Agreement on the Conservation of Albatrosses and Petrels

Tenth Meeting of the Seabird Bycatch Working Group

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Seeking Solutions to Net Captures in New Zealand Squid Trawl Fishery

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SUMMARY

The New Zealand squid trawl fishery has recognised and been addressing risk to albatross and diving seabird species since the mid-1980s. Early focus on netsonde and trawl cables saw measures applied that have reduced risk from these hazards. However, several species are still at risk from capture within, or entanglement on, the trawl nets themselves. The fishery is well observed and the most significant deep water trawl fishery contributor to impacts on several species.

Attention, analysis and activities have been considering net capture risk between 2008 and 2018. Despite workshops and ideas, no significant mitigation tools had been found.

In 2019 renewed, structured and collaborative impetus was given to the problem, again focussed on information and idea gathering followed by distillation of ideas into practical projects worthy of trials at sea.

1. BACKGROUND

New Zealand's southern squid trawl operates in high latitudes (48ºS-51ºS) during the austral summer and autumn months. The fleet uses both bottom and midwater trawls, on well-defined and relatively small grounds on the shelf edge. For a range of policy and economic reasons the fleet and effort has declined over the period, even in recent times between 2003 and 2018 effort has reduced more than 60% to around 2-3,000 tows per annum.

There is significant overlap with foraging seabirds notably due to the proximity of adjacent breeding areas of sooty shearwaters (*Puffinus griseus* approx. 10 million prs) white-chinned petrels (*Procellaria aequinoctialis* 200,000 prs) and two albatross species, whitecapped and southern Buller's (*Thalassarche cauta* and *T. bulleri* – approx. 95,000 prs and 12,000 prs respectively).

Since its development in the early 1980s, the fishery has been recognised for interactions with all of the above species.

The early focus was on the effects of net sonde cables and more recently (2000-2006) warp strikes on albatross. Both regulatory Regulations Factsheet and non-regulatory (vessel risk management Operational Procedures DWG Seabirds OP measures have significantly reduced these risks with high certainty in the results due to government observer coverage of fishing events averaging 15 - 40% from 2003-2012 and stepped up to 86 - 93% from 2013-2018 (Fisheries New Zealand data - Dragonfly website here).

However gross capture rates and trends continue to both fluctuate and be high enough to cause concern. Whilst sooty shearwater and white-chinned petrels have always been observed captured in squid trawl nets and dominate the total interactions, it is now more common to also see albatross caught. A fraction (varying annually between approx. 30-50%) of these interactions are at least initially non-lethal as birds are reported as released alive; however, some are obviously compromised, and all are fate unknown. Assessment of risk to seabirds and seabird populations is reviewed annually by Fisheries New Zealand (AEBR 2020 pp21-316 here)

For the whole New Zealand offshore trawl fleet, the squid fishery accounts for the majority of seabird captures annually. The relatively high interaction rates, high observer coverage and species mix make it an obvious target to seek to both reduce impacts and trial tools and measures with some ability to detect efficacy.

2. PAST WORK

Analyses and focus have been ongoing since about 2008. Both industry and government have funded scientific analysis of the observer data to endeavour to assess and understand risk and risk factors or exacerbators regarding trawl net interactions with the publication of Fisheries New Zealand reports pending.

An Information paper was submitted to ACAP SBWG in 2014 (SBWG6 Inf-04 here) summarising a workshop focussed on solutions for trawls and set nets. Trawl net mitigation figured in the Southern Seabirds Mitigation Stocktake Parker, 2017 (Mitigation Stocktake).

3. CURRENT WORK

3.1. Workshops

Subsequently, a group has been reformed (2019) to continue to focus on the issue in a structured way. The group is led by Southern Seabird Solutions (Southern Seabirds) and Deepwater Group (industry association DWG) and consists of government agencies (Department of Conservation and Fisheries New Zealand), fishing companies, gear suppliers and technical experts.

Two days of meetings were held in June 2019 which were used to review the landscape, look back at past information and then seek from the discussion all options to consider for mitigation. These workshops were summarised by Southern Seabirds and the meeting notes are posted here .

Based on all information three key themes were used to classify mitigation options:

1. Attraction – reduce seabirds' attendance to the vessel by reducing cues (sound and scent)
2. Deterrence – keep attending seabirds away from the danger area (by distraction, scaring)
3. Prevention – create barriers to seabirds becoming caught (physical or visual barriers)

3.2. Distillation Process for Candidate Projects

Once a wide suite of options had been collated from the meetings a subgroup was mandated to crystallise options for further consideration and trial.

Whilst the earlier meetings were held on a "all ideas on the table" basis in order not to constrain thinking, the discussion regarding candidate tools needed to be tempered by reality. The group, selected for their expertise in key areas therefore considered all options with the following in mind:

- Regulatory environment including animal welfare, protected species, fisheries, maritime, food production and health and safety rules
- Practicality – encompassing cost, potential efficacy, ability to operate in an ongoing manner in real situations (i.e. commercially viable)
- Risk – no greater risk to vessel and crew safety, seabird, other protected species or unwanted catch and fish quality

3.3. Candidate Projects

3.3.1. Attraction

- Reduce fishmeal plant odours - two project variants aimed at reducing smell by altering the condenser or masking by introducing main engine exhaust into the meal plant stack

3.3.2. Deterrence

- Distraction – strategic batching of fish waste immediately prior to haul to provide seabirds with an alternative food source
- Water spray – "heavy rain" from an agricultural irrigator over danger area

- Coloured strips – red streamers, white strips,
- Coloured netting components in net (wings, body)
- Strobes (on-net)

3.3.3 Barrier

- Wide strips (note this project developed from initial trials of white strips as a deterrent)

3.4. Creating Operational Projects

Further meetings of specialist groups were held to further develop the candidate projects with gear and engineering specialists involved as appropriate. Meetings were documented and notes circulated to the wider group to maintain inclusion, knowledge and consensus.

The arrival of Covid-19 impinged on the programme due to lockdown preventing vessel visits and the importation of some materials, especially coloured netting.

The fishmeal odour projects never reached field testing due to apparent cost and complexity following an engineering assessment (and considering likely overall efficacy given other cues available to seabirds (sight and sound).

Marine safety strobes were tested ashore on black-backed gulls (*Larus dominicanus dominicanus*) in an informal trial. The lack of any observable deterrent effect on this species has meant more desktop research relating to light is to be undertaken before any sea trials are considered.

Visualization of net haul via video and observing the size and visibility of the large brightly coloured floats on the wings led to an agreement that coloured netting was less likely to have efficacy than first envisaged and this project was put on hold (it was also affected by international material delivery).

3.5. Projects that reached the at-sea testing phase

For each project that reached the stage of testing at sea, a pro forma protocol document was developed along with a data recording form for the government observer (see Annex 2). Initial observations were focussed on seabird behaviour during trials. Vessel captains collected their own information on any operational issues arising and handheld video was used where possible.

In 2020 the following initial “proof of concept” trials commenced on four options (Figures 1-3 in Annex 1 of options 2-4) at sea:

1. Strategic batching
2. White strips
3. Red streamers
4. High capacity water sprayer

Subsequently, feedback has been received on each of these projects from both observers and captains.

Several small groups of government observers were interviewed in a panel-type situation by Southern Seabirds, DWG and Fisheries New Zealand. Their verbal feedback on how, when and where interactions occurred was noted.

A meeting in June 2021 of the wider group has considered the above information gathered to date and is now considering options including further trials and/or adaption of the methods.

3.6. Future Work and Discussion

Further trials will be undertaken during the austral spring and summer when seabird abundance again peaks for the breeding season of migratory albatross and petrel/shearwater species.

There will be an effort to again seek information from the international seascape via fishing companies and NGOs, especially in the Southern Hemisphere.

The process to date has highlighted the need to collect adequate data and with explicit objectives for the data such that it poses the right questions sought to be answered. Trawl net captures are complex in nature and simple forms for observers may be inadequate for this purpose.

References

Fisheries New Zealand AEBR (2020) Aquatic Environment and Biodiversity Annual Review 2019-20. Compiled by the Aquatic Environment Team, Fisheries New Zealand Science and Information, Fisheries New Zealand, Wellington, New Zealand. 765p.

Dragonfly website Dragonfly Science

Parker, GC 2017. Stocktake of measures for mitigating the incidental capture of seabirds in New Zealand commercial fisheries. Report to Southern Seabirds by Parker Conservation, Dunedin

Annex 1

Pictures of 3 trialled options

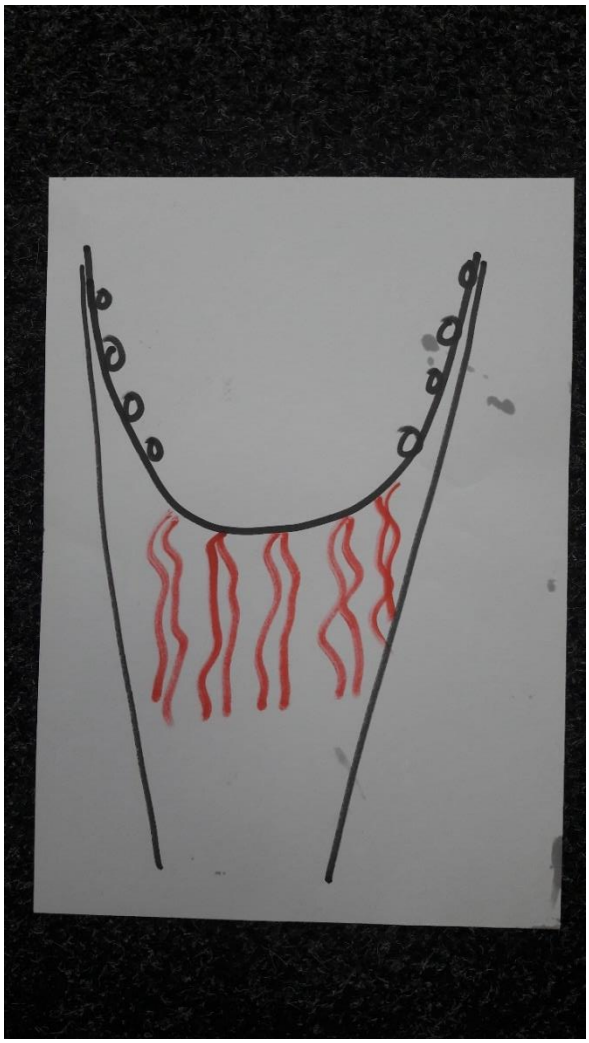

Figure 1: Red strips to act as per tori line streamers from head of net

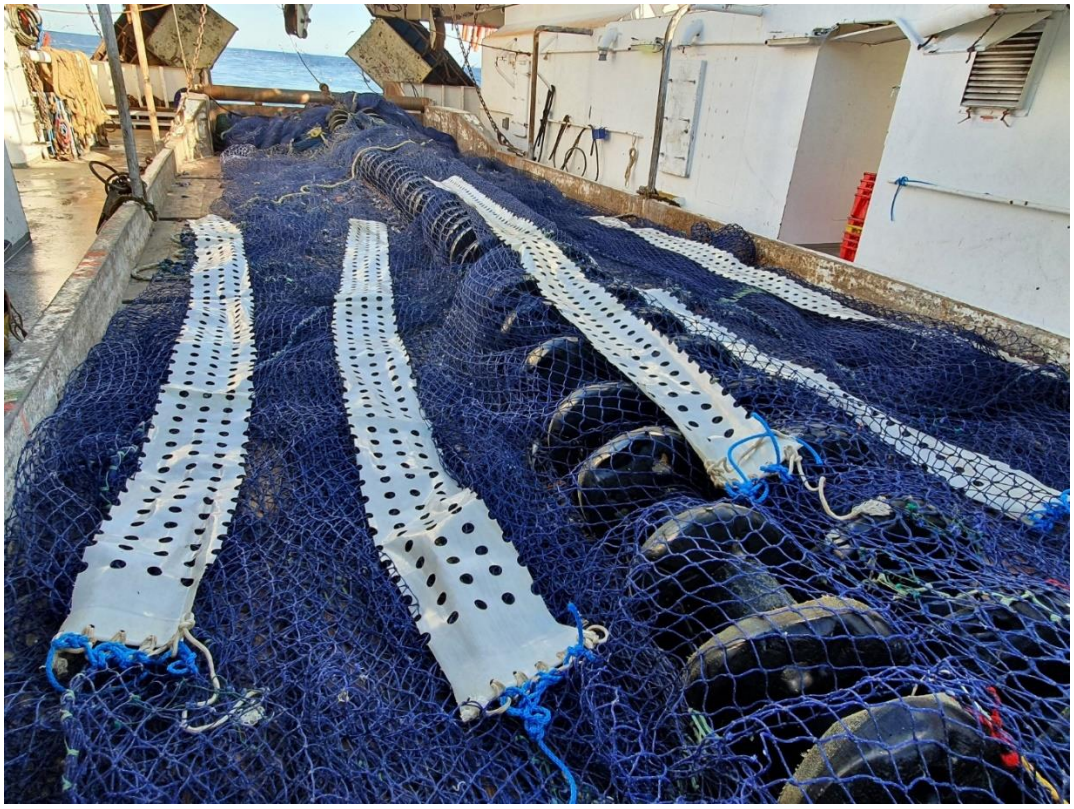

Figure 2: White strips on upper body of squid trawl (first envisaged as a visual deterrent and then as a barrier to ingress

Figure 3: High capacity water sprayer on fantail of trawler (seabird scaring barrier in background)

ANNEX 2

Pro-forma for vessel trial and observer recording protocols

Trial Protocols for Vessel

<table>
<tr><td>Concept Title
Water spray from vessel</td><td>Sponsor:
Lead Investigator and Vessel Name</td></tr>
<tr><td colspan="2">Objective:
To make a water spray curtain to cover the trawl while hauling and shooting.</td></tr>
<tr><td colspan="2">Brief Description/Method Summary
Install a large water irrigator sprayer in the middle of the fantail pointing aft.
The vector of the gun would be 25 degrees with 18 degrees elevation covering approximately 35 – 40mtr behind the vessel.
Initially plumbed with a lay flat hose from a fire hydrant on the trawl deck.
This is to be used once the sweeps are being hauled until the cod end is onboard. (Approximately 4-5 minutes) and turned off again.
A similar process while shooting and similar timeframes initially ie spray not to be “overused” resulting in habituation. Turn on when the trawl is shot down the ramp and turned off after the headline is below the surface.
See method and trial experiments to be tested below</td></tr>
<tr><td>In Scope:
Observe and record the effect of the large water droplets in the zone from behind the vessel to the trawl.
The water spray needs to be visible to the birds, so they won’t fly under the spray.</td><td>Out of Scope:</td></tr>
<tr><td colspan="2">Requirements (including financial and human resources)
Pumps and Filters Ltd to come up with the correct gun to suit the pump capacity on the vessel that will do the trial and supply a quote to install the set up. Keep it simple.
Human resources to turn a tap on and off when required.

DWG & SSST have funds to purchase sprayer, pipe and cost of fitting

Requires FNZ/MPI Observer</td></tr>
<tr><td colspan="2">Assumptions:
Water spray will deter birds away from the danger zone while hauling and shooting.

FV Trial Vessel is participating in squid fishery where bird numbers are sufficient to observe any effects</td></tr>
<tr><td colspan="2">Limitations/constraints:
Fitting will occur late in season and squid fishery may be poor leading to redeployment
Weather maybe an issue if blowing from behind the vessel and the spray ending up on deck.
May not be as effective at night.
If risks listed below are observed to be real then halt trial and contact DWG by email</td></tr>
</table>

<table>
<tr><td>Health and Safety Considerations
vessel and crew:

Nil beyond any activity on fantail etc which is already in vessel risk plan

Ensure ability to quick disconnect from fire hydrant outlet (vessel management must update risk plan for this</td><td>Health and Safety Considerations
other marine species:

Nil expected but crew and observer to remain alert and respond reasonably (and report) to any emerging issues</td></tr>
<tr><td colspan="2">Risks:
Birds fly into water jet close to nozzle and get deflected from flightpath or otherwise negatively affected
Deterrent effect shifts birds to an area of greater risk
Birds rapidly become habituated</td></tr>
<tr><td colspan="2">Timeline:
To be fitted next port call of FV Trial Vessel. High bird attendance is between mid Feb to end April however plan is to leave equipment fitted for a long term project e.g. at least 12 months noting may not be in use in all fisheries/seasons</td></tr>
<tr><td colspan="2">Recording:
Observer to record on form(s) provided

Skipper to take notes on bird behaviour and numbers in area covered by water spray
Skipper and Chief Engineer to provide feedback on any vessel or crew issues and safety matters

Video to be collected by vessel; still shots by vessel and observers if possible</td></tr>
<tr><td colspan="2">Methodology
<u>Principles</u>
Vessel and crew safety paramount; all rules and regulations remain in force
Any observed risk to seabirds from sprayer should mean cessation of trial till review; skipper has on/off control of hydrant from bridge
Not all tows nor all shoot or haul events must be a trial
Sprayer only to be operated for trial events or testing prior to trial events; not operated continuously; sprayer <u>always to be disconnected from hydrant after each trial event</u>
Trials best undertaken initially in good weather and with abundant seabirds
Observer and Skipper should confer before trial is undertaken
Skipper must inform observers if any changes to sprayer (nozzle etc) which should only occur after consult with Vessel Owner and DWG
The sprayer has been fitted with “best guess” nozzle and should not be changed willy nilly
We are uncertain as to effect of valve control on pressure (how far open) and vessel will need to experiment with this prior to trials; care needed to avoid excessive jet of water too far aft as this will impact birds; we are seeking a “heavy rain” over the risk area</td></tr>
</table>

- If ever sprayer poses increased risk to seabirds cease and record; review and advise Vessel Owner/DWG
- Vessel crew will operate sprayer and any mounted camera system
- Vessel will download data from their (DWG supplied) camera and hold noting should review to check efficacy of camera
- Look-Think-Act
- Communicate with shore on any matter as need be
- Protocols below can be adapted dependent on conditions and learnings after seeking feedback from DWG/Vessel Owner and FNZ but new protocols will need to be adapted

Protocols - Detail

Shooting events – three trial options for when sprayer and camera to be activated (in order of priority):

1. When trawl is commenced to be hauled down deck
2. When codend enters ramp
3. When wing ends leave transom

- Crewman on station on fantail and checks camera lens clear (cloth and spray); connects to hydrant and quick spray burst to test
- Observer must record on form if trial event is Shoot Option 1, 2 or 3 and duration of sprayer on
- Crewman must activate camera before sprayer and activate sprayer based on eyeball of deployment of gear above
- Crewman turns off sprayer when net visibly passes range of sprayer then turns off camera
- Crewman disconnects sprayer from hydrant and if required brings SD card back to wheelhouse

Hauling events – three trial options in order of priority

1. When doors break water (doors up)
2. When sweep winches engaged
3. When bridles reach ramp

- Crewman on station on fantail and checks camera lens clear (cloth and spray); connects to hydrant and quick spray burst to test
- Observer must record on form if trial event is Haul Option 1, 2 or 3 and duration of sprayer on
- Crewman must activate camera before sprayer and activate sprayer based on eyeball of deployment of gear above
- Crewman turns off sprayer when codend fully into ramp then turns off camera
- Crewman disconnects sprayer from hydrant and if required brings SD card back to wheelhouse

Seabird Mitigation: Water Sprayer trial

Trip Number Observer code

This form is designed to collect detailed information on the behaviour of seabirds around trawl nets when a **high pressure water sprayer** is being used. We are interested in understanding the effectiveness of the water sprayer as a deterrent to keep birds away from the trawl net.

- The objective of a water sprayer is to make a curtain of spray to cover the trawl gear **during shooting and hauling**.
- The purpose is to deter seabirds from interacting with the trawl net and therefore mitigate against capture events.
- The use of a high pressure water sprayer is to cause as much deterrence to the birds as possible without causing them harm.

For the purpose of this trial a '**water sprayer**' is defined as a high-pressure irrigation hose positioned at the stern of the vessel pointing aft. The vector of the gun should be **25 degrees** with **18 degrees elevation** covering approximately **35 to 40 m** behind the vessel.

To avoid habituation the water sprayer will only be turned on once the sweeps begin to be hauled and turned off again once the codend is on the deck. A similar process will happen during shooting. The water sprayer will be turned on when the net is shot down the ramp and turned off after the headline is under the water (Est. 4-5 minutes).

As the observer onboard, your purpose is to observer the use of the water sprayer and its effectiveness at deterring seabirds from interacting with the fishing gear. Record **in detail** where, when and how the water sprayer is used and the behaviour of the birds before and after the sprayer is turned on. Please provide any additional information that you think may be useful in understanding the effectiveness of the mitigation device.

Use the form provided to record this information and take as many **photos/ videos** as possible. The vessel will have a camera mounted on the fantail pointing aft of the stern. This will also be collecting valuable footage of the water sprayer in use and the captain will also be taking notes.

If the water sprayer seems to have a negative effect on seabird mitigation (e.g. birds are injured by the device or birds are deterred to an area of greater risk), then please record this information and discuss with the captain how the water sprayer could be adjusted (or in worst case cease trial).The captain must inform the observer before changes are made to the water sprayer. If deemed necessary to halt trial seek guidance from shore management.

To assess the efficacy of the water sprayer, it is necessary to collect information on the number and behaviour of seabirds immediately prior to and during the trial. To allow comparison, it is also necessary to collect the same information during hauls where the water sprayer was not used.

If a seabird capture (alive or dead) occurs while the water sprayer is in use, you **must** discuss the capture event with the senior crew and determine whether (**in your opinion**), the use of the water sprayer was a contributing factor to the capture event.

Fill in a form on every set or haul where an observation was conducted. Repeat as often as possible when other tasks of more importance have been completed. We are interested in knowing how effective the water sprayer is during a variety of environmental conditions, so try to conduct observations in different wind and sea states as well as day and night.

Please note that this is a qualitative data collection exercise and that we are interested in your thoughts and observations regarding seabird behaviour. Please be as descriptive as possible and record additional data in your diary if necessary.

Tow number	FMA	Set/ haul	Target species	Viewed by observer (Y/N)	Visibility	Position on the vessel (observer)	Beaufort scale	Start time (setting/ hauling)	End time(setting/ hauling)	Night or daylight
								:	:	

Describe the species, behaviour and quantity of seabirds around the vessel before the water sprayer was turned on.	
Give detail on where were seabirds were distributed and the densities of seabirds around the vessel before sprayer was turned on. (*e.g. 0-5m aft of the vessel, port side near discard chute, large congregations 10-100m aft of vessel)*	

Time sprayer was turned on	Time sprayer was turned off	Height of sprayer above sea surface (m)	Arial extent of spray (m)		
			Aft	Port	Starboard
:	:				

Describe any other characteristics of the sprayer, e.g. angle, effects from weather, water pressure? (please provide detail).	
Describe the behaviour of the seabirds during the time the water sprayer was in use. (*Were the birds deterred by the water spray? Did some species seem more deterred than others? At any point did the behaviour of the seabirds change through the duration of the haul/ set?)*	
Describe the fish waste management during the extent of the trial (if applicable).	

Was there a NFBC event during this tow? *If Y, please describe the event and the outcome of your conversation with the crew regarding contributing factors*	
Comments:	