New Zealand Northern Tuna Fleet: Report of Advisory Officer—Seabird/Fisheries Interactions 2001/02

DOC SCIENCE INTERNAL SERIES 99

Dave Kellian

Published by
Department of Conservation
PO Box 10-420
Wellington, New Zealand

DOC Science Internal Series is a published record of scientific research carried out, or advice given, by Department of Conservation staff, or external contractors funded by DOC. It comprises progress reports and short communications that are generally peer-reviewed within DOC, but not always externally refereed. Fully refereed contract reports funded from the Conservation Services Levy (CSL) are also included.

Individual contributions to the series are first released on the departmental intranet in pdf form. Hardcopy is printed, bound, and distributed at regular intervals. Titles are listed in the DOC Science Publishing catalogue on the departmental website http://www.doc.govt.nz and electronic copies of CSL papers can be downloaded from http://www.csl.org.nz

ISSN 1175–6519

ISBN 0–478–22381–1

In the interest of forest conservation, DOC Science Publishing supports paperless electronic publishing. When printing, recycled paper is used wherever possible.

This is a client report funded from the Conservation Services Levy (investigation no. 3061). It was prepared for publication by DOC Science Publishing, Science & Research Unit; editing and layout by Jaap Jasperse. Publication was approved by the Manager, Science & Research Unit, Science Technology and Information Services, Department of Conservation, Wellington.

CONTENTS

New Zealand Northern Tuna Fleet: Report of Advisory Officer—Seabird/Fisheries Interactions 2001/02

Dave Kellian

c/o CSL Unit, Department of Conservation, P.O. Box 10-420, Wellington

ABSTRACT

The Department of Conservation (DOC) employed the author from July 2001 to July 2002, to work alongside skippers and crew in the northern domestic tuna fleet. The seabird/fisheries advisory officer position focused on ensuring skippers and crew were aware of the range of measures available to them to fish without incidentally catching seabirds. The position was funded from the Conservation Services Levy.

During the year 113 skippers operating 108 vessels were visited. A further six skippers in the southern fleet were interviewed by Tuna New Zealand president, John Gallagher (114 boats in total).

Tuna fishers experienced in seabird-friendly fishing practice were observed and the methods they used to mitigate the incidental capture of seabirds were noted. From these observations some best practices, including a best practice design for tori lines, and holding offal on board until the line hauling process is complete, were identified.

Tori lines were built based on the design developed by Auckland fisherman, Laurie Hill, and distributed to each of the vessels visited. A folder of information on seabirds and practical advice on seabird-friendly fishing practices was updated and distributed.

Many skippers included in the project are aware of issues around the incidental capture of seabirds and mitigation measures. Specific follow up is suggested for new skippers who may benefit from repeat visits to encourage and reinforce the adoption of good practices. Information about minimum mitigation requirements needs to be passed on to skippers working on behalf of permit holders. Further recommendations for skipper training and providing incentives for best practice are given.

Keywords: incidental capture of seabirds, tuna longline fishery, pelagic, tori lines, mitigation measures

Kellian, D. 2003: New Zealand Northern Tuna Fleet: Report of Advisory Officer—Seabird/Fisheries Interactions 2001/02. *DOC Science Internal Series 99*. Department of Conservation, Wellington. 22 p. http://www.csl.org.nz/dsis99.pdf

1. Introduction

1.1 THE TUNA LONGLINE FISHERY

While commercial fisheries have used longlines since the nineteenth century, pelagic longlining is relatively new for New Zealand. The number of domestic vessels fishing by this method has significantly increased over the years 1990–2002.

There are two tuna longline fisheries in the New Zealand exclusive economic zone (EEZ), the boundary between the northern and southern fishery being latitude 40°S (Manly et al. 2002). From 1987 to 1994 the northern fishery was frequented by foreign-licensed Japanese vessels, with a few foreign-licensed Korean vessels as well before 1989. The fishery was closed to foreign-licensed vessels from 1995 onwards because of increasing domestic capacity for longline fishing. Domestic-owned and operated vessels have used the area since 1991, along with some chartered Japanese vessels (Manly et al. 2002).

Domestic vessels have made increasing use of the southern fishery since 1994. Chartered Japanese vessels have also been more active in this fishery than the northern one (Manly et al. 2002).

The northern domestic tuna longline fleet comprises predominantly small vessels. Those included in this report varied in length between 10.4 and 34 m. Since 2000, the fleet has grown from 60–70 to more than 145 vessels (pers. obs.; Keith 2000). The fleet is registered in ports as far south as Milford, but most are based on the east coast of the North Island, from Gisborne to Mangonui.

Detailed information on the methodology used to set and retrieve pelagic longlines has been publsihed elsewhere (Keith 2000).

The focus tuna species in New Zealand's pelagic fisheries are albacore, *Thunnus alalunga*, skipjack, *Katsuwonus pelamis*, southern bluefin, *T. maccoyii*, yellowfin, *T. albacares*, and bigeye tuna, *T. obesus* (Ministry of Fisheries website, from which the information in the four paragraphs below was also gleaned)[1].

Southern bluefin tuna are part of a single stock found in the Atlantic, Indian and western Pacific Oceans, primarily from 30 to 55°S. Most of the global southern bluefin catch is taken in the high seas of the western Indian Ocean, and off South Australia and Tasmania (Mfish website, 2000). The southern bluefin tuna season in New Zealand begins in April, when up to 80 per cent of the northern fleet head as far south as Napier, to target this species. When the southern bluefin tuna season ends, boats then head north again and spread throughout the northern tuna fishery. It is noted that the southern bluefin tuna season used to end in about August, but in recent years the closure has come forward to June.

---

[1] Information from Ministry of Fisheries website, 2000. Pelagic Fisheries: Tuna and Swordfish. http://www.mfish.govt.nz/sustainability/research/planning/medium/pelagic5.htm#tuna

Bigeye caught in the New Zealand EEZ are part of a single Pacific Ocean stock ranging from about 40°N to 40°S across the entire Pacific Ocean basin. About 75 per cent of bigeye are caught from November to May and domestic longliners account for more than 99 per cent of all reported New Zealand bigeye catches.

There is little targeting of yellowfin, which is mainly a bycatch species of the bigeye longline fishery and albacore troll fisheries. Swordfish, *Xiphius gladius*, are also caught by tuna longliners throughout the Pacific Ocean, usually as bycatch.

No tuna species are currently included in New Zealand's quota management system (QMS). Southern bluefin is jointly managed by New Zealand, Australia, Korea and Japan through the Commission for the Conservation of Southern Bluefin Tuna (CCSBT). Commercial landings of southern bluefin in the New Zealand EEZ are monitored against its 420 greenweight tonne annual quota (Ministry of Fisheries 2000). This fishery closed for the 2002 year on 20 June, 3 months before the maximum season duration, because the catch limit was filled.

Swordfish are also not included in the QMS and targeting swordfish is prohibited under the Billfish Moratorium.

1.2 SEABIRD/FISHERY INTERACTIONS IN THE DOMESTIC PELAGIC LONGLINE FLEET

Seabirds most frequently caught on longlines in southern ocean fisheries are albatrosses and petrels. Larger seabirds, such as albatross, are able to swallow the baited hook before it has a chance to sink, whereas the smaller petrels can be foul-hooked or entangled in the line.

Once snared, seabirds are drawn underwater by the sinking longline and drown. Seabirds can also be hooked as the longlines are hauled back on board - often these animals can be released alive.

The incidental capture of seabirds occurs because many are natural scavengers and they appear to have learnt that fishing boats are a food source—from the squid and fish used for bait, to the offal discarded from processed catches.

Fishers in New Zealand's northern tuna fleet report that seabird/fishery interactions vary, depending on the time of year and location of the fleet (pers. obs.). For example, flesh-footed shearwaters (*Puffinus carneipes*) and black petrels (*Procellaria parkinsoni*) breed between November and March and during this period are particularly hungry and forage aggressively behind vessels. The fleet overlaps with their foraging range during these months.

The latest New Zealand figures about the incidental capture of seabirds in the domestic tuna longline fishery come from the 1999/2000 year (Baird 2001). About 100 domestic-owned and operated tuna longline vessels took part that season, with most fishing effort in the area north from Raglan Harbour on the west coast of the North Island, round to Cape Campbell on the east coast of the South Island. Of the more than 7.2 million hooks set in the domestic tuna fishery that year, 96 per cent were in this northern area where vessels fished throughout the year for albacore, bigeye, southern bluefin and yellowfin tuna, averaging about 1100 hooks per set (Baird 2001).

MFish observer coverage only occurred on boats fishing the eastern half of the area—from Cape Campbell north to Spirits Bay. In all, in 1999/2000 less than 0.5 per cent of all hooks set by the domestic-owned and operated vessels were observed (Baird 2001).

Of the 36 observed domestic sets, seabirds were caught in 44 per cent of them (34 seabirds). Sixteen of the sets were in the Bay of Plenty, from December to February inclusive, and accounted for 25 of the 34 seabirds. Of the 29 seabirds released alive:

- 10 were caught in the wing;
- 8 were tangled;
- 11 hooked in the bill/mouth.

Five seabirds, about 15 per cent of those caught, were landed dead—tangled, hooked in the wing or having swallowed the hook (Baird in press).

An autopsy report of the seabirds caught by the domestic tuna longline fleet over four seasons from 1996 to 2000 shows the species to be (Robertson & Bell 2002):

- Antipodean (wandering) albatross, *Diomedea antipodensis*;
- Gibson's (wandering) albatross, *D. gibsoni*;
- Black petrel;
- White-chinned petrel *Procellaria aequinoctialis;*
- Campbell albatross, *Thalassarche impavida*;
- Flesh-footed shearwater.

Of these, all but the flesh-footed shearwater and grey petrel are considered threatened (vulnerable) by IUCN criteria (Taylor 2000).

Some of the technical and operational fishing measures currently used by the pelagic domestic longline fleet to help reduce the incidental capture of seabirds include:

- Setting lines at night;
- Use of tori lines, to reduce the exposure of baited hooks to seabirds;
- Thawing bait to overcome buoyancy problems;
- Increasing sink rates by using weights;
- Use of seabird scaring devices, such as gas cannons and star shells;
- Holding offal and baits to reduce vessel attractiveness to seabirds;
- Use of dyed baits;
- Avoiding fishing in areas with a high abundance of seabirds.

Smith (2001) suggested that two types of information were needed to help design effective mitigation methods and to test the effectiveness of these. These are:

- The diving and foraging behaviours of various seabird species;
- The longline sink rate.

The data will reveal how long baited hooks remain accessible to seabirds, and suggest changes to gear performance that are required to mitigate incidental seabird mortality.

1.3 HOW NEW ZEALAND ADDRESSES INCIDENTAL CAPTURE OF SEABIRDS

1.3.1 Internationally

New Zealand is part of the 27-nation Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR). The Commission's role is to reduce seabird mortality associated with fishing in Antarctic waters. In 1992 it adopted practical mitigation measures, known as 'Conservation Measure 29/XIX' (CCAMLR website 2001[2]). These include the use of streamer lines, night setting, line weighting and controlling offal dumping. CCAMLR's 2001 report states the number of seabirds captured in the Convention Area's regulated longline fisheries was substantially reduced between 1997 and 2000 because of the use of mitigation measures, combined with seasonal closures.

New Zealand, along with Japan, Australia and Korea, is a member of the Commission for the Conservation of Southern Bluefin Tuna (CCSBT). The commission was established to jointly manage southern bluefin tuna stocks. A working group (Ecologically Related Species Working Group) has been formed to provide the commission with advice on issues such as the incidental capture of seabirds. The key activity of the group to date has been the exchange of information on national research and education programme. The commission has endorsed the mandatory requirements for the use of tori lines (J. Molloy, DOC, pers. comm).

In June 2001, New Zealand was one of seven countries to sign the Agreement on the Conservation of Albatrosses and Petrels, and other nations with seabird/fisheries interactions are expected to sign. The Agreement will provide a framework for countries to co-operatively address incidental capture of seabirds. New Zealand and Australia have ratified the Agreement, as soon as three more countries ratify, it will come into force.

1.3.2 Within New Zealand

Since 1993, New Zealand has required all pelagic (tuna) fishing vessels to use an approved seabird-scaring device during setting: the tori line.

Funds derived from a levy on fishers are being used:

- To increase observer coverage on fleets fishing in the New Zealand EEZ;
- For autopsies on seabirds returned by observers stationed on vessels;
- To investigate mitigation techniques;
- To detect population trends in seabird species most likely to be affected by fishing interactions (Taylor 2000);
- For the position of seabird/fisheries advisory officer.

In 2002, New Zealand Japan Tuna (NZJT) adopted a voluntary code of practice for its chartered fishing vessels in New Zealand waters to reduce the incidental catch of 'at-risk' seabird species. NZJT is responsible to the Ministry of Fisheries and the Department of Conservation for ensuring that vessels it charters comply

[2] CCAMLR's work on the elimination of seabird mortality associated with fishing (Science Officer, CCAMLR Secretariat). http://www.ccamlr.org

with the code. The code sets an 85-seabird limit on the incidental mortality of 'at risk' species for all vessels combined, for the 2002 southern bluefin tuna fishery. The code aims to reduce the incidental catch of at risk species to nominal levels within 5 years.

Also in 2002, the New Zealand ling longline fleet developed a voluntary code of practice to mitigate the incidental capture of seabirds in that fishery. It is likely that other industry-led codes of practice will be developed for other fisheries (J. Molloy, DOC, pers comm.).

MFish and DOC are developing a Seabird National Plan of Action (NPOA) to provide objectives for monitoring, assessing and reducing seabird mortality in key fisheries over five years to 2006[3]. The NPOA is part of New Zealand's response to a United Nations Food and Agricultural Organisation initiative to encourage countries to mitigate the incidental capture of seabirds.

Also, the Seafood Industry Training Organisation is developing a unit standard covering environmental aspects of fishing, including methods to mitigate against the incidental capture of seabirds. Encouraging skippers to sit the unit standard has been suggested to some tuna fishers and received support from them (pers. obs.).

2. The seabird/fisheries advisory officer position

2.1 INTRODUCTION

In a stakeholder meeting in November 1998, the fishing industry suggested that an advisory officer be appointed by DOC, and funded from the Conservation Services Levy, to work with fishers in the domestic tuna fleet. The contract role was to provide assistance, advice and information for fishers on how to minimise incidental seabird capture. The first contractor, Crispin Keith, worked for 11 months (from March 1999) with skippers and crew on 41 vessels in 10 ports.

Feedback from the fishing industry suggested the position was valuable. In July 2001, the second seabird/fisheries advisory officer, was employed to work alongside skippers and crew in the northern domestic tuna fleet. Project co-ordinator in DOC, Janice Molloy, wrote to all permit holders to seek permission for the advisory officer to visit their skippers; no negative responses were received.

The one-year contract built on and expanded previous liaison work, advocated best practice mitigation methods developed by fishers, and distributed tori lines to vessels. The project ended on 4 July 2002.

---

[3] Hodgson, P. 2001: Review of sustainability measures and other management controls for the 2001-02 fishing year. Letter to Stakeholders, Ministry of Fisheries, Wellington.

2.2 OBJECTIVE

The key objective for the contract was to liaise/educate within the domestic northern tuna longline fleet, and relied on good working relationships with skippers.

Key tasks included:

- Meeting with skippers of as many vessels in the North Island domestic tuna longline fleet as possible;
- Providing vessel-specific advice on how best to address the problem of incidental capture of seabirds, including tori lines;
- Advocating to skippers the importance of seabird conservation, from both a fisheries and conservation perspective;
- Providing resources and information on seabird identification and mitigation measures.

2.3 ACTIVITIES

Vessels were visited in port and observations recorded on five fishing trips.

Fishers were given a brief summary of the project and its aims. While conversations naturally canvassed a wide range of topics, data was recorded on a standard questionnaire form during meetings with skippers. This was to make sure that a key range of questions was covered in each meeting. The topics and details sought are provided in Appendix 1.

Tuna fishers known to use seabird-friendly fishing practice were observed during the first two months and their mitigation methods recorded. The aim was to then transfer the observed best practices to other skippers in the fleet.

3. Results

3.1 VISITING SKIPPERS

During the year from July 2001 to July 2002, 114 vessels and 119 skippers in 15 ports were visited as part of this project; 26 vessels have homeports in the South Island. Table 1 shows the number of vessels in the survey registered to each port.

The ports visited were Mangonui, Opua, Whangerei, Auckland, Onehanga, Tauranga, Whakatane, Gisborne, Napier, Picton and Nelson.

John Gallagher, president of Tuna New Zealand, interviewed six skippers based in Riverton, Bluff, Milford Sound and Stewart Island.

Visits began in July 2001 when the boats were in the northern fishing grounds.

Five multi-day trips were made on four vessels[5] to observe first hand the fishing practices used. Some best practices that could be used by the whole fleet were identified from these observations, including:

- A best-practice design for tori lines;
- How to set and manage tori lines;
- Night setting;
- Deck lighting;
- Using chemical light sticks on tori lines;
- Bait thawing;
- Holding offal on board until the line hauling process is complete.

3.2 INFORMATION COLLECTED FROM SKIPPERS

3.2.1 Fisher awareness

It was found that the awareness of the need to mitigate the incidental capture of seabirds was very high and the will not to catch seabirds was entrenched. Table 2 shows an assessment of skippers' level of awareness and knowledge on aspects of mitigating incidental seabird capture. Table 3 is an assessment of their attitudes to the problem of incidental seabird capture, and a sample of mitigation measures.

Experienced tuna skippers reported that the increased size of the tuna fleet has meant a decline in the number of seabirds around individual vessels. Skippers reported that problems they personally had with incidental capture had been reduced.

Some skippers had a problem with the amount of money levied, largely because they did not catch seabirds and felt they were being unfairly penalised.

TABLE 1. HOME PORTS FOR THE 114 DOMESTIC TUNA LONGLINE VESSELS VISITED DURING 2001/02.

PORT	VESSELS
Milford	2
Riverton	2
Stewart Is	1
Bluff	1
Timaru	2
Nelson	11
Havelock	1
Picton	6
Napier	4
Gisborne	13
Whakatane	1
Tauranga	32
Auckland	15
Onehunga	2
Opua	4
Leigh	1
Whangaparoa	1
Whangerei	7
Mangonui	1
Whitianga	4
Unrecorded	3

TABLE 2. ASSESSMENT OF SKIPPERS' LEVEL OF AWARENESS ABOUT THE INCIDENTAL CAPTURE OF SEABIRDS MITIGATION. RESPONSES WERE NOT RECORDED FROM ALL SKIPPERS.

	LEVEL OF KNOWLEDGE		
TOPIC	HIGH	MEDIUM	LOW
Impact on seabirds	68	39	6
Mitigation measures	88	22	3
Setting a good tori line	77	26	8
National Plan of Action	14	32	67
Tori line regulations	99	6	6

[5] *Green Pastures* (Opua), with skipper Barry Newland; *Melinda* (Gisborne) with skipper Karl Bennett; *Emerald Isles* (Tauranga), with skipper John Gallagher; and *Ikatere* (Auckland) with skipper Laurie Hill.

TABLE 3. ASSESSMENT OF SKIPPERS' ATTITUDES TO THE PROBLEM OF THE INCIDENTAL CAPTURE OF SEABIRDS AND TWO COMMON MITIGATION MEASURES. RESPONSES WERE NOT RECORDED FROM ALL SKIPPERS.

	Supportive	Neutral	Not Supportive
Advisory officer position	112	1	0
	Accepting	Mod. Accepting	Not Accepting
Tori lines	108	4	1
Offal retention	107	1	1
	Concerned	Neutral	Not Concerned
Catching muttonbirds	100	4	8
Catching albatross	108	2	1
Catching seabirds on the haul	61	3	47

A common resentment among the fishers is that the pelagic tuna fleet is the only one required by law to practise seabird mitigation measures, despite their belief that their fishery does not have the biggest impacts. They were heartened by the draft NPOA as this plans to involve other fisheries. General awareness of the NPOA among the fleet's skippers was not high (see Table 2). Few had an in-depth knowledge of the document and the majority had a 'low awareness'. This suggests consultation with tuna fishers, the target audience, is far from optimal.

As Table 3 shows, the assessment is that skippers on 108 vessels accept the need for tori lines as part of their tuna fishing practice. The only skipper who did not accept the need for tori lines was a reluctant participant in the entire project.

Most skippers interviewed do not like tori line use being mandatory as there are times when its use is either unsafe (rough weather) or unnecessary (at night when it is less likely that seabirds at risk are present). In such conditions, they feel a tori line is just another opportunity for something to go wrong. Fishers resent that not using their tori line in these circumstances, technically makes them law-breakers.

Fishers valued the seabird identification book (Onley & Bartle 1999) which is well used. The CSL-funded 'Tuna Fishers Folder' (DOC 2001) contains information on seabirds and practical advice on seabird-friendly fishing practices and is also well used. A folder update to specifically highlight and promote best practices is recommended.

3.2.2 Mitigation measures

Tori lines

All but three skippers report they use tori lines 'sometimes' (58%) or 'always' (39%) when longlining for tuna. Those who use them 'sometimes' do so on the full moon, when setting into daylight, when many seabirds are present or when seabirds are aggressive. On repeat visits to boats, it was obvious that some skippers had not yet used the best practice tori line the advisory officer had built and supplied.

Best-practice design

The five trips with best-practice vessels in the tuna fleet were used to compare observations of three tori line designs—the Fishing Industry Board (FIB) design (Nelson 1998, in Keith 2000), one developed by the previous advisory officer (Keith 1999), and one designed by Auckland-based fisherman, Laurie Hill.

The effectiveness of a tori line is determined by its aerial coverage (how far it extends out the back of the vessel before hitting the water) and its movement and visibility (this increases its deterrent factor).

The results clearly showed Laurie Hill's design was superior in mitigating incidental seabird capture. This is because it:

- Had 30–40 per cent greater aerial coverage when hung from the same height (it achieved 100 m of coverage, from a height of 6 m, towed at 7 knots);
- Was less likely to get tangled in gear;
- Had greater movement and visibility due to its design and the materials used;
- Was consistently avoided by seabirds.

The tori line's aerial coverage was measured as follows. During the set, a stopwatch was used to record the time it took for a float attached to the backbone to reach the point where the tori line touched the water. The stopwatch was started as soon as the float hit the water, and stopped when it reached the tori line's entry point. The distance was calculated by using the vessel's speed (taken off its GPS), converting this into metres per second, and then multiplying by the time in seconds recorded on the stopwatch.

More than 30 measurements were made with the tori line fixed to a 6-m mast. The aerial coverage gained varied with sea conditions and wind. On calm days, travelling at seven knots with the tori line fixed to a 6-m mast, a minimum of 100 m aerial coverage was consistently achieved. On windy days, with a rough sea, aerial coverage ranged from 60 to 120 m as the vessel rose and sank on the waves. However, the vessel's movement caused the tori line to be more active, which meant it was still an effective deterrent. A few comparative tests were done with the tori line fixed to a higher mast. More drag was required to achieve the same aerial coverage; this caused the line to be pulled tighter resulting in less movement.

Following the tests, the Hill tori line was adopted as the best-practice design. Half way through the contract, it was discovered that this design's effectiveness could be further enhanced by attaching chemical light sticks (such as zylume sticks) on to the vertical streamers to make them even more visible to seabirds at night time. The best arrangement is five light sticks: four on the vertical streamers and one on the backbone itself, halfway between the last dropper and the water. To help mitigate costs (light sticks cost about NZ$1 each), they can be re-used if stored in ice during the day to slow the chemical reaction.

The FIB design proved ineffective on smaller boats, with only 30 m of aerial coverage and continual entanglement with fishing gear. A number of boats carried FIB tori lines and never used them.

Specifications

Figure 1 (overleaf) shows the design of the best-practice tori line. The target aerial coverage is 100 m or greater and this is achieved by ensuring the tori line is 6 m from the water line at the stern of the vessel. Aerial coverage is enhanced by increasing the drag of the line in the water. For vessels setting at less than 7 knots, the addition of a funnel and weight (shown in Fig. 1) enables the 100-metre minimum aerial coverage to be maintained. For vessels setting at between 4 and 7 knots, a 100 mm diameter funnel is used. For less than 4 knots, a 150 mm funnel is suitable. When the tori line is being towed, the funnel slides over the weight, removing any hooking points. The weight prevents the funnel skipping over the water. The in haul line shown in Fig. 1 is similar to that used when trolling for albacore.

Supply

In total, 120 best-practice design tori lines were built and distributed to vessels involved in the study.

Because fishers are likely to need to replace their tori lines two or three times a year, two suppliers of fishing gear, Decoro Fishing Supplies Ltd (Mt Manganui) and Gourock New Zealand (Auckland), were encouraged to build and stock best-practice design tori lines at their outlets.

Use

Fishers were shown how to correctly deploy the tori lines if they were unsure how to use them. As indicated in Table 2, 78 skippers had a good understanding of how to set a good line. It appeared that some skippers were not aware of the legal requirement to use a tori line 100 per cent of the time; 10 boats had no tori line on board when visited. Permit holders receive information about minimum requirements (attached to their permit); if they are not owner-operators, this information may not get passed on to their skipper.

Skippers were encouraged to adapt the best-practice design to suit their vessels' particular specifications. They appreciated not having to adhere to one prescriptive design. This flexibility will allow skippers to further improve the design and come up with new best practices which will be to the benefit of the whole fleet the long-term.

The following tips were promulgated to help make tori line use simple and easy:

- Alter course slightly when radio buoys are dropped in the water to avoid them becoming snagged in the tori line;
- Set the tori line before beginning to set the long line to remove the risk of it becoming snagged;
- Keep steaming after the radio buoy is dropped in the water to make sure the tori line is clear of the long line, before stopping;
- If the tori line does get caught in the gear, take it down and clip it onto the backbone so that it can be retrieved at the end of the fishing cycle and set the spare;
- Towing point needs to be set as high as possible. A minimum of 6 m for a setting speed of 7 knots is recommended.

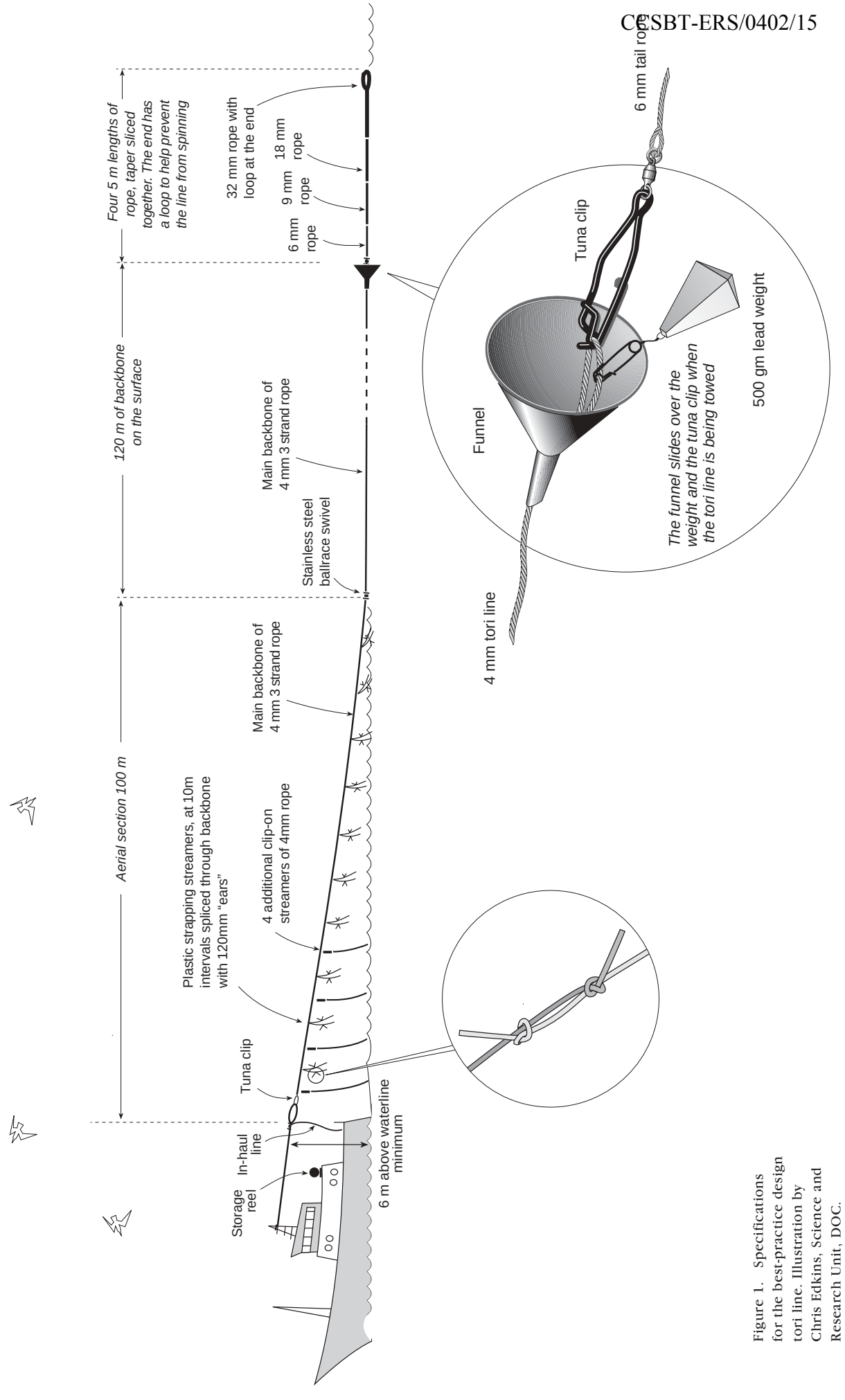

Figure 1. Specifications for the best-practice design tori line. Illustration by Chris Edkins, Science and Research Unit, DOC.

Night setting

All skippers recognise that day setting is a higher-risk time for catching seabirds and all report that their regular fishing routine is to set their lines at night; 57 reported no exceptions to this practice. Of the remainder, exceptions were caused by:

- Overshoots into the dawn;
- Arriving late at the fishing ground;
- Early evening sets;
- When targeting yellowfin.

About six boats specifically target yellowfin tuna during daylight hours.

Fishing direction in relation to the weather

Fishing with the weather is the most effective direction to set in to reduce seabird interactions. This is because seabirds have to turn around and come upwind to land, by which time the boat has moved on. As Table 4 shows, more than half of the skippers report that they have adopted the practice of fishing with the weather, and only 9 skippers fish into the weather. The remainder were not specific, varying their direction according to the conditions.

TABLE 4. FISHING DIRECTION WITH RESPECT TO PREVAILING WEATHER. N= NUMBER OF BOATS.

DIRECTION	N
With the weather	69
Into the weather	9
On beam	4
Not specified	32
TOTAL	114

Lineshooters

Lineshooters are designed to pull the longline from the vessel, rather than relying on the drag of the gear in the water and the forward motion of the vessel to do this.

It was observed that lineshooter use has decreased in the New Zealand fleet as skippers learn alternate techniques to help their longline reach the required depth.

Offal and used bait retention

Retaining offal and used bait on board is a simple method for tuna fishers to use to avoid attracting scavenging seabirds to their vessels.

Skippers on 80 per cent of the vessels involved in the study report they already keep used baits on board as a way to avoid attracting and catching sharks, and have noticed that seabird numbers are also reduced. Thirty-five skippers report retaining offal as a routine part of their fishing practice and consequently report hugely reduced seabird numbers around their vessel.

One practice currently used by some fleet members is baiting hooks in a way that allows the bait to be easily tugged off by the crew during the haul so that they do not have to physically remove it from the hook. Because this leaves a steady stream of floating food to attract seabirds, the practice should be discouraged.

Best practice is to avoid dumping any bait or offal at all and store it instead. Almost all skippers who do not already retain offal and used bait as part of their fishing practice say they will experiment with techniques suggested by the advisory officer.

TABLE 5 PROPORTIONS OF SQUID AND FISH BAITS USED BY THE 114 VESSELS SURVEYED.

100% squid	90% squid	80% squid	70–75% squid	60% squid	50% squid	<50% squid
14	3	8	11	12	58	8
100% fish	90% fish	80% fish	70% fish	60% fish	50% fish	<50% fish
1	1		4	2	58	48

Bait types

The type of bait (squid or fish) used to catch tuna appears to have a bearing on the number and species of seabirds caught. Reports from fishers suggest fewer seabirds are caught with fish bait, as this is less firm than squid and easily breaks off the hook when pecked at by seabirds. Squid tends to stay whole and on the hook which means that large seabirds, such as albatross, are able to swallow a whole piece of squid and end up swallowing the hook as well (the effects of various hook types and sizes are discussed below).

Boats in the domestic longline tuna fleet use different baits depending on whether they are fishing north or south. Squid is preferred when targeting southern bluefin tuna. Boats fishing the northern areas use a combination of squid and fish (sanmar and pilchards): fish bait is particularly effective for catching albacore tuna, which makes up about half of the northern catch.

The proportion of squid and fish baits used by boats involved in this study is shown in Table 5. Nearly half of skippers use a 50:50 ratio of squid and fish, with just one skipper using 100 per cent fish bait.

Fishers report that when a combination of fish and squid is used as bait, seabirds ignore the squid completely and only go for the fish. This suggests that boats targeting southern bluefin tuna could use specified baits as a mitigation measure to avoid catching albatrosses.

A few of the northern fleet have been primarily using green or blue-dyed squid bait as a way to catch more tuna. All reported these baits to be much less attractive to albatrosses.

Hooks

Notes were taken on the type of hooks used (stainless or galvanised steel), and their size, on the 82 vessels involved in the project. This information is presented in Table 6.

First, hook size and type may have a bearing on the incidental capture of seabirds for two reasons. First, while smaller seabirds, such as petrels, can be ensnared in lines regardless of the hook size, they are likely to be more able to swallow 15/0 hooks than the larger size 17/0 hooks.

Secondly, the larger hooks are heavier—17/0 hooks are nearly twice as heavy as 15/0 hooks—and are therefore likely to sink more rapidly, taking the bait out of the reach of seabirds sooner. Table 6 indicates that most fishers favour larger hook sizes.

TABLE 6. SIZE AND TYPE OF FISH HOOKS USED ON 82 VESSELS SURVEYED.

Size of hook	15/0	16/0	17/0
Stainless steel	2	31	43
Galvanised steel	1	9	6

More tuna fishers now use stainless steel hooks as prices have dropped and stainless hooks stay sharp and last longer. However, some fishers deliberately avoid stainless steel hooks because they do not degrade as rapidly when lost.

Weighted snoods

Weighted snoods are a technique to help take baits down beyond the reach of seabirds quicker, and/or help keep the baits at the desired fishing depth.

Weights at the hook are not favoured by fishers because of the risk of injury during the haul should a snood slingshot out of the water. Only two skippers in the survey used weights at the hook. However, 19 of the skippers surveyed used wire traces on some of their snoods. A 185 mm wire trace, swivel and crimps are around 25 grams heavier than monofilament, and this has been shown to increase the depth of the hook by 2 m at a point 100 m behind the vessel (Anderson 2002). Skippers used wire traces on 5–50 per cent of snoods in any one set.

TABLE 7. TYPES OF LINE WEIGHTING USED BY 29 OF THE TUNA SKIPPERS (N) SURVEYED.

Type of line weighting	N
Clip with swivel	8
Clip with swivel and wire trace	14
Wire trace only	5
Weight at hook	2
TOTAL	29

There is an increasing trend to using clips with swivels incorporated in them as this gear has become more readily available during the last few seasons (Table 7). They are seen to enhance the fishing effort in rough weather by preventing snoods from twisting around the backbone and in helping to keep lines down. Keeping lines down may also help reduce the number of seabirds incidentally caught during the soak period in rough weather.

Bait thawing

Using fully thawed bait helps mitigate the incidental capture of seabirds as the bait is less buoyant and sinks out of the seabirds' reach more quickly. Nearly all skippers in the survey (102) report that they routinely thaw the bait; the other 12 use partially thawed baits.

Deck lighting

Limiting the amount of light and keeping it off the water during the set and haul operations makes it more difficult for seabirds to take baits. Most skippers are aware of the issue and 104 boats keep their lighting levels low and inboard. Only three had light directly on the water and all three skippers were encouraged to remedy the problem to keep all light to a minimum and inboard.

Underwater setting

Skippers were asked whether they support further investigation of the concept of underwater setting as a technique to mitigate the incidental capture of seabirds. Of the 106 responses, 68 supported further investigation and 34 moderately accepted the need. Four did not accept it.

Other techniques

One skipper reported that when he was part of the demersal longlining fleet he successfully used cayenne pepper mixed with detergent on baits as a deterrent to seabirds. He had not tried the technique while tuna longlining.

Two skippers reported using oil on the water to create a slick for discouraging seabirds.

Three skippers sprayed water during the haul to keep seabirds away.

4. Conclusions

There is a high level of awareness of the issue of incidental capture of seabirds amongst fishers in the northern tuna fleet. Almost all setting of longlines occurs during the night time when seabirds are less likely to become caught. The majority of vessels now have a best practice tori line on board. Further specific follow up is required for new skippers who may benefit from repeat visits to encourage and reinforce the adoption of good practices. It is important to ensure that permit holders who are not also owner-operators, pass the minimum mitigation requirements on to their skippers.

The fishery will benefit from a reliable supply of pre-made tori lines.

Four recommendations are made:

1. That the tuna longline industry adopt the best-practice tori line design detailed in this report as a minimum industry standard, recognising that improvements may already have been, and may continue to be, made.
2. That all tuna skippers be encouraged to sit the unit standard being developed by the Seafood Industry Training Organisation and currently known as 'ADHF-#7 Vessel Operators' Fields.'
3. That holding offal and used bait be adopted as industry best practice.
4. That forms of reward or incentive should be investigated to encourage people to adopt the best practices.

5. Acknowledgments

I would like to thank all the fishers who participated in the project and helped make it a success. In particular, I thank Laurie Hill for his energy and commitment, Carl Fry and Tom Mayo for trips aboard the Daniel Solander, Karl Bennett on the Melinda, Barry Newland on Green Pastures and Tuna New Zealand president John Gallagher.

I would especially like to thank Marieke Hilhorst for preparing this report based on my information.

Thanks also to Janice Molloy for the opportunity to be involved in the project, and for her help, support, advice and encouragement.

6. References

Anderson, S. 2002: Preliminary Assessment of hook sink rates using two branchline types aboard FV *Ikatere*. Unpublished report to Department of Conservation. 11 p.

Baird, S. J. 2001: Estimation of the incidental capture of seabird and marine mammal species in commercial fisheries in New Zealand waters, 1999/00. Unpublished draft report, New Zealand Fisheries Assessment. 57 p.

Department of Conservation 2001: The Tuna fishers folder, revised. Department of Conservation, Science and Research Unit. 43 p. loose-leafed.

Keith, C. 1999: Tori line designs for New Zealand domestic pelagic longliners. *Conservation Advisory Science Notes 248*. Department of Conservation, Wellington.

Keith, C. 2000: Seabird/fisheries interactions. Final report of advisory officer. *Conservation Advisory Science Notes 295*. Department of Conservation, Wellington.

Manly, B.F.J; Fletcher, D.; Cameron, C. 2002: Longline bycatch of birds and mammals in New Zealand fisheries, 1990/91–1995/96, and observer coverage. *DOC Science Internal Series 43*. 51 p.

Onley, D.; Bartle, B. 1999: Identification of seabirds of the Southern Ocean. A guide for scientific observers aboard fishing vessels. Museum of New Zealand Te Papa Tongarewa, Wellington. 81 p.

Robertson, C.J.R.; Bell, E. 2002: Autopsy report for seabirds killed and returned from New Zealand fisheries, 1 October 1999 to 30 September 2000: Birds returned by Ministry of Fisheries observers to the Department of Conservation. *DOC Science Internal Series 29*. 41 p.

Smith, N. W. McL. 2001: Longline sink rates of an autoline vessel, and notes on seabird interactions. *Science for Conservation 183*. 32 p.

Taylor, G.A. 2000: Action plan for seabird conservation in New Zealand. Part A, Threatened seabirds. *Threatened Species Occasional Publication 16*. Biodiversity Recovery Unit, Department of Conservation, Wellington.

!

Appendix 1

STANDARD INFORMATION SOUGHT FROM EACH INTERVIEW

ADVISORY OFFICER'S INTERVIEW FORM: THE INCIDENTAL CAPTURE OF SEABIRDS.

TOPIC	DETAILS SOUGHT
Vessel details	• Name • Home port • Permit holder • Vessel type and size • Skipper's name
Gear details	• Length of backbone (miles) and snood (metres) • Snood materials, including any extras over and above standard gear • Bait type: thawed/frozen/partial • Deck lighting: on water/on deck • Line shooter use: yes/no
Fishing routine	• Bait thaw: yes/no/partial • Time of set: night/day • Haul operation: night/day • Setting speed (knots) • Direction in relation to weather • Offal dumping routine: yes/no/will experiment
Mitigation measures	• Tori line carried on board and frequency of use: sometimes/always/never • Tori line specifications • Night setting: any exceptions • Any other measures used on set • Any measures used on haul
Knowledge of:	• Impact on seabirds • Mitigation measures • Setting a tori line • National Plan of Action • Tori line regulations • 'The Tuna Fishers' Folder'
Attitude towards:	• Advisory officer position • Tori lines • Offal retention • Underwater setting • Catching muttonbirds • Catching albatrosses • Catching seabirds on the haul