

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

Published by
Science & Technical Publishing
Department of Conservation
PO Box 10420, The Terrace
Wellington 6143, New Zealand

DOC Research & Development 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 reports and short communications that are peer-reviewed.

Individual contributions to the series are first released on the departmental website in pdf form.

Hardcopy is printed, bound, and distributed at regular intervals. Titles are also listed in our catalogue on the website, refer www.doc.govt.nz under *Publications*, then *Science & technical*.

© Copyright May 2008, New Zealand Department of Conservation

ISSN 1176-8886 (hardcopy)

ISSN 1177-9306 (web PDF)

ISBN 978-0-478-14404-8 (hardcopy)

ISBN 978-0-478-14405-5 (web PDF)

This report was prepared for publication by Science & Technical Publishing. Publication was approved by the Chief Scientist (Research, Development & Improvement Division), Department of Conservation, Wellington, New Zealand.

In the interest of forest conservation, we support paperless electronic publishing. When printing, recycled paper is used wherever possible.

CONTENTS

| | |
|--|----|
| Abstract | 5 |
| <hr/> | |
| 1. Introduction | 6 |
| <hr/> | |
| 2. Methods | 6 |
| <hr/> | |
| 2.1 Sexing and ageing birds | 7 |
| 2.2 Determination of the breeding status of adults | 7 |
| 2.3 Subcutaneous fat score | 7 |
| 2.4 Stomach contents | 8 |
| 2.5 Moulting and brood patch development | 8 |
| 3. Results | 9 |
| <hr/> | |
| 3.1 Species returned | 9 |
| 2002-2003 | 9 |
| 2003-2004 | 9 |
| 2004-2005 | 9 |
| 1996-2005 | 12 |
| 3.2 Fishery contributions | 13 |
| 3.3 Abundance of each sex | 15 |
| 3.4 Abundance of each age-class | 16 |
| 3.5 Stomach contents of returned birds | 16 |
| 3.6 Fat scores of most commonly returned species | 17 |
| 3.7 Identifications of seabirds by observers | 18 |
| 4. Conclusions | 21 |
| <hr/> | |
| 5. Acknowledgements | 21 |
| <hr/> | |
| 6. References | 22 |
| <hr/> | |
| Appendix 1 | |
| <hr/> | |
| Raw data for autopsied seabirds for 2002/03, 2003/04, 2004/05 fishing years | 23 |

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

Summarised from:

Robertson, C.J.R.; Bell, E.; Blezard, R.H.; Scofield, P. 2005: Autopsy report for seabirds killed and returned from New Zealand fisheries, 1 October 2003 to 30 September 2004. Unpublished report to the Department of Conservation.

Robertson, C.J.R.; Bell, E.; Scofield, P. 2005: Autopsy report for seabirds killed and returned from New Zealand fisheries, 1 October 2002 to 30 September 2003. Unpublished report to the Department of Conservation.

Robertson, C.J.R.; Bell, E.; Fraser, M.J.; Scofield, P. 2006: Autopsy report for seabirds killed and returned from New Zealand fisheries, 1 October 2004 to 30 September 2005. Unpublished report to the Department of Conservation.

ABSTRACT

In the 9 years between 1 October 1996 and 30 September 2005, New Zealand Government fisheries observers returned 4055 seabirds incidentally killed aboard longline and trawl vessels. The birds returned represented 44 taxa, with 6 taxa making up 86.3% of returns. Birds were received from squid, scampi and fish trawlers (47.4%), domestic bottom (demersal) longliners (34.9%) and pelagic tuna longliners (17.7%). During these 9 years, white-chinned petrels ($n = 947$), white-capped albatross ($n = 876$), sooty shearwaters ($n = 711$), grey petrels ($n = 533$), Salvin's albatross ($n = 247$) and Buller's albatross ($n = 184$) were the most commonly returned of the 44 taxa. For each fishing type and fishery, a few of the fishing vessels were responsible for catching more than 80% of the birds returned for autopsy. Bird body condition (based on fat scores) declined over the 9 years of returns.

Keywords: seabirds, bycatch, albatross, shearwater, petrel, seabird diet, fishing practice, New Zealand

© May 2008, New Zealand Department of Conservation. This paper may be cited as:
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. 110p.

1. Introduction

Large numbers of seabirds frequent New Zealand commercial fishing waters. Some are caught unintentionally during fisheries operations. Birds with significant differences in conservation status can appear morphologically similar. In order to monitor the effectiveness of different strategies aimed at avoiding or mitigating seabird captures, and to ensure that captures of particular species of high to medium risk are avoided, identification of the species caught in fisheries is required. This information is also useful in assessing the effect of fisheries on seabird populations, as it allows an assessment of the relative importance of different species in the composition of the total seabird catch. Further, the mode of capture combined with information about condition of the birds enables the factors contributing to seabird capture events to be analysed.

Government fisheries observers on commercial vessels are not always able to identify seabirds at sea with high precision. To a large extent, identifying species is a specialist task, while assessment of the age-class, sex and provenance of captured individuals requires autopsy (in the majority of cases). The information from these autopsy studies can inform ongoing research, assist in modelling the effects of fisheries removals for selected populations of high-risk seabirds, and contribute to other relevant research projects.

Autopsies of incidentally-caught seabirds returned by observers were undertaken for the Department of Conservation (DOC) as Conservation Services Programme (CSP) Contract 3051 (2002/03 and 2003/04) and INT2004/02 (2004/05). This report summarises the information gained during the autopsies of these specimens, with particular reference to those specimens returned in the three most recent fishing years surveyed (2002/03; 2003/04; 2004/05).

The number of specimens returned for autopsy does not indicate the total seabird catch rates for differing classes of vessels or fishing methods, as the observer coverage was not equally distributed throughout the fishing effort, nor were all incidentally caught birds returned for autopsy (D. Fairfax, formerly of Conservation Services Programme, DOC, pers. comm.).

Specific catch locations and the names of the vessels from which the specimens were returned are not provided because of commercial confidentiality.

2. Methods

Seabirds returned for autopsy were examined to determine the following:

- Species identification and classification
- Sex and age
- Subcutaneous fat score as an index of body condition
- Stomach and gizzard contents
- Molt and brood patch development as a partial indicator of breeding status
- Provenance (origin) (where possible)

Raw data for each autopsied specimen are detailed in Appendix 1. To ensure compatibility with previous autopsy programmes, the methods and definitions described by Bartle (2000) have been followed (unless otherwise stated). These are described below.

2.1 SEXING AND AGEING BIRDS

All birds were sexed by dissection, except those that had been disembowelled by scavengers or machinery. Birds were aged by a combination of plumage, gonadal and brood patch characters. Age categories used were:

- *Juveniles*—birds in their first year of life (first plumage)
- *Immatures*—older birds in non-adult plumage (small gonads)
- *Sub-adults*—birds in adult plumage which have not yet bred (gonadal evidence especially in females with straight oviducts)
- *Adults*—birds in adult plumage where breeding status could not be positively determined (females showed convoluted oviducts)
- *Breeding adults*—birds which were breeding at the time of capture (gonadal and brood patch evidence)
- *Non-breeding adults*—adults which were definitely not breeding at the time of capture (flight-feather moult, gonadal and brood patch evidence)

2.2 DETERMINATION OF THE BREEDING STATUS OF ADULTS

Breeding status could be assessed for many individuals by looking at their flight-feather moult, gonad development, and brood patch, in relation to the date caught:

- *Non-breeders*—adult birds in active flight feather moult are not breeders. Other non-breeders were classed as such by their enlarged gonads during the incubation period, when breeders' gonads have already regressed. Also, although brood patches of non-breeders become clear of down several weeks later than those of breeders, they remain bare longer (Bartle 1968).
- *Breeders*—at nesting time, breeders show no moult except for contour feather moult, gonads are (briefly) much enlarged, and the brood patch is bare. Males tend to have whitish or bicoloured testes, and females greatly enlarged ovules. An independent check on the assessment of breeding status was sometimes available from banding data.

2.3 SUBCUTANEOUS FAT SCORE

Initially, the amount of subcutaneous fat was scored to obtain a general idea of body condition as follows: 1 = no fat; 2 = little fat; 3 = moderate fat; 4 = fat; 5 = very fat (Bartle 2000). Subsequent observations (Fraser 2005) have allowed more precise definitions to be categorised from the amount of fat deposited on

the exterior of the stomach and gizzard, the amount of fat between the intestines and the thickness of any subcutaneous fat under the skin next to the pectoral muscles. Accordingly, a more precise interpretation has been developed:

1. No fat on stomach, gizzard or between intestines. No subcutaneous fat. Areas where fat normally accumulates show as collapsed yellow/orange cells.
2. Subcutaneous fat, white or yellow, and <0.5-mm thick in thin lines or small patches. The stomach and gizzard both have a covering of thin or patchy white and yellow fat, with the yellow areas being predominant. There are small globules of fat between the intestines.
3. A thin covering of patchy subcutaneous white fat (0.5–1 mm) with small amounts of yellow. Moderately thick (1 mm) patches of white fat cover up to 75% of stomach and gizzard while small amounts of yellow fat may be present where the white fat is thinnest. Small globules (1 mm) of white fat in separate patches between intestines with some yellow fat present.
4. Thick (1–2 mm) white subcutaneous fat. Thick (2–4 mm) white fat covering most of stomach and gizzard, but with small bare patches and, occasionally, small areas of yellow fat. Thick (3 mm) white globules of fat gathered in small clumps between the intestines, almost forming a thick band between the intestines.
5. Very thick (>3 mm) white subcutaneous fat and thick (>4 mm) white fat covering all of stomach and gizzard. There is a thick (>5 mm) accumulation of globules or bands of white fat between the intestines. Examination of the body cavity becomes difficult because of the thick fat deposits.

2.4 STOMACH CONTENTS

The contents of the stomach and gizzard were examined and identified as to major animal group (e.g. fish, squid) and, since 1998, an attempt has been made to determine the origin of the contents, especially factory processing waste or longline baits.

2.5 MOULT AND BROOD PATCH DEVELOPMENT

Active wing or tail moult was noted, as well as the active moult of body (= contour) feathers, which is most evident when the skin is turned inside out. Presence or absence of down on the brood patch was recorded.

3. Results

Table 1 lists all species returned during the 9-year monitoring period.

Fishing years begin on 1 October and finish on 30 September the following year. In the 2002/03 fishing year, 496 birds were returned from 57 separate fishing trips with on-board observers. In 2003/04, 351 were returned from 101 different vessels and 164 separate observed fishing trips. In 2004/05, 360 were returned from 98 different vessels and 148 separate observed fishing trips.

Over the nine fishing years between 1 October 1996 and 30 September 2005, 278 individual vessels were observed by government fisheries observers on 1171 trips. During this period, a total of 4055 seabird specimens were returned to the autopsy programme.

3.1 SPECIES RETURNED

2002–2003

During the 2002/03 fishing year, a total of 496 birds were returned, representing 20 taxa (Table 2A). Of these, two taxa returned over 100 specimens each: white-chinned petrels ($n = 140$) and sooty shearwaters ($n = 100$). Nine of the 20 taxa returned more than 10 specimens and contributed 95.2% of the returned birds.

New taxa returned and recorded for the first time in the programme were the white-headed petrel and the western weka. The latter is a non-flying land bird that was recovered from a mid-water trawl off the west coast of the South Island. The autopsy determined that the bird had been dead for more than a day prior to capture. No banded birds were returned during this fishing year.

2003–2004

During the 2003/04 fishing year, a total of 351 birds were returned, representing 20 taxa (Table 2B). Of these, over 100 specimens of white-capped albatross ($n = 145$) were returned. Five of the 20 taxa returned more than ten specimens and contributed 92.8% of the returned birds.

New taxa returned and recorded for the first time in the autopsy programme were the blackbird, pied shag, grey-backed storm petrel and white-faced storm petrel. Two banded birds were returned during this fishing year: L-34155—a Westland petrel banded as a chick on 4 December 1997 (Autopsy 43940); and M-58338—a Campbell albatross banded as a chick on 17 March 1994 (Autopsy 43954).

2004–2005

During the 2004/05 fishing year, a total of 360 birds were returned, representing 20 taxa (Table 2C). Of these, more than 100 specimens of white-capped albatross ($n = 169$) were returned. Five of the 20 taxa each returned more than ten specimens and contributed 90.8% of the returned birds. Of the 98 vessels

TABLE 1. LIST OF COMMON AND SCIENTIFIC NAMES FOR ALL TAXA (SPECIES) REFERRED TO IN THIS REPORT, THE APPENDICES AND SUPPLEMENT, ALONG WITH THE NUMBER, SEX AND AGE CLASS OF EACH SPECIES KILLED AND RETURNED FROM THE OBSERVED FISHERIES BETWEEN 1 OCTOBER 1996 AND 30 SEPTEMBER 2005.

| COMMON NAME | SCIENTIFIC NAME | NUMBER KILLED AND RETURNED | | | | | | | | | | | | | | | | | | | |
|----------------------------------|--|----------------------------|-------------------------|------------------------------|------------------------|----------------|---------------|---------|-------|------|--------|-----|---------|-------|-----------|---------|----|----|----|----|----|
| | | FISHERY | | | | | SEX | | | | | AGE | | | | | | | | | |
| | | DOMESTIC BOTTOM LONGLINER | DOMESTIC TUNA LONGLINER | JOINT VENTURE TUNA LONGLINER | PELAGIC TUNA LONGLINER | SCAMPI TRAWLER | SQUID TRAWLER | TRAWLER | TOTAL | MALE | FEMALE | | UNKNOWN | ADULT | NON-ADULT | UNKNOWN | | | | | |
| Antarctic prion | <i>Pachyptila desolata</i> | | | | | | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | | |
| Antipodean (wandering) albatross | <i>Diomedea antipodensis</i> | | 3 | 87 | 2 | | | | | | | | | 48 | 42 | 3 | 89 | 3 | 1 | | |
| Black petrel | <i>Procellaria parkinsoni</i> | 2 | 9 | | | | | | | | | | 11 | 6 | 5 | | 10 | 1 | | | |
| Black-backed gull | <i>Larus dominicanus</i> | | | | | | | | | | | | 1 | 1 | 1 | | 1 | | | | |
| Black-bellied storm petrel | <i>Fregatta tropica</i> | | | | | | | | | | | | 1 | 1 | 1 | | 1 | | | | |
| Blackbird | <i>Turdus merula</i> | | | | | | | | | | | | 1 | 1 | 1 | | 1 | | | | |
| Black-browed albatross | <i>Thalassarche melanophrys</i> | | 2 | 23 | 1 | 1 | 6 | 34 | 17 | 17 | 1 | 17 | 17 | 17 | 17 | | 17 | 17 | 17 | 1 | |
| Black-browed albatross spp. | <i>Thalassarche melanophrys/impavida</i> | | | | | | | | | | | | 1 | 1 | 1 | | 1 | | | | |
| Broad-billed prion | <i>Pachyptila vittata</i> | 1 | | | | | | | | | | | 1 | 1 | 1 | | 1 | | | | |
| Buller's albatross | <i>Thalassarche bulleri</i> | 4 | 9 | 84 | 5 | 34 | 48 | 184 | 87 | 84 | 13 | 161 | 11 | 2 | 1 | | 2 | | | | |
| Buller's shearwater | <i>Puffinus bulleri</i> | 2 | | | | | | | | | | | 2 | 1 | 1 | | 45 | 46 | 3 | 56 | 38 |
| Campbell albatross | <i>Thalassarche impavida</i> | | 6 | 62 | 12 | | | | | | | | 2 | 12 | 94 | 45 | 46 | 3 | 56 | 38 | |
| Cape pigeon spp. | <i>Daption</i> spp. | | | | | | | | | | | | 1 | 1 | 1 | | 1 | | | | 1 |
| Chatham albatross | <i>Thalassarche eremita</i> | 11 | | 1 | | | | | | | | | 3 | 16 | 9 | 7 | 15 | 1 | 1 | 1 | 1 |
| Common diving petrel | <i>Pelecanoides urinatrix</i> | 4 | | | | | | | | | | | 2 | 2 | 8 | 3 | 4 | 1 | 3 | 4 | 1 |
| Fairy prion | <i>Pachyptila turtur</i> | | | | | | | | | | | | 7 | 7 | 7 | 6 | 1 | 1 | 7 | 7 | 7 |
| Flesh-footed shearwater | <i>Puffinus carneipes bullianus</i> | 17 | 21 | | | | | | | 5 | | | | | 43 | 21 | 22 | 39 | 4 | 4 | 4 |
| Fluttering shearwater | <i>Puffinus gavia</i> | 2 | | | | | | | | | | | | | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Gibson's (wandering) albatross | <i>Diomedea gibsoni</i> | | 3 | 33 | 4 | | | | | | | | | | 40 | 20 | 18 | 2 | 39 | 1 | 1 |
| Goldfinch | <i>Carduelis carduelis</i> | | | | | | | | | | | | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Grey petrel | <i>Procellaria cinerea</i> | 371 | 3 | 145 | 5 | 7 | 533 | 173 | 153 | 207 | 497 | 36 | 36 | 36 | 36 | | 36 | | | | |
| Grey-backed storm petrel | <i>Oceanites nerets</i> | | | | | | | | | | | | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Grey-faced petrel | <i>Pterodroma macroptera</i> | 11 | 2 | | 15 | | | | | | | | | | 29 | 18 | 11 | 26 | 3 | 3 | 3 |
| Light-mantled sooty albatross | <i>Phoebastria palpebrata</i> | | 1 | 38 | | | | | | | | | | | 39 | 30 | 9 | 37 | 2 | 2 | 2 |
| Mottled petrel | <i>Pterodroma inexpectata</i> | | | | | | | | | | | | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

Continued on next page.

Table 1 continued from previous page

| COMMON NAME | SCIENTIFIC NAME | NUMBER KILLED AND RETURNED | | | | | | | | | | | | | | | |
|-----------------------------|--|------------------------------|----------------------------|---------------------------------|---------------------------|---------------|---------------|------------|-------------|------------|------------|---------|-------|-----------|-----|---------|--|
| | | FISHERY | | | | | | | | | | | SEX | | AGE | | |
| | | DOMESTIC BOTTOM LONGLINER | DOMESTIC TUNA LONGLINER | JOINT VENTURE TUNA LONGLINER | PELAGIC TUNA LONGLINER | SCAMP TRAWLER | SQUID TRAWLER | TRAWLER | TOTAL | MALE | FEMALE | UNKNOWN | ADULT | NON-ADULT | | UNKNOWN | |
| Northern giant petrel | <i>Macronectes halli</i> | 3 | 6 | 8 | 17 | 9 | 7 | 1 | 7 | 10 | | | | | | | |
| Northern royal albatross | <i>Diomedea sanfordi</i> | | 2 | 2 | 4 | 2 | 2 | | 4 | | | | | | | | |
| Pacific albatross | <i>Thalassarche (platei) sp. nov.</i> | 1 | | 3 | 5 | 4 | | 1 | 3 | 2 | | | | | | | |
| Pied shag | <i>Phalacrocorax varius varius</i> | 1 | | | 1 | 1 | | | 1 | | | | | | | | |
| Salvin's albatross | <i>Thalassarche salvini</i> | 134 | 5 | 11 | 247 | 94 | 148 | 5 | 211 | 32 | 4 | | | | | | |
| Short-tailed shearwater | <i>Puffinus tenuirostris</i> | | | 33 | 33 | 16 | 17 | | 33 | | | | | | | | |
| Snares cape pigeon | <i>Deception australe</i> | 1 | | | 1 | | | 1 | | | | | | | | | |
| Snowy (wandering) albatross | <i>Diomedea chionopectera</i> | | 2 | | 2 | | 2 | | 2 | | | | | | | | |
| Sooty shearwater | <i>Puffinus griseus</i> | 96 | | 6 | 711 | 599 | 108 | 4 | 659 | 48 | 4 | | | | | | |
| Southern cape pigeon | <i>Deception capense</i> | 14 | | 1 | 27 | 17 | 9 | 1 | 19 | 6 | 2 | | | | | | |
| Southern giant petrel | <i>Macronectes giganteus</i> | 4 | 2 | | 6 | 4 | 2 | | 1 | 5 | | | | | | | |
| Southern royal albatross | <i>Diomedea epomophora</i> | | 1 | 7 | 17 | 12 | 5 | | 17 | | | | | | | | |
| Welcome swallow | <i>Hirundo tahitica</i> | | | | 1 | | | 1 | | | | | | | | | |
| Western weka | <i>Gallinulus australis</i> | | | | 1 | | | 1 | | | | | | | | | |
| Westland petrel | <i>Procellaria westlandica</i> | | 1 | 1 | 5 | 2 | 3 | | 4 | 1 | | | | | | | |
| White-capped albatross | <i>Thalassarche steadi</i> | 1 | 4 | 50 | 876 | 505 | 332 | 39 | 740 | 84 | 52 | | | | | | |
| White-chinned petrel | <i>Procellaria aequinoctialis steadi</i> | 735 | 5 | 34 | 947 | 715 | 222 | 10 | 914 | 30 | 3 | | | | | | |
| White-faced storm petrel | <i>Pelagodroma marina</i> | 2 | | | 2 | 2 | | | 2 | | | | | | | | |
| White-headed petrel | <i>Pterodroma lessoniti</i> | | | | 3 | 2 | 1 | | 3 | | | | | | | | |
| Unknown | | | | | 1 | 2 | | 2 | 2 | | | | | | | | |
| TOTAL | | 1417 | 75 | 588 | 4055 | 2477 | 1282 | 296 | 3625 | 311 | 119 | | | | | | |

TABLE 2A. SPECIES, NUMBERS, SEX AND AGE OF BIRDS KILLED AND RETURNED FROM THE OBSERVED NEW ZEALAND FISHERIES BETWEEN 1 OCTOBER 2002 AND 30 SEPTEMBER 2003.

| SPECIES | NUMBER KILLED AND RETURNED | | | | | | | | | | | | | |
|----------------------------------|------------------------------|----------------------------|---------------------------------|---------------------------|----------------|---------------|------------|-------------|-------------|-------------|------------|-------------|------------|------------|
| | FISHERY | | | | | | | SEX | | | AGE | | | |
| | DOMESTIC BOTTOM LONGLINER | DOMESTIC TUNA LONGLINER | JOINT VENTURE TUNA LONGLINER | PELAGIC TUNA LONGLINER | SCAMPI TRAWLER | SQUID TRAWLER | TRAWLER | TOTAL | MALE | FEMALE | UNKNOWN | ADULT | NON-ADULT | UNKNOWN |
| Antipodean (wandering) albatross | | | | 2 | | | | 2 | 1 | 1 | | 1 | 1 | |
| Black-browed albatross | | | | 1 | | | | 1 | 1 | | | | 1 | |
| Buller's albatross | 1 | | 15 | 5 | | 4 | | 25 | 11 | 14 | | 20 | 5 | |
| Campbell albatross | | | | 12 | | | | 12 | 6 | 6 | | 2 | 10 | |
| Chatham albatross | 2 | | | | | | | 2 | 1 | 1 | | 2 | | |
| Common diving petrel | 1 | | | | | | 1 | 2 | 1 | | 1 | 1 | | 1 |
| Fairy prion | | | | | | | 1 | 1 | 1 | | | 1 | | |
| Gibson's (wandering) albatross | | | 1 | 4 | | | | 5 | 3 | 2 | | 5 | | |
| Grey petrel | 55 | | | 5 | | | | 60 | 29 | 13 | 18 | 58 | | 2 |
| Grey-faced petrel | | | | 15 | | | | 15 | 7 | 8 | | 13 | 2 | |
| Northern giant petrel | | | | | | | 2 | 2 | 1 | 1 | | 2 | | |
| Salvin's albatross | 12 | | | | | | 20 | 32 | 16 | 16 | | 30 | 2 | |
| Sooty shearwater | 19 | | | 6 | 1 | 46 | 28 | 100 | 80 | 19 | 1 | 93 | 6 | 1 |
| Southern cape pigeon | 8 | | | | | | 4 | 12 | 7 | 4 | 1 | 8 | 3 | 1 |
| Southern royal albatross | | 1 | 2 | | | | | 3 | 1 | 2 | | 3 | | |
| Western weka | | | | | | | 1 | 1 | 1 | | | 1 | | |
| Westland petrel | | | | 1 | | | 1 | 2 | 1 | 1 | | 1 | 1 | |
| White-capped albatross | | | 2 | | 2 | 59 | 13 | 76 | 45 | 28 | 3 | 57 | 13 | 6 |
| White-chinned petrel | 128 | | 2 | 1 | | 4 | 5 | 140 | 122 | 18 | | 116 | 23 | 1 |
| White-headed petrel | | | | 2 | | 1 | | 3 | 2 | 1 | | | 3 | |
| TOTAL 2002–2003 | 226 | 1 | 22 | 54 | 3 | 114 | 76 | 496 | 337 | 135 | 24 | 414 | 70 | 12 |
| TOTAL 1996–2005 | 1417 | 75 | 588 | 54 | 35 | 1389 | 497 | 4055 | 2480 | 1279 | 296 | 3625 | 311 | 119 |

observed, 40 (40.8%) killed and returned one or more birds to the autopsy programme. The majority of these birds (84%) were returned from only 18 of the 40 vessels.

New taxa returned and recorded for the first time in the autopsy programme were the goldfinch and mottled petrel. One banded bird was returned during this fishing year: O-18817—a Campbell albatross banded as a chick on 23 March 1997 (Autopsy 54324) and previously recovered at Campbell Island.

1996–2005

Over the nine fishing years between 1996 and 2005, 4055 birds were killed and returned to the autopsy programme. Birds were recorded from 44 taxa, and two specimens were unidentifiable (Table 1). Of the 44 taxa, six were represented by at least 100 specimens, with white-chinned petrels being the most frequently returned species ($n = 947$) followed by white-capped albatross ($n = 876$), sooty shearwaters ($n = 711$), grey petrels ($n = 533$), Salvin's albatross ($n = 247$) and

TABLE 2B. SPECIES, NUMBERS, SEX AND AGE OF BIRDS KILLED AND RETURNED FROM THE OBSERVED NEW ZEALAND FISHERIES BETWEEN 1 OCTOBER 2003 AND 30 SEPTEMBER 2004.

| SPECIES | NUMBER KILLED AND RETURNED | | | | | | | | | | | | | |
|-------------------------------|------------------------------|----------------------------|---------------------------------|---------------------------|----------------|---------------|------------|-------------|-------------|-------------|------------|-------------|------------|------------|
| | FISHERY | | | | | | | SEX | | | AGE | | | |
| | DOMESTIC BOTTOM LONGLINER | DOMESTIC TUNA LONGLINER | JOINT VENTURE TUNA LONGLINER | PELAGIC TUNA LONGLINER | SCAMPI TRAWLER | SQUID TRAWLER | TRAWLER | TOTAL | MALE | FEMALE | UNKNOWN | ADULT | NON-ADULT | UNKNOWN |
| Black petrel | 1 | | | | | | | 1 | 1 | | | 1 | | |
| Blackbird | | | | | | | 1 | 1 | 1 | | | | 1 | |
| Black-browed albatross | | 1 | | | | | | 1 | | 1 | | 1 | | |
| Buller's albatross | | 7 | 15 | | | | 3 | 5 | 30 | 16 | 11 | 3 | 27 | |
| Campbell albatross | | 1 | | | | | 1 | 2 | 4 | 2 | 2 | | 3 | 1 |
| Common diving petrel | 1 | | | | | | | | 1 | 1 | | | 1 | |
| Flesh-footed shearwater | 1 | | | | | | | | 1 | 1 | | | 1 | |
| Fluttering shearwater | 1 | | | | | | | | 1 | 1 | | | 1 | |
| Grey petrel | 1 | 3 | | | | | | | 4 | 1 | 3 | | 4 | |
| Grey-backed storm petrel | | | | | | | 1 | 1 | 2 | 2 | | | 1 | 1 |
| Light-mantled sooty albatross | | 1 | | | | | | | 1 | 1 | | | 1 | |
| Northern royal albatross | | | | | | | | 1 | 1 | 1 | | | 1 | |
| Pied shag | 1 | | | | | | | | 1 | 1 | | | 1 | |
| Salvin's albatross | 2 | | | | 3 | | | 7 | 12 | 5 | 5 | 2 | 8 | 2 |
| Sooty shearwater | 45 | | | | 1 | 49 | 1 | 96 | 76 | 20 | | | 96 | |
| Southern cape pigeon | 1 | | | | 1 | | | 2 | 1 | 1 | | | 1 | 1 |
| Westland petrel | | 1 | | | | | | 1 | 2 | | 2 | | 2 | |
| White-capped albatross | | 4 | 12 | | 1 | 120 | 8 | 145 | 69 | 60 | 16 | 109 | 19 | 17 |
| White-chinned petrel | 25 | | 2 | | 1 | 15 | | 43 | 34 | 8 | 1 | 41 | 1 | 1 |
| White-faced storm petrel | 2 | | | | | | | 2 | 2 | | | | 2 | |
| TOTAL 2003–2004 | 81 | 18 | 29 | 0 | 7 | 190 | 26 | 351 | 216 | 113 | 22 | 302 | 26 | 23 |
| TOTAL 1996–2005 | 1417 | 75 | 588 | 54 | 35 | 1389 | 497 | 4055 | 2480 | 1279 | 296 | 3625 | 311 | 119 |

Buller's albatross ($n = 184$). These six taxa contributed 86.3% of the returns over the 9 years of monitoring. The majority of returns were therefore made up of relatively few taxa and, overall, 19 of the 44 taxa identified contributed 98.4% of the returned birds.

Out of the 278 vessels observed, 132 (47.5%) killed and returned one or more birds to the autopsy programme.

3.2 FISHERY CONTRIBUTIONS

1996–2005

Overall, the domestic bottom longline and squid trawling fisheries returned the most seabirds over this period, accounting for 34.9% and 34.3% of the total returns respectively (Table 1). Figure 1 displays the proportions of small and large birds returned from each of the observed fisheries, with large birds including all

TABLE 2C. SPECIES, NUMBERS, SEX AND AGE OF BIRDS KILLED AND RETURNED FROM THE OBSERVED NEW ZEALAND FISHERIES BETWEEN 1 OCTOBER 2004 AND 30 SEPTEMBER 2005.

| SPECIES | NUMBER KILLED AND RETURNED | | | | | | | | | | | | | |
|--------------------------------|------------------------------|----------------------------|---------------------------------|---------------------------|----------------|---------------|------------|-------------|-------------|-------------|------------|-------------|------------|------------|
| | FISHERY | | | | | | | SEX | | | AGE | | | |
| | DOMESTIC BOTTOM LONGLINER | DOMESTIC TUNA LONGLINER | JOINT VENTURE TUNA LONGLINER | PELAGIC TUNA LONGLINER | SCAMPI TRAWLER | SQUID TRAWLER | TRAWLER | TOTAL | MALE | FEMALE | UNKNOWN | ADULT | NON-ADULT | UNKNOWN |
| Black petrel | 1 | | | | | | | 1 | 1 | | | 1 | | |
| Black-browed albatross | | | | | | | | 1 | 1 | | | 1 | | |
| Buller's albatross | | | 6 | | | 9 | 9 | 24 | 11 | 10 | 3 | 20 | 1 | 3 |
| Campbell albatross | | 2 | 4 | | | | | 7 | 6 | 1 | | 2 | 5 | |
| Chatham albatross | | | | | 1 | | | 1 | | 1 | | 1 | | |
| Common diving petrel | 1 | | | | | | 1 | 3 | 1 | 2 | | 1 | 2 | |
| Fairy prion | | | | | | | 2 | 2 | 2 | | | 2 | | |
| Flesh-footed shearwater | 4 | | | | | | | 4 | 3 | 1 | | 3 | 1 | |
| Gibson's (wandering) albatross | | 1 | | | | | | 1 | | 1 | | 1 | | |
| Goldfinch | | | | | | | 1 | 1 | | | 1 | 1 | | |
| Grey petrel | 1 | | 2 | | | | | 5 | 3 | 2 | | 5 | | |
| Mottled petrel | | | | | | | 1 | 1 | | 1 | | | 1 | |
| Pacific albatross | | | | | 2 | | | 2 | 2 | | | | 2 | |
| Salvin's albatross | | | | | 2 | 9 | 14 | 25 | 13 | 11 | 1 | 18 | 5 | 2 |
| Sooty shearwater | 2 | | | | | | 52 | 56 | 46 | 9 | 1 | 55 | | 1 |
| Southern cape pigeon | | | | | | | | 1 | 1 | | | 1 | | |
| Southern giant petrel | | | 2 | | | | | 2 | 1 | 1 | | 1 | 1 | |
| Southern royal albatross | | | | | | | 1 | 1 | 1 | | | 1 | | |
| White-capped albatross | | | 2 | | 1 | 162 | 4 | 169 | 100 | 66 | 3 | 147 | 14 | 8 |
| White-chinned petrel | 10 | 1 | 2 | | 1 | 36 | 3 | 53 | 28 | 25 | | 53 | | |
| TOTAL 2004–2005 | 19 | 4 | 18 | 0 | 7 | 272 | 40 | 360 | 220 | 131 | 9 | 314 | 32 | 14 |
| TOTAL 1996–2005 | 1417 | 75 | 588 | 54 | 35 | 1389 | 497 | 4055 | 2480 | 1279 | 296 | 3625 | 311 | 119 |

albatross and giant petrel species, and small birds including all petrel, shearwater and other species. For the domestic bottom longline, 88.9% of returned birds were large birds, whereas both large and small birds were present in almost equal numbers in the squid trawler returns (Fig. 1; Table 1).

The contribution some fisheries make to the total number of birds killed and returned has changed over the 9 years of monitoring (Fig. 2). The number of birds returned from the domestic bottom longline fishery increased until the 2001/02 fishing year, but has steadily decreased since then to 5.3%. The contribution by the joint venture tuna longline fishery has decreased from almost 80% in 1996/97 to only 5% in 2004/05. In contrast, the contribution by the squid trawling fishery has generally increased over this period, and in 2004/05 was the highest contributor to the total number of returns (Tables 2A-C).

Figure 1. The proportion of small and large birds killed and returned in each of the observed fisheries between 1 October 1996 and 30 September 2005. Small birds = petrels, shearwaters and others. Large birds = albatross and giant petrels.

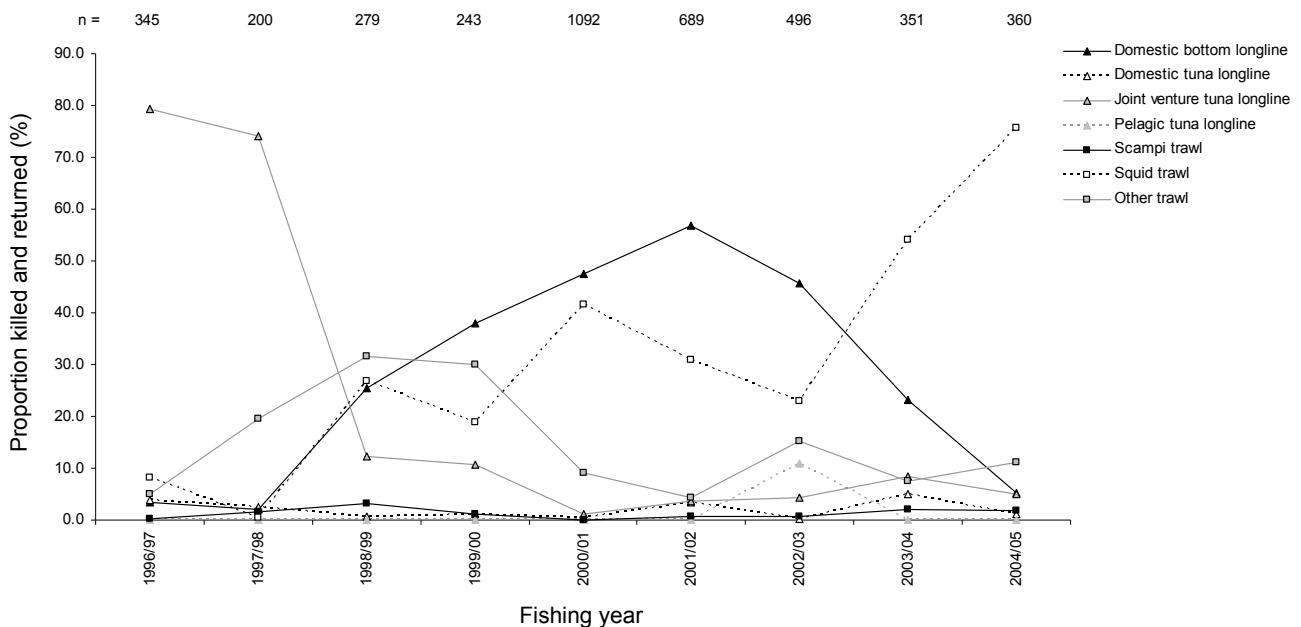
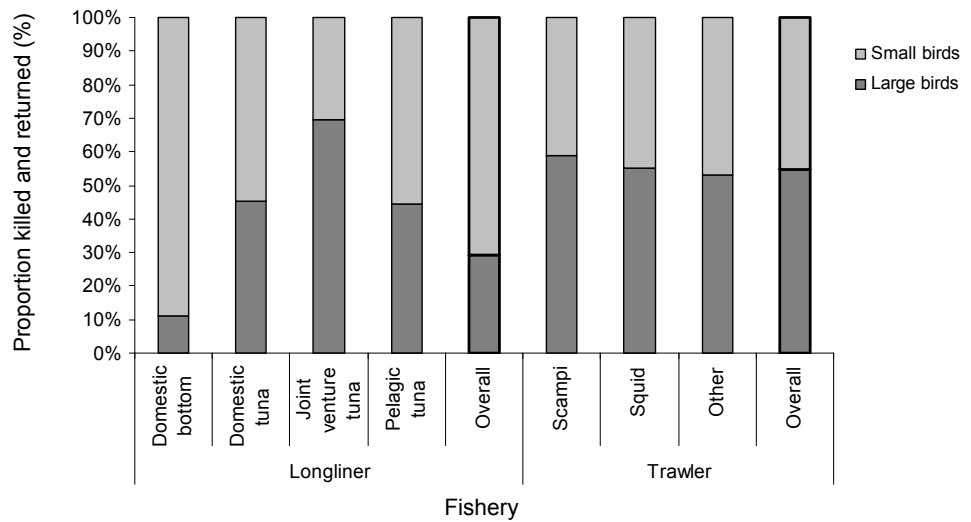


Figure 2. The contribution of each observed fishery to the number of birds killed and returned every fishing year between 1996 and 2005.

3.3 ABUNDANCE OF EACH SEX

1996–2005

Over the 9-year period between 1 October 1996 and 30 September 2005, almost twice as many male birds were returned as females (Table 1; Table 3). This trend was contributed to by three species (sooty shearwaters, white-capped albatross and white-chinned petrels), three of the most commonly caught taxa. In most other taxa, males and females were present in similar numbers, and for Salvin's albatross more females than males were caught. These patterns were also present in the data for the three most recent fishing years (Tables 2A-C). The high number of grey petrels of unknown sex is due to a number of specimens that could not be sexed due to sea lice damage.

TABLE 3. THE CONTRIBUTION (%) OF EACH OBSERVED FISHERY TO THE NUMBER OF BIRDS KILLED AND RETURNED EVERY FISHING YEAR BETWEEN 1996 AND 2005, AND THE RELATIVE ABUNDANCE OF EACH SEX AND AGE-CLASS.

| | YEAR | NUMBER KILLED AND RETURNED | | | | | | | | | | | | | |
|-------------------------------------|------------------|------------------------------|----------------------------|---------------------------------|---------------------------|----------------|---------------|-------------|-------------|-------------|-------------|------------|-------------|------------|------------|
| | | FISHERY | | | | | | | SEX | | | AGE | | | |
| | | DOMESTIC BOTTOM LONGLINER | DOMESTIC TUNA LONGLINER | JOINT VENTURE TUNA LONGLINER | PELAGIC TUNA LONGLINER | SCAMPI TRAWLER | SQUID TRAWLER | TRAWLER | TOTAL BIRDS | MALE | FEMALE | UNKNOWN | ADULT | NON-ADULT | UNKNOWN |
| PROPORTION OF BIRDS RETURNED (%) | 2004-2005 | 5.3 | 1.1 | 5.0 | 0.0 | 1.9 | 75.6 | 11.1 | 360 | 61.1 | 36.4 | 2.5 | 87.2 | 8.9 | 3.9 |
| | 2003-2004 | 23.1 | 5.1 | 8.3 | 0.0 | 2.0 | 54.1 | 7.4 | 351 | 61.5 | 32.2 | 6.3 | 86.0 | 7.4 | 6.6 |
| | 2002-2003 | 45.6 | 0.2 | 4.4 | 10.9 | 0.6 | 23.0 | 15.3 | 496 | 67.9 | 27.2 | 4.8 | 83.4 | 14.1 | 2.4 |
| | 2001-2002 | 56.9 | 3.5 | 3.6 | 0.0 | 0.7 | 30.9 | 4.4 | 689 | 73.3 | 24.8 | 1.9 | 93.5 | 5.1 | 1.5 |
| | 2000-2001 | 47.6 | 0.5 | 1.1 | 0.0 | 0.1 | 41.5 | 9.2 | 1092 | 58.5 | 27.1 | 14.4 | 93.0 | 5.0 | 2.0 |
| | 1999-2000 | 37.9 | 1.2 | 10.7 | 0.0 | 1.2 | 18.9 | 30.0 | 243 | 56.0 | 34.5 | 9.5 | 89.7 | 7.4 | 2.9 |
| | 1998-1999 | 25.4 | 0.7 | 12.2 | 0.0 | 3.2 | 26.9 | 31.6 | 279 | 65.6 | 25.4 | 9.0 | 83.9 | 6.4 | 9.7 |
| | 1997-1998 | 2.0 | 2.5 | 74.0 | 0.0 | 1.5 | 0.5 | 19.5 | 200 | 34.5 | 64.0 | 1.5 | 93.0 | 5.0 | 2.0 |
| | 1996-1997 | 3.5 | 3.8 | 79.4 | 0.0 | 0.3 | 8.1 | 4.9 | 345 | 52.8 | 44.0 | 3.2 | 86.1 | 13.9 | 0.0 |
| | 1996-2005 | 34.9 | 1.8 | 14.5 | 1.3 | 0.9 | 34.3 | 12.3 | 4055 | 61.2 | 31.5 | 7.3 | 89.4 | 7.7 | 2.9 |

3.4 ABUNDANCE OF EACH AGE-CLASS

1996-2005

Over the 9 fishing years between 1996 and 2005, more than ten times as many adults were returned as juveniles (Table 1; Table 3). This trend is fairly consistent throughout all taxa, and is prominent in the data for the three most recent fishing years (Tables 2A-C).

3.5 STOMACH CONTENTS OF RETURNED BIRDS

1996-2005

The stomach contents of birds returned from both the longline and trawling fisheries between 1 October 1996 and 30 September 2005 are shown in Fig. 3. In both the trawling and longline fisheries samples, a small proportion of specimens were missing their stomachs or their stomach contents could not be determined.

A higher proportion of birds returned from longline vessels, particularly large birds, had empty stomachs compared with those returned from trawl fisheries. Fewer birds returned from longliners contained natural food only (2-15% of large birds and 7-30% of small birds). Figure 3 shows that the stomachs of small birds tended to contain more natural food than those of large birds. In the longline fisheries, bait was more prevalent in stomachs than offal. More of the birds returned from longliners had mixed stomach contents compared with those returned from trawlers.

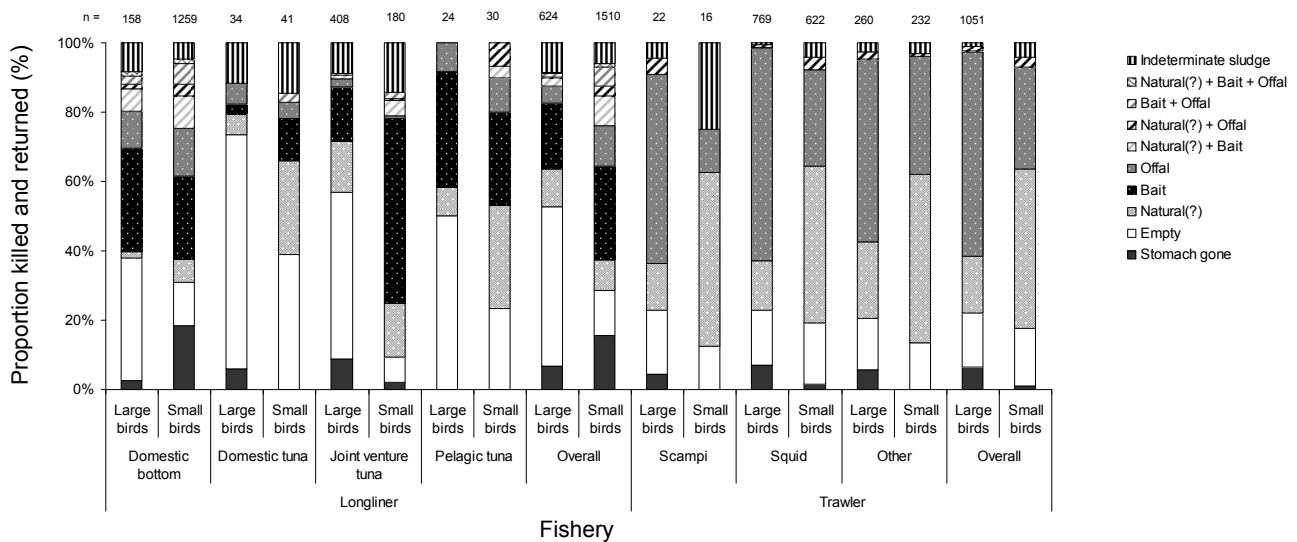


Figure 3. The stomach contents of large and small birds caught and returned from each of the observed fisheries between 1 October 1996 and 30 September 2005. Large birds = albatross and giant petrels. Small birds = petrels, shearwaters and others.

Throughout all trawl fisheries, a greater proportion of small birds had stomachs containing natural food only (45–50%) compared with large birds (14–22%), while a greater proportion of large birds had only eaten offal (52–61% compared with 12–34%). Few birds’ stomachs, regardless of size, contained natural food plus offal (0–5%). Offal in the stomach contents tended to be fresh, suggesting it was being obtained immediately prior to the birds’ interaction with the fishing gear that resulted in their death.

Plastic and rubber were the most common non-food items retrieved from stomach and gizzard contents, being found in 11.5% of all birds autopsied. These items were particularly common in the three shearwater taxa returned, with 40%, 81.8% and 34.9% of all flesh-footed shearwaters, short-tailed shearwaters and sooty shearwaters respectively containing such items. Following this in abundance were stones and grit, seaweed, and barnacles and shell, each being found in 4.9%, 4% and 3.1% of all birds autopsied respectively. Other non-food items found were seeds and vegetation, cord and rope, wood, feathers, hair and paint flakes.

3.6 FAT SCORES OF MOST COMMONLY RETURNED SPECIES

1996–2005

Table 4 compares the annual fat scores of the six species most commonly returned between 1 October 1996 and 30 September 2005. The mean fat scores per year for each of these species are displayed in Fig. 4. A trend of decreasing fat score over time can be seen for each of the species.

Among the six most commonly returned taxa, there was a trend towards an increasing proportion having the lowest fat scores (1 = no fat) over the 9 years monitored. This reached 52% of all specimens (where a score could be determined) in the most recent fishing year. The previous 8 fishing years recorded 0%, 11%, 20%, 23%, 29%, 34%, 47.5%, 41.5% (1996–2004) respectively.

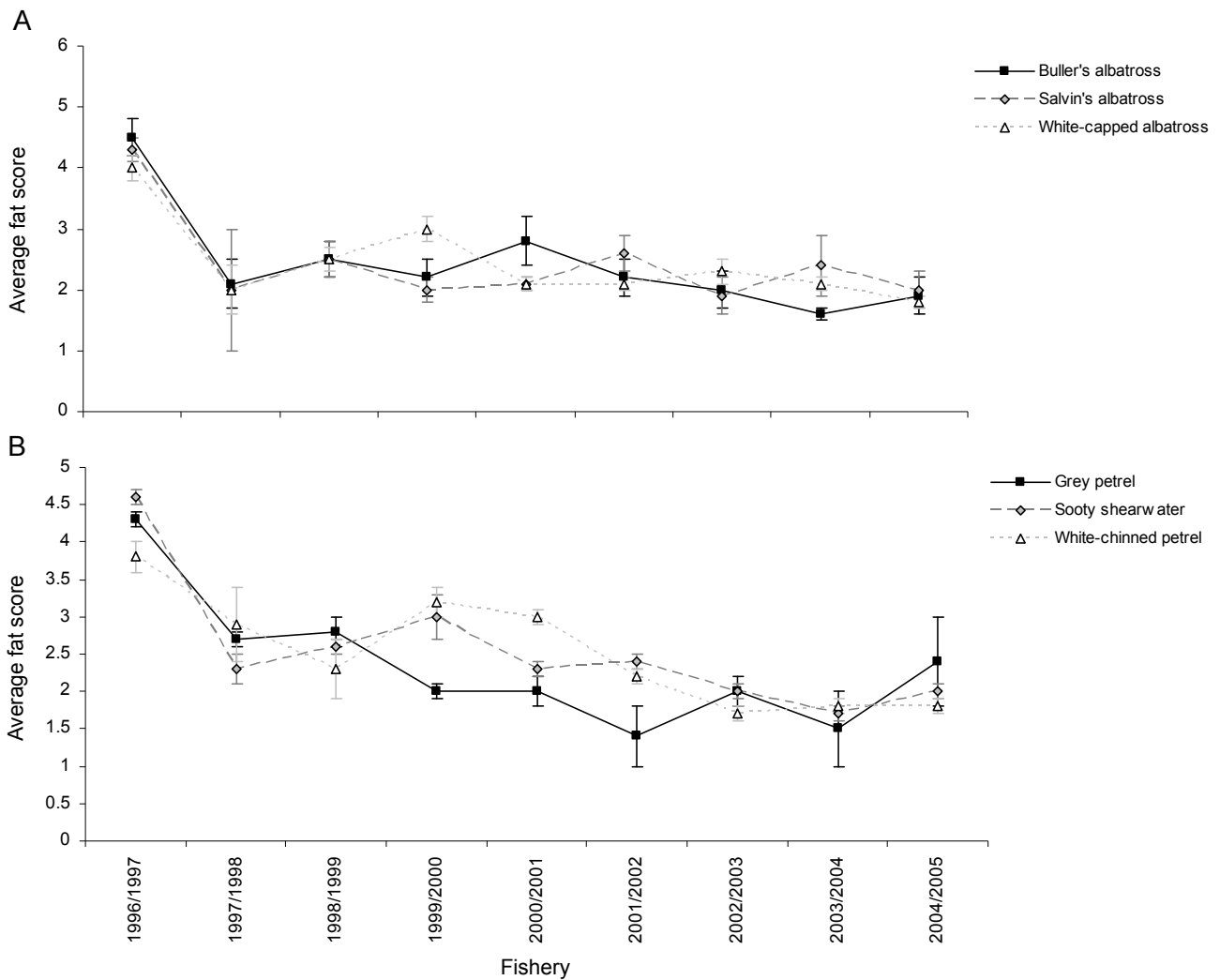


Figure 4. Mean annual fat score comparison for the six species killed and returned between 1996 and 2005 in significant numbers (>100 birds). A = large birds, B = small birds.

3.7 IDENTIFICATIONS OF SEABIRDS BY OBSERVERS

The at-sea species identifications made by observers, along with the final species identifications, as confirmed by autopsy, are given in Table 5 for all specimens returned between 1 October 1997 and 30 September 2005.

TABLE 4. ANNUAL FAT SCORE COMPARISON FOR THE SIX SPECIES KILLED AND RETURNED BETWEEN 1996 AND 2005 IN SIGNIFICANT NUMBERS (>100 BIRDS).

| SPECIES | YEAR | TOTAL NUMBER OF SPECIMENS (<i>n</i>) | FAT SCORES | | | | | | | MEAN | SE |
|---------------------------|-----------|---|------------|-----|----|----|----|-----|----|------|-----|
| | | | 1 | 2 | 3 | 4 | 5 | U | | | |
| Buller's albatross | 2004/2005 | 24 | 12 | 4 | 1 | 4 | | | 3 | 1.9 | 0.3 |
| | 2003/2004 | 30 | 17 | 6 | 5 | | | | 2 | 1.6 | 0.1 |
| | 2002/2003 | 25 | 15 | 1 | 3 | 2 | 3 | | 1 | 2.0 | 0.3 |
| | 2001/2002 | 21 | 9 | 5 | 4 | | 3 | | | 2.2 | 0.3 |
| | 2000/2001 | 18 | 4 | 4 | 3 | 2 | 3 | | 2 | 2.8 | 0.4 |
| | 1999/2000 | 18 | 7 | 3 | 4 | | 2 | | 2 | 2.2 | 0.3 |
| | 1998/1999 | 30 | 8 | 11 | 3 | 2 | 5 | | 1 | 2.5 | 0.3 |
| | 1997/1998 | 10 | 2 | 4 | 1 | 1 | | | 2 | 2.1 | 0.4 |
| | 1996/1997 | 8 | | | 1 | 2 | 5 | | | 4.5 | 0.3 |
| Grey petrel | 2004/2005 | 5 | 2 | | 2 | 1 | | | | 2.4 | 0.6 |
| | 2003/2004 | 4 | 3 | | 1 | | | | | 1.5 | 0.5 |
| | 2002/2003 | 58 | 10 | 14 | 8 | | 1 | 25 | | 2.0 | 0.2 |
| | 2001/2002 | 5 | 4 | | 1 | | | | | 1.4 | 0.4 |
| | 2000/2001 | 190 | 12 | 16 | 5 | 2 | 1 | 154 | | 2.0 | 0.2 |
| | 1999/2000 | 60 | 11 | 20 | 7 | 2 | | | 20 | 2.0 | 0.1 |
| | 1998/1999 | 70 | 5 | 13 | 13 | 10 | 3 | | 26 | 2.8 | 0.2 |
| | 1997/1998 | 73 | | 24 | 45 | 4 | | | | 2.7 | 0.1 |
| | 1996/1997 | 66 | | | 2 | 40 | 23 | | 1 | 4.3 | 0.1 |
| Salvin's albatross | 2004/2005 | 25 | 12 | 3 | 3 | 3 | 1 | | 3 | 2.0 | 0.3 |
| | 2003/2004 | 12 | 4 | 3 | | | 1 | 2 | 2 | 2.4 | 0.5 |
| | 2002/2003 | 32 | 21 | 3 | 2 | 2 | 4 | | | 1.9 | 0.3 |
| | 2001/2002 | 22 | 7 | 6 | 2 | 2 | 5 | | | 2.6 | 0.3 |
| | 2000/2001 | 104 | 45 | 26 | 19 | 7 | 7 | | | 2.1 | 0.1 |
| | 1999/2000 | 23 | 9 | 9 | 1 | 3 | 1 | | | 2.0 | 0.2 |
| | 1998/1999 | 14 | 2 | 8 | 1 | 1 | 2 | | | 2.5 | 0.3 |
| | 1997/1998 | 2 | 1 | | 1 | | | | | 2.0 | 1.0 |
| | 1996/1997 | 13 | | | 3 | 3 | 7 | | | 4.3 | 0.2 |
| Sooty shearwater | 2004/2005 | 56 | 20 | 20 | 12 | 3 | | | 1 | 2.0 | 0.1 |
| | 2003/2004 | 96 | 53 | 25 | 14 | 2 | 1 | | 1 | 1.7 | 0.1 |
| | 2002/2003 | 100 | 39 | 33 | 16 | 9 | 2 | | 1 | 2.0 | 0.1 |
| | 2001/2002 | 99 | 19 | 34 | 36 | 4 | 5 | | 1 | 2.4 | 0.1 |
| | 2000/2001 | 228 | 57 | 85 | 58 | 20 | 6 | | 2 | 2.3 | 0.1 |
| | 1999/2000 | 23 | 2 | 9 | 4 | 4 | 4 | | | 3.0 | 0.3 |
| | 1998/1999 | 62 | 8 | 22 | 21 | 10 | 1 | | | 2.6 | 0.1 |
| | 1997/1998 | 28 | 6 | 13 | 6 | 2 | 1 | | | 2.3 | 0.2 |
| | 1996/1997 | 19 | | | | 7 | 12 | | | 4.6 | 0.1 |
| White-capped albatross | 2004/2005 | 169 | 89 | 29 | 21 | 9 | 4 | | 17 | 1.8 | 0.1 |
| | 2003/2004 | 145 | 43 | 42 | 24 | 13 | 1 | | 22 | 2.1 | 0.1 |
| | 2002/2003 | 75 | 25 | 18 | 13 | 5 | 8 | | 6 | 2.3 | 0.2 |
| | 2001/2002 | 140 | 54 | 29 | 20 | 14 | 8 | | 15 | 2.1 | 0.1 |
| | 2000/2001 | 191 | 85 | 37 | 26 | 16 | 17 | | 10 | 2.1 | 0.1 |
| | 1999/2000 | 52 | 11 | 10 | 9 | 7 | 12 | | 3 | 3.0 | 0.2 |
| | 1998/1999 | 63 | 14 | 17 | 13 | 7 | 5 | | 7 | 2.5 | 0.2 |
| | 1997/1998 | 7 | 3 | 1 | 3 | | | | | 2.0 | 0.4 |
| | 1996/1997 | 33 | | | 10 | 4 | 11 | | 8 | 4.0 | 0.2 |
| White-chinned petrel | 2004/2005 | 53 | 24 | 18 | 6 | 5 | | | | 1.8 | 0.1 |
| | 2003/2004 | 43 | 17 | 18 | 5 | 2 | | | 1 | 1.8 | 0.1 |
| | 2002/2003 | 140 | 78 | 35 | 14 | 7 | 3 | | 3 | 1.7 | 0.1 |
| | 2001/2002 | 361 | 120 | 104 | 72 | 42 | 14 | | 9 | 2.2 | 0.1 |
| | 2000/2001 | 278 | 38 | 65 | 80 | 50 | 40 | | 5 | 3.0 | 0.1 |
| | 1999/2000 | 34 | 2 | 8 | 9 | 8 | 6 | | 1 | 3.2 | 0.2 |
| | 1998/1999 | 12 | 5 | 3 | 2 | | 2 | | | 2.3 | 0.4 |
| | 1997/1998 | 7 | 1 | 2 | 2 | 1 | 1 | | | 2.9 | 0.5 |
| | 1996/1997 | 19 | | 2 | 4 | 8 | 5 | | | 3.8 | 0.2 |

TABLE 5. SUMMARY OF THE IDENTIFICATIONS RECORDED BY ON-BOARD OBSERVERS AT SEA WHEN COMPARED WITH AUTOPSY IDENTIFICATION FOR BIRDS KILLED BETWEEN 1 OCTOBER 1997 AND 30 SEPTEMBER 2005.

| SPECIES IDENTIFICATION AFTER AUTOPSY | OBSERVERS' ID | | | | | | | TOTAL | |
|--------------------------------------|---------------|------------|----------------------------|----------------------------------|------------------------------------|--|-----------------|-----------|----------------------------|
| | ID CORRECT | ID WRONG | ID AS CORRECT 'SPP.' GROUP | ID AS SEABIRD LARGE OR ALBATROSS | ID AS PETREL OR PRION UNIDENTIFIED | ID AS SEABIRD, SEABIRD SMALL, OR SEAGULL | ID NOT ON LABEL | | SPECIES CODE DID NOT EXIST |
| Antarctic prion | 1 | | | | 1 | | | | 2 |
| Antipodean (wandering) albatross | | 37 | (37) | | | | 4 | | 41 |
| Black petrel | 7 | 1 | | | | 1 | | | 9 |
| Black-backed gull | | | | | | 1 | | | 1 |
| Black-bellied storm petrel | | | | | 1 | | | | 1 |
| Blackbird | | | | | 1 | | | | 1 |
| Black-browed albatross | 1 | 9 | (6) | 2 | | | 2 | 2 | 16 |
| Black-browed albatross spp. | 1 | | | | | | | | 1 |
| Broad-billed prion | | | | | | | | 1 | 1 |
| Buller's albatross | 132 | 15 | (2) | 5 | | | 16 | 8 | 176 |
| Buller's shearwater | | | | | 2 | | | | 2 |
| Campbell albatross | 25 | 18 | (13) | 1 | | | 5 | | 49 |
| Cape pigeon spp. | | 1 | (1) | | | | | | 1 |
| Chatham albatross | 8 | 2 | | | | | 1 | | 11 |
| Common diving petrel | 2 | 2 | | | 1 | | 2 | 1 | 8 |
| Fairy prion | | | | | 5 | | 1 | | 6 |
| Flesh-footed shearwater | 35 | | | | 1 | | | | 36 |
| Fluttering shearwater | | | | | 1 | | | | 1 |
| Gibson's (wandering) albatross | 1 | 27 | (27) | | | | 2 | | 30 |
| Goldfinch | | | | | | | 1 | | 1 |
| Grey petrel | 274 | 2 | | 1 | 119 | 40 | 29 | 2 | 467 |
| Grey-backed storm petrel | 1 | | | | 1 | | | | 2 |
| Grey-faced petrel | 1 | 14 | | 3 | 11 | | | | 29 |
| Light-mantled sooty albatross | 1 | | | | | | 1 | 1 | 3 |
| Mottled petrel | | | | | 1 | | | | 1 |
| Northern giant petrel | 3 | 8 | (8) | | | | 1 | | 12 |
| Northern royal albatross | | 2 | (2) | | | | | | 2 |
| Pacific albatross | | 4 | (4) | | | | | | 4 |
| Pied shag | | | | | | | | 1 | 1 |
| Salvin's albatross | 179 | 40 | | 9 | | | 3 | 3 | 234 |
| Short-tailed shearwater | | | | | 11 | | 22 | | 33 |
| Snares cape pigeon | | 1 | (1) | | | | | | 1 |
| Sooty shearwater | 562 | 12 | | 2 | 21 | 29 | 30 | 36 | 692 |
| Southern cape pigeon | 2 | 24 | (22) | | 1 | | | | 27 |
| Southern giant petrel | 4 | 2 | (2) | | | | | | 6 |
| Southern royal albatross | 11 | 3 | | | | | 1 | | 15 |
| Welcome swallow | | | | | | | 1 | | 1 |
| Western weka | | | | | | | | 1 | 1 |
| Westland petrel | 1 | 3 | | | | | 1 | | 5 |
| White-capped albatross | 535 | 170 | (112) | 107 | | | 28 | 3 | 843 |
| White-chinned petrel | 569 | 30 | | | 309 | 5 | 14 | 1 | 928 |
| White-faced storm petrel | | 2 | | | | | | | 2 |
| White-headed petrel | | 1 | | | 2 | | | | 3 |
| TOTAL | 2356 | 430 | (237) | 130 | 489 | 76 | 165 | 60 | 3706 |

4. Conclusions

- A small number of vessels in each fishery have consistently caught the majority (>80%) of birds returned to the autopsy programme. Of the observed vessels, 50-60% consistently returned no birds.
- Birds returned from the six most commonly caught taxa over the past 8 years have greatly reduced body condition (fat scores) compared with those returned in 1996/97. The data for each taxa in recent years have shown that the birds had, on average, little or no fat.
- The role of offal, discards and bait should be regarded as a principal factor in the incidental capture of seabirds in both trawl and the longline fisheries.
- Changes in the contribution of individual fisheries to the total number of birds killed and returned over the 9-year recording period might not reflect the real contribution of each fishery to overall seabird incidental catch. Observer coverage differed between the fisheries and the analyses of returned birds do not take account of fishing effort. In addition, the numbers returned for autopsy represent only the most conservative estimate for the actual numbers of birds caught, as not all birds killed were retrieved and returned to the autopsy programme.

5. Acknowledgements

The New Zealand Government's fisheries observers provide dedicated work in often trying conditions to record on-the-spot data and in retaining the birds provided for autopsy. We acknowledge their role in providing the primary material upon which this report is based. Tranz Rail Limited provided an efficient frozen transport and storage location while the Ministry of Defence provided leasehold space for the autopsy laboratory facility. N. Stewart assisted with data recording in the laboratory and later database entry of information. Reg Blezard, Dennis Fairfax and Wendy Norden provided the essential liaison and administrative link with the observers. S. Baird, L. Griggs, B. Sanders and C. Sutton correlated the autopsy database for consistency with the NIWA database compiled from the observers' non-fish bycatch data. This is a client report funded from the Conservation Services Programme (Investigation no. CSP 1NV2004/02).

6. References

- Bartle, J.A. 1968: Observations on the breeding habits of Pycroft's petrel. *Notornis* 15: 70-99.
- Bartle, J.A. 2000: Autopsy report for seabirds killed and returned from New Zealand fisheries 1 October 1996 to 31 December 1997. *Conservation Advisory Science Notes* 293. Department of Conservation, Wellington. 43 p.
- Croxall, J.P.; Gales, R. 1998: An assessment of the conservation status of albatrosses. Pp. 46-65 in Robertson, G.; Gales, R. (Eds): Albatross biology and conservation. Surrey Beatty & Sons, Chipping Norton, Australia.
- Fraser, M.J. 2005: Characteristics of white-chinned petrels *Procellaria aequinoctialis* Linnaeus in New Zealand waters. Unpublished MSc Thesis, Massey University, Palmerston North.
- Nunn, G.B.; Cooper, J.; Jouventin, P.; Robertson, C.J.R.; Robertson, G.G. 1996: Evolutionary relationships among extant albatrosses (Procellariiformes: Diomedidae) established from complete cytochrome-b gene sequences. *The Auk* 113(4): 784-801.
- Robertson, C.J.R.; Bell, E.; Scofield, P. 2004: Autopsy report for seabirds killed and returned from New Zealand fisheries, 1 October 2001 to 30 September 2002: birds returned by Ministry of Fisheries observers to the Department of Conservation. *DOC Science Internal Series* 155. Department of Conservation, Wellington. 49 p. Data supplement www.csl.org.nz/idsisl/S5sup.vdf
- Robertson, C.J.R.; Nunn, G.B. 1998: Towards a new taxonomy for albatrosses. Pp. 13-19 in Robertson, G.; Gales, R. (Eds): Albatross biology and conservation. Surrey Beatty & Sons, Chipping Norton, Australia.

Continue to next file: drds291a.pdf