



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

## SQU6T Operational Plan: Initial Position Paper



## **Squid fishery around the Auckland Islands (SQU6T): Initial Position Paper**

The Ministry of Agriculture and Forestry (the Ministry) is consulting on the Operational Plan for the squid trawl fishery that operates around the Auckland Islands. The Ministry emphasises the views and proposals outlined in this paper are preliminary and are provided as a basis for consultation with stakeholders.

The Ministry welcomes written submissions on the proposals, which must be received by the Ministry no later than 4pm, Friday 23 December 2011.

For more information or any queries on the content of the document please contact Jeremy Helson at (04) 819 4643 or [Jeremy.Helson@maf.govt.nz](mailto:Jeremy.Helson@maf.govt.nz)

If you would like a hard copy of the document to be sent to you, please contact Kara McKelvey at (04) 819 4372 or [Kara.McKelvey@maf.govt.nz](mailto:Kara.McKelvey@maf.govt.nz)

**Please note: The closing date for submissions is 4pm, Friday 23 December 2011.**

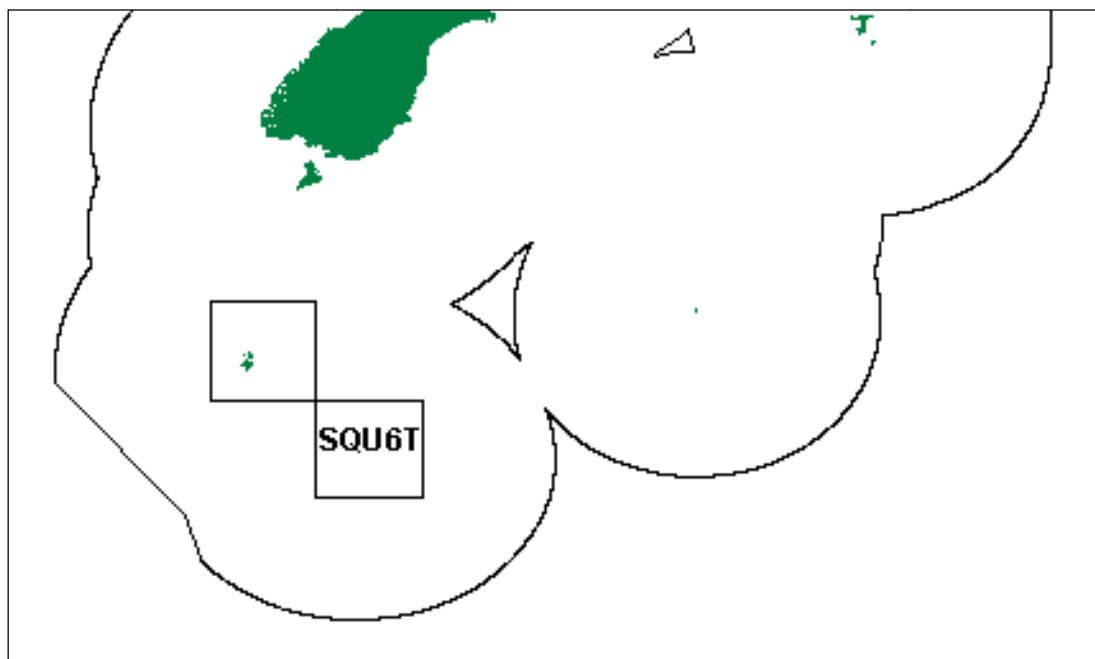
Written submissions should be sent directly to:

Kara McKelvey  
Ministry of Agriculture and Forestry  
PO Box 1020  
Wellington 6140

or emailed to [Kara.McKelvey@maf.govt.nz](mailto:Kara.McKelvey@maf.govt.nz)

## SQU6T – INITIAL POSITION PAPER

---



**Figure 1:** Location of the SQU6T fishery (both boxes).

### Purpose

1 This paper sets out the Ministry of Agriculture and Forestry's (Ministry) initial position on management measures for the squid trawl fishery operating around the Auckland Islands (SQU6T).

2 The purpose of the initial position paper (IPP) is to provide stakeholders with the most recent information and proposed management measures, including the initial views of the Ministry where appropriate, so that stakeholders can provide relevant feedback. The contents of the IPP, the views of stakeholders and any additional information are then used to formulate final advice for the Minister's consideration.

### PART ONE: BACKGROUND

3 The fishing grounds of the SQU6T fishery partially overlap with the foraging range of sea lions that inhabit the Auckland Islands; this leads to the incidental capture of sea lions by vessels that trawl for squid. The entire 12 nautical mile territorial sea around the Auckland Islands is a marine reserve. As such, all fishing is prohibited in this area which provides a measure of protection to sea lions that inhabit the Auckland Islands.

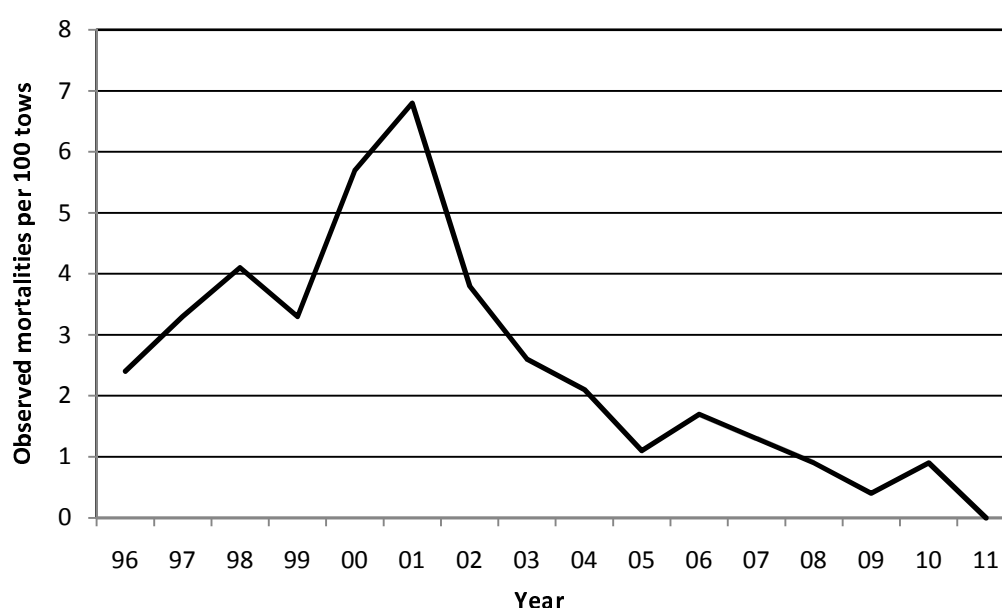
4 In recent years, the management approach has been to set a fishing-related mortality limit (FRML) to constrain sea lion mortality to an appropriate level and the Minister may close the SQU6T fishery to ensure that the FRML is not exceeded. The FRML is set using a population model that tests the likely performance of different management settings.

5 The primary risk mitigation practice used by trawl vessels is the sea lion exclusion device (SLED). These devices are fitted inside the trawl net and allow sea lions that enter the net to escape through a hole in the roof of the net. SLEDs have been subject to continuous design improvements over the last 10-15 years and since 2007 have been used by all vessels in the SQU6T fishery. The number and rate of observed mortalities has

declined markedly in recent years and the improvements to SLED design and use are likely to have contributed to this trend (Table 1 and Figure 2).

**Table 1:** Observed sea lion mortalities in the SQU6T fishery.

Year	1996	1997	1998	1999	2000	2001	2002	2003
Observed tows	535	747	338	153	435	577	560	426
Observed mortalities	13	25	14	5	25	39	21	11
Observed mortalities per 100 tows	2.4	3.3	4.1	3.3	5.7	6.8	3.8	2.6
Year	2004	2005	2006	2007	2008	2009	2010	2011
Observed tows	778	812	542	541	582	728	220	517
Observed mortalities	16	9	9	7	5	3	2	0
Observed mortalities per 100 tows	2.1	1.1	1.7	1.3	0.9	0.4	0.9	0



**Figure 2:** Observed rate of sea lion mortality since 1996.

6 However, despite this declining trend in sea lion captures there has been significant uncertainty over the last decade about the efficacy of SLEDs; particularly whether animals sustain fatal injuries in the process of exiting a SLED. Until 2010, sea lions that did not escape from trawl nets were necropsied to examine the extent of their injuries. This information was used to estimate whether those animals that did escape from the net would have suffered injuries that would compromise their survival chances (e.g. internal injuries or concussion after collision with the SLED grid).

7 In 2010, a review of all necropsy data was conducted by an international panel of four veterinary pathologists and one veterinary neurologist. The Panel's report discounted the possibility that any thoracic or abdominal injury would compromise the survival prognosis

of sea lions. Although no fatal head injuries have been observed in necropsied sea lions, mild trauma to the head that may result in drowning remained the other possible cause of mortality. The Panel's report concluded that because head injuries could be obscured by freezing sea lion bodies, and that the same freezing process could mimic lesions, necropsy data were not useful in assessing head injury in sea lions and hence their survival after they exit a net fitted with a SLED.

8 In 2010, an alternative method of assessing the potential for head injury, and the subsequent survival prognosis of animals that interact with a SLED grid, was trialled in a preliminary study. This method used biomechanical modelling to estimate the forces involved in collisions and to assess the likelihood that a sea lion would be killed or concussed if it collided with a SLED grid. This is similar to work conducted using crash-test dummies to record forces that are exerted on human bodies during car accidents. In 2011, the preliminary study was reviewed by the Ministry's Aquatic Environment Working Group. Following that review, the Ministry convened a research advisory group, comprised of local and international experts, to design a comprehensive research project to build upon and refine the preliminary work. This new research project was then conducted and the results reviewed by the Aquatic Environment Working Group. This paper uses the results of this new information to inform management of the SQU6T fishery.

## The New Zealand Sea Lion

9 The New Zealand sea lion was reclassified by the Department of Conservation in 2010 as "Nationally Critical" under the New Zealand Threat Classification System. This classification was made on the basis of an actual and projected decline in the population.

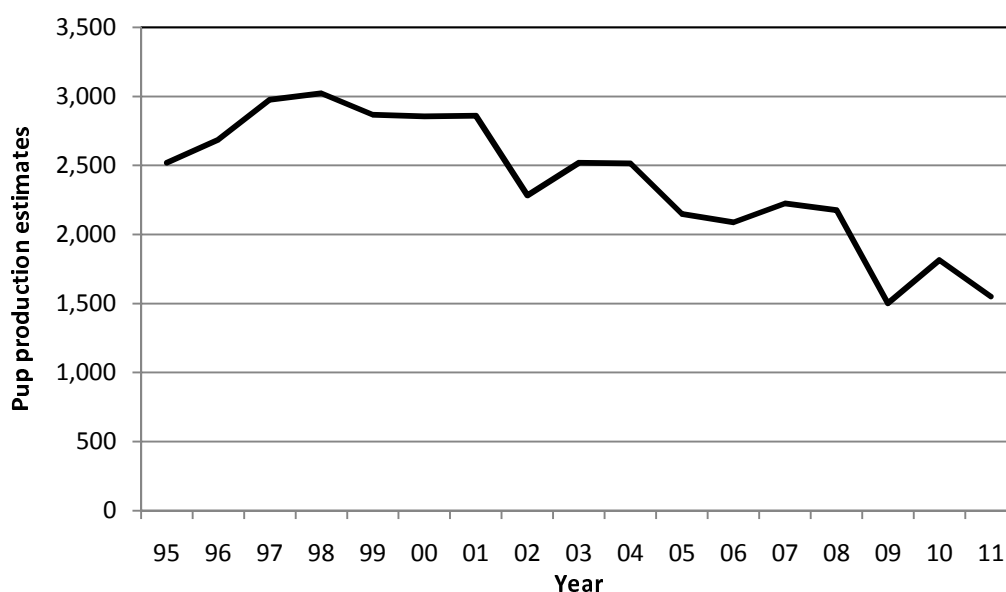
10 Pup numbers from the Auckland Islands are an important input into the population model and are used to estimate sea lion population size (Table 2 and Figure 3). The overall trend in pup production shows a steady decline since the late 1990s, this decline includes several disease events that are known to have caused significant pup mortality in 1998, 2002 and 2003.

11 In 2009 there was a significant decline in the pup production estimate that resulted in the fishing industry voluntarily limiting their effort in SQU6T for that season. The pup count rebounded in 2010 but the cause of the decline in 2009 remains unknown. The pup count in 2011 was again lower but due to extreme weather conditions there was some delay in making this pup count, which may affect comparability with previous years. The Department of Conservation's (DOC) analysis suggests any such effect is unlikely to be large.

12 Although the long-term decline in pup counts remains a concern, the most recent research, discussed in this paper, demonstrates that fishing is very unlikely to be having a direct effect on the sea lion population that could be considered adverse. The Ministry continues to work with the DOC to investigate the cause of the pup decline.

**Table 2:** Pup production estimates from the Auckland Islands rookeries combined, 1997-2011 (Source: Department of Conservation).

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003
Pup numbers	2,518	2,685	2,975	3,021	2,867	2,856	2,859	2,282	2,518
Year	2004	2005	2006	2007	2008	2009	2010	2011	-
Pup numbers	2,515	2,148	2,089	2,224	2,175	1,501	1,814	1,550	-



**Figure 3:** Pup production estimates from the Auckland Islands rookeries combined, 1997-2011.  
(Source: Department of Conservation).

## The Squid Fishery

13 Squid continues to be one of the main export earners for the seafood industry. In 2011, the export value for squid was \$98.2 million up to 1 October 2011 (Table 3). Squid is primarily harvested and sold during the first half of the year so the figure up to 1 October 2011 is likely to represent the bulk of export earnings for the year. The export revenues in Table 3 relate to the entire squid fishery and it is not possible to determine how much of this export revenue has come from squid harvested in SQU6T. However, in the 2011 season about 55% of the reported total squid landings were from SQU6T and squid harvested from SQU6T is typically larger and commands a higher price.

**Table 3:** Total export revenues (\$ millions) and catches (tonnes) from SQU1T and SQU6T.

	2004	2005	2006	2007	2008	2009	2010	2011*
Export revenue	\$171.8 M	\$168.1 M	\$118.0 M	\$85.7 M	\$71.0 M	\$75.3 M	\$89.4 M	\$98.2 M
Catch (SQU6T)	34,635 t	27,314 t	17,425 t	18,479 t	18,493 t	28,872 t	14,786 t	20,934 t
Catch (SQU1T)	48,060 t	49,779 t	49,149 t	49,495 t	36,171 t	16,407 t	14,957 t	16,759 t

\* Total export revenue is based on figures from 1 January to 1 October 2011.

## Legislative Considerations

14 The Marine Mammals Protection Act 1978 provides the opportunity for the Minister of Conservation to approve a population management plan (PMP). A PMP may contain an assessment of known fisheries interactions with sea lions, an assessment of the risk caused by fishing-related mortality and can also be used to set a maximum allowable level of fishing-related mortality. There is no PMP in place for New Zealand sea lions and consequently the interactions between sea lions and the SQU6T fishery are managed under the protected species provisions of the Fisheries Act 1996 (Act).

15 Section 15 of the Act sets out the Minister's responsibilities for managing the fishing-related mortality of protected species. Section 15(2) states that, in the absence of a PMP, the Minister may, after consultation with the Minister of Conservation, take such measures as he or she considers are necessary to avoid, remedy or mitigate the effect of fishing-related mortality on any protected species, and such measures may include setting a limit on fishing-related mortality.

16 In making his/her decision on management measures for the SQU6T fishery, the Minister is required to consider those measures that are "necessary" to avoid, remedy or mitigate the effect of fishing-related mortality on the New Zealand sea lion.

## **PART TWO: MANAGEMENT APPROACH**

17 In previous years, the management approach has been to set an annual fishing-related mortality limit (FRML) on the number of sea lions that can be incidentally caught in the SQU6T fishery. Since the 2003-04 fishing season, a population model has been used to evaluate the performance of harvest control rules against agreed management criteria to derive an appropriate FRML.

18 Each harvest control rule is examined to estimate the effects of fishing on the sea lion population and the potential fishing opportunities foregone as a result of constraining fishers from catching the squid Total Allowable Commercial Catch (TACC). The population model used to manage the SQU6T fishery assesses harvest control rules against the following criteria:

- a) A harvest control rule must provide for an increase in the sea lion population to more than 90% of carrying capacity, or to within 10% of the population size that would have been attained in the absence of fishing, and that these levels must be attained with 90% certainty, over 20-year and 100-year projections.
- b) A harvest control rule must attain a mean number of mature mammals that exceeded 90% of carrying capacity in the second 50 years of 100-year projection runs (to allow for build up of numbers in hypothetical depleted populations over time).

19 These management criteria were developed and approved in 2003 by a Technical Working Group comprised of the Ministry, DOC, squid industry representatives, and environmental groups. Although the Minister is free to make his own determination as to what is necessary to avoid, remedy or mitigate the effect of fishing-related mortality on the sea lion population, the Ministry considers that these management criteria provide guidance with regard to section 15(2). As with all models there is some uncertainty about how closely the model approximates real life. As such, sensitivity trials are conducted to test the effect that this uncertainty has on determining which harvest control rules, and hence FRMLs, meet the management criteria.

## **PART THREE: STRIKE RATE AND DISCOUNT RATE**

20 The strike rate and SLED discount rate are important components of the population model and for this reason are discussed prior to the model results. More importantly, new research is now available that demonstrates the discount rate should be higher than the current value of 35%.

### **Strike Rate**

21 When an FRML is set, fishing activity is monitored against this limit. However, the actual number of sea lions that are incidentally caught in squid fishing gear cannot be directly recorded due to the use of SLEDs which are designed to enable sea lions to escape from the trawl net.

22 Therefore an approximation of fatal interactions between squid vessels and sea lions is used. The number of sea lions that are presumed to be killed in the fishery is estimated using a pre-determined strike rate that is currently set at 5.65%. This means that for every 100 tows conducted, there are assumed to be 5.65 sea lion interactions with trawls that would be fatal in the absence of SLEDs.

23 The current strike rate is based on the modelled assessment of the mean strike rate for SQU6T vessels. Further modelling of the strike rate was undertaken in 2008 which estimated a strike rate of 5.6% with a 95% confidence interval from 2.7% to 10%.<sup>1</sup> The mean strike rate for the last ten years is 6.1%.<sup>2</sup>

24 There remains some uncertainty associated with the modelled strike rate which is likely to vary from season to season. In some years, it could be above the mean while in other years it is likely to be below the mean. This level of variation is not problematic if the average strike rate is close to 5.65%. Despite the variation in estimates of strike rate, the long-term mean is close to the current estimate of 5.65% and the confidence interval around this estimate remains relatively wide. For these reasons the Ministry proposes retaining the current strike rate of 5.65%.<sup>3</sup>

### **SLED Discount Rate**

25 SLEDs are installed inside trawl nets and are designed to allow sea lions to escape from the net alive. The “discount rate” refers to the relative survival of sea lions encountering a net with a SLED that would have otherwise drowned in a net without a SLED. Since the 2003-04 season a discount on the strike rate has been applied to tows where vessels have deployed an approved SLED and where vessel operators have complied with the monitoring and reporting requirements set out in the SQU6T Operational Plan.<sup>4</sup> The current discount rate is 35%, which means that for all eligible tows the strike rate is reduced from 5.65% to 3.67%.

26 Two factors influence how effective SLEDs are at reducing sea lion mortalities: the probability that animals escape from the net via the SLED’s escape hole and the probability that those animals that do successfully escape subsequently survive. The discount rate is the product of these two probabilities.

27 New information is discussed below that has allowed the Ministry to assess these parameters more accurately; particularly the survival rate of animals that successfully escape from nets.

#### ***Probability that animals escape from the net***

28 The first factor that influences SLED efficacy is the frequency with which animals enter the trawl net and exit the net via the escape hole. This is referred to as the escape probability. The Ministry considers that escape probability may have increased in recent years due to ongoing improvements in SLED design and the ubiquitous use of SLEDs. This

---

<sup>1</sup> Thompson FN and Abraham ER. 2009. *Estimation of the capture of New Zealand sea lions (Phocarctos hookeri) in trawl fisheries, from 1995-96 to 2006-07*. New Zealand Aquatic Environment and Biodiversity Report 2009.

<sup>2</sup> Thompson FN, Abraham ER and Berkenbusch K. 2011. Marine mammal bycatch in New Zealand trawl fisheries, 1995-96 to 2009-10. Presented at the Aquatic Environment Working Group 9 November 2011.

<sup>3</sup> The population model also assumes that FRMLs will be calculated using a strike rate 5.65%; changing this may compromise the assessed performance of rules.

<sup>4</sup> The SQU6T Operational Plan contains the details regarding how the SQU6T fishery is managed. It includes the number of tows that are available in the fishery, the reporting requirements and SLED specifications that must be in place to receive the SLED discount.



may be a factor that has contributed to the demonstrated reduction in the rate of observed mortalities (see Table 1 and Figure 2).

29 Two estimates of escape probability have been calculated. The first estimate uses data from all years and does not assume any change to SLED efficacy in recent years. The second estimate allows for the possibility that SLEDs have become more effective from the 2006/07 fishing year and calculates escape probability accordingly. The estimates from these models are 80.0% (67.0–88.0%) and 90.0% (76.0–96.0%) respectively. The Aquatic Environment Working Group could find no reason to support one estimate over the other and instead considered that using an average of these two estimates was the most robust approach in the circumstances. This results in the current escape probability of 85.0% (69.0–96.0%) and means that, on average 85% of sea lions that enter a trawl net escape from the net.<sup>5</sup>

### *Probability that animals that escape via SLEDs survive*

30 In the past, a significant source of uncertainty has been whether animals that interact with the SLED, and subsequently exit the net, have sustained fatal injuries in that process. This was initially investigated using necropsies on animals retained in the net. However, expert reviews have concluded that this approach cannot be used to estimate injuries because freezing sea lions after capture both mimics and obscures lesions. More recently, biomechanical modelling has been used to estimate the forces involved in collisions between sea lions and SLED grids to assess the likelihood that impacts compromise the chances of a sea lion surviving after exiting the SLED. The likely speed and location of collisions was inferred from video footage of Australian fur seals interacting with a Seal Exclusion Device in a trawl. The estimated collision speeds were consistent with the observed swimming speeds for New Zealand sea lions. This is a closely related and similarly-sized species to the New Zealand sea lion and, although the trawl and exclusion devices are not identical, the Ministry considers the information to be a reasonable proxy in the absence of specific video footage.

31 Biomechanical modelling suggested that the probability of brain trauma sufficient in itself to cause death because of an impact with a SLED grid is zero. Further, the mean probability of a mild traumatic brain injury that could result in the animal drowning after exiting the SLED was estimated as 2.7%. This accounts for both the probability of an animal having a head first collision with a SLED grid, and the possibility of a single animal having multiple collisions that would compound any injury.<sup>6</sup> This means that animals are very unlikely to sustain any life-threatening injuries during the course of exiting the net via the SLED. Consequently, the Ministry's view is that the probability that animals have not had a life-threatening trauma after exiting a trawl net via a SLED is 97%.

32 However, there remains the possibility that those animals that exit the net have done so late in their dive. The time taken to negotiate the SLED and exit the trawl net could result in sea lions drowning before they reach the surface because they exceed their breath-holding capacity. Should this occur, the probability that animals survive after escaping from a trawl net would be lower than 97%. The Ministry considers that this should be taken into account and for that reason has conducted a sensitivity trial that assumes a lower survival probability. The possibility of this occurring is reflected in applying a reduced discount rate in the population model as a sensitivity analysis. The Ministry is not aware of any information that would inform an estimate of the likelihood of post-exit drowning; as such the Ministry

---

<sup>5</sup> Thompson FN. 2011. Marine mammal bycatch in New Zealand trawl fisheries, 1995–96 to 2009–10. PRO2010/01. Aquatic Environment Working Group, 9 November 2011.

<sup>6</sup> Abraham ER 2011. Probability of Mild Traumatic Brain Injury for sea lions interacting with SLEDs. Final Research Report for Ministry of Fisheries project SRP2011-03 (Unpublished report held by the Ministry of Fisheries, Wellington). 21 pages.

has assumed a reduction of the discount rate by 10% for the purpose of a sensitivity analysis.

### *Revision of the Discount Rate*

33 The SLED discount rate is the product of the probability that animals escape from the net and the probability that those animals that escape subsequently survive. The most recent information has estimated these probabilities to be 85.0% and 97.0% respectively. This information results in a discount rate of 82.0% (i.e.  $0.85 \times 0.97 = 0.8245$ ). The Ministry considers this constitutes the best available information and proposes increasing the SLED discount rate from 35% to 82%.

## **PART FOUR: CALCULATING AN FRML**

34 The FRML is a limit on the number of sea lions that can be incidentally caught in the SQU6T fishery. Since the 2003-04 fishing season a population model has been used to evaluate the performance of harvest control rules against the agreed management criteria to derive an FRML.

### **The Population Model**

35 This section describes model results and the effect of some of the uncertainty associated with the model. The outputs of the population model are used to calculate FRMLs using the average of the last two years' pup counts; as such, the FRMLs will vary annually as pup counts vary.<sup>7</sup>

### *Key model inputs*

36 The Ministry considers a SLED discount of 82% and a strike rate of 5.65% represents the best available information. This information is the most appropriate to use as a Base Case in the population model. However, due to time constraints, the Ministry was required to contract the population modelling prior to final confirmation of the probabilities used to estimate the discount rate. Consequently, the Ministry had the population model run using preliminary information and requested a Base Case using a discount rate of 75% and sensitivities of 65% and 85% to account for the range of possible uncertainty associated with the discount rate. Including previous model runs, the Ministry now has model outputs at discount rates that span the whole range from 0 to 100%.

### *Sensitivity analyses*

37 To assess the possibility that post-exit survivability is lower than 82%, due to the possibility that animals drown on their return swim to the surface, the Ministry ran a sensitivity using a discount rate of 65% (i.e. 10% lower than the then assumed Base Case of 75%).

38 In addition to the sensitivity trial associated with the SLED discount rate, there is also uncertainty about some of the values of other parameters used in the population model. This uncertainty relates to the following:

- a. The maximum rate of population growth (sensitivity trials 1 & 2)
- b. How pup survival responds to population size (sensitivity trials 3 & 4)
- c. The maximum pupping rate (sensitivity trial 5).

---

<sup>7</sup> The population model also assesses a Rule 2 Series. This generates fixed FRMLs that do not rely on estimating the pup numbers each year. Given recent fluctuations in pup numbers, the Ministry is continuing to assess potential management measures using the Rule 3 Series only.

39 To assess the influence of the above sources of uncertainty, each of the three model runs (65%, 75% and 85%) was also assessed against the five sensitivity trials to test the influence that varying these parameters has on which harvest control rules meet the management criteria. These trials take into account the possible impact on the model results if current assumptions about the outstanding areas of uncertainty are incorrect.

40 The 75% Base Case using the Base Model assumptions (i.e. with no sensitivities) indicates that the management criteria would be met without the need for an FRML (Table 4). This is also the case for the two other models that use the 65% and 85% discount rates as sensitivities. Under all three models, four of the sensitivity trials indicate that no FRML is required to meet the management criteria. If a new Base Case was run using the best estimate of the discount rate of 82%, the management criteria would also be met without the need for an FRML.

41 The most conservative sensitivity trial (sensitivity trial 2 which imposes no influential prior belief on the rate of maximum population growth rate in the model) did not meet the management criteria at any point (Table 4). Based on this sensitivity trial, even no fishing would fail to meet the management criteria. In effect, this sensitivity trial predicts that even if all fishing was stopped, the sea lion population would continue to decline towards extinction. In previous years, the Ministry has questioned the credibility of this sensitivity trial given the sea lion population has sustained significant reductions in the past due to sealing in the early nineteenth century and has subsequently rebounded to a stable higher level.<sup>8</sup> The Ministry considers that sensitivity trial 2 is not plausible over the long term.

**Table 4:** The results of the population model using the Base Case (shaded area) and the described sensitivity trials. “No FRML” indicates that the management criteria were met without the need for an FRML. “- -” indicates that even the absence of fishing does not meet the management criteria.

	65% SLED discount rate		75% SLED discount rate		85% SLED discount rate	
	Rule	FRML	Rule	FRML	Rule	FRML
Base Model	No FRML	No FRML	No FRML	No FRML	No FRML	No FRML
Most conservative sensitivity trial	--	--	--	--	--	--
All other sensitivity trials	No FRML	No FRML	No FRML	No FRML	No FRML	No FRML

## The Ministry’s proposed management

42 The Ministry considers that the best available information demonstrates that the current management procedures adequately manage the risk of fishing to the sea lion population. The most recent research strongly suggests that the direct effect of fishing-related mortality on the New Zealand sea lion population is minimal and the results of the population model also demonstrate that no FRML is necessary to meet the established management criteria. This conclusion is robust to uncertainty in many of the key parameters individually (not necessarily in combination), but may not apply if the level of fishing effort or sea lion catchability increase beyond the bounds assumed by the model. However, this is based on strict adherence to the current management regime; most importantly the use of SLEDs that comply with the specifications in the SQU6T Operational Plan.

<sup>8</sup> The possibility of the sea lion population becoming extinct in the absence of fishing is also considered by the population model’s primary author to be unlikely.

43 For this reason, the Ministry proposes that an FRML no longer be set in the SQU6T fishery. This management approach would be conditional on the following:

- a) All vessels operating in the SQU6T fishery continue to carry and deploy SLEDs that meet the specifications in the SQU6T Operational Plan;
- b) All vessels follow the reporting requirements specified in the SQU6T Operational Plan; and,
- c) No new information becomes available that suggests the risk to sea lions posed by fishing in SQU6T is appreciably greater than current information suggests.

### ***Monitoring and Review***

44 The Ministry will continue to implement similar monitoring and reporting procedures to those in place in the 2010-11 SQU6T season. However, the Ministry intends to increase the target for observer coverage on vessels in the SQU6T fishery from 30% to 50%. This is to ensure that compliance with the Operational Plan remains high and to provide additional monitoring that would become part of the ongoing management of the SQU6T fishery.

45 The Ministry proposition is that the “no FRML” management approach would be reviewed after five years unless an earlier review is triggered by one or more of the following:

- a) Less than 98% of tows undertaken in the SQU6T fishery use a SLED that meets the specification detailed in the SQU6T Operational Plan;
- b) Less than 95% of tows undertaken in the SQU6T fishery meet the reporting requirements specified in the SQU6T Operational Plan;
- c) More than 15 observed sea lion captures in any one SQU6T season;
- d) More than 4,700 tows;
- e) A pup count of fewer than 1,501 pups on the Auckland Islands;
- f) Any new information that suggests the risk to sea lions posed by fishing in SQU6T is appreciably greater than current information suggests.

46 The population model assumes the fishery will attempt a certain number of tows each year. Squid are highly variable and the model incorporates this through an assumption that the number of tows varies between 405 and 6,082. If the real SQU6T fishery undertakes more tows than this, the model’s assessment of rule performance may be optimistic. The Ministry therefore proposes a trigger of 4,700 tows, being the 90<sup>th</sup> percentile of the number of tows assumed in the model. It is more appropriate to use some percentile of the distribution rather than the maximum because average tow length has steadily increased from about four hours in 2002 to about eight hours in 2010 and longer tows are expected to catch somewhat more sea lions than shorter tows.

47 The Ministry notes that pup counts have in the past been used to generate FRMLs from the harvest control rules that meet the management criteria. As all plausible model runs meet the management criteria without the need for an FRML, the pup counts have not been used to generate FRMLs this year. In essence, the latest research strongly suggests that the direct effect of fishing will not compromise the sea lion population’s ability to meet the agreed management criteria and fishing-related mortality is not the primary cause of the observed pup decline. However, the population model used to evaluate the harvest control rules predicted a strong increase in the sea lion population after the 2009 nadir and further declines in pup production would be increasingly inconsistent with the model’s predictions. If

pup production on the Auckland Islands falls below the lowest level previously reported (1,501 in 2009), it would be reasonable to reassess the reliability of the model and the effect on harvest control rule performance.

48 The Ministry notes that section 15(5) of the Act provides the Minister with the option of closing the fishery to ensure an FRML is not exceeded. This option has been exercised in previous years. The proposal to no longer set an FRML in the SQU6T fishery would remove the ability for the Minister to close the SQU6T fishery under section 15; this would not remove the possibility of closing the SQU6T fishery as an emergency measure under section 16.

## **PART FIVE: MONITORING AND REPORTING**

### **Overview of 2010-11 season**

49 During the 2010-11 fishing year, 1,573 tows were conducted. Based on the assumptions in 2010 of a strike rate of 5.65% and a 35% discount rate, 1,573 tows results in an estimate of 58 mortalities from the current FRML of 68. This estimate is an assumed mortality only and is based on current assumptions.

50 The Ministry's Observers observed 517 (33%) of the 1,573 tows in the fishery during the season and no actual mortalities were observed by Ministry Observers or reported by the fishing industry.

51 Ministry Observers carried out audits of SLEDs while onboard SQU6T vessels and all SLEDs that were used in the fishery met the agreed specifications and passed in-season checks by Observers and fishery officers. Of the 1,573 tows that were undertaken during the 2010-11 season, 1,551 (98.6%) tows were eligible for the discounted strike rate. Twenty-two tows were not eligible for the SLED discount because one vessel failed to provide the required 72 hour notification to the Ministry.

### **Monitoring and reporting requirements for 2011-12**

52 The Ministry proposes to implement similar monitoring and reporting procedures that were in place for the 2010-11 season. This will require:

- a) The fishing vessel operator to notify the Ministry's Observer Programme at least 72 hours before leaving port to ensure there is sufficient time to place an observer onboard the vessel before it sails. This notification may also be used as an opportunity for fishery officers to undertake a port inspection of the SLED.
- b) The Master of the fishing vessel is required to report to the Ministry, at the end of the fishing trip, any encounter with a marine mammal that resulted in death or injury. Ministry Observers will notify the Observer Programme immediately following the capture of a sea lion.
- c) All vessels in the SQU6T fishery will participate in a weekly reporting regime managed by the Deepwater Group Ltd (DWG). Upon the request of the Ministry's Fisheries Manager Deepwater, reporting will be daily. The information reported will include:
  - i. Each tow undertaken in the SQU6T fishery.
  - ii. Whether the tow was observed by a Ministry Observer.
  - iii. If an approved SLED was deployed during the tow.
  - iv. If a sea lion was caught during the tow and whether it was released alive, retained or returned dead to the sea.

53 All SLEDs will be returned to port to be audited prior to the start of the SQU6T season. Both the Ministry Observer Programme and Field Operations will continue to inspect SLEDs throughout the season to ensure the vessel is carrying the SLED for which it was given approval and that the SLED has not been adjusted or modified and is in working order.

54 The Ministry no longer requires frozen sea lions to be returned for necropsy.

55 As specified above, the Ministry intends to increase the minimum target of observer coverage across the SQU6T fishery during the 2011-12 fishing season from 30% to 50%.

### **Consultation**

56 The Ministry is seeking views from stakeholders on the management options presented in this IPP. Stakeholder submissions will be considered before final advice is prepared for the Minister. **The Ministry reminds stakeholders that submissions received will be posted on the Ministry's website.** If for any reason a submission contains confidential information and it should not be made public then the Ministry should be advised at the time the submission is made.