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A summary of observer biological information on the
New Zealand black oreo and smooth oreo fisheries
from 1979–80 to 2004–05

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EXECUTIVE SUMMARY

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Black oreo and smooth oreo biological data and samples (total length, sex ratios and otoliths) collected mainly by observers from the Ministry of Fisheries Observer Programme (OP) plus data and samples from the Orange Roughy Management Company (ORMC) from 1979–80 to 2004–05 and from research sources from the main oreo fisheries in OEO 3A and OEO 4 were summarised. Expected and actual levels of observer coverage for oreos by management area and proportion of oreo catch sampled by observers by fishing area were summarised. For both species, annual length data by sex were tabulated to provide number of tows sampled and number of fish measured (usually about 100 fish per sample). Mean length by year by sex scaled by catch weight was calculated.

OP and ORMC observer biological samples from the smaller black oreo and smooth oreo fisheries on the northwest Chatham Rise (OEO 3A), northeast Chatham Rise (OEO 4), Southland, Pukaki Rise (west), Pukaki Rise (east), Bounty Plateau, Auckland Islands/Macquarie Ridge, and Puysegur were also summarised. For both species, annual total length data by sex were tabulated to provide number of trips and tows sampled and number of fish measured. Mean length by year by sex scaled by catch weight was calculated and tabulated. Most of the recent ORMC data were from these smaller fisheries, so the data were reported separately as well as being combined with the OP data.

The main results were as follows.

Observer coverage in the largest oreo fisheries OEO 3A and OEO 4 exceeded the number of oreo samples targeted in four of the last eight years (1997–98 to 2004–05), although the requested number of samples was not met in the last two fishing years. In oreo management areas OEO 1 and OEO 6 target oreo coverage was seldom met by OP observers, except for 1999–2000 in OEO 1, and was nearly met in OEO 6 in 2004–05. However, there were additional biological data for these areas from ORMC sampling from 1998–99 to 2001–2002. In OEO 1 the proportion of the samples achieved that contained smooth oreo data fluctuated with a low proportion of smooth oreo in the early years and high proportions in the later years. The ratio of smooth oreo:black oreo in samples from OEO 3A/OEO 4 was high in all years (1997–98 to 2004–05). In OEO 6 the proportion of smooth oreo was varied but was generally large and always favoured smooth oreo.

Sampling of black oreo and smooth oreo in OEO 3A and OEO 4 was highly variable between 1979–80 and 1998–99 with 0–43 tows sampled per year in OEO 3A and 0–98 tows sampled per year in OEO 4. Sampling of black oreo in OEO 3A increased in 1999–2000 and 2000–01 to 115 and 136 samples respectively, but then fell to 12–42 samples from 2001–02 to 2004–05. Sampling of smooth oreo in OEO 3A increased in 1999–2000 and 2000–01 with 82 and 97 samples, but then declined markedly to 4–22 samples in 2001–02 to 2004–05. In OEO 4 there was increased sampling from 2000–01 to 2004–05 for black oreo (15–42 samples). Smooth oreo sampling increased to 32–86 samples in 1999–2000 to 2004–05.

OEO 3A black oreo mean lengths for males and females appear to show a spatial effect, as small fish are in shallower water and larger fish in deeper water. Mean lengths from the shallow strata averaged 30 cm and 31 cm respectively for males and females, and 33 cm for both sexes in the deep strata. In the shallow strata mean lengths appear to be increasing slightly since 1999–2000 for both sexes, whereas in the deep strata mean lengths are about 5 cm less in the later years than in the earliest year. OEO 3A smooth oreo mean length for males and females appeared to decline by about 1 cm from 1988–89 to 2004–05.

OEO 4 black oreo mean length varied over time, perhaps due to the progressive discovery of new fishing areas along the south Chatham Rise. Smooth oreo mean length appeared to decline over time by about 1.2 cm for males and about 2.6 cm for females (OP data, 1988–89 to 2004–05), but there are likely to be sampling depth and area effects. Mean length by fishing area in OEO 4 indicate that larger fish tend to be caught in the more recently fished hill areas, rather than in the areas containing flat bottom or the older, and probably more heavily fished, hills. Mean lengths of fish from the recently fished hill areas were 1.2 cm longer for males and 1.9 cm for females than for fish in the flat bottom areas. One area of hills that is still being fished had mean lengths that declined by 1.4 cm for males and 3.4 cm for females from 1991–92 to 2004–05. Mean lengths for smooth oreo in other fishing areas within OEO 4 fluctuated and show no clear trend.

Areas in OEO 1 and OEO 6 where numbers of samples were acceptable for black oreos included Southland, Pukaki Rise (east), Auckland Island, and Puysegur/Snares. For smooth oreo there were a number of fishing areas that frequently had over 1000 fish measured per fishing year including, Southland, Pukaki (east), Bounty Plateau, Auckland Island, Puysegur/Snares. Sex ratios for these areas were highly variable and in some areas appear to indicate imbalance in sex selection.

Numbers of otoliths collected by observers and the number of tows from which otolith samples were taken are tabulated by fishing area and fishing year for black oreo and smooth oreo. Otolith collection by observers has only been requested since 2002, consequently there are few samples available before this. There are a total of 2316 black oreo otoliths and 5428 otoliths for smooth oreos from all areas and all years.

The number of research tows where black oreo or smooth oreo were caught and the number of fish measured by area and fishing year were tabulated. These data came from 102 individual research surveys: about 15% are from middle depth trips where survey depth ranges overlapped oreo depths. Of the deepwater surveys, many were designed to target orange roughy adults or juveniles, some were random trawl surveys, and others targeted acoustic marks.

1. INTRODUCTION

This report presents analyses for the following objectives for the Ministry of Fisheries funded research project “Oreo stock assessment” (OEO2005/02).

Overall objective

1. To carry out a stock assessment of black oreo (*Allocyttus niger*) and smooth oreo (*Pseudocyttus maculatus*), including estimating biomass and sustainable yields

Specific objective

3. To analyse length frequency, sex ratio, and reproductive condition data for black oreo and smooth oreo collected by the Observer Programme and other sources during the 2004/05 fishing year for input into stock assessment models.

The work analysed the biological data collected on commercial fishing vessels by observers funded either by the Ministry of Fisheries (OP) or by the fishing industry (ORMC). Data from research sources are also presented. No data were available from market sampling programmes. All data are summarised for the fisheries areas described by Hart et al. (2005). Additional data are presented from the main oreo fisheries in management areas OEO 3A and OEO 4 by depth and subarea. The main fisheries away from the Chatham Rise include Southland (OEO 1), Puysegur/Snares (OEO 1), Pukaki Rise east (OEO 6), Bounty Plateau (OEO 6), and Auckland Islands/Macquarie Ridge (OEO 6) (Figure 1).

Length data were used in a stock assessment analysis of OEO 3A black oreo by Hicks et al. (2002) and Doonan et al. (2004) who noted strong area and/or depth effects for observer data and each modelled the stock using three subareas. It seems highly likely that depth and area effects are also present for observer-collected black oreo data from other areas, and also for smooth oreo, so analysis of the length data for stock assessment needs to be handled carefully.

2. DATA COLLECTION

MFish (OP) observers are requested to collect length and sex measurements from 100 to 200 fish per trawl from at least one trawl a day where oreos are targeted, or where oreos are caught as a bycatch in orange roughy fishing. Instructions on the collection of length measurements, reproductive condition, and otolith collection have varied over time. The observer manual (Ministry of Fisheries 1992) section on oreos prioritised four requests. The first two priorities were the recording of oreo catch weight and recording of discarding of oreos. The third priority was collection of length frequency data if time permitted. The fourth request was for gonad staging from at least 100 fish per day, and otolith collection was not requested. The updated manual (MAF 2002) did not request reproductive condition data to be reported, but required otoliths to be collected from every tenth fish from the length sample where the catch weight exceeded 1t. Length samples were required to be taken by each observer each day from oreo catches, and from at least one of the oreo species if orange roughy was the target. Industry observers (ORMC) collected similar data including fish length, sex and some reproductive data.

3. METHODS

3.1 Data sources

Biological data collected by observers from both OP and ORMC sources are held on the Empress *obs_lfs* database. Length measurements without position or catch weight data were not included in these analyses. Records of OP collected otoliths were extracted from the Empress *age* database which contains biological information related to archived otoliths. These databases are managed by NIWA under contract to MFish. Research data were extracted from the NIWA *trawl* database and summarised by area. These data include biological data from all surveys catching oreos, and combine middle depth

and deepwater surveys, random trawls and trawls targeted on fish marks. There are no records of black oreo or smooth oreo length measurements from the *market* database which contains biological data collected from shed sampling of landed catch.

3.2 Definition of fishing areas

Data from all sources are summarised by fishing areas within each of the oreo management areas (see Figure 1 for locations of fishing areas). The main fisheries for oreos occur on the Chatham Rise in management areas OEO 3A and OEO 4. Most fishing occurs on the south Chatham Rise: fishing areas are defined as; OEO 3A ncr = OEO 3A north of 44° S, OEO 4 ncr = OEO 4 north of 44° S, OEO 3A scr = OEO 3A south of 44° S, OEO 4 scr = OEO 4 south of 44° S. Lesser fishing areas occur within management areas OEO 1 and OEO 6 including Southland (OEO 1), Puysegur/Snares (OEO 1), Pukaki Rise east (OEO 6), Bounty Plateau (OEO 6), and Auckland Islands/Macquarie (OEO 6). The fisheries defined in this study are larger than the individual fisheries identified in previous descriptive analyses of oreo CPUE (Coburn et al. 2005) and sample areas defined in stock assessment analyses (Sullivan et al. 2005) due to the need to encompass all available data.

In addition, OEO 4 scr is split into five major fishing areas plus the remaining area within OEO 4 based on known spatial and temporal fishing patterns for oreos in OEO 4 (Coburn et al. 2001). The areas are:

Area 1 178° E to 177° 08' W. Flat ground and drop-offs excluding seamounts (includes Bobbin Tow and Urk).

Area 2 177° 08' W to 176° 16' W. Includes seamounts such as Hegerville and Paranoia.

Area 3 176° 16' W to 175° W. Includes seamounts such as Condoms and Big Chief.

Area 4 175° to 174° W. Includes the Andes seamount complex.

Area 5 178° E to 178° 40' W. Older seamounts including Trev's, Fletchers Pinni, and Mt. Kiso.

Area 6 The remainder of OEO 4 south of 44° S and west of 178° E.

For black oreo in OEO 3A scr a further summary is provided where the fishing area is split by depth into shallow (less than 900 m) and deep (over 900 m) sub areas.

3.3 Observer coverage levels

The level of coverage of observer catch as a proportion of estimated commercial catch is calculated by fishing area and fishing year. The weight of observer catch from which biological samples were taken is divided by the sum of the reported estimated commercial catch from the NIWA Empress database *dw_cdb* for black oreo and smooth oreo. Coverage is expressed as a percentage.

The number of proposed observer oreo samples from Ministry of Fisheries research tender background documents for the years from 1997–98 on by oreo management area is compared with the actual number of oreo samples taken from those fishing years. The proportion of the oreo samples from OP sources that were from tows that targeted smooth oreo are also calculated.

The number of trips where biological data were obtained, the number of tows observed, number of fish measured and number of otoliths collected was determined for each species, fishing area, and fishing year for both the OP and ORMC observer programmes.

3.4 Length frequency and sex ratios from observer data

Mean lengths for black oreo and smooth oreo, weighted by catch, for males and females by fishing area and fishing year were estimated and tabulated. Hicks et al. (2002) determined that five or more length samples per year were acceptable for their stock assessment analysis, so mean lengths are not presented where this criterion is not met. Additional summaries of mean length, with sample sizes, are

presented for the main oreo fisheries in OEO 3A and OEO 4. Scaled mean length by two depth categories separated at 900 m are calculated for the south Chatham Rise portion of OEO 3A for black oreo only. Mean length data are provided by five major fishing areas, plus the remaining area, within OEO 4 for both species. Sex ratios (percentage male) are calculated for each species by fishing area and fishing year. Length distribution plots of observer data that have been appropriately scaled and groomed have been presented in oreo stock assessments including for OEO 3A black oreo (Doonan et al. 2004) and OEO 3A smooth oreo Doonan et al. (unpublished results), and Pukaki smooth oreo (R.Coburn, NIWA, pers comm.), and are not repeated here.

3.5 Female reproductive summaries

Hart & McMillan (2006) noted that gonad staging data has been a requirement for observers in the past, although of low priority, but was not requested in the 2002 observer manual. Also that the usefulness of the data is compromised by the possibility that staging definitions used by observers may be a mixture of the four-stage oreo scale contained in the 1992 observer manual, (Ministry of Fisheries 1992) and the five-stage orange roughy scale (below) provided in the 1992 and 2002 observer manual, (Ministry of Fisheries 2002). In the five-stage scale, stages 3 and 4 are equivalent to stage 3 in the four-stage scale.

Stage	Name
1	Immature/resting
2	Maturing
3	Ripening
4	Running ripe
5	Spent

Gonad stage data from black oreo and smooth oreo females sampled from the south Chatham Rise (OEO 3A and OEO 4 south of 44° S) by OP observers were tabulated for the fishing years 1979–80 to 2003–2004 by stage and month for all years combined in Hart & McMillan (2006). Data were not presented separately by fishing area and fishing year due to the sparse collection of data. Smooth oreo reproductive condition data from ORMC observers included active spawning stages from all months (except October). This is at variance with research findings and therefore ORMC data are not reported. Reproductive data were not requested from OP observers in 2004–05, and no reproductive data were collected for black oreo from OEO 3A or OEO 4 in this fishing year, and only a few records (245) were reported for smooth oreo. Due to the comparability issues in the data caused by the mix of staging methods, and the paucity of data in the last fishing year, female reproductive summaries have not been produced.

3.6 Otolith collection

Numbers of otoliths collected by observers and the number of tows from which otolith samples were taken are tabulated by fishing area and fishing year for black oreo and smooth oreo. These data were selected from the *age* database.

3.7 Biological data from research surveys

Biological data for black oreo and smooth oreo have been recorded on research surveys since the first deepwater survey, by *R.V. Wesermünde* in 1979. Research data are sourced from a variety of vessels and survey types including deepwater and middle depth random trawl surveys, juvenile (fine mesh) surveys, and acoustic surveys where fish marks are targeted. Data from all research surveys are tabulated by fishing area and fishing year by tow and number of fish measured for black oreo and smooth oreo.

4. RESULTS

Target oreo observer coverage

The number of expected oreo observer samples compared to the actual OP oreo observer samples achieved is summarised in Table 1. The targeted oreo coverage is for combined oreo (OEO) by management area rather than separately for black oreo and smooth oreo. For half (four) of the years tabulated, coverage in the large oreo fisheries in OEO 3A and OEO 4 exceeded the number of oreo samples required, although the target number of samples was not met in the last two fishing years. The proportion of the samples that were smooth oreo from OEO 3A and OEO 4 varied, but always favoured smooth oreo, often by a large margin. In OEO 1 and OEO 6 target oreo coverage was seldom met, except for two years in OEO 1, and was nearly met in the last fishing year in OEO 6. In OEO 1 the proportion of the samples achieved that contained smooth oreo data fluctuated, but samples were mostly smooth oreo in the later years. In OEO 6 the proportion of smooth oreo varied, but was generally large and always favoured smooth oreo.

4.1 Black oreo

OEO 3A south of 44° S

The percentage of the commercial catch of black oreo with observed trawls from which biological samples were taken in OEO 3A varied considerably between fishing years (Table 2). Coverage levels were highest from 1999–2000 to 2002–03 but dropped in the last two fishing years. The number of trips and tows sampled (Tables 3 and 4) fluctuated, with mostly low sampling before 1988–89 and from 1992–93 to 1998–99. There was a large increase in the numbers of fish measured in 1999–2000 and 2000–01, but previous years had an erratic sampling history and sampling declined again from 2001–02 to 2004–05 (Table 5).

Sex ratios, percentage male, are presented in Table 6. Ratios in OEO 3A varied between fishing years, with 52% male from all years for all OP data. Mean length of black oreo appeared to decline from 1979–80 to 2004–05 by about 2 cm for males and about 3 cm for females (Table 7). The means (male, female) at the end of the data series are less than those at the start, but are variable among years, with an apparent increase in the last fishing year. Doonan et al. (1999) examined black oreo observer length sampling and found a spatial pattern to the distribution of small and large fish and an erratic sampling history. Smaller fish (32 cm or less) were caught in shallower water than larger fish and in some years most of the samples came from shallow water and consequently scaled mean annual length was less in those years. This pattern is shown in our data when black oreo mean lengths are calculated with a depth partition (Table 8). Mean lengths from the shallow strata average 30 cm and 31 cm respectively for males and females, and 33 cm for both sexes in the deep strata. In the shallow strata mean lengths appear to be increasing slightly since 1999–2000 for both sexes, whereas in the deep strata mean lengths are about 5 cm less in the later years than in the earliest year.

OEO 4 south of 44° S

There was a very erratic sampling history with good numbers of samples from the early to mid 1990s, but few samples from 1995–96 to 1999–2000. Sampling peaked in 2002–03, declined again in 2003–04 and picked up in 2004–05 (Tables 2 to 5). Sex ratios fluctuated with an overall ratio of 53% males from all OP data for all years. The total area mean length fluctuated for both sexes (See Table 7) and there was no clear trend.

Strong spatial structure and the erratic nature of observer sampling were revealed when the data were analysed by fishing area (Tables 9 to 11). Area 1, which is dominated by flat bottom and dropoffs, was sparsely sampled with the first data taken in 1988–89, even though the area was fished by Soviet vessels from and before 1981 (McMillan 1985). Numerous samples were taken in areas 3 and 4 from 1990–91 to 1994–95 during development of fishing on seamounts in those areas, but few samples were taken from 1994–95 to 2001–02. Samples increased for areas 1 and 3 in the last fishing year 2004–05. Distribution of observed tows locations by fishing area from the last fishing year 2004–05, and from previous fishing years, are shown in Figure 4.

Other areas

Observer coverage in OEO 6 fishing areas Pukaki east and Auckland Islands/Macquarie Ridge started in 1996–97 with OP observers, ORMC sampling lasted from 1998–99 to 2001–2002, and commercial fishing in OEO 6 began in the early 1980s. The Bounty Plateau fishing area had adequate sampling in one year only. Fishing areas in OEO 1 (Puysegur and Southland) seldom had observer sampling greater than 10% of the commercial catch. Sampling increased in some areas in the last 2–8 years (see Tables 2 to 5). The areas where numbers of samples were acceptable included Southland, Pukaki Rise (east), Auckland Island/Macquarie Ridge, and Puysegur/Snares. Mean lengths by area are shown in Table 7. Distribution of observed tows locations from the last fishing year 2004–05, and from previous fishing years, are shown in Figure 2.

Otolith collection

Black oreo otoliths have been intermittently collected since 1991–92 (Tables 12 and 13), but this is not surprising as otoliths have only been requested since 2002. There are a total of 2316 otoliths archived from observer sources.

Biological data from research surveys

The number of research tows where black oreo were caught and the number of fish measured by area and fishing year are presented (Tables 14 and 15). These data come from 102 individual research surveys: about 15% are from middle depth trips where survey depth ranges overlapped oreo depths. Of the deepwater surveys, many were designed to target orange roughy adults or juveniles, some were random trawl surveys, and others targeted acoustic marks.

4.2 Smooth oreo

OEO 3A south of 44° S, smooth oreo

The percentage of the commercial catch of smooth oreo with observed trawls from which biological samples were taken shows a similar pattern to that for black oreos. Coverage levels were highest from 1999–2000 to 2002–03 (Table 16), but dropped in the last two fishing years. The number of trips and tows sampled (Tables 17 and 18) fluctuated, with a period of low sampling in the 1990s. There was a large increase in the numbers of fish measured from 1999–2000 to 2002–03, but previous years had an erratic sampling history and sampling declined again in 2003–04 (Table 19).

Sex ratios, percentage male, fluctuated between fishing years: the total percentage male from all years for all OP data was 48% (Table 20). Mean length for males and females appeared to decline by about 1 cm from 1988–89 to 2004–05 (Table 21).

OEO 4 south of 44° S, smooth oreo

There were few samples taken in the early years of the observer programme (1986 on), but numbers of samples increased from 1988–89 (see Tables 17 and 18). The total number of fish measured in OEO 4 for all years was over 92 000, making it the most sampled area. Sampling increased in 2004–05 with 8 780 fish measured (see Table 19). The total area mean length appeared to decline from 1988–89 to 2004–05 for males and females (Table 21).

Analyses by fishing area showed that the sampling had a spatial structure, e.g., sampling in the early years came from tows in the flat/dropoff (Area 1). There were numerous samples from Areas 3 and 4 from 1990–91 to 1994–95, then few samples in the next five years (Tables 22 and 23). Sample sizes were generally much larger than those made in the same area and time for black oreo, although sampling was erratic. Sample sizes increased in the last four fishing years, reaching a maximum of 134 tows in 2002–03, but many of these tows had few fish measured. Mean length by fishing area in OEO 4 south of 44° S (Table 24) indicates that larger fish tend to be caught in the more recently fished hill areas (Areas 3 and 4), rather than in the areas containing flat bottom (Areas 1 and 6, and the rest of OEO 4) or the older and probably more heavily fished hills (Areas 2 and 5). Distribution of observed tows locations by fishing area from the last fishing year 2004–05, and from previous fishing years, are shown in Figure 5.

Other areas

Biological sampling for smooth oreos in other than the main fishing areas in OEO 3A and OEO 4 included samples provided by ORMC from 1998–99 to 2001–2002. Within fishing areas in OEO 1 and OEO 6, generally more smooth oreo tows were sampled and fish measured than for black oreo (see Tables 1, 17 and 18). A number of fishing areas frequently had over 1000 fish measured per fishing year including; Southland, Pukaki (east), Bounty Plateau, Auckland Island/Macquarie Ridge, Puysegur/Snares (Table 19). Sex ratios for these areas were highly variable and in some areas appear to indicate imbalance in sex selection (Table 20). Mean lengths are given in Table 21 but comparisons are difficult because of the variable sampling. Distribution of observed tows locations from the last fishing year 2004–05, and from previous fishing years, are shown in Figure 3.

Otolith collection

Smooth oreo otoliths were also only intermittently collected since 1991–92 (Tables 25 and 26). Most were collected from 2002–2003 onward when otoliths were added to the requests in the observer manual. There are 5428 otoliths archived from observer sources.

Biological data from research surveys

The number of research tows where smooth oreo were caught, and the number of fish measured by area and fishing year are presented in Tables 27 and 28. These data come from 138 individual research surveys, and only 5% are from middle depth trips compared to 15% for black oreo due to the deeper minimum depth range of smooth oreos. Many of the deepwater surveys were designed to target orange roughy adults or juveniles. Those that targeted oreos were either random trawl surveys or targeted acoustic marks. The use of smooth oreo research data in stock assessment is not considered in this report.

5. ACKNOWLEDGMENTS

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Table 1: The number of observer samples expected for oreos by the Ministry of Fisheries for the fishing years 1997–98 to 2004–05, by oreo management area, and the number of actual OP oreo samples, and the proportion of the actual OP samples that were from smooth oreo. * complied from Ministry of Fisheries tender background documents.

	OEO 3A / OEO 4			OEO 1			OEO 6		
	Expected*	Actual	% SSO	Expected*	Actual	% SSO	Expected*	Actual	% SSO
1997–98	100	91	69	60	30	40	140	76	66
1998–99	100	80	89	60	43	21	140	55	51
1999–00	100	251	51	60	110	67	140	82	82
2000–01	100	354	57	60	27	44	100	44	64
2001–02	190	149	57	60	83	61	100	71	82
2002–03	190	235	67	60	19	68	100	62	71
2003–04	190	118	69	60	16	94	100	54	57
2004–05	190	167	76	60	33	76	100	99	68

Table 2: All fishing areas, black oreo. Summary of weight of catch sampled for black oreo length measurement by OP and ORMC observers by fishing area relative to the estimated catch of black oreo taken from the fishing area. The figures shown are percentages, rounded to the nearest percent. 0, no sampled catch; *, less than 0.5 % of catch sampled. See section 3.2 and Figure 1 for an explanation of the areas.

	OEO3A ncr	OEO4 ncr	OEO3A scr	OEO4 scr	Southland	Pukaki west	Pukaki east	Bounty	Auckland	Puysegur	All areas
OP											
1979-80	0	0	2	0	0	0	0	0	0	0	1
1980-81	0	0	0	0	0	0	0	0	0	0	0
1981-82	0	0	0	0	0	0	0	0	0	0	0
1982-83	0	0	0	0	0	0	0	0	0	0	0
1983-84	0	0	0	0	0	0	0	0	0	0	0
1984-85	0	0	0	0	0	0	0	0	0	0	0
1985-86	0	0	*	0	0	0	0	0	0	0	0
1986-87	0	0	3	0	0	0	0	0	0	0	2
1987-88	0	0	2	0	0	0	0	0	0	0	1
1988-89	0	12	9	3	1	0	0	0	0	0	7
1989-90	0	0	7	0	0	0	0	0	0	0	4
1990-91	0	2	1	9	0	0	0	0	0	0	1
1991-92	0	0	8	27	0	0	0	0	0	*	9
1992-93	0	3	0	21	0	0	0	0	0	2	3
1993-94	0	0	2	15	*	0	0	0	0	3	4
1994-95	0	26	1	12	*	0	0	0	0	7	4
1995-96	0	0	1	2	2	0	0	0	0	1	1
1996-97	0	11	1	1	*	100	2	0	21	32	5
1997-98	0	1	3	1	6	0	7	0	0	8	5
1998-99	0	0	0	4	0	0	5	0	11	3	2
1999-00	1	2	18	5	9	1	2	0	3	8	12
2000-01	4	*	36	7	0	0	5	*	0	0	21
2001-02	0	*	14	8	19	0	1	0	19	5	10
2002-03	0	4	34	6	0	*	5	39	2	8	12
2003-04	0	0	4	4	1	8	6	0	1	0	4
2004-05	0	15	11	13	8	0	10	3	0	2	9
ORMC											
1998-99	0	0	0	0	5	0	19	0	12	14	5
1999-00	0	0	0	0	0	0	0	0	0	1	0
2000-01	0	0	0	0	7	0	10	0	1	11	3
2001-02	0	0	0	0	2	0	7	0	9	*	2
2002-03	0	0	0	0	0	0	1	0	0	0	*
2003-04	0	0	0	0	0	0	0	0	0	0	0
Both											
All years	*	2	3	4	2	1	5	*	6	5	4

Table 3: All fishing areas, black oreo. Number of trips where OP and ORMC length samples were taken by fishing year. See section 3.2 and Figure 1 for an explanation of the areas.

	OEO3A ncr	OEO4 ncr	OEO3A scr	OEO4 scr	Southland	Pukaki west	Pukaki east	Bounty	Auckland	Puysegur	All areas
OP											
1979–80	0	0	3	0	0	0	0	0	0	0	3
1980–81	0	0	0	0	0	0	0	0	0	0	0
1981–82	0	0	0	0	0	0	0	0	0	0	0
1982–83	0	0	0	0	0	0	0	0	0	0	0
1983–84	0	0	0	0	0	0	0	0	0	0	0
1984–85	0	0	0	0	0	0	0	0	0	0	0
1985–86	0	0	1	0	0	0	0	0	0	0	1
1986–87	0	0	1	0	0	0	0	0	0	0	1
1987–88	0	0	2	0	0	0	0	0	0	0	2
1988–89	0	2	5	4	1	0	0	0	0	0	12
1989–90	0	0	3	0	0	0	0	0	0	0	3
1990–91	0	2	1	4	0	0	0	0	0	0	7
1991–92	0	1	2	6	0	0	0	0	0	1	10
1992–93	0	1	0	4	0	0	0	0	0	1	6
1993–94	0	0	6	9	1	0	0	0	0	5	21
1994–95	0	1	4	5	1	0	0	0	0	2	13
1995–96	0	0	4	4	1	0	0	0	0	1	10
1996–97	0	1	1	2	1	1	3	0	1	4	14
1997–98	0	1	6	4	2	0	3	0	0	4	20
1998–99	0	0	2	2	0	0	2	0	1	1	8
1999–00	1	1	11	2	5	1	4	0	2	4	31
2000–01	1	1	11	5	0	0	2	1	0	0	21
2001–02	0	1	8	4	3	1	3	0	1	1	22
2002–03	0	3	6	5	1	1	3	1	2	1	23
2003–04	0	1	4	4	1	1	5	0	1	0	17
2004–05	0	2	4	5	2	0	3	2	1	1	20
All years	2	18	85	69	19	5	28	3	9	26	265
ORMC											
1998–99	0	0	0	0	7	0	10	0	7	13	37
1999–00	0	0	0	0	1	0	1	0	0	1	3
2000–01	0	0	0	0	2	0	5	0	1	3	11
2001–02	0	0	0	0	3	0	4	0	3	1	11
2002–03	0	0	0	0	0	0	1	0	0	0	1
All years	0	0	0	0	13	0	21	0	11	18	63

Table 4: All fishing areas, black oreo. Number of tows where OP and ORMC length samples were taken by fishing year. See section 3.2 and Figure 1 for an explanation of the areas.

	OEO3A ncr	OEO4 ncr	OEO3A scr	OEO4 scr	Southland	Pukaki west	Pukaki east	Bounty	Auckland	Puysegur	All areas
OP											
1979–80	0	0	45	0	0	0	0	0	0	0	45
1980–81	0	0	0	0	0	0	0	0	0	0	0
1981–82	0	0	0	0	0	0	0	0	0	0	0
1982–83	0	0	0	0	0	0	0	0	0	0	0
1983–84	0	0	0	0	0	0	0	0	0	0	0
1984–85	0	0	0	0	0	0	0	0	0	0	0
1985–86	0	0	1	0	0	0	0	0	0	0	1
1986–87	0	0	8	0	0	0	0	0	0	0	8
1987–88	0	0	9	0	0	0	0	0	0	0	9
1988–89	0	2	43	7	1	0	0	0	0	0	53
1989–90	0	0	19	0	0	0	0	0	0	0	19
1990–91	0	2	15	23	0	0	0	0	0	0	40
1991–92	0	1	11	61	0	0	0	0	0	1	74
1992–93	0	1	0	25	0	0	0	0	0	9	35
1993–94	0	0	26	59	1	0	0	0	0	22	108
1994–95	0	1	7	39	1	0	0	0	0	4	52
1995–96	0	0	8	7	2	0	0	0	0	2	19
1996–97	0	1	4	2	2	1	7	0	2	30	49
1997–98	0	1	20	7	8	0	26	0	0	10	72
1998–99	0	0	6	3	0	0	8	0	19	34	143
1999–00	1	1	115	7	19	2	10	0	3	17	177
2000–01	1	1	136	15	0	0	14	1	1	15	211
2001–02	0	1	42	21	26	1	4	0	8	6	126
2002–03	0	7	28	42	1	1	13	1	3	5	103
2003–04	0	1	12	23	1	1	21	0	1	0	60
2004–05	0	2	12	26	5	0	29	2	1	3	80
All years	2	22	567	367	93	6	227	4	38	158	1 484
ORMC											
1998–99	0	0	0	0	12	0	61	0	9	31	113
1999–00	0	0	0	0	0	0	1	0	0	2	3
2000–01	0	0	0	0	6	0	21	0	1	15	43
2001–02	0	0	0	0	7	0	10	0	5	2	24
2002–03	0	0	0	0	0	0	2	0	0	0	2
All years	0	0	0	0	25	0	95	0	15	50	185

Table 5: All fishing areas, black oreo. Number of fish measured by OP and ORMC observers by fishing year. See section 3.2 and Figure 1 for an explanation of the areas. See section 3.2 and Figure 1 for an explanation of the areas.

	OEO3A ncr	OEO4 ncr	OEO3A scr	OEO4 scr	Southland	Pukaki west	Pukaki East	Bounty	Auckland Islands	Puysegur	All areas
OP											
1979–80	0	0	5 160	0	0	0	0	0	0	0	5 160
1980–81	0	0	0	0	0	0	0	0	0	0	0
1981–82	0	0	0	0	0	0	0	0	0	0	0
1982–83	0	0	0	0	0	0	0	0	0	0	0
1983–84	0	0	0	0	0	0	0	0	0	0	0
1984–85	0	0	0	0	0	0	0	0	0	0	0
1985–86	0	0	103	0	0	0	0	0	0	0	103
1986–87	0	0	978	0	0	0	0	0	0	0	978
1987–88	0	0	1 284	0	0	0	0	0	0	0	1 284
1988–89	0	182	5 284	899	100	0	0	0	0	0	6 344
1989–90	0	0	2 288	0	0	0	0	0	0	0	2 288
1990–91	0	131	1 541	2 625	0	0	0	0	0	0	4 297
1991–92	0	83	1 155	5 868	0	0	0	0	0	118	7 224
1992–93	0	101	0	2 719	0	0	0	0	0	932	3 752
1993–94	0	0	2 485	5 381	45	0	0	0	0	2 399	10 310
1994–95	0	99	805	4 308	11	0	0	0	0	335	5 558
1995–96	0	0	866	731	258	0	0	0	0	228	2 083
1996–97	0	104	504	177	211	104	784	0	218	3 223	5 325
1997–98	0	50	1 863	558	878	0	2 447	0	0	1 149	6 945
1998–99	0	0	825	526	0	0	635	0	187	3 180	2 657
1999–00	46	106	12 309	815	1 743	83	945	0	299	1 893	18 039
2000–01	20	15	13 751	628	0	0	932	1	0	1 500	15 347
2001–02	0	10	4 033	1 291	2 782	5	290	0	332	551	9 194
2002–03	0	123	2 720	1 367	25	25	1 121	25	57	447	5 910
2003–04	0	1	1 278	524	10	100	1 741	0	20	0	3 674
2004–05	0	40	1 171	2 364	252	0	2 802	48	6	136	6 819
All years	66	1 045	60 403	30 660	6 315	317	11 697	74	1 119	11 697	123 291
ORMC											
1998–99	0	0	0	0	1 265	0	5 876	0	896	2 696	10 733
1999–00	0	0	0	0	0	0	98	0	0	200	298
2000–01	0	0	0	0	599	0	2 106	0	71	1 500	4 276
2001–02	0	0	0	0	703	0	1 009	0	355	100	2 167
2002–03	0	0	0	0	0	0	290	0	0	0	290
All years	0	0	0	0	2 567	0	9 379	0	1 322	4 496	17 764

Table 6: All fishing areas, black oreo. Sex ratios (percent male) from OP and ORMC length/sex samples by fishing year. *, 1 to 3 samples, See section 3.2 and Figure 1 for an explanation of the areas.

	OEO3A ncr	OEO4 ncr	OEO3A scr	OEO4 scr	Southland	Pukaki west	Pukaki east	Bounty	Auckland Islands	Puysegur	All Areas
OP											
1979–80			50								50
1980–81											
1981–82											
1982–83											
1983–84											
1984–85											
1985–86			*								*
1986–87			64								64
1987–88			54								54
1988–89		*	49	55	*						50
1989–90			53								53
1990–91		*	61	57							59
1991–92			58	54						*	54
1992–93		*		51						54	52
1993–94			52	53	*					53	53
1994–95		*	55	53	*					*	52
1995–96			51	51	*					*	53
1996–97		*	*	*	*	*	56		*	54	55
1997–98		*	50	50	60		50			65	53
1998–99			54	*			54		47	51	52
1999–00	*	*	51	46	55	*	48		*	53	51
2000–01	*	*	52	48	44		51	*	*	46	51
2001–02		*	54	62	50	*	51		50	50	53
2002–03		65	51	53	*	*	60	*	*	47	53
2003–04		*	57	58	*	*	55		*		56
2004–05		*	47	51	62	*	53	*	*	*	51
All years	*	56	52	53	53	56	53	42	49	52	53
ORMC											
1998–99					50		54		47	53	53
1999–00					*		*			*	48
2000–01					*		50		*	*	48
2001–02					*		50		*	*	51
2002–03							*				54
All years					49		53		48	51	51

Table 7: All fishing areas, black oreo. Mean length by sex from OP and ORMC length samples, scaled by catch, by fishing year. –, no samples or less than 4 samples. See section 3.2 and Figure 1 for an explanation of the areas.

Males										
	OEO3A Ncr	OEO4 ncr	OEO3A scr	OEO4 scr	Southland	Pukaki west	Pukaki east	Bounty	Auckland Islands	Puysegur
OP										
1979–80	–	–	34.4	–	–	–	–	–	–	–
1980–81	–	–	–	–	–	–	–	–	–	–
1981–82	–	–	–	–	–	–	–	–	–	–
1982–83	–	–	–	–	–	–	–	–	–	–
1983–84	–	–	–	–	–	–	–	–	–	–
1984–85	–	–	–	–	–	–	–	–	–	–
1985–86	–	–	–	–	–	–	–	–	–	–
1986–87	–	–	33.6	–	–	–	–	–	–	–
1987–88	–	–	33.6	–	–	–	–	–	–	–
1988–89	–	–	29.6	31.4	–	–	–	–	–	–
1989–90	–	–	28.9	–	–	–	–	–	–	–
1990–91	–	–	32.6	34.6	–	–	–	–	–	–
1991–92	–	–	34.3	35.6	–	–	–	–	–	–
1992–93	–	–	–	36.8	–	–	–	–	–	34.7
1993–94	–	–	29.6	36.4	–	–	–	–	–	33.6
1994–95	–	–	33.9	33.0	–	–	–	–	–	–
1995–96	–	–	29.5	32.1	–	–	–	–	–	–
1996–97	–	–	–	–	–	–	34.4	–	–	34.2
1997–98	–	–	29.6	31.8	32.6	–	33.2	–	–	33.6
1998–99	–	–	31.0	–	–	–	32.8	–	35.0	32.3
1999–00	–	–	30.8	32.4	32.4	–	32.0	–	–	33.3
2000–01	–	–	31.1	34.6	–	–	32.2	–	–	–
2001–02	–	–	31.0	34.4	31.6	–	–	–	34.9	33.1
2002–03	–	35.6	31.3	35.4	–	–	31.4	–	–	31.7
2003–04	–	–	31.0	34.8	–	–	32.8	–	–	–
2004–05	–	–	32.0	35.6	32.8	–	32.5	–	–	–
ORMC										
1998–99	–	–	–	–	32.7	–	33.3	–	35.8	34.8
1999–00	–	–	–	–	–	–	–	–	–	–
2000–01	–	–	–	–	33.1	–	34.1	–	–	34.1
2001–02	–	–	–	–	34.2	–	34.3	–	37.4	–
OP + ORMC										
1998–99	–	–	31.0	–	32.7	–	33.2	–	35.4	34.5
1999–00	–	–	30.8	32.4	32.4	–	32.0	–	33.9	32.6
2000–01	–	–	31.1	34.6	33.1	–	33.6	–	–	34.1
2001–02	–	–	31.0	34.4	32.0	–	34.2	–	35.7	33.3

Table 7: continued.

Females

	OEO3A Ncr	OEO4 ncr	OEO3A scr	OEO4 scr	Southland	Pukaki west	Pukaki east	Bounty	Auckland Islands	Puysegur
OP										
1979–80	–	–	35.0	–	–	–	–	–	–	–
1980–81	–	–	–	–	–	–	–	–	–	–
1981–82	–	–	–	–	–	–	–	–	–	–
1982–83	–	–	–	–	–	–	–	–	–	–
1983–84	–	–	–	–	–	–	–	–	–	–
1984–85	–	–	–	–	–	–	–	–	–	–
1985–86	–	–	–	–	–	–	–	–	–	–
1986–87	–	–	33.8	–	–	–	–	–	–	–
1987–88	–	–	34.7	–	–	–	–	–	–	–
1988–89	–	–	30.4	34.1	–	–	–	–	–	–
1989–90	–	–	29.2	–	–	–	–	–	–	–
1990–91	–	–	34.6	36.3	–	–	–	–	–	–
1991–92	–	–	35.3	37.1	–	–	–	–	–	–
1992–93	–	–	–	37.8	–	–	–	–	–	35.9
1993–94	–	–	30.1	37.8	–	–	–	–	–	33.9
1994–95	–	–	35.5	34.8	–	–	–	–	–	–
1995–96	–	–	30.1	32.8	–	–	–	–	–	–
1996–97	–	–	–	37.2	–	–	35.2	–	–	34.6
1997–98	–	–	30.3	31.3	33.7	–	33.8	–	–	34.8
1998–99	–	–	31.4	33.0	–	–	33.7	–	34.7	–
1999–00	–	–	31.3	33.7	33.0	–	32.7	–	–	33.9
2000–01	–	–	31.7	37.0	–	–	33.1	–	–	–
2001–02	–	–	31.7	37.8	32.2	–	–	–	37.3	–
2002–03	–	37.2	31.8	36.9	–	–	32.6	–	–	31.5
2003–04	–	–	32.1	35.0	–	–	33.5	–	–	–
2004–05	–	–	32.6	36.1	33.3	–	33.3	–	–	–
ORMC										
1998–99	–	–	–	–	33.8	–	33.7	–	36.6	35.9
1999–00	–	–	–	–	–	–	–	–	–	–
2000–01	–	–	–	–	33.7	–	34.7	–	–	34.4
2001–02	–	–	–	–	35.1	–	35.2	–	39.2	–
OP + ORMC										
1998–99	–	–	31.5	–	33.8	–	33.7	–	35.9	35.9
1999–00	–	–	31.3	33.8	33.0	–	32.7	–	33.2	33.1
2000–01	–	–	31.7	37.0	33.7	–	34.2	–	–	34.4
2001–02	–	–	31.7	37.8	32.8	–	35.0	–	37.9	34.4

Table 8: OEO 3A, black oreo. Mean length (scaled by catch), number of OP tows and number of fish measured by depth and fishing year. See section 3.2 and Figure 1 for an explanation of the areas. –, no data or too few data to estimate a mean.

	< 900m				> 900m			
	Mean length		Tows	Total N	Mean length		Tows	Total N
	Males	Females			Males	Females		
1979–80	30.2	27.9	6	611	34.5	35.6	39	4 549
1980–81	–	–	0	0	–	–	0	0
1981–82	–	–	0	0	–	–	0	0
1982–83	–	–	0	0	–	–	0	0
1983–84	–	–	0	0	–	–	0	0
1984–85	–	–	0	0	–	–	0	0
1985–86	–	–	0	0	–	–	1	103
1986–87	33.0	32.6	6	707	–	–	2	271
1987–88	–	–	1	214	33.5	34.4	8	1 070
1988–89	28.9	29.3	33	4 278	33.6	35.3	10	1 006
1989–90	28.9	29.2	16	2 124	–	–	3	164
1990–91	29.3	30.7	5	512	33.2	35.0	10	1 029
1991–92	34.4	35.5	8	904	–	–	3	251
1992–93	–	–	0	0	–	–	0	0
1993–94	29.4	29.9	19	1 750	31.2	31.3	7	735
1994–95	–	–	3	335	–	–	4	470
1995–96	29.2	29.8	5	493	–	–	3	373
1996–97	–	–	4	504	–	–	0	0
1997–98	29.1	29.8	17	1 429	–	–	3	434
1998–99	–	–	3	367	–	–	3	458
1999–00	30.5	30.8	56	6 358	31.5	32.1	59	5 951
2000–01	30.6	31.2	71	7 017	32.2	32.5	65	6 734
2001–02	30.5	31.1	25	2 206	32.0	32.5	17	1 827
2002–03	31.4	31.9	20	2 084	30.9	31.1	8	636
2003–04	29.4	30.3	9	1 094	–	–	3	184
2004–05	31.9	32.5	8	892	–	–	4	279

Table 9: OEO 4 black oreo. Numbers of tows where OP and ORMC observer length/sex samples were taken by fishing year. See section 3.2 and Figure 1 for an explanation of the areas.

Fishing year	Area 1	Area 2	Area 3	Area 4	Area 5	Rest of OEO 4	Total
1988–89	5	0	0	0	1	2	7
1989–90	0	0	0	0	0	0	0
1990–91	2	0	21	0	0	2	23
1991–92	3	1	1	54	2	1	61
1992–93	0	0	16	9	0	1	25
1993–94	1	6	23	28	1	0	59
1994–95	1	4	3	30	0	2	39
1995–96	1	2	0	1	3	0	7
1996–97	0	0	1	1	0	1	2
1997–98	3	0	0	1	2	1	7
1998–99	2	0	0	0	0	1	3
1999–00	1	0	3	1	1	2	7
2000–01	6	0	6	0	1	3	15
2001–02	3	2	2	13	1	0	21
2002–03	2	0	11	29	0	5	47
2003–04	5	0	9	9	0	1	24
2004–05	5	1	11	6	2	2	27

Table 10: OEO 4 black oreo. Numbers of fish measured from OP and ORMC observers by fishing year. Total includes unsexed fish. See section 3.2 and Figure 1 for an explanation of the areas.

Fishing year	Area 1	Area 2	Area 3	Area 4	Area 5	Rest of OEO 4	Total
1988-89	764	0	0	0	35	171	899
1989-90	0	0	0	0	0	0	0
1990-91	171	0	2 454	0	0	131	2 625
1991-92	220	57	100	5 298	193	83	5 868
1992-93	0	0	1 775	944	0	101	2 719
1993-94	144	441	1 903	2 791	102	0	5 381
1994-95	182	349	288	3 463	0	216	4 399
1995-96	128	193	0	102	308	0	731
1996-97	0	0	85	92	0	104	177
1997-98	152	0	0	103	204	99	558
1998-99	259	0	0	0	0	267	526
1999-00	122	0	328	97	156	218	815
2000-01	162	0	228	0	20	233	628
2001-02	245	31	54	1 009	52	0	1 391
2002-03	40	0	699	628	0	106	1 473
2003-04	205	0	129	206	0	1	541
2004-05	840	18	1 042	306	143	396	2 745

Table 11: OEO 4 black oreo. Mean length by sex from OP and ORMC observer length samples, data scaled by catch, by fishing year. See section 3.2 and Figure 1 for an explanation of the areas. See text and Figure 4 for an explanation of the areas. -, no data or too few data to estimate a mean.

Males	Area 1	Area 2	Area 3	Area 4	Area 5	Rest of OEO 4
OP						
1988-89	29.3	-	-	-	-	-
1989-90	-	-	-	-	-	-
1990-91	-	-	35.7	-	-	-
1991-92	-	-	-	35.5	-	-
1992-93	-	-	37.1	35.8	-	-
1993-94	-	26.7	36.8	36.0	-	-
1994-95	-	-	-	33.0	-	-
1995-96	-	-	-	-	-	-
1996-97	-	-	-	-	-	-
1997-98	-	-	-	-	-	-
1998-99	-	-	-	-	-	-
1999-00	-	-	-	-	-	-
2000-01	31.9	-	38.2	-	-	-
2001-02	-	-	-	35.0	-	-
2002-03	-	-	36.3	34.2	-	35.6
2003-04	32.1	-	36.6	34.0	-	-
2004-05	32.7	-	36.5	36.0	-	-

Table 11: continued.

Females	Area 1	Area 2	Area 3	Area 4	Area 5	Rest of OEO 4
OP						
1988–89	29.7	–	–	–	–	–
1989–90	–	–	–	–	–	–
1990–91	–	–	37.5	–	–	–
1991–92	–	–	–	37.1	–	–
1992–93	–	–	38.0	37.4	–	–
1993–94	–	27.4	38.1	37.6	–	–
1994–95	–	–	–	34.9	–	–
1995–96	–	–	–	–	–	–
1996–97	–	–	–	–	–	–
1997–98	–	–	–	–	–	–
1998–99	–	–	–	–	–	–
1999–00	–	–	–	–	–	–
2000–01	32.4	–	40.9	–	–	–
2001–02	–	–	–	38.2	–	–
2002–03	–	–	38.2	35.6	–	37.2
2003–04	–	–	35.7	37.7	–	–
2004–05	34.4	–	36.7	38.1	–	–

Table 12: All fishing areas, black oreo. Number of tows where otoliths were collected by OP Observers by fishing year. See section 3.2 and Figure 1 for an explanation of the areas.

	OEO3A ncr	OEO4 ncr	OEO3A scr	OEO4 scr	Southland	Pukaki west	Pukaki east	Bounty	Auckland Islands	Puysegur	All areas
OP											
1991–92	0	0	0	9	0	0	0	0	0	0	9
1992–93	0	0	0	11	0	0	0	0	0	0	11
1993–94	0	0	0	1	0	0	0	0	0	0	1
1994–95	0	0	0	1	1	0	0	0	0	1	3
1995–96	0	0	0	3	0	0	0	0	0	0	3
1996–97	0	0	0	0	0	0	0	0	0	0	0
1997–98	0	0	0	0	0	0	6	0	0	2	8
1998–99	0	0	0	0	0	0	0	0	0	1	1
1999–00	0	0	0	0	0	0	0	0	0	0	0
2000–01	0	0	0	0	0	0	0	0	0	0	0
2001–02	0	0	0	0	2	1	0	0	0	0	3
2002–03	0	5	22	21	1	1	12	0	4	4	70
2003–04	0	0	11	5	1	0	17	0	0	0	34
2004–05	0	2	10	23	5	0	25	1	1	1	68
All years	0	7	43	74	10	2	60	1	5	9	211

Table 13: All fishing areas, black oreo. Number of otoliths collected by OP observers by fishing year. See section 3.2 and Figure 1 for an explanation of the areas.

OP	OEO3A ncr	OEO4 Ncr	OEO3A scr	OEO4 scr	Southland	Pukaki west	Pukaki east	Bounty	Auckland Islands	Puysegur	All areas
1991-92	0	0	0	137	0	0	0	0	0	0	137
1992-93	0	0	0	104	0	0	0	0	0	174	278
1993-94	0	0	0	25	0	0	0	0	0	0	25
1994-95	0	0	0	20	10	0	0	0	0	18	48
1995-96	0	0	0	60	0	0	0	0	0	0	60
1996-97	0	0	0	0	0	0	0	0	0	0	0
1997-98	0	0	0	0	0	0	30	0	0	10	40
1998-99	0	0	0	0	0	0	0	0	0	25	25
1999-00	0	0	0	0	0	0	0	0	0	0	0
2000-01	0	0	0	0	0	0	0	0	0	0	0
2001-02	0	0	0	0	19	4	0	0	0	0	23
2002-03	0	16	295	158	5	5	125	0	36	48	688
2003-04	0	0	123	37	5	0	146	0	0	0	311
2004-05	0	13	148	211	25	0	258	10	6	10	681
All years	0	29	566	752	64	9	559	10	42	285	2 316

Table 14: All fishing areas, black oreo. The number of research tows that caught black oreo by fishing year. See section 3.2 and Figure 1 for an explanation of the areas.

OP	OEO3A ncr	OEO4 Ncr	OEO3A scr	OEO4 scr	Southland	Pukaki west	Pukaki east	Bounty	Auckland Islands	Puysegur	All areas
1978-79	0	0	0	2	0	0	0	0	0	0	2
1979-80	0	0	4	0	0	0	0	0	0	0	4
1980-81	0	1	0	2	0	0	0	0	0	0	3
1981-82	0	0	14	8	0	14	0	0	0	0	36
1982-83	1	2	10	1	0	9	0	0	0	0	23
1983-84	0	0	69	0	2	67	0	0	0	0	138
1984-85	0	1	13	4	0	8	0	0	0	0	26
1985-86	9	3	3	16	0	4	0	0	0	0	35
1986-87	0	4	73	86	0	25	0	0	0	0	188
1987-88	2	6	86	98	0	36	0	0	0	0	228
1988-89	3	0	4	7	0	6	0	0	0	0	20
1989-90	1	3	13	16	2	9	1	1	0	0	46
1990-91	0	1	50	58	6	39	3	2	1	47	207
1991-92	0	10	50	90	5	62	2	0	0	62	281
1992-93	0	5	30	97	1	14	0	0	1	2	150
1993-94	10	42	65	174	0	16	0	0	0	9	316
1994-95	0	7	3	4	0	1	0	0	2	35	52
1995-96	1	15	30	139	3	19	4	0	0	0	211
1996-97	1	10	12	2	0	11	0	0	0	0	36
1997-98	0	11	50	16	1	18	3	0	0	0	99
1998-99	0	45	4	82	0	2	0	0	0	0	133
1999-00	0	1	4	12	0	0	0	0	0	0	17
2000-01	0	1	3	48	3	10	2	0	0	3	70
2001-02	0	37	11	89	2	13	2	0	0	1	155
2002-03	0	2	16	2	1	15	1	0	0	0	37
2003-04	0	6	4	4	3	6	4	0	0	0	27
2004-05	3	19	4	1	4	1	1	0	0	0	33
All years	28	232	625	1 058	33	405	23	3	4	159	2 573

Table 15: All fishing areas, black oreo. The number of fish measured during research surveys by fishing year. See section 3.2 and Figure 1 for an explanation of the areas.

	OEO3A ncr	OEO4 ncr	OEO3A scr	OEO4 scr	Southland	Pukaki west	Pukaki east	Bounty	Auckland Islands	Puysegur	All areas
OP											
1978-79	0	0	0	304	0	0	0	0	0	0	304
1979-80	0	0	584	0	0	0	0	0	0	0	584
1980-81	0	386	0	669	0	0	0	0	0	0	1 055
1981-82	0	0	2 641	645	0	0	0	0	0	0	3 286
1982-83	115	271	1 644	142	0	0	0	0	0	0	2 172
1983-84	0	0	12 334	0	322	0	0	0	0	0	12 656
1984-85	0	152	1 723	560	0	0	0	0	0	0	2 435
1985-86	190	405	201	1 250	0	0	0	0	0	0	2 046
1986-87	0	770	7 671	7 098	0	0	0	0	0	0	15 539
1987-88	36	909	9 396	9 588	0	0	0	0	0	0	19 929
1988-89	319	0	218	773	0	0	0	0	0	0	1 310
1989-90	84	313	1 900	1 970	159	0	78	56	0	0	4 560
1990-91	0	240	6 005	5 375	503	219	232	5	41	7 218	19 838
1991-92	0	760	4 899	8 783	472	30	237	0	0	8 924	24 105
1992-93	0	620	2 575	7 377	181	263	0	0	146	307	11 469
1993-94	32	1 401	5 057	16 712	0	0	0	0	0	42	23 244
1994-95	0	572	202	181	0	0	0	0	4	2 804	3 763
1995-96	2	648	4 610	8 537	289	114	434	0	0	0	14 634
1996-97	4	128	924	223	0	0	0	0	0	0	1 279
1997-98	0	22	6 296	1 164	144	551	322	0	0	0	8 499
1998-99	0	766	671	14 019	0	0	0	0	0	0	15 456
1999-00	0	1	526	1 129	0	0	0	0	0	0	1 656
2000-01	0	214	536	19 668	305	444	255	0	0	13	21 435
2001-02	0	1 837	2 609	13 571	294	450	432	0	0	2	19 195
2002-03	0	110	3 343	332	3	331	207	0	0	0	4 326
2003-04	0	23	300	339	24	154	458	0	0	0	1 298
2004-05	4	47	416	188	194	3	9	0	0	0	861
All years	786	595	77 281	597	2 890	2 559	2 664	61	191	19 310	236 934

Smooth oreo

Table 16: All fishing areas, smooth oreo. Summary of weight of catch sampled for smooth oreo length measurement by OP and ORMC observers by fishing area relative to the estimated catch of smooth oreo taken from the fishing area. The figures shown are percentages, rounded to the nearest percent. 0, no catch; *, less than 0.5 % of catch sampled. See section 3.2 and Figure 1 for an explanation of the areas.

	OEO3A ncr	OEO4 ncr	OEO3A scr	OEO4 scr	Southland	Pukaki west	Pukaki east	Bounty	Auckland Islands	Puysegur	All areas
OP											
1979–80	0	0	2	0	0	0	0	0	0	0	2
1980–81	0	0	0	0	0	0	0	0	0	0	0
1981–82	0	0	0	0	0	0	0	0	0	0	0
1982–83	0	0	0	0	0	0	0	0	0	0	0
1983–84	0	0	0	0	0	0	0	0	0	0	0
1984–85	0	0	0	0	0	0	0	0	0	0	0
1985–86	0	6	0	0	0	0	0	0	0	0	*
1986–87	0	37	4	*	0	0	0	0	0	0	2
1987–88	0	55	0	0	0	0	0	0	0	0	0
1988–89	1	45	8	1	0	0	0	0	0	0	4
1989–90	0	0	1	0	0	0	0	0	0	0	1
1990–91	0	2	5	12	0	0	0	0	0	0	7
1991–92	0	1	2	12	0	0	0	0	0	0	7
1992–93	0	2	0	5	0	0	0	0	0	3	2
1993–94	1	12	1	11	*	0	0	0	2	0	5
1994–95	0	6	2	14	8	0	0	5	15	*	9
1995–96	0	11	0	13	1	0	0	1	0	1	5
1996–97	0	7	1	12	6	0	*	0	3	5	6
1997–98	0	2	2	7	1	0	4	1	46	9	7
1998–99	1	3	4	10	0	0	3	0	11	9	7
1999–00	3	2	14	10	16	*	17	13	11	26	13
2000–01	2	1	32	9	*	0	2	28	0	1	7
2001–02	*	6	18	9	12	1	15	3	25	5	11
2002–03	0	4	32	8	7	0	8	14	13	8	10
2003–04	*	6	5	9	15	3	5	1	6	6	7
2004–05	0	7	8	14	18	1	11	15	14	18	11
ORMC											
1998–99	0	0	0	0	7	24	12	18	12	13	0
1999–00	0	0	0	0	1	0	*	0	0	*	0
2000–01	0	0	0	1	21	35	6	8	17	13	0
2001–02	0	0	0	0	14	15	11	3	12	15	0
2002–03	0	0	0	0	1	4	*	0	0	0	5
2003–04	0	0	0	0	0	0	0	0	0	0	*
Both											
All years	*	6	3	6	8	10	9	10	16	9	2

Table 17: All fishing areas, smooth oreo. Number of trips where OP and ORMC length samples were taken by fishing year. See section 3.2 and Figure 1 for an explanation of the areas.

	OEO3A ncr	OEO4 ncr	OEO3A scr	OEO4 scr	Southland	Pukaki west	Pukaki east	Bounty	Auckland Islands	Puysegur	All areas
OP											
1979–80	0	0	3	0	0	0	0	0	0	0	3
1980–81	0	0	0	0	0	0	0	0	0	0	0
1981–82	0	0	0	0	0	0	0	0	0	0	0
1982–83	0	0	0	0	0	0	0	0	0	0	0
1983–84	0	0	0	0	0	0	0	0	0	0	0
1984–85	0	0	0	0	0	0	0	0	0	0	0
1985–86	0	0	1	0	0	0	0	0	0	0	1
1986–87	0	0	2	2	1	0	0	0	0	0	5
1987–88	0	0	3	0	0	0	0	0	0	0	3
1988–89	0	4	3	4	1	0	0	0	0	0	12
1989–90	0	1	0	2	0	0	0	0	0	0	3
1990–91	0	2	1	6	0	0	0	0	0	0	9
1991–92	0	3	2	4	0	0	0	1	0	1	11
1992–93	0	2	0	5	0	0	0	0	0	1	8
1993–94	2	5	6	10	1	0	0	0	1	4	29
1994–95	0	3	3	11	1	0	0	2	1	1	22
1995–96	0	2	2	5	1	0	0	1	0	2	13
1996–97	0	3	1	4	1	0	1	0	1	2	13
1997–98	0	4	3	4	2	0	2	1	5	4	25
1998–99	2	2	1	4	0	0	2	0	2	1	14
1999–00	4	3	10	4	5	1	5	3	4	5	44
2000–01	5	4	9	5	1	0	3	4	1	2	34
2001–02	1	6	5	6	4	3	3	1	1	2	32
2002–03	0	5	3	9	2	1	3	3	3	2	31
2003–04	1	6	2	8	2	1	5	3	1	1	30
2004–05	0	5	3	7	2	1	5	5	1	1	30
All years	15	60	63	100	24	7	29	24	21	29	372
ORMC											
1998–99	0	0	0	0	11	1	10	8	13	17	60
1999–00	0	0	0	0	1	0	1	0	0	1	3
2000–01	0	0	0	2	6	4	6	3	6	5	32
2001–02	0	0	0	0	10	4	5	2	4	2	27
2002–03	0	0	0	0	1	1	1	0	0	0	3
All years	0	0	0	2	29	10	23	13	23	25	125

Table 18: All fishing areas, smooth oreo. Number of tows where OP and ORMC length samples were taken by fishing year. See section 3.2 and Figure 1 for an explanation of the areas.

	OEO3A ncr	OEO4 ncr	OEO3A scr	OEO4 scr	Southland	Pukaki west	Pukaki East	Bounty	Auckland Islands	Puysegur	All areas
OP											
1979–80	0	0	32	0	0	0	0	0	0	0	32
1980–81	0	0	0	0	0	0	0	0	0	0	0
1981–82	0	0	0	0	0	0	0	0	0	0	0
1982–83	0	0	0	0	0	0	0	0	0	0	0
1983–84	0	0	0	0	0	0	0	0	0	0	0
1984–85	0	0	0	0	0	0	0	0	0	0	0
1985–86	0	0	1	0	0	0	0	0	0	0	1
1986–87	0	0	4	7	1	0	0	0	0	0	12
1987–88	0	0	10	0	0	0	0	0	0	0	10
1988–89	0	9	15	20	2	0	0	0	0	0	46
1989–90	0	1	0	4	0	0	0	0	0	0	5
1990–91	0	5	28	46	0	0	0	0	0	0	79
1991–92	0	3	9	78	0	0	0	4	0	1	95
1992–93	0	3	0	29	0	0	0	0	0	8	40
1993–94	4	11	24	98	1	0	0	0	1	8	147
1994–95	0	11	8	70	3	0	0	3	6	2	103
1995–96	0	3	2	32	2	0	0	4	0	2	45
1996–97	0	7	3	42	4	0	1	0	4	6	67
1997–98	0	9	14	40	3	0	15	1	34	9	125
1998–99	3	5	5	58	0	0	9	0	19	9	108
1999–00	6	7	82	32	36	1	36	8	22	38	268
2000–01	12	12	97	80	4	0	14	13	1	8	241
2001–02	1	15	22	47	43	5	18	5	30	8	194
2002–03	0	48	25	85	8	1	11	12	20	5	215
2003–04	1	23	4	54	13	1	17	4	9	2	128
2004–05	0	29	12	86	13	1	27	31	8	12	219
All years	27	201	397	908	133	9	133	85	154	118	2 180
ORMC											
1998–99	0	0	0	0	31	1	61	35	40	46	214
1999–00	0	0	0	0	1	0	5	0	0	2	8
2000–01	0	0	0	7	41	13	24	4	41	38	168
2001–02	0	0	0	0	43	17	25	4	22	7	118
2002–03	0	0	0	0	1	3	1	0	0	0	5
All years	0	0	0	7	117	34	116	43	103	93	513

Table 19: All fishing areas, smooth oreo. Number of fish measured by OP and ORMC observers by fishing year. See section 3.2 and Figure 1 for an explanation of the areas.

	OEO3A ncr	OEO4 ncr	OEO3A scr	OEO4 scr	Southland	Pukaki west	Pukaki east	Bounty	Auckland Islands	Puysegur	All areas
OP											
1979–80	0	0	3 499	0	0	0	0	0	0	0	3 499
1980–81	0	0	0	0	0	0	0	0	0	0	0
1981–82	0	0	0	0	0	0	0	0	0	0	0
1982–83	0	0	0	0	0	0	0	0	0	0	0
1983–84	0	0	0	0	0	0	0	0	0	0	0
1984–85	0	0	0	0	0	0	0	0	0	0	0
1985–86	0	0	106	0	0	0	0	0	0	0	106
1986–87	0	0	387	992	119	0	0	0	0	0	1 498
1987–88	0	0	1 300	0	0	0	0	0	0	0	1 300
1988–89	0	418	1 540	2 707	189	0	0	0	0	0	4 854
1989–90	0	104	0	451	0	0	0	0	0	0	555
1990–91	0	432	3 029	6 374	0	0	0	0	0	0	9 835
1991–92	0	248	919	7 255	0	0	0	336	0	100	8 858
1992–93	0	330	0	3 077	0	0	0	0	0	869	4 276
1993–94	268	1 153	1 454	9 916	102	0	0	0	110	882	13 885
1994–95	0	1 009	778	7 515	139	0	0	318	603	17	10 379
1995–96	0	367	207	4 027	229	0	0	352	0	124	5 306
1996–97	0	675	365	4 837	438	0	40	0	427	509	7 291
1997–98	0	756	1 826	4 042	403	0	1 535	91	3 223	1 144	13 020
1998–99	294	680	770	7 981	0	0	523	0	1 155	1 188	12 591
1999–00	383	520	7 700	3 505	3 593	6	3 970	833	2 329	4 508	27 347
2000–01	739	561	9 450	6 689	178	0	825	864	17	153	19 476
2001–02	174	1 041	3 068	4 041	3 643	124	2 041	297	3 265	644	18 338
2002–03	0	891	1 667	5 293	720	25	1 085	1 055	1 883	558	13 177
2003–04	25	516	321	4 783	1 200	100	1 414	370	552	120	9 401
2004–05	0	985	881	8 780	943	105	2 153	3 901	1 081	755	19 584
All years	1 883	10 686	19 267	92 265	11 896	360	13 586	8 417	14 645	11 571	204 576
ORMC											
1998–99	0	0	0	0	3 449	100	5 924	3 491	4 100	4 217	21 281
1999–00	0	0	0	0	99	0	490	0	0	200	789
2000–01	0	0	0	654	4 009	1 250	2 340	410	3 990	3 788	16 441
2001–02	0	0	0	0	4 168	1 703	2 361	398	2 213	632	11 475
2002–03	0	0	0	0	100	348	99	0	0	0	547
All years	0	0	0	654	11 825	3 401	11 214	4 299	10 303	8 837	50 533

Table 20: All fishing areas, smooth oreo. Sex ratios (percent male) from OP and ORMC length/sex samples by fishing year. See section 3.2 and Figure 1 for an explanation of the areas.

	OEO3A ncr	OEO4 ncr	OEO3A scr	OEO4 scr	Southland	Pukaki west	Pukaki east	Bounty	Auckland Islands	Puysegur	All areas
OP											
1979–80			34								34
1980–81											
1981–82											
1982–83											
1983–84											
1984–85											
1985–86			53								53
1986–87			51	45	48						47
1987–88			52								52
1988–89		65	41	59	54						52
1989–90		39		47							45
1990–91		57	49	52							52
1991–92		47	58	51				50		59	52
1992–93		50		49						40	47
1993–94	47	59	50	50	44				35	50	51
1994–95		44	51	50	49			35	54	53	50
1995–96		48	56	48	37			47		66	48
1996–97		51	53	49	50		55		55	62	50
1997–98		40	54	50	63		47	58	51	63	51
1998–99	47	45	46	55	49	51	50	45	46		54
1999–00	43	57	45	51	50	17	50	50	51	52	49
2000–01	47	19	50	48	55	52	49	52	52	51	50
2001–02	45	47	52	47	52	55	48	49	54	47	51
2002–03		55	47	51	55	44	63	55	54	57	53
2003–04	60	48	64	57	55	52	54	70	55	67	57
2004–05		51	51	54	57	50	52	53	51	52	53
All years	46	46	48	49	51	51	48	40	50	59	51
ORMC											
1998–99					49	51	50	45	45	100	54
1999–00					34		74			44	32
2000–01				48	55	52	48	51	52	51	52
2001–02					52	54	45	51	55	42	51
2002–03					48	44	46				45
All years				48	52	52	47	46	50	67	52

Table 21: All fishing areas, smooth oreo. Mean length by sex from OP and ORMC length samples, scaled by catch, by fishing year. See section 3.2 and Figure 1 for an explanation of the areas. -, no data or too few data to estimate a mean.

	OEO3A ncr	OEO4 ncr	OEO3A scr	OEO4 scr	Southland	Pukaki west	Pukaki east	Bounty	Auckland Islands	Puysegur
Males										
OP										
1979–80	–	–	38.1	–	–	–	–	–	–	–
1980–81	–	–	–	–	–	–	–	–	–	–
1981–82	–	–	–	–	–	–	–	–	–	–
1982–83	–	–	–	–	–	–	–	–	–	–
1983–84	–	–	–	–	–	–	–	–	–	–
1984–85	–	–	–	–	–	–	–	–	–	–
1985–86	–	–	–	–	–	–	–	–	–	–
1986–87	–	–	–	37.0	–	–	–	–	–	–
1987–88	–	–	37.3	–	–	–	–	–	–	–
1988–89	–	40.5	36.9	37.5	–	–	–	–	–	–
1989–90	–	–	–	–	–	–	–	–	–	–
1990–91	–	38.5	36.9	36.2	–	–	–	–	–	–
1991–92	–	–	36.1	35.6	–	–	–	–	–	–
1992–93	–	–	–	35.6	–	–	–	–	–	39.2
1993–94	–	38.3	33.5	35.5	–	–	–	–	–	40.4
1994–95	–	36.7	36.4	35.6	–	–	–	–	39.7	–
1995–96	–	–	–	35.7	–	–	–	–	–	–
1996–97	–	45.7	–	37.2	–	–	–	–	–	42.7
1997–98	–	31.1	36.0	35.4	–	–	32.4	–	40.1	39.6
1998–99	–	36.4	35.8	35.0	–	–	33.6	–	38.7	40.1
1999–00	–	37.6	34.6	34.4	33.2	–	35.9	35.4	40.7	38.1
2000–01	31.3	31.7	34.8	36.4	–	–	34.5	36.1	–	41.8
2001–02	–	35.2	35.3	35.5	37.3	35.7	35.6	35.2	39.2	38.5
2002–03	–	36.3	36.0	35.6	40.7	–	33.4	35.9	37.5	37.3
2003–04	–	34.6	–	35.8	38.2	–	35.1	–	38.5	–
2004–05	–	35.6	35.7	36.3	36.3	35.1	36.3	35.8	35.2	33.6
ORMC										
1998–99	–	–	–	–	33.4	–	33.4	36.2	39.8	36.1
1999–00	–	–	–	–	–	–	–	–	–	–
2000–01	–	–	–	36.4	42.9	35.9	37.5	–	42.4	41.4
2001–02	–	–	–	–	36.9	36.2	34.6	–	41.2	27.0
2002–03	–	–	–	–	–	–	–	–	–	–
OP + ORMC										
1998–99	–	36.4	35.8	35.0	33.4	–	33.5	36.2	39.4	37.3
1999–00	33.4	37.7	34.6	34.4	32.9	–	35.8	35.3	40.7	38.1
2000–01	31.3	31.7	34.8	36.4	42.7	35.9	37.0	35.8	42.4	41.5
2001–02	–	35.1	35.3	35.5	37.0	36.1	35.1	35.4	39.9	29.6
2002–03	–	36.3	36.0	35.7	40.7	–	33.2	35.9	37.5	37.3

Table 21: continued.

	OEO3A ncr	OEO4 ncr	OEO3A scr	OEO4 scr	Southland	Pukaki west	Pukaki east	Bounty	Auckland Islands	Puysegur
Females										
OP										
1979–80	–	–	40.8	–	–	–	–	–	–	–
1980–81	–	–	–	–	–	–	–	–	–	–
1981–82	–	–	–	–	–	–	–	–	–	–
1982–83	–	–	–	–	–	–	–	–	–	–
1983–84	–	–	–	–	–	–	–	–	–	–
1984–85	–	–	–	–	–	–	–	–	–	–
1985–86	–	–	–	–	–	–	–	–	–	–
1986–87	–	–	–	39.3	–	–	–	–	–	–
1987–88	–	–	39.9	–	–	–	–	–	–	–
1988–89	–	43.8	38.4	40.7	–	–	–	–	–	–
1989–90	–	–	–	–	–	–	–	–	–	–
1990–91	–	41.3	38.9	38.4	–	–	–	–	–	–
1991–92	–	–	39.1	37.9	–	–	–	–	–	–
1992–93	–	–	–	37.7	–	–	–	–	–	43.0
1993–94	–	41.5	34.9	37.2	–	–	–	–	–	43.4
1994–95	–	40.1	37.6	37.6	–	–	–	–	44.0	–
1995–96	–	–	–	37.3	–	–	–	–	–	–
1996–97	–	46.9	–	39.4	–	–	–	–	–	45.7
1997–98	–	30.7	38.5	36.9	–	–	32.7	–	43.5	42.9
1998–99	–	36.6	36.0	36.9	–	–	34.6	–	39.7	44.9
1999–00	34.3	40.5	36.7	35.5	33.5	–	37.4	37.1	43.3	41.6
2000–01	33.5	35.7	36.4	38.2	–	–	36.1	38.3	35.3	44.6
2001–02	–	37.7	37.0	37.0	39.7	37.2	36.9	38.8	42.5	42.6
2002–03	–	38.9	37.6	37.2	43.8	–	34.0	37.7	40.2	40.7
2003–04	–	36.1	–	37.5	41.3	–	36.5	–	–	–
2004–05	–	36.7	37.4	38.1	39.4	36.6	36.5	37.3	38.3	34.6
ORMC										
1998–99	–	–	–	–	33.9	–	34.8	38.2	43.5	40.2
1999–00	–	–	–	–	–	–	–	–	–	–
2000–01	–	–	–	37.5	45.1	37.7	38.4	–	46.4	46.0
2001–02	–	–	–	–	39.8	38.2	35.3	–	45.4	28.5
2002–03	–	–	–	–	–	–	–	–	–	–
OP + ORMC										
1998–99	–	36.6	36.0	36.9	33.9	–	34.8	38.2	42.0	41.8
1999–00	34.6	40.5	36.7	35.5	33.4	–	37.3	37.1	43.3	41.6
2000–01	33.6	35.6	36.4	38.1	44.9	37.7	37.9	37.9	46.4	46.0
2001–02	–	37.7	37.0	37.0	39.8	38.1	36.2	37.7	43.5	32.9
2002–03	–	38.8	37.6	37.2	43.7	–	33.9	37.7	40.2	40.7

Table 22: OEO 4 smooth oreo. Numbers of tows where OP and ORMC observer length/sex samples were taken by fishing year. See section 3.2 and Figure 1 for an explanation of the areas.

Fishing year	Area 1	Area 2	Area 3	Area 4	Area 5	Rest of OEO 4	Total
OP							
1986-87	7	0	0	0	0	0	7
1987-88	0	0	0	0	0	0	0
1988-89	16	0	0	0	3	1	20
1989-90	3	0	0	0	1	0	4
1990-91	16	2	21	1	9	0	46
1991-92	11	5	4	50	8	1	78
1992-93	1	5	11	9	1	0	26
1993-94	1	23	32	42	0	0	98
1994-95	13	17	11	29	0	0	70
1995-96	14	10	0	2	6	0	32
1996-97	14	19	3	2	4	0	42
1997-98	10	14	7	2	6	2	40
1998-99	8	38	7	0	4	1	57
1999-00	9	2	5	4	1	18	32
2000-01	18	11	21	20	10	15	83
2001-02	5	9	4	28	1	9	56
2002-03	7	6	16	52	5	48	134
2003-04	13	4	16	18	2	25	78
2004-05	7	26	24	23	7	28	115
ORMC							
2000-01	2	0	2	3	0	0	7

Table 23: OEO 4 smooth oreo. Numbers of fish measured from OP and ORMC observers by fishing year. Total includes unsexed fish. See section 3.2 and Figure 1 for an explanation of the areas.

Fishing year	Area 1	Area 2	Area 3	Area 4	Area 5	Rest of OEO 4	Total
OP							
1986-87	992	0	0	0	0	0	992
1987-88	0	0	0	0	0	0	0
1988-89	2 517	0	0	0	342	523	3 382
1989-90	321	0	0	0	130	104	555
1990-91	2 887	210	2 649	102	1 326	254	7 428
1991-92	1 032	495	433	4 560	735	350	7 605
1992-93	111	545	1 039	1 053	111	330	3 189
1993-94	36	2 598	3 054	4 228	0	1 153	11 069
1994-95	1 881	1 724	1 185	3 299	0	1 009	9 098
1995-96	1 876	1 278	0	297	576	367	4 394
1996-97	1 677	2 437	287	211	425	675	5 712
1997-98	1 330	1 448	711	187	582	951	5 209
1998-99	1 267	5 733	691	0	544	787	9 022
1999-00	971	351	578	389	146	1590	4 025
2000-01	1 677	973	2 043	1 564	748	833	8 092
2001-02	567	1 295	289	1 845	150	525	4 671
2002-03	866	649	1 429	1 977	625	902	6 448
2003-04	2 667	335	1 408	944	295	775	6 424
2004-05	1 865	2 884	2 046	1 652	862	1 221	10 530
ORMC							
2000-01	200	0	200	254	0	0	654

Table 24: OEO 4 smooth oreo. Mean length by sex from OP and ORMC observer length samples, data scaled by catch, by fishing year. See section 3.2 and Figure 1 for an explanation of the areas. -, no data or too few data to estimate a mean.

Males	Area 1	Area 2	Area 3	Area 4	Area 5	Rest of OEO 4
OP						
1986-87	37.0	-	-	-	-	-
1987-88	-	-	-	-	-	-
1988-89	37.6	-	-	-	-	-
1989-90	-	-	-	-	-	-
1990-91	36.4	-	36.5	-	35.3	-
1991-92	33.9	34.8	-	37.1	34.5	-
1992-93	-	33.8	36.0	36.3	-	-
1993-94	-	33.2	36.6	36.7	-	-
1994-95	35.1	35.4	36.8	36.6	-	-
1995-96	35.0	36.8	-	-	35.4	-
1996-97	35.6	38.2	-	-	-	-
1997-98	33.5	35.4	37.2	-	33.5	-
1998-99	33.6	34.9	36.1	-	-	-
1999-00	34.7	-	35.9	-	-	34.2
2000-01	35.4	37.0	37.0	38.0	35.3	35.3
2001-02	35.5	35.2	-	36.3	-	30.9
2002-03	35.2	35.2	35.5	36.5	35.8	36.2
2003-04	35.6	-	35.7	36.0	-	35.4
2004-05	36.2	36.6	36.6	35.7	35.1	36.2

Females	Area 1	Area 2	Area 3	Area 4	Area 5	Rest of OEO 4
OP						
1986-87	39.3	-	-	-	-	-
1987-88	-	-	-	-	-	-
1988-89	40.9	-	-	-	-	-
1989-90	-	-	-	-	-	-
1990-91	37.9	-	39.3	-	36.8	-
1991-92	35.7	35.9	-	40.4	35.6	-
1992-93	-	35.7	37.5	39.5	-	-
1993-94	-	33.5	38.5	39.6	-	-
1994-95	37.2	37.1	38.5	39.2	-	-
1995-96	36.4	38.8	-	-	36.7	-
1996-97	37.4	40.7	-	-	-	-
1997-98	34.3	37.2	40.0	-	34.4	-
1998-99	34.7	36.8	37.8	-	-	-
1999-00	35.8	-	38.8	-	-	35.5
2000-01	36.5	38.6	38.7	41.3	36.7	37.9
2001-02	36.7	36.7	-	39.2	-	31.1
2002-03	36.7	35.9	37.9	38.6	36.9	38.7
2003-04	37.2	-	37.8	38.1	-	36.7
2004-05	38.1	38.3	38.8	37.0	36.4	38.4

Table 25: All fishing areas, smooth oreo. Number of tows where otoliths were collected by OP Observers by fishing year. See section 3.2 and Figure 1 for an explanation of the areas.

	OEO3A ncr	OEO4 ncr	OEO3A scr	OEO4 scr	Southland	Pukaki west	Pukaki east	Bounty	Auckland Islands	Puysegur	All areas
OP											
1991-92	0	1	0	9	0	0	0	3	0	0	13
1992-93	0	2	0	10	0	0	0	0	0	8	20
1993-94	0	0	0	0	0	0	0	0	0	0	0
1994-95	0	0	0	3	1	0	0	1	0	2	7
1995-96	0	0	1	8	0	0	0	3	0	1	13
1996-97	0	1	0	0	0	0	0	0	0	0	1
1997-98	0	0	0	0	1	0	5	0	21	1	28
1998-99	0	0	0	0	0	0	0	0	0	1	1
1999-00	0	0	0	0	0	0	0	0	0	0	0
2000-01	1	0	0	0	0	0	0	0	0	0	1
2001-02	0	0	0	0	5	1	0	0	0	3	9
2002-03	0	41	22	43	8	1	10	10	18	5	158
2003-04	0	9	2	34	13	1	11	3	6	1	80
2004-05	0	11	8	77	10	1	20	29	6	2	164
All years	1	65	33	184	38	4	46	49	51	24	495

Table 26: All fishing areas, smooth oreo. Number of otoliths collected by OP observers by fishing year. See section 3.2 and Figure 1 for an explanation of the areas.

	OEO3A ncr	OEO4 Ncr	OEO3A scr	OEO4 scr	Southland	Pukaki west	Pukaki east	Bounty	Auckland Islands	Puysegur	All areas
OP											
1991-92	0	11	0	116	0	0	0	60	0	0	187
1992-93	0	20	0	93	0	0	0	0	0	158	271
1993-94	0	0	0	0	0	0	0	0	0	0	0
1994-95	0	0	0	59	20	0	0	20	0	15	114
1995-96	0	0	20	160	0	0	0	60	0	7	247
1996-97	0	6	0	0	0	0	0	0	0	0	6
1997-98	0	0	0	0	5	0	25	0	438	5	473
1998-99	0	0	0	0	0	0	0	0	0	25	25
1999-00	0	0	0	0	0	0	0	0	0	0	0
2000-01	2	0	0	0	0	0	0	0	0	0	2
2001-02	0	0	0	0	35	1	0	0	0	20	56
2002-03	0	161	229	446	76	5	102	117	198	66	1 400
2003-04	0	59	20	402	124	10	112	40	90	20	877
2004-05	2	75	108	828	105	10	172	363	89	20	1 770
All years	4	332	377	2 104	365	26	411	660	815	336	5 428

Table 27: All fishing areas, smooth oreo. The number of research tows by fishing year. See section 3.2 and Figure 1 for an explanation of the areas.

	OEO3A	OEO4	OEO3A	OEO4	Southland	Pukaki	Pukaki	Bounty	Auckland	Puysegur	All
	ncr	ncr	scr	scr		west	east		Islands		areas
1978-79	6	6	0	1	0	2	0	0	1	0	16
1979-80	0	2	0	1	0	0	1	0	0	0	4
1980-81	1	1	0	1	0	0	0	0	0	0	3
1981-82	2	13	9	2	0	0	0	0	0	0	26
1982-83	1	0	6	1	0	0	0	0	0	0	8
1983-84	0	0	61	0	0	0	0	0	0	0	61
1984-85	0	9	12	5	0	0	0	0	0	0	26
1985-86	25	9	1	16	0	0	0	0	0	0	51
1986-87	0	4	73	105	0	0	0	0	0	0	178
1987-88	16	73	85	118	0	0	0	0	0	0	292
1988-89	22	2	5	25	0	0	0	0	0	0	54
1989-90	18	38	7	40	0	1	0	1	0	0	104
1990-91	10	0	27	78	5	4	2	1	3	55	187
1991-92	1	112	44	109	5	4	0	0	1	68	344
1992-93	2	6	23	125	2	2	0	0	5	7	172
1993-94	55	225	56	189	0	0	0	0	0	15	540
1994-95	0	77	1	2	0	0	0	0	6	55	140
1995-96	2	43	26	158	3	6	4	0	3	2	247
1996-97	4	15	8	1	0	0	0	0	0	0	28
1997-98	3	45	44	17	1	8	3	0	2	2	125
1998-99	2	97	2	86	0	0	0	0	0	0	159
1999-00	2	20	1	19	0	0	0	0	0	0	41
2000-01	2	6	3	48	3	5	0	0	1	4	72
2001-02	3	99	10	133	2	5	2	0	2	7	258
2002-03	0	3	12	1	1	6	1	0	2	8	34
2003-04	2	65	2	9	3	2	1	0	0	2	75
2004-05	8	85	3	1	3	1	0	0	0	6	107
All years	187	1 011	521	1 284	28	46	14	2	26	233	3 352

Table 28: All fishing areas, smooth oreo. Number research fish measured by fishing year. See section 3.2 and Figure 1 for an explanation of the areas.

	OEO3A ncr	OEO4 ncr	OEO3A scr	OEO4 scr	Southland	Pukaki west	Pukaki east	Bounty	Auckland Islands	Puysegur	All areas
1978–79	247	530	0	7	0	130	0	0	1	0	915
1979–80	0	77	0	104	0	0	132	0	0	0	313
1980–81	11	201	0	135	0	0	0	0	0	0	347
1981–82	399	1 642	992	346	0	0	0	0	0	0	3 379
1982–83	136	0	222	47	0	0	0	0	0	0	405
1983–84	0	0	5 514	0	0	0	0	0	0	0	5 514
1984–85	0	882	162	117	0	0	0	0	0	0	1 161
1985–86	829	500	7	500	0	0	0	0	0	0	1 836
1986–87	0	334	4 292	12 015	0	0	0	0	0	0	16 641
1987–88	1 464	3 889	3 650	12 492	0	0	0	0	0	0	21 495
1988–89	2 264	357	62	2 267	0	0	0	0	0	0	4 950
1989–90	1 127	2 967	182	8 589	0	46	0	6	0	0	12 917
1990–91	774	0	2 344	11 653	951	400	14	124	392	6 104	22 756
1991–92	3	6 428	1 511	16 224	569	23	0	0	1	8 491	33 250
1992–93	197	103	953	15 214	396	152	0	0	525	237	17 777
1993–94	2 239	9 014	2 951	30 886	0	0	0	0	0	109	45 199
1994–95	0	1 900	49	40	0	0	0	0	1 331	3 622	6 942
1995–96	11	1 654	1 643	18 049	403	615	295	0	17	4	22 691
1996–97	74	374	328	129	0	0	0	0	0	0	905
1997–98	14	964	3 144	2 564	182	1 191	306	0	6	3	8 374
1998–99	3	5 682	77	26 961	0	0	0	0	0	0	32 723
1999–00	57	822	49	1 874	0	0	0	0	0	0	2 802
2000–01	2	11	160	26 156	381	494	0	0	4	94	27 302
2001–02	187	1 792	1 142	34 490	431	622	394	0	20	53	39 131
2002–03	0	8	1 617	5	7	351	126	0	9	52	2 175
2003–04	10	1 365	242	176	53	330	257	0	0	3	2 436
2004–05	80	1 136	276	1	340	3	0	0	0	85	1 921
All years	10 128	42 632	31 569	221 041	3 713	4 357	1 524	130	2 306	18 857	336 257

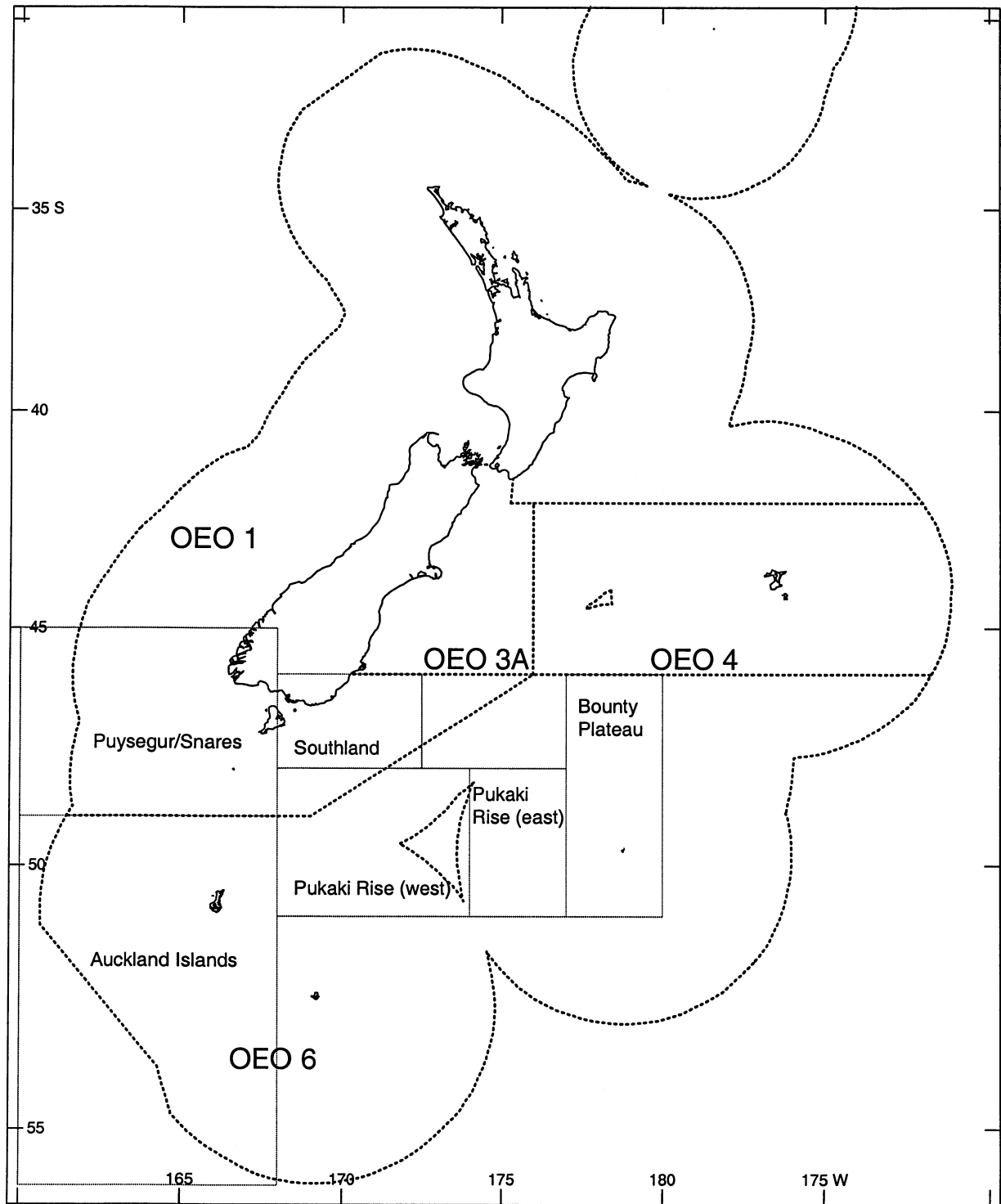


Figure 1: Oreo management areas OEO 1, OEO 3A, OEO 4, OEO 6 (dotted lines) and the fishing areas (rectangles, solid lines) where length and associated data were extracted for each analysis.

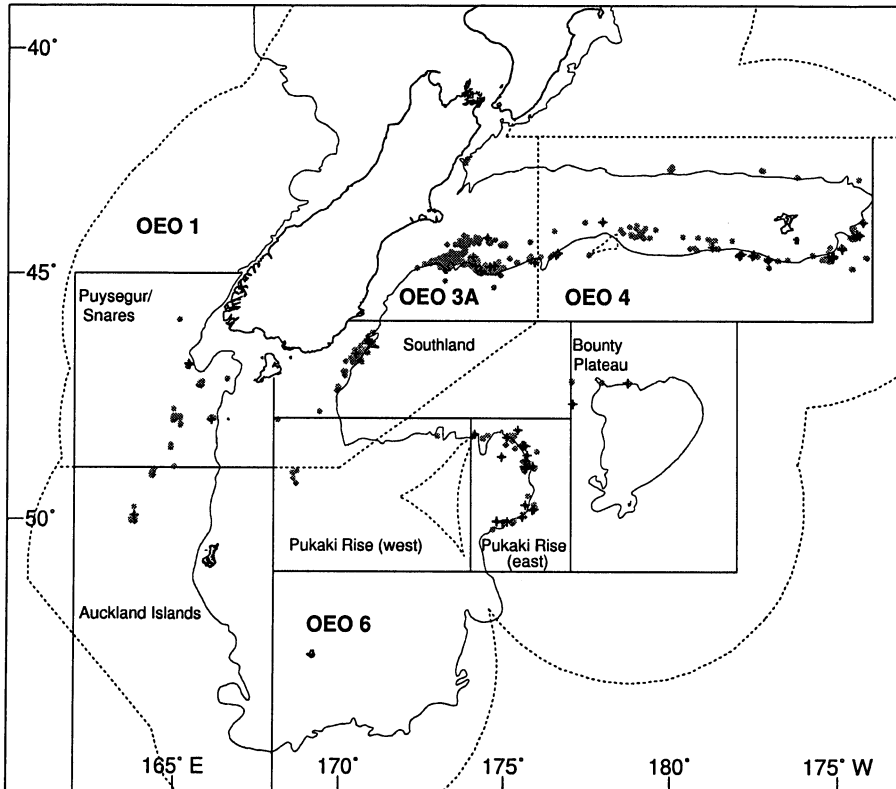


Figure 2: Fishing areas referred to in the report and all black oreo tow positions (for fishing years 1979–1980 to 2003–2004) from which observer biological data were taken. Tow positions are displayed as dots, last fishing year 2004–2005 as cross.

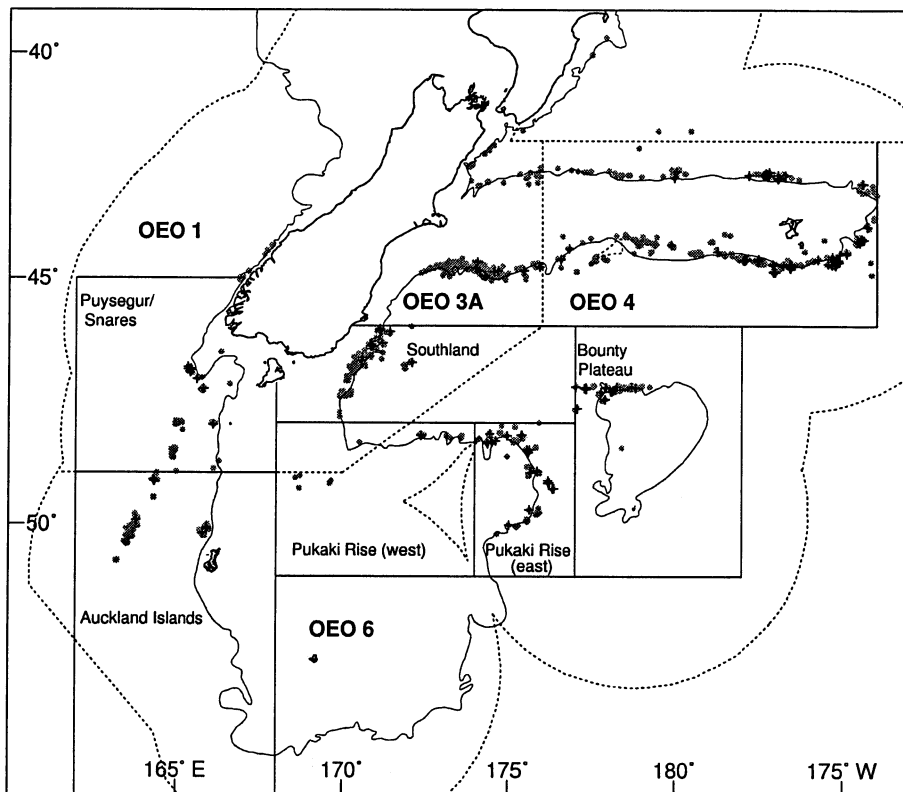


Figure 3: Fishing areas referred to in the report and all smooth oreo tow positions (fishing years 1979–1980 to 2004–2005) from which observer biological data were taken. Tow positions are displayed as dots, last fishing year 2004–2005 as cross.

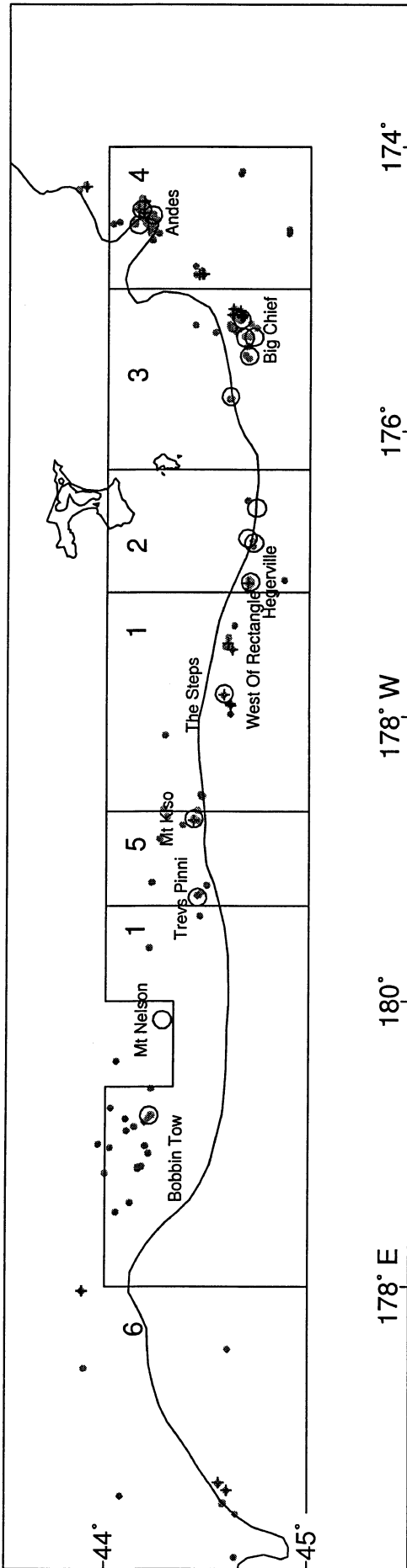


Figure 4: Sample areas defined for OEO 4 (1-6), with black oreo biological sample tow positions marked by grey dots, last fishing year 2004-2005 as cross, and major seamounts denoted by open circle, and some other main fishing areas.

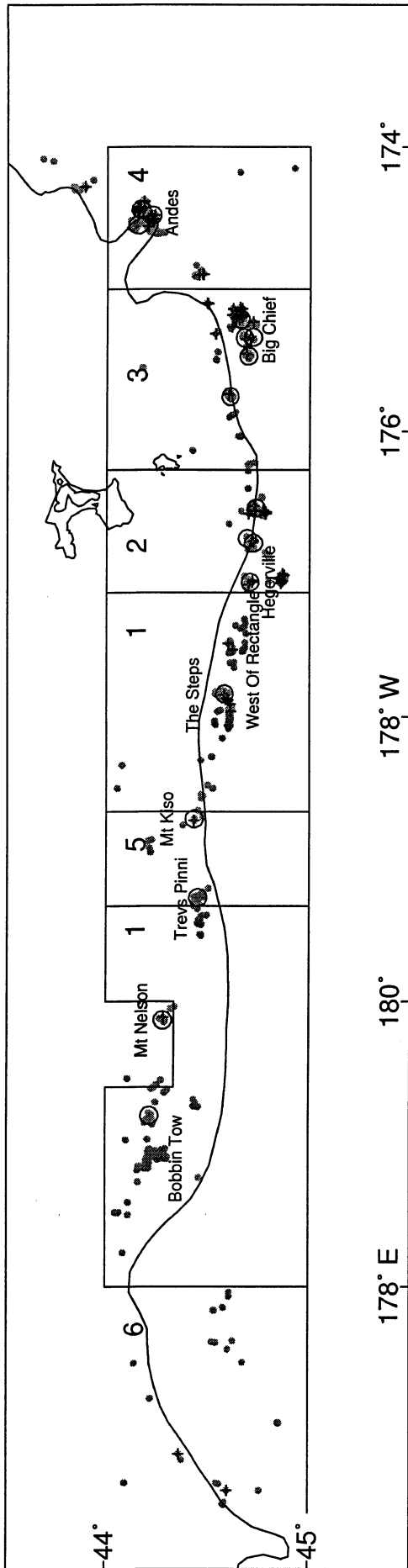


Figure 5: Sample areas defined for OEO 4 (1-6), with smooth oreo biological sample tow positions marked by grey dots, last fishing year 2004–2005 as cross, and major seamounts denoted by open circle, and some other main fishing areas.