



Operational Plan to Manage the Incidental Capture of New Zealand Sea lions in the Southern Squid Trawl Fishery (SQU6T) for 2016-17

Decision Document

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Executive Summary

The New Zealand sea lion is one of the rarest sea lions in the world with a current estimated population of around 11,800. The commercial southern squid trawl fishery (SQU6T) overlaps with the foraging range of sea lions that breed at the Auckland Islands. This can lead to the incidental capture of sea lions in fishing gear.

For the last five years, sea lion interactions with the SQU6T fishery have been managed through the 'Operational Plan to Manage the Incidental Capture of New Zealand Sea lions in the Southern Squid Trawl Fishery (SQU 6T) 2012 – 2016' (Operational Plan 2012-16) which expired on 30 September 2016. The measures in the Operational Plan gave effect to the Minister for Primary Industries' decisions to set a fishing-related mortality limit of 68 sea lions under section 15(2) of the Fisheries Act 1996 (the Act), and information provision requirements set under section 15(3) of the Act, for the duration of the plan.

A review and update of management settings for the SQU6T fishery has been included as an action under the proposed 'New Zealand Sea lion/Rāpoka Threat Management Plan' (TMP) however, because the TMP has not yet been finalised, revised management measures have not been developed in time for the 2016-17 fishery. The TMP will provide a framework for all sea lion research and threat management for the Ministry for Primary Industries (MPI) and the Department of Conservation (DOC).

MPI undertook a targeted consultation¹ in December 2016 with SQU6T quota holders, iwi and environmental stakeholders on a proposal to extend the provisions of the Operational Plan (2012-16) for a further year pending the outcome of a full review proposed for 2017. Six submissions were received; two supported the proposal and four opposed it and instead proposed more stringent management settings. Submissions in opposition reiterated concerns raised in relation to the development of the Operational Plan 2012-16.

After considering the submissions, MPI recommends that you maintain the same FRML and other management measures contained in the Operational Plan (2012-16) for one more fishing year. MPI considers this to be consistent with your statutory obligations under the Act. A thorough review of the management measures used to avoid, remedy or mitigate the effect of SQU6T fishing related mortality of sea lions will take place in 2017.

PURPOSE

This decision document provides you with final advice on setting management measures to manage sea lion interactions with the southern squid trawl fishery (SQU6T) for the current fishing year (2016-17).

BACKGROUND

The New Zealand sea lion (sea lion) is an endemic, protected species that is a taonga for tangata whenua. New Zealand sea lions have been protected since 1894 when their hunting was prohibited. As a result of intense hunting prior to 1894, the breeding distribution is now concentrated in the sub-Antarctic islands with about 98% of annual pup production coming from the Auckland Islands and Campbell Island. The New Zealand sea lion is currently categorised as a threatened species under section 2(3) of the Marine Mammals Act 1978.

¹ Letter dated 12 December 2016 from Dave Turner, Director Fisheries Management, MPI

The New Zealand sea lion population is monitored using pup counts to estimate pup production which is considered to be an index of total population size. Pup counts at the main breeding site at the Auckland Islands have been completed annually for over 20 years. Pup production at the Auckland Islands declined by 50% between 1998 and 2009 but appears to have stabilised in the last eight years (Figure 1). Due to the observed decline in pup production and the limited number of breeding sites, New Zealand sea lions were classified by the Department of Conservation (DOC) in 2010 as ‘Nationally Critical’ under the New Zealand Threat Classification System.

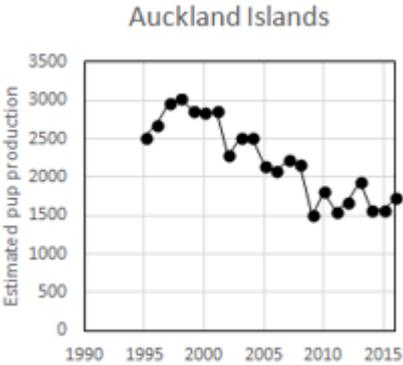


Figure 1: Pup production estimates from Auckland Islands 1995 - 2015

Recent scientific modelling² to support the development of the Threat Management Plan for New Zealand sea lions, suggests that the decline in pup production was caused by a number of factors including several large disease events that are known to have caused significant sea lion pup mortality in 1998, 2002 and 2003.

Auckland Islands Squid Fishery (SQU6T)

The southern squid trawl fishery (SQU6T) targets squid on the Auckland Islands shelf from January to June each year (Figure 2). The TACC is 32,369 tonnes but landings have not reached the TACC since 2004. The catch in the last fishing year (2015-16) was 25,171 tonnes. The number of vessels participating in the SQU6T fishery has declined significantly over time, from 63 vessels operating in 1990 to 20 in 2016.

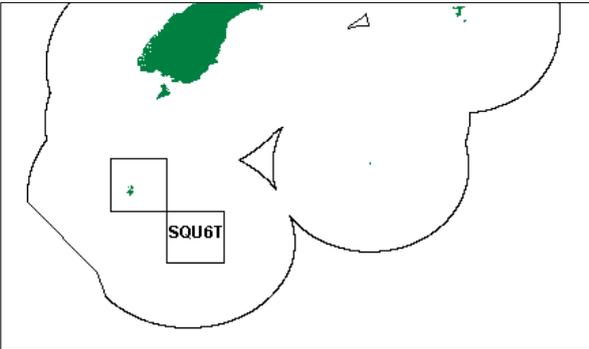


Figure 2: Quota Management Area SQU6T

² Roberts, J.; Doonan, I. (2016). Quantitative Risk Assessment of Threats to New Zealand Sea Lions. *New Zealand Aquatic Environment and Biodiversity Report No. 166*. 111 p.

Squid is one of New Zealand's most valuable export fish species. In 2015, the export value of squid was \$41M. Approximately 55% of squid landings were from SQU6T, with an estimated export value of \$22.5M in 2015.

MANAGEMENT OF INTERACTIONS

Auckland Islands Marine Mammal Sanctuary and Marine Reserve

The first protection given to the marine environment around the Auckland Islands was in 1993 when the area out to 12 nautical miles (the limit of the territorial sea) was made a marine mammal sanctuary. This was to protect both New Zealand sea lions which breed on the islands and feed in the waters around them, and Southern right whales which breed in the Port Ross area during the winter. The area was later designated as a Marine Reserve in 2003. However, sea lions also forage beyond 12 nautical miles from the shore of the Auckland Islands, and therefore there remains overlap between foraging sea lions and the SQU6T fishery.

Fishing-Related Mortality Level (FRML)

Under section 3E of the Marine Mammals Protection Act 1978, the Minister of Conservation may approve a population management plan for any marine mammal species. To date, no such plan has been approved.

Under section 15(2) of the Fisheries Act 1996 in the absence of a population management plan, you may, after consultation with the Minister of Conservation, take such measures as you consider are necessary to avoid, remedy, or mitigate the effect of fishing-related mortality on any protected species. Such measures may include setting a limit on fishing-related mortality (FRML). If the FRML is reached in a year, you may close the fishery under Section 15(5) of the Act.

Mortality limits for New Zealand sea lions have been in place for the SQU6T fishery since 1991. In concept, the FRML is based on scientific estimates of the number of mortalities which may occur without adversely impacting the sea lion population. The FRML that has applied for the past five years of 68 sea lions was set based on a New Zealand sea lion-specific population model known as the Breen-Fu-Gilbert (BFG) Model³.

The BFG population model assessed management settings against the following management criteria which were developed and approved in 2003 by a Technical Working Group comprised of the Ministry of Fisheries⁴, DOC, squid industry representatives, and environmental groups.

- a) The management setting 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) The management setting 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).

³ Breen, P.A.; Fu, D.; Gilbert, D.J. (2016). Sea lion population modelling and management procedure evaluations. *New Zealand Aquatic Environment and Biodiversity Report No. 175*. 89 p.

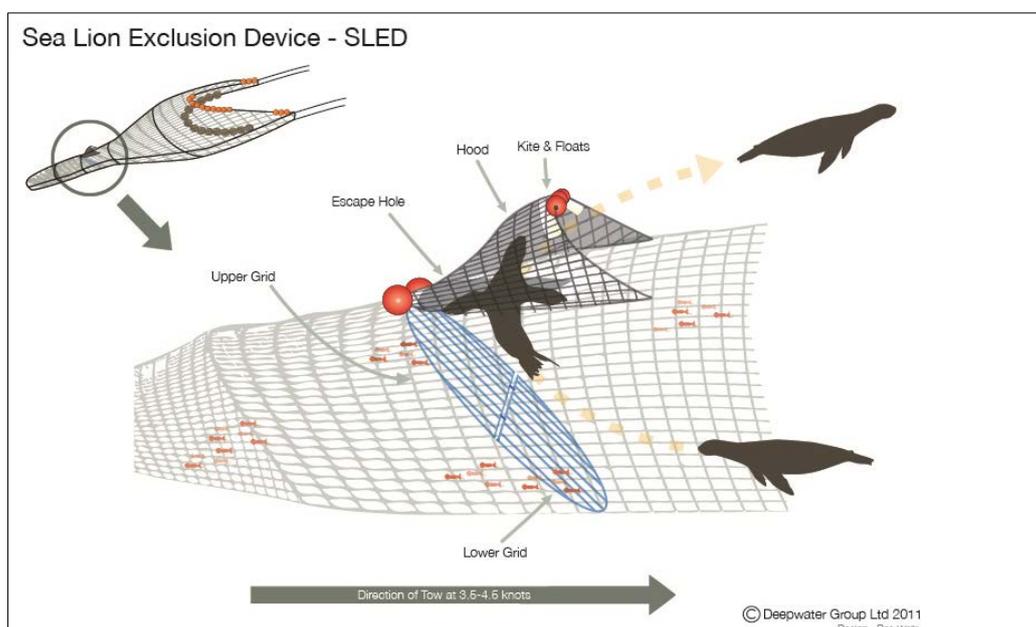
⁴ Now MPI

Following several iterations of the BFG model, the authors of the model concluded that, using the currently assumed value for the SLED discount rate (see below), restriction of fishing is not necessary to meet the agreed management criteria as long as fishing effort does not increase beyond its historical range and SLEDs are used. Despite this conclusion, the FRML was set at 68 sea lions.

Sea Lion Exclusion Devices (SLEDs)

Significant work and investment was undertaken by the fishing industry from 1998 until 2007 to develop the 'Sea Lion Exclusion Device' (SLED). SLEDs are designed to allow sea lions that enter the trawl net to escape through a hole in the roof of the net (Figure 3). SLEDs began to be used in the SQU6T fishery regularly from 2003 resulting in a marked decline in the number of sea lion captures recorded by MPI Observers.

Figure 3: Diagram of a SLED (courtesy of Deepwater Group Ltd)



The use of SLEDs is not regulated, however all vessels fishing in SQU6T carry at least two approved SLEDs which are inspected at the start of every season by a registered net making company to make sure they meet pre-agreed specifications. The condition and use of SLEDs is also audited by MPI observers. Based on a combination of observer and fisher-reported data, SLEDs have been used on over 99% of all tows in the last five years.

A side effect of the use of SLEDs has been the inability to directly observe the interaction rate of sea lions with trawl nets. Pre-SLED use, sea lions that entered trawl nets were generally retained in the trawl gear and could be counted. It is currently not possible to directly observe sea lions that enter the net and escape through the SLED, therefore the assessment of overall sea lion mortality now relies on assumptions based on historical information and scientific modelling. Two factors are relevant. The first is an estimate of the number of sea lions that enter the trawl net (strike rate) and the second is the proportion of these that would escape through the SLED and survive. The second factor (the discount rate) is the most contentious, compounded by the fact that to date there has been limited direct monitoring of SLEDs in operation.

Modelling of observed captures in SQU6T over time to estimate the probability that sea lions escape from trawl nets through SLEDs⁵⁶ indicated that 85% of sea lions that enter a trawl net can be expected to exit through a SLED when one is fitted. Additional work looking at potential injuries to sea lions encountering a SLED grid estimated that 3% of encounters with a grid could potentially prove fatal.⁷ The proportion of sea lions that exit a trawl via a SLED but drown after exceeding their breath-holding capacity is unknown.

A management action in the draft Threat Management Plan includes investigating new technologies (i.e. ultrasound cameras or RFID detectors) to improve understanding of sea lion interactions with trawl nets and SLEDs.

Operational Plan 2012-16

The 'strike rate' used in the Operational Plan 2012-16 and proposed for 2016-17 is a model-based estimate of the number of sea lions that would be killed (per 100 trawl tows) were no SLEDs used. 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%. In 2012, the mean long-term strike rate was updated to 5.89%.⁸ This means that for every 100 tows conducted in SQU6T, it is assumed that 5.89 sea lions would be killed if no SLED was deployed.

As outlined above, the SLED discount rate is a 'discount' on the agreed strike rate to reflect the increased chance of a sea lion surviving an interaction with trawl gear when a SLED is deployed compared to a net without a SLED.

Based on the work by Abraham et al. published in 2011, 85% of sea lions that enter trawl gear will escape through a SLED if it is fitted. Additional research on potential injuries to sea lions interacting with SLEDs suggested that roughly 3% of sea lions that interact with the SLED grid sustain a mild traumatic brain injury and their survival at depth is probably compromised. As a result, MPI adjusted the SLED discount rate from 35% to 82% in 2012.

Based on a strike rate of 5.89 per 100 tows it is estimated that it would take 1,154 tows in SQU6T for the FRML to be reached if no SLEDs were used in the fishery. Based on a discount rate of 82%, with SLEDs in use for all tows, it would take 6,415 tows for the FRML to be reached. Because the fishery has never reached this level of effort, it was agreed when developing the Operational Plan 2012-16 that a tow limit of 4,700 be applied in the fishery, with immediate review of management settings if effort reached that level. Effort and performance against the FRML for the most recent 10 years is shown in Table 1.

⁵ Ponte, G; van den Berg, A; Anderson, R W G (2011) Further analysis of the impact characteristics of the New Zealand Fisheries sea lion exclusion device stainless steel grid. Final Research Report for Ministry of Fisheries project SRP2010-05, Sept. 2011. 36 p. (Unpublished report held by the Ministry for Primary Industries, Wellington.)

⁶ Thompson, F.N.; Abraham, E.R. (2011). Estimation of the capture of New Zealand sea lions (*Phocarcetos hookeri*) in trawl fisheries, from 1995–96 to 2008–09. New Zealand Aquatic Environment and Biodiversity Report No. 66. 25p.

⁷ Abraham, E R (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 for Primary Industries, Wellington). 21 pages

⁸ Thompson FN, Abraham ER and Berkenbusch K. 2011. Marine mammal bycatch in New Zealand trawl fisheries, 1995–96 to 2009–10. Draft Final Research Report for Ministry of Fisheries project PRO2010-01 (Unpublished report held by the Ministry of Fisheries, Wellington). 80 pages

Table 1: Summary of the performance of the SQU6T fishery against the FRML

Weeks	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Max # of vessels reporting	22	20	18	21	20	17	16	12	15	11
Tows	1,318	1,257	1,916	1,159	1,573	1,260	1,015	761	616	1,364
Weeks	13	14	24	24	22	21	22	21	21	23
% of tows observed, by week	41%	47%	38%	19%	33%	48%	86%	84%	88%	92%
Estimated mortality	56	46	72	44	58	47	11	8	7	14
Reported mortalities	8	5	4	2	0	0	3	2	1	0
FRML	93	81	113	76	68	68	68	68	68	68
% of FRML	60%	57%	64% ⁹	57%	85%	69%	16%	12%	10%	21%

Other management measures

The Operational Plan 2012-16 details all of the relevant management settings, including

- An FRML of 68 sea lions set under section 15(2) of the Fisheries Act
- Arrangements to monitor the FRML of:
 - Strike rate in the absence of an approved SLED (5.89%)
 - SLED Discount factor (82%)
- Reporting requirements under section 15(3) of the Fisheries Act of
 - 72 hour notice of any trip intending to operate in SQU6T
 - Notification of any marine mammal captures within 48 hours
- Non-regulatory agreed requirements to report to Deepwater Group Ltd each tow, whether the tow was observed by an MPI observer, if a SLED was deployed, and if there were any sea lions observed captured (dead or alive)
- MPI to provide a minimum of 50% observer coverage across all tows in SQU6T fishery to audit SLED deployment and reporting of any interactions.
- Trigger points for immediate reconsideration of the settings of the Operational Plan or the FRML. (Note that these have been updated to reflect only those that are relevant for a single year Operational Plan).

Consultation

A targeted consultation on a proposal to extend the provisions of the Operational Plan (2012-16) for a further year took place from 12 to 23 December 2016. MPI directly contacted relevant SQU6T quota owners, commercial iwi interests, environmental groups and members of the public who had made individual submissions on the TMP. The consultation letter was also publically available on the MPI website. Stakeholders were invited to make a submission on the proposal to retain the FRML at 68 sea lions and retain the same management settings from the previous 5-year Operational Plan (2012-16).

⁹ In January 2009 industry agreed to reduce fishing effort by approximately 16% in SQU6T as an interim measure for the 2009 season in response to pup numbers being lower than expected.

SUBMISSIONS RECEIVED

Submissions were received from:

- a) Deepwater Group Ltd (DWG);
- b) Dr Simon Childerhouse, Blue Planet Marine;
- c) Professor Liz Slooten, University of Otago;
- d) The Royal Forest and Bird Protection Society of New Zealand Inc;
- e) The New Zealand Sea Lion Trust; and
- f) Associate Professor Bruce C. Robertson, University of Otago.

SUMMARY OF SUBMISSIONS

Full copies of submissions are attached (Appendix 1).

Support for the extension of the Operational Plan 2012-16 for one more year.

Two submissions agreed with the extension of the previous 5-year Operational Plan for one more year:

1. Deepwater Group Ltd (DWG) is a non-profit organisation representing holders of around 90% of the entire deepwater quota in New Zealand. DWG state that they have supported improved risk management and monitoring of sea lion captures in SQU6T for 10 years. They note that DWG works to ensure that all vessels fishing in SQU6T carry at least two SLEDs and every year all SLEDs are rechecked to the specified standard by approved net sheds and copies of each individual SLED “warrant of fitness” is provided to MPI. They state that squid trawler crews are briefed by the DWG Liaison Officer prior to the squid season and that fleet conformance with the Operational Plan has been very good.
2. Dr Simon Childerhouse, (Blue Planet Marine) is a Senior Marine Scientist involved with New Zealand sea lion research and field work. He supports the extension of the previous Operational Plan for one more year because of (a) the lack of an approved sea lion TMP; (b) the stabilisation of sea lion pup production at the Auckland Islands since 2009 and (c) the trigger to review management settings if the annual estimate of pup production at the Auckland Islands falls below 1,501 pups.

Opposition to the extension of the previous Operational Plan for one more year.

Four submissions suggested more stringent management measures be implemented:

1. Professor Liz Slooten from the Zoology Department at University of Otago submitted that she does not support the strike rate, SLED discount rate or the FRML as she considers them to be based on weak evidence and outdated information. She proposes that a precautionary approach must be applied, that the SLED discount rate be revised down to the previous discount rate of 35%, the FRML be halved to 34 and the strike rate increased to 10.
2. The Royal Forest and Bird Protection Society of New Zealand Inc. have been actively involved with MPI and DOC working groups and the management of marine mammals. They submit in agreement with Dr. Slooten that a precautionary approach must be applied, that the SLED discount rate be revised down and the strike rate increased. In addition they consider that the fishing industry has been able to double the trawling effort by increasing the length of tows and thus increasing the likelihood of sea lion interactions. They do not agree with the proposed FRML and recommend

zero mortality of sea lions from all fishing activities as soon as reasonably practical, and in any event, within 5 years while the fishing industry transitions to more sustainable fishing methods. They advocate for alternative fishing methods to be used such as jigging.

3. The New Zealand Sea Lion Trust has been involved with the protection of sea lions particularly on the Otago Coast since their formation in 2003. They acknowledge that the TMP has not been finalised but believe that progress could have been made to reduce the uncertainty around the efficacy of SLEDs and the BFG model on which the FRML, strike rate, SLED discount rate and maximum allowable number of tows is based. They submit that a reduction in the FRML and maximum number of tows is more than justified.
4. Associate Professor Bruce C. Robertson (University of Otago), considers that the evidence for high SLED efficacy is weak and, given this, the use of an 82% SLED discount rate is not justifiable. He supports the previous discount rate of 35% as an interim measure while further research on SLED efficacy is undertaken. He notes that the FRML of 68 is based on the Breen-Fu-Gilbert (BFG) model, which he considers “badly dated”. He proposes a FRML of 62 (the lowest value used since the 1992-93 squid season) or to halve the present limit and use a mortality limit of 34. He submits that the current strike rate (5.89) needs to be set to a level of at least 10. Based on these parameters (35% SLED discount rate; a 62 mortality limit, and a strike rate of 10), he submits that the maximum number of tows that should be allowed in SQU6T in 2016-17 is 954 tows.

MPI response to the suggestions for more stringent management measures

MPI considered submissions in the context that firstly it is proposed to extend the provisions of the operational plan for one year only and secondly a full review of the features of the operational plan will occur this year. With respect to the specific parameters used to monitor against the FRML the following considerations applied.

Some submitters suggested that the SLED discount rate should be set at the previous rate of 35%. MPI notes that the previous rate was based on outdated information, and was not informed by the quantitative modelling supporting 82% as an alternative.

The suggestion that the strike rate be increased to ten on the basis that the information used to estimate strike rate is dated. The current strike rate of 5.89 is based on the modelled assessment of the mean strike rate for SQU6T prior to full deployment of SLEDs. Submitters suggest that, instead, the highest single year should be used. This alternative would be significantly more conservative and is not supported by recent performance in the fishery. Further, MPI considers it better to average over a number of years when interpreting such variable information.

There were a number of suggestions regarding the setting of the FRML. The BFG model, which remains the best available information for setting management measures and a FRML, indicated that no FRML was required to meet the agreed objectives and this applied across a range of assumptions in the modelling including different values for strike rate and the SLED discount rate. The FRML of 68 was set to take a more cautious approach and provide a mechanism to allow closure of the fishery should it be required.

Legal Considerations

The New Zealand sea lion is a protected species under the Marine Mammals Protection Act 1978 which provides the opportunity for the Minister of Conservation to approve a population management plan. There is no population management plan approved for New Zealand sea lions. Accordingly section 15(2) of the Fisheries Act 1996 applies and says:

“the Minister may, after consulting 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, such measures may include setting a limit on fishing-related mortality.”

Section 15(5) of the Act gives you the power to close the SQU6T fishery in the event that the fishing-related mortality limit (FRML) is reached.

In making your decision on management measures for the SQU6T fishery you are required to:

- a) Consider the purpose of the Act which is to provide for utilisation while ensuring sustainability (section 8) – for this purpose:
 - a. Ensuring sustainability means
 - i. Maintaining the potential of fisheries resources to meet the reasonably foreseeable needs of future generations; and
 - ii. Avoiding, remedying, or mitigating any adverse effects of fishing on the aquatic environment
 - b. Utilisation means conserving, using, enhancing, and developing fisheries resources to enable people to provide for their social, economic, and cultural well-being.

MPI considers the recommended option to be consistent with the purpose of the Act because it provides for utilisation by allowing fishing within science-based limits which are set to avoid adverse effects of fishing on the New Zealand sea lion population.

- b) Take into account the environmental principles set out in the Act (section 9):
 - a. “Associated or dependent species should be maintained above a level that ensures their long-term viability;
 - b. Biological diversity of the aquatic environment should be maintained; and
 - c. Habitat of particular significance for fisheries management should be protected.”

MPI considers the recommended option to be consistent with the environmental principles of the Act because it sets management measures based on modelling done with the objectives of ensuring that the sea lion population is not adversely affected.

- c) Take into account the information principles in section 10 which require that:
 - a. “Decisions should be based on the best available information;
 - b. Decision makers should consider any uncertainty in the information available in any case;
 - c. Decision makers should be cautious when information is uncertain, unreliable, or inadequate; and
 - d. The absence of, or uncertainty in, any information should not be used as a reason for postponing or failing to take any measure to achieve the purpose of this Act.”

The proposal is consistent with section 10 of the Act because the settings are based on the best available information. The strike rate is set using an average of those years before SLEDs were deployed where information on strike rate is available. The SLED discount rate is set based on the most recent studies on the efficacy of SLEDs and the likelihood of subsequent survival of sea lions that interact with them. The FRML is set based on the BFG model which recommends a mortality limit that would ensure the sea lion population is not adversely impacted.

There are always uncertainties in science, however this is dealt with explicitly in the modelling that supports the setting of management measures. The main sources of uncertainty regarding the management settings for SQU6T include the inability to update the strike rate, uncertainties in the actual efficacy and survivability of SLEDs, and the overall number of mortalities that can occur without adversely impacting the sea lion population.

The FRML, strike rate and SLED discount rate are individual and separate components of the management decision. This means you should not deliberately try to compensate or offset one decision by being more optimistic or pessimistic in another. MPI acknowledges that, in terms of the day to day management of the fishery, the FRML, strike rate and SLED discount rate are inextricably linked.

You must also take into account the National Fisheries Plan for Deepwater and Middle-depth Fisheries (the National Deepwater Plan) that was approved under section 11A of the Act. The most relevant Management Objectives under the National Deepwater Plan are:

- i. MO1.1: Enable economically viable deepwater and middle-depth fisheries in New Zealand over the long-term
- ii. MO2.5: Manage deepwater and middle-depth fisheries to avoid or minimise adverse effects on the long-term viability of endangered, threatened and protected species

The recommended management settings are consistent with management objectives MO1.1 and MO2.5 of the National Deepwater Plan.

Under Section 5(a) of the Fisheries Act 1996 (the Act) you are required to act in a manner consistent with New Zealand's international obligations relating to fishing. This section of the Act makes relevant the United Nations Convention on the Law of the Sea ("UNCLOS") and in particular articles 61, 62 and 65. MPI considers the option proposed is consistent with international obligations and UNCLOS as it considers both conservation and utilisation of living resources.

Case Law

In 2004 the fishing industry sought judicial review of the Minister's decision to set an FRML of 62 sea lions (including a strike rate of 5.3 and a SLED discount rate of 20%).¹⁰ The Court found for the Industry and the FRML was increased to 124 for that season. In doing so, the Court of Appeal emphasised that section 15(2) only authorises measures that are "necessary" to avoid, remedy or mitigate the effect of fishing-related mortality on the sea lion population.

[7] "Fishing related mortality" refers only to the death of sea lions in the course of fishing activity. It does not extend to impacts on the sea lion population associated with, for instance, competition for squid. Further, what is important is the impact of fishing on the sea lion

¹⁰ Case citation CA 39/04

population as a whole and the section does not provide for measures aimed simply at eliminating or reducing individual deaths.”

What is necessary is a matter for your judgement; however, this assessment should be guided by the purpose and principles of the Act that are set out above. Further, the Court commented that the Minister was required to balance utilisation objectives and conservation values, and in the context of a harvestable species, this requires utilisation to the extent that it is sustainable. However, the Court recognised that:

[77]“*The point of the exercise is not to arrive at a number of sea lions which can be harvested sustainably, and thinking associated with sustainability of a harvestable species is not appropriate.”*

Given the underlying uncertainties involved the Court noted that any FRML chosen is likely to carry some degree of risk (perhaps negligible) to sea lions and that optimum usage does not equate to maximum usage. They were not aware of a simple method by which risk can be balanced against utilisation advantages and that a precautionary approach to the required balancing exercise is open to you. The Court also commented that a value judgment was called for and the Court was satisfied that the legislative framework required the Minister to form a view as to the extent to which (or the point at which) utilisation of the squid SQU6T resource threatened the sustainability of the sea lion population.

Other Matters

A key aspect of the development of the draft Threat Management Plan was the completion of a quantitative risk assessment of threats to New Zealand sea lions¹¹. This risk assessment identified a number of threats to the population including disease, commercial fishing, and high pup mortality from drownings. It also indicated that the complete alleviation of a single threat, such as fishing, would be unlikely to increase the sea lion population.

The risk assessment included the development of a new population model for sea lions at the Auckland Islands. This model is likely to be used when reviewing management settings in future, but has not yet been employed in that way.

ANALYSIS

MPI undertook public consultation on the proposal to extend the management settings in the previous 5-year Operational Plan for the SQU6T fishery for one more year (2016-17). Two submissions supported this proposal while four submissions opposed it and requested that you set more stringent management measures. Submissions in opposition were generally a reiteration of issues raised during the development of the Operational Plan 2012-16.

Specifically, submissions in opposition proposed:

- reducing the SLED discount rate of 82% to the previous discount rate set in 2011 of 35% until further data on SLED efficacy become available
- halving the FRML from 68 to 34 until a new model is available or reduce it from 68 to a FRML of 62
- a strike rate of (10) until robust data on strike rate are gathered
- that the maximum number of tows that should be allowed in SQU6T in 2016-17 is 954 tows rather than 4,700

¹¹ Roberts, J.; Doonan, I. (2016). Quantitative Risk Assessment of Threats to New Zealand Sea Lions. *New Zealand Aquatic Environment and Biodiversity Report No. 166*. 111 p.

MPI has considered these submissions but consider them to be inconsistent with your legal obligations to balance utilisation and sustainability. Further under section 10 of the Act, decisions should be based on the best available information.

Amending the management settings in the way proposed by the submitters would result in settings that were not based on the best available information and the recent performance in the fishery.

Under the proposal that was publically consulted, the main management settings are:

- fishing-related mortality limit (FRML) set at 68 sea lions
- pre-determined strike rate set at 5.89% and
- SLED discount rate set at 82%

Under section 15(5), you may close the fishery by notice in the Gazette to ensure that the fishing-related mortality limit is not exceeded. Under the management settings in the Operational Plan 2012-16, vessels report weekly and if the estimated sea lion mortalities are nearing the FRML, vessels report daily to ensure appropriate and timely management response. MPI will continue to provide you with weekly updates during the season which update the data that is contained in Table 1.

Officials are satisfied that operating under the these management settings will avoid, remedy, or mitigate the effect of fishing-related mortality of New Zealand sea lions during the 2016-17 SQU6T fishing season. This is based on the low observed sea lion interactions with SQU6T trawl nets in the last 5 years, the stable to increasing annual estimates of sea lion pup production since 2009 and the outcomes of the Quantitative Risk Assessment¹² undertaken to support the development of the TMP.

The management measures set out in the SQU6T Operational Plan have contributed to the estimated captures of sea lions in SQU6T declining from 43 in 2004 to 14 in 2016. The Quantitative Risk Assessment also suggests that the current level of direct impact on sea lions from the SQU6T fishery would not, in itself, cause the rate of decline in pup production at the Auckland Islands that was experienced between 1998 and 2009.

Conclusion

The key decision MPI is asking you to make is provided for under section 15 of the Act relating to fishing-related mortality of marine mammals or other wildlife. Note that you are required to consult with the Minister of Conservation before you set measures under section 15(2) of the Act. This decision document provides you with background information and advice for decisions on the management settings for an interim one year Operational Plan (2016-17). The recommendation under section 15(2) of the Act is to set the FRML at 68 sea lions although you have discretion to make alternative decisions.

Based on the outcomes of recent modelling work, MPI is satisfied that operating under the same management settings that have been in place for the previous five years will avoid, remedy, or mitigate the effect of fishing-related mortality of New Zealand sea lions during the SQU6T fishing season in 2016-17. The Operational Plan management settings will be

¹² Roberts, J.; Doonan, I. (2016). Quantitative Risk Assessment of Threats to New Zealand Sea Lions. *New Zealand Aquatic Environment and Biodiversity Report No. 166*. 111 p.

comprehensively reviewed in 2017 under the TMP framework. Using this framework will allow for robust discussions with stakeholders prior to public consultation. Under section 15(5) of the Act, you may close the fishery by notice in the Gazette to ensure that the fishing-related mortality limit is not exceeded. Under the management settings proposed in the interim Operational Plan (2016-17), vessels will report weekly to MPI and if estimated sea lion mortalities are nearing the FRML of 68, vessels will report daily to ensure appropriate and timely management response. MPI will provide you with weekly updates as the SQU6T fishery progresses.

Next Steps

The full review of the management settings for 2017 will be based on updated scientific modelling and include regular engagement with stakeholders through the Sea Lion Forum proposed as part of the Threat Management Plan. Key steps and indicative timeframe for the 2017 full review of the management measures for SQU6T:

Key step	Indicative timing
Scientific modelling initiated	Early March
Engagement with sea lion stakeholder group 'Sea Lion Forum'	April/May
Public consultation begins	End June
Provision of advice	October/November
Agreed Operational Plan	December

Appendix 1: Submissions

1. Richard Wells, Deepwater Group Ltd (DWG);
2. Dr Simon Childerhouse, Blue Planet Marine;
3. Professor Liz Slooten, University of Otago;
4. Katrina Goddard, Royal Forest and Bird Protection Society of New Zealand Inc;
5. Stephen Broni, Chairman, New Zealand Sea Lion Trust;
6. Associate Professor Bruce C. Robertson, University of Otago.

Submission 1

Dear MPI Managers

This email is Deepwater Group Ltd's (DWG) submission on the Operational Plan to manage the Incidental Capture of new Zealand Sea Lions in the Southern Squid Trawl Fishery (SQU6T) 2016-17.

DWG has been engaged in the support of improved risk management and monitoring of NZ sea lion captures in SQU6T for 10 years. We fully supported the previous 5 year MPI Operational Plan 2012-16.

Further, DWG works to ensure that all vessels carry at least two SLEDs, many carry three. Every year (and including this year) all SLEDs are rechecked to the specified standard by approved netsheds and copies of each individual SLED "warrant of fitness" provided to MPI. Squid trawlers are briefed by the DWG Liaison Officer prior to the squid season with a very strong focus on the MPI Operational Plan, and DWG risk mitigation Operational Procedures for seabirds and sea lions. Fleet conformance over the last 5 years to the MPI Operational Plan has been very good.

In regard the request for feedback on the 2016-17 Operational Plan DWG has canvassed all companies who operate vessels in SQU 6T and all major quotashare owners of SQU6T. All respondents to our request for feedback have advised that they support the proposed plan for 2016-17 as provided in the consultation document and therefore this submission supports that view.

Any queries regarding this submission may be directed to myself with contacts below.

Regards,

Richard Wells

Fisheries Specialist

Deepwater Group Ltd

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New Zealand

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Submission 2

Dear MPI,

I support the proposal for the existing 2012-2016 SQU 6T Operational Plan settings to be extended for an additional year including the proposed FRML of 68. I support the extension for a single year in light of:

- A lack of an approved TMP;
- The stabilisation of pup production at the Auckland Islands; and
- The trigger to review management settings if estimates of pup production fall below 1501 pups.

Thanks for the opportunity to comment.

Regards

Simon

Simon Childerhouse, Ph.D.

Senior Marine Scientist | Nelson Office | Ph: +64 (0)27 641-0164 |

Email: simon.childerhouse@blueplanetmarine.com | www.blueplanetmarine.com

PO Box 3639, Richmond, Nelson, New Zealand



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Submission 3

Submission on the Operational Plan to Manage the Incidental Capture of New Zealand Sea lions in the Southern Squid Fishery (SQU 6T) 2016-17

- The use of an 82% SLED discount rate is not justified give the very weak evidence for SLED efficacy. The SLED discount rate must be revised down to the previous discount rate of 35% until further data on SLED efficacy become available.
- The FRML of 68 is based on the Breen-Fu-Gilbert (BFG) model, which requires a major overhaul (e.g. Breen et al. 2016).
- A precautionary approach must be applied to setting the sea lion mortality limit in SQU6T. Given the continued decline of the population, I recommend halving the limit to 34 until a new model for setting sustainable mortality limits is available.

- The current strike rate (5.89) is more than a decade out of date. It needs to be set to a precautionary level of at least 10 until robust and current data on strike rate are gathered. In the 2001 squid fishing season there was 100% observer coverage of the SQU6T fishing fleet and the strike rate was more than 10 sea lions per 100 tows.
- These precautionary parameters (35% SLED discount rate; a 62 mortality limit, and a strike rate of 10) lead to a maximum number of 954 tows in SQU6T during the 2016-17 fishing season. This level of fishing effort is within the range recorded over the course of the 5 year operational plan (737 to 1281 tows).
- It is not clear why MPI is ignoring expert scientific advice and retaining its optimistic view that SLEDs are working as designed without evidence to substantiate this claim.
- The working group approach (e.g. AEWG) to science decisions allows the government to avoid legal battles with the NZ fishing industry, but does so at the expense of robust science and sustainable management of New Zealand's fisheries. I urge MPI to improve its science process by routinely including and heeding expert scientific advice.

Professor Liz Slooten, Zoology Department, Otago University, Dunedin, New Zealand
(027) 447-4418

Submission 4

Deepwater Fisheries Management Team
Ministry for Primary Industries
PO Box 2526
Wellington 6140



FMSubmission@mpi.govt.nz
19th December, 2016

Submission: Consultation on the Operational Plan to Manage the Incidental Capture of New Zealand Sea Lions in the Southern Squid Trawl Fishery (SQU6T) 2016 – 2017

The Royal Forest and Bird Protection Society of New Zealand Inc. (Forest & Bird) is New Zealand's largest independent conservation organization, numbering around 80,000 members and supporters. Our members are people that work to preserve our natural heritage and native species. Forest and

Bird is the New Zealand partner of the global BirdLife International network of NGOs with partners in 120 countries.

Key comments

- **Forest & Bird does not support the proposed FRML, strike rate and discount rate.**
- **We recommend taking a precautionary approach while key research including an expert panel is carried out to explore existing uncertainty in SLED efficacy, post-SLED survival and direct fishing impacts.**
- **In the interim we recommend for 2017 reverting back to the justifiable discount rate of 35% and an updated strike rate of 10 to reflect tow length.**
- **We wish to participate in the full review of the operational plan to manage the incidental capture of NZ sea lions in the SQU6T fishery and that this project follows international best practice which is to ensure that the process is open, transparent, and includes the best available information including peer reviewed published literature and that independent scientist are represented alongside fishing interests.**
- **As required, we want MPI to highlight all uncertainties and concerns raised through this submission, our draft TMP submission and TMP meetings (which relate to the FRML, discount rate and strike rate) with appropriate Ministers before any final management decisions are made.**

Consultation and Threat Management Plan:

Forest & Bird appreciates the opportunity to comment on the operational plan for the SQU6T fishery but is disappointed that the Ministry for Primary Industries (MPI) is consulting on the incidental capture of New Zealand sea lions when the Threat Management Plan (TMP) has not been completed.

The timing of the consultation and length of consultation period is also inappropriate and disappointing. As a member of the Aquatic Environment Working Group, the Conservation Services Programme and a key national environmental stakeholder that has participated in TMP meetings over the last few years and has consistently submitted on the proposed fisheries management plans, we would appreciate being kept updated and not blindsided with a consultation days before most offices close for Christmas.

The 5 year Operational Plan expired on 30th September, 2016 yet MPI waited until the evening of the 12th of December to email stakeholders the consultation letter. Forest & Bird had even discussed the operational plan review in a meeting with DOC and MPI representatives and was told that there wouldn't be a consultation this year and that the review of the 5 year operation plan would not take place in 2017, after critical research on sea lion exclusion device (SLED) had been completed. The concern with approving the expired operational plan for another year is that MPI have failed to use the best available science, have failed in the consultation letter to highlight any uncertainties around SLED efficacy, and have failed to recommend any precautionary management. Also as previously experienced, one year interim measures – like what is being proposed end up being in place for 5 years.

Of particular concern in the consultation letter is the paragraph:

“Based on the outcomes of research done to support the development of the TMP, it is considered that operating under the current management setting for one more season will

not pose any additional risk to the NZ sea lion population and remains consistent with sections 8, 9 and 10 of the Fisheries Act 1996”

As a key stakeholder we have not received any research that supports this underlined statement, nor are there any references included in the consultation document. In fact, what we know from the TMP process to date is that expert scientists have challenged MPIs model, the data, and the uncertainties around SLED efficacy. Yet, none of this uncertainty is mentioned in the consultation letter and we suspect none of this has been presented to the appropriate Ministers.

We request assurance that when the full review of the operational plan to manage the incidental capture of NZ sea lions in the SQU6T fishery takes place, that this project follows international best practice which is to ensure that the process is open, transparent, and includes the best available information including peer reviewed published literature. While fisheries interests are sure to be well represented in this work, we would also like to ensure that national conservation interests and independent scientists are also well represented and this requires our early participation in the projects design and objectives formation.

Before this review can take place an expert workshop needs to be carried out to explore the existing uncertainty in SLED efficacy, post-SLED survival and direct fishing impacts, the same as was done for pup mortality in June 2014, to thoroughly review fishing as a threat to sea lions at the Auckland Islands. We also want MPIs project - PRO2017-10 assessing “Cryptic mortality method-specific estimates for marine mammals (sea lions) (include design workshop, SLED interactions and other)”, to be completed. We support this important work to improve estimates of cryptic mortality in sea lions including the efficacy of SLEDs, and the interaction rates. In the research plan MPI correctly identifies that *“these parameters may significantly changes the results of the marine mammal risk assessment.”* It is for this important reason that this project must be carried out before the operational plan review and before the proposed cost-benefit analysis of additional fisheries restrictions. We cannot know the true costs and benefits of fisheries restrictions if we do not have a more accurate estimation of fisheries mortality. MPI have highlighted above that there could in fact be significant risk to NZ sea lions based on the cryptic mortality work, yet none of this has been presented in the consultation letter.

Forest & Bird does not support the proposed FRML, strike rate and SLED discount rate values being proposed for the interim management for 2016 – 2017.

Forest & Bird have previously highlighted in our submission on the 2012 Operational Plan review, through the TMP process and in our draft TMP submission, the serious concerns and the large uncertainties and assumptions especially around SLED efficacy. Our recommendation is to take a precautionary management approach, for this one year interim period while the review is undertaken.

Discount rate

There is no justification in the consultation letter as to why the discount rate concerns continuously raised have been dismissed or any reference to the cryptic mortality work. We can only assume this is because MPI are backing their unproven assumption that “approximately 82% of sea lions probably survive their interaction with fishing gear” (Background TMP document pg. 14).

From 2004-2007, the discount rate was set at 20%, before being increased to 35% (2008-2011). In 2012 to present the discount rate was increased to 82% on the assumption of high SLED efficacy. The expert panel's report indicates that they thought the 82% discount rate was not precautionary, as they stated that the "most plausible value" for the discount rate would be one that is "deliberately low to provide a precautionary approach" (Bradshaw et al, 2013). The expert panel even suggest "*Given the uncertainty associated with cryptic mortality and the intractability of its quantification, we consider that a value of 0.82 is more likely to be optimistic than pessimistic*" (Bradshaw et al, 2013). Given that there is no scientific evidence to support such a high survival rate a precautionary approach must be followed.

Forest & Bird does not support the discount rate of 82%. We recommend the discount rate should be reverted at a minimum back to the 35% (used during the 2010-11 fishing season) as post exit SLED survival is completely unknown and cryptic mortality has never been appropriately addressed since it was increased. The 35% discount rate should be reinstated for the 2017 fishing year until further research is conducted to determine post-exit survivability and cryptic mortality is accounted for, as both would affect the discount rate.

This is not a new recommendation Associate Professor Bruce Robertson also made this recommendation in his TMP submission. Please refer to both Forest & Bird's submissions and Associate Professor Bruce Robertson's submission for further detail.

Strike rate

Strike rate is another important factor that managers use when setting the total allowable kill quota of sea lions in a fishery – the fishing related mortality limit (FRML). The strike rate determines how many sea lions are killed per tow, if there was no SLED. As SLEDs are used in trawl nets the actual strike rate is not able to be determined, instead it is estimated. It was initially based on the standard average tow of less than four hours and was 5.3%, however tow length has doubled as vessels are trawling for longer periods, some greater than eight hours. This is a concern as effectively the industry has been able to double the trawling effort by increasing the length of tows and thus increasing the likelihood of sea lion interactions. Forest & Bird has preciously raised these concerns in our 2012 Operational plan submission as well as through the TMP process and our draft TMP submission. We recommended that MPI update the strike rate based on the best available information.

Forest & Bird is therefore disappointed that the uncertainty around strike rates are completely excluded from the consultation letter. There is clearly scientific evidence to support a higher strike rate and therefore for this interim year a precautionary approach must be followed.

Forest & Bird does not support the strike rate of 5.89. We recommend a strike rate of 10 be used while the important SLED research is carried out during the TMP process.

This is not a new recommendation Associate Professor Bruce Robertson also made this recommendation in his TMP submission. Please refer to both Forest & Bird's submissions and Associate Professor Bruce Robertson's submission for further detail.

FRML

Given the objective of the draft TMP “to promote the recovery and ensure the long-term viability of the NZ sea lion population” we do not support an allowable kill quota. Forest & Bird considers that no marine mammal, particularly nationally critical NZ sea lions which have declined by 50%, and that have full protection under the Marine Mammal Protection Act should be killed in any fishing operation, either accidentally or deliberately.

Forest & Bird recommends zero mortality of NZ sea lions from all fishing activities as soon as reasonably practical, and in any event within 5 years while the fishing industry transitions to more sustainable fishing methods. We therefore do not support the FRML of 68 being proposed. We have previously advocated for alternative fishing methods to be promoted and supported by MPI. There has been no effort from MPI to do so, and there is no mention of jigging as an alternative fishing method. Jigging would still allow for utilization of squid, but would not kill sea lions, other marine mammals or seabirds in the process.

Thank you for taking the time to hear Forest & Bird’s key concerns regarding the proposed Operational Plan measures for 2016 – 2017. Should you have any queries regarding our comments please do not hesitate to contact me.

Regards,

Katrina Goddard
Marine Conservation Advocate
K.Goddard@forestandbird.org.nz
PO Box 108055,
Symonds Street,
Auckland 1150

Submission 5

New Zealand Sea Lion Trust

Consultation on the Operational Plan to Manage the Incidental Capture of New Zealand Sea lions in the Southern Squid Fishery (SQU 6T) 2016-17

The New Zealand Sea Lion Trust is once again disappointed by the consultation process and the lack of progress in eliminating the high levels of uncertainty in the management of the SQU6T fishery.

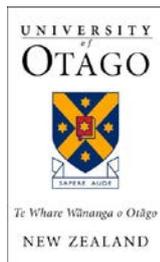
Firstly, the timing of this request for submissions just before the Christmas break and the start of the new squid fishery season means that even if reasonable suggestions were made and backed by already undertaken, credible science there would not be enough time to consult with all relevant parties and implement changes before the season begins. This is largely acknowledged in the letter requesting submissions and suggests that it is a foregone conclusion that status quo management measures will remain in place.

Secondly, while the Trust acknowledges the Threat Management Plan has not been finalised there are areas of uncertainty that have been widely acknowledged even prior to the beginning of the TMP process where progress could be made, this season, to reduce the uncertainty. In particular, the uncertainty around the efficacy of SLEDs. This was highlighted by independent scientific experts undertaking the review of the earlier statistical model back in 2013 and was again mentioned during consultation over the range of threats to New Zealand sea lions during the TMP process. Because it is unknown how many sea lions are drowning in nets and then being lost through the escape hatch (could range from 1-100) this uncertainty could have a large effect on management measures. Reducing this uncertainty has been listed as a high priority in the draft TMP and as it is likely to take several years of research it is important that we begin this process as quickly as possible. Regarding the Breen, Fu & Gilbert model on which the FRML, Strike Rate, Sled Discount Rate and Maximum allowable number of tows is based, the authors acknowledge “There are many potential uncertainties” and “this work is now badly flawed”¹³. Given that and uncertainties over efficacy of SLEDs the NZ Sea lion Trust believes a reduction in the FRML and maximum number of tows is more than justified and we are disappointed the Fishing Industry continues to fail to adopt a precautionary approach while the TMP is in process.

Stephen Broni MSc (Chairman)
New Zealand Sea Lion Trust
PO Box 6012
Dunedin

¹³ Breen, Fu & Gilbert Dec 2016: *Sea lion population modelling and management procedure evaluations New Zealand Aquatic Environment and Biodiversity Report No. 175*.

Submission 6



Department of Zoology

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Thursday, 22 December 2016

Submission on the Operational Plan to Manage the Incidental Capture of New Zealand Sea lions in the Southern Squid Fishery (SQU 6T) 2016-17

Please find my submission on the proposed Operational Plan to Manage the Incidental Capture of New Zealand Sea lions in the Southern Squid Fishery (SQU 6T) 2016-17.

My key recommendations are:

1. The evidence for high SLED efficacy is weak and, given this, the use of an 82% SLED discount rate is not justifiable, hence the SLED discount rate must be revised down. **The previous discount rate was 35% and I support this as an interim measure** while further research on SLED efficacy is undertaken.
2. The FRML of 68 is based on the Breen-Fu-Gilbert (BFG) model, which in the modellers' own words is "badly dated". Given the major overhaul required of this model (6 points noted in discussion of Breen et al. 2016), it is imperative that a precautionary approach be applied to setting the sea lion mortality limit in SQU6T. **I propose that a mortality limit of 62** (the lowest value used since the 1992-93 squid season: Table 3.8 in Sea Lion Chapter in AEBAR 2015) **be set until such time as a new model for determining a mortality limit is in place.** An alternative is to half the present limit and use a mortality limit of 34, which is more in keeping with a PBR approach to sea lion bycatch management.
3. **The current strike rate (5.89) needs to be set to a pre-cautionary level and hence to at least 10.** In the 2001 squid fishing season when there was 100% observer coverage of the SQU6T fishing fleet, the strike rate was over 10 sea lions per 100 tows. A strike rate of at least 10 will also reflect the impact of doubling of fishing effort in SQU6T from 2004 to the present.

4. Based on my proposed precautionary parameters (35% SLED discount rate; a 62 mortality limit, and a strike rate of 10), **the maximum number of tows that should be done in SQU6T in 2016-17 is 954 tows.**

This level of fishing effort is within the range recorded over the course of the 5 year operational plan (i.e. 737 to 1281 tows), indicating that taking a precautionary approach to sea lion management in the operational plan for the Southern Squid Fishery (SQU 6T) 2016-17 will not significantly impact on the squid fishery.

5. The question must be asked why MPI is choosing to ignore the expert scientific advice and sticking to its optimistic view that SLEDs are working as designed without appropriate evidence to back up this controversial claim.

This stance appears to be a reflection of “regulatory capture”, in that the NZ fishing industry has worked its way deeply into the decision making processes of MPI, hence becoming an “influential force”.

MPI relies heavily on working groups to run and peer-review the science process. These working groups are made up of predominantly government and fishing industry officials who decide how best to run the science process and what constitutes the best available information (the so called, BAI) for sea lion management. Other stakeholders (environmental NGOs and university) are fewer in number at these meetings and their dissenting views are invariably ignored in favour of the industry and governmental agenda. Expert scientific panels indicate that these working groups lead to science outcomes (the BAI) that may be acceptable to government and the NZ fishing industry, but do not stand up to international scientific scrutiny.

The working group approach to science decisions may allow the government to avoid legal battles with the NZ fishing industry, but it is at the expense of good science, logic and sustainable management of New Zealand’s fisheries. Until MPI’s science process changes to routinely include and heed expert scientific advice, we will continue to have non-sense, like the 82% SLED discount rate, being passed off as good science appearing in operational plans and government decision-making.

I call for a review of the apparent “regulatory capture” by the NZ fishing industry of MPI’s decision-making and science review processes. This needs to examine the role that the NZ fishing industry is playing in the decision-making process of MPI, including the science review process.

It is worth noting that in the Seafood Industry Council’s Business Plan 2011/12, it states that SeaFIC’s Chief Executive spent 0.1 FTE in the existing activity of “manag[ing] relationships with Ministers, officials and industry participants” with the intent of “establish[ing] the seafood industry as an influential force in government decision-making”. Clearly industry has been striving for “regulatory capture” of MPI’s decision-making processes. In this context, MPI’s strong resistance to expert scientific advice from independent sources needs to be examined urgently to rule out such “capture”.

The rushed timing of this consultation is disappointing, especially as the last 5-year plan for SQU6T expired on the 30 September 2016 and the consultation process for the sea lion Threat Management Planning process closed on the 19 August 2016. Furthermore, the “collaborative review of management settings for the SQU6T fishery” included as an action under the TMP cannot take place until the TMP is finalised, hence the present consultation was always going to be needed before late January 2017 when the southern squid fishery begins in 2017. **[At the rate of progress on the TMP and the future “collaborative review”, I suspect that MPI will have to revert to an *ad hoc* operational plan in the 2017-18 fishing year also, hence getting this extension right is paramount.]**

Despite this, stakeholders are asked to consult urgently on an extension of the operational plan days before the Christmas break. This sends the message that MPI are trying to limit the inclusion of stakeholders in the consultation by dumping the operational plan out in this busy time of year or that the decision of what parameters to use in the operational plan has already been made and hence this consultation is just a formality. Another option is that MPI’s processes are incompetent. Whatever the reason, all these options do not bode well for effective management of sea lion captures in SQU6T.

The proposed operational plan outlines keeping in place the previous 5-year operational plan (effectively rolling it over) that used a FRML of 68; a strike rate of 5.89; a SLED discount rate (which reflects SLED efficacy) of 82%; and a maximum number of tows of 4,700. **I do not support the use of these parameters in the proposed operational plan** given the remaining uncertainties associated with these parameters.

My stance should come as no surprise to MPI, as I have previously extensively set out my concerns with the “science” and “logic” that MPI uses to justify these parameter choices in various consultation submissions, email correspondence with MPI officials, and scientific publications. I would direct MPI officials to again reread my submission on the TMP (<https://sealiontrust.org.nz/wp-content/uploads/2016/10/Assoc-Prof-Bruce-Robertson-TMP-submission-minus-appendices.pdf>), which addresses a range of matters, including SLED efficacy that impacts on SLED discount rate.

The SLED discount rate is a pivotal parameter in the setting of the operational plan in SQU6T. For example, as noted in Figure 1, if the correct discount rate is actually 0.35 (35%) then less than 2000 tows can be done before breaching a FMRL of 68 and the Minister can close the fishery. If the correct discount rate was 0.35 (35%), but MPI incorrectly assumes it is 0.82 (82%), then allowing 4,700 tows would result in 180 sea lion deaths before the fishery is closed. Clearly getting the SLED discount rate right is paramount for meaningful sea lion management.

strike rate (SR, deaths per 100 tows)	5.89	5.89	5.89	5.89	5.89	5.89	5.89	5.89	5.89	5.89	5.89	5.89	5.89
discounted SR	1.06	1.18	1.47	1.77	2.06	2.36	2.65	2.95	3.24	3.53	3.83	4.12	4.42
SLED discount rate	0.82	0.8	0.75	0.7	0.65	0.6	0.55	0.5	0.45	0.4	0.35	0.3	0.25

tows													
Fishing effort in 2013 was													
1015	10.8	12.0	14.9	17.9	20.9	23.9	26.9	29.9	32.9	35.9	38.9	41.8	44.8
1500	15.9	17.7	22.1	26.5	30.9	35.3	39.8	44.2	48.6	53.0	57.4	61.8	66.3
2000	21.2	23.6	29.5	35.3	41.2	47.1	53.0	58.9	64.8	70.7	76.6	82.5	88.4
2500	26.5	29.5	36.8	44.2	51.5	58.9	66.3	73.6	81.0	88.4	95.7	103.1	110.4
3000	31.8	35.3	44.2	53.0	61.8	70.7	79.5	88.4	97.2	106.0	114.9	123.7	132.5
3500	37.1	41.2	51.5	61.8	72.2	82.5	92.8	103.1	113.4	123.7	134.0	144.3	154.6
4000	42.4	47.1	58.9	70.7	82.5	94.2	106.0	117.8	129.6	141.4	153.1	164.9	176.7
4500	47.7	53.0	66.3	79.5	92.8	106.0	119.3	132.5	145.8	159.0	172.3	185.5	198.8
4700	49.8	55.4	69.2	83.0	96.9	110.7	124.6	138.4	152.3	166.1	179.9	193.8	207.6

Fishing related morality limit = 68 sea lions

Figure 1 Impact of varying discount rate on the strike rate and the estimated number of sea lion deaths (numbers in the box) for varying levels of fishing effort (up to 4700 tows in the current operation plan for SQU6T). Green denotes number of sea lion deaths that are below the current Fishing Related Mortality Limit (FRML of 68 sea lions), while red indicate the fishing effort (tows) that would exceed the FRML of 68. Discount rates highlighted in yellow are the present (0.82), past (0.35) and a 0.5 discount rate (i.e. 50%). This analysis highlights that optimistic discount rates can result in higher numbers of estimated deaths than expected.

As MPI are not proposing to change the SLED discount rate in the current proposed operational plan, it is clear that my concerns with SLED efficacy and the other parameters are yet again being ignored.

So just for the record here are my concerns again:

- a SLED discount rate (which reflects SLED efficacy) of 82%:

MPI has been told repeatedly that the evidence for high SLED efficacy is weak and that given this the use of an 82% SLED discount rate is not justified. The sea lion expert panel in 2013 (Bradshaw et al. 2013) noted that until “real data” are available to inform SLED efficacy, a more precautionary discount rate should be used in the operational plan. Furthermore, available information, repeatedly ignored by MPI, indicates that hydrodynamics in the hood of the SLED could result in dead sea lions falling or floating out of the hood of the SLED, hence statements that equate declines in observed captures of sea lions with SLED efficacy are deceptive at best (Robertson 2015). The previous SLED discount rate used in operational plans was 35% - I support this value as an interim measure until a thorough reassessment of SLED efficacy is undertaken.

- a FRML of 68:

The FRML of 68 is based on the Breen-Fu-Gilbert (BFG) model that was extensively reviewed by the sea lion expert panel in 2013 (Bradshaw et al. 2013). This review was a consequence of widespread stakeholder concern with the assumptions and application of this model (Final Advice Paper 2012; available on MPI’s website). The expert panel found that the modelling infrastructure was adequate to undertake the task, but the panel (and various scientists) had many concerns with the assumptions and parameterisation of the model (Bradshaw et al. 2013; Breen et al. 2016).

Based on this, the panel concluded that “it will be impossible to determine whether the current limits upon the SQU6T fishery will succeed in meeting the agreed management requirements. Delaying re-assessment of the situation and management for five years appears inherently risky in the face of the unknown uncertainty around the model’s predictions.” [pg1, (Bradshaw et al. 2013)].”

That was 3 years ago and, with no change, the BFG model is still being used to set the FRML, even in the present proposed operational plan.

Just recently, the BFG modellers made an extraordinary admission about their model. They noted that the model is still used as the basis of sea lion management, but that it is “now badly dated” (Breen et al. 2016 AEBR-175).

So for the last 6 years (at least), MPI have used and defended a “badly dated” model to manage sea lion incidental mortality in SQU6T.

“Although it is the basis for MPI’s bycatch management, this work is now badly dated. If further work were to be conducted with a version of this model, much work would be required (in addition to incorporating the most recent data and the good estimates of bycatch now available, e.g. Thompson et al. 2013). This would include:

- revising the parameterisation for stochastic survival to remove the artefact
- including tag loss estimation in the predictions for tagged female re-sightings (Chilvers & MacKenzie 2010)
- trying to obtain pre-1988 bycatch estimates, which might have been high when the squid fishery first began (Richard Wells, pers. comm.)
- considering a female-only model, although this should not make much material difference
- running sensitivity trials on the effects of assumed z , and basing the assumption of z on a literature review
- combining the rookery pup counts after 1993 and fitting a single Auckland Islands population
- relaxing the prior on R_{max} and conducting sensitivity trials to the effect of this prior
- given the increase in tow length in the fishery, re-considering the estimation and projection of catchability “ [Breen et al. 2016]

Of even greater concern, the proposed operational plan glosses over that the BFG model is “badly dated” and instead, MPI proposes that a FRML of 68 will have no impact on the sea lion population. This is the same careless attitude that allowed FRMLs as high as 150 sea lions to be accepted in sea lion management using the BFG modelling (Table 3.8 in Sea lion Chapter in AEBA 2015).

The pre-cautionary approach with setting a mortality limit of sea lions in SQU6T is to reduce the FRML until such a time as a new model is fully tested and validated. Unfortunately, **MPI seems to prefer the “inherently risky” (Bradshaw et al. 2013) approach to sea lion management in SQU6T.**

Given the major overhaul required of this model (6 points noted in discussion of Breen et al. 2016), it is imperative that a precautionary approach be applied to the setting the mortality limit. **I propose that a mortality limit of 62** (the lowest value used since the 1992-93 squid season: Table 3.8 in Sea lion Chapter in AEBA 2015) **be used until such time as a new model for determining a mortality 160 limit is in place.** An alternative is to half the present limit (68) and use a mortality limit of 34, which is more in keeping with a PBR approach to determining sea lion fisheries mortality.

- a strike rate of 5.89:

As I noted in my submission on the 5-year operational plan consultation in 2011, the fishing industry doubled their tow durations and effectively doubled its fishing effort in the face of tow restrictions between 2004 and 2008 (Robertson 2011 – in the final advice documents presented to the Minister). Despite fishing effort doubling, the strike rate increased by only 0.35.

This illogically means that nets in the water for double the amount of time only catch 6% more sea lions.

MPI has pointed to work done in the early 2000s that suggests that tow duration is not a factor in catchability of sea lions, which goes against what is known for otariids in other fisheries world-wide. Note above that even MPI's modellers (Breen et al 2016) highlight that "given the increase in tow length in the fishery, re-considering the estimation and projection of catchability" is important in sea lion modelling, and hence management.

Catchability of sea lions is determined by fishing practices. Fishing practices have changed over the period when tow duration doubled (i.e. between early and late 2000s). I found using underwater camera footage summarised in Middleton and Banks (2008) that the number of turns in tows had increased significantly since the early and late 2000s. This is not surprising given that fishing effort for squid in SQU6T targets spawning aggregations and vessels need to turn more often to keep in contact with identified aggregations now that trawls are longer.

As nets must be partially hauled off the bottom when a vessel turns, this significantly increased the chances of sea lions interacting with nets mid-tow (in some tows nets are observed to be brought to the surface on a turn). Couple this with the existing uncertainty of SLED efficacy (i.e. it is unknown if dead animals are retained in the hood of the SLED; Robertson 2015), then **it is unclear what the current strike rate is or should be.**

The observed change in fishing practice information has been passed onto MPI (to the fisheries management and to the Ministerial level), but clearly it has not been included into the decision-making or the proposed operational plan currently under consultation. This is yet another piece of evidence that MPI is happy to ignore, as it does not fit with the government's agenda.

In 2001, when there was 100% observer coverage of the SQU6T fishing fleet, the strike rate was over 10 sea lions per 100 tows. The current strike rate needs to be set to a pre-cautionary level and hence to at least 10, which would be consistent with fishing effort doubling in response to fishing restrictions.

As I note above, **MPI currently have no empirical evidence that rules out the possibility that SLED design allows dead sea lions to float or fall out of trawl nets** and hence are not present at hauling for government observers to record them as bycatch. Indeed, the best available information (camera footage of SLED hood underwater dynamics indicates that dead animals can float out of the hood of the SLED: Middleton & Banks 2008; Robertson 2015).

Despite this, **MPI is happy to mislead the general public into believing that SLEDs are functioning as planned** and that these devices are responsible for solving the issue of sea lion bycatch in the southern squid fishery SQU6T.

MPI repeatedly state that their decision making is “science-based”. Even in the latest consultation on the “Future of our Fisheries” (consultation also closes the 23 December 2017), MPI states “MPI has a well-established and internationally recognised science process”. It is hard to see how an “internationally recognised science process” can allow decisions that are based on a lack of empirical evidence and that ignore the best available information that points to the need for a less optimistic conclusion (i.e. SLEDs may not be functioning as planned).

Clearly, MPI knows of the existing uncertainty with SLED efficacy, as it is proposing a research project (PRO2017-10 assessing “Cryptic mortality method-specific estimates for marine mammals (sea lions) (include design workshop, SLED interactions and other)”) to examine this uncertainty in SLED function, yet this uncertainty is ignored here and MPI insists on retaining the unjustified SLED discount rate of 82%.

This casual approach to fisheries management has been used before and appears to be one of MPI’s strategies to circumvent stakeholder concerns while sticking to its agenda. For example, the Final Advice Paper on the 5 year operational plan for SQU6T noted that the BFG model was appropriate for setting the FRML of 68 used in the 5 year operational plan, but at the same time acknowledged that the model was in need of urgent independent expert scientific review because of consistent stakeholder concerns.

The fact that the model needed review should have ruled out it being appropriate for use in sea lion management. The fact that the subsequent expert panel review upheld stakeholder concerns about the BFG model was of no consequence, as we are still lumped with this “badly dated” model that leaves sea lion management in an “inherently risky” position.

When claims are made that are not supported by evidence or do not adequately reflect real uncertainties, such claims are deceptive at best, but can be seen as fraudulent. **From a science perspective, I am embarrassed for MPI, because misrepresenting the findings of research or ignoring scientific findings risks heading down the path of research misconduct.** This type of conduct is not what should be expected of an “internationally recognised science process”, hence I encourage MPI to reconsider its operational plan and set a SLED discount rate that is precautionary and reflects the existing uncertainty in SLED efficacy.

As I note in my TMP submission (link above), the 2013 expert panel on sea lion management “deliberate[d] extensively on the efficacy of SLEDs” [Bradshaw et al. 2013] and questioned the use of the current 82% discount rate in sea lion management. The expert panel’s report indicates that they thought the 82% discount rate was not precautionary, as they stated that the “most plausible value” for the discount rate would be one that is “deliberately low to provide a precautionary approach”: “Our terms of reference specify that we are to evaluate the model as a management tool. We consider that until real data become available, MPI’s options regarding discount rate use in the model are:

1. Abandoning discount rates altogether (possibly politically unacceptable and implausibly assuming no animals that leave via the SLED survive);
2. Setting a coin toss discount rate of 0.5 (which would be arbitrary);
3. Sampling the rate from an uninformative (wide-interval) prior distribution (the result of which will depend entirely on the arbitrary centring of that prior);

4. Estimating it directly in the model as a parameter (although it might not be estimable and might bias other parameter estimates);
5. Making a subjective choice as to the most 'plausible' value (but perhaps deliberately 'low' to provide a precautionary approach); or
6. Examining current tagging and other data to determine whether there is any information on survival of vulnerable age classes already available (also unlikely to provide much useful information)." [Pg 25, Expert panel review of sea lion management, Bradshaw et al. 2013]

Given this damning expert criticism of an 82% SLED discount rate, the question must be asked, why is MPI choosing to ignore the expert advice and sticking to its optimistic view that SLEDs are working as designed without appropriate evidence to back up this controversial claim?

I suspect that this stance is a reflection of "regulatory capture", in that the NZ fishing industry has worked its way into the decision making processes of the MPI.

This is evident in the "internationally recognised science process" that relies heavily on working groups to run and peer-review the science process. These working groups are made up of predominantly government and fishing industry officials deciding how best to run the science process and what constitutes the best available information (the so called, BAI) for sea lion management. Other stakeholders (environmental NGOs and university) are fewer in number at these meetings and their dissenting views are invariably ignored in favour of the industry and governmental agenda.

There is also the perception that much of what is discussed in these working groups is a fait accompli, which is likely decided at other meetings, probably under the auspices of the Memorandum of Understanding between the NZ government and the NZ fishing industry. The MOU has brought MPI and the NZ fishing industry into closer partnership and was singled out for mention as contributing to SLED development in one MPI document.

As was demonstrated by the 2013 expert panel review of sea lion management (Bradshaw et al 2013), the working groups lead to science outcomes (referred to as the BAI defined in the Fisheries Act) that may be acceptable to government and the NZ fishing industry, but do not stand up to international scientific scrutiny (note, 3 years on, the expert panel's criticism of the SLED discount rate has still fallen on deaf ears).

The working group approach to science decisions may allow the government to avoid legal battles with the NZ fishing industry, but it is at the expense of good science, logic and sustainable management of New Zealand's fisheries. Threats of litigation – real or perceived – might also be ailing MPI's science and decision making process. Until MPI's science process changes to heed expert scientific advice, we will continue to have non-sense, like the 82% SLED discount rate, being passed off as good science appearing in operational plans and government decision-making to further government agendas.

Thank you for the opportunity to submit on the proposed operational plan. I hope that my submission will result in a reappraisal of the proposed operational plan.

Yours sincerely

A handwritten signature in black ink, appearing to read 'B Robertson', written in a cursive style.

Associate Professor Bruce Robertson