# Level 1 Risk Assessment for Incidental Seabird Mortality Associated with New Zealand Fisheries in the NZ-EEZ

S. Rowe
Marine Conservation Services
Department of Conservation

August 2010

# Contents

# *Summary*

A qualitative (Level 1) risk assessment was conducted to examine the likelihood of fisheries effects on populations of New Zealand seabirds in New Zealand fisheries waters. The method involved assigning levels of exposure and consequence at a workshop of scientific and technical experts. Uncertainty around the assessment was explicitly stated.

Risk scores are presented for 101 seabird taxa and 26 fishing methods. *Thalassarche* albatrosses, or mollymawks, *Procellaria* petrels and large shearwaters were found to be at greatest national risk from fishing. Other species at risk from one or just a few fisheries included yellow-eyed penguins, shag species, little blue penguins and Hutton's and fluttering shearwaters. The fishery found to be posing the greatest risk to seabirds was the setnet fishery followed by all longline fisheries, although the risk from longline fisheries was lower when current mitigation measures are used correctly.

The results of this assessment can be used to identify additional information requirements for more robust assessments of fishing risks to seabirds with reduced uncertainty. Such assessments form an important basis for managing fishing impacts on seabirds.

# *1. Introduction*

Risk assessment is the procedure by which the risks posed by inherent hazards are estimated either quantitatively or qualitatively. Environmental risk arises from the impact of humans and human activity on the environment. Environmental risk assessment (ERA) is often used to aid decision making or to prioritise research areas. A major difficulty facing ERA is complexity of the environment, in particular the availability of data, and the uncertainty in available data.

Hobday *et al* (2007) describe a general framework for ecological risk assessment in a fisheries context. They identify three levels: Level 1 SICA (Scale, Intensity, Consequence Analysis), Level 2 PSA (Productivity Susceptibility Analysis) and Level 3 fully quantitative with uncertainty analysis. In a Level 1 risk assessment where there is often an absence of information, evidence or logical argument, expert workshop participants assign scores based on best judgment and document the rationale for those scores. The rationale behind assessment and decisions at each step of the methodology must be documented. A profile of each fishery being assessed must be scoped prior to starting the risk assessment including the location and timing of fishing activities, and seabird species that may interact with the fishery (Hobday et al. 2007).

Fletcher *et al.* (2002) and Fletcher (2005) describe a qualitative risk assessment methodology for prioritising fisheries management issues and its application to a range of Western Australian commercial fisheries. The process involves the examination of sources of risk, assessment of the consequences for each source and the likelihood of a particular level of consequence occurring. This methodology was developed from the AS/NZS 4360 standard, and used workshops with participants from government agencies, fishing industry and other stakeholder groups. Five sets of consequences are considered, including the impact on protected species. This method was found to be successful in identifying and prioritising fisheries management issues across the range of environmental impacts considered. It has since been used across a number of fisheries in Australia.

The aim of this study was to conduct a qualitative, or Level 1, risk assessment to examine the likelihood of fisheries effects on populations of New Zealand seabirds, with explicit statement of the uncertainty around the assessment.

# *2. Methods*

This Level 1 risk assessment uses six levels of exposure to describe the likelihood of a seabird interacting with a fishing method. Levels of exposure range from remote to likely. There are also six levels of consequence ranging from negligible (virtually no impact with a score of 1) to intolerable (irreversible with a score of 6), with moderate (a score of 3) being defined as the highest acceptable level of consequence.

Risk scores were determined for all seabird species listed in Appendix 1 and for all fisheries listed in Appendix 2. Uncertainty around this score is also considered and stated. The risk score is a critical first step in determining risk reduction objectives at a fishery level. However, a number of other steps are equally critical, including determining which fisheries are causing any unacceptable risk and how reductions in risk can be monitored and/or mitigated. The cumulative impacts on any species across a number of fisheries must also be considered.

The Level 1 Risk assessment was undertaken at a workshop comprising invited scientific and technical experts with knowledge of fisheries practices and/or seabird biology. It should be noted that the results of a Level 1 Risk Assessment are dependent on the people in the room and the timing of the assessment.

## *2.1 Pre-workshop preparation*

### 2.1.1 Score vulnerability

The behavioural and life history characteristics that may render a seabird species vulnerable to fisheries mortality were identified. Documentation was provided to describe such characteristics (Appendix 1). This included assigning each species a score for behavioural susceptibility to capture, based on capture data and observer comments, taking population size into consideration. Scores were circulated to participants prior to the workshop, and adjusted according to feedback. The following criteria were used to assess whether species are at risk from fisheries mortality (adapted from Phillips & Small 2007).

**a) Threat status of the species**
For the purposes of the workshop, the Department of Conservation threat classifications list and associated nomenclature was used (Miskelly et al 2008).

| **b) Breeding population status** | **Score** |
|---|---|
| Rapid decline (>2% per year) | 3 |
| Decline | 2 |
| Stable | 1 |
| Increase | 0 |

| **c) Behavioural susceptibility to capture** | **Score** |
|---|---|
| High | 3 |
| Medium | 2 |
| Low | 1 |

| **d) Life-history strategy** | **Score** |
|---|---|

| | |
|---|---|
| Biennial breeder, single egg clutch | 3 |
| Annual breeder, single egg clutch | 2 |
| Annual breeder, multiple egg clutch | 1 |

The average of the attributes b) to d) for each population was used to calculate relative vulnerability. This method has been applied to the International Commission for the Conservation of Atlantic Tuan (ICCAT) and where information is unknown or uncertain, the highest risk score was allocated so that risk scoring is precautionary (Phillips & Small, 2007). Phillips & Small (2007) also scored the degree of overlap with the ICCAT fishery. For the NPOA Level 1 Risk assessment, the spatial and temporal scale of fishing effort is assessed by participants during the meeting.

The vulnerability scores were supplied to participants prior to the meeting. The score for each taxa was not used directly, but the analysis was used in making judgments about the consequence scores determined at 2.3.2.

### 2.1.2 Assess spatial scale of activity

Maps showing the number of fishing events by statistical area for each fishery during the 2007/08 fishing year were supplied to workshop participants. The 2007/08 fishing year was chosen, as this represented the most recent complete data set at the time of workshop preparation. Fishing effort is likely to have changed since 2007/08, especially for inshore fisheries where area closures have been put in place through the Hector's dolphin Threat Management Plan. For each fishery, the workshop assessed the number of fishing events undertaken in each statistical area to inform judgements about the level of exposure to be scored at 2.3.1.

### 2.1.3 Score temporal scale of activity

A table showing the number of fishing events per month for each fishery during the 2007/08 fishing year was supplied to the workshop participants. For each fishery, the workshop viewed graphs showing the number of fishing events per month to inform judgements about the level of exposure to be scored at 2.3.1.

## *2.2 Workshop Participants*

Chair: Johanna Pierre, Department of Conservation

Participants:

| | |
|---|---|
| Suze Baird | National Institute of Water and Atmospheric Research |
| Dave Bilton | Ministry of Fisheries |
| Leigh Bull | Boffa Miskell |
| Chris Gaskin | Kiwi Wildlife Tours |
| Colin Miskelly | Department of Conservation |
| Geordie Murman | Fisherman |
| Stephanie Rowe | Department of Conservation |
| David Thompson | National Institute of Water and Atmospheric Research |
| Nathan Walker | Ministry of Fisheries |
| Richard Wells | Deepwater Group Ltd. |

The workshop participants worked through the following steps for each species by fishery combination.

## *2.3 Workshop methods*

### 2.3.1 Score the level of exposure

Participants scored the likelihood of each seabird species being exposed to, and interacting with, each fishery. The term 'interaction' means any interaction between a seabird and fishing gear leading to injury or mortality. Essentially, this score reflects the combination of species by fishery spatial overlap and, where there is overlap, the likelihood that the inherent nature of the species will lead to an interaction. Consideration was given to the vulnerability scores (Appendix 1) and, in particular, the behaviour and at-sea distribution of each species. Participants also considered the temporal and spatial scale of the fishery in question to decide whether each seabird species by fishery combination is likely to lead to an interaction.

The score for exposure is based on the probability of a particular species by fishery interaction actually occurring. The likelihood of an interaction between a seabird and fishery may range from rare events to likely or frequent events and is determined using Table 1. For example, while the consequences of a Magenta petrel (Chatham taiko) capture in the southern blue whiting fishery is high, the likelihood of an individual of that species being exposed to the fishery is remote.

**Table 1: Exposure scores for Level 1 Risk assessment** (modified from Fletcher 2005, Hobday *et al* 2007)

| Score | Descriptor | Description |
|---|---|---|
| 0 | Remote | The species will not interact directly with the fishery |
| 1 | Rare | Interactions may occur in exceptional circumstances |
| 2 | Unlikely | Evidence to suggest interactions possible |
| 3 | Possible | Evidence to suggest interactions occur, but are uncommon |
| 4 | Occasional | Interactions likely to occur on occasion |
| 5 | Likely | Interactions are expected to occur |

### 2.3.2 Score the consequence of exposure

Consequence is only scored for those species by fishery combinations given an exposure score of 1 or greater. For any species scoring 'remote' for a particular fishery, interactions will not occur (based on spatial overlap and / or species behaviour) so there can be no direct consequence to the population. Given a species may be exposed to a fishery and deemed likely to interact at some level (exposure scores 1 – 5); the participants then assessed the potential effect (or consequence) to the population. Consideration was given to the extent of fishing effort, the timing and location of fishing effort, the method used and the population structure of the species in question. For example, a particularly common species interacting with an isolated, low scale fishery would likely score a consequence of 'negligible'. In contrast, a particularly rare species interacting with a widespread fishery may be given a consequence score from moderate upwards. The consequences of the impact (adverse effect to populations) were scored based on the levels identified in Table 2. The score should be based on existing information and/or the expertise in the risk assessment workshop. In the absence of agreement or information, the workshop participants agreed on a score considered most plausible.

Exposure and consequence must be combined to determine risk. Exposure alone only indicates the likelihood of a species interacting with a particular fishery, but does not show the population impact of any such interactions. Consequence alone only indicates the impact to the population if interactions do occur, but does not account for the extent, or likelihood, of such interactions. For example, the likelihood, or exposure score, for a critically endangered species interacting with any fishery may only range from 0 to 1 given the behaviour and spatial distribution of the species. But, the consequence for any interaction would score 'intolerable' (6). Viewing the product of the two scores multiplied (range 0 – 6) indicates no intervention is necessary to manage this species by fishery combination. In contrast, the exposure of a common species to a fishery may be 'likely' (5) but, given the population levels, the consequence of such interactions may be 'minor' (2), giving a risk score of 10. Note that the score for the common species is higher that the critically endangered species due to the greater likelihood of this species interacting, despite the lower consequence of any interactions.

**Table 2: Consequence scores for Level 1 Risk assessment** (modified from Fletcher 2005, Campbell & Gallagher 2007 and Hobday et al. 2007)

| Level | Score | Description |
|---|---|---|
| Negligible | 1 | Some or one individual/s impacted, no population impact. |
| Minor | 2 | Some individuals are impacted, but minimal impact on population structure or dynamics. In the absence of further impact, rapid recovery would occur |
| Moderate | 3 | The level of interaction / impact is at the maximum acceptable level that still meets an objective. In the absence of further impact, recovery is expected in years |
| Major | 4 | Wider and longer term impacts; loss of individuals; potential loss of genetic diversity. Level of impact is above the maximum acceptable level. In the absence of further impact, recovery is expected in multiple years |
| Severe | 5 | Very serious impacts occurring, loss of seabird populations causing local extinction; decline in species with single breeding population, measurable loss of genetic diversity. In the absence of further impact, recovery is expected in years to decades |
| Intolerable | 6 | Widespread and permanent / irreversible damage or loss occurring; local extinction of multiple seabird populations; serious decline of a species with a single breeding population, significant loss of genetic diversity. Even in the absence of further impact, long-term recovery period to acceptable levels will be greater than decades or may never occur |

### 2.3.3 Record confidence/uncertainty

The confidence ratings reflect the levels of certainty or uncertainty for scores provided by participants. The confidence rating for the exposure and consequence scores are rated as 1 (low confidence) or 2 (high confidence) with the qualifiers identified (Table 3). The score was recorded and the rationale documented in order to inform management decisions.

**Table 3: Description of confidence scores for consequences** (from Hobday 2007)

| Confidence rating | Score | Rationale for confidence score |
|---|---|---|
| Low | 1a<br>1b<br>1c<br>1d | Data exists, but is considered poor or conflicting.<br>No data exists.<br>Agreement between experts, but with low confidence<br>Disagreement between experts |
| High | 2a<br>2b<br>2c | Data exists and is considered sound.<br>Consensus between experts<br>High confidence exposure to impact can not occur (e.g. no spatial overlap of fishing activity and at-sea seabird distribution) |

## *2.4 Post-workshop calculations*

After the workshop, the following calculations were made to determine potential and optimum risk. These figures determine the likely management response for each fishery. It is important to note that workshop participates do not consider these values as part of the workshop as they are determined through multiplying the exposure and consequence scores assigned in the workshop.

### 2.4.1 Calculate potential risk values

Potential risk is the risk to seabirds in the absence of mitigation. Based upon information discussed and agreed at the workshop, each fishing method by seabird combination was assigned exposure and consequence scores. The potential risk value for each species by fishery combination was calculated as the mathematical product of these scores, producing possible risk values between 1 and 30 (from Fletcher 2005). To standardize the management outcomes that result from these risk analyses, the risk values are separated into five Risk Categories ranging from negligible to extreme (Table 4). The categories identify the level of monitoring or reporting needed and, more importantly, whether direct management of the risk (e.g. introducing mitigation techniques, collecting more data) is required.

**Table 4: Risk categories** (from Fletcher 2005)

| **Risk category** | **Value** | **Likely management response** |
|---|---|---|
| Negligible | 1 | No direct management needed |
| Low | 2-6 | No specific management actions needed, indirect management likely |
| Moderate | 7-12 | Specific management needed, some additions to current levels possible |
| High | 13-20 | Increases to current management activities probably needed |
| Extreme | 21-30 | Significant additional management activities needed |

### 2.4.2 Calculate optimum risk values

The potential risk value assigned to each seabird by fishery combination in 2.4.1 determines the potential risk to each seabird species from each fishery assessed. However, mitigation devices and / or avoidance practices are in place for some fisheries through either regulatory or voluntary frameworks (see Appendix 2). The workshop participants reassessed the exposure scores based on knowledge of mitigation devices required or documented to be used voluntarily. Participants scored optimum risk on the assumption that mitigation was used throughout the fishery and deployed correctly.

As in 2.4.1, Table 4 can be used to view the optimum risk value once the likelihood of capture has taken consideration of mitigation devices in use. Managers can view the potential risk scores against the optimum risk scores to determine whether further management is required in each fishery.

### 2.4.3 Assess relative effects

For all species and fishing methods, scores were added to rank which species of seabird are at highest relative risk and which fisheries are thought to pose the greatest relative risk to seabirds. These scores were determined for the 'potential' and 'optimum' risk scores.

For example, Table 5 indicates that Fishery D has the highest impact across all taxa assessed and the petrel species have the highest relative risk scores of all taxa assessed.

**Table 5: Example of cumulative risk scores by fishery and seabird species**

| | Fishery A | Fishery B | Fishery C | Fishery D | Total all fisheries |
|---|---|---|---|---|---|
| Penguin sp. | 1 | 15 | 0 | 16 | 32 |
| Albatross sp. | 0 | 4 | 25 | 20 | 49 |
| Petrel sp. | 1 | 8 | 30 | 25 | 64 |
| Shag sp. | 1 | 20 | 0 | 12 | 33 |
| Total all spp. | 3 | 47 | 55 | 73 | 178 |

# 3 Results

## 3.1 Fishery assessments

### 3.1.1 Beach seine, drag net

Beach seining or drag-netting is normally carried out using a length of net and an additional length of warp (rope). The net and warp are laid out from, and back to, the shore and retrieved by hauling on to the shore. The net used is similar to that used for set-netting. Most fishing effort targets trevally. There is relatively little effort, which is mostly in the Bay of Plenty and east coast Northland. Small vessels (4 m to 14 m) use this method. Most vessels also use other methods including bottom longlining, potting and setnetting. This fishery has never been observed.

Further background to this method was provided by industry participants indicating that this fishery is characterised by small catches, shallow fishing depths and a short fishing duration with the net always attended. The participants agreed that under normal fishing conditions an entangled bird would be noticed and most likely released alive and largely uninjured.

Given this information, there was evidence to suggest that interactions were possible for pied shags as well as black-backed and red-billed gulls (Table 6). The participants also agreed that interactions may occur in exceptional circumstances for a number of other species, particularly gulls, terns, penguins and shags. Blue penguins were considered to be at lower risk as they do not forage in close proximity to human activity. The level of confidence for the exposure scores was 1c (agreement between experts, but with low confidence due to limited evidence) and the confidence for the consequence scores was 2b (agreement between experts).

**Table 6: Seabird species potentially at risk from beach seine, drag net fisheries**

| Common name | Exposure | Consequence | Potential risk score | Risk category |
|---|---|---|---|---|
| Black-backed gull | 2 | 1 | 2 | Low |
| Red-billed gull | 2 | 1 | 2 | Low |
| Pied shag | 2 | 3 | 6 | Low |
| Australasian gannet | 1 | 1 | 1 | Negligible |
| Black-billed gull | 1 | 1 | 1 | Negligible |
| Caspian tern | 1 | 2 | 2 | Low |
| Fairy tern | 1 | 3 | 3 | Low |
| White-fronted tern | 1 | 1 | 1 | Negligible |
| Northern blue penguin | 1 | 2 | 2 | Low |
| Southern blue penguin | 1 | 2 | 2 | Low |
| Yellow-eyed penguin | 1 | 2 | 2 | Low |
| Spotted shag | 1 | 1 | 1 | Negligible |
| Stewart Island shag | 1 | 1 | 1 | Negligible |
| Little shag | 1 | 1 | 1 | Negligible |
| Little black shag | 1 | 1 | 1 | Negligible |
| Fluttering shearwater | 1 | 1 | 1 | Negligible |

While there was low confidence in the exposure scores, experts had higher confidence about the impacts to populations should an interaction occur. All exposure by

consequence calculations resulted in a low or negligible score indicating no specific management action is needed in this fishery.

As fishers often access this fishery from shore, a particular concern with this fishing method was the potential for human disturbance at nesting sites. While this threat is outside the scope of the risk assessment, the group discussed the need for a code of practice to mitigate such disturbance. A code could include education about coastal nesting species as well as access considerations at different times of the year and during varying tidal heights.

### 3.1.2 Dahn line

Dahn lines are a form of drop-line, vertically deployed between surface buoys and a seabed weight, with a bottom section rigged with hooked snoods to fish a specific depth range above the seabed. Multiple species are targeted with the greatest effort for bass, bluenose, hapuku and ling. Most fishing effort targets hapuku throughout the year in the North and South Islands and bluenose throughout the year in the upper North Island. Vessels range in size from 5 to 21 m. This fishery has never been observed.

Industry participants explained that this method generally uses 5 – 20 large 'J' hooks and fishing takes place on a particular feature so that deployment of the line must be accurate. An individual vessel may have up to 10 dahn lines and could potentially set every 20 minutes. Heavy anchors are attached to each dahn line so the line sinks quickly; therefore, the greater risk is on hauling. This fishing method is common off the coast of Northland and in the Chathams. Lines are retrieved directly against the side of vessels so more aggressive birds would be at risk. With the exception of highly aggressive birds, risk is most likely to be caused by gear failure. Generally, the crew have good control of where the bait and hooks are. Smaller vessels tend to process as they are fishing which is likely to attract birds. Large vessels looking for new fishing grounds also use this method and given the height of the vessel, interactions were considered to be of higher risk, as fishers can not easily chase birds away from the hauling area. It was noted that this method is also used outside the New Zealand EEZ.

Given participants' knowledge of dahn lining and other hook fisheries, confidence for exposure was 1c and confidence for the consequence of interactions was 2b for all seabirds. From Table 7 it can be seen that all species that are known to approach hooks scored at least a 1 (rare) and species that are particularly hook aggressive scored 3 (possible), but the nature of this method ensured there were no 4 (occasional) or 5 (likely) scores for any species. Most species scored a 1 (negligible) for consequence indicating there would be no population impact from this method. Given the location of this fishery, flesh-footed shearwaters and black petrels scored a consequence of 2 (minor) suggesting some individuals will be impacted, but there would be minimal population impact from this fishery. These two species also scored the highest risk score, but no risk scores were above the level requiring management action.

**Table 7: Seabird species potentially at risk from dahn line fisheries**

| Common name | Exposure | Consequence | Potential risk score | Risk category |
|---|---|---|---|---|
| Flesh-footed shearwater | 3 | 2 | 6 | Low |
| Black petrel | 3 | 2 | 6 | Low |
| Northern Buller's albatross | 3 | 1 | 3 | Low |
| Southern Buller's albatross | 3 | 1 | 3 | Low |
| Salvin's albatross | 3 | 1 | 3 | Low |
| White-capped albatross | 3 | 1 | 3 | Low |
| Antipodean albatross | 2 | 1 | 2 | Low |
| Gibson’s albatross | 2 | 1 | 2 | Low |
| Southern royal albatross | 2 | 1 | 2 | Low |
| Wandering albatross | 2 | 1 | 2 | Low |
| Sooty shearwater | 2 | 1 | 2 | Low |
| Grey petrel | 2 | 1 | 2 | Low |
| Westland petrel | 2 | 1 | 2 | Low |
| White-chinned petrel | 2 | 1 | 2 | Low |
| Black-browed albatross | 2 | 1 | 2 | Low |
| Campbell albatross | 2 | 1 | 2 | Low |
| Chatham albatross | 2 | 1 | 2 | Low |
| Indian yellow-nosed albatross | 2 | 1 | 2 | Low |
| Northern giant petrel | 2 | 1 | 2 | Low |
| Southern giant petrel | 2 | 1 | 2 | Low |
| Northern royal albatross | 1 | 1 | 1 | Negligible |
| Grey-headed albatross | 1 | 1 | 1 | Negligible |
| Light-mantled albatross | 1 | 1 | 1 | Negligible |
| Buller's shearwater | 1 | 1 | 1 | Negligible |
| Fluttering shearwater | 1 | 1 | 1 | Negligible |
| Hutton's shearwater | 1 | 1 | 1 | Negligible |
| Brown skua | 1 | 1 | 1 | Negligible |
| Cape petrel | 1 | 1 | 1 | Negligible |
| Snares Cape petrel | 1 | 1 | 1 | Negligible |

### 3.1.3 Danish seine

Danish seining is used to encircle, herd and finally trap the fish. A net bag, similar in shape to a trawl bag is operated by a long, weighted rope fixed to each end. The two ropes are used to encircle the fish and also to haul the net in. Fishing effort is undertaken throughout the year, mostly targeting flatfish (east and west coasts South Island), gurnard (North Island), john dory and snapper (upper North Island). Vessels in this fishery range in size from 10 m to 24 m. This fishery has not been observed.

Danish seining is undertaken in relatively shallow water (maximum 180 m), the net sits on the bottom and shooting and hauling is relative quick. This method is similar to beach seining except that this method uses a larger net and takes place in deeper water. Vessels use mechanised ropes to heard fish into the net where a light –weight codend with wings gathers the fish. Fishing is undertaken during the day as it is a visual-based fishing technique. The presence of a codend does present some risk to seabirds, but there is no warp. Participants agreed this fishing method presented less risk to seabirds compared to trawling methods.

Given the description of this method, interactions with this fishery were considered to be rare or unlikely (Table 8).

**Table 8: Seabird species potentially at risk from Danish seine fisheries**

| Common name | Exposure | Consequence | Potential risk score | Risk category |
|---|---|---|---|---|
| Sooty shearwater | 2 | 1 | 2 | Low |
| Northern blue penguin | 2 | 1 | 2 | Low |
| White-flippered blue penguin | 2 | 2 | 4 | Low |
| Black petrel | 2 | 2 | 4 | Low |
| Fluttering shearwater | 2 | 1 | 2 | Low |
| Hutton's shearwater | 2 | 2 | 4 | Low |
| Australasian gannet | 1 | 1 | 1 | Negligible |
| Black-backed gull | 1 | 1 | 1 | Negligible |
| Red-billed gull | 1 | 1 | 1 | Negligible |
| Flesh-footed shearwater | 1 | 2 | 2 | Low |
| Grey petrel | 1 | 1 | 1 | Negligible |
| Westland petrel | 1 | 1 | 1 | Negligible |
| White-chinned petrel | 1 | 1 | 1 | Negligible |
| King shag | 1 | 4 | 4 | Low |
| Spotted shag | 1 | 2 | 2 | Low |

Participants agreed on exposure scores but with low confidence due to lack of data. Participants had greater confidence in the consequence scores and all agreed that the consequence of almost all interactions were negligible or minor. The only species for which the consequence of interaction with this fishery was considered to be above the acceptable level in terms of adverse effects to populations was the king shag. The king shag population is low and the potential loss of one or two individuals from the population was considered to have a high impact.

### 3.1.4 Diving

Some commercial and recreational fishers dive for seafood, mostly paua, but also rock lobster, sea cucumbers and sea urchins. Most effort targets red rock lobster and sea cucumber in the Marlborough Sounds and sea urchins in the North and South Islands. This fishery has not been observed.

The workshop participants agreed there was no known or expected impact to any seabird species, therefore all species scored zero for exposure.

### 3.1.5 Dredge

Dredging involves fishing vessels towing a rigid steel-framed dredge along the sea floor. While most effort targets oysters and scallops, deepwater tuatua, sea urchins, triangle shells and trough shells are all targeted using this method. Fishing effort is undertaken throughout the year with oysters targeted from January through to June and scallops from July through to February. The majority of the fishery can be divided into: oyster dredge in Foveaux Straight; oyster dredge in Marlborough/Nelson; and scallop dredge. Vessels range in size from 5 to 22 m. Some vessels employ other methods including bottom trawling, fish pots, potting and trolling. This fishery has not been observed.

Those with knowledge of this fishery indicated that birds do not follow vessels and are generally not attracted to this method as dredging is a slow, noisy operation. It was noted, however, there is potential for the bucket to scoop up a bird as the dredge is brought on board. While some level of risk was noted, the workshop participants agreed there was no known impact to any seabird species, therefore all species scored zero for exposure.

### 3.1.6 Fish traps and potting

Fish traps are used to trap fish or crabs in stationary gear where the fish can enter the trap but cannot escape. Fishing effort is undertaken throughout the year and targets paddle crabs in the Bay of Plenty and northern South Island and hagfish in northern North Island, west coast North Island and west coast South Island. Rock lobsters and blue cod are caught in pots, usually made of a steel frame, covered with wire mesh. The pot is baited with fish and dropped from the boat on the end of a rope long enough to reach the bottom. Fishing effort using traps or pots is undertaken throughout the year around mainland New Zealand and around the Chatham Islands. Generally, fish traps are set and retrieved within a day whereas pots are left out overnight, for up to three nights. These fisheries have not been observed for protected species interactions.

Those with experience in this fishery indicated there are shags present when potting. Buller's albatrosses are also known to attend cray potting activities, especially when small fish are being discarded. Shags are thought to likely target the small live fish inside pots and become trapped after swimming through the aperture. Participants agreed there was higher risk closer to shore as shags tend to forage on the bottom. A known interaction from the Chatham Islands occurred when a fisherman set pots hard up against rocks and subsequently caught shags. Participants also knew of shag captures in the Central East Fisheries Management Area on the east coast of the North Island. Spotted shags were also known to aggregate around pots and there was greater concern for North Island populations of spotted shags. While spotted shags as a species scored a 1 (rare) for exposure to pots, the North Island populations alone would score a 3 (interactions are uncommon) as they are of higher concern than South Island populations. The foraging techniques of penguins suggest they may be susceptible to potting or trapping and participants agreed that mainland breeding penguins were a particular concern due to other anthropogenic threats to the species.

Participants had high confidence and were in agreement for all scores (2b). In general, the assessment of this fishery indicated that shags are at greatest risk of interaction (Table 9). Of greatest concern is the Pitt Island shag, for which interactions are considered likely to occur on occasion. There was also evidence to suggest interactions are possible but uncommon for Chatham Island and pied shags and possible but unlikely for the king and Stewart Island shags. A further eleven species were considered likely to interact with potting or trapping fisheries in exceptional circumstances.

Given the exposure to this fishing method, three species scored a consequence of 'major' indicating the level of impact to the population would be above the maximum acceptable level. The calculation of risk scores indicated Chatham Island shags and

king shags were at moderate risk from potting and trapping fisheries, indicating some level of specific management is needed. Pitt Island shags scored a 'high' potential risk value suggesting that increases to current management are needed.

**Table 9: Seabird species potentially at risk from fish traps and potting fisheries**

| Common name | Exposure | Consequence | Potential risk score | Risk category |
|---|---|---|---|---|
| Pitt Island shag | 4 | 4 | 16 | High |
| Chatham Island shag | 3 | 4 | 12 | Moderate |
| Pied shag | 3 | 1 | 3 | Low |
| King shag | 2 | 4 | 8 | Moderate |
| Spotted shag | 2 | 1 | 2 | Low |
| Stewart Island shag | 2 | 2 | 4 | Low |
| Chatham Island blue penguin | 1 | 2 | 2 | Low |
| Fiordland penguin | 1 | 2 | 2 | Low |
| Northern blue penguin | 1 | 1 | 1 | Negligible |
| Southern blue penguin | 1 | 2 | 2 | Low |
| White-flippered blue penguin | 1 | 2 | 2 | Low |
| Yellow-eyed penguin | 1 | 2 | 2 | Low |
| Little shag | 1 | 1 | 1 | Negligible |
| Little black shag | 1 | 1 | 1 | Negligible |
| Black shag | 1 | 1 | 1 | Negligible |
| Fluttering shearwater | 1 | 1 | 1 | Negligible |
| Hutton's shearwater | 1 | 1 | 1 | Negligible |

### 3.1.7 Hand gather

Seafood suitable for gathering by hand includes aquatic invertebrates such as molluscs, crustaceans, and echinoderms as well as aquatic plants. Most commercial effort in New Zealand targets cockles and pipi. Fishing is undertaken throughout the year, particularly over the summer months. Vessels in this fishery are less than 18 m in length and some vessels use other methods including dahn lining, diving, rock lobster potting and setnetting. This fishery has not been observed.

The workshop participants agreed there was no known direct impact to any seabird species from hand gathering, therefore all species scored zero for exposure. However, as was the case for beach seining, participants had concerns about indirect site based impacts and human disturbance. Of particular concern was the potential displacement from foraging effort and breeding sites and the disturbance impacts from humans, dogs and vehicles on beaches. The need for 'no go' zones was discussed. It was also noted that the impact from recreational fishers was probably greater than that from commercial fishers.

### 3.1.8 Hand Line

A hand-line is a single fishing line, usually attached to a rod, and held by hand. This method is mainly used by recreational fishers, but also commercial fishers to target species such as blue code, hapuku, bass and snapper. Commercial fishing effort is undertaken throughout the year around the New Zealand mainland and the Chatham Islands. Vessels using the method of hand line range in size from 3 m to 36 m and

most would use at least one other fishing method including bottom longline, bottom trawl, cod pots, setnet, dahn line, Danish seine, dredge, rock lobster potting, surface longline and troll. This fishery has not been observed.

Industry participants provided further details of this fishery. When fishing for blue cod, two hooks and a sinker are used whereas snapper hand lines are not weighted, set on twilight and drift behind the vessel. Some fishers will often hand line while soaking a bottom longline. It was noted that a small number of hooks are set so efficacy would be very low if birds were caught often or in great numbers. Those who had fished in the Northland region considered hand-lining to be a greater risk over summer, especially to black petrels where the risk of capture is high if baits sink slowly. In generally, recreational hand-lining was considered a higher risk as burley is often used and bait is thrown into the water. It was agreed there was a need to educate recreational fishers about the risk of catching seabirds with this method.

Participants agreed on all exposure and consequence scores with high confidence given the direct or anecdotal knowledge of hand line risk (Table 10).

**Table 10: Seabird species potentially at risk from hand line fisheries**

| Common name | Exposure | Consequence | Potential risk score | Risk category |
|---|---|---|---|---|
| Flesh-footed shearwater | 5 | 2 | 10 | Moderate |
| Black petrel | 5 | 2 | 10 | Moderate |
| Red-billed gull | 3 | 1 | 3 | Low |
| Sooty shearwater | 3 | 1 | 3 | Low |
| Northern Buller's albatross | 3 | 1 | 3 | Low |
| Southern Buller's albatross | 3 | 1 | 3 | Low |
| Black-backed gull | 2 | 1 | 2 | Low |
| Westland petrel | 2 | 1 | 2 | Low |
| White-chinned petrel | 2 | 1 | 2 | Low |
| Black-browed albatross | 2 | 1 | 2 | Low |
| Campbell albatross | 2 | 1 | 2 | Low |
| Chatham albatross | 2 | 1 | 2 | Low |
| Indian yellow-nosed albatross | 2 | 1 | 2 | Low |
| Salvin's albatross | 2 | 1 | 2 | Low |
| White-capped albatross | 2 | 1 | 2 | Low |
| Buller's shearwater | 2 | 1 | 2 | Low |
| Fluttering shearwater | 2 | 1 | 2 | Low |
| Cape petrel | 2 | 1 | 2 | Low |
| Northern giant petrel | 2 | 1 | 2 | Low |
| Snares Cape petrel | 2 | 1 | 2 | Low |
| Southern giant petrel | 2 | 1 | 2 | Low |
| Australasian gannet | 1 | 1 | 1 | Negligible |
| Pied shag | 1 | 1 | 1 | Negligible |
| Grey-headed albatross | 1 | 1 | 1 | Negligible |
| Light-mantled albatross | 1 | 1 | 1 | Negligible |
| Hutton's shearwater | 1 | 1 | 1 | Negligible |
| Brown skua | 1 | 1 | 1 | Negligible |

### 3.1.9 Inshore drift net

An inshore drift net is a type of gillnet that drifts with the current or tide. A number of species are targeted including flatfish, grey mullet, kahawai, yellow belly flounder and yellow-eyed mullet. Fishing effort is throughout the year, especially over summer months, in two areas: Hauraki gulf (yellow belly flounder) and north of Taranaki (grey mullet, kahawai and yellow-eyed mullet). Few vessels use this method and are 4 or 5 m in length. This fishery has not been observed.

**Table 11: Seabird species potentially at risk from inshore drift net fisheries**

| Common name | Exposure | Consequence | Potential risk score | Risk category |
|---|---|---|---|---|
| Pied shag | 4 | 2 | 8 | Moderate |
| Little shag | 3 | 1 | 3 | Low |
| Little black shag | 3 | 1 | 3 | Low |
| Black shag | 3 | 1 | 3 | Low |
| Australasian gannet | 2 | 1 | 2 | Low |
| Black-backed gull | 2 | 1 | 2 | Low |
| Red-billed gull | 2 | 1 | 2 | Low |
| Northern blue penguin | 2 | 2 | 4 | Low |
| Spotted shag | 2 | 1 | 2 | Low |
| Fluttering shearwater | 2 | 1 | 2 | Low |
| Caspian tern | 1 | 1 | 1 | Negligible |
| White-fronted tern | 1 | 1 | 1 | Negligible |

Participants were informed that effort in this fishery is declining, particularly because of area closures made under the Hector's dolphin Threat Management Plan. As such, very few vessels have used this method in recent years. Fishing activity occurs inside harbours and it was agreed that this method is likely to catch pied shags, but effort would be too low to make a significant impact to populations. However, if effort in this fishery was greater, the consequence of catching pied shags would be increased to 4 (major). While this method may also catch penguins, their presence inside harbours is rare.

Participants agreed to the exposure scores but with low confidence due to the lack of known interactions (1c), the consequence scores were agreed with high confidence (2b). Twelve species were considered to be exposed to this fishery at varying levels. Of greatest concern is the pied shag with an exposure score of 4 indicating interactions are likely to occur on occasion. Other shag species were given an exposure score of 3 (uncommon interactions). All but two species were given a consequence score of 1, so that consequences are expected to be negligible in this fishery. Northern blue penguins and pied shags scored 2 for consequence indicating a minimal impact on populations. In terms of risk scores, only pied shags were scored at a level indicating some specific management is needed to mitigate impacts.

### 3.1.10 Purse seine

Purse seining is used to catch surface dwelling species such as tuna, mackerels, kahawai and trevally. The purse seine net is laid in a circle around the school and then "pursed", drawing the bottom closed and entrapping the fish. Fishing effort is throughout the year, particularly in the summer months. Most fishing effort is in the upper North Island, and the west coast of the South Island. Vessels range in size from 17 m to over 60 m in length. Most vessels in this fishery only use the method of purse seining, but a few also Danish seine, handline or surface longline. There has been observer coverage in this fishery with few seabird interactions observed.

The discussion of purse seine fisheries was focussed on the effect of lights in the pilchard purse seine fishery, which will be discussed further below. In terms of direct impacts with the gear, participants felt there would need to be an exceptional event for capture to occur. Penguins were considered to have slightly higher risk as they would be unable to fly out of the net as easily. In general, seabirds are not interested in this method, and are more interested in the fish outside the net.

Eight species were considered likely to interact with purse seine gear, but only in exceptional circumstances (Table 12a). Three species scored a higher level of exposure (2), with evidence to suggest interactions are possible. Of these three species, the king shag was considered to have the highest consequence level with interactions expected to be at the highest level acceptable. The multiplication of exposure and consequence scores gave risk scores in the low or negligible categories. As such, no management for direct impacts is required in this fishery. Participants were in agreement for all scores and with high confidence.

**Table 12a: Seabird species potentially at direct risk from purse seine fisheries**

| Common name | Exposure | Consequence exposure | Potential risk score | Risk category |
|---|---|---|---|---|
| Northern blue penguin | 2 | 2 | 4 | Low |
| King shag | 2 | 3 | 6 | Low |
| Spotted shag | 2 | 2 | 4 | Low |
| Australasian gannet | 1 | 1 | 1 | Negligible |
| Black-backed gull | 1 | 1 | 1 | Negligible |
| Red-billed gull | 1 | 1 | 1 | Negligible |
| Flesh-footed shearwater | 1 | 1 | 1 | Negligible |
| Sooty shearwater | 1 | 1 | 1 | Negligible |
| Black petrel | 1 | 1 | 1 | Negligible |
| Buller's shearwater | 1 | 1 | 1 | Negligible |
| Fluttering shearwater | 1 | 1 | 1 | Negligible |

Participants felt the most likely cause of death or injury to seabirds in this fishery would be through lights leading to a deck strike or actual capture, particularly in the pilchard purse seine fishery. Purse seining for pilchards takes place almost entirely at night and uses massive lights under the water so that the pilchards ball around the light. These lights increase the number of birds on the water and could therefore increase the risk of birds being dragged under on deployment or retrieval of gear. Storm petrels in particular were considered to be at risk from this method of fishing.

Participants felt this fishery would have a greater environmental impact on seabirds due to the lights.

The scores in Table 12b relate to the effect of lights, with a confidence level of 1a (poor data). While all species listed in Table 12b scored 4 (occasional) or 5 (likely) in terms of exposure to this method, only the New Zealand storm petrel had a consequence level greater than 2. The extreme risk category assigned to the New Zealand storm petrel reflects the data deficient status of this species. Flesh-footed shearwaters, black petrels, New Zealand white-faced storm petrel, North Island little shearwater and Pycroft's petrel are all in the moderate risk category for the impact of lights. According to the scoring sheet in Table 4, specific management is necessary for these species and significant additional management is required for the New Zealand storm petrel in relation to lights.

**Table 12b: Seabird species potentially at risk from purse seine lights**

| Common name | exposure Lights | Consequence lights | Risk - lights | Risk category |
|---|---|---|---|---|
| Pycroft's petrel | 5 | 2 | 10 | Moderate |
| Northern diving petrel | 5 | 1 | 5 | Low |
| North Island little shearwater | 5 | 2 | 10 | Moderate |
| New Zealand white-faced storm petrel | 5 | 2 | 10 | Moderate |
| New Zealand storm petrel | 5 | 6 | 30 | Extreme |
| Fairy prion | 5 | 1 | 5 | Low |
| Cook's petrel | 5 | 1 | 5 | Low |
| Sooty shearwater | 4 | 1 | 4 | Low |
| Black petrel | 4 | 2 | 8 | Moderate |
| Grey-faced petrel | 4 | 1 | 4 | Low |
| Fluttering shearwater | 4 | 1 | 4 | Low |
| Flesh-footed shearwater | 4 | 2 | 8 | Moderate |
| Buller's shearwater | 4 | 1 | 4 | Low |
| Black-winged petrel | 4 | 1 | 4 | Low |

### 3.1.11 Ring net

Ring netting is defined as a gill net which acts by enmeshing, entrapping, or entangling fish. Ring nets are set for a time of less than 1 hour and are continuously attended by the fisher. Most effort targets grey mullet in west coast North Island harbours. All vessels are very small and range in size from 3 to 9 m, many of which also setnet and a few surface longline and troll. There has been minimal observer coverage of a few vessels operating in west coast North Island harbours.

Industry participants explained that ring netting needs to take place in a confined space where fish are geographically confined so that the school can be chased into the net. Fishing takes place in 6 – 10 m water, nets are continuously attended and fishing time is short. Seabirds tend to stay away due to the noise of the operation and the proximity of the boat to the net. Gannets and shags were discussed as the species most likely to interact, but at low levels.

The exposure and consequence scores were agreed to by the experts with high confidence (2b). Of the 12 species likely to interact with this fishery, eleven are expected to do so only in exceptional circumstances. Pied shags scored 2 indicating there is evidence to suggest interactions are possible. All consequence scores were negligible and all potential risk scores were low or negligible so that no management is required in this fishery.

**Table 13: Seabird species potentially at risk from ring net fisheries**

| Common name | Exposure | Consequence | Potential risk score | Risk category |
|---|---|---|---|---|
| Pied shag | 2 | 1 | 2 | Low |
| Australasian gannet | 1 | 1 | 1 | Negligible |
| Caspian tern | 1 | 1 | 1 | Negligible |
| Black-backed gull | 1 | 1 | 1 | Negligible |
| Red-billed gull | 1 | 1 | 1 | Negligible |
| White-fronted tern | 1 | 1 | 1 | Negligible |
| Northern blue penguin | 1 | 1 | 1 | Negligible |
| Spotted shag | 1 | 1 | 1 | Negligible |
| Little shag | 1 | 1 | 1 | Negligible |
| Little black shag | 1 | 1 | 1 | Negligible |
| Black shag | 1 | 1 | 1 | Negligible |
| Fluttering shearwater | 1 | 1 | 1 | Negligible |

### 3.1.12 Squid jig

Jigging is a method of catching squid by continuously lowering and retrieving lines from the fishing vessel. Fishing is generally done at night when squid are attracted by powerful lights on the vessel. There is minimal commercial effort in New Zealand compared to squid trawl. Most effort is on the east and south coasts of the South Island over summer months. In recent years there have been two vessels using this method, both over 60 m in length, and both vessels only used the method of jigging. In 1998/1999, 100 observer days were achieved in this fishery operating off the Otago Coast. No seabirds were injured or captured during 100 days of observer coverage (Burgess & Blezard 1999).

Participants familiar with this fishing method described the use of short barbless hooks and the absence of bait or offal in this fishery. In addition, this fishery cannot work in bad weather. Squid jiggers use lights as part of the gear to attract squid, which is likely to also attract birds. Participants scored interactions with gear and light interactions separately but the scores were the same (Table 14). Due to the lack of bait and hooks, it was felt only the most aggressive birds would be at risk and would likely feed on discards or escapees.

Confidence for the exposure scores was low (1a – poor or conflicting data) but was high for the consequence scores (2b). Scores for exposure to gear and exposure to light were all 1, indicating interactions would only occur in exceptional circumstances for the 44 species listed in Table 14. Consequence scores were all negligible or minor except for the Chatham petrel (Nationally vulnerable), the Codfish Island South Georgian diving petrel (Nationally critical) and the Magenta petrel (Nationally critical). All risk scores were negligible or low indicating no management action is required in this fishery.

**Table 14: Seabird species potentially at risk from squid jig fisheries (NB: exposure and consequence scores relating to interactions as a result of lights were identical)**

| Common name | Exposure | Consequence exposure | Potential risk score | Risk category |
|---|---|---|---|---|
| Codfish Island South Georgian diving petrel | 1 | 6 | 6 | Low |
| Magenta petrel (Chatham taiko) | 1 | 6 | 6 | Low |
| Chatham petrel | 1 | 4 | 4 | Low |
| Grey petrel | 1 | 2 | 2 | Low |
| White-chinned petrel | 1 | 2 | 2 | Low |
| Chatham albatross | 1 | 2 | 2 | Low |
| Grey-headed albatross | 1 | 2 | 2 | Low |
| Light-mantled albatross | 1 | 2 | 2 | Low |
| Antipodean albatross | 1 | 1 | 1 | Negligible |
| Gibson’s albatross | 1 | 1 | 1 | Negligible |
| Southern royal albatross | 1 | 1 | 1 | Negligible |
| Wandering albatross | 1 | 1 | 1 | Negligible |
| Grey-faced petrel | 1 | 1 | 1 | Negligible |
| Soft-plumaged petrel | 1 | 1 | 1 | Negligible |
| White-headed petrel | 1 | 1 | 1 | Negligible |
| Sooty shearwater | 1 | 1 | 1 | Negligible |
| Westland petrel | 1 | 1 | 1 | Negligible |
| Black-browed albatross | 1 | 1 | 1 | Negligible |
| Northern Buller's albatross | 1 | 1 | 1 | Negligible |
| Southern Buller's albatross | 1 | 1 | 1 | Negligible |
| Campbell albatross | 1 | 1 | 1 | Negligible |
| Indian yellow-nosed albatross | 1 | 1 | 1 | Negligible |
| Salvin's albatross | 1 | 1 | 1 | Negligible |
| White-capped albatross | 1 | 1 | 1 | Negligible |
| Hutton's shearwater | 1 | 1 | 1 | Negligible |
| Antarctic prion | 1 | 1 | 1 | Negligible |
| Black-bellied Storm petrel | 1 | 1 | 1 | Negligible |
| Blue petrel | 1 | 1 | 1 | Negligible |
| Broad-billed prion | 1 | 1 | 1 | Negligible |
| Cape petrel | 1 | 1 | 1 | Negligible |
| Chatham fulmar prion | 1 | 1 | 1 | Negligible |
| Cook's petrel | 1 | 1 | 1 | Negligible |
| Fairy prion | 1 | 1 | 1 | Negligible |
| Fulmar prion | 1 | 1 | 1 | Negligible |
| Grey-backed storm petrel | 1 | 1 | 1 | Negligible |
| Lesser fulmar prion | 1 | 1 | 1 | Negligible |
| Mottled petrel | 1 | 1 | 1 | Negligible |
| New Zealand white-faced storm petrel | 1 | 1 | 1 | Negligible |
| Northern giant petrel | 1 | 1 | 1 | Negligible |
| Snares Cape petrel | 1 | 1 | 1 | Negligible |
| Southern diving petrel | 1 | 1 | 1 | Negligible |
| Southern giant petrel | 1 | 1 | 1 | Negligible |
| Subantarctic diving petrel | 1 | 1 | 1 | Negligible |
| Subantarctic little shearwater | 1 | 1 | 1 | Negligible |

### 3.1.13 Troll

In trolling, baited hooks or lures are towed behind a boat and fish are pulled aboard when caught. This method is designed to target fast-moving surface-swimming fish such as tuna, marlin and kingfish. The most common target in New Zealand is albacore tuna which is targeted from January to March with the majority of coverage on the west coasts of the South and North Islands. Vessels range in size from 5 m to 27 m. A few trips have been observed in this fishery to date.

Industry participants with knowledge of this fishery had witnessed or heard of seabird captures in troll fisheries. Albatrosses had been reported captured in the Chatham's, but it was noted that exposure scores should not be overly influenced by the knowledge of one person catching three albatrosses in a trip. Black petrels and gannets were know to chase lures off East Cape and gannets had been seen diving on lures, but often missed and continued lunging onto lures repeatedly. Buller's shearwaters are also known to follow troll lures. As noted for other line fisheries with few hooks, vessels would not continue to work if they constantly caught birds as they would not be catching fish.

Confidence scores in troll fishery were 1a (low, poor or conflicting data) for exposure and 2b for consequence (Table 15).

**Table 15: Seabird species potentially at risk from troll fisheries**

| Common name | Exposure | Consequence | Potential risk score | Risk category |
|---|---|---|---|---|
| Australasian gannet | 4 | 1 | 4 | Low |
| Black petrel | 3 | 3 | 9 | Moderate |
| Buller's shearwater | 3 | 1 | 3 | Low |
| Black-backed gull | 2 | 1 | 2 | Low |
| Red-billed gull | 2 | 1 | 2 | Low |
| Flesh-footed shearwater | 2 | 2 | 4 | Low |
| Westland petrel | 2 | 2 | 4 | Low |
| White-chinned petrel | 2 | 2 | 4 | Low |
| Northern Buller's albatross | 2 | 1 | 2 | Low |
| Southern Buller's albatross | 2 | 1 | 2 | Low |
| Antipodean albatross | 1 | 1 | 1 | Negligible |
| Gibson's albatross | 1 | 1 | 1 | Negligible |
| Northern royal albatross | 1 | 1 | 1 | Negligible |
| Southern royal albatross | 1 | 1 | 1 | Negligible |
| Wandering albatross | 1 | 1 | 1 | Negligible |
| Sooty shearwater | 1 | 1 | 1 | Negligible |
| Grey petrel | 1 | 2 | 2 | Low |
| Black-browed albatross | 1 | 1 | 1 | Negligible |
| Campbell albatross | 1 | 1 | 1 | Negligible |
| Chatham albatross | 1 | 1 | 1 | Negligible |
| Indian yellow-nosed albatross | 1 | 1 | 1 | Negligible |
| Salvin's albatross | 1 | 1 | 1 | Negligible |
| White-capped albatross | 1 | 1 | 1 | Negligible |

Australasian gannets scored the highest level of exposure (4) suggesting interactions are likely to occur on occasion. Interactions with black petrels and Buller's shearwaters were thought to be possible but uncommon. All other species listed in Table 15 were given scores of 1 (rare) or 2 (unlikely). Consequence scores were negligible or minor for all species exposed to the troll fishery except black petrels. Overall, risk scores were low or negligible for all species except black petrels for which some specific management is needed.

### 3.1.14 Trot line

Trot lines can be considered to be a combination of the bottom longline and drop line fishing methods. For this method a buoyed longline is suspended above the seabed, which is equipped with short dropper lines of 20 - 25 hooked short snoods. Trot lines are generally used to target bass, bluenose, hapuku and school shark. There is very little commercial effort relative to other methods with coverage scattered throughout the year in the upper North Island, east coast South Island, south coast South Island and the Chatham's. Vessels using the method of trot line range in size from 7 to 22 m. The greatest number of events undertaken by any one vessel during 2007/08 was 5 with many vessels only using the method of trot line once in the year examined. Primary methods employed by these vessels include bottom longline and surface longline. This fishery has not been observed.

Compared to other lining methods, trot line gear is more complicated and, therefore, there is a greater opportunity for things to go wrong. The backbone is floated above the bottom with droplines hanging off and hooks can be attached either to the droplines or on snoods from the backbone. In addition, many fishers using this method discard offal while gear is being hauled. All hooks are brought up in one group.

From Table 16 it can be seen that albatross species, particularly Buller's, Salvin's and white-capped, as well as flesh-footed shearwaters and black petrels are most likely to be exposed to this fishing method. For these species interactions are expected to be uncommon. The exposure level for all other species listed in Table 16 is rare or unlikely. The consequence of exposure was negligible for all species except flesh-footed shearwaters and black petrels. The consequence or impact on these two species is expected to be minor, with minimal impact on population structure or dynamics. The confidence score for exposure was 1c (agreement between experts but little supporting evidence) and 2b for consequence. For all species likely to be exposed to this method, overall risk was low or negligible indicating no management is necessary.

**Table 16: Seabird species potentially at risk from trot line fisheries**

| Common name | Exposure | Consequence | Potential risk score | Risk category |
|---|---|---|---|---|
| Flesh-footed shearwater | 3 | 2 | 6 | Low |
| Black petrel | 3 | 2 | 6 | Low |
| Northern Buller's albatross | 3 | 1 | 3 | Low |
| Southern Buller's albatross | 3 | 1 | 3 | Low |
| Salvin's albatross | 3 | 1 | 3 | Low |
| White-capped albatross | 3 | 1 | 3 | Low |
| Antipodean albatross | 2 | 1 | 2 | Low |
| Gibson’s albatross | 2 | 1 | 2 | Low |
| Southern royal albatross | 2 | 1 | 2 | Low |
| Wandering albatross | 2 | 1 | 2 | Low |
| Sooty shearwater | 2 | 1 | 2 | Low |
| Grey petrel | 2 | 1 | 2 | Low |
| Westland petrel | 2 | 1 | 2 | Low |
| White-chinned petrel | 2 | 1 | 2 | Low |
| Black-browed albatross | 2 | 1 | 2 | Low |
| Campbell albatross | 2 | 1 | 2 | Low |
| Chatham albatross | 2 | 1 | 2 | Low |
| Indian yellow-nosed albatross | 2 | 1 | 2 | Low |
| Northern giant petrel | 2 | 1 | 2 | Low |
| Southern giant petrel | 2 | 1 | 2 | Low |
| Northern royal albatross | 1 | 1 | 1 | Negligible |
| Grey-headed albatross | 1 | 1 | 1 | Negligible |
| Light-mantled albatross | 1 | 1 | 1 | Negligible |
| Buller's shearwater | 1 | 1 | 1 | Negligible |
| Fluttering shearwater | 1 | 1 | 1 | Negligible |
| Hutton's shearwater | 1 | 1 | 1 | Negligible |
| Brown skua | 1 | 1 | 1 | Negligible |
| Cape petrel | 1 | 1 | 1 | Negligible |
| Snares Cape petrel | 1 | 1 | 1 | Negligible |

### 3.1.15 Bottom longline – vessels less than 40 m

Longlining is a passive method which involves luring the fish to take a baited hook. The weighted line is set from a moving vessel and left for between six and twelve hours to fish on or near the bottom. Bait may be hooked by hand or baiting machine. Smaller bottom longline vessels target bass, bluenose, hapuku, ling, school shark and snapper. Around 50 vessels, ranging in size from 4 to 34 m, each fish at least 100 days a year around the coast of New Zealand. A few larger vessels in this fishery also fish on the Chatham Rise. There has historically been little observer effort in this fishery, but despite low coverage, seabird interactions have been reported.

The vessels in this category are generally domestic vessels that use either hand-baiting or auto-baiting of some sort. Hand-baiters will set around 6000 hooks/day whereas large scale auto-baiters set 30,000-35,000 hooks/day. Small bottom longline vessels targeting snapper float their longlines over foul ground, which may increase the risk of catching species such as black petrels. Red-billed and black-backed gulls also interact with the snapper fishery. Gear is also partially floated when fishing for bluenose. Participants agreed that albatrosses were at high risk in this fishery, especially where there are overlaps with spatial distribution, for example with the Antipodean albatross and the bluenose fishery. It was noted that the bulk of sooty shearwaters nest south of where fishing effort occurs. White-chinned petrels are particularly susceptible to this type of fishery and the New Zealand population is much smaller than previously thought.

The unmitigated, or potential, risk was scored first with confidence levels of 2b (high, agreement between experts) for both exposure and consequence. Seventeen species scored the highest level of exposure indicating interactions are expected to occur (Table 17). Five species scored the second highest level indicating that interactions are likely to occur on occasion, another five species scored a 3 (possible) and six species scored a 2 (unlikely). For flesh-footed shearwaters, grey petrels and black petrels the consequences of interacting with this fishery were severe suggesting that serious impacts would occur, with the potential for local extinctions or population decline requiring years to decades to recover. As such, the risk scores for these species are extreme so that significant additional management is needed. Consequence scores of 4 (major) were recorded for seven species (Antipodean albatross, Gibson's albatross, southern royal albatross, wandering albatross, Westland petrel, white-chinned petrel and Chatham albatross) with corresponding risk scores of 'high'. Increases to current management are required where high risk scores are recorded. Three species (Salvin's albatross and northern and southern giant petrels) were given a consequence score of 3 (moderate) but due to exposure scores of 5 these species have risk scores of 'high' as well.

The optimum risk scores were determined next. Exposure scores were provided in consideration of the legislated mitigation and the assumption that it is being used correctly. Based on the use of line weighting, tori lines and / or night setting, all exposure scores were reduced to 1 (rare) or 2 (unlikely). The confidence rating for this score was low (1a, data exists but is poor) as due to the low levels of observer coverage, it can not be determine how widely or how appropriately the mitigation is being used. The optimum risk scores were reduced to low for all species exposed to

this method except for ten species which reduced from extreme or high to moderate (Table 17) indicating some specific management is still needed.

**Table 17: Seabird species potentially at risk from bottom longline small vessel fisheries**

| Common name | Exposure | Consequence | Potential risk score | Risk category | Optimum exposure | Actual risk | Optimum risk category |
|---|---|---|---|---|---|---|---|
| Flesh-footed shearwater | 5 | 5 | 25 | Extreme | 2 | 10 | Mod |
| Grey petrel | 5 | 5 | 25 | Extreme | 2 | 10 | Mod |
| Black petrel | 5 | 5 | 25 | Extreme | 2 | 10 | Mod |
| Westland petrel | 5 | 4 | 20 | High | 2 | 8 | Mod |
| White-chinned petrel | 5 | 4 | 20 | High | 2 | 8 | Mod |
| Chatham albatross | 5 | 4 | 20 | High | 2 | 8 | Mod |
| Salvin's albatross | 5 | 3 | 15 | High | 2 | 6 | Low |
| Northern giant petrel | 5 | 3 | 15 | High | 2 | 6 | Low |
| Southern giant petrel | 5 | 3 | 15 | High | 2 | 6 | Low |
| Grey faced petrel | 5 | 2 | 10 | Mod | 2 | 4 | Low |
| Sooty shearwater | 5 | 2 | 10 | Mod | 2 | 4 | Low |
| Black-browed albatross | 5 | 2 | 10 | Mod | 2 | 4 | Low |
| Northern Buller's albatross | 5 | 2 | 10 | Mod | 2 | 4 | Low |
| Southern Buller's albatross | 5 | 2 | 10 | Mod | 2 | 4 | Low |
| Campbell albatross | 5 | 2 | 10 | Mod | 2 | 4 | Low |
| White-capped albatross | 5 | 2 | 10 | Mod | 2 | 4 | Low |
| Indian yellow-nosed albatross | 5 | 1 | 5 | Low | 2 | 2 | Low |
| Antipodean albatross | 4 | 4 | 16 | High | 2 | 8 | Mod |
| Gibson’s albatross | 4 | 4 | 16 | High | 2 | 8 | Mod |
| Southern royal albatross | 4 | 4 | 16 | High | 2 | 8 | Mod |
| Wandering albatross | 4 | 4 | 16 | High | 2 | 8 | Mod |
| Buller's shearwater | 4 | 2 | 8 | Mod | 2 | 4 | Low |
| Northern royal albatross | 3 | 1 | 3 | Low | 2 | 2 | Low |
| Grey-headed albatross | 3 | 1 | 3 | Low | 2 | 2 | Low |
| Light-mantled albatross | 3 | 1 | 3 | Low | 2 | 2 | Low |
| Fluttering shearwater | 3 | 1 | 3 | Low | 2 | 2 | Low |
| Hutton's shearwater | 3 | 1 | 3 | Low | 2 | 2 | Low |
| Australasian gannet | 2 | 1 | 2 | Low | 1 | 1 | Low |
| Black-backed gull | 2 | 1 | 2 | Low | 1 | 1 | Low |
| Red-billed gull | 2 | 1 | 2 | Low | 1 | 1 | Low |
| Brown skua | 2 | 1 | 2 | Low | 1 | 1 | Low |
| Cape petrel | 2 | 1 | 2 | Low | 1 | 1 | Low |
| Snares Cape petrel | 2 | 1 | 2 | Low | 1 | 1 | Low |

### 3.1.16 Bottom longline – vessels greater than 40 m

As compared to small vessel bottom longliners, vessels in this category are typically larger (from 46 to over 50 m), target mostly ling and use automated baiting systems. Fishing effort is throughout the year with most effort on the east coast of the North Island in June and July, on the Chatham rise in August and September, Southland in October and November and in the Subantarctic from March to June. Ongoing observer coverage has been delivered in this fishery with 20 – 30% effort observed. Historically, large bycatch events have been reported from this fishery leading to numerous mitigation techniques being introduced. Seabird mortalities are still reported but at much lower rates.

Confidence was rated as 2b (high, agreement between experts) for all scores in Table 18. The potential risk from this fishery was assessed first. Exposure scores were similar to those for the small vessel bottom longline fishery (Table 17) with the exception of black petrels, flesh-footed shearwaters and grey-faced petrels which do not overlap spatially with this fishery to the same extent. For interactions with the larger bottom longline vessels, thirteen species scored an exposure level of 5, indicating that interactions are expected to occur (Table 18). Of these species, 12 had consequence scores of 3 or 4 so that the overall risk score was 'high'. The remaining two species had risk scores that were 'moderate'. Four species had exposure scores of 4 suggesting interactions are likely to occur on occasion, and given the consequence scores for these three species were all 3 (moderate), the risk score for these species is moderate. There are, therefore, eighteen species exposed to this fishery for which some level of management is required. The combinations of exposure and consequence scores for all other species were lower, placing them in the risk categories of negligible and low.

The optimum risk scores were determined next and given the knowledge of these practices, confidence was high (2a, data exists and is considered sound). It was noted that these vessels still catch birds in low numbers despite the mitigation in place. The optimum exposure scores dropped to 1 (rare) or 2(unlikely) for all species which mostly reduced the optimum risk scores to negligible or low. However, the optimum risk score for grey petrel, Westland petrel, white-chinned petrel and Salvin's albatross was moderate so that some specific management is still required to reduce interactions with these species. There was some general discussion about the consequence of this fishery on the white-chinned petrel population. It was also note that yellow-nosed albatrosses are present in such small numbers in New Zealand that the consequence score should be high.

**Table 18: Seabird species potentially at risk from bottom longline deep sea ling fisheries**

| Common name | Exposure | Consequence | Potential risk score | Risk category | Optimum exposure | Actual risk | Optimum risk category |
|---|---|---|---|---|---|---|---|
| Grey Petrel | 5 | 4 | 20 | High | 3 | 12 | Mod |
| White-chinned petrel | 5 | 4 | 20 | High | 3 | 12 | Mod |
| Chatham albatross | 5 | 4 | 20 | High | 2 | 8 | Mod |
| Salvin's albatross | 5 | 4 | 20 | High | 2 | 8 | Mod |
| Westland petrel | 5 | 3 | 15 | High | 3 | 9 | Mod |
| Northern Buller's albatross | 5 | 3 | 15 | High | 2 | 6 | Low |
| Southern Buller's albatross | 5 | 3 | 15 | High | 2 | 6 | Low |
| Campbell albatross | 5 | 3 | 15 | High | 2 | 6 | Low |
| Indian yellow-nosed albatross | 5 | 3 | 15 | High | 2 | 6 | Low |
| White-capped albatross | 5 | 3 | 15 | High | 2 | 6 | Low |
| Northern giant petrel | 5 | 3 | 15 | High | 1 | 3 | Low |
| Southern giant petrel | 5 | 3 | 15 | High | 1 | 3 | Low |
| Sooty Shearwater | 5 | 2 | 10 | Mod | 3 | 6 | Low |
| Black-browed albatross | 5 | 2 | 10 | Mod | 2 | 4 | Low |
| Antipodean albatross | 4 | 3 | 12 | Mod | 2 | 6 | Low |
| Gibson’s albatross | 4 | 3 | 12 | Mod | 2 | 6 | Low |
| Southern royal albatross | 4 | 3 | 12 | Mod | 2 | 6 | Low |
| Wandering albatross | 4 | 3 | 12 | Mod | 2 | 6 | Low |
| Grey faced petrel | 3 | 2 | 6 | Low | 1 | 2 | Low |
| Flesh-footed shearwater | 3 | 2 | 6 | Low | 1 | 2 | Low |
| Black petrel | 3 | 2 | 6 | Low | 2 | 4 | Low |
| Northern royal albatross | 3 | 1 | 3 | Low | 1 | 1 | Neg |
| Grey-headed albatross | 3 | 1 | 3 | Low | 1 | 1 | Low |
| Light-mantled albatross | 3 | 1 | 3 | Low | 1 | 1 | Low |
| Buller's shearwater | 2 | 2 | 4 | Low | 1 | 2 | Low |
| Fluttering shearwater | 2 | 1 | 2 | Low | 1 | 1 | Low |
| Hutton's shearwater | 2 | 1 | 2 | Low | 1 | 1 | Low |
| Brown skua | 2 | 1 | 2 | Low | 1 | 1 | Low |
| Cape petrel | 2 | 1 | 2 | Low | 1 | 1 | Low |
| Snares Cape petrel | 2 | 1 | 2 | Low | 1 | 1 | Low |
| Black-backed gull | 1 | 1 | 1 | Neg | 1 | 1 | Neg |
| Red-billed gull | 1 | 1 | 1 | Neg | 1 | 1 | Neg |

### 3.1.17 Deep water bottom trawl

As for all trawl fisheries, a large net is towed behind the vessel, generally on the bottom. Strong steel cables (referred to as warps) connect the net to the trawler and the net is held open by two large trawl doors which stop the mouth of the net from closing. Fish enter the net through the mouth and then make their way to the other end, called the "codend". This fishery mostly targets orange roughy, oreo species, cardinal fish, rubyfish and other deep water fish stocks throughout the year. Most larger vessels operate on the Chatham Rise and in the Subantarctic while smaller vessels operate in the upper North Island. Vessels range in size from around 20 m to over 100 m in length. There has been ongoing observer coverage of large vessels in this fishery with some minimal coverage of smaller vessels. Seabird mortalities have been reported, but at lower rates compared to other trawl fisheries. On larger vessels,

there are often non-fishing gear-related seabird interactions (e.g. birds striking the deck).

Compared to other trawl fisheries, the warp is closer to the vessel, which nearly eliminates the risk of warp strike. Trawl events are also relatively shorter compared to other trawl fisheries.

Given the ongoing observer coverage in this fishery, experts were able to agree on scores with high confidence. All birds considered at risk of exposure to this fishery scored either 1 (remote) or 2 (unlikely) with the exception of the two Buller's albatrosses, Salvin's albatross and white-capped albatross which all scored 3 (interactions are uncommon). Consequence scores for all species were negligible or minor so that all risk scores were in the negligible or low category even without consideration of mitigation. The optimum risk scores were also negligible or low.

**Table 19: Seabird species potentially at risk from deep water bottom trawl fisheries**

| Common name | Exposure | Consequence | Potential risk score | Risk category | Optimum exposure | Actual risk | Optimum risk category |
|---|---|---|---|---|---|---|---|
| Northern Buller's albatross | 3 | 2 | 6 | Low | 2 | 4 | Low |
| Southern Buller's albatross | 3 | 2 | 6 | Low | 2 | 4 | Low |
| Salvin's albatross | 3 | 2 | 6 | Low | 2 | 4 | Low |
| White-capped albatross | 3 | 2 | 6 | Low | 2 | 4 | Low |
| Sooty shearwater | 2 | 1 | 2 | Low | 2 | 2 | Low |
| White-chinned petrel | 2 | 1 | 2 | Low | 2 | 2 | Low |
| Black-browed albatross | 2 | 1 | 2 | Low | 1 | 1 | Neg |
| Campbell albatross | 2 | 1 | 2 | Low | 1 | 1 | Neg |
| Chatham albatross | 2 | 1 | 2 | Low | 1 | 1 | Neg |
| Antipodean albatross | 1 | 1 | 1 | Neg | 1 | 1 | Neg |
| Gibson's albatross | 1 | 1 | 1 | Neg | 1 | 1 | Neg |
| Northern royal albatross | 1 | 1 | 1 | Neg | 1 | 1 | Neg |
| Southern royal albatross | 1 | 1 | 1 | Neg | 1 | 1 | Neg |
| Wandering albatross | 1 | 1 | 1 | Neg | 1 | 1 | Neg |
| Grey petrel | 1 | 1 | 1 | Neg | 1 | 1 | Neg |
| Grey-headed albatross | 1 | 1 | 1 | Neg | 1 | 1 | Neg |
| Light-mantled albatross | 1 | 1 | 1 | Neg | 1 | 1 | Neg |
| Cape petrel | 1 | 1 | 1 | Neg | 1 | 1 | Neg |
| Northern giant petrel | 1 | 1 | 1 | Neg | 1 | 1 | Neg |
| Snares Cape petrel | 1 | 1 | 1 | Neg | 1 | 1 | Neg |
| Southern giant petrel | 1 | 1 | 1 | Neg | 1 | 1 | Neg |

### 3.1.18 Inshore trawl

Most small, inshore trawl vessels fish on the bottom. In some cases two vessels are used, termed pair trawling, where one of the lines from the net is passed to a second trawler and the two boats tow in tandem, using the distance between them to assist in keeping the mouth of the net open. Prior to hauling the net in, the line is passed back to the first boat, and the net is hauled onto one boat. Small vessels using the method of trawl target multiple species with greatest effort for flatfish, gurnard, john dory, lemon sole, red cod, snapper, tarakihi and trevally. Fishing effort is undertaken throughout the year with over 100 vessels fishing greater than 100 days a year. Vessels range in size from 5 m to 30 m and may employ other methods including potting, dahn lining and trolling. Despite very low observer coverage in this fishery, seabird catch rates are high compared with offshore trawl fisheries, especially on the east coast of the South Island.

No mitigation is regulated in this fishery except for the few vessels over 28 m in length. However, some fishers have developed their own mitigation devices, mostly warp scarers in the South Island and baffler devices in the Auckland region. Based on observer comments, offal discharge has been a major factor leading to warp strikes and there can also be substantial non quota bycatch. While captures of albatrosses, petrels and shags have been reported from the South Island, net captures of gannets, flesh-footed shearwaters and black petrels have been reported from the North Island. Participants with knowledge of the fishery were aware of gannets and gulls congregating behind nets in the Auckland and Northland region. There was also concern expressed for king shags in areas of the outer Marlborough Sounds where small vessels targeting flat-fish overlap with king shag foraging areas. The extent to which albatrosses or other seabirds are impacted by warps was considered.

Participants agreed to exposure and confidence scores with high confidence except for king shags and eastern rockhopper penguins. Exposure for these two species could not be scored with high confidence without further examination of fishing effort around breeding locations. Interactions are expected to occur (score 5) in inshore fisheries with nine species (Table 20). Of these nine species, the consequences were considered to be major for black petrels and Salvin's albatross and moderate for the black-browed albatross, Campbell albatross and white-capped albatross. These five species all have a risk score of high, indicating that increases to current management are needed. Seven species are in the 'moderate' risk category for this fishery which indicates some specific management is needed; sooty shearwater, white-chinned petrel, northern and southern Buller's albatross, flesh-footed petrel, spotted shag and Chatham albatross. While the consequence scores for these seven species were minor or moderate, the level of exposure ranged from 3 (interactions uncommon) through to 5 (interactions expected to occur). A further 20 species were given a risk score of low and 12 were given negligible. While no specific management is required to mitigate impacts on these species, Table 20 does provide an indication of the large number of species that may interaction with inshore trawl fisheries.

**Table 20: Seabird species potentially at risk from inshore trawl fisheries**

| Common name | Exposure | Consequence | Potential risk score | Risk category |
|---|---|---|---|---|
| Black petrel | 5 | 4 | 20 | High |
| Salvin's albatross | 5 | 4 | 20 | High |
| Black-browed albatross | 5 | 3 | 15 | High |
| Campbell albatross | 5 | 3 | 15 | High |
| White-capped albatross | 5 | 3 | 15 | High |
| Sooty shearwater | 5 | 2 | 10 | Moderate |
| White-chinned petrel | 5 | 2 | 10 | Moderate |
| Northern Buller's albatross | 5 | 2 | 10 | Moderate |
| Southern Buller's albatross | 5 | 2 | 10 | Moderate |
| Flesh-footed shearwater | 4 | 3 | 12 | Moderate |
| Spotted shag | 4 | 2 | 8 | Moderate |
| Chatham albatross | 3 | 3 | 9 | Moderate |
| Westland petrel | 3 | 2 | 6 | Low |
| Northern giant petrel | 3 | 1 | 3 | Low |
| Southern giant petrel | 3 | 1 | 3 | Low |
| King shag | 2 | 3 | 6 | Low |
| Stewart Island shag | 2 | 3 | 6 | Low |
| Australasian gannet | 2 | 1 | 2 | Low |
| Black-backed gull | 2 | 1 | 2 | Low |
| Antipodean albatross | 2 | 1 | 2 | Low |
| Gibson’s albatross | 2 | 1 | 2 | Low |
| Southern royal albatross | 2 | 1 | 2 | Low |
| Wandering albatross | 2 | 1 | 2 | Low |
| Grey faced petrel | 2 | 1 | 2 | Low |
| Grey petrel | 2 | 1 | 2 | Low |
| Buller's shearwater | 2 | 1 | 2 | Low |
| Fluttering shearwater | 2 | 1 | 2 | Low |
| Hutton's shearwater | 2 | 1 | 2 | Low |
| Cape petrel | 2 | 1 | 2 | Low |
| Snares Cape petrel | 2 | 1 | 2 | Low |
| Indian yellow-nosed albatross | 1 | 6 | 6 | Low |
| Chatham Island shag | 1 | 3 | 3 | Low |
| Red-billed gull | 1 | 1 | 1 | Negligible |
| Northern royal albatross | 1 | 1 | 1 | Negligible |
| Chatham Island blue penguin | 1 | 1 | 1 | Negligible |
| Eastern Rockhopper penguin | 1 | 1 | 1 | Negligible |
| Fiordland penguin | 1 | 1 | 1 | Negligible |
| Northern blue penguin | 1 | 1 | 1 | Negligible |
| Snares penguin | 1 | 1 | 1 | Negligible |
| Southern blue penguin | 1 | 1 | 1 | Negligible |
| White-flippered blue penguin | 1 | 1 | 1 | Negligible |
| Yellow-eyed penguin | 1 | 1 | 1 | Negligible |
| Grey-headed albatross | 1 | 1 | 1 | Negligible |
| Light-mantled albatross | 1 | 1 | 1 | Negligible |

### 3.1.19 Middle depth trawl – finfish

Middle depth trawl fisheries drag the net at a lesser depth compared to the bottom trawl fisheries discussed above. This fishery includes the finfish targets hoki, hake, ling and warehou species (excludes southern blue whiting). Fishing effort is undertaken throughout the year in around the New Zealand mainland, on the Chatham rise and in the Subantarctic. Vessels range in size from 30 m to over 100 m in length. Historically, around 15-20% observer coverage has been achieved in this fishery. Seabirds are known to be caught by middle depth trawl vessels targeting finfish including a number of albatross and petrel species, particularly Buller's albatross, Salvin's albatross, white-capped albatross, sooty shearwater and white-chinned petrel.

It was noted that more offal is dumped in this fishery compared to other mid-water trawl fisheries. Mitigation is currently regulated to reduce warp interactions and initiatives to manage offal continue, but the quantity produced limits options. There are currently no mitigation measures in place to address net captures.

Potential, or unmitigated, risk was scored first and participants agreed to all scores with high confidence. Four species scored a 5 for exposure as interactions are expected to occur with white-chinned petrels, Salvin's albatross, sooty shearwaters and white-capped albatross. The consequences of interacting with this fishery were 4 (major) for white-chinned petrels and Salvin's albatrosses and 3 (moderate) for sooty shearwaters and white-capped albatrosses so that all four species are in the 'high' risk category. Four species are in the 'moderate' risk category indicating that in the absence of mitigation, specific management is needed. A further 14 species likely to interact with this fishery were scored as 'low' or 'negligible'.

To determine the actual risk in this fishery, exposure scores were reassessed for each species with consideration of the regulations in place. The score of 5 (interactions are expected to occur) for white-chinned petrels and sooty shearwaters did not change as these species are generally caught in the net for which no mitigation is currently in place. The exposure scores for all other species in the 'high' or 'moderate' potential risk categories dropped, except for grey petrels which are also more likely to be caught in the net. The movement between potential and actual risk indicates that further management actions are necessary to further reduce interactions in this fishery.

**Table 21: Seabird species potentially at risk from middle depth trawl finfish fisheries**

| Common name | Exposure | Consequence | Potential risk score | Risk category | Optimum exposure | Actual risk | Optimum risk category |
|---|---|---|---|---|---|---|---|
| White-chinned petrel | 5 | 4 | 20 | High | 5 | 20 | High |
| Salvin's albatross | 5 | 4 | 20 | High | 3 | 12 | Moderate |
| Sooty shearwater | 5 | 3 | 15 | High | 5 | 15 | High |
| White-capped albatross | 5 | 3 | 15 | High | 3 | 9 | Moderate |
| Black-browed albatross | 4 | 3 | 12 | Moderate | 3 | 9 | Moderate |
| Southern Buller's albatross | 4 | 3 | 12 | Moderate | 3 | 9 | Moderate |
| Chatham albatross | 3 | 4 | 12 | Moderate | 2 | 8 | Moderate |
| Grey petrel | 3 | 3 | 9 | Moderate | 3 | 9 | Moderate |
| Common name | Exposure | Consequence | Potential risk score | Risk category | Optimum exposure | Actual risk | Optimum risk category |
| Northern Buller's albatross | 3 | 2 | 6 | Low | 2 | 4 | Low |
| Campbell albatross | 3 | 2 | 6 | Low | 2 | 4 | Low |
| Northern giant petrel | 3 | 1 | 3 | Low | 2 | 2 | Low |
| Southern giant petrel | 3 | 1 | 3 | Low | 2 | 2 | Low |
| Antipodean albatross | 2 | 2 | 4 | Low | 1 | 2 | Low |
| Gibson’s albatross | 2 | 2 | 4 | Low | 1 | 2 | Low |
| Southern royal albatross | 2 | 2 | 4 | Low | 1 | 2 | Low |
| Wandering albatross | 2 | 2 | 4 | Low | 1 | 2 | Low |
| Westland petrel | 2 | 2 | 4 | Low | 2 | 4 | Low |
| Cape petrel | 2 | 1 | 2 | Low | 2 | 2 | Low |
| Snares Cape petrel | 2 | 1 | 2 | Low | 2 | 2 | Low |
| Northern royal albatross | 1 | 1 | 1 | Negligible | 1 | 1 | Negligible |
| Grey-headed albatross | 1 | 1 | 1 | Negligible | 1 | 1 | Negligible |
| Light-mantled albatross | 1 | 1 | 1 | Negligible | 1 | 1 | Negligible |

### 3.1.20 Middle depth trawl – scampi

Scampi fishing effort is undertaken throughout the year in the upper North Island, Chatham rise and the Subantarctic. Vessel ranges in size from 18 m to over 40 m in length. Historically, observer coverage in the scampi fishery has been on the Chatham rise and the Subantarctic with lesser coverage in AKE and CEE. High rates of seabird captures have been reported from this fishery. Seabird species incidentally killed include Buller’s albatross, Salvin’s albatross, white-capped albatross, white-chinned petrel, flesh-footed shearwater, sooty shearwater, northern giant petrel and black-browed albatross.

Only one vessel in this fishery is over 28 m in length and therefore required to use bird scaring lines, although some smaller vessels do use warp scarers or other homemade devices. Typically, flesh-footed shearwaters and black petrels have been reported from northern fisheries, whereas albatrosses and other petrel species are more likely to be caught in the southern scampi fishery. In previous years, observer records have shown a high strike rate in this trawl fishery compared to other mid-water trawl fisheries (Rowe 2009). It was also noted that there is a lot of discarding in this fishery and that once the net is cleared; many crews tow the nets in the water to clean them out. Both factors may increase the chances of bird interactions.

As most vessels in this fishery are not required to use mitigation, only potential risk was scored (confidence 2b for all scores). Only flesh-footed shearwaters had an exposure score of 5 (interactions are expected to occur) and, with a consequence of 3 (moderate), this species had a potential risk score of high. As such, increases to current management are required. Black petrels and sooty shearwaters scored an exposure of 4 (interactions likely to occur on occasion) with the consequences for black petrels (moderate) higher than for sooty shearwaters (minor). Both species had a potential risk score of 'moderate' suggesting specific management is needed. A further 20 species had potential risk scores of 'low' or 'negligible' and while these scores indicate no requirement for management, the number of birds likely to interact with this fishery needs to be considered.

**Table 22: Seabird species potentially at risk from middle depth trawl scampi fisheries**

| Common name | Exposure | Consequence | Potential risk score | Risk category |
|---|---|---|---|---|
| Flesh-footed shearwater | 5 | 3 | 15 | High |
| Black petrel | 4 | 3 | 12 | Moderate |
| Sooty shearwater | 4 | 2 | 8 | Moderate |
| White-chinned petrel | 3 | 2 | 6 | Low |
| Black-browed albatross | 3 | 2 | 6 | Low |
| Northern Buller's albatross | 3 | 2 | 6 | Low |
| Southern Buller's albatross | 3 | 2 | 6 | Low |
| Campbell albatross | 3 | 2 | 6 | Low |
| Salvin's albatross | 3 | 2 | 6 | Low |
| White-capped albatross | 3 | 2 | 6 | Low |
| Northern giant petrel | 3 | 1 | 3 | Low |
| Chatham albatross | 2 | 1 | 2 | Low |
| Southern giant petrel | 2 | 1 | 2 | Low |
| Antipodean albatross | 1 | 1 | 1 | Negligible |
| Gibson's albatross | 1 | 1 | 1 | Negligible |
| Northern royal albatross | 1 | 1 | 1 | Negligible |
| Southern royal albatross | 1 | 1 | 1 | Negligible |
| Wandering albatross | 1 | 1 | 1 | Negligible |
| Grey petrel | 1 | 1 | 1 | Negligible |
| Grey-headed albatross | 1 | 1 | 1 | Negligible |
| Light-mantled albatross | 1 | 1 | 1 | Negligible |
| Cape petrel | 1 | 1 | 1 | Negligible |
| Snares Cape petrel | 1 | 1 | 1 | Negligible |

### 3.1.21 Middle depth trawl – southern blue whiting

Fishing effort for southern blue whiting is undertaken from August to October around the Bounty Islands, Pukaki Rise, and east of Campbell Island. Vessels range in size from 30 m to over 100 m in length. Historically, around 20% observer coverage has been achieved in this fishery. Seabirds are known to be caught by middle depth trawl vessels targeting finfish including a number of albatross and petrel species, but in lower numbers compared to other mid-water trawl fisheries.

Potential risk was scored first (confidence 2b) with all species in the low risk category. The species most likely to interact with this fishery, but with minimal

impact on population structure or dynamics, were grey petrel, black-browed albatross, Campbell albatross, Salvin's albatross and white-capped albatross.

The actual risk scores reduced or remained at 1 (rare) for all species except grey petrels, sooty shearwaters and white-chinned petrels which are more likely to be caught in the net for which no mitigation is in place. No direct management is required in this fishery as actual risk scores were all low or negligible.

**Table 23: Seabird species potentially at risk from middle depth trawl southern blue whiting fisheries**

| Common name | Exposure | Consequence | Potential risk score | Risk category | Optimum exposure | Actual risk | Optimum risk category |
|---|---|---|---|---|---|---|---|
| Grey petrel | 3 | 2 | 6 | Low | 3 | 6 | Low |
| Black-browed albatross | 3 | 2 | 6 | Low | 2 | 4 | Low |
| Campbell albatross | 3 | 2 | 6 | Low | 2 | 4 | Low |
| Salvin's albatross | 3 | 2 | 6 | Low | 2 | 4 | Low |
| White-capped albatross | 3 | 2 | 6 | Low | 2 | 4 | Low |
| Sooty shearwater | 2 | 1 | 2 | Low | 2 | 2 | Low |
| White-chinned petrel | 2 | 1 | 2 | Low | 2 | 2 | Low |
| Northern Buller's albatross | 2 | 1 | 2 | Low | 1 | 1 | Negligible |
| Southern Buller's albatross | 2 | 1 | 2 | Low | 1 | 1 | Negligible |
| Chatham albatross | 2 | 1 | 2 | Low | 1 | 1 | Negligible |
| Northern giant petrel | 2 | 1 | 2 | Low | 1 | 1 | Negligible |
| Southern giant petrel | 2 | 1 | 2 | Low | 1 | 1 | Negligible |
| Antipodean albatross | 1 | 1 | 1 | Negligible | 1 | 1 | Negligible |
| Gibson's albatross | 1 | 1 | 1 | Negligible | 1 | 1 | Negligible |
| Northern royal albatross | 1 | 1 | 1 | Negligible | 1 | 1 | Negligible |
| Southern royal albatross | 1 | 1 | 1 | Negligible | 1 | 1 | Negligible |
| Wandering albatross | 1 | 1 | 1 | Negligible | 1 | 1 | Negligible |
| Grey-headed albatross | 1 | 1 | 1 | Negligible | 1 | 1 | Negligible |
| Light-mantled albatross | 1 | 1 | 1 | Negligible | 1 | 1 | Negligible |
| Cape petrel | 1 | 1 | 1 | Negligible | 1 | 1 | Negligible |
| Snares Cape petrel | 1 | 1 | 1 | Negligible | 1 | 1 | Negligible |

### 3.1.22 Middle depth trawl – squid

Squid trawl effort occurs in three main areas: east coast South Island, south coast South Island and in the Subantarctic near the Auckland Islands. Vessels targeting squid range in size from 15 m (inshore vessels) to over 100 m. Historically most observer effort has been in Southland and around the Auckland Islands with little effort on the east coast of the South Island, despite high seabird capture rates in that area. Historically, high levels of seabird bycatch have been reported in this fishery, especially white-capped albatross warp captures and net captures of sooty shearwaters and white-chinned petrels.

While bird scaring devices are required in this fishery to mitigate warp strikes, no net capture mitigation is currently in place. Relatively high numbers of sooty shearwaters and white-chinned petrels are caught in squid nets, with sooty shearwater captures high in April and May on the east coast of the South Island. Prior to warp mitigation

and the retention of offal during shooting and hauling, albatross interactions with warps were higher. However, albatrosses also get caught in the net.

Potential risk in the squid fishery was scored first. Confidence in exposure scores was high (2a, data exists and is considered sound) and participants agreed to all consequence scores with high confidence. Four species were expected to interact with the squid fishery; white-chinned petrels, Salvin's albatrosses, sooty shearwaters and white-capped albatrosses. The consequences of white-chinned petrels and Salvin's albatrosses interacting with this fishery in the absence of mitigation was considered to be major, with wider and longer term population impacts expected. The consequence score for sooty shearwaters and white-capped albatrosses interacting with this fishery is 3 (minor). For all four species with high exposure scores, the potential risk is 'high'. A further four species had 'moderate' potential risk scores; black-browed albatross, southern Buller's albatross, Chatham albatross and grey petrel. In addition to the eight species with 'high' and 'moderate' potential risk scores, thirteen species had 'low' or 'negligible' risk scores indicating these species may interact with this fishery, but impacts are expected to be below the acceptable level.

With consideration of the mitigation and offal management practices in place, the exposure scores were re-examined to determine actual risk in the squid fishery. The risk to white-chinned petrels, sooty shearwaters and grey petrels did not change as these species are most likely to be caught in the net. As such, the actual risk for white-chinned petrels and sooty shearwaters remains high and for grey petrels remains at moderate. The exposure score for Salvin's albatross and white-capped albatross reduced from 5 (likely) to 3 (uncommon) with the actual risk scores for these species reducing to 'moderate'. The exposure scores for black-browed albatross, southern Buller's albatross and Chatham albatross each reduced by one, so that the actual risk for white-capped albatrosses reduced from 'high' to moderate, but remained at moderate for the southern Buller's and Chatham albatrosses. Further management is required in this fishery given eight species had actual risk scores of 'moderate' or 'high'.

**Table 24: Seabird species potentially at risk from middle depth trawl squid fisheries**

| Common name | Exposure | Consequence | Potential risk score | Risk category | Optimum exposure | Actual risk | Optimum risk category |
|---|---|---|---|---|---|---|---|
| White-chinned petrel | 5 | 4 | 20 | High | 5 | 20 | High |
| Salvin's albatross | 5 | 4 | 20 | High | 3 | 12 | Moderate |
| Sooty shearwater | 5 | 3 | 15 | High | 5 | 15 | High |
| White-capped albatross | 5 | 3 | 15 | High | 3 | 9 | Moderate |
| Black-browed albatross | 4 | 3 | 12 | Moderate | 3 | 9 | Moderate |
| Southern Buller's albatross | 4 | 3 | 12 | Moderate | 3 | 9 | Moderate |
| Chatham albatross | 3 | 4 | 12 | Moderate | 2 | 8 | Moderate |
| Grey petrel | 3 | 3 | 9 | Moderate | 3 | 9 | Moderate |
| Northern Buller's albatross | 3 | 2 | 6 | Low | 2 | 4 | Low |
| Campbell albatross | 3 | 2 | 6 | Low | 2 | 4 | Low |
| Northern giant petrel | 3 | 1 | 3 | Low | 2 | 2 | Low |
| Southern giant petrel | 3 | 1 | 3 | Low | 2 | 2 | Low |
| Antipodean albatross | 2 | 2 | 4 | Low | 1 | 2 | Low |
| Gibson’s albatross | 2 | 2 | 4 | Low | 1 | 2 | Low |
| Southern royal albatross | 2 | 2 | 4 | Low | 1 | 2 | Low |
| Wandering albatross | 2 | 2 | 4 | Low | 1 | 2 | Low |
| Cape petrel | 2 | 1 | 2 | Low | 2 | 2 | Low |
| Snares Cape petrel | 2 | 1 | 2 | Low | 2 | 2 | Low |
| Northern royal albatross | 1 | 1 | 1 | Negligible | 1 | 1 | Negligible |
| Grey-headed albatross | 1 | 1 | 1 | Negligible | 1 | 1 | Negligible |
| Light-mantled albatross | 1 | 1 | 1 | Negligible | 1 | 1 | Negligible |

### 3.1.23 Pelagic mackerel trawl

Pelagic trawlers target Jack mackerel, English mackerel and barracouta throughout the year mostly in on the west coasts of the North and South Island and east coast of the South Island. Vessels targeting these stocks range in size from around 15 m to over 100 m in length. Ongoing observer coverage in this fishery, generally around 15-20% of effort observed. Seabird interactions have been reported in this fishery including mortalities of Buller’s albatrosses, common diving petrel, fairy prions, sooty shearwaters, white-capped albatrosses and white-chinned petrels.

Seabird interactions are considered to be lower in this fishery compared to other trawl fisheries with most birds caught in the Southland region. Vessels operating in this fishery are required to use bird scaring devices to mitigate warp interactions.

Potential risk was scored first with agreement amongst participants and high confidence for all scores (Table 25). The sooty shearwater was given an exposure score of 4 (interactions likely to occur on occasion) due to the tendency of this species to be caught in trawl nets. However, the impact on populations of sooty shearwaters was considered to be minor in this fishery so that, overall, the potential risk to sooty shearwaters was ‘moderate’. Four species were given exposure scores of 3 (interactions are uncommon) but the consequences of interactions were considered minor in this fishery, giving ‘low’ potential risk scores. A further 22 species were assigned exposure scores of 2 (unlikely) or 1 (rare) and in all cases the consequence of impact at the population level was considered negligible.

Actual risk was not reduced for sooty shearwaters or other petrel species likely to be caught in the net. Across the 27 species likely to interact to some degree with this fishery, actual risk was assigned as ‘low’ or ‘negligible’ for all species except sooty shearwaters. As such, some level of specific management is required in this fishery to mitigate sooty shearwater interactions.

**Table 25: Seabird species potentially at risk from pelagic trawl fisheries**

| Common name | Exposure | Consequence | Potential risk score | Risk category | Optimum exposure | Actual risk | Optimum risk category |
|---|---|---|---|---|---|---|---|
| Sooty shearwater | 4 | 2 | 8 | Moderate | 4 | 8 | Moderate |
| White-chinned petrel | 3 | 2 | 6 | Low | 3 | 6 | Low |
| Southern Buller's albatross | 3 | 2 | 6 | Low | 2 | 4 | Low |
| Salvin's albatross | 3 | 2 | 6 | Low | 2 | 4 | Low |
| White-capped albatross | 3 | 2 | 6 | Low | 2 | 4 | Low |
| Westland petrel | 2 | 1 | 2 | Low | 2 | 2 | Low |
| Black-browed albatross | 2 | 1 | 2 | Low | 1 | 1 | Low |
| Northern Buller's albatross | 2 | 1 | 2 | Low | 1 | 1 | Negligible |
| Campbell albatross | 2 | 1 | 2 | Low | 1 | 1 | Negligible |
| Chatham albatross | 2 | 1 | 2 | Low | 1 | 1 | Negligible |
| Cape petrel | 2 | 1 | 2 | Low | 2 | 2 | Low |
| Northern giant petrel | 2 | 1 | 2 | Low | 1 | 1 | Negligible |
| Snares Cape petrel | 2 | 1 | 2 | Low | 2 | 2 | Low |
| Southern giant petrel | 2 | 1 | 2 | Low | 1 | 1 | Negligible |
| Antipodean albatross | 1 | 1 | 1 | Negligible | 1 | 1 | Negligible |
| Gibson’s albatross | 1 | 1 | 1 | Negligible | 1 | 1 | Negligible |
| Common name | Exposure | Consequence | Potential risk score | Risk category | Optimum exposure | Actual risk | Optimum risk category |
| Northern royal albatross | 1 | 1 | 1 | Negligible | 1 | 1 | Negligible |
| Southern royal albatross | 1 | 1 | 1 | Negligible | 1 | 1 | Negligible |
| Wandering albatross | 1 | 1 | 1 | Negligible | 1 | 1 | Negligible |
| Flesh-footed shearwater | 1 | 1 | 1 | Negligible | 1 | 1 | Negligible |
| Grey petrel | 1 | 1 | 1 | Negligible | 1 | 1 | Negligible |
| Black petrel | 1 | 1 | 1 | Negligible | 1 | 1 | Negligible |
| Grey-headed albatross | 1 | 1 | 1 | Negligible | 1 | 1 | Negligible |
| Light-mantled albatross | 1 | 1 | 1 | Negligible | 1 | 1 | Negligible |
| Buller's shearwater | 1 | 1 | 1 | Negligible | 1 | 1 | Negligible |
| Fluttering shearwater | 1 | 1 | 1 | Negligible | 1 | 1 | Negligible |
| Hutton's shearwater | 1 | 1 | 1 | Negligible | 1 | 1 | Negligible |

### 3.1.24 Setnet

Setnetting is the most common form of netting. Most nets have a series of floats at the top, and a series of weights at the bottom that keep the net upright in the water. Fish are caught as they swim into the net. The size of the mesh in the set net determines the size and species of fish caught. Surface nets are used in shallow water, or where the targeted fish feeds on the surface. Bottom setnets are similar in design to surface nets, but use lighter floats and heavier weights so that the net sinks to the bottom. Multiple species are targeted with greatest fishing effort for butterfish, flatfish, grey mullet, school shark, rig, tarakihi and yellow belly flounder. Fishing effort is throughout the

year around the mainland and the Chatham Islands. Fishing vessels range in size from 2 m to 20 m. Other methods employed include bottom trawling, trolling, hand-lining, potting and dahn lining. Despite low levels of observer coverage, a number of seabird species have been incidentally killed in setnets including spotted and pied shags, fluttering shearwaters, sooty shearwaters and yellow-eyed penguins.

The different types of risk posed by this fishery were discussed. Species such as yellow-eyed penguins are more likely to become entangled while the net is soaking. In contrast, petrels and albatrosses are more likely to become entangled during setting or hauling as these species may dive on the net for 'stickers' or target fish. Those familiar with this fishery noted that an abundance of large albatrosses are often present around setnet vessels in Foveaux Strait, that the likelihood of shag captures increases if gear is left out over night, that crayfish operators often setnet for bait in the 'far south' and that fishers on the Chathams are know to net for bait without recording the catch. There was some discussion around the setnet effort displayed around the Snares Islands and potential impacts on Snare's crested penguins. Clarification of whether the few vessels operating in this area use the method of setnet needs to be determined. It was also noted there are records of 100s of Hutton's and fluttering shearwaters caught in recreational setnets.

While there is currently no seabird mitigation in place in this fishery, many fishers process fish on the way back to port thereby eliminating offal discharge during shooting or hauling. Only potential risk was assessed. When scoring exposure, it was noted that confidence for shags was low due to the lack of data. As such, the confidence scores are included in Table 26 as they differed between species. There was, however, agreement on the consequence scores with high confidence. Sixteen species of seabird were expected to interact with setnet fisheries (exposure score 5). The consequence of interacting with setnet fisheries was considered extreme for the Chatham Island shag, king shag and Pitt Island shag indicating that interactions are expected to lead to widespread and permanent damage with local extinction or serious population decline. It should be noted that the confidence scores for exposure were low for these three species. The consequence of yellow-eyed penguins interacting with this fishery is expected to be a severe impact on populations. Stewart Island shags and Hutton's shearwater scored a consequence level of 4 (major) and all other species with an exposure level of 5 had 'moderate' consequence levels. The Fiordland penguin was given an exposure score of 4 (interactions likely to occur on occasion) and, given other impacts to populations, a consequence score of 4 (major) so that this species was in the 'high' risk category. Unlike any other fishery discussed, four species were assigned to the 'extreme' risk category, ten species were assigned to the 'high' risk category and five species were assigned to the 'moderate' risk category. Some level of additional management is required for these 19 species to mitigate interactions with setnet fisheries. An additional 23 species were assigned to the 'low' or 'negligible' risk categories.

**Table 26: Seabird species potentially at risk from setnet fisheries**

| Common name | Exposure | Confidence | Consequence | Potential risk score | Risk category |
|---|---|---|---|---|---|
| Chatham Island shag | 5 | 1b | 6 | 30 | Extreme |
| King shag | 5 | 1b | 6 | 30 | Extreme |
| Pitt Island shag | 5 | 1b | 6 | 30 | Extreme |
| Yellow-eyed penguin | 5 | 2b | 5 | 25 | Extreme |
| Stewart Island shag | 5 | 1b | 4 | 20 | High |
| Hutton's shearwater | 5 | 2b | 4 | 20 | High |
| Sooty shearwater | 5 | 2b | 3 | 15 | High |
| Northern blue penguin | 5 | 2b | 3 | 15 | High |
| White-flippered blue penguin | 5 | 2b | 3 | 15 | High |
| Pied shag | 5 | 2b | 3 | 15 | High |
| Spotted shag | 5 | 2b | 3 | 15 | High |
| Little black shag | 5 | 1b | 3 | 15 | High |
| Fluttering shearwater | 5 | 2b | 3 | 15 | High |
| Southern blue penguin | 5 | 2b | 2 | 10 | Moderate |
| Black shag | 5 | 1b | 2 | 10 | Moderate |
| Little shag | 5 | 1b | 2 | 10 | Moderate |
| Fiordland penguin | 4 | 1b | 4 | 16 | High |
| Chatham Island blue penguin | 3 | 1b | 3 | 9 | Moderate |
| Flesh-footed shearwater | 3 | 2b | 2 | 6 | Low |
| Australasian gannet | 3 | 2b | 1 | 3 | Low |
| Codfish Island South Georgian diving petrel | 2 | 1b | 6 | 12 | Moderate |
| Snares penguin | 2 | 1b | 2 | 4 | Low |
| Caspian tern | 2 | 2b | 1 | 2 | Low |
| White-fronted tern | 2 | 2b | 1 | 2 | Low |
| Northern Buller's albatross | 2 | 2b | 1 | 2 | Low |
| Southern Buller's albatross | 2 | 2b | 1 | 2 | Low |
| Salvin's albatross | 2 | 2b | 1 | 2 | Low |
| White-capped albatross | 2 | 2b | 1 | 2 | Low |
| Buller's shearwater | 2 | 2b | 1 | 2 | Low |
| Northern diving petrel | 2 | 2b | 1 | 2 | Low |
| Northern giant petrel | 2 | 2b | 1 | 2 | Low |
| Snares Cape petrel | 2 | 2b | 1 | 2 | Low |
| Southern diving petrel | 2 | 2b | 1 | 2 | Low |
| Southern giant petrel | 2 | 2b | 1 | 2 | Low |
| Black-backed gull | 1 | 2b | 1 | 1 | Negligible |
| Red-billed gull | 1 | 2b | 1 | 1 | Negligible |
| Antipodean albatross | 1 | 2b | 1 | 1 | Negligible |
| Gibson’s albatross | 1 | 2b | 1 | 1 | Negligible |
| Southern royal albatross | 1 | 2b | 1 | 1 | Negligible |
| Wandering albatross | 1 | 2b | 1 | 1 | Negligible |
| Black-browed albatross | 1 | 2b | 1 | 1 | Negligible |
| Campbell albatross | 1 | 2b | 1 | 1 | Negligible |

### 3.1.25 Surface longline – vessels less than 50 m

A surface longline consists of a main line that can be many kilometres long and supported in the water by a series of floats. Attached to this main line are branch lines that are each up to 50-75 metres long. Every branch line carries a baited hook, and there can be up to 3000 hooks on a longline. Most fishing effort targets bigeye tuna in northern New Zealand waters, southern bluefin tuna on the west coast of the South Island and the east coast and northern regions of the North Island and swordfish, mostly in the Kermadec region. Other tuna stocks are also targeted to a lesser degree. Vessels in this category range in size from 12 m to 29 m in length. Observer coverage in recent years has ranged between 4 and 8%. A number of albatross and petrel species have been reported incidentally killed in this fishery.

The group discussed the differences between the smaller, domestic vessels and the larger charter vessels, which both target tuna in New Zealand waters. The domestic fleet also targets swordfish in the Kermadec region and there has been one incident observed where over 50 seabirds were caught on one trip. The domestic fleet is generally owner-operated and fishes year round. Snoods are around 18 m in length. Surface longliners are required to use tori lines as well as either line weighting or night setting.

Potential risk scores were determined with a confidence rating of 2b (high, agreement between experts). Table 27 shows that 15 species are expected to interact with domestic surface longliners and one species is likely to interact on occasion. For 13 of these species with high exposure scores, the consequence scores are either 4 (major) or 3 (moderate) which places these birds in the high risk category. A further five birds are in the ‘moderate’ category, one of which is the Indian yellow-nosed albatross. While New Zealand is probably on the outer range for Indian yellow-nosed albatrosses, there are two breeding pairs resident in New Zealand and, if these are treated as the New Zealand population, then the impact must be high. A further seven species were in the ‘low’ category.

Given the use of mitigation devices in this fishery, the optimum exposure scores were reduced to 3 (interactions are uncommon) so that actual risk scores are no greater than moderate. As such, specific management is needed with some additions to current levels.

**Table 27: Seabird species potentially at risk from surface longline small vessel fisheries**

| Common name | Exposure | Consequence | Potential risk score | Risk category | Optimum exposure | Actual risk | Optimum risk category |
|---|---|---|---|---|---|---|---|
| Antipodean albatross | 5 | 4 | 20 | High | 3 | 12 | Moderate |
| Gibson's albatross | 5 | 4 | 20 | High | 3 | 12 | Moderate |
| Wandering albatross | 5 | 4 | 20 | High | 3 | 12 | Moderate |
| Grey petrel | 5 | 4 | 20 | High | 3 | 12 | Moderate |
| Black petrel | 5 | 4 | 20 | High | 3 | 12 | Moderate |
| White-chinned petrel | 5 | 4 | 20 | High | 3 | 12 | Moderate |
| Southern royal albatross | 5 | 3 | 15 | High | 3 | 9 | Moderate |
| Westland petrel | 5 | 3 | 15 | High | 3 | 9 | Moderate |
| Black-browed albatross | 5 | 3 | 15 | High | 3 | 9 | Moderate |
| Northern Buller's albatross | 5 | 3 | 15 | High | 3 | 9 | Moderate |
| Southern Buller's albatross | 5 | 3 | 15 | High | 3 | 9 | Moderate |
| Salvin's albatross | 5 | 3 | 15 | High | 3 | 9 | Moderate |
| White-capped albatross | 5 | 3 | 15 | High | 3 | 9 | Moderate |
| Sooty shearwater | 5 | 2 | 10 | Moderate | 3 | 6 | Low |
| Campbell albatross | 5 | 2 | 10 | Moderate | 3 | 6 | Low |
| Flesh-footed shearwater | 4 | 3 | 12 | Moderate | 3 | 9 | Moderate |
| Chatham albatross | 3 | 3 | 9 | Moderate | 2 | 6 | Low |
| Grey faced petrel | 3 | 2 | 6 | Low | 2 | 4 | |
| Light-mantled albatross | 3 | 2 | 6 | Low | 2 | 4 | Low |
| Northern giant petrel | 3 | 1 | 3 | Low | 2 | 2 | Low |
| Southern giant petrel | 3 | 1 | 3 | Low | 2 | 2 | Low |
| Indian yellow-nosed albatross | 2 | 6 | 12 | Moderate | 1 | 6 | Low |
| Northern royal albatross | 2 | 1 | 2 | Low | 1 | 1 | Negligible |
| Buller's shearwater | 2 | 1 | 2 | Low | 1 | 1 | Negligible |
| Grey-headed albatross | 1 | 2 | 2 | Low | 1 | 2 | Low |

### 3.1.26 Surface longline – vessels greater than 50 m

The larger surface longline vessels set a greater number of hooks and mostly target bigeye tuna and southern bluefin tuna. This fishery generally consists of around four chartered Japanese vessels which come to fish off the west coast of the South Island before heading up to north east New Zealand. The fishery operates in New Zealand for around 3 months of the year. As compared to domestic surface longliners, snoods in this fishery are around 40 m in length. Generally, at least 50% observer coverage has been achieved in recent years. This fishery historically has high captures of seabirds, including a variety of albatrosses and petrels.

Like the smaller domestic vessels, larger surface longline vessels are required to use tori lines and either weight lines or set at night. The charter vessels also have a code of practice and vessels will often use danglers, water canons and other methods of scaring birds away from the stern of the vessel. It was noted however that even when vessels follow the regulations they are still known to catch birds, particularly during

full moon. Participants also discussed large vessel surface longliners operating just outside New Zealand's EEZ, which are also likely to have an impact on New Zealand seabirds.

Participants scored potential risk in this fishery with high confidence for both exposure and consequence scores and it was acknowledged that good data exists to access exposure scores. The potential exposure scores were essentially the same as in the small vessel, domestic surface longline fishery but consequence scores differed slightly given difference in fishing effort. Consequence scores in the large vessel surface longline fishery were higher for Chatham and white-capped albatrosses. Overall, 14 species were in the 'high' category, four in the 'moderate' and seven in the 'low' for potential risk. As in the smaller surface longline fleet, exposure scores reduced for all species based on the mitigation practices in place. Despite these reductions in risk, 15 species continue to be in the 'moderate' category of actual risk which means further specific management is required to reduce interactions in this fishery.

**Table 28: Seabird species potentially at risk from surface longline large vessel fisheries**

| Common name | Exposure | Consequence | Potential risk score | Risk category | Optimum exposure | Actual risk | Optimum risk category |
|---|---|---|---|---|---|---|---|
| Antipodean albatross | 5 | 4 | 20 | High | 3 | 12 | Moderate |
| Gibson's albatross | 5 | 4 | 20 | High | 3 | 12 | Moderate |
| Wandering albatross | 5 | 4 | 20 | High | 3 | 12 | Moderate |
| Grey petrel | 5 | 4 | 20 | High | 3 | 12 | Moderate |
| Black petrel | 5 | 4 | 20 | High | 3 | 12 | Moderate |
| White-chinned petrel | 5 | 4 | 20 | High | 3 | 12 | Moderate |
| White-capped albatross | 5 | 4 | 20 | High | 3 | 12 | Moderate |
| Southern royal albatross | 5 | 3 | 15 | High | 3 | 9 | Moderate |
| Westland petrel | 5 | 3 | 15 | High | 3 | 9 | Moderate |
| Black-browed albatross | 5 | 3 | 15 | High | 3 | 9 | Moderate |
| Northern Buller's albatross | 5 | 3 | 15 | High | 3 | 9 | Moderate |
| Southern Buller's albatross | 5 | 3 | 15 | High | 3 | 9 | Moderate |
| Salvin's albatross | 5 | 3 | 15 | High | 3 | 9 | Moderate |
| Sooty shearwater | 5 | 2 | 10 | Moderate | 3 | 6 | Low |
| Campbell albatross | 5 | 2 | 10 | Moderate | 3 | 6 | Low |
| Flesh-footed shearwater | 4 | 3 | 12 | Moderate | 3 | 9 | Moderate |
| Chatham albatross | 3 | 5 | 15 | High | 2 | 10 | Moderate |
| Grey faced petrel | 3 | 2 | 6 | Low | 2 | 4 | Low |
| Light-mantled albatross | 3 | 2 | 6 | Low | 2 | 4 | Low |
| Northern giant petrel | 3 | 1 | 3 | Low | 2 | 2 | Low |
| Southern giant petrel | 3 | 1 | 3 | Low | 2 | 2 | Low |
| Indian yellow-nosed albatross | 2 | 6 | 12 | Moderate | 1 | 6 | Low |
| Northern royal albatross | 2 | 1 | 2 | Low | 1 | 1 | Negligible |
| Buller's shearwater | 2 | 1 | 2 | Low | 1 | 1 | Negligible |
| Grey-headed albatross | 1 | 2 | 2 | Low | 1 | 2 | Low |

## *3.2 Relative assessments across all fisheries*

### 3.2.1 Seabirds

In order to assess which seabird species are at greatest risk of interacting with fisheries throughout the New Zealand EEZ, potential and optimum risk scores were summed across all fishing methods investigated. The results are split into high-moderate risk species (total score > 30) and low or no risk species (total score < 30)[1].

***Seabirds species at high to moderate risk of interacting with New Zealand fisheries***
Table 29a lists the individual seabird species considered to be at high to moderate potential risk of interacting with New Zealand fisheries. Table 29b shows the proportion (percentage) that each fishery contributes to that potential risk score for each species. Table 30 takes account of the optimum risk scores, for which the use of mitigation has been considered.

The workshop agreed that, *Thalassarche* albatrosses, or mollymawks, *Procellaria* petrels and large shearwaters are at greatest national risk from fishing (Table 29a). This conclusion is supported by observer records (Rowe 2009). *Diomedea* albatrosses are also high, but due to the less aggressive nature of these species, they are at lower risk that the smaller *Thalassarche* species. Species with high risk scores are typically caught across a number of fisheries which increases their ranking in the table. Other species scored high when one considers they are likely to interact with only a few, or even only one fishery such as yellow-eyed penguins, shag species, little blue penguins and Hutton's and fluttering shearwaters.

**Table 29a: Seabirds at higher to moderate potential risk of population effects from New Zealand fisheries**

| Species | Score | Species | Score |
|---|---|---|---|
| Salvin's Albatross | 161 | Southern Royal Albatross | 79 |
| White-chinned Petrel | 159 | Northern Giant-petrel | 62 |
| White-capped Albatross | 141 | Southern Giant-petrel | 61 |
| Parkinson's Petrel | 139 | Indian Yellow-nosed Albatross | 58 |
| Sooty Shearwater | 126 | King Shag | 48 |
| Grey Petrel | 123 | Pitt Island Shag | 46 |
| Southern Buller's Albatross | 123 | Chatham Island Shag | 45 |
| Flesh-footed Shearwater | 117 | Hutton's Shearwater | 37 |
| Black-browed Albatross | 114 | Pied shag | 35 |
| Chatham Albatross | 114 | Fluttering Shearwater | 34 |
| Northern Buller's Albatross | 107 | Grey-faced Petrel | 31 |
| Campbell Albatross | 97 | Spotted Shag | 31 |
| Antipodean Albatross | 89 | Stewart Island Shag | 31 |
| Gibson's Albatross | 89 | Light-mantled Albatross | 30 |
| Wandering Albatross | 89 | Yellow-eyed Penguin | 30 |
| Westland Petrel | 89 | | |

[1] This score was chosen to indicate a reasonable division between lower and higher risk scores.

**Table 29b: Proportion (percentage) each fishery contributes to seabird risk scores for those species at higher to moderate potential risk of population effects** (BS beach seine, DL dahn line, DS Danish seine, PT pots and traps, HL hand line, IDN inshore drift net, RN ring net, SJ squid jig, TO troll, TL trot line, PS purse seine, BLS bottom longline small vessel, BLL bottom longline large vessel, DWT deep water trawl, IT inshore trawl, FIN middle depth finfish, SCI middle depth trawl scampi, SBW middle depth trawl southern blue whiting, SQU middle depth trawl squid, PT pelagic trawl, SET setnet, SLS surface longline small vessel, SLL surface longline large vessel)

| Species | BS | DL | DS | PT | HL | IDN | RN | SJ | TO | TL | PS | BLLS | BLL | DWT | IT | FIN | SCI | SBW | SQU | PT | SET | SLS | SLL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Antipodean Albatross | | 2.2 | | | | | | 1.1 | 1.1 | 2.2 | | 18.0 | 13.5 | 1.1 | 2.2 | 4.5 | 1.1 | 1.1 | 4.5 | 1.1 | 1.1 | 22.5 | 22.5 |
| Black Petrel | | 4.3 | 2.9 | | 7.1 | | | | 6.4 | 4.3 | 0.7 | 17.9 | 4.3 | | 14.3 | | 8.6 | | | 0.7 | | 14.3 | 14.3 |
| Black-browed Albatross | | 1.8 | | | 1.8 | | | 0.9 | 0.9 | 1.8 | | 8.8 | 8.8 | 1.8 | 13.2 | 10.5 | 5.3 | 5.3 | 10.5 | 1.8 | 0.9 | 13.2 | 13.2 |
| Campbell Albatross | | 2.1 | | | 2.1 | | | 1.0 | 1.0 | 2.1 | | 10.3 | 15.5 | 2.1 | 15.5 | 6.2 | 6.2 | 6.2 | 6.2 | 2.1 | 1.0 | 10.3 | 10.3 |
| Chatham Albatross | | 1.8 | | | 1.8 | | | 1.8 | 0.9 | 1.8 | | 17.5 | 17.5 | 1.8 | 7.9 | 10.5 | 1.8 | 1.8 | 10.5 | 1.8 | | 7.9 | 13.2 |
| Chatham Island Shag | | | | 26.7 | | | | | | | | | | | 6.7 | | | | | | 66.7 | | |
| Flesh-footed Shearwater | | 5.1 | 1.7 | | 8.5 | | | | 3.4 | 5.1 | | 21.4 | 5.1 | | 10.3 | | 12.8 | | | 0.9 | 5.1 | 10.3 | 10.3 |
| Fluttering Shearwater | 2.9 | 2.9 | 5.7 | 2.9 | 5.7 | 5.7 | 2.9 | | | 2.9 | 2.9 | 8.6 | 5.7 | | 5.7 | | | | | 2.9 | 42.9 | | |
| Gibson's Albatross | | 2.2 | | | | | | 1.1 | 1.1 | 2.2 | | 18.0 | 13.5 | 1.1 | 2.2 | 4.5 | 1.1 | 1.1 | 4.5 | 1.1 | 1.1 | 22.5 | 22.5 |
| Grey Petrel | | 1.6 | 0.8 | | | | | 1.6 | 1.6 | 1.6 | | 20.3 | 16.3 | 0.8 | 1.6 | 7.3 | 0.8 | 4.9 | 7.3 | 0.8 | | 16.3 | 16.3 |
| Grey-faced Petrel | | | | | | | | 3.2 | | | | 32.3 | 19.4 | | 6.5 | | 0.0 | | | | | 19.4 | 19.4 |
| Hutton's Shearwater | | 2.7 | 10.8 | 2.7 | 2.7 | | | 2.7 | | 2.7 | | 8.1 | 5.4 | | 5.4 | | | | | 2.7 | 54.1 | | |
| Indian Yellow-nosed Albatross | | 3.4 | | | 3.4 | | | 1.7 | 1.7 | 3.4 | | 8.6 | 25.9 | | 10.3 | | | | | | | 20.7 | 20.7 |
| King Shag | | | 7.4 | 14.8 | | | | | | | 11.1 | | | | 11.1 | | | | | | 55.6 | | |
| Light-mantled Albatross | | 3.3 | | | 3.3 | | | 6.7 | | 3.3 | | 10.0 | 10.0 | 3.3 | 3.3 | 3.3 | 3.3 | 3.3 | 3.3 | 3.3 | | 20.0 | 20.0 |
| Northern blue penguin | 6.7 | | 6.7 | 3.3 | | 13.3 | 3.3 | | | | 13.3 | | | | 3.3 | | | | | | 50.0 | | |
| Northern Buller's Albatross | | | | | | | | | | | | | | | | | | | | | | | |
| Northern Giant-petrel | | 3.2 | | | 3.2 | | | 1.6 | | 3.2 | | 24.2 | 24.2 | 1.6 | 4.8 | 4.8 | 4.8 | 3.2 | 4.8 | 3.2 | 3.2 | 4.8 | 4.8 |
| Pied Shag | 17.1 | | | 8.6 | 2.9 | 22.9 | 5.7 | | | | | | | | | | | | | | 42.9 | | |
| Pitt Island Shag | | | | 34.8 | | | | | | | | | | | | | | | | | 65.2 | | |
| Salvin's Albatross | | 1.9 | | | 1.2 | | | 0.6 | 0.6 | 1.9 | | 9.3 | 12.4 | 3.7 | 12.4 | 12.4 | 3.7 | 3.7 | 12.4 | 3.7 | 1.2 | 9.3 | 9.3 |
| Sooty Shearwater | | 1.6 | 1.6 | | 2.4 | | | 0.8 | 0.8 | 1.6 | | 7.9 | 7.9 | 1.6 | 7.9 | 11.9 | 6.3 | 1.6 | 11.9 | 6.3 | 11.9 | 7.9 | 7.9 |

| Species | BS | DL | DS | PT | HL | IDN | RN | SJ | TO | TL | PS | BLLS | BLL | DWT | IT | FIN | SCI | SBW | SQU | PT | SET | SLS | SLL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Southern Buller's Albatross | | 2.4 | | | 2.4 | | | 0.8 | 1.6 | 2.4 | | 8.1 | 12.2 | 4.9 | 8.1 | 9.8 | 4.9 | 1.6 | 9.8 | 4.9 | 1.6 | 12.2 | 12.2 |
| Southern Giant-petrel | | 3.3 | | | 3.3 | | | 1.6 | | 3.3 | | 24.6 | 24.6 | 1.6 | 4.9 | 4.9 | 3.3 | 3.3 | 4.9 | 3.3 | 3.3 | 4.9 | 4.9 |
| Southern Royal Albatross | | 2.5 | | | | | | 1.3 | 1.3 | 2.5 | | 20.3 | 15.2 | 1.3 | 2.5 | 5.1 | 1.3 | 1.3 | 5.1 | 1.3 | 1.3 | 19.0 | 19.0 |
| Spotted Shag | 2.9 | | 5.7 | 5.7 | | 5.7 | 2.9 | | | | 11.4 | | | | 22.9 | | | | | | 42.9 | | |
| Stewart Island Shag | 3.2 | | | 12.9 | | | | | | | | | | | 19.4 | | | | | | 64.5 | | |
| Wandering Albatross | | 2.2 | | | | | | 1.1 | 1.1 | 2.2 | | 18.0 | 13.5 | 1.1 | 2.2 | 4.5 | 1.1 | 1.1 | 4.5 | 1.1 | 1.1 | 22.5 | 22.5 |
| Westland Petrel | | 2.2 | 1.1 | | 2.2 | | | 1.1 | 4.5 | 2.2 | | 22.5 | 16.9 | | 6.7 | 4.5 | | | | 2.2 | | 16.9 | 16.9 |
| White-capped Albatross | | 2.1 | | | 1.4 | | | 0.7 | 0.7 | 2.1 | | 7.1 | 10.6 | 4.3 | 10.6 | 10.6 | 4.3 | 4.3 | 10.6 | 4.3 | 1.4 | 10.6 | 14.2 |
| White-chinned Petrel | | 1.3 | 0.6 | | 1.3 | | | 1.3 | 2.5 | 1.3 | | 12.6 | 12.6 | 1.3 | 6.3 | 12.6 | 3.8 | 1.3 | 12.6 | 3.8 | | 12.6 | 12.6 |
| Yellow-eyed Penguin | 6.7 | | | 6.7 | | | | | | | | | | | 3.3 | | | | | | 83.3 | | |

When considering the mitigation in place across all longline and most trawl fisheries, the number of species in the high-moderate range reduces from 31 species to 29 species (Tables 29a, 30). In general, the same species appear at the top of the list, but in a slightly different order (Table 30). The lack of fully effective mitigation for trawl net captures probably has some influence over the upward movement of petrel species. Also of note is that some species, particularly shags and penguins, have no change in score at all as they are impacted by fisheries with no mitigation in place.

**Table 30: Seabirds at higher to moderate optimum risk of population effects from New Zealand fisheries**

| Seabird | Score | Seabird | Score |
|---|---|---|---|
| White-chinned Petrel | 123 | Wandering Albatross | 55 |
| Sooty Shearwater | 108 | Southern Royal Albatross | 49 |
| Parkinson's Petrel | 106 | King Shag | 48 |
| Salvin's Albatross | 106 | Pitt Island Shag | 46 |
| White-capped Albatross | 94 | Chatham Island Shag | 45 |
| Flesh-footed Shearwater | 92 | Pied shag | 35 |
| Southern Buller's Albatross | 85 | Hutton's Shearwater | 35 |
| Grey Petrel | 84 | Northern Giant-petrel | 35 |
| Black-browed Albatross | 80 | Indian Yellow-nosed Albatross | 34 |
| Northern Buller's Albatross | 72 | Southern Giant-petrel | 34 |
| Chatham Albatross | 71 | Fluttering Shearwater | 32 |
| Campbell Albatross | 66 | Spotted Shag | 31 |
| Westland Petrel | 59 | Stewart Island Shag | 31 |
| Antipodean Albatross | 55 | Yellow-eyed Penguin | 30 |
| Gibson's Albatross | 55 | | |

***Seabird species at low or no risk of interacting with New Zealand fisheries***

The species listed in Tables 31a (potential risk) are either less likely to interact with fisheries or are only at risk of interacting with a few fisheries (as shown in Table 31b). Nevertheless, some species in these tables have high threat classifications so the consequences of interacting with any fishery would be high, for example the Fiordland penguin, Codfish Island South Georgian diving petrel, magenta petrel (Chatham taiko), Chatham petrel, fairy tern and New Zealand storm petrel.

**Table 31a: Seabirds with lower to no potential risk of population effects from New Zealand fisheries**

| Species | Score | Species | Score |
|---|---|---|---|
| Buller's Shearwater | 28 | Fulmar prion | 1 |
| Northern blue penguin | 26 | Grey-backed Storm-petrel | 1 |
| Cape petrel | 22 | Lesser fulmar prion | 1 |
| Grey-headed Albatross | 22 | Mottled Petrel | 1 |
| Snares Cape petrel | 22 | New Zealand white-faced storm petrel | 1 |
| White-flippered blue penguin | 22 | Soft-plumaged Petrel | 1 |
| Little black shag | 21 | Subantarctic diving petrel | 1 |
| Northern Royal Albatross | 20 | Subantarctic Little shearwater | 1 |
| Fiordland Penguin | 19 | White-headed Petrel | 1 |
| Codfish Island South Georgian diving petrel | 18 | Antarctic Tern | 0 |
| Australasian Gannet | 17 | Auckland Island Shag | 0 |
| Black-backed gull | 16 | Australian white-faced storm petrel | 0 |
| Little shag | 16 | Black-fronted tern | 0 |
| Red-billed gull | 16 | Black-winged Petrel | 0 |
| Black shag | 15 | Bounty Island Shag | 0 |
| Southern blue penguin | 15 | Campbell Island Shag | 0 |
| Chatham Island blue penguin | 12 | Common noddy | 0 |
| Brown Skua | 7 | Erect-crested Penguin | 0 |
| Caspian Tern | 6 | Grey ternlet | 0 |
| Magenta Petrel | 6 | Kermadec little shearwater | 0 |
| Snares Penguin | 5 | Kermadec Petrel | 0 |
| White-fronted tern | 5 | Kermadec white-faced storm petrel | 0 |
| Chatham Petrel | 4 | Masked Booby | 0 |
| Fairy Tern | 3 | New Zealand Storm-petrel | 0 |
| Southern diving petrel | 3 | Norfolk Island little shearwater | 0 |
| Northern diving petrel | 2 | North Island little shearwater | 0 |
| Antarctic Prion | 1 | Pycroft's Petrel | 0 |
| Black-bellied Storm-petrel | 1 | Red-tailed Tropicbird | 0 |
| Black-billed Gull | 1 | Sooty Tern | 0 |
| Blue Petrel | 1 | Southern white-fronted tern | 0 |
| Broad-billed Prion | 1 | Wedge-tailed Shearwater | 0 |
| Chatham fulmar prion | 1 | White tern | 0 |
| Cook's Petrel | 1 | White-bellied Storm-petrel | 0 |
| Eastern Rockhopper Penguin | 1 | White-capped noddy | 0 |
| Fairy Prion | 1 | White-necked Petrel | 0 |

**Table 31b: Proportion (percentage) each fishery contributes to seabird risk scores for those species with lower to no potential risk of population effects from New Zealand fisheries** (BS beach seine, DL dahn line, DS Danish seine, PT pots and traps, HL hand line, IDN inshore drift net, RN ring net, SJ squid jig, TO troll, TL trot line, PS purse seine, BLS bottom longline small vessel, BLL bottom longline large vessel, DWT deep water trawl, IT inshore trawl, FIN middle depth finfish, SCI middle depth trawl scampi, SBW middle depth trawl southern blue whiting, SQU middle depth trawl squid, PT pelagic trawl, SET setnet, SLS surface longline small vessel, SLL surface longline large vessel)

| Species | BS | DL | DS | PT | HL | IDN | RN | SJ | TO | TL | PS | BLS | BLL | DWT | IT | FIN | SCI | SBW | SQU | PT | SET | SLS | SLL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Antarctic Prion | | | | | | | | 100 | | | | | | | | | | | | | | | |
| Antarctic Tern | | | | | | | | | | | | | | | | | | | | | | | |
| Auckland Island Shag | | | | | | | | | | | | | | | | | | | | | | | |
| Australasian Gannet | 5.6 | | 5.6 | | 5.6 | 11.1 | 5.6 | | 22.2 | | 5.6 | 11.1 | | | 11.1 | | | | | | 16.7 | | |
| Australian white-faced storm petrel | | | | | | | | | | | | | | | | | | | | | | | |
| Black shag | | | | 6.7 | | 20.0 | 6.7 | | | | | | | | | | | | | | 66.7 | | |
| Black-backed gull | 11.8 | | 5.9 | | 11.8 | 11.8 | 5.9 | | 11.8 | | 5.9 | 11.8 | 5.9 | | 11.8 | | | | | | 5.9 | | |
| Black-bellied Storm-petrel | | | | | | | | 100 | | | | | | | | | | | | | | | |
| Black-billed Gull | 100 | | | | | | | | | | | | | | | | | | | | | | |
| Black-winged Petrel | | | | | | | | | | | | | | | | | | | | | | | |
| Blue Noddy | | | | | | | | | | | | | | | | | | | | | | | |
| Blue Petrel | | | | | | | | 100 | | | | | | | | | | | | | | | |
| Bounty Island Shag | | | | | | | | | | | | | | | | | | | | | | | |
| Broad-billed Prion | | | | | | | | 100 | | | | | | | | | | | | | | | |
| Brown Skua | | 14.3 | | | 14.3 | | | | | 14.3 | | 28.6 | 28.6 | | | | | | | | | | |
| Buller's Shearwater | | 3.4 | | | 6.9 | | | | 10.3 | 3.4 | 3.4 | 27.6 | 13.8 | | 6.9 | | | | | 3.4 | 6.9 | 6.9 | 6.9 |
| Campbell Island Shag | | | | | | | | | | | | | | | | | | | | | | | |
| Cape petrel | | 4.5 | | | 9.1 | | | 4.5 | | 4.5 | | 9.1 | 9.1 | 4.5 | 9.1 | 9.1 | 4.5 | 4.5 | 9.1 | 9.1 | 9.1 | | |
| Caspian Tern | 33.3 | | | | | 16.7 | 16.7 | | | | | | | | | | | | | | 33.3 | | |
| Chatham fulmar prion | | | | | | | | 100 | | | | | | | | | | | | | | | |
| Chatham Island blue penguin | | | | 16.7 | | | | | | | | | | | 8.3 | | | | | | 75.0 | | |

| Species | BS | DL | DS | PT | HL | IDN | RN | SJ | TO | TL | PS | BLS | BLL | DWT | IT | FIN | SCI | SBW | SQU | PT | SET | SLS | SLL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chatham Petrel | | | | | | | | 100 | | | | | | | | | | | | | | | |
| Codfish Island South Georgian diving petrel | | | | | | | | 33.3 | | | | | | | | | | | | | 66.7 | | |
| Cook's Petrel | | | | | | | | 100 | | | | | | | | | | | | | | | |
| Eastern Rockhopper Penguin | | | | | | | | | | | | | | | 100 | | | | | | | | |
| Erect-crested Penguin | | | | | | | | | | | | | | | | | | | | | | | |
| Fairy Prion | | | | | | | | 100 | | | | | | | | | | | | | | | |
| Fairy Tern | 100 | | | | | | | | | | | | | | | | | | | | | | |
| Fiordland Penguin | | | | 10.5 | | | | | | | | | | | 5.3 | | | | | | 84.2 | | |
| Fulmar prion | | | | | | | | 100 | | | | | | | | | | | | | | | |
| Grey-backed Storm-petrel | | | | | | | | 100 | | | | | | | | | | | | | | | |
| Grey-headed Albatross | | 4.5 | | | 4.5 | | | 9.1 | | 4.5 | | 13.6 | 13.6 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | | 9.1 | 9.1 |
| Kermadec little shearwater | | | | | | | | | | | | | | | | | | | | | | | |
| Kermadec Petrel | | | | | | | | | | | | | | | | | | | | | | | |
| Kermadec white-faced storm petrel | | | | | | | | | | | | | | | | | | | | | | | |
| Lesser fulmar prion | | | | | | | | | | | | | | | | | | | | | | | |
| Little black shag | 6.3 | | | 6.3 | | 18.8 | 6.3 | | | | | | | | | | | | | | 62.5 | | |
| Little shag | 4.8 | | | 4.8 | | 14.3 | 4.8 | | | | | | | | | | | | | | 71.4 | | |
| Magenta Petrel | | | | | | | | 100 | | | | | | | | | | | | | | | |
| Masked Booby | | | | | | | | | | | | | | | | | | | | | | | |
| Mottled Petrel | | | | | | | | 100 | | | | | | | | | | | | | | | |
| New Zealand Storm-petrel | | | | | | | | | | | | | | | | | | | | | | | |
| New Zealand white-faced storm petrel | | | | | | | | 100 | | | | | | | | | | | | | | | |
| Norfolk Island little shearwater | | | | | | | | | | | | | | | | | | | | | | | |

| Species | BS | DL | DS | PT | HL | IDN | RN | SJ | TO | TL | PS | BLS | BLL | DWT | IT | FIN | SCI | SBW | SQU | PT | SET | SLS | SLL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| North Island little shearwater | | | | | | | | | | | | | | | | | | | | | | | |
| Northern diving petrel | | | | | | | | | | | | | | | | | | | | | 100 | | |
| Northern Royal Albatross | | 5.0 | | | | | | | 5.0 | 5.0 | | 15.0 | 15.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | | 10.0 | 10.0 |
| Pycroft's Petrel | | | | | | | | | | | | | | | | | | | | | | | |
| Red-billed gull | 11.8 | | 5.9 | | 17.6 | 11.8 | 5.9 | | 11.8 | | 5.9 | 11.8 | 5.9 | | 5.9 | | | | | | 5.9 | | |
| Red-tailed Tropicbird | | | | | | | | | | | | | | | | | | | | | | | |
| Snares Cape petrel | | 4.5 | | | 9.1 | | | 4.5 | | 4.5 | | 9.1 | 9.1 | 4.5 | 9.1 | 9.1 | 4.5 | 4.5 | 9.1 | 9.1 | 9.1 | | |
| Snares Penguin | | | | | | | | | | | | | | | 20.0 | | | | | | 80.0 | | |
| Soft-plumaged Petrel | | | | | | | | 100 | | | | | | | | | | | | | | | |
| Sooty Tern | | | | | | | | | | | | | | | | | | | | | | | |
| Southern blue penguin | 13.3 | | | 13.3 | | | | | | | | | | | 6.7 | | | | | | 66.7 | | |
| Southern diving petrel | | | | | | | | 33.3 | | | | | | | | | | | | | 66.7 | | |
| Southern white-fronted tern | | | | | | | | | | | | | | | | | | | | | | | |
| Subantarctic diving petrel | | | | | | | | 100 | | | | | | | | | | | | | | | |
| Subantarctic Little shearwater | | | | | | | | 100 | | | | | | | | | | | | | | | |
| Wedge-tailed Shearwater | | | | | | | | | | | | | | | | | | | | | | | |
| White tern | | | | | | | | | | | | | | | | | | | | | | | |
| White-bellied Storm-petrel | | | | | | | | | | | | | | | | | | | | | | | |
| White-capped noddy | | | | | | | | | | | | | | | | | | | | | | | |
| White-flippered blue penguin | | | 18.2 | 9.1 | | | | | | | | | | | 4.5 | | | | | | 68.2 | | |
| White-fronted tern | 20.0 | | | | | 20.0 | 20.0 | | | | | | | | | | | | | | 40.0 | | |
| White-headed Petrel | | | | | | | | 100 | | | | | | | | | | | | | | | |
| White-necked Petrel | | | | | | | | | | | | | | | | | | | | | | | |

The change between the potential risk and optimum risk scores has placed two species at a lower level of risk (Table 30 versus Table 32); grey-faced petrel and light mantled sooty albatross (Table 32).

**Table 32: Seabirds with lower to no optimum risk of population effects from New Zealand fisheries**

| Seabird | Score | Seabird | Score |
|---|---|---|---|
| Northern blue penguin | 26 | Chatham fulmar prion | 1 |
| Light-mantled Albatross | 23 | Cook's Petrel | 1 |
| White-flippered blue penguin | 22 | Fairy Prion | 1 |
| Little black shag | 21 | Fulmar prion | 1 |
| Buller's Shearwater | 20 | Grey-backed Storm-petrel | 1 |
| Cape petrel | 20 | Lesser fulmar prion | 1 |
| Snares Cape petrel | 20 | Mottled Petrel | 1 |
| Fiordland Penguin | 19 | New Zealand white-faced storm petrel | 1 |
| Grey-headed Albatross | 19 | Subantarctic diving petrel | 1 |
| Codfish Island South Georgian diving petrel | 18 | Subantarctic Little shearwater | 1 |
| Grey-faced Petrel | 17 | Masked Booby | 0 |
| Australasian Gannet | 16 | Antarctic Tern | 0 |
| Little shag | 16 | Black-fronted tern | 0 |
| Black-backed gull | 15 | Grey ternlet | 0 |
| Red-billed gull | 15 | Sooty Tern | 0 |
| Northern Royal Albatross | 15 | White tern | 0 |
| Southern blue penguin | 15 | Southern white-fronted tern | 0 |
| Black shag | 15 | Common noddy | 0 |
| Chatham Island blue penguin | 12 | White-capped noddy | 0 |
| Caspian Tern | 6 | Wedge-tailed Shearwater | 0 |
| Magenta Petrel | 6 | Erect-crested Penguin | 0 |
| White-fronted tern | 5 | Auckland Island Shag | 0 |
| Snares Penguin | 5 | Bounty Island Shag | 0 |
| Brown Skua | 5 | Campbell Island Shag | 0 |
| Chatham Petrel | 4 | Australian white-faced storm petrel | 0 |
| Fairy Tern | 3 | Black-winged Petrel | 0 |
| Southern diving petrel | 3 | Kermadec little shearwater | 0 |
| Northern diving petrel | 2 | Kermadec Petrel | 0 |
| Black-billed Gull | 1 | Kermadec white-faced storm petrel | 0 |
| Soft-plumaged Petrel | 1 | New Zealand Storm-petrel | 0 |
| White-headed Petrel | 1 | Norfolk Island little shearwater | 0 |
| Eastern Rockhopper Penguin | 1 | North Island little shearwater | 0 |
| Antarctic Prion | 1 | Pycroft's Petrel | 0 |
| Black-bellied Storm-petrel | 1 | Red-tailed Tropicbird | 0 |
| Blue Petrel | 1 | White-bellied Storm-petrel | 0 |
| Broad-billed Prion | 1 | White-necked Petrel | 0 |

### 3.2.2 Fisheries

The potential and optimum risk posed to seabirds was summed for all fisheries (Table 33). The fishery posing the greatest risk to seabirds is the setnet fishery followed by all longline fisheries. However, the placement of the longline fisheries in this list is lower when current mitigation is in place and being used correctly. When considering the mitigation currently in use across longline and trawl fisheries, inshore trawl presents the second highest risk relative to other fisheries.

Of particular interest is the potential risk of hand-lining, inshore drift-netting, potting and trapping techniques and trolling. All fisheries pose some level of risk to seabirds except diving, dredging and hand gathering, although the indirect disturbance effects of diving and hand gathering were discussed.

**Table 33: Cumulative potential risk and optimum risk scores for each fishery**

| Fishery | Potential risk | No. seabirds interacting | Fishery | Optimum risk | No. seabirds interacting |
|---|---|---|---|---|---|
| Setnet | 374 | 42 | Setnet | 374 | 42 |
| BLL - small | 354 | 33 | Inshore trawl | 225 | 44 |
| SLL -charter | 313 | 25 | SLL -charter | 191 | 25 |
| BLL - large | 311 | 32 | SLL -dom | 184 | 25 |
| SLL -dom | 302 | 25 | BLL - small | 154 | 33 |
| Inshore trawl | 225 | 44 | BLL - large | 139 | 32 |
| MDT - finfish | 160 | 22 | MDT - finfish | 122 | 22 |
| MDT - squid | 156 | 21 | MDT - squid | 118 | 21 |
| MDT - scampi | 94 | 23 | MDT - scampi | 94 | 23 |
| Hand line | 68 | 27 | Hand line | 68 | 27 |
| Pelagic trawl | 63 | 27 | Squid jig | 62 | 44 |
| Squid jig | 62 | 44 | Dahn line | 61 | 29 |
| Dahn line | 61 | 29 | Pots, traps | 61 | 17 |
| Pots, traps | 61 | 17 | Trot line | 61 | 29 |
| Trot line | 61 | 29 | Pelagic trawl | 51 | 27 |
| MDT - SBW | 53 | 21 | Troll | 50 | 23 |
| Troll | 50 | 23 | MDT - SBW | 40 | 21 |
| Deep water BT | 46 | 21 | Deep water BT | 35 | 21 |
| Inshore drift net | 33 | 12 | Inshore drift net | 33 | 12 |
| Danish seine | 32 | 15 | Danish seine | 32 | 15 |
| Beach seine | 29 | 16 | Beach seine | 29 | 16 |
| Purse seine | 22 | 11 | Purse seine | 22 | 11 |
| Ring net | 13 | 12 | Ring net | 13 | 12 |
| Diving | 0 | 0 | Diving | 0 | 0 |
| Dredge | 0 | 0 | Dredge | 0 | 0 |
| Hand gather | 0 | 0 | Hand gather | 0 | 0 |

# *4. Discussion*

During the workshop exposure, consequence and confidence scores were assigned to each seabird by fishery combination. Following the workshops, the potential and optimum risk scores were calculated by the author. That is, participants did not discuss the resulting risk scores but were asked to provide comment on the results overall. Comments relating to management in the discussion below are derived directly from Table 4 and are given to provide guidance around levels of risk to managers.

## *4.1 Fishery assessments*

Fisheries are listed in order of optimum risk scores from highest to lowest.

### 4.1.1 Setnet

This fishery scored the highest risk relative to all other fishing methods. The different types of risk posed by this fishery include entanglement while the net is soaking in the water column and entanglement during setting or hauling. As there is currently no seabird mitigation in place in this fishery, only potential risk was assessed. The consequence of interacting with setnet fisheries was considered extreme for the Chatham Island shag, king shag and Pitt Island shag indicating that interactions are expected to lead to widespread and permanent damage with local extinction or serious population decline. However, the confidence scores for exposure were low for these three species due to the lack of data. The consequence of yellow-eyed penguins interacting with this fishery is expected to have a severe impact on populations. Other species of particular concern include Stewart Island shags, Hutton's shearwaters and Fiordland penguins. Nineteen species had risk scores above the acceptable level. Some level of additional management is required for these 19 species to mitigate interactions with setnet fisheries. With an additional 23 species assigned to the 'low' or 'negligible' risk categories, a total of 43 species are considered to be at some level of risk of interacting with setnet fisheries.

### 4.1.2 Inshore trawl

Mitigation is not regulated in these fisheries although some fishers have developed their own mitigation devices, including warp scarers in the South Island and baffler devices in the Auckland region. Based on observer comments, offal and waste fish discharge has been a major factor leading to warp strikes and there can also be substantial non quota bycatch. Interactions are expected to occur with nine species, of which the consequences are thought to be major for black petrels and Salvin's albatross and moderate for the black-browed albatross, Campbell albatross and white-capped albatross. These five species all have a risk score of high, and a further seven were assessed at moderate risk (sooty shearwater, white-chinned petrel, Northern and Southern Buller's albatross, flesh-footed petrel, spotted shag and Chatham albatross) indicating some specific management is needed. A further 32 species may interact with this fishery to some degree. While no specific management is required to mitigate impacts on these species, the assessment shows the large number of species that may interaction with inshore trawl fisheries.

### 4.1.3 Surface longline – vessels greater than 50 m

This fishery scored 3rd highest relative to all other fisheries assessed indicating that potential risk in this fishery is high. The potential exposure scores were essentially the same as in the small vessel, domestic surface longline fishery. Consequence scores differed slightly given difference in fishing effort between the two fisheries. Overall, 14 species were in the 'high' category, four in the 'moderate' and seven in the 'low' for potential risk.

As in the smaller surface longline fleet, exposure scores reduced for all species based on the mitigation practices in place. Despite these reductions in risk, 15 species continue to be in the 'moderate' category of optimum risk which means further specific management is required to reduce interactions in this fishery.

### 4.1.4 Surface longline – vessels less than 50 m

Small vessel surface longline fisheries posed the 5th highest potential risk relative to other fishing methods assessed. When considering potential risk, 15 species are expected to interact with domestic surface longliners and one species is likely to interact on occasion. Given the expected impact on populations, thirteen of these species are in the high risk category and five are in the moderate category.

Surface longliners are required to use tori lines and either line weighting or night setting. Given the use of mitigation devices in this fishery, the optimum exposure scores were reduced so that the optimum risk scores are no greater than moderate for any species. That 14 species are in the 'moderate' category for optimum risk implies that specific management is needed with some additions to current levels.

### 4.1.5 Bottom longline– vessels less than 40 m

This fishery scored the second highest cumulative potential risk scores across all fisheries. The vessels in this category are generally domestic vessels that use either hand baiting or auto baiting of some sort. When considering potential risk in this fishery, seventeen species scored the highest possible level of exposure indicating interactions are expected to occur, with an additional five species scoring the second highest level. The consequences of interacting with this fishery were also severe to high for many species and, as such, the risk scores for these species are extreme so that significant additional management is needed.

The optimum risk scores were assessed, but with some discussion around the lack of knowledge to determine whether regulated mitigation is being followed. The optimum risk scores were reduced, but for ten species some specific management is still required even with the mitigation currently in place.

### 4.1.6 Bottom longline– vessels greater than 40 m

Across all fisheries, this fishery ranked fourth highest on the list for potential risk. Historically, the large vessels operating in this fishery have had large captures of seabirds, but now have an industry code of practice and effective, mandatory mitigation in place. Not surprisingly, potential risk is high for a number of species, particularly *Thalassarche* albatrosses, *Procellaria* petrels, giant petrels and larger shearwaters.

The optimum risk scores were then determined and it was noted that these vessels still catch birds in low numbers despite the mitigation in place. The optimum risk scores reduced to negligible or low for most species except for grey petrels, Westland petrels, white-chinned petrels and Salvin's albatrosses which all scored 'moderate' optimum risk. As such, some specific management is still required to reduce interactions with these species.

### 4.1.7 Middle depth trawl – finfish

Potential, or unmitigated, risk was high for white-chinned petrels, Salvin's albatross, sooty shearwaters and white-capped albatross, with an additional four species in the moderate risk category. As such, in the absence of mitigation, specific management is required in this fishery.

For middle-depth trawlers over 28 m in length, mitigation is currently regulated to reduce warp interactions and initiatives to manage offal continue, but the quantity of offal produced limits options in many cases. There are currently no highly effective mitigation measures in place to address net captures. As such, the risk to white-chinned petrels and sooty shearwaters did not change as these species are generally caught in the net. The exposure scores for all other species in the 'high' or 'moderate' potential risk categories dropped, except for grey petrels which are more likely to be caught in the net. The movement between potential and optimum risk indicates that further management actions are necessary to reduce interactions in this fishery.

### 4.1.8 Middle depth trawl – squid

Potential risk in the squid fishery is high for white-chinned petrels, Salvin's albatrosses, sooty shearwaters and white-capped albatrosses and moderate for black-browed albatross, southern Buller's albatross, Chatham albatross and grey petrel. A further thirteen species had low or negligible risk scores indicating these species may interact with this fishery.

With consideration of the mitigation and offal management practices in place in the squid fishery, the exposure scores were re-examined to determine optimum risk. The risk to white-chinned petrels, sooty shearwaters and grey petrels did not change as these species are most likely to be caught in the net. Optimum risk for those albatross previously at high risk reduced to moderate. Further management is required in this fishery given eight species had optimum risk scores of 'moderate' or 'high', particularly to address net captures.

### 4.1.9 Middle depth trawl – scampi

Only one vessel in this fishery is over 28 m in length and therefore regulated to use bird scaring devices, although some smaller vessels do use warp scarers or other home made devices. As most vessels in this fishery are not required to use mitigation, only potential risk was scored. Flesh-footed shearwaters, black petrels and sooty shearwaters had the highest risk scores in this fishery and a further 20 species had low or negligible risk scores indicating the number of species likely to interact with this fishery. Overall, some specific management is required in this fishery, particularly for net captures.

### 4.1.10 Hand Line

Hand lining was the 10th highest fishery on the list, with particular concern for black petrels and flesh-footed shearwaters. The moderate risk scores for these two species indicate some additional management is needed in this fishery. The impact of recreational hand liners on seabirds also needs to be considered.

### 4.1.11 Squid jig

This fishery scored 12th on the list of all fisheries assessed. As this fishery works without baits or barbed hooks, only the most aggressive birds are expected to interact directly with squid jig fishing gear. Such interactions were only expected to occur in exceptional circumstances. All risk scores were negligible or low indicating no management action is required in this fishery.

### 4.1.12 Dahn line

This fishery scored 13th overall indicating a moderate to low risk to seabirds from this method. Given the nature of this fishery it was agreed that all species known to interact with hook fisheries could potentially interact with dahn lining. For most species, such interactions were expected to occur only in exceptional circumstances but the likelihood of interactions was considered slightly higher for black petrels and flesh-footed shearwaters. Overall, no species was assigned a risk score indicating that this fishery may have an adverse impact on populations and, therefore, no specific management is required in this fishery.

### 4.1.13 Fish traps and potting

The potting and trapping fishery scored 14th out of the 26 fisheries, however, many species thought to interact with this fishery would not necessarily interact with any other fishery. Of particular concern are Pitt and Chatham Island shags which are both threatened and known to associate with potting activities. Given the exposure to this fishing method, three species scored a consequence of ‘major’ indicating the level of impact to the population would be above the maximum acceptable level. Increases to current management are required given the moderate or high risk scores assigned to Chatham Island, king and Pitt Island shags.

### 4.1.14 Trot line

Trot lining was described as a combination of dahn lining and longlining with the level of risk falling between these two methods, although trot lining scored below both these methods. The most likely species to be exposed to this fishery are albatross species, particularly Buller’s, Salvin’s and white-capped, as well as flesh-footed shearwaters and black petrels with interactions expected to be uncommon. The consequence of exposure was negligible for all species except flesh-footed shearwaters and black petrels. The impact on these two species is expected to be minor, with minimal impact on population structure or dynamics. For all species likely to be exposed to this method, overall risk was low or negligible indicating no management is necessary.

### 4.1.15 Pelagic mackerel trawl

Seabird interactions are considered to be lower in this fishery compared to some other trawl fisheries with most birds caught in the Southland region. Sooty shearwaters had

an potential risk score of ‘moderate’, and an additional 26 species were assigned low or negligible risk scores.

As for other trawlers over 28 m in length, vessels operating in this fishery are required to use bird scaring devices to mitigate warp interactions. Optimum risk was not reduced for sooty shearwaters or other petrel species likely to be caught in the net. Across the 27 species likely to interact to some degree with this fishery, only sooty shearwaters scored a level of risk requiring specific management to reduce interactions.

### 4.1.16 Troll

Participants with knowledge of trolling had witnessed or heard about seabird captures in this fishery. Species considered to have the highest level of exposure to trolling were Australasian gannets, black petrels and Buller’s shearwaters. Confidence levels in scoring exposure were low given the poor data available to assess this fishery. Overall, risk scores were low or negligible for all species except the black petrel where the category of moderate suggests some specific management is needed.

### 4.1.17 Middle depth trawl – southern blue whiting

The species most likely to interact with this fishery, but with minimal impact on population structure or dynamics, were grey petrel, black-browed albatross, Campbell albatross, Salvin’s’ albatross and white-capped albatross. Potential risk was low for all species that may interact with this fishery. The optimum risk scores reduced or remained at the lowest score for all species except grey petrels, sooty shearwaters and white-chinned petrels which are more likely to be caught in the net. No direct management is required in this fishery as optimum risk scores were all low or negligible, but as for other trawl fisheries, consideration should be given to net captures.

### 4.1.18 Deep water bottom trawl

The risk from deep water bottom trawlers was considered to be lower than other offshore trawl fisheries, which is illustrated by this fishery scoring lowest of all trawl fisheries. The potential exposure to this fishery was expected to be remote or rare with the exception of the two Buller’s albatrosses, Salvin’s albatross and white-capped albatross for which interactions were expected to be uncommon. As the consequences of interactions with this fishery were considered to be low or negligible, potential risk scores were in the negligible or low category even without consideration of mitigation. The optimum risk scores were also negligible or low indicating no management action is required in this fishery.

### 4.1.19 Inshore drift net

Shag species were considered to be at greatest risk in this fishery, particularly pied shags. Of the twelve species with the potential to interact with this fishery, specific management is only required to mitigate pied shag interactions.

### 4.1.20 Danish seine

Danish seining scored 20$^{th}$ of the 26 fisheries assessed, suggesting a lower risk to seabirds. Interactions with this fishery were considered to be rare or unlikely, but

concern was raised at the potential impact of this fishery on king shag populations where longer term impacts could result. However, the likelihood of exposure for this species was considered rare. Overall, all species they could potentially interact with this fishery were assigned to the low or negligible risk category.

### 4.1.21 Beach seine, drag net

Out of 26 fisheries, beach seining and drag netting ranked 21st on the list indicating that the risk to seabirds is lower with this method. One reason for the lower ranking of this fishery is the likelihood that any entangled seabirds would likely be released alive as nets are generally attended. The species of greatest concern in this fishery were pied shags, red billed gulls and black backed gulls. As it was generally felt that interactions (i.e. leading to death or injury) would be unlikely or occur only in exceptional circumstances, the risk scores for this fishery were all low or negligible. As such, no management is required to mitigate any direct impacts of this fishery. There is, however, some need for education about the threats to nesting birds at particular times of the year and during varying tidal heights.

### 4.1.22 Purse seine

In the purse seine fishery, it was agreed that there would need to be an exceptional event for a seabird to be caught on the optimum fishing gear. Of those species that may interact directly with this fishery, king shags were of greatest concern given the low population level of this species. All risk scores were in the low or negligible categories, so no level of management is required for direct impacts.

In the pilchard purse seine fishery, large lights are placed under the water to attract fish. It is likely that these lights will increase the number of birds on the water and could therefore increase the risk of birds being dragged under on deployment or retrieval of gear. Storm petrels in particular were considered to be at risk from this method of fishing. Participants felt this fishery would have a greater impact on seabirds due to the lights, but confidence was low given the lack of data.

### 4.1.23 Ring net

In terms of relative risk between the 26 fisheries assessed, ring netting ranked 23rd on the list. Seabirds would interact with this fishery only in exceptional circumstances, and generally entangled birds are expected to be released alive as nets are continuously attended. The species considered most likely to interact with this fishery is the pied shag, but the consequences of any interactions were considered negligible. All potential risk scores for this fishery were low or negligible.

### 4.1.24 Diving

As there is no known impact to seabird species from this method, no management is required.

### 4.1.25 Dredge

Given the low number of birds known to associate with dredging activities, this fishery scored zero for all species assessed. While some level of risk was noted, there was no information to suggest interactions would occur in this fishery.

### 4.1.26 Hand gather

The workshop participants agreed there was no known direct impact to any seabird species from hand gathering. However, there is concern about indirect site based disturbance from humans and associated activities such as vehicles and dogs. Some indirect management is likely required for this fishery, both commercial and recreational, including site restrictions at certain times of the year.

## *4.2 Relative assessments across all fisheries*

### 4.2.1 Seabirds

Four species are impacted across the greatest number of fisheries and with potentially high consequences; Salvin's albatross, white-chinned petrel, white-capped albatross and black petrel. This information aligns well with what is known from autopsy and observer records (CSP 2008, Rowe 2009). Further attention should be paid to the fisheries these birds interact with so that management can be targeted. It should be noted however, that these scores were determined from potential risk. When the actual risk is examined, the species at highest risk are the same, but *Thalassarche* albatrosses drop down relative to petrels, which are more likely to be caught in trawl nets. There is no change in overall risk score for species such as shags and penguins as they are impacted by fisheries with no mitigation in place.

The second highest grouping of birds includes sooty shearwater, grey petrel, southern Buller's albatross, flesh-footed shearwater, black-browed albatross, Chatham albatross and the northern Buller's albatross. These species too are at high risk of interacting with commercial fishing operations, although interactions will reduce for many that interact with fisheries where mitigation is in use.

While some species scored relatively high as they interact with a number of fisheries, consideration needs to be given to those species with high threat status, localised foraging areas and specific fisheries they may interact with. Examples include yellow-eyed penguins in setnets, Chatham and Pitt Island shags in pots, king shags in a small number of fishing methods and the potential for Hutton's and fluttering shearwaters to be caught in large numbers in setnets. As such, the overall scores for seabirds do not give a complete picture of risk as individual fisheries need to be examined.

### 4.2.2 Fisheries

Twenty three of the 26 fisheries assessed were considered to pose some level of risk to seabirds in the New Zealand EEZ. The setnet fishery scored highest relative to all other fishing methods and considering no mitigation is currently in place, should be a priority for research and management. When viewing the actual risk scores, the inshore trawl fishery poses the second highest risk to seabirds. The development of mitigation in inshore trawl fisheries should be a priority, with knowledge gained from the mitigation used on larger trawl vessels and the innovations already in place on some inshore trawlers.

Despite mitigation requirements on all longline vessels and trawlers over 28 m, most of these fisheries still ranked in the top ten. What needs to be considered though, is the number of species likely to interact with these fisheries and the extent of fishing effort relative to other methods. Nevertheless, further work is still required to reduce interactions in these fisheries.

A number of fisheries that have never been observed had results indicating that further knowledge about interactions is required in order to determine necessary levels of management. These are potting and trapping, hand-lining and trolling. While other fisheries may have relative risk scores comparable to these fisheries, that are often the result of the number of birds likely to interact, not the actual risk scores to individual species.

Two fisheries, beach seine / drag-netting and hand gathering were identified as requiring some level of indirect management to reduce human disturbance at breeding and foraging sites. The concept of 'no go' zones were discussed to reduce at-site disturbance from fishers accessing fishing locations.

Of the 26 fisheries assessed, no management action was considered necessary to mitigate direct impacts for seven fisheries with a further three fisheries assessed as having no impact on seabird populations.

# 5. *Literature cited*


Australian/ New Zealand Standards. (1999). Standard for Risk Management. AS/NZS 4360. Standards Association of Australia, Stratfield, NSW: 46 pp.

Burgess, J., Blezard, R.H. (1999). Observer reports from squid-jigging vessels off the New Zealand coast 1999. *Conservation Advisory Science Notes No. 255*, Department of Conservation, Wellington.

Campbell, J.L., Gallagher, C. (2007). Assessing the relative effects of fishing on the New Zealand marine environment through risk analysis. *ICES Journal of Marine Science*, 64: 256 – 270.

Conservation Services Programme (2008). Summary of autopsy reports for seabirds killed and returned from observed New Zealand fisheries: 1 October 1996 – 30 September 2005, with specific reference to 2002/03, 2003/04, 2004/05. *DOC Research & Development Series 291*. Department of Conservation, Wellington. 110 p.

Fletcher, W.J. (2005). The application of qualitative risk assessment methodology to prioritize issues for fisheries management. *ICES Journal of Marine Science 62*:1576-1587.

Fletcher, W.J., Chesson, J., Fisher, M., Sainsbury, K.J., Hundloe, T., Smith, A.D.M., Whitworth, B. (2002). National ESD reporting framework for Australian Fisheries: The how to guide for wild capture fisheries. FRDC Report 2000/145, Canberra, Australia.

Hobday, A.J., Smith, A., Webb, H., Daley, R., Wayte, S., Bulman, C., Dowdney, J., Williams, A., Sporcic, M., Dambacher, J., Fuller, M., Walker, T. (2007) Ecological Risk Assessment for the Effects of Fishing: Methodology. Report R04/1072 for the Australian Fisheries Management Authority, Canberra.

Miskelly, C.M., Dowding, J.E., Elliott, G.P., Hitchmough, R.A., Powlesland, R.G., Robertson, H.A., Sagar, P.M., Scofield, R.P., Taylor, G.A. (2008). Conservation status of New Zealand birds, 2008. *Notornis 55*: 117-135.

Phillips, R.A., Small, C.J. 2007. Results of the preliminary risk prioritization exercise for the ICCAT seabird assessment, updated. Paper submitted to the 2007 meeting of the ICCAT Sub-Committee on Ecosystems, Madrid, Spain, Feb 19-23, 2007, SCRS/2007/129.

Rowe, S.J. (2009) Conservation Services Programme observer report: 01 July 2004 to 30 June 2007. *DOC Marine Conservation Services Series 1*. Department of Conservation, Wellington. 93 p.

Rowe, S.J. (2010): Conservation Services Programme observer report: 01 July 2007 to 30 June 2008. *DOC Marine Conservation Services Series 4.* Department of Conservation, Wellington.

# *Appendix 1*

## *Threat classification, vulnerability scores and the fishing methods where captures have been reported for all seabird species assessed*

DOC threat classification from Miskelly *et al*. (2008). (Qualifiers - (CD) Conservation Dependent, (DP) Data Poor, (De) Designated, (EF) Extreme Fluctuations, (Inc) Increasing, (IE) Island Endemic, (OL) One Location, (PD) Partial Decline, (RR) Range Restricted, (RF) Recruitment Failure, (SO) Secure Overseas, (Sp) Sparse, (St) Stable, (TO) Threatened Overseas)

| ***Species group*** | ***Common name*** | ***Scientific name*** | ***DOC threat classification*** | ***DOC qualifier*** | ***Breeding population status*** | ***Behavioural susceptibility to capture*** | ***Life-history strategy*** | ***Average*** | ***Observed caught / method*** |
|---|---|---|---|---|---|---|---|---|---|
| Gannets | Australasian gannet | *Morus serrator* | Not Threatened | De Inc SO | 0 | 2 | 1 | 1.00 | BLL |
| Gannets | Masked booby | *Sula dactylatra fullageri* | Nationally Endangered B (1/1) | RR St TO | 1 | 1 | 1 | 1.00 | |
| Gulls & terns | Common noddy | *Anous stolidus pileatus* | Coloniser | OL SO | 1 | 1 | 1 | 1.00 | |
| Gulls & terns | White-capped noddy | *Anous tenuirostris minutus* | Naturally Uncommon | RR SO | 1 | 1 | 1 | 1.00 | |
| Gulls & terns | Black-fronted tern | *Chlidonias albostriatus* | Nationally Endangered C (1/1) | DP | 1 | 1 | 1 | 1.00 | |
| Gulls & terns | White tern | *Gygis alba royana* | Nationally Critical A | OL SO | 3 | 1 | 1 | 1.67 | |
| Gulls & terns | Black-billed gull | *Larus bulleri* | Nationally Endangered E | De | 2 | 1.5 | 1 | 1.50 | |
| Gulls & terns | Black-backed gull | *Larus dominicanus dominicanus* | Not Threatened | SO | 0 | 1.5 | 1 | 0.83 | TRW |
| Gulls & terns | Red-billed gull | *Larus novaehollandiae scopulinus* | Nationally Vulnerable E (1/1) | | 2 | 1.5 | 1 | 1.50 | |
| Gulls & terns | Caspian tern | *Hydroprogne caspia* | Nationally Vulnerable B (1/1) | SO | 1 | 1 | 1 | 1.00 | |

DOC threat classification from Miskelly *et al*. (2008). (Qualifiers - (CD) Conservation Dependent, (DP) Data Poor, (De) Designated, (EF) Extreme Fluctuations, (Inc) Increasing, (IE) Island Endemic, (OL) One Location, (PD) Partial Decline, (RR) Range Restricted, (RF) Recruitment Failure, (SO) Secure Overseas, (Sp) Sparse, (St) Stable, (TO) Threatened Overseas)

| ***Species group*** | ***Common name*** | ***Scientific name*** | ***DOC threat classification*** | ***DOC qualifier*** | ***Breeding population status*** | ***Behavioural susceptibility to capture*** | ***Life-history strategy*** | ***Average*** | ***Observed caught / method*** |
|---|---|---|---|---|---|---|---|---|---|
| Gulls & terns | Sooty tern | *Onychoprion fuscata kermadeci* | Naturally Uncommon | DP RR | 1 | 1 | 2 | 1.33 | |
| Gulls & terns | Fairy tern | *Sternula nereis davisae* | Nationally Critical A | CD RR | 3 | 1 | 1.5 | 1.83 | |
| Gulls & terns | White-fronted tern | *Sterna striata* | Declining B (1/1) | DP | 2 | 1 | 1.5 | 1.50 | |
| Gulls & terns | Antarctic tern | *Sterna vittata bethunei* | Recovering A | RR | 0 | 1 | 1.5 | 0.83 | |
| Gulls & terns | Southern white-fronted tern | *Sterna striata aucklandorna* | Nationally Vulnerable B (1/1) | DP RR | 1 | 1 | 1 | 1.00 | |
| Large albatrosses | Antipodean wandering albatross | *Diomedea antipodensis antipodensis* | Naturally Uncommon | IE RR | 1 | 3 | 3 | 2.33 | SLL, TRW |
| Large albatrosses | Gibson's wandering albatross | *Diomedea antipodensis gibsonii* | Nationally Vulnerable D (1/1) | IE RR | 2 | 3 | 3 | 2.67 | SLL, TRW |
| Large albatrosses | Southern royal albatross | *Diomedea epomophora epomophora* | Naturally Uncommon | RR | 1 | 2.5 | 3 | 2.17 | BLL, SLL, TRW |
| Large albatrosses | Wandering albatross | *Diomedea exulans* | Migrant | TO | 1 | 3 | 3 | 2.33 | BLL, SLL, TRW |
| Large albatrosses | Northern royal albatross | *Diomedea epomophora sanfordi* | Naturally Uncommon | RR | 1 | 2 | 3 | 2.00 | SLL, TRW |
| Large pterodroma petrels | White-headed petrel | *Pterodroma lessonii* | Not Threatened | De RR SO | 0 | 2 | 2 | 1.33 | SLL, TRW |
| Large pterodroma petrels | Grey-faced petrel | *Pterodroma macroptera* | Not Threatened | De Inc RR | 0 | 2 | 2 | 1.33 | BLL, SLL, TRW |

DOC threat classification from Miskelly *et al*. (2008). (Qualifiers - (CD) Conservation Dependent, (DP) Data Poor, (De) Designated, (EF) Extreme Fluctuations, (Inc) Increasing, (IE) Island Endemic, (OL) One Location, (PD) Partial Decline, (RR) Range Restricted, (RF) Recruitment Failure, (SO) Secure Overseas, (Sp) Sparse, (St) Stable, (TO) Threatened Overseas)

| ***Species group*** | ***Common name*** | ***Scientific name*** | ***DOC threat classification*** | ***DOC qualifier*** | ***Breeding population status*** | ***Behavioural susceptibility to capture*** | ***Life-history strategy*** | ***Average*** | ***Observed caught / method*** |
|---|---|---|---|---|---|---|---|---|---|
| Large pterodroma petrels | Soft-plumaged petrel | *Pterodroma mollis* | Coloniser | Inc OL SO | 1 | 1 | 2 | 1.33 | |
| Large shearwaters | Flesh-footed shearwater | *Puffinus carneipes* | Declining B (1/1) | RR TO | 2 | 3 | 2 | 2.33 | BLL, SLL, TRW |
| Large shearwaters | Sooty shearwater | *Puffinus griseus* | Declining C (1/1) | SO(NT) | 3 | 3 | 2 | 2.67 | BLL, SLL, SN, TRW |
| Large shearwaters | Wedge-tailed shearwater | *Puffinus pacificus* | Relict B | RR SO | 1 | 2 | 2 | 1.67 | |
| Penguins | Eastern rockhopper penguin | *Eudyptes filholi* | Nationally Critical C | TO | 3 | 1 | 1 | 1.67 | |
| Penguins | Fiordland penguin | *Eudyptes pachyrhynchus* | Nationally Vulnerable C (1/1) | Sp | 2 | 1 | 1 | 1.33 | |
| Penguins | Snares penguin | *Eudyptes robustus* | Naturally Uncommon | IE OL | 1 | 1 | 1 | 1.00 | |
| Penguins | Erect-crested penguin | *Eudyptes sclateri* | Naturally Uncommon | RR | 1 | 1 | 1.5 | 1.17 | |
| Penguins | White-flippered blue penguin | *Eudyptula minor albosignata* | Nationally Vulnerable B | De RR | 1 | 2 | 1 | 1.33 | |
| Penguins | Chatham Island blue penguin | *Eudyptula minor chathamensis* | Naturally Uncommon | IE RR | 1 | 2 | 1 | 1.33 | |
| Penguins | Northern blue penguin | *Eudyptula minor iredalei* | Declining A (1/1) | DP EF | 2 | 2 | 1 | 1.67 | |
| Penguins | Southern blue penguin | *Eudyptula minor minor* | Declining A (1/1) | DP | 2 | 2 | 1 | 1.67 | |
| Penguins | Yellow-eyed penguin | *Megadyptes antipodes* | Nationally Vulnerable B (1/1) | EF | 1 | 3 | 1 | 1.67 | SN |

DOC threat classification from Miskelly *et al*. (2008). (Qualifiers - (CD) Conservation Dependent, (DP) Data Poor, (De) Designated, (EF) Extreme Fluctuations, (Inc) Increasing, (IE) Island Endemic, (OL) One Location, (PD) Partial Decline, (RR) Range Restricted, (RF) Recruitment Failure, (SO) Secure Overseas, (Sp) Sparse, (St) Stable, (TO) Threatened Overseas)

| ***Species group*** | ***Common name*** | ***Scientific name*** | ***DOC threat classification*** | ***DOC qualifier*** | ***Breeding population status*** | ***Behavioural susceptibility to capture*** | ***Life-history strategy*** | ***Average*** | ***Observed caught / method*** |
|---|---|---|---|---|---|---|---|---|---|
| Procellaria petrels | White-chinned petrel | *Procellaria aequinoctialis* | Declining C (1/1) | RR TO | 3 | 3 | 2 | 2.67 | BLL, SLL, SN, TRW |
| Procellaria petrels | Grey petrel | *Procellaria cinerea* | Declining B (1/1) | | 2 | 3 | 2 | 2.33 | BLL, SLL, TRW |
| Procellaria petrels | Parkinson's petrel | *Procellaria parkinsoni* | Nationally Vulnerable B (1/1) | RR | 1 | 3 | 2 | 2.00 | BLL, SLL, TRW |
| Procellaria petrels | Westland petrel | *Procellaria westlandica* | Naturally Uncommon | OL St | 1 | 2 | 2 | 1.67 | BLL, SLL, SN, TRW |
| Shags | Campbell Island shag | *Leucocarbo campbelli* | Naturally Uncommon | DP IE OL | 1 | 2 | 1 | 1.33 | |
| Shags | King shag | *Leucocarbo carunculatus* | Nationally Endangered B (1/1) | | 1 | 2 | 1 | 1.33 | |
| Shags | Stewart Island shag | *Leucocarbo chalconotus* | Nationally Vulnerable B (1/1) | | 1 | 2 | 1 | 1.33 | |
| Shags | Auckland Island shag | *Leucocarbo colensoi* | Nationally Vulnerable B (1/1) | IE RR St | 1 | 2 | 1 | 1.33 | |
| Shags | Pitt Island shag | *Stictocarbo featherstoni* | Nationally Endangered A (1/1) | IE RR | 2 | 2 | 1 | 1.67 | |
| Shags | Chatham Island shag | *Leucocarbo onslowi* | Nationally Endangered B (1/1) | DP IE RR | 1 | 2 | 1 | 1.33 | |
| Shags | Spotted shag | *Stictocarbo punctatus punctatus* | Not Threatened | | 0 | 2 | 1 | 1.00 | SN, TRW |
| Shags | Bounty Island shag | *Leucocarbo ranfurlyi* | Nationally Critical A | IE OL | 3 | 2 | 1 | 2.00 | |

DOC threat classification from Miskelly *et al*. (2008). (Qualifiers - (CD) Conservation Dependent, (DP) Data Poor, (De) Designated, (EF) Extreme Fluctuations, (Inc) Increasing, (IE) Island Endemic, (OL) One Location, (PD) Partial Decline, (RR) Range Restricted, (RF) Recruitment Failure, (SO) Secure Overseas, (Sp) Sparse, (St) Stable, (TO) Threatened Overseas)

| ***Species group*** | ***Common name*** | ***Scientific name*** | ***DOC threat classification*** | ***DOC qualifier*** | ***Breeding population status*** | ***Behavioural susceptibility to capture*** | ***Life-history strategy*** | ***Average*** | ***Observed caught / method*** |
|---|---|---|---|---|---|---|---|---|---|
| Shags | Pied shag | *Phalacrocorax varius varius* | Nationally Vulnerable C (1/1) | | 2 | 2 | 1 | 1.67 | BLL, SN |
| Shags | Black shag | *Phalacrocorax carbo novaehollandiae* | Naturally Uncommon | SO Sp | 1 | 2 | 1 | 1.33 | |
| Shags | Little shag | *Phalacrocorax melanoleucos brevirostris* | Naturally Uncommon | Inc | 1 | 2 | 1 | 1.33 | |
| Shags | Little black shag | *Phalacrocorax sulcirostris* | Naturally Uncommon | RR | 1 | 2 | 1 | 1.33 | |
| Small albatrosses | Light-mantled albatross | *Phoebetria palpebrata* | Declining B (1/1) | DP RR SO(NT) | 2 | 3 | 2 | 2.33 | SLL |
| Small albatrosses | Buller's albatross (Northern) | *Thalassarche nov. sp.* | Naturally Uncommon | RR | 1 | 3 | 2 | 2.00 | BLL, SLL, TRW |
| Small albatrosses | Buller's albatross (Southern) | *Thalassarche bulleri* | Naturally Uncommon | RR | 1 | 3 | 2 | 2.00 | BLL, SLL, TRW |
| Small albatrosses | Indian Yellow-nosed albatross | *Thalassarche carteri* | Coloniser | TO | 1 | 3 | 2 | 2.00 | BLL |
| Small albatrosses | Grey-headed albatross | *Thalassarche chrysostoma* | Nationally Critical C | DP OL TO | 3 | 3 | 2 | 2.67 | |
| Small albatrosses | Chatham albatross | *Thalassarche eremita* | Naturally Uncommon | IE OL | 1 | 3 | 2 | 2.00 | BLL, SLL, TRW |
| Small albatrosses | Campbell albatross | *Thalassarche impavida* | Naturally Uncommon | IE OL | 1 | 3 | 2 | 2.00 | SLL, TRW |
| Small albatrosses | Black-browed albatross | *Thalassarche melanophrys* | Coloniser | TO | 1 | 3 | 2 | 2.00 | BLL, SLL, TRW |
| Small albatrosses | Salvin's albatross | *Thalassarche salvini* | Nationally Vulnerable D (1/1) | DP RR TO | 2 | 3 | 2 | 2.33 | BLL, SLL, TRW |

DOC threat classification from Miskelly *et al*. (2008). (Qualifiers - (CD) Conservation Dependent, (DP) Data Poor, (De) Designated, (EF) Extreme Fluctuations, (Inc) Increasing, (IE) Island Endemic, (OL) One Location, (PD) Partial Decline, (RR) Range Restricted, (RF) Recruitment Failure, (SO) Secure Overseas, (Sp) Sparse, (St) Stable, (TO) Threatened Overseas)

| ***Species group*** | ***Common name*** | ***Scientific name*** | ***DOC threat classification*** | ***DOC qualifier*** | ***Breeding population status*** | ***Behavioural susceptibility to capture*** | ***Life-history strategy*** | ***Average*** | ***Observed caught / method*** |
|---|---|---|---|---|---|---|---|---|---|
| Small albatrosses | White-capped albatross | *Thalassarche steadi* | Declining C (1/1) | DP RR | 3 | 3 | 3 | 3.00 | BLL, SLL, TRW |
| Small shearwaters | Buller's shearwater | *Puffinus bulleri* | Naturally Uncommon | OL St | 1 | 2 | 2 | 1.67 | BLL, TRW |
| Small shearwaters | Fluttering shearwater | *Puffinus gavia* | Relict B | RR | 1 | 2 | 2 | 1.67 | BLL, SN, TRW |
| Small shearwaters | Hutton's shearwater | *Puffinus huttoni* | Declining C (1/1) | OL | 3 | 2 | 2 | 2.33 | |
| Other birds | Brown skua | *Catharacta antarctica lonnbergi* | Naturally Uncommon | Sp | 1 | 1 | 1 | 1.00 | |
| Other birds | Snares Cape pigeon | *Daption capense australe* | Naturally Uncommon | RR | 1 | 2.5 | 2 | 1.83 | BLL, TRW |
| Other birds | Cape pigeon | *Daption capense capense* | Migrant | SO | 1 | 2.5 | 2 | 1.83 | BLL, SLL, SN, TRW |
| Other birds | White-bellied storm petrel | *Fregetta grallaria grallaria* | Nationally Endangered B (1/1) | DP | 1 | 1.5 | 2 | 1.50 | |
| Other birds | Black-bellied storm petrel | *Fregetta tropica* | Not Threatened | De RR | 0 | 1.5 | 2 | 1.17 | TRW |
| Other birds | Grey-backed storm petrel | *Garrodia nereis* | Relict B | RR SO | 1 | 1.5 | 2 | 1.50 | TRW |
| Other birds | Blue petrel | *Halobaena caerulea* | Migrant | SO | 1 | 1 | 2 | 1.33 | |
| Other birds | Southern giant petrel | *Macronectes giganteus* | Migrant | SO(NT) | 1 | 2 | 2 | 1.67 | BLL, SLL, TRW |
| Other birds | Northern giant petrel | *Macronectes halli* | Naturally Uncommon | RR SO(NT) | 1 | 2 | 2 | 1.67 | BLL, SLL, TRW |
| Other birds | New Zealand storm petrel | *Oceanites maorianus* | Data deficient | DP | 2 | 1 | 2 | 1.67 | |

DOC threat classification from Miskelly *et al*. (2008). (Qualifiers - (CD) Conservation Dependent, (DP) Data Poor, (De) Designated, (EF) Extreme Fluctuations, (Inc) Increasing, (IE) Island Endemic, (OL) One Location, (PD) Partial Decline, (RR) Range Restricted, (RF) Recruitment Failure, (SO) Secure Overseas, (Sp) Sparse, (St) Stable, (TO) Threatened Overseas)

| ***Species group*** | ***Common name*** | ***Scientific name*** | ***DOC threat classification*** | ***DOC qualifier*** | ***Breeding population status*** | ***Behavioural susceptibility to capture*** | ***Life-history strategy*** | ***Average*** | ***Observed caught / method*** |
|---|---|---|---|---|---|---|---|---|---|
| Other birds | Fulmar prion | *Pachyptila crassirostris crassirostris* | Naturally Uncommon | RR St | 1 | 1 | 2 | 1.33 | |
| Other birds | Lesser fulmar prion | *Pachyptila crassirostris flemingi* | Naturally Uncommon | OL SO St | 1 | 1 | 2 | 1.33 | |
| Other birds | Chatham fulmar prion | *Pachyptila crassirostris pyramidalis* | Naturally Uncommon | IE RR | 1 | 1 | 2 | 1.33 | |
| Other birds | Antarctic prion | *Pachyptila desolata* | Naturally Uncommon | RR SO | 1 | 2 | 2 | 1.67 | TRW |
| Other birds | Fairy prion | *Pachyptila turtur* | Relict B | RR SO | 1 | 2 | 2 | 1.67 | TRW |
| Other birds | Broad-billed prion | *Pachyptila vittata* | Relict B | RR SO | 1 | 2 | 2 | 1.67 | BLL, TRW |
| Other birds | Kermadec white-faced storm petrel | *Pelagodroma albiclunis* | Nationally Critical A | IE OL | 3 | 1 | 2 | 2.00 | |
| Other birds | Australian white-faced storm petrel | *Pelagodroma marina dulciae* | Vagrant B | SO | 1 | 1 | 2 | 1.33 | |
| Other birds | New Zealand white-faced storm petrel | *Pelagodroma marina maoriana* | Relict B | RR | 1 | 1 | 2 | 1.33 | |
| Other birds | Codfish Island South Georgian diving petrel | *Pelecanoides georgicus "Codfish Island"* | Nationally Critical A | IE OL | 3 | 1 | 2 | 2.00 | |
| Other birds | Southern diving petrel | *Pelecanoides urinatrix chathamensis* | Relict B | RR | 1 | 1.5 | 2 | 1.50 | |

DOC threat classification from Miskelly *et al*. (2008). (Qualifiers - (CD) Conservation Dependent, (DP) Data Poor, (De) Designated, (EF) Extreme Fluctuations, (Inc) Increasing, (IE) Island Endemic, (OL) One Location, (PD) Partial Decline, (RR) Range Restricted, (RF) Recruitment Failure, (SO) Secure Overseas, (Sp) Sparse, (St) Stable, (TO) Threatened Overseas)

| ***Species group*** | ***Common name*** | ***Scientific name*** | ***DOC threat classification*** | ***DOC qualifier*** | ***Breeding population status*** | ***Behavioural susceptibility to capture*** | ***Life-history strategy*** | ***Average*** | ***Observed caught / method*** |
|---|---|---|---|---|---|---|---|---|---|
| Other birds | Subantarctic diving petrel | *Pelecanoides urinatrix exsul* | Not Threatened | De RR SO | 0 | 1.5 | 2 | 1.17 | |
| Other birds | Northern diving petrel | *Pelecanoides urinatrix urinatrix* | Relict B | Inc RR SO | 1 | 1.5 | 2 | 1.50 | |
| Other birds | Red-tailed tropicbird | *Phaethon rubricauda* | Nationally Endangered B (1/1) | RR SO St | 1 | 1 | 2 | 1.33 | |
| Other birds | Grey ternlet | *Procelsterna cerulea albivittata* | Naturally Uncommon | RR | 1 | 1 | 2 | 1.33 | |
| | | | | | | | | | |
| Other birds | Chatham petrel | *Pterodroma axillaris* | Nationally Vulnerable A (1/1) | CD IE Inc OL | 0 | 1 | 2 | 1.00 | |
| Other birds | White-necked petrel | *Pterodroma cervicalis* | Relict B | OL | 1 | 1 | 2 | 1.33 | |
| Other birds | Cook's petrel | *Pterodroma cookii* | Relict B | Inc RR | 1 | 1 | 2 | 1.33 | |
| Other birds | Mottled petrel | *Pterodroma inexpectata* | Relict B | Inc RR | 1 | 1 | 2 | 1.33 | |
| Other birds | Magenta petrel (Chatham Island taiko) | *Pterodroma Magentae* | Nationally Critical A | CD IE Inc OL | 3 | 1 | 2 | 2.00 | |
| Other birds | Kermadec petrel | *Pterodroma neglecta* | Relict A | SO | 1 | 1 | 2 | 1.33 | |
| Other birds | Black-winged petrel | *Pterodroma nigripennis* | Not Threatened | De Inc RR | 0 | 1 | 2 | 1.00 | |
| Other birds | Pycroft's petrel | *Pterodroma pycrofti* | Recovering B | Inc RR | 0 | 1 | 2 | 1.00 | |
| Other birds | Norfolk Island little shearwater | *Puffinus assimilis assimilis* | Vagrant B | SO | 1 | 1 | 2 | 1.33 | |

DOC threat classification from Miskelly *et al*. (2008). (Qualifiers - (CD) Conservation Dependent, (DP) Data Poor, (De) Designated, (EF) Extreme Fluctuations, (Inc) Increasing, (IE) Island Endemic, (OL) One Location, (PD) Partial Decline, (RR) Range Restricted, (RF) Recruitment Failure, (SO) Secure Overseas, (Sp) Sparse, (St) Stable, (TO) Threatened Overseas)

| ***Species group*** | ***Common name*** | ***Scientific name*** | ***DOC threat classification*** | ***DOC qualifier*** | ***Breeding population status*** | ***Behavioural susceptibility to capture*** | ***Life-history strategy*** | ***Average*** | ***Observed caught / method*** |
|---|---|---|---|---|---|---|---|---|---|
| Other birds | North Island little shearwater | *Puffinus assimilis haurakiensis* | Recovering B | Inc RR | 0 | 1 | 2 | 1.00 | |
| Other birds | Kermadec little shearwater | *Puffinus assimilis kermadecensis* | Relict B | IE RR | 1 | 1 | 2 | 1.33 | |
| Other birds | Subantarctic little shearwater | *Puffinus elegans* | Naturally Uncommon | RR | 1 | 1 | 2 | 1.33 | |

# *Appendix 2*

## *Mitigation devices known to be in use for each fishery examined*

| Fishery | Mitigation devices |
|---|---|
| Beach seine / drag net | Unknown |
| BLL inshore | Line weighting, tori lines, bait and discard management, acoustic or physical deterrents |
| BLL deep-sea | Line weighting, tori lines, bait and discard management, acoustic or physical deterrents |
| Dahn line | Unknown |
| Danish seine | Unknown |
| Deep water bottom trawl | Bird scaring devices, offal management |
| Diving | Unknown |
| Dredge | Unknown |
| Fish traps | Unknown |
| Hand gather | Unknown |
| Hand line | Unknown |
| Inshore drift net | Unknown |
| Inshore trawl | Bird scaring devices, offal management |
| Middle depth trawl targeting finfish | Bird scaring devices, offal management |
| Middle depth trawl - scampi | Bird scaring devices, offal management |
| Middle depth trawl - southern blue whiting | Bird scaring devices, offal management |
| Middle depth trawl - squid | Bird scaring devices, offal management |
| Pelagic mackerel trawl | Bird scaring devices, offal management |
| Pots | Unknown |
| Purse seine | Unknown |
| Ring net | Unknown |
| Setnet | Offal management |
| Squid jig | Unknown |
| Surface longline < 50 m | Tori lines, bait and discard management, line weighting, night setting |
| Surface longline > 50 m | Tori lines, bait and discard management, line weighting, night setting |
| Troll | Unknown |
| Trot line | Unknown |