward in the protection of sea lions, citing several features of the IPP that may impact sea lions. MFish reiterates the purpose of the Act is to provide for the utilisation of fisheries resources while ensuring sustainability. Under s 8(2) of the Act, 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. MFish considers that the interim sea lion management objective adopted by the AEWG provides a robust framework for assessing adverse effects of SQU6T fishing interactions in light of your obligations under the Act.

Breen-Kim model

Submissions

31 SeaFIC agrees with paragraph 54 of the IPP that the Breen-Kim modeling is the best information available to guide decision-making.

32 SeaFIC disagrees with paragraph 57 of the IPP that there is uncertainty over whether the sea lion population is at or near its carrying capacity. They contend that the Breen-Kim modeling work has pointed to a high likelihood that the sea lion population is at a very high level, and it is inconsistent to accept the Breen-Kim model is the best available information and then to reject one

of its major conclusions. They note that the Breen-Kim modeling has shown clearly that the AEWG objective which has been adopted can be met even when incidental captures are limited by a harvest control rule such as rule 392 (the "Cusp Rule"). They also note that the Breen-Kim modeling must also be seen as conservative given that Campbell Island pup counts have not been considered in the setting of an incidental catch limit.

33 The SFMC supports the MFish view that the Breen-Kim model constitutes the best available information for decisions in relation to management of the sea lion/SQU6T interaction.

34 SFMC comments in relation to the Minister's decision as to the appropriate measures he "considers necessary" in terms of avoiding, remedying or mitigating adverse effects of fishing on sea lions, the following conclusions drawn from the Breen-Kim 2004 model are important:

a) the population of sea lions on the Auckland Islands is probably near its carrying capacity (K);

b) the squid fishery and any resulting sea lion bycatch has a small effect on the sea lion population based on current levels of fishing effort;

c) for a designer of a rule to mitigate the effects of fishing to satisfy the agreed AEWG criteria, there is little effort to mitigate.

35 Dr Slooten disagrees that the results of the Breen-Kim model represent the best available information. She contends that the PBR method (described by Wade 1998) traditionally used for calculating bycatch limits for the NZ sea lion is a more robust model to consider the uncertainties outlined in paragraph 57 of the IPP. Dr Slooten disagrees that the Breen-Kim model was adequately reviewed and approved with certain caveats, and submits that the key criticisms of the model made by Dan Goodman, Paul Wade and the AEWG need to be included in advice to the Minister.

36 WWF notes they are astonished that the external review of the Breen-Kim model has not been completed yet the model had been used to calculate a FRML in the 2003-04 operational plan. They note that issues raised by the Goodman peer review have not been further considered by the AEWG and there has been no notification by MFish that the review was considered complete and sufficient.

37 WWF submits that the Breen-Kim model should have undergone rigorous international peer review before being applied to a management situation as critical as that of the New Zealand sea lion. WWF notes that this approach diverges significantly from government standard practice. WWF has been advised by marine mammal modelers that with the current model structure geared towards fish stock assessments, parallel sensitivity testing using Population Viability Analysis (PVA) is vital. With peer review of the Breen-Kim model having not been appropriately completed, the only viable option is for the Minister to set a FRML according to 'rule 310' which is based on the Wade formula previously used by government to set annual mortality limits.

38 RFB contends that the Breen-Kim model is not the best available information and requires further work and analysis. They are concerned that there has been no response to the Goodman review (2003). RFB rejects any suggestion that the model result is indicating the current sea lion population in relation to K. RFB proposes a return to the alternative Potential Biological Removal model developed by Wade and used in previous operational plans.

MFish discussion

39 MFish notes that in the process of internal review, Dr Breen has identified several technical corrections regarding the MFish characterisation or interpretation of the Breen-Kim model and associated harvest control rules. For corrections not otherwise addressed in this advice paper, MFish acknowledges appropriate revisions in the IPP in the following areas:

a) There are some discrepancies in the various time series data depending on source relating to sea lion mortalities. MFish is aware of inconsistencies in the data and is considering research proposals to evaluate the information from alternative sources and provide a groomed set of data.

b) Paragraph 21 of the IPP confuses issues of achieving non-threatened status and rebuilding the sea lion population, which are not the same. This matter is more fully developed in this advice paper as regards distinction between the Marine Mammals Protection Act and those obligations under the Fisheries Act 1996.

c) The IPP appears to use interchangeably the terms pup births, pup production and pup counts as inputs to the model. Based on consultation with Department of Conservation scientists, MFish has adopted the more appropriate terminology "pup production" as noted in footnote 11 in the IPP.

d) The mathematical specification for rule 4 in paragraph 37d) of the IPP is incorrect, the description set by the AEWG is: a polynomial function that produces the rule 305 FRML when pup production is 30% of the 1999-2003 average, the rule 310 FRML when pup production is 60% of that average, the rule 320 FRML when pup production is 100% of that average, and higher FRMLs when pup production exceed the 1999-2003 average.

e) Paragraph 53 of the IPP implies that an estimate of lambda (the intrinsic rate of population increase) was used in the Breen-Kim model. Lambda is a derived parameter of the model, not an estimated input.

f) The characterisation of rule 4 in paragraph 66 of the IPP as providing proportionally smaller FRMLs when pup production is low is inaccurate. Rule 4 provides a variable rate of responsiveness to pup production.

g) Economic impacts described in paragraph 77 of the IPP should include reference to Table 2 results from the Breen-Kim model that indicate the lost fishing effort associated with the harvest control rules, qualifying that the characterisation of lost fishing effort in paragraph 43 of the IPP should not be interpreted as an indicator of lost revenue; only lost fishing effort.

40 MFish notes these and other constructive comments provided by Dr Breen, and has sought to correct resulting inaccuracies from the IPP in this final advice paper. The comments are important in interpreting and accurately characterising the Breen-Kim research results, but MFish does not believe that these fundamentally alter the conclusions drawn in the IPP.

41 MFish considers as unproven the assertion by SeaFIC that the exclusion of Campbell Island pup numbers in the Breen-Kim model is likely to create conservative FRML estimates. The extent and quality of information about the Campbell population was too limited for use in the

Breen-Kim model. In addition, there is little evidence as to the extent to which sea lions from Campbell Island are killed in the SQU6T fishery.

42 MFish disagrees with Dr Slooten, WWF and RFB that the Breen-Kim model is not the best information available to assess different harvest control rules. MFish considers that development of the Breen-Kim model has occurred under the scrutiny of the AEWG. The working group accepted the resulting research on 11 June 2003 as presenting a realistic model of the New Zealand sea lion population, and providing a sufficient scientific basis for decision-making in managing sea lion interactions in the SQU6T fishery.

43 MFish disagrees that the review of the Breen-Kim model by Dan Goodman has not been considered when adopting the Breen-Kim model as the best available information to manage the sea lion-SQU6T interaction. As explained in the IPP (paragraphs 53-55) MFish advises there are no major considerations coming out of the Goodman review in terms of changes to the model structure or interpretations, although there are grounds for cautious acceptance of the Breen-Kim model given the uncertainties highlighted by Goodman. MFish acknowledges stakeholder concerns, but advises that the Breen-Kim modeling process remains as the best available information to consider for decision making in managing sea lion interactions in the SQU6T fishery.

44 MFish further notes that reviewer and submitter concerns about the Breen-Kim model can be managed under s 10 of the Fisheries Act whereby decision makers must proceed with caution where information is uncertain. Accordingly, while the Breen-Kim model does constitute the best available information for decision making purposes, MFish recognises that, as with most modeling procedures, there may be variability in some model parameters that cannot be realistically managed. MFish advises that you need to consider this as part of your decision making.

Fishing-related mortality limit (FRML)

Submissions

45 SeaFIC notes that the initial proposals are conservative and do not reflect a full and objective continuum of possibilities.

46 SeaFIC disagree with MFish's arguments set out in paragraphs 61 to 69 of the IPP for the recommendation of rule 4. They contend that MFish has failed to provide the Minister with the full range of potential options. MFish has ignored the extreme options of no catch and unconstrained fishing and has provided information on the lower, conservative end of the potential spectrum of possibilities even when all the rules presented meet the agreed interim objective.

47 SeaFIC submit that the logical starting point for decision making is the Cusp rule. Adoption of the Cusp rule would meet the agreed management objectives and give the greatest expression to the purpose of the fisheries Act – to provide for utilisation whilst ensuring sustainability as well as sections 8, 9 and 10. They contend that adoption of any other option must be seen as a means of introducing protectionist and political aspirations. They further note that adoption of the Cusp rule would not mean that close to 600 sea lions would be incidentally captured each year, as table 2 of the IPP shows the mean annual bycatch for the Cusp rule is 98. SeaFIC recognises that the Squid Fishery Management Company does not need an FRML of close to 600 seal lions. They suggest the adoption of the Cusp rule, with a voluntary agreed maximum of 150 sea lions.

48 SFMC submits that the Breen-Kim model, which is the best available information, demonstrates that a formal limit on fishing-related mortalities in the 2004-05 season is unnecessary. The model concludes the SQU6T fishery is only having a small effect on the sea lion population with unconstrained fishing failing just one of the evaluation criteria by 0.54%. They contend that a FRML is no longer relevant and stakeholders should focus on mitigating all sea lion capture by continuing to develop, refine, test and evaluate SLEDs and any other mitigation devices.

49 SFMC notes that if you do decide to set a FRML for the 2004-05 season the FRML must be based on an assessment of the extent or point at which utilisation threatens sustainability of the sea lion population (Court of Appeal reasons for judgement). The Cusp rule, which results in a FRML of 598 sea lions meets the agreed management objective and all three evaluation criteria. They further note that a FRML of 598 sea lions does not mean that number of sea lions would be incidentally caught on an annual basis as modeling shows that the average annual incidental take over time is 97 sea lions. They contend that since a FRML just beyond that produced by the Cusp rule could be considered the point at which utilisation threatens the sustainability of the sea lion population, a FRML based on the Cusp rule is the only logical starting point to the Minister's consideration under s15(2).

50 The SFMC submit that a discount of more than 25% of the Cusp rule cannot be justified on a rational scientific basis. That would produce a FRML of approximately 448 sea lions. They further note that a FRML of 448 is far greater than the SFMC needs in order to operate in this fishery. SFMC is therefore prepared to accept, on a without prejudice basis, a FRML of 150 sea lions (which is about 75% of the Cusp rule).

51 SFMC disagrees with the justification in the IPP for setting a FRML based on rule 4 of the Breen-Kim model. They state rule 4 is clearly inappropriate unless it can be applied on a constant basis. DOC has advised stakeholders that a PMP will be imposed and implemented for the 2005-06 fishing year. DOC has also advised stakeholders that its 2003-04 interim management objective for sea lions will not apply to a MALFiRM under a PMP. Therefore MFish cannot assume rule 4 can be adopted on a constant basis.

52 SFMC also dispute the MFish suggestion that rule 4, if it were adopted, should operate with an upper cap in years of high pup production. Given the performance criteria established modeled in the Breen-Kim model, there is no rationale basis for establishing a cap.

53 SFMC contends that MFish is open to allegations that it has not satisfied its obligations under the information principles, by failing to set out in the IPP the FRMLs relating to the rule 3 variants that demonstrate the range of FRMLs the Minister should consider. They ask that the Ministry commission NIWA to calculate the range of possible FRMLs that pass the interim management criteria including rules 330, 350, 360, 370 and 380.

54 Dr Slooten submits that "unconstrained fishing" is an inappropriate term for rule 1. She contends that the 'Cusp rule' contradicts the statutory obligations, and falls into the category of sustainably harvesting a threatened species. She notes that the New Zealand sea lion is threatened and the management focus should be on allowing recovery to a non-threatened status. The Minister needs to consider the possible bycatch levels in light of their ability to ensure the species reaches non-threatened status as soon as practically achievable, and if possible within 20 years.

55 Dr Slooten contends that use of the adaptive rule (rule 4) is a return to unsustainable management practices of the past. It aims to vary the bycatch rate depending on population size

using pup counts as an index of abundance. She notes that marine mammal populations are difficult to census, and it usually takes years to detect population trends. In addition, pup counts are an indirect measure of abundance, and are not necessarily a straight-forward indication of trends in population size. She contends that the adaptive rule reverts to management practices that are out of date, due to their failure to meet basic standards of scientific and management performance.

56 The Royal Forest and Bird Protection Society (RFB) reiterates that the IPP is a major step backward in the protection of sea lions. They are strongly opposed to any increase in sea lion deaths in the squid fishery.

57 RFB submits that any FRML selected should be required to show that the species would move to a non-threatened state in the quickest time possible if not within the 20 year timeframe required by the Marine Mammals Protection Act (section 3F). They consider the only option is close to zero mortality.

58 RFB contends that the FRML proposed by MFish places too much balance on the fishing industry and little balance on the impact on the sea lions. A more balanced scenario would have resulted in the fishery closing early at least 50 percent of the time. In the 10 years up to 1997 this would require a by-kill limit of under 80 sea lions. RFB considers the limit of under 80 provides the right balance and recognises the inherent variability in the squid fishery.

59 RFB concludes that a FRML of 115, and a discount factor, would place little incentive on the industry to use alternative fishing methods or improve the use of SLEDs, and recommends a fishing-related mortality limit for New Zealand sea lions for the 2004-05 fishing year be based on a PBR approach at either 62 or 33 sea lions.

MFish discussion

60 MFish notes strong ideological differences among stakeholders in their attitudes towards the optimal FRML and the additional criteria that they have differentially applied in submissions to arrive at their respective judgments.

61 Stakeholder submissions relate largely to the FRML levels proposed, and the underlying harvest control rules employed to estimate these levels. Submissions from SeaFIC, the SFMC and TOKM support a preferred management strategy that, having satisfied the underlying sea lion conservation objectives, allows for the greatest utilisation of the squid resource. Submissions from Dr Slooten, RFB and WWF support the more conservative FRML harvest control rules in limiting sea lion mortalities.

62 The Breen-Kim model is used to evaluate alternative s in light of the interim management objectives. The Breen-Kim model does not in itself specify a singular or optimal level of sea lion bycatch. Consideration of the range of allowable mortalities that meets the interim management objective (from nil to 598), illustrates that many alternative rules can be used to generate a FRML. The rules put forth have been reviewed by the AEWG, but there has not been consensus agreement by the working group specifically, or stakeholders in general, for a preferred harvest control rule. Rather, rules were evaluated against a set of performance criteria, determined by the AEWG before the modeling work was carried out, to enable an objective assessment of rule performance relative to management objectives. An acceptable management regime was determined to be among those rules that passed all performance criteria.

63 MFish disagrees with the SFMC submission that the Breen-Kim model demonstrates that a formal limit on fishing-related mortalities in the 2004-05 season is unnecessary. This SFMC position appears predicated on the basis that the model concludes the SQU6T fishery is only having a small effect on the sea lion population, since unconstrained fishing fails just one of the AEWG evaluation criteria by a small amount. MFish acknowledges the Cusp rule implications that a significantly higher FRML as simulated under the Breen Kim model satisfies the criteria established for the interim management objectives. However, because unconstrained fishing does narrowly fail the assessment criteria, MFish disputes SFMC's position that a formal limit on mortalities is unnecessary. The Breen-Kim model used the best available data, and model parameters were set to be neither conservative nor liberal, but to represent the current state of knowledge of sea lion biology and demography as accurately as possible. 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.

64 MFish acknowledges the SFMC submission that any FRML under s 15(2) of the Act must be assessed against the purpose of the Act in section 8, the environmental principles in section 9, and the information principles in section 10, which includes the obligation to take into account the best available information. MFish notes that your obligations under the Fisheries Act 1996 have been explained in the IPP, both generally and as these obligations relate to specific proposals.

65 SeaFIC, the SFMC and TOKM contend that the initial proposals MFish considered in the IPP do not reflect a full and objective continuum of possibilities. They note that MFish has failed to consider the entire range of FRMLs up to the Cusp rule that the Minister should take into account when setting a FRML. The Court of Appeal ruling notes the importance that you be aware of the range of sea lion mortalities limits that satisfy the interim management objectives.

66 MFish clarifies that to meet the interim management objective for the sea lion SQU6T interaction, you could theoretically set a FRML determined by the harvest control rule that just satisfies the formal assessment criteria developed through the AEWG (the Cusp rule). For the 2004-05 squid fishing year, the mortality range therefore extends from nil (no fishing), to 598 (the FRML corresponding to the Cusp rule). Submitters note that the Cusp rule does not mean 598 sea lions would be killed in the SQU6T fishery given the fishing effort (tows) reported in the SQU6T fishery in recent years. Based on the Breen-Kim model simulation runs, mean projected annual bycatch under the Cusp rule is 98 sea lions, as reported in Table 2 of the IPP (represented below).

Table 2: **Rule performance against key indicators, from the base case projections from Breen and Kim, 2003. For *crit20* and *crit100* the values shown are the sum of years in which the criterion was true; for *Nmat/K* the value is the mean of the posterior distribution; for all others the value is the median of the posterior distribution.**

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

67 SFMC submits that a FRML is unlikely to be reached given historical observed bycatch, combined with widespread use of SLEDs. Thus, you are advised that establishing a FRML does not imply that many sea lion mortalities are expected to occur in any specific year given the variability in squid availability and sea lion interactions. However, MFish notes that the actual bycatch in any given year may be over or under the mean annual bycatch projection shown in Table 2.

68 MFish questions the SeaFIC, SFMC and TOKM assertions that the Cusp rule is the only logical starting point to set a FRML. SFMC contends that a FRML just beyond that produced by the Cusp rule could be considered the point at which utilisation threatens sustainability and that a FRML based on the Cusp rule is the only logical starting point to the Minister's considerations under s15(2). MFish acknowledges that the Cusp rule represents the theoretical maximum that would just meet the management objectives when tested against the Breen Kim model, and advises you that the Cusp rule can be used to assess the degree of headroom available when determining a limit on fishing related mortality.

69 MFish does not agree, however, that the Cusp rule represents the only logical starting point for consideration of the FRML. MFish offers the following additional considerations drawn from the Court of Appeal decision (paragraph 77):

- *"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*".

70 MFish challenges the SFMC assertion that "a discount of more than 25% of the FRML at the Cusp [resulting in a FRML of 448 sea lions] cannot be justified on any rational scientific basis". MFish considers that information about the incremental trade-off between sea lion mortalities and fishing opportunities as provided in Table 2 of the IPP (above) is relevant to your consideration of a FRML. 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 provided in Table 2 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.

71 MFish's preference for rule 4 is founded in the balance between sustainability and utilisation objectives as described above, and the variable sensitivity to changes in annual pup production. The 115 animal FRML prescribed under rule 4 for the 2004-05 season meets the interim sea lion management objectives, consistent with your obligations to take such measures as you consider are necessary to avoid, remedy or mitigate effects of fishing related mortalities. Harvest control rule 4 is expected to provide fishers with access to about 88% of SQU6T fishing opportunities based on model simulations from 2003. Increasingly higher mortality limits may meet the interim management objectives, but provide progressively smaller increases in access to the squid resource.

72 MFish notes the submission from SFMC alleging that rule 4 is clearly inappropriate unless it can be applied on a constant basis, and that this is uncertain once a sea lion population management plan (PMP) has been completed by the Department of Conservation. MFish acknowledges that the rationale for rule 4 is predicated in part on its variable responsiveness to pup production over time, and the implication that this rule would continue to be applied in the future. However, the prescribed FRML still has value in any given year; it does not negate the basis for the choice of a harvest control rule. The maximum allowable fishing related mortality limit set forth in a sea lion PMP is not bound to the modeling assumptions or interim management objectives MFish has employed in developing a FRML under past or current sea lion operational plans. Thus, application of any harvest control rule or allowable mortality limit is subject to change under a PMP. The value of the modeled harvest control rule 4 in this advice is in formalizing and giving transparency to the balance between sustainability and utilisation.

73 MFish clarifies that the comments regarding an upper cap to the FRML under rule 4 (paragraph 67 of the IPP) are made to identify the issue of a significantly greater mortality limit possible under rule 4 in the case of higher pup production. MFish notes that the reference to a rule 4 FRML cap was intended to illustrate that other management actions are available to address this issue if it becomes relevant, but MFish is not proposing specific measures at this time.

74 SFMC also asserts that all rule 3 variants (rules 320 through 390) should have been modeled as part of the assessment. MFish notes that model runs for all rule 3 variants were presented to the AEWG, but that the working group did not reach consensus on a preferred harvest control rule. The summary of indicators of the rule 3 variants from the Breen-Kim 2004 modelling is shown in the extracted Table 11b shown below. MFish maintains that the range of rule 3 (Wade) variants up to the Cusp rule present a continuum of possibilities available to you. The information presented in Table 2 indicates where rule 4 sits on that continuum relative to other possibilities.

Table 11b: Summary of indicators from the base case projections for each of the Wade rule variants modelled in 2004. For *crit20* and *crit100* the values shown are the sum of years in which the criterion was true; for *Nmat/K* the value is the mean of the posterior distribution; for all others the value is the median of the posterior distribution.

Multiplier	**0**	**0.5**	**1**	**2**	**3**	**4**	**5**	**8**	**9**	**9.23**	**10**
Rule	**300**	**305**	**310**	**320**	**330**	**340**	**350**	**380**	**390**	**Cusp**	**399**
Crit20	100000	100000	100000	99989	99810	99409	99006	98264	98131	98115	98053
Crit100	500000	500000	499052	487109	473902	464642	458702	451181	450181	450003	449508
Nmat/K (%)	98.2%	96.4%	95.0%	93.4%	92.6%	92.2%	92.0%	91.8%	91.8%	91.8%	91.7%
effortlost (tows)	2910	1614	904	328	138	64	31	0	0	0	0
maxcatch	0	39	77	151	222	290	355	516	540	542	545
meancatch	0	31	53	76	87	92	95	98	98	98	99
Umax (%)	0.00	0.35	0.70	1.38	2.01	2.61	3.17	4.43	4.66	4.71	4.79
Umean(%)	0.00	0.27	0.46	0.67	0.76	0.81	0.84	0.87	0.87	0.87	0.87
nadir	6248	6127	6039	5935	5885	5859	5843	5821	5820	5819	5818
nadir/*K* (%)	84.8	83.2	82.0	80.7	80.0	79.6	79.4	79.2	79.1	79.1	79.1
%mat	39.0	38.6	38.4	38.1	38.0	37.9	37.9	37.8	37.8	37.8	37.8
n100/*K* (%)	98.7	96.9	95.6	94.1	93.4	93.0	92.8	92.6	92.6	92.6	92.6
%closed	100.0	77.0	51.9	23.1	11.1	5.7	3.2	0.7	0.5	0.4	0.3
pupmin	2197	2192	2188	2180	2176	2174	2172	2169	2169	2169	2169
pupmax	3200	3195	3188	3180	3177	3176	3175	3174	3174	3174	3174
puprange	1011	1010	1009	1009	1011	1012	1013	1014	1015	1015	1015

75 SFMC submits that, despite their rationale supporting a higher FRML, they would be prepared to accept, without prejudice, a FRML of 150 sea lions (SFMC contends that this equates to about 75% of the Cusp rule limit). MFish acknowledges that this is much closer to the range of FRMLs prescribed under rules 320 and 4. All three limits would appear to satisfy the interim management objective as evaluated in the Breen-Kim model, assuming the SFMC proposal is roughly the equivalent of a rule 323.[3] The SFMC proposal for a 150-animal FRML has not been evaluated by the AEWG, or consulted on. Detailed performance indices relating to lost fishing effort, percent of season closed, and expected sea lion bycatch levels for the SFMC proposed 150-animal FRML have not been specifically estimated.

76 MFish acknowledges Dr Slooten's concern that the characterisation of harvest control rule 1 as representative of 'unconstrained' fishing over the time series represented is incorrect and potentially misleading. Rule 1 is described by Breen and Kim as not completely unconstrained fishing. The modelling assumed that the mean effort expended was the same as the recent mean effort that was expended, or the estimated effort that would have been expended had the fishery not been constrained, and that effort had the same variability as that seen in recent years. Breen and Kim characterized rule 1 an extreme case of partially unconstrained fishing, with mean expended effort at a constant 2871 tows with a standard deviation of 1567.

77 Dr Slooten does not provide explicit rationale to support her assertion that rule 4 is not a precautionary approach, other than her comparison of the FRML prescribed by rule 4 relative to the lower FRML generated by rule 310. MFish contends that Rule 4 represents a precautionary approach in how it establishes sea lion bycatch limits at variable rates relative to pup counts. The IPP provides a description of the attributes of rule 4 and the rule 3 variants at paragraphs 61-68.

[3] Extrapolating from existing FRML calculations, a FRML of 150 would correspond to a harvest control rule between rule 320 and 330. MFish has estimated this as the general equivalent of a rule 323.

MFish further emphasizes that rule 4 does satisfy the interim sea lion management objectives as modeled in the Breen-Kim model.

78 MFish notes submission from RFB, WWF and Dr Slooten calling for a much smaller or nil FRML to ensure the NZ sea lion will move as quickly as possible to a non-threatened state. As explained in paragraphs 13 –19 of the IPP, the Minister of Fisheries has an obligation under s 8 of the Act to provide for the utilisation of fisheries resources while ensuring sustainability. Mortality limits in the range of those generated by harvest control rule 310 or below may provide for greater protection of sea lions, but also result in a significantly greater lost fishing effort compared to rule 4. You are charged with balancing sustainability and utilisation obligations, and much smaller or nil FRMLs appear to discount utilisation objectives in view of the Breen-Kim model results.

The strike rate

Submissions

79 SeaFIC supports the monitoring arrangements outlined in the IPP. They note that an adaptive in-season monitoring system is workable and desirable. They support the continued use of the default strike rate of 5.3% as proposed, noting that it is probably high, given the 2002-03 season rate of 2.8% and the 2003-04 season rate (based on limited data) of 3.4%. SeaFIC reiterates their 2003 submission that an adaptive in-season monitoring system is workable and desirable.

80 SFMC notes that the monitoring requirements detailed in the IPP are workable, but do not agree with the strike rate of 5.3% proposed in the IPP. They propose a strike rate of 4.6%, being the simple average of the nine years where observer coverage has been 20% or greater.

81 Dr Slooten submits that the strike rate for 2003-04 should be calculated. She agrees that there are potential biases in the strike rate (paragraph 88 of the IPP). She submits that this should introduce grounds for caution in setting the strike rate and bycatch limits.

82 WWF contends that the IPP wrongly states at paragraph 84 that "for the purposes of determining the predetermined strike rate for the 2003-04 operational plan, representatives from stakeholders (including WWF) agreed on the use of a simple average of the actual strike rate achieved during recent years and for which a minimum 20% annual observer coverage was achieved was the most appropriate method for setting a default strike rate." WWF notes that they have never endorsed nor agreed to such an approach. WWF considers monitoring of the FRML by applying an extrapolated strike rate to the fleet, as suggested in sections 86 to 93, an unsafe method due to observed variation in the strike rate, particularly over recent years. WWF believes that 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 K.

83 RFB propose that a monitoring and reporting regime be implemented to estimate the total number of New Zealand sea lion catches against the FRLM using dedicated 'FRLM' vessels to establish an actual strike rate based on specified observer coverage. 100 percent of vessels would be observed to ensure that SLEDs are used with all tows and determine the type of SLED that is used. If the above actual strike rate monitoring criteria are not satisfied during a reporting period, RFB submit that a predetermined 6.6% strike rate be applied to all vessels to estimate the total number of sea lion catches against the fishing-related mortality limit.

MFish Discussion

84 MFish agrees that an actual strike rate based on 100% observer coverage provides the most reliable information on observed sea lion bycatch. However, in order to apply this coverage as an absolute means for calculating actual mortalities, all tows would need to be performed without SLEDs, or with SLED cover nets closed. Past operational plans have sampled a portion of vessels in the SQU6T fishery with voluntarily closed nets to generate an 'estimated' strike rate, that is then extrapolated to the remainder of tows undertaken in order to project total sea lion mortalities. Industry has strongly objected to tied down cover nets on SLED vessels, on the grounds that this causes unnecessary sea lion mortalities, and elected not to tie down cover nets in the 2003-04 season. It is unclear whether MFish has the facility to effect compliance with tied down cover nets provisions.

85 MFish considers that 100% empirical verification of actual sea lion deaths in SQU6T is an unworkable option for 2004-05 because: 1) MFish is unable to provide 100% observer coverage for the SQU6T fleet, owing to concurrent needs for observer coverage for other fisheries and limited observer resources; 2) industry appears opposed to deploying SLEDs with tied down cover nets, such that some mortally wounded sea lions will not be retained in the net for observer verification; and, 3) in the event all SQU6T vessels were required to tie down cover nets and carry observers for empirical verification of sea lion mortalities, those mortalities occurring in tied down cover nets could not be counted against the FRML (based on the 2003 High Court ruling), such that the FRML would become ineffectual at closing the SQU6T fishery.

86 MFish acknowledges the opposing positions regarding the viability of the proposed predetermined strike rate, and notes that there is a range of possible strike rates. Table 4 in the IPP describes actual strike rates since 1987-88, along with the level of observer coverage for each year. Actual strike rates range from 0.6 to 11.8 sea lions per 100 tows. As an acceptable method to calculate a pre-determined strike rate, the AEWG put forth in 2003 a methodology relying upon a simple average of actual observed strike rates from recent years when observer coverage was over 20%. MFish acknowledges the WWF position that not all participants in the working group endorsed the level of agreement reached on the pre-determined strike rate at the AEWG meeting. Years in which observer coverage fell below 20% are excluded from the average as being potentially misrepresentative. The seven years between 1996-97 and 2002-03 thus comprised the simple average used to calculate the 5.3% strike rate. This calculation of the predetermined strike rate was adopted in the 2003-04 operational plan.

87 MFish supports this approach for the 2004-05 operational plan, and clarifies that there is no new information from the fishery supporting a change. However, MFish also acknowledges that there is uncertainty surrounding the proposed predetermined strike rate as a true representation of sea lion interactions in the SQU6T fishery in any given season. This is explicit in the variability in observed strike rates over the past 16 years. In addition, the extent to which the level of observer coverage and other factors impact on the reported observed strike rate is uncertain. As no new data is being gathered on the actual strike rate, these reservations over the use of historical reported averages are of concern. MFish recommends you take into account that uncertainty when considering the pre-determined strike rate that will apply to the SQU6T fishery for the 2004-05 fishing year.

88 SeaFIC contends that an adaptive in-season monitoring system is workable and desirable. MFish notes that in order for an adaptive in-season monitoring system to be effective, industry needs to commit to helping with estimation of the estimated strike rate to update the historic average. MFish also notes that the SFMC has pledged to address questions concerning the strike

rate as part of an industry initiative to increase understanding of the sea lion strike rate and SLED effectiveness. This initiative is to be advanced through an independently chaired stakeholder group, as noted in the SFMC submission. Independent recommendations to change or adopt a new in-season sea lion bycatch monitoring regime would be advanced through the AEWG.

89 MFish notes that calculation of a 2003-04 actual strike rate as proposed by Dr Slooten is impractical given fishers' decisions to operate with open cover nets over SLED escape hatches. MFish further clarifies that there were no SQU6T vessels operating with tied down cover nets in the 2003-04 season. This has precluded empirical measurement of a strike rate as had been performed in previous seasons.

SLED discount

Submissions

90 SeaFIC considers the proposed discount factor of 20% to be implausible, given the relatively low speeds used when towing for squid and the consequent low probability that serious damage would result to these animals.

91 The SFMC agrees with the work commissioned by MFish and considered in last years operational plan that concluded that the SLED will almost certainly eject sea lions. The SFMC proposes that the squid trawl fleet utilise the latest standardised model (Model 13) SLEDs with cover nets open. However, the SFMC submit that the best available information demonstrates that the Ministry's proposal of a 20% discount for the use of SLEDs is conservative and this was acknowledged by the Court of Appeal (paragraph 66).

92 SFMC maintains the view that an appropriate discount for the use of SLEDs is at least 40%, which is clearly supported by the best available information. SFMC also accepts that there needs to be further work done to further assess the survivability of the sea lions that are ejected via SLEDs, and this year is committed to work with an independently chaired working group to address this issue.

93 Dr Slooten submits that the data currently available does not seem to provide justification for a discount factor to be applied, concluding that vessels with SLEDs kill the same number of sea lions as vessels without SLEDs.

94 WWF strongly opposes the use of a discount factor for the use of SLEDs in the operational plan for the reasons described in the IPP. For a discount rate to be assigned, an accurate estimation of sea lion survival from SLED-equipped trawl nets is essential. As stated in the IPP, paragraph 96: *"As at August 2004, the scientific criteria described above to establish SLED survivability have not been satisfied, such that statistically reliable conclusions on SLED efficacy cannot be made"*. WWF is concerned that advice by the Technical Working Group of 16 June 2003 not to apply a discount at this inconclusive stage of SLED trials has again been disregarded by Ministry officials, who go on to conclude their discussion on the shortcomings of SLED trials by suggesting a 20% discount rate.

95 WWF notes that last year's indication of SLED performance raises serious questions about the efficacy of this mitigation device. WWF understands that current SLED trials do not meet MFish scientific standards and therefore MFish should not be suggesting a discount rate for the 2004-05 operational plan.

96 WWF welcomes the suggestion of a working group to examine issues related to SLED efficacy. They believe government should lead such a working group. A research plan to assess the efficacy of SLEDs should not be voluntary but compulsory under the operational plan, given that knowledge on the SLED needs to be advanced to answer the statistical criteria for mitigation effectiveness developed by the Ministry.

97 RFB notes that international reviews of the autopsy results have agreed with the DoC contracted assessment by Massey University veterinary pathologists regarding sea lion survivability in SLEDs. RFB contends that SLED effectiveness has been poorly assessed, and this is compounded by the changing design of the SLED and the number of designs used each season. Given the uncertainty about the type of SLEDs used and the effectiveness of each type of SLED, the results of autopsy shouldn't be used to calculate a discount factor.

MFish discussion

98 There is disagreement among stakeholders on the justification for a SLED discount factor, and what that factor should be. MFish consider that the reasons behind providing a discount strike rate of 20% have been carefully explained in the IPP, paragraphs 94 – 109.

99 MFish reiterates that there is a range of possible discount factors you could set for the 2004-05 fishing year. Industry submissions support higher discount factors and also discuss information supporting this approach. This support is in the form of alternative survival prognoses of sea lions captured in SLED cover nets indicating a discount factor between 33% and 40% could be justified. MFish clarifies that the interpretation of the survival prognosis reviews by a technical working group concludes that for purposes of determining the efficacy of SLEDs at ejecting sea lions in viable condition, there was some certainty that a proportion (2/7) had a high likelihood of survival. The working group did not agree that there was sufficient information on which to make a recommendation as to a scientifically-derived discount rate for SLEDs.

100 MFish acknowledges 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 not scientifically or statistically robust. Information in industry submissions does not address uncertainty in available information (beyond that already available), nor contribute to SLED efficacy understanding any more than already understood. MFish recommends you bear in mind s 10(c) of the Act and proceed with caution in determining whether a discount factor should apply to the strike rate and the magnitude of any such discount for 2004-05 fishing year. In doing so, recognise that MFish considers there is evidence of some animals surviving exit from SLEDs, but longer term survival cannot be factually quantified given the best available information at this time.

101 The 20% discount factor proposed by MFish is based on the AEWG technical working group conclusion that for purposes of determining the efficacy of SLEDs at ejecting sea lions in viable condition, there was some certainty that a proportion (2/7) had a high likelihood of survival. The technical working group did not agree, however, that this 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. The information indicating two of seven (28.6%) sea lions had a high probability of survival was modestly discounted to 20% based on remaining concerns over the ultimate survival of sea lions once ejected from SLEDs, and the lack of uniformity in SLED design from which the survival prognosis were drawn. This recommendation acknowledged the

likelihood of modest survival, but MFish withholds scientific endorsement of SLED efficacy pending better information.

102 MFish emphasises there is a need for robust data on SLED efficacy, and that measuring survivability has been a challenge for industry and MFish. MFish supports the concept of an independently chaired group to address SLED efficacy questions, and anticipates that results from this initiative would be used as an input into the formal AEWG process.

103 Following assessment of stakeholder submissions on, and internal review of the operational plan IPP, MFish has determined that the process for identifying and authorising SLED use described in paragraph 120 of the IPP warrants clarification as follows.

a) In the absence of robust SLED efficacy research, recommendations as to appropriate SLED design will be as determined by SFMC. It is the responsibility of the Squid Fishery Management Company to inform MFish prior to fishing operations as to the SLED design requirements as prescribed by the SFMC.

b) MFish will identify the relevant specifications that constitute an approved SLED for purposes of allowing the 20% SLED discount.

c) The MFish-approved SLED specifications will be used for purposes of observer briefings and as the standard for establishing compliance with design requirements.

d) SQU6T vessels seeking the SLED discount will be required to notify MFish of their intentions to obtain the SLED discount in advance of departure (see observer coverage notification requirements, below), to declare their intended SLED use, and describe the SLED device such that it can be verified by MFish against the approved SLED design. SLED designs that do not satisfy the approved design will not be eligible for the 20% discount.

e) In the event the SFMC has not supplied new SLED design specifications prior to 1 December 2004, MFish will act on the specifications used in the 2003-04 sea lion operational plan.

Observer coverage and reporting requirements

Submissions

104 SeaFIC support the need for observers. However, they caution that MFish needs to apply discretion in its requirements for placing of observers as the logistics of fisheries operations are complex and decisions need to be made quickly.

105 The SFMC asks MFish not to apply a "knife edge" requirement of 72 hours notice to the Observer programme prior to departure for the purposes of qualifying the SLED discount.

106 WWF considers that an observer-based approach with strict monitoring of mortalities is the only valid approach to assess whether the fishery has reached the sea lion FRML. They suggest that as a precautionary approach the monitoring regime for the FRML of sea lions needs to be based on at least 50% observer coverage at any time.

107 WWF seek clarification from MFish officials why the implementation of an observer bycatch monitoring programme in SQU6T is not presented as an option in the IPP. They

understand that there are no technical problems in the fishery that would hinder the monitoring of mortalities by observers; to adopt a less reliable alternative measure is unacceptable.

108 RFB supports 100% observer coverage in the SQU6T fishery. This provision avoids any suggestion of bias in observer coverage, ensures all vessels are treated equally, and ensures that the strike rate is determined from actual data. RFB contends that greater observer coverage in other fisheries also is necessary to reflect all fishery related sea lion deaths.

MFish discussion

109 SeaFIC, SFMC and TOKM support the proposed observer coverage, however, they ask for reasonable discretion in administering the required notification period prior to vessel departure. WWF submits that there needs to be at least 50% observer coverage.

110 MFish proposed in the IPP that 72 hours notice prior to vessel departure would be required to give sufficient time for observers to be briefed and located to the port of departure. In order to provide flexibility in the notification period as requested in the industry submissions, MFish further proposes to modify the 72 hour advance notification requirement to a minimum of *two working days* prior to vessel departure. This is considered by the MFish observer program to be the minimum time required to locate, brief, and transport an observer for placement on a vessel. MFish notes that the difficulty in coordinating observer placement on short notice is especially problematic on weekends, and therefore stresses the requirement for two working days advance notification. Thus, a vessel intending to depart on Friday at midday is required to notify the observer program no later than midday of the prior Wednesday. While this may shorten the advance notification requirement in some cases, MFish emphasizes that weekends do not constitute working days, such that a vessel planning to depart at midday on a Monday must notify the observer program no later than midday of the prior Thursday, allowing MFish two full working to arrange for the observer. MFish also notes that available observer coverage needs to be rationalised against available risks and spread across fisheries. As such, it is not viable to reduce coverage in other fisheries in order to provide higher coverage in the SQU6T fishery.

111 MFish clarifies that monitoring SLED use will be conducted through representative MFish observer coverage of squid vessels intending to fish in SQU6T, or through the use of alternative monitoring measures agreed with the Ministry. The 20% discount to the 5.3% predetermined strike rate is applicable only to those vessels using an approved SLED.

112 MFish notes that if additional observer coverage (i.e., greater than the level specified in the Statement of Intent) in the SQU6T fishery is provided in order to monitor SLED use, it will be done so as a fisheries service and is to the benefit of all SQU6T quota owners (i.e. the fishery will stay open for a longer period, and the SQU6T catch will be greater). Given the nature of this service, the Ministry believes it is not appropriate to charge individual companies for the coverage, but that the additional cost is recovered by an increase in the fisheries services levies for SQU6T in future years.[4]

113 Any additional expenditure related to the observer coverage above the planned level, which may not be specifically consulted, is provided at the request of, and solely for the benefit of industry. As such, this expenditure should be 100% recoverable from industry by way of the annual under and over recovery process as a recoverable under recovery (i.e. the Ministry

[4] Part XIV of the Fisheries Act 1996

delivered more observer days than planned/levied).[5] As the additional coverage related to documenting SLED use is requested by industry, and for the benefit of industry, the expenditure will be exempt from the agreed principles for management of under and over-recovery of cost recovery levies.

114 MFish acknowledges that greater observer coverage would be expected to provide better 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 SQU6T fishery to approximately 30%. This estimate is based on the number of vessels participating in the fishery, the FRML, and the period of time squid are generally available to fishers. Past experience in assigning observers to the SQU6T fishery has demonstrated that vessels often leave port without definitive expectations of where or how long they may be fishing in the combined SQU6T and SQU1 fisheries. As a result, a greater number of observers is necessary in order to ensure a target level of about 30% observer coverage within SQU6T.

115 MFish notes an error in the IPP concerning which vessels are subject to the voluntary reporting arrangements. The reporting requirements described in the IPP at paragraph 110 d), subheadings i) through v) apply to *all* vessels targeting squid in the SQU6T fishery, not just observed vessels. Tows undertaken, observer coverage, SLED use, and sea lion bycatch information is needed from all SQU6T vessels in order to generate accurate estimates of sea lion bycatch as prescribed in the monitoring procedure. MFish clarifies also that observed sea lion mortalities do not figure in the estimation of bycatch subject to the FRML.

Economic considerations

Submissions

116 WWF notes that the recent modeling of management rules incorporated a component for lost fishing effort. Considering past strike rates of the fishery, WWF acknowledges that a rule 310 based FRML of sea lions will limit the squid fishing effort in SQU6T. However, WWF believes that the level of protection that needs to be afforded to New Zealand sea lions in order to achieve overall goals must drive FRML levels. WWF considers that the level of protection required in this case outweighs the economic cost assigned by modeling. They further note that squid availability has fluctuated greatly since establishment of the fishery in the 1970s, and that the TACC has not been reached in three of the past eight seasons even though the fishery remained open. WWF believe that introducing this economic measure into the evaluation of the different FRML rules is misleading, because it cannot be assumed that the economic cost of the FRML is the dollar value of uncaught TACC.

117 RFB submits that the figures presented in the IPP of loss to the industry of fishing closure are just speculation and should not be taken seriously given the highly variable nature of the squid fishery.

118 RFB also challenges MFish's characterisation of the obligation to provide industry access to the squid resource based on the TACC, noting that squid fisheries are notoriously variable. Between 1986 and 1995, the years the fishery was not constrained by a MALFIRM, on average only 56 percent of the catch limit was caught. RFB maintains that the TACC for this fishery is ad hoc and has no relationship to whether it is sustainable or not, or whether it meets the purposes and principles of the Fisheries Act 1996.

[5] Part XIV of the Fisheries Act 1996

MFish discussion

119 MFish does not agree with the position by WWF and RFB that economic loss to industry from closure of the fishing season are not relevant considerations when setting a FRML. MFish considers that economic loss from closure of the fishing season is a relevant consideration when balancing your sustainability and utilisation obligations as defined in s 8 of the Act. MFish accepts that underlying variability in squid catch and sea lion mortalities create uncertainty as to actual economic impacts in any given year, but notes the aggregate value of the fishery as reported in the IPP is substantial, and the modelled estimates reported in Table 2 illustrate the relative impacts in terms of lost fishing effort associated with alternative harvest control rules.

Other issues

120 Several additional issues or clarifications were raised in stakeholder submissions relevant to your consideration of the 2004-05 operational plan. These are organized below by submission and MFish response.

Sea lion bycatch in other fisheries

Submissions

121 WWF notes that MFish suggests in paragraph 60 that the proposed FRML figure is conservative in nature taking into account that sea lions are also caught in other fisheries. The IPP confirms that observer coverage in those other fisheries is low to nonexistent, and that knowledge on sea lion bycatch in those fisheries is limited. Consequently, WWF believes that the mortality of sea lions in those other fisheries referred to in paragraph 60 needs to be assessed by a one-off programme, using a minimum of 20% observer coverage, so that an appropriate bycatch figure can be calculated and included in the catch records when monitoring progress towards the FRML. WWF believes that bycatch in other fisheries is likely to be higher than the reported 1.75 observed catches in 1991-92, as observer coverage of those fleets in 1991-92 was insufficient to allow extrapolation and estimation of a total bycatch figure for those other fisheries.

122 RFB asserts that the IPP fails to acknowledge that other trawl fisheries kill sea lions and these need to be managed as part of any operational plan. The proposal does not integrate the effects of all fisheries on Hooker's sea lion within the FRML. This approach would breach the requirements of section 3G of the Marine Mammals Protection Act. RFB considers that the mortality limit must consider the effects of other fishing methods including trawling for orange roughy, southern blue whiting, and scampi. RFB notes that this is not considered in the Breen-Kim model.

123 RFB is also concerned with the poor consultation and reporting to environmental NGOs that has occurred in recent years. In past years there was an agreement to report all sea lions captured to the end of February and then report weekly. RFB submits that this system must be reinstated.

MFish discussion

124 MFish acknowledges that additional sea lion mortalities are occurring in other fisheries, as explained in paragraph 60 of the IPP. MFish notes that uncertainty in the level of sea lion bycatch in other fisheries, and the impracticality of including this mortality as part of the Breen Kim model. This information on additional mortality is a consideration you should include in your

determination of the FRML estimate relative to the range of mortality limits modeled as satisfying the interim management objectives. MFish understands that the Department of Conservation will endeavour to address other sources of sea lion mortality outside the SQU6T fishery as part of the population management plan, although this will not be available for consideration as part of the 2004-05 operational plan.

125 MFish tracks sea lion bycatch reports from both observer and vessel reports, and notes some discrepancies in the accounting of mortalities from the two sources over time. Stakeholders interested in the weekly sea lion bycatch report can arrange with MFish to be included in the distribution of sea lion bycatch information.

Characterisation of the breeding population

Submission

126 SFMC does not agree with paragraph 7 of the IPP that 95% of the breeding population occurs on two small rookeries on Dundas and Enderby Island. SFMC notes that there are five distinct breeding rookeries that are treated separately by DOC for the purposes of pup counts.

MFish discussion

127 MFish clarifies SFMC's point that there are five distinct breeding rookeries that are treated separately by the Department of Conservation for the purpose of pup counts. The Department considers that there are three discrete breeding colonies: 1) Northern Auckland Islands--Dundas Island and two sites on Enderby island (sandy bay and south east point); 2) Figure of Eight Island; and 3) Campbell Island. A small number of New Zealand sea lions are also breeding on Otago Peninsula. MFish also corrects the figure concerning the breeding population at the Dundas and Enderby Island sites as representing 83% of the total, not 95% as reported in the IPP.

Mortality events

Submission

128 RFB notes that the effects of the 1997 mass death of pups and adults and the last two years' high mortality of pups have not been adequately considered in the IPP.

MFish discussion

129 MFish considers that these effects were taken into account in the Breen-Kim model through the addition of stochastic variability in survival of pups and adults representative of observed data, and thereby encompassed several pup and adult mortality events.

Alternative fishing methods

Submission

130 RFB maintain that MFish should consider alternative methods of catching fish apart from trawling. Jigging is an internationally accepted method of fishing for squid and is used elsewhere in New Zealand. Jiggers have been used to catch squid around the Auckland Islands in past years including 1979-80 and 1984-85. RFB asserts that jig caught squid has always fetched a premium

price over trawl caught squid on the Japanese market (eg Mattlin 1983, p4, Barclay 2003[6], and others).

MFish discussion

131 MFish acknowledges that jigging may offer a more selective fishing method than trawling, and might thereby reduce sea lion bycatch. Vessels are 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 SQU6T and SQU1J, squid jigging has declined significantly since the mid 1990s. MFish has been advised that rough ocean conditions in the sub Antarctic ocean squid fishing grounds around the Auckland Islands can be both difficult and hazardous for squid jigging operations. MFish will examine more closely the feasibility of jig fishing in the SQU6T fishery, but feels it inappropriate to require jig methods as part of the operational plan in the absence of further information concerning its efficacy in this fishery.

Consultation with the Department of Conservation

132 Under s15(2) of the Fisheries Act, you are required to consult with the Minister of Conservation in taking measures set forth in the SQU6T sea lion Operational Plan. The Department of Conservation (Department) 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.

133 As a consequence of these relationships, the Department is afforded the opportunity to provide critical review and comment of the MFish policy papers leading to the SQU6T sea lion Operational Plan. This communication also allows Department officials to better advise their Minister in consulting with you on the Operational Plan.

Summary

134 Interested parties have been given an opportunity to provide written comments on the Initial Position Paper assessing operational plan alternatives. Comments were received from the Squid Fishery Management Company, Seafood Industry Council, Te Ohu Kai Moana, Dr Elizabeth Slooten, World Wildlife Fund New Zealand, and Royal Forest and Bird Protection Society. These parties have proposed a variety of operational plan refinements or changes for both estimating and monitoring the FRML. MFish has evaluated and responded to these submissions in this FAP in arriving at the recommendations provided to you.

135 Under section 15(2) of the Fisheries 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. MFish has developed a management process to address the New Zealand sea lion-trawl interactions in the SQU6T fishery during the 2004-05 fishing year. This process is similar to that used in previous years and continues to rely on the use of a fishing-related mortality limit (FRML) as enabled under s 15(2), to constrain New Zealand sea lion mortalities to a biologically acceptable level. The FRMLs calculated by NIWA from rules 310, 320, 4 and the Cusp rule all satisfied sea lion interim management objectives agreed upon by the Aquatic Environment Working Group, according to specific criteria also established by that group.

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[6] Barclay P (2003) Dancing the squid jig. Big Byte. Seafic.

136 After considering submissions from stakeholders, MFish recommends the FRML proposed in the IPP (115 sea lions for the 2004-05 SQU6T season), based on the associated harvest control rule (rule 4), as the approach to manage the sea lion SQU6T interaction, giving effect to the purpose of the Fisheries Act. This conclusion acknowledges the range in mortality limits satisfying the interim management objectives, but also recognises information uncertainty and the Court of Appeal determination that sea lions cannot be managed like a harvestable stock that can be exploited to a level that is just sustainable. Under these constraints, the adaptive approach of rule 4 offers a balance in meeting the dual obligation in the Fisheries Act. Rule 4 provides an increasing rate of sea lion bycatch at higher pup production levels, but is relatively more conservative when pup production is low. Model projections indicate Rule 4 will result in mean lost fishing effort of 12.2% over time.

137 Procedures proposed to measure and monitor sea lion bycatch applicable to the FRML include the use of a predetermined strike rate of 5.3%, and a strike rate discount factor of 20% for vessels employing SLEDS to estimate the total number of sea lion captures within the SQU6T fleet. Vessel reporting requirements are necessary to establish the number of tows undertaken in the SQU6T fishery as a basis for application of the predetermined strike rate needed to estimate sea lion mortalities applicable to the FRML. Vessels also need to notify the MFish observer program concerning their intended use of SLEDs in order to qualify for the discount allowance.

Key Elements of the Operational Plan

138 Having given due consideration to the submissions received, MFish proposes the following elements of the Operational Plan to address fishing-related mortality of the New Zealand sea lion in the SQU6T fishery for the 2004-05 season:

a) Adoption of harvest control rule 4, resulting in a FRML of 115 sea lions;

b) A predetermined strike rate of 5.3%;

c) A strike rate discount factor of 20% applicable to vessels using approved SLEDs.

Recommendations

139 It is recommended that you:

a) **Note** that management interventions for sea lion interactions in SQU6T fishery have been designed 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** that the Breen-Kim model indicates that unconstrained fishing almost meets the interim management objectives and that the maximum FRML that meets the objectives is the Cusp rule equating to 598 sea lions

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

   i) of harvest control rules meeting the interim management objectives concerning the Fishing Related Mortality Limit (FRML)

ii) of actual FRMLs meeting the interim management objectives as generated by the harvest control rules

iii) of possible pre-determined strike rates

iv) of possible strike rate discount factors

d) **Agree**, under s 15(2) of the Fisheries Act 1996, to establish a management intervention prescribing a FRML of **115** New Zealand sea lions for the 2004-05 fishing year**,** based on harvest control rule 4

e) **Agree** to implement a monitoring and reporting regime to estimate the total number of New Zealand sea lion catches against the FRML using a predetermined strike rate of **5.3%**

f) **Note** that continued research is necessary to establish the efficacy of SLEDs as they affect sea lion survival

g) **Agree** that a **20%** discount be applied to vessels employing a SLED design established by the Squid Fishery Management Company and approved by MFish

h) **Note** that vessels intending to fish for squid in SQU6T may be required to carry an observer to document SLED design and use as a condition for the 20% discount

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

Jim Cornelius
for Chief Executive
Ministry of Fisheries

APPROVED / APPROVED AS AMENDED / NOT APPROVED

Hon David Benson Pope
Ministry of Fisheries

21 / 10/2004

Encl