

SCIENCE & RESEARCH SERIES NO.65

**REPORT ON A TUNA LONG-LINING
FISHING VOYAGE ABOARD
Southern Venture TO OBSERVE
SEABIRD BY CATCH PROBLEMS**

SCIENCE & RESEARCH SERIES NO.65

**REPORT ON A TUNA LONG-LINING
FISHING VOYAGE ABOARD
Southern Venture TO OBSERVE
SEABIRD BY CATCH PROBLEMS**

by

M.J. Imber

Published by
Head Office,
Department of Conservation,
P O Box 10-420,
Wellington,
New Zealand

ISSN 0113-3713

ISBN 0-478-01554-2

© February 1994, Department of Conservation

Cataloguing-in-Publication data

Imber, M. J. (Michael John), 1940-

Report on a tuna long-lining fishing voyage aboard Southern Venture to observe seabird by-catch problems / by M.J. Imber. Wellington.

N.Z. : Dept. of Conservation, 1994.

1 v. ; 30 cm. (Science & Research series, 0113-3713 ; no. 65.)

Includes bibliographic references.

ISBN 0478015542

1. Sea birds. 2. Fisheries. I. New Zealand. Dept. of Conservation. Science and Research Division. II. Title. III. Series: Science & research series ; no. 65.

598.4 20

zbn94-004743

Keywords: sea birds, mortality, tuna, long-lining, Wandering Albatross, *Diomedea exulans*, night setting, day setting

CONTENTS

ABSTRACT	1
1. INTRODUCTION	1
1.1 The ship and the fishery	2
1.2 Fishing area	3
2. METHODS / RESEARCH	3
3. RESULTS	4
3.1 Observations	4
3.2 How birds become hooked	4
3.3 The birds hooked	5
3.4 Numbers of birds following	6
3.5 Vulnerability	6
3.6 Effect of the moon	7
3.7 Effect of wind	7
3.8 The bird-scaring lines	7
3.9 Night versus day setting	7
3.10 Comparison of tuna catch-rates against bird by-catch rates	8
4. DISCUSSION	8
5. CONCLUSIONS	9
6. ACKNOWLEDGEMENTS	9
7. REFERENCES	10
APPENDIX 1	11
Bird observations	11

**REPORT ON A TUNA LONG-LINING FISHING VOYAGE ABOARD
Southern Venture TO OBSERVE SEABIRD BY-CATCH PROBLEMS**

by
M.J. Imber
Science & Research Division, Department of Conservation,
PO Box 10-420, Wellington

ABSTRACT

Incidental captures of seabirds, and the behaviour of seabirds around the fishing gear as it was deployed, were observed during 8-days' fishing of a New Zealand-owned tuna long-liner. From 11,200 hooks set 6 seabirds were hooked and recovered: 5 Wandering Albatross *Diomedea exulans* of which 3 were released alive, and one Black-browed Mollymawk *D. melanophrys impavida*. Relatively more birds survived hooking in this study because of the lighter gear and quicker recovery of the long-line (about 6 hours between beginning the set and beginning hauling-in).

Petrels, particularly Cape Pigeons *Daption capense*, were mainly responsible for bringing the sinking baits back to the surface where albatrosses/mollymawks subsequently ate most of them. About 1.2% of baits were taken by seabirds, but only 4.5% of bait-takes resulted in a bird being hooked. The mollymawk was hooked at night near full moon, but under thick cloud.

Most bait-takes occurred in daylight, particularly before dusk. The vessel's bird-scaring line seemed to reduce, but not eliminate bait-taking. The mortality rate of seabirds (0.27/1000 hooks set) is similar to that in the only other two reported studies.

Seabirds scavenged intensively on the waste baits (41% of those cast) thrown overboard during hauling-in. More birds followed in the wake during hauling than during setting.

1. INTRODUCTION

Since 1991 the Department of Conservation (DoC) has been interested in placing a seabird biologist on board a tuna long-liner to observe fishing methods, so as to better understand the bycatch of seabirds and how it might be reduced, if not prevented. The fishery for tuna, particularly directed at the large and valuable southern blue-fin tuna *Thunnus maccoyii*, in the Southern Hemisphere has been in progress for over 30 years. Fishing effort and catch rates around New Zealand were highest between 1970-1985, but have recently been declining as the resource is over-fished (Safina 1993). Japan is the main consumer of fresh tuna (for sashimi) and is also the main nation fishing for

it in the Southern Hemisphere. New Zealand-owned ships have only recently become involved in long-lining for tuna.

The problem of seabird by-catch in the industry has only recently become prominent through the work of Brothers (1991) on tuna long-liners off Australia; the evidence of declines of some albatross populations in the South Atlantic and Indian Oceans from French (Weimerskirch & Jouventin 1987) and British (Croxall & Prince 1990) research teams; and the combined recent work of J.A. Bartle (Museum of New Zealand) and the MAF Observer Programme (Murray *et al.* 1992). The main species of concern has been the Wandering Albatross *Diomedea exulans*, whose populations at South Georgia have shown a decline of about 1% per year over 30 years (Croxall *et al.* 1990), while at the Crozet Islands declines averaging 4.5 % per year over 20 years have occurred (Weimerskirch & Jouventin 1987). For New Zealand colonies of this albatross (Auckland and Antipodes Islands) there is evidence of a decline of 3% per year over 18 years in the large Auckland Islands population (Walker *et al.* 1991), but no data for Antipodes Island.

Analysis of band recoveries of South Georgia Wandering Albatrosses indicated that 35% of recoveries during 1975-1988 were from tuna long-lines (Croxall & Prince 1990), without allowing for possible non-reporting of recoveries, or the possibility that other recoveries (e.g., from beaches) were deaths due to long-lining injuries.

This report describes the observations I made as a DoC representative, invited aboard a tuna long-liner through the courtesy of Mr Murray Broomhall, representing the owners; facilitated by Allen Mills of Tulagi Group, the agent, and Talbot Murray of MAF who made the first contacts. J.A. Bartle of the Museum of New Zealand provided early advice, and the idea to seek access to a New Zealand ship when approaches to the Japanese fishery failed.

1.1 The ship and the fishery

The MV *Southern Venture* is a second-hand Japanese tuna long-liner owned by Southern Ocean Trawling Ltd. of Timaru. This is its first fishing season for its New Zealand owners. The *Southern Venture*, with 7 crew under Captain Paul McLellan, has been targeting big-eye tuna *Thunnus obesus* in MAF Statistical Reporting Areas 1 and 5, particularly north-east of Northland. Some southern blue-fin tuna are also caught, and both these species receive very special treatment as they are destined to be flown to Japan, for the lucrative sashimi market. Other fish caught include albacore tuna *T. alalunga* (frozen, whole, for canning), blue shark *Prionace glauca* (flesh, fins, livers, bile), several other shark species in small numbers, moonfish, sunfish (cut free), Ray's bream, oilfish, and swordfish.

The gear (mainline material and length, number of hooks) differed from that reported for Japanese ships. The winch (Fijian) held about 36 km (19-20 nautical miles) of 6 mm monofilament mainline. This was set at normal cruising speed of 9.5-10 knots, with about 800 hooks, c. 40 m apart, 10 between each supporting buoy (thus 80 buoys), with a beacon at each end of the mainline. The line hung on c. 15 m of rope from the buoys, and the hooks on c. 20 m of monofilament from the mainline. Thus the fishing

depth would seem to have been 35+ m. The hooks were mainly the Japanese type (preferred), but a small proportion were the "eagle-claw" round type.

The bait used was arrow squid *Nototodarus*. This came in frozen blocks and was thawed out during the hauling of the previous set. It was preferred to be just thawed for use, and so there was a tendency for it to be least well thawed at the beginning of setting. When the line was hauled some baits remained on the hooks and these used baits were thrown overboard, providing much food for the escorting seabirds. I made counts of discarded baits on two hauls and found that 41% of baits came back aboard intact, or at least the mantle, and were discarded.

Setting took about 2-2.3 hours, soaking about 4 hours, and hauling 5-6 hours. Thus it was possible to set twice in 24 hours. The routine on the ship became roughly as follows: set 0500-0715, soak, haul 1100-1600, set 1645-1900, soak, haul 2300-0400, set . . ., etc.

1.2 Fishing area

We were operating in an area east of the northern extremity of New Zealand, between 34° and 34°27' S and 175°20' and 175°53' E. This area is from 130 to 220 km north-east of Cape Brett, on the southern edge of the South Fiji Basin. It is off the continental shelf, and over depths of about 2000 m, with water temperature of about 17°C.

I did not see other fishing vessels, but apparently one or two other New Zealand vessels were in the vicinity. The birds seen in this area are listed in Appendix 1.

2. METHODS / RESEARCH

I observed all setting in daylight to full darkness or after dawn, standing on the rear high deck above the baiting/casting point at the stern. There I supervised the bird-scaring lines, which were used on every daylight setting, and observed the following birds' behaviour and bait-taking.

The ship already had a bird-scaring line in place: about 150 m of 8-10 mm rope. This had once had a buoy at the end to add drag but, after that fouled a mainline buoy and caused a considerable tangle and upset to the setting procedure, the buoy was removed. In fact there seemed to be little need for a buoy as the line itself created sufficient drag when 50-100 m of it lay in the wake, so that a buoy seemed to make little or no difference.

I had also brought with me a bird-scaring line to Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR) specifications, and alternated this with the *Southern Venture* line, or used both in tandem. Both lines were hitched to the upper stern handrail, which gave enough elevation above the sea at the stern, according to the CCAMLR instructions. The line was usually attached to the port side, below which the baited hooks landed (there did not seem to be much of a problem with precisely where

they landed, as all the bait-taking happened 50+ m astern). Where both lines were used, I attached one on each side, so they were about 4 m apart.

I counted how many baits were taken by seabirds, and tried to ascertain whether a bird became hooked. This proved difficult, however, as the few that were hooked became so about 150 m or more astern, or in darkness. Thus I could not confirm any hookings. In the worst set for bait-takes by seabirds, I lost count of the number because I was concentrating (futilely) on trying to see if birds became hooked.

I also observed most of the entire haul, mainly to count how many birds were hauled in, but also out of interest in the catch. The crew were very co-operative in alerting me whenever a hooked bird came aboard when I was not present.

3. RESULTS

3.1 Observations

There were 14 sets during the 8 days on the fishing grounds from 24 to 31 July 1993. I observed 14 of the 15 hours of setting in daylight, and 83% of the total hauling time of 69 hours.

3.2 How birds become hooked

The problem occurs with the setting of the line, not the hauling. When hauled, the hooks still baited are pulled quickly into the ship, usually at a steep angle, and there is no chance for birds to attempt to seize them.

When setting, the unweighted baited hooks are tossed across the wake to land under the bird line, in the port side of the wake, and then sink under their own weight. The problems arise when the baits are slow to sink (which can be caused by their being insufficiently thawed), or they are churned up by the random eddies in the wake. Rougher seas (as in the later part of this trip) accentuate this eddying, as the ship's movement brings the propeller to the surface when cresting a swell. A curving setting course (sometimes used) also caused more wake turbulence.

Ironically, it was rarely the bird that first seized the bait that got hooked: typically it was Cape Pigeons (73% of cases) or Grey-faced Petrels (15%) rather than Black-browed Mollymawks (7%), Yellow-nosed Mollymawks (3%) or Wandering Albatrosses (2%) that seized baited hooks first. This occurred from near the end of the aerial part of the bird-scaring line (about 50 m astern) backwards, and usually the bait was seized by diving, probably up to a depth of about 3 m.

The following is a typical scenario: a Cape Pigeon saw a sinking bait, dived, and retrieved it to the surface; other Cape Pigeons joined in and a commotion developed; next usually came Grey-faced Petrels, perhaps also a Grey Petrel; soon the first mollymawk came in and scattered the petrels, then more mollymawks; finally, a Wandering Albatross(es) splashed into the fray and finished off the bait.

A high proportion of baits taken did not result in a hooking. I estimated seeing 134 hooked baits taken (1.2% of the number set), (accurate counts on all, but the one set, where taking was on a large scale and I estimated 70 baits taken), but only 6 birds were hooked: that is, only 4.5% of bait-taking resulted in a hooking. It is possible that there is a difference in how the birds dealt with baited hooks as against the discarded baits, as if they had learned about the hooks. Whereas discarded baits were often swallowed without hesitation, there seemed to be much more nibbling of baited hooks by mollymawks and albatrosses. Often a mollymawk would try to fly off with the baited hook, as if to test if it was attached to a line. Although mollymawks and albatrosses are quite capable of swallowing whole the squid used for bait, only 2 of the 6 hooked birds had swallowed the hook; the others were hooked by the beak (3) or foul-hooked in the wing (1).

3.3 The birds hooked

Only three sets of the 14 caught birds (Table 1). Six birds were hooked: 5 Wandering Albatrosses and 1 N.Z. Black-browed Mollymawk. Of the Wandering Albatrosses, 3 were alive when hauled aboard and were released almost unharmed. One, a juvenile, was very lively and was returned to sea soonest. The other two (adults or subadults) were more tired and I fed both with several squid before release; one was quite exhausted, so was kept for 12 hours in a small storeroom on the foredeck, where it recovered completely. None were banded.

Table 1 Observations on sets in daylight, with details of wind speeds, birds following in the wake, bait takes and birds hooked. One set in darkness caught a bird; 4 uneventful sets in darkness not included.

Date	Wind kts	Setting period hrs	Albatrosses following	Petrels following	Bait takes	Birds hooked
24/7	15-20	1500-1715	5	25	4	0
25/7	15-20	730-1000	2	23	3	0
26/7	5-10	1700-1930	2	10	2	0
27/7	5	1700-1915	5	20	3	0
28/7	10	1630-1835	9	35	12+	0
29/7	10-15	515-730	9	35	2	0
29/7	10-15	1600-1815	16	40	c.70	2 (alive)
30/7	15	530-740	14	33	12	0
30/7	20	1630-1850	13	50	26	3 (1 alive)
31/7*	25-30	1830-2100	?	some	?	1

+ Possibly baits were less well thawed at the beginning of this set

* Set in darkness, moon nearly full

The two Wandering Albatrosses recovered dead seemed to have become hooked in the throat, and the drowned N.Z. Black-browed Mollymawk was hooked by the bill. The albatrosses were returned to the Museum of New Zealand where J.A. Bartle identified them as subspecies *gibsoni* from the Auckland Islands; an adult male and an adult or subadult female. One of the live birds, photographed, was considered to be a subadult of *gibsoni* or, less likely, *antipodensis* by C.J.R. Robertson.

The mortality rate was thus 0.27 individuals per 1000 hooks set.

Paul Staff of N.Z. Fishing Industry Board calculated the 95% confidence limits for this estimate to be 0.05/1000 hooks to 0.78/1000 hooks.

3.4 Numbers of birds following

Periodic counts were made of birds following in the wake during setting and hauling (Table 2). These were 10-min. counts, but most of the birds seemed in prolonged attendance so it was basically a sweep count of all following birds, repeated for accuracy. Between setting and hauling we slept; the birds also rested on the sea if the ship was hove to, or some continued to follow in the wake.

Table 2 Comparison of the numbers of birds following during setting and hauling. Generally there was only one setting and hauling in daylight each day but, where two occurred, the numbers are means.

Date	Setting		Hauling	
	Albatrosses	Petrels	Albatrosses	Petrels
24/7	5	25	0?	DARK ?
25/7	2	23+	7	30+
26/7	2	10	15	27
27/7	7	20	12	50-60
28/7	9	35	15	55+
29/7	16	40	11	40
30/7	14	40-50	12	50+
31/7	4	DARK	17	35+

There seem to have been more birds following during the hauling, which may have been because of the greater availability of food (waste baits).

3.5 Vulnerability

It is not practicable to estimate the mortality rate of any species from those hooked and killed compared to the numbers seen alive, as there is no way of telling which birds are the same individuals from day to day, nor what proportion they represent of the total populations of that species.

However, a vulnerability estimate could be derived from the average numbers seen/day, summed, and the numbers killed calculated as a percentage. Thus the figures are:

Wandering Albatross	5.3
Black-browed Mollymawk	1.9
All other albatrosses and petrels	0

By chi-square test, the difference between the vulnerability of Wanderers against all other species is highly significant ($P < 0.005$).

3.6 Effect of the moon

The moon was full on 3 August and there was a noticeable increase in the visible activity at night of seabirds from 27 July. Wandering Albatrosses, Black-browed Mollymawks, Grey Petrels and Cape Pigeons were active and flying on the periphery of the ship's lights on moonlit nights. The only Black-browed Mollymawk hooked was on a hook set c. 1915 h on 31 July in moonlight obscured by cloud (fully dark by 1815 h).

3.7 Effect of wind

As seabirds require moderate to fresh winds to assist flight, and a ship has the effect of attracting many seabirds, windy as opposed to calmer conditions have the logical effect of increasing bird numbers following a ship. In turn this increases the risk of hookings. In the area where we were fishing it seemed, also logically, that onshore winds increased bird numbers more than comparable offshore winds. With the rougher seas of 20+ knot winds, there is also a greater risk of baited hooks being churned near the surface in the more turbulent wake, as the ship's pitching increases.

3.8 The bird-scaring lines

I found that nearly all bait-taking occurred beyond the aerial part of these lines. I compared the effectiveness of the CCAMLR and *Southern Venture* bird-scaring lines by alternating them from set to set, but detected no difference in numbers of baits taken, though the 14 sets observed could not be considered sufficient for a thorough comparison. Trailing a small buoy on the CCAMLR line did not appreciably improve its extension, so I removed it, in consideration of the problem previously encountered by this ship (the bird-line buoy fouling a mainline buoy).

Towards the end of the voyage, when bird numbers increased because of increasing wind, I experimented with the 2 lines in tandem.

3.9 Night versus day setting

Night-setting very significantly reduces bait-taking by birds, and hence the risk of hooking them, though there is a slight problem with, and around, full moon. Obviously I was restricted in observing bait-taking at night (as birds could not be seen). However, there was much bait-taking in the setting that took place between 1600 h and dark (about 1800 h), particularly later in the voyage. Though some setting took place after dawn, only once was there significant bait-taking then. This was on 30 July, when 12 baits were taken in the 30 minutes up to finishing the set at 0740 h (getting light about 0645 h) but no birds were hooked. Table 3 shows this effect.

Table 3 Comparison of bait-taking after dawn versus before dusk.

	DAWN			DUSK		
	Time observed	Baits taken	Birds hooked	Time observed	Baits taken	Birds hooked
	4.0h	15	0	9.5h	119	5
Rate per hour		3.75	0		12.53	0.53

3.10 Comparison of tuna catch-rates against bird by-catch rates

The 14 sets can be divided into 8 mainly daytime sets (setting starting between 0800 and 1830 h) and 6 nighttime sets (setting starting between 0130 and 0530 h). The former sets caught only 4 tuna and all the seabirds, whereas the fewer nighttime (really early morning) sets caught 10 tuna and no seabirds. The chi-square comparison of these figures is statistically significant ($\chi^2 = 5.95, P < 0.05$). Thus the ship, had it concentrated on the early morning sets, roughly between midnight and dawn, and not even fished by day (no setting between 0800 and 2000 h) would probably have caught as many or more tuna and no seabirds. The midnight-0700 h setting period seems to be one which is particularly good for catching big-eye tuna.

4. DISCUSSION

The results can be compared (Table 4) with those obtained by Brothers (1991), who studied the Japanese long-line fishery for tuna south of Tasmania, and Murray *et al.* (1992) who analysed hauling results in New Zealand seas.

Table 4 Comparison of results from three studies of seabird by-catch during tuna long-lining in Australasian seas.

	Brothers 1991	This study	Murray et al. 1992
Hooks monitored	108,662	11,200	866,688
Baits taken/1000 hooks set	8.0	12.0	-
Birds killed/1000 hooks (A)	0.41	0.27	0.31
Average no. albatrosses in wake (B)	10.8	7.5	-
A/B%	3.80	3.60	-

There was much more bait-taking in my study, which was apparently caused by the greater number of petrels following and initiating the stealing. Brothers made little mention of petrels, but did suggest that they would be a problem by making more hooked baits available to albatrosses, as my observations support.

Thus it is notable that the kill rate in relation to the numbers of albatrosses following was almost the same in the two studies (last line of the table). The similar vulnerability of albatrosses following *Southern Venture* was caused by the high survival rate of those hooked: 3 out of 6 vs 1 out of 45. This can be attributed to two factors:

1. Quicker turn around from setting to hauling.
2. The lighter lines used.

Whereas typical Japanese methods involve 1 set per day, with 22 h elapsing between beginning the set and completing the haul, *Southern Venture* did so in 11 h, so hooked birds spent only half the time on hooks that they would have on Japanese lines. The latter's mainlines, being 3 times as long, are of heavier material, as are the hook lines, and usually longer, so there is more weight to drag the birds under.

These results, though preliminary because they are based on a small sample of sets and hooks set, add further evidence that it is Wandering Albatrosses that are particularly at risk from long-lining for tuna.

5. CONCLUSIONS

- 5.1 Wandering Albatrosses seem most vulnerable to being hooked on tuna long-lines.
- 5.2 Night setting of longlines greatly reduces the risk of seabird bycatch. There is a greater risk around the full moon (possibly for 5 days up to and after it), and I suggest that bird-scaring lines might be used at such times when setting with the moon up.
- 5.3 Where setting occurs in daylight, there seems to be a greater risk to birds pre-dusk than post-dawn, so setting during the afternoon up to full darkness should be avoided if possible.
- 5.4 Increased wind, above about Force 2 or 3, increases both the numbers of following birds and turbulence in the wake, and increases the risk of seabird bycatch, so daylight setting then should be avoided.
- 5.5 Bird-scaring lines are very valuable in daylight setting, but there seems no need to attach a buoy. In conditions of higher wind and large bird numbers, two lines could be towed, one from each side at the stern.
- 5.6 Bait-taking mainly occurs beyond the aerial part of the bird-scaring lines. There does not seem to be any easy way to rectify this. However, baits must be well thawed.
- 5.7 As this study has been based on a brief experience of the subject, I suggest that further voyages be requested, but at different times and/or in different fishing areas. I would be very pleased to continue working with Southern Ocean Trawling Ltd. and *Southern Venture*.

6. ACKNOWLEDGEMENTS

I thank Murray Broomhall and Southern Ocean Trawling Ltd. for allowing me to make these studies aboard *Southern Venture*; also Allen Mills, Talbot Murray and Sandy Bartle for establishing the first lines of contact. I am particularly grateful to Paul McLellan and the crew (Phil Neame, Bob Adam, Bruce Smith, Chris Rangi, Mathew Austin, Arran Riwaka, Nathan Lucas), for their hospitality and assistance at all times, and for making it a very enjoyable cruise. Thanks also to Paul Taylor of MAF Fisheries for providing materials for a CCAMLR spec. bird-scaring line, and Paul Starr of the N.Z. Fishing Industry Board for providing statistical analyses.

7. REFERENCES

- Brothers, N. 1991. Albatross mortality and associated bait loss in the Japanese longline fishery in the Southern Ocean. *Biological Conservation* 55: 255-268.
- Croxall, J.P, Prince, P.A. 1990. Recoveries of Wandering Albatrosses *Diomedea exulans* ringed at South Georgia 1958-1986. *Ringing & Migration* 11: 43-51.
- Croxall, J.P, Rothery, P, Pickering, S.P.C., Prince, P.A. 1990. Reproductive performance, recruitment and survival of Wandering Albatrosses *Diomedea exulans* at Bird Island, South Georgia. *Journal of Animal Ecology* 59: 775-796.
- Murray, T.E., Taylor, P.R., Greaves, J., Bartle, J.A., Molloy, J. 1992. Seabird bycatch by Southern Fishery longline vessels in New Zealand waters. N.Z Fisheries Assessment Research Document 92/22. MAF Fisheries, Wellington. 21p.
- Safina, C. 1993. Bluefin Tuna in the West Atlantic: negligent management and the making of an endangered species. *Conservation Biology* 7: 229-234.
- Walker, K., Dilks, P, Elliott, G., Stahl, J.C. 1991. Wandering Albatross on Adams Island February 1991. *Science & Research Internal Report No.109*. Department of Conservation, Wellington. 14p.
- Weimerskirch, H., Jouventin, P 1987. Population dynamics of the wandering albatross, *Diomedea exulans*, of the Crozet Islands: causes and consequences of the population decline. *Oikos* 49: 315-322.

APPENDIX 1

Bird observations

Wandering Albatross *Diomedea exulans* subsp.: Nearly always 1 to 7 following the ship scavenging, with a tendency to increase later in the trip with north-east winds. Two specimens killed on the long-line were identified as an adult male and a subadult female *gibsoni* from the Auckland Islands by J.A. Bartle at the Museum of New Zealand. Three caught and released alive included one first-year bird and 2 that were probably female *gibsoni* or *antipodensis*.

Salvin's Mollymawk *D. cauta salvini*: Five adults seen, singly, usually only briefly interested in joining the scavenging flock behind the ship, and soon passing on.

N.Z. Black-browed Mollymawk *D. melanophrys inpavida*: The commonest associated scavenging albatross, all ages being seen, with numbers increasing during the trip; thus 1-4 on 24/7, 1-5 on 25/7, 2-6 on 26-27/7, 5-12 on 28/7, 3-7 on 29-30/7 and 4-18 on 31/7. Only 1 was hooked: a bird of about 2-4 years old hooked at 1915 h on 31/7, when fully dark, but with a nearly-full moon obscured by cloud; this bird was drowned.

Yellow-nosed Mollymawk *D. chlororhynchos carteri*: At least 2 adults regularly following throughout 24/7, scavenging when fishing began, and one early on 25/7, but not seen again. No obvious reason for this pattern, but perhaps the ship moved too far east or offshore.

Light-mantled Sooty Albatross *Phoebastria palpebrata*: One seen twice within an hour on 31/7, passing forward and only briefly in the wake.

Sooty Shearwater *Puffinus griseus*: Seen singly on 26/7 and 1/8, following closely and actively diving for scraps and baits in the wake. The first, by its uniform, fresh, non-moulting plumage seemed likely to be a first-year bird, but the failing light on 1/8 made such a judgement impossible. No other shearwaters were seen in the fishing area, though Fluttering Shearwaters *P. gavia* were plentiful in the Hauraki Gulf as we left Auckland.

Grey Petrel *Procellaria cinerea*: Nearly always 1-4 scavenging in the wake from 25/7 to 1/8. They did not dive as much as their reputation implied.

White-chinned Petrel *P. aequinoctialis*: One on 28/7 scavenging in the wake for a while.

Cape Pigeon Daption *capense australe*: At first scarce, only 1 briefly on 24/7, 1 on 25/7; then increasing, 10-13 on 26/7, 7-18 on 27/7, 15-43 on 28/7, 30-35 on 29/7, 15-25 on 30/7 and 8-13 on 31/7, scavenging in the wake.

Northern Giant Petrel *Macronectes halli*: One juvenile (probably first year) from noon on 27/7 to late on 29/7, possibly the same bird, scavenging in the wake.

Fairy Prion *Pachyptila turtur*: About 7 seen erratically in the fishing area, passing by; more (8) on 1/8 at 35°14' S, 175°13' E (about 50 km north-east of the Poor Knights Islands where they breed) as returning to port.

Grey-faced Petrel *Pterodroma macroptera gouldi*: The commonest bird in the fishing area, both following in the wake scavenging and passing by. During 10-minute counts, 5-23 on 24/7, 30-35 on 25/7, 1-8 on 26/7, 8-21 on 27/7, 6-15 on 28/7, 4-7 on 29/7, 28 on 30/7, 7-30 on 31/7 and 8-52 on 1/8.

White-headed Petrel *P. lessondii*: Three seen singly, passing by, on 24/7, 30/7 and 1/8.

Soft-plumaged Petrel *P. mollis*: Two seen; 25/7 and 31/7; both spent about 15 min in the wake.

No Storm Petrels were seen throughout the voyage.

Australasian Gannet *Morus serrator*: An adult passed close by on 28/7, but showed no interest in the wake.

Spur-winged Plover *Vanellus miles*: A party of 4 flew southwards past the ship on 26/7. The nearest land in the direction whence they flew is the Kermadec Islands.