Review of Worldwide Best Practice to Mitigate Pinniped Incidental Capture in Trawls

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A REPORT COMMISSIONED BY DEPARTMENT OF CONSERVATION

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Report Prepared by:

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Part 1: Summary

Summary

The number of experts in the field of pinniped mitigation is relatively limited, discrete and well known.
This is particularly so on a regional basis (New Zealand and Australia).

Several major fishing nations are not actively engaged in mitigation either by research or in practice because either:

a) They do not have a problem to mitigate
b) They do not consider incidental captures a problem

South Africa is a good example of this.

Mitigation tools can be segregated as either activity (time, space or operation) based or technical (device of some sort to deter interaction or prevent capture/allow escape).

New Zealand trawl fisheries where the majority of incidental captures occur are often characterised by:

- Limited spatial extent of fishing grounds
- Multiple vessels
- Seasonal fishery (1-3 months duration)
- Bulk fishery (high catch rates, often tonnes per minute)
- Near shore (10-30 nm)

Acoustic Devices

Acoustic devices fall into two categories:

1. "Soft" pinger that alerts animal to potential danger and
2. "Hard" pinger that has deterrent effect due to either frequency or volume

We have found no evidence to suggest acoustic devices will have an application for mitigating fur seal incidental captures.

Exclusion Devices

Exclusion of pinnipeds by separating using a physical barrier completed with an escape hatch is documented to be the most common method either researched or employed in a number of fisheries globally (see Part 2).

It is apparent however that this method is not an "off the shelf" solution and may be deemed fishery dependant, with the characteristics of the animal to be excluded and the fishery having a major effect on potential efficacy.

Summary cont

This review (and the one undertaken by S Rowe for DoC in 2007) failed to discover any technical device or application that is being considered actively researched or applied currently beyond those well known (particularly Seal Exclusion Devices, or SEDs).

M Cawthorn notes that most researchers tend to look to New Zealand for information regarding pinniped bycatch mitigation due to the implementation of Sea Lion Exclusion Devices (SLEDs) in the New Zealand squid trawl fishery adjacent to the Auckland Islands.

It is likely that Australia, despite its relatively small fisheries is also more actively engaged in this field than most other nations, however much research there is driven with New Zealand input.

Part 2: Review of Worldwide Best Practice Mitigation Devices for Pinniped Incidental Captures in Trawls

M.Cawthorn April 2008

Introduction

This summary is intended to update as far as possible existing reviews of studies into the mitigation of pinniped bycatch in commercial trawl fisheries.

The question of seal biology, diet and foraging behaviour, interactions with fishing gear, and the efficacy of mitigation methods and equipment in trawl fisheries has been thoroughly addressed by the following authors: Northridge,(1991); Wickens and Sims, (1994); Fertl and Leatherwood, (1997); Knuckey et al,(2002); Shaughnessy et al, (2003); Wilkinson et al, (2003); Stewardson and Cawthorn (2004); Baird (2004); Mattlin (2005); Hooper et al (2005); Tilzey et al (2006); Hamer and Goldsworthy, (2006); Rowe (2007); and Lyle (2008).

Marine Mammal Scientists Consulted

To bring this topic as much up to date as possible the following marine mammal scientists were consulted. Dr Arne Bjørge, Norway; Dr Dick De Haan, Netherlands; Dr Simon Northridge, SMRU, Aberdeen; Dr Mike Meyer, Dept of Marine and Coastal Management, Cape Town South Africa; Dr Tom Loughlin NMFS USA (ret.); Dr Peter Shaughnessy, S.Australian Museum; Neville Smith, Mfish, Wellington, New Zealand. Scientists in Chile with knowledge of local seal bycatch problems were unavailable at time of writing.

Northern Hemisphere

Most current activity in the Northern Hemisphere is dedicated to the reduction of cetacean bycatch in trawl gear and static fisheries. Seals are occasionally taken in fish traps and gill nets around the Baltic Sea and along the coast of Norway but are not considered a major problem in that area. In UK fisheries waters where dolphin bycatch is a continuing problem, hard grids have been tested in pair trawl nets in the pelagic fishery for sea bass. The results have so far been equivocal. In the North East Pacific pollock fishery, trawlers used to have a major problem with the bycatch of Steller sea lions. Various combinations of 'blowout panels' and 'windows' in trawls to facilitate seals' escape were trialled with mixed results, but it seems the most effective measures to reduce bycatch were temporal and regional restrictions to fishing.

Southern Hemisphere

In the Southern Hemisphere, major pinniped bycatch occurs in the very large Chilean purse seine fisheries for jack mackerel, but bycatch mitigation is not a priority in this area. Fur seals interact in such numbers with purse seine fisheries for clupeids and mackerel in South Africa that, like Chile, mitigation of bycatch is not a consideration. Antarctic fur seals are taken in fisheries in the CCAMLR circum polar fisheries management areas. The true levels of bycatch are unknown. In the 2004 season over 150 were taken. However, in that season Hooper (2005) reported on mitigation experiments on 6 vessels in the commercial krill trawl fishery around South Georgia. These ranged from hard exclusion grids, with top or bottom opening hatches, to large mesh panels and a complicated series of mesh barriers inside the nets. In all cases, Hooper reports, the incidence of seal entanglements in the 2004 South Georgia fishery was either eliminated or greatly reduced. The data comparing total effort and observed effort exist but have not yet been processed. (Neville Smith, MFish pers comm.).

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New Zealand

It is currently recognised by those involved in mitigation studies that the development of seal exclusion devices by the fishing industry in New Zealand is leading the field. This is because New Zealand legislation protecting marine mammals has resulted in FRMLs being used as one of the tools to control the squid fishery. This in turn has forced the industry to be proactive and seek innovative mitigation methods that are effective and workable.

SLEDs

A consultative approach, involving all stakeholders, is taken when reviewing SLED efficacy. Input to design changes is provided by all participants resulting in incremental improvements each year with The overall aim is for bycatch to be as near to zero as practicably possible. SLEDs are designed to allow the free passage of target fish species into the codend while excluding adult and sub-adult seals which have free access out of the net via a permanently open escape hatch in the top panel of the net. Despite these efforts, there is one factor over which we have no control and that is seal behaviour. Mitigation strategies need to focus on allowing animals to exit the net of their own volition and maximise the likelihood of their survival. Exclusion devices like SLEDs offer the most practical solution.

To properly evaluate the benefits in any refinements to SLED designs, underwater monitoring is vital. Properly designed camera systems are an integral part of SLED evolution and a key to the successful escape and survival of any seals through better understanding of their behaviour within a net.

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Part 3: Other Relevant Information

Other Relevant Information

In addition to the work undertaken by M Cawthorn presented here, the following contacts and enquiries were made for either direct information or leads to information.

Ulrik Hansen

Senior Research Scientist, Ulrik Hansen of the Sintef Marine Facility and Flume Tank in Hirtshals, Denmark was contacted. This facility does a large amount of research into fishing gear separator devices and environmental mitigation methods for the entire North Sea region.

There has been no research undertaken to mitigate fur seal incidental captures in trawls at this centre. Neither could Mr Hansen describe any work (either research or commercial) of this nature in the region. It was noted (as in other information presented here), that The Scottish Marine Research Institute was looking at dolphin exclusion in particular trawl fisheries in the United Kingdom.

Rob Mattlin

The project and information being sought was noted to R Mattlin who provided two papers he has either written or had knowledge of. These were passed to M Cawthorn.

SETFIA Bycatch Forum

R Wells attended the SETFIA Bycatch Forum at the Australian Maritime College, Tasmania in April 2008.

Incidental capture of Australian and NZ furseals is an issue in three specific trawl fisheries there:

1. Grenadier (hoki) fishery which is seasonal on West Coast Tasmania
2. Pelagic redbait fishery on East Coast Tasmania
3. General “inshore” groundfish fishery around Victoria and South Australian coast

To date hard and soft grid SEDs have been trialled in the first two of these fisheries, and research is underway for the last. M Cawthorn has played a major role and has an excellent understanding of the issues there.

2004 NIWA Review

In 2004 the Hoki Fishery Management Company Ltd (HFMC) contracted NIWA to write a report on approaches to mitigating furseal captures in the hoki fishery.

This was completed by Suze Baird of NIWA in March 2004 for presentation to the Environmental Steering Group set up by HFMC and is appended as Appendix 1, in its entirety.

The search by S Baird poses no particular solutions that have not been discussed or considered here.

Part 4: Project Proposal

Desktop Review of potential mitigation options and gear operating parameters	This report has reviewed the world's best practice to assess potential mitigation options that may be applicable to mitigate interactions between New Zealand fur seals and trawl nets. In addition we will also assess trawl gear operating parameters, and provide a plan for the construction and deployment of a purpose-designed Seal Exclusion Device (SED) for New Zealand fur seals, *Arctocephalus forsteri*.
Development of a Prototype Fur Seal Exclusion Device	We will develop and construct a prototype SED, based on: • Outcomes from the above desktop review, • An assessment of New Zealand fur seal morphology • Experience from the Australian trawl fishery for blue grenadier • The successful development and deployment of a Sea Lion Excluder Device (SLED) in the New Zealand trawl fishery for squid • This will involve defining the prototype grid specifications; determining grid design, materials and escape hatch configurations.
Undertake Sea Trials with SED	We will undertake sea trials with the prototype SED to assess trawl dynamics with the SED deployed with the same vessel and net that will be used in the interactions of the SED with fur seals and commercial fish species.
Trial plan	We envisage that we will trial the SED under medium and heavy volume conditions (tentatively a total of 2 vessel trips covering a minimum of 4 tows) onboard the Sealord vessel *Taimania* during the winter Cook Strait spawning season.

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Assess SED impacts on fur seals and commercial fish species

The trawl gear containing the pre-trialled SED will be deployed and fished using current commercial practices. Monitoring equipment will be deployed with the trial SED will include video, depth and temperature loggers to profile the trawling environment. The trials will be undertaken by John Cleal, Martin Cawthorn, and the assessment of impacts on commercial fish species by Alistair Jerrett and Suzy Black, from Crop & Food Research Limited (C&FR).

Video:

- Two cameras will be deployed. One underwater video camera will be placed on top of the trawl looking back toward the hood opening to view fur seal and fish exits. Another camera will be placed inside the trawl looking back at the SED to view the catch. Video footage will be downloaded and a back up copy made after each tow.

Fishing conditions:

- We envisage that the SED will be trialled under medium and heavy volume conditions (tentatively a total of 2 vessel trips covering a minimum of 4 tows) onboard Sealord's vessel *Taimania* during the winter Cook Strait hoki spawning season.

Fish sampling and storage:

- On hauling, 25 fish will be randomly sampled from the cod-end and stored in insulated bins containing chilled seawater at 3^{o}C, prior to transportation back to the C&FR laboratory in Nelson.
- While onboard, fish will be visually assessed for external damage and manually checked for the onset of rigor development.

Laboratory sampling:

- On return to the C&FR laboratory, each fish will be characterised in terms of its damage, fatigue state and physiological condition and compared with fish sampled from a standard commercial trawl.
- Fish will be dissected and imaged using C&FR standard protocols (as developed and used in FRST contract C02X0302 Creating Higher Value Seafoods 2003-2008 and Seafood Innovations Limited contract Optimising Hoki Quality 2005-2008):
- Approximately 30 morphometric measurements including weight, length, sex, liver weight, gonad weight, etc
- Biochemical measurements on muscle pH, fillet Torrymeter reading
- Observational measurements including 9 x 16mpixel images per fish

Analyses of flesh quality:

- Raw data and images will be analysed for overall colour of the fillets and incidence of defects (gaping, bruising, blood spot, pinking) and damage.

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Video footage analysis

Underwater video footage will be analysed and an event log established.

Together with data from the monitoring equipment the footage will be analysed to determine the positive and/or negative conditions created by the trial SED in terms of:

- Escapement of fur seals
- Escapement of hoki and by-catch
- Physical damage to hoki and by-catch
- Altered flow profiles (e.g. bow wave)
- Flow/blockage of the trial SED

After analysing both the information gained from the in-trawl monitoring equipment, fish characterisation results and comparison with the C&FR archive data we will get a preliminary picture of the level of damage (if any) resulting from the trial SED and the nature of fur seal interactions with it.

Final report

A final report will be prepared detailing the comparisons between hoki captured with and without the SED in place. The report will cover:

- All fur seal images and sightings during trials, from vessel surface and underwater images
- Fur seal escapement
- Camera event log
- Hoki and by-catch fish quality comparison
- Physical fish damage
- Altered water profiles
- Flow/blockage of SED