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A summary of observer biological information
on the New Zealand black oreo and smooth oreo
fisheries from 1979–80 to 2006–07

A. C. Hart
P. J. McMillan

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A. C. Hart
P. J. McMillan

NIWA
Private Bag 14901
Wellington 6241

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EXECUTIVE SUMMARY

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This report summarises black oreo and smooth oreo biological data (total length/sex ratios/otoliths) from 1979–80 to 2006–07. Data were collected mainly by observers from the Ministry of Fisheries Observer Programme (OP) but some samples from fishing industry funded groups including the Orange Roughy Management Company (ORMC) before to 2006–07 and the Deepwater Group (DWG) from 2006–07 are also included. Analyses were carried out for each individual oreo fishery as well as for some areas outside the main fisheries. Data from research sources from the main oreo fisheries in OEO 3A and OEO 4 were also summarised. Expected and actual levels of observer coverage for oreos by management area and proportion of oreo catch sampled by observers by fishing area are provided. 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.

The main results were as follows.

- The number of samples carried out by the Observer programme in 2006–07 exceeded the planned numbers in OEO 1 (60 achieved, 45 planned) and OEO 6 (500 achieved, 130 planned) and was slightly less than planned in OEO 3A/4 (163 achieved, 175 planned).
- In 2006–07 there was a very large increase in sampling in Pukaki Rise (east), with smaller increases in Southland and Bounty Plateau.
- Sampling in OEO 3A in 2006–07 was reduced to very low levels, i.e., 1% of black oreo catch and 2% of smooth oreo catch
- A good level of sampling maintained in 2006–07 in New Zealand’s largest oreo fishery for smooth oreo in OEO 4 (15% of catch, 6,915 fish sampled).
- There were very few samples in 2006–07 from the small Puysegur/Snares and Auckland Islands fisheries, probably a consequence of reduced commercial fishing effort in these fisheries.
- Smooth oreo mean length from Pukaki Rise (east) samples decreased by about 10 cm from 2005–6 to 2006–07.
- In 2006–07 otoliths were collected in large numbers, mostly from Pukaki Rise (east) taking the total for black oreo otoliths from 3379 to 6053 and the total otoliths collected for smooth oreos from 7106 to 9789 for all areas and all years.

Summary of main trends in observer sampling for the last three years. Major changes in bold.

Black oreo	OEO 3A		OEO 4		Southland		Pukaki Rise (east)	
	% catch	Samples	% catch	Samples	% catch	Samples	% catch	Samples
2004–05	11	1 171	13	2 364	8	252	10	2 802
2005–06	43	6 480	3	439	2	19	10	2 993
2006–07	1	332	6	1 164	44	2 276	56	21 026

Smooth oreo	OEO 3A		OEO 4		Southland		Pukaki Rise (east)		Bounty Plateau	
	% catch	Samples	% catch	Samples	% catch	Samples	% catch	Samples	% catch	Samples
2004–05	8	881	14	8 780	18	943	11	2 153	15	3 901
2005–06	36	3 424	10	4 652	3	286	29	2 163	26	4 864
2006–07	2	225	15	6 915	66	2 685	41	11 227	43	2 484

1. INTRODUCTION

This report presents analyses for the following objectives for the Ministry of Fisheries funded research project “Oreo stock assessment” (OEO2007/01).

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 2006/07 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/DWG). 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 quota 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 (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 both noted strong area and/or depth effects for observer data and each modelled the stock using three sub-areas. 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 100–200 fish per tow from at least one tow a day where oreos are targeted, or where oreos are caught as a bycatch to 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 (Ministry of Fisheries, 2002) did not request reproductive condition data to be reported but required otoliths to be collected from every 10th fish from the length sample where the catch weight exceeded 1 tonne. 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/DWG) collected similar data including fish length, sex, and some reproductive data.

3. METHODS

3.1 Data sources

Biological data collected by observers from OP sources, and ORMC from 1998–99 to 2004–05, are held on the Empress *obs_lfs* database. ORMC data from the fishing years 2005–06 to 2006–07 were not authorised for inclusion in *obs_lfs* database and had to be extracted from a spreadsheet provided by ORMC/DWG. Length measurements without associated 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 from 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 tows, and tows 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). Historically, the main fisheries for oreos occurred on the south Chatham Rise in management areas OEO 3A and OEO 4. Fishing areas used in this analysis 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. Other fishing areas occurred 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 (OEO 6). The fisheries areas defined in this study are mostly larger than the individual fisheries identified in previous descriptive analyses of oreo CPUE e.g., Coburn et al. (2006) and sample areas defined in stock assessment analyses (Ministry of Fisheries 2008), 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 hills (includes Bobbin Tow and Urk).
- Area 2 177° 08' W to 176° 16' W. Includes hills such as Hegerville and Paranoia.
- Area 3 176° 16' W to 175° W. Includes hills such as Condoms and Big Chief.
- Area 4 175° to 174° W. Includes the Andes hill complex.
- Area 5 178° E to 178° 40' W. Older hills 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 (under 900 m) and deep (over 900 m) sub areas.

3.3 Observer coverage

The level of coverage of observer catch as a proportion of estimated commercial catch is calculated by fishing area and fishing year. 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 and is expressed as a percentage.

The number of annual observer oreo samples that the Ministry of Fisheries planned was obtained from research project tender background documents for 1997–98 to 2006–07 by oreo management area and is compared with the actual number of oreo samples from those fishing years. The proportion of the oreo samples from OP sources that targeted smooth oreo is 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/DWG data.

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; 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 selected and scaled have been presented in previous oreo stock assessments, e.g., OEO 3A black oreo (Doonan et al. 2004), OEO 4 smooth oreo Doonan et al. (2008), and Pukaki Rise smooth oreo (Coburn et al. 2007), and are not repeated here.

3.5 Female reproductive summaries

Hart & McMillan (2006) noted that gonad staging data was a requirement for observers in the past, although of low priority, but is no longer requested in the observer manual. Further 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 observer manual, (Ministry of Fisheries 1992) and the five-stage orange roughly scale (below) provided in the 1992 and current 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 from 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 to research findings and therefore ORMC and DWG data (which are sparse) are not reported. Reproductive data were not requested from OP observers in 2006–07. Few reproductive data were collected for black oreo and smooth oreo from OEO 3A plus OEO 4 in 2006–07, 27 and 74 measurements respectively.

Due to the comparability issues in the data caused by the mix of staging methods, and the paucity of new data (2006–07), 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 were recorded on research surveys since the first deepwater survey by *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 oreos and smooth oreos.

4. RESULTS

Target oreo observer coverage

The number of expected or planned samples compared to the actual OP 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. Samples taken in the large OEO 3A and OEO 4 oreo fisheries exceeded the number of samples planned for three of the ten years, and were less than but close to the target in all other years except 2003–04. The proportion of smooth oreo samples from OEO 3A and OEO 4 varied, but always favoured smooth oreo, often by a large margin, but this is hardly surprising because OEO 4 has the largest oreo fishery in the EEZ. In OEO 1 target coverage was met in three years and nearly met in one other of the ten year series. In OEO 6 target coverage was met in only one year, 2006–07, when a substantial 500 samples were reported compared to the 130 planned. In OEO 1 the sample proportion has favoured smooth oreo since 1999–2000. In OEO 6 the sample proportion favoured smooth oreo in seven of the ten year series. In 2006–07 the ratio of black oreo and smooth oreo samples was nearly equal, possibly as a result of orange roughy target fishing, and consequent black oreo bycatch.

The locations of observed tows that caught black oreo and smooth oreo from 2006–07, and from previous fishing years, are shown in Figures 2 and 3. Figure 2 shows that 2006–07 black oreo samples were mainly from Pukaki Rise (east) and from OEO 4, with only a few samples from OEO 3A, Pukaki Rise (west), and Southland. There were no 2006–07 black oreo samples from Puysegur/Snares and Auckland Islands. Past black oreo sampling took place mainly in OEO 3A where the largest fishery occurred until recently. The spatial split between samples taken in the shallow northern part of OEO 3A (smaller fish) and those taken in the deeper southern part (larger fish) is apparent. Figure 3 shows good levels of 2006–07 smooth oreo samples from OEO 4, Pukaki Rise (east), and Bounty Plateau. Very few 2006–07 smooth oreo samples came from Puysegur/Snares and Auckland Islands. Past smooth oreo sampling reflects the importance of the large OEO 4 fishery and the former importance of the OEO 3A and Southland fisheries.

4.1 Black oreo

OEO 3A south of 44° S

The percentage of the commercial catch of black oreo with observed tows from which biological samples were taken in OEO 3A varied considerably between fishing years (Table 2). Coverage levels were high in 1999–2000 to 2002–03 and in 2005–06 and very low in 2006–07. The number of trips and tows sampled (Tables 3 and 4) fluctuated, with a period of low sampling in the 1990s. 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, rising in 2005–06, then declined in 2006–07. Only 332 fish were measured in 2006–07 compared to 6 480 in the previous year, 2005–06 (Table 5).

Sex ratios, percentage male, are presented in Table 6. Ratios in OEO 3A varied between fishing years, but the total percentage male from all years for all OP data was 52%. Mean length of black oreo appeared to decline from 1979–80 to 2005–06 by about 3 cm for both males and females (Table 7). Only 332 fish from 9 tows were sampled in 2006–07, so it seems unwise to draw a trend from those data. 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 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 have increased slightly since 1999–2000 for both sexes, whereas in the deep strata mean lengths were about 3 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 were taken from 1995–96 to 2001–02. Sampling increased from 2002–03, declining in 2005–06, but increased again in 2006–07 (See Tables 2–5). 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 were no clear trends.

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 tows 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 hills in those areas, but few samples were taken from 1994–95 to 2000–01. Sampling increased for areas 1 and 3 in 2004–05, declined in 2005–06, then increased in 2006–07. The locations of observed tows by fishing area from 2006–07, and from previous fishing years, are shown in Figure 4.

Other areas

Observer coverage in OEO 6, including Pukaki Rise (east) and Auckland Islands started in 1996–97 with OP observers, but commercial fishing in OEO 6 began in the early 1980s. Only small catches of black oreo have been reported from Bounty Plateau. Fishing areas in OEO 1 (Puysegur and Southland) seldom had observer sampling greater than 10% of the commercial catch and recent low sampling probably reflects low levels of fishing in these areas.

In 2006–07 there appears to have been a major shift of observer effort towards the Pukaki Rise and to a much lesser degree the Southland fishery; 56% of the reported commercial catch in Pukaki Rise (east) was observed, from 8 trips, 251 tows, with 21026 fish measured. This is the

largest number of black oreo ever measured by observers in any year. Sampling increased in Southland in 2006–07 where 44% of the reported commercial catch was observed, from 2 trips, 22 tows, with 2276 fish measured (See Tables 2–5). ORMC sampling was from 1998–99 to 2001–2002, resumed again in 2005–06 after a three year break and continued in 2006–07. Most of the 2006–07 samples, 1170 fish, were from Pukaki Rise (east) (See Table 5). Mean length values for the other areas are shown in Table 7.

Otolith collection

Black oreo otoliths were very intermittently collected since 1991–92 (Tables 12 and 13), but this is not surprising as otoliths have been requested only since 2002. In 2006–07 2674 otoliths were collected, mostly from Pukaki Rise (east). There are a total of 6053 otoliths archived from observer sources from all years.

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 in Tables 14 and 15. These data come from 142 individual research surveys, approximately 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

The percentage of the commercial catch of smooth oreo with observed tows from which biological samples were taken shows a similar pattern to that for black oreos. Coverage levels were highest in 1999–2000 to 2002–03 (Table 16) and increased again in 2005–06, declining in 2006–07. 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 sampling declined in 2003–04 and 2004–05, increased in 2005–06, but declined in 2006–07 (Table 19).

Sex ratios, percentage male, fluctuated between fishing years, the total percentage male from all years for all OP data was 49% (Table 20). Mean length appeared to decline from 1979–80 to 2002–03 by 2–3 cm for both males and females (Table 21).

OEO 4 south of 44° S

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 103 832 making it the most sampled area. Sampling remained high in 2006–07 with 6 915 fish measured (See Table 19). Sex ratios, percentage male, fluctuated between fishing years, the total percentage male from all years for all OP data was 51% (Table 20). The total area mean length appeared to decline from 1988–89 to 2006–07 by about 1.3 cm for males and 1.9 cm for 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 five subsequent years (Tables 22 and 23). Sample sizes were generally much larger than those in the same area and time for black oreo although sampling was erratic. Sample sizes increased in the last seven 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) indicate 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) or the older and probably more heavily

fished hills (areas 2 and 5). Mean lengths of fish from areas 3 and 4 were on average 1.2 cm larger for males and 2.1 cm for females than for fish in area 1. Mean lengths in area 4 appeared to show a decline of 1.4 cm for males and 3.4 cm for females between 1991–92 and 2004–05, but showed an increasing trend in the last two fishing years. Mean lengths for smooth oreo in other fishing areas within OEO 4 fluctuated and showed no clear trend. The locations of observed tows by fishing area from 2006–07, and from previous fishing years, are shown in Figure 5.

Other areas

Fishing areas in OEO 1 and OEO 6 generally had more smooth oreo tows sampled and fish measured than for black oreo (See Tables 1, 17 and 18). In 2006–07 the fishing areas that had over 1000 fish measured included OEO 4 ncr, OEO 4 scr, Southland, Pukaki Rise (west), Pukaki Rise (east), and Bounty Plateau (See Table 19). ORMC samples were taken in 1998–99 to 2001–2002, and DWG provided samples in 2006–2007.

In 2006–07 there appears to have been a major shift of observer effort towards the Pukaki Rise, and to a much lesser degree the Southland fishery, with good levels of sampling also maintained on Bounty Plateau. Forty one percent of the reported commercial catch in Pukaki Rise (east) was observed, from 8 trips, 187 tows, with 11227 fish measured. This is the largest number of smooth oreo ever measured by observers in any year. Sampling increased in Southland in 2006–07 where 66% of the reported commercial catch was observed, from 3 trips, 32 tows, with 2685 fish measured (See Tables 16–19).

Sex ratios for some areas are highly variable and appear to indicate imbalance in sex selection (See Table 20). Mean lengths for males from Pukaki Rise (east) scaled by catch fluctuated from a mean of 34.6 cm from the first eight years of the series to spike at 40.6 cm in 2005–2006, then dropped to 30.9 cm in 2006–07 (See Table 21), while the unscaled mean length for males in 2006–07 was 29.5 cm. Pukaki Rise (east) female mean length scaled to catch similarly showed a steep decline from an unusually high 43.1 cm in 2005–2006 to 32.0 cm in 2006–07. This trend may be of concern and samples from subsequent years should be analysed to see if it continues.

Otolith collection

Smooth oreo otoliths were also only intermittently collected since 1991–92 (Tables 25 and 26). Most were collected from 2002–03 onward when otoliths were added to the requests in the observer manual. A total of 2683 smooth oreo otolith were collected in 2006–07, most from OEO 4 and Pukaki Rise (east). There are a total of 9789 smooth oreo 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 150 individual research surveys, and only 5% are from middle depth trips compared to 15% for black oreos 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 2006–07, 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. *, compiled from Ministry of Fisheries research project 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	55	16	140	116	24
1999–00	100	251	51	60	139	68	140	83	81
2000–01	100	354	57	60	46	54	100	65	43
2001–02	190	149	57	60	97	59	100	81	72
2002–03	190	235	67	60	32	81	100	64	69
2003–04	190	118	69	60	19	95	100	54	57
2004–05	190	167	76	60	33	76	100	99	68
2005–06	190	178	65	60	23	96	100	90	63
2006–07	175	163	74	45	60	63	130	500	47

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. ORMC data from 2006–07 has length data with no catch recorded so is not reported in this table. 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	*	4	4	1	8	6	0	1	0	4
2004–05	0	15	11	13	8	0	10	3	0	2	9
2005–06	0	5	43	3	2	1	10	0	0	0	14
2006–07	0	2	1	6	44	16	56	86	0	0	35
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
2004–05	0	0	0	0	0	0	0	0	0	0	0
2005–06	0	0	0	4	0	8	22	0	0	10	0
2006–07											
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
2005–06	0	2	6	5	1	1	3	2	0	0	20
2006–07	0	2	3	7	2	4	8	2	0	0	28
All years	2	22	94	81	22	10	39	8	9	26	313
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
2003–04	0	0	0	0	0	0	0	0	0	0	0
2004–05	0	0	0	0	0	0	0	0	0	0	0
2005–06	0	0	0	2	0	4	6	1	0	2	15
2006–07	0	0	2	2	2	0	2	0	0	0	8
All years	0	0	0	2	13	4	27	1	11	20	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	12	0	69	0	19	34	143
1999–00	1	1	115	7	20	2	11	0	3	17	177
2000–01	1	1	136	15	6	0	35	1	1	15	211
2001–02	0	1	42	21	33	1	14	0	8	6	126
2002–03	0	7	28	42	1	1	15	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
2005–06	0	3	48	12	1	1	26	6	0	0	97
2006–07	0	3	9	31	22	8	251	4	0	0	328
All years	2	28	624	410	116	15	504	14	38	158	1 909
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
2003–04	0	0	0	0	0	0	0	0	0	0	0
2004–05	0	0	0	0	0	0	0	0	0	0	0
2005–06	0	0	0	5	0	8	43	1	0	5	62
2006–07	0	0	3	2	5	0	11	0	0	0	21
All years	0	0	3	7	30	8	149	1	15	55	247

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.

	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	1 265	0	6 511	0	187	3 180	2 657
1999–00	46	106	12 309	815	1 832	83	1 043	0	299	1 893	18 039
2000–01	20	15	13 751	628	599	0	3 038	1	0	1 500	15 347
2001–02	0	10	4 033	1 291	3 485	5	1 299	0	332	551	9 194
2002–03	0	123	2 720	1 367	25	25	1 324	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
2005–06	0	57	6 480	439	19	120	2 993	43	0	0	10 151
2006–07	0	24	332	1 164	2 276	429	21 026	86	0	0	25 337
All years	66	1 126	67 215	32 384	11 266	866	45 008	203	1 119	16 091	175 344
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
2003–04	0	0	0	0	0	0	0	0	0	0	0
2004–05	0	0	0	0	0	0	0	0	0	0	0
2005–06	0	0	0	525	0	795	4 417	103	0	501	6 341
2006–07	0	0	286	200	503	0	1 170	0	0	0	2 159
All years	0	0	286	725	3 070	795	15 169	103	1 322	4 997	26 467

Table 6: All fishing areas, black 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. *, 1–3 samples.

	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	*	50		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
2005–06		35	51	54	74	48	50	35			
2006–07		67	59	48	55	48	47	57			48
All years	*	55	52	53	53	51	50	47	49	52	52
ORMC											
1998–99					50		54		47	53	53
1999–00					*		*			*	48
2000–01					*		50		*	*	48
2001–02					*		50		*	*	51
2002–03							*				54
2003–04											
2004–05											
2005–06				50		62	54	*		64	54
2006–07			46	59	45		56				52
All years				46	48	62	53		48	52	52

Table 7: All fishing areas, black 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 samples or fewer than 4 samples.

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	–	–	–
2005–06	–	30.5	31.5	33.6	32.0	32.5	31.5	–	–	–
2006–07	–	27.5	32.7	33.4	31.6	32.8	31.6	33.5	–	–
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	–
2002–03	–	–	–	–	–	–	–	–	–	–
2003–04	–	–	–	–	–	–	–	–	–	–
2004–05	–	–	–	–	–	–	–	–	–	–
2005–06	–	–	–	32.1	–	35.2	34.1	–	–	39.3
2006–07	–	–	32.2	38.1	32.1	–	30.6	–	–	–
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
2002–03	–	–	31.3	35.4	–	–	31.7	–	–	–
2003–04	–	–	31.0	34.8	–	–	32.8	–	–	–
2004–05	–	–	32.0	35.6	32.8	–	32.5	–	–	–
2005–06	–	–	31.5	32.6	32.0	34.5	32.3	–	–	39.3
2006–07	–	27.5	32.5	34.1	31.7	32.8	31.6	33.5	–	–

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	–	–	–
2005–06	–	–	32.1	35.3	–	–	32.3	35.0	–	–
2006–07	–	28.5	34.0	33.8	32.3	33.3	32.2	34.6	–	–
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	–
2002–03	–	–	–	–	–	–	–	–	–	–
2003–04	–	–	–	–	–	–	–	–	–	–
2004–05	–	–	–	–	–	–	–	–	–	–
2005–06	–	–	–	32.7	–	36.5	34.1	–	–	40.1
2006–07	–	–	32.0	38.4	31.9	–	30.0	–	–	–
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
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	–	–	–
2005–06	–	–	32.1	33.7	–	35.8	33.4	34.4	–	40.1
2006–07	–	28.5	33.3	34.8	32.2	33.3	32.1	34.6	–	–

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. –, 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
2005–06	31.4	32.1	35	5 161	31.7	32.1	13	1 319
2006–07	32.7	34.1	9	332	–	–	–	0

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 4 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
2005–06	4	0	0	4	4	2	14
2006–07	8	2	4	2	6	2	24

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 4 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
2005–06	69	0	0	68	302	38	477
2006–07	244	142	364	14	114	204	1 082

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 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	–	–
2005–06	33.9	–	–	36.1	32.5	33.7
2006–07	32.7	30.2	36.2		31.7	33.9

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	–	–
2005–06	34.3	–	–	39.3	33.9	34.8
2006–07	33.4	30.1	36.2	34.5	32.6	33.9

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
2005–06	0	2	45	7	1	1	24	2	0	0	82
2006–07	0	3	8	31	22	7	207	4	0	0	282
All years	0	12	96	112	33	10	291	7	5	9	575

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.

	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	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
2005–06	0	10	682	51	5	12	293	10	0	0	1 063
2006–07	0	9	47	187	220	52	2 138	21	0	0	2 674
All years	0	48	1 295	990	289	73	2 990	41	42	285	6 053

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.

	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	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	0	0	0	0	0	22
1982–83	1	2	10	1	0	0	0	0	0	0	14
1983–84	0	0	69	0	2	0	0	0	0	0	71
1984–85	0	1	13	4	0	0	0	0	0	0	18
1985–86	9	3	3	16	0	0	0	0	0	0	31
1986–87	0	4	73	86	0	0	0	0	0	0	163
1987–88	2	6	86	98	0	0	0	0	0	0	192
1988–89	3	0	4	7	0	0	0	0	0	0	14
1989–90	1	1	13	16	2	0	1	1	0	0	35
1990–91	0	1	50	58	6	3	3	2	1	47	171
1991–92	0	10	50	90	5	2	2	0	0	62	221
1992–93	0	5	30	97	1	4	0	0	1	2	140
1993–94	10	42	65	174	0	0	0	0	0	9	300
1994–95	0	7	3	4	0	0	0	0	2	35	51
1995–96	1	15	30	139	3	5	4	0	0	0	197
1996–97	1	10	12	2	0	0	0	0	0	0	25
1997–98	0	11	50	16	1	6	3	0	0	0	87
1998–99	0	50	4	82	0	0	0	0	0	0	136
1999–00	0	1	4	12	0	0	0	0	0	0	17
2000–01	0	1	3	48	3	6	2	0	0	3	66
2001–02	0	38	11	89	2	6	2	0	0	1	149
2002–03	0	2	16	2	1	7	1	0	0	0	29
2003–04	0	6	4	4	3	2	4	0	0	0	23
2004–05	3	19	4	1	4	1	1	0	0	0	33
2005–06	0	2	3	77	2	6	3	0	1	0	94
2006–07	0	2	24	4	3	4	1	0	0	1	39
All years	31	240	652	1 139	38	52	27	3	5	160	2 347

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
2005–06	0	2	486	3 212	82	301	479	0	1	0	4 563
2006–07	0	2	3 380	264	276	87	187	0	0	2	4 198
All years	786	10 599	81 147	124 073	3 248	2 947	3 330	61	192	19 312	245 695

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. ORMC data from 2006–07 has length data with no catch recorded so is not reported in this table. 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
2005–06	4	11	36	10	3	0	29	26	0	28	14
2006–07	0	7	2	15	66	17	41	43	9	58	21
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	*
2006–07											
Both											
All years	*	7	4	7	8	10	11	12	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 Ser	OEO4 ser	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
2005–06	2	8	5	8	1	0	4	2	0	1	31
2006–07	0	4	1	6	3	4	8	5	1	2	34
All years	17	72	69	114	28	11	41	31	22	32	437
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
2006–07	0	0	2	3	2	1	3	2			13
All years	0	0	2	5	31	11	26	15	23	25	138

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 Ser	OEO4 ser	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
2005–06	4	33	37	41	3	0	20	37	0	19	194
2006–07	0	46	3	71	32	15	187	33	2	6	395
All years	31	280	437	1 020	168	24	355	155	156	143	2 769
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
2006–07	0	0	5	8	4	1	8	5	0	0	31
All years	0	0	5	15	121	35	124	48	103	93	544

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
2005–06	63	712	3 424	4 652	286	0	2 163	4 864	0	1 908	18 072
2006–07	0	1 017	225	6 915	2 685	1 170	11 227	2 484	40	533	26 296
All years	1 946	12 415	42 916	103 832	14 867	1 530	26 976	15 765	14 685	14 012	248 944
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
2003–04	0	0	0	0	0	0	0	0	0	0	0
2004–05	0	0	0	0	0	0	0	0	0	0	0
2005–06	0	0	0	0	0	0	0	0	0	0	0
2006–07	0	0	496	800	401	100	801	522			3 120
All years	0	0	496	1 454	12 226	3 501	12 015	4 821	10 303	8 837	53 653

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
2005–06		51	52	49	50		47	49		47	49
2006–07		47	64	51	57	53	52	54	53	48	52
All years	46	49	49	51	52	52	50	50	51	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
2003–04											
2004–05											
2005–06											
2006–07			52	46	59	44	49	49			50
All years			52	46	52	52	48	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.

Males

	OEO3A ncr	OEO4 ncr	OEO3A scr	OEO4 scr	Southland	Pukaki west	Pukaki east	Bounty	Auckland Islands	Puysegur
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
2005–06	–	36.0	35.7	36.2	–	–	40.6	35.5	–	36.8
2006–07	–	33.4	34.3	35.7	37.2	32.1	30.9	35.4	28.3	28.3
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	–	–	–	–	–	–	–	–	–	–
2006–07	–	–	34.3	37.3	39.6	36.4	34.6	35.9	–	–
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
2006–07	–	33.5	34.3	35.8	37.6	32.8	31.1	35.5	28.2	28.3

Table 21: continued.

Females

	OEO3A ncr	OEO4 ncr	OEO3A scr	OEO4 scr	Southland	Pukaki west	Pukaki East	Bounty	Auckland Islands	Puysegur
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
2005–06	–	38.6	38.1	37.8	–	–	43.1	37.3	–	38.6
2006–07		35.2	35.2	37.4	40.5	33.2	32.0	36.8	33.1	27.7
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	–	–	–	–	–	–	–	–	–	–
2006–07	–	35.2	35.3	37.5	40.6	33.7	32.2	36.8	33.1	27.7
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
2006–07	–	–	35.5	39.2	41.3	37.1	35.1	36.2	–	–

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 5 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
2005-06	15	9	1	7	11	32	75
2006-07	20	23	7	15	6	45	116
ORMC							
2000-01	2	0	2	3	0	0	7
2006-07	0	1	3	3	1	0	8

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 5 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
2005-06	2 146	1 277	175	136	1 539	703	5 976
2006-07	3 736	2 186	505	881	759	1 014	9 081
ORMC							
2000-01	200	0	200	254	0	0	654
2006-07	0	100	300	300	0	0	800

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 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						
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
2005–06	36.1	36.8	36.2	36.5	35.4	36.0
2006–07	34.9	36.9	36.5	37.4	35.0	33.8
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
2005–06	37.8	38.4	37.8	38.8	37.0	38.6
2006–07	36.4	38.7	38.4	40.1	36.2	36.1

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
2005–06	0	25	34	34	2	0	15	37	0	3	150
2006–07	0	41	3	71	32	13	123	30	2	6	321
All years	1	131	70	289	72	17	184	116	53	33	966

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 n cr	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
2005–06	0	122	379	468	20	0	190	485	0	14	1 678
2006–07	0	147	22	739	287	107	1 039	262	10	70	2 683
All years	4	601	778	3 311	672	133	1 640	1 407	825	420	9 789

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	10	12	5	0	0	0	0	0	0	27
1985-86	24	9	1	16	0	0	0	0	0	0	50
1986-87	0	4	73	105	0	0	0	0	0	0	182
1987-88	18	76	85	122	0	0	0	0	0	0	301
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	106
1990-91	10	0	27	78	5	4	2	1	3	57	187
1991-92	1	112	44	109	5	4	0	0	1	81	357
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	75	1	2	0	0	0	0	6	55	139
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	57	44	17	1	8	3	0	2	2	137
1998-99	2	97	2	86	0	0	0	0	0	0	187
1999-00	2	20	1	19	0	0	0	0	0	0	42
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	263
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	86
2004-05	8	83	3	1	3	1	0	0	0	6	105
2005-06	1	3	3	95	2	5	2	0	4	2	117
2006-07	7	31	18	10	3	4	2	0	0	7	82
All years	197	1 101	542	1 400	33	55	18	2	30	255	3 633

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
2005–06	4	6	259	14 528	253	256	31	0	10	7	15 354
2006–07	122	306	1 844	134	170	316	18	0	0	41	2 951
All years	10 254	42 944	33 672	235 672	4 136	4 929	1 573	130	2 316	18 905	354 562

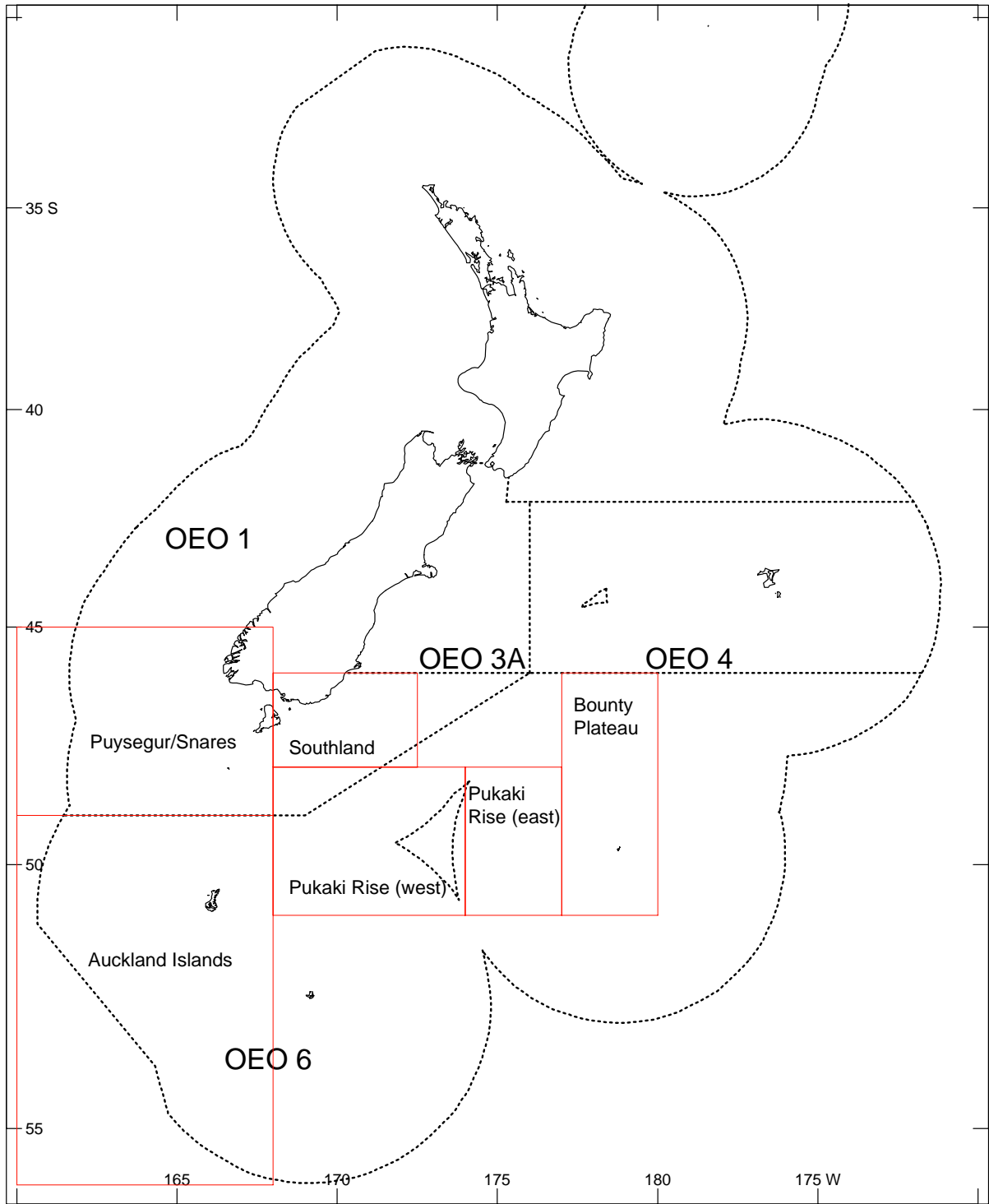


Figure 1: Oreo management areas OEO 1, OEO 3A, OEO 4, OEO 6 (dotted lines) and the fishing areas (rectangles, solid lines) where length and associated data were extracted for each analysis.

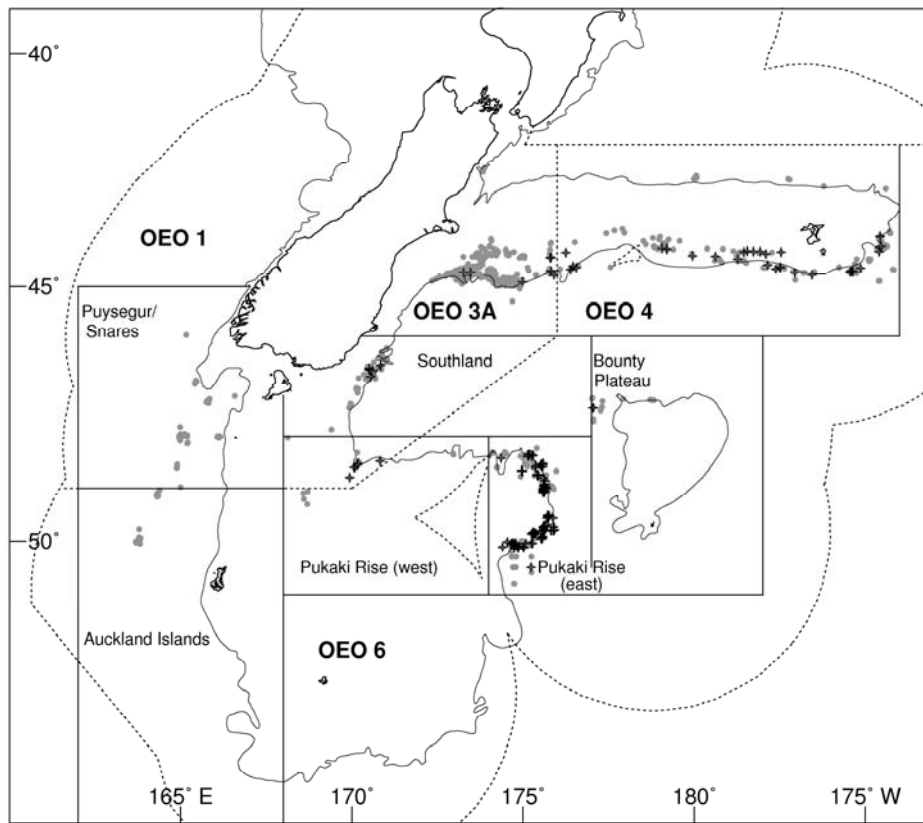


Figure 2: Fishing areas referred to in the report and all black oreo tow positions (for fishing years 1979–1980 to 2006–07) from which observer biological data were taken. Tow positions are displayed as dots, 2006–07 as a cross.

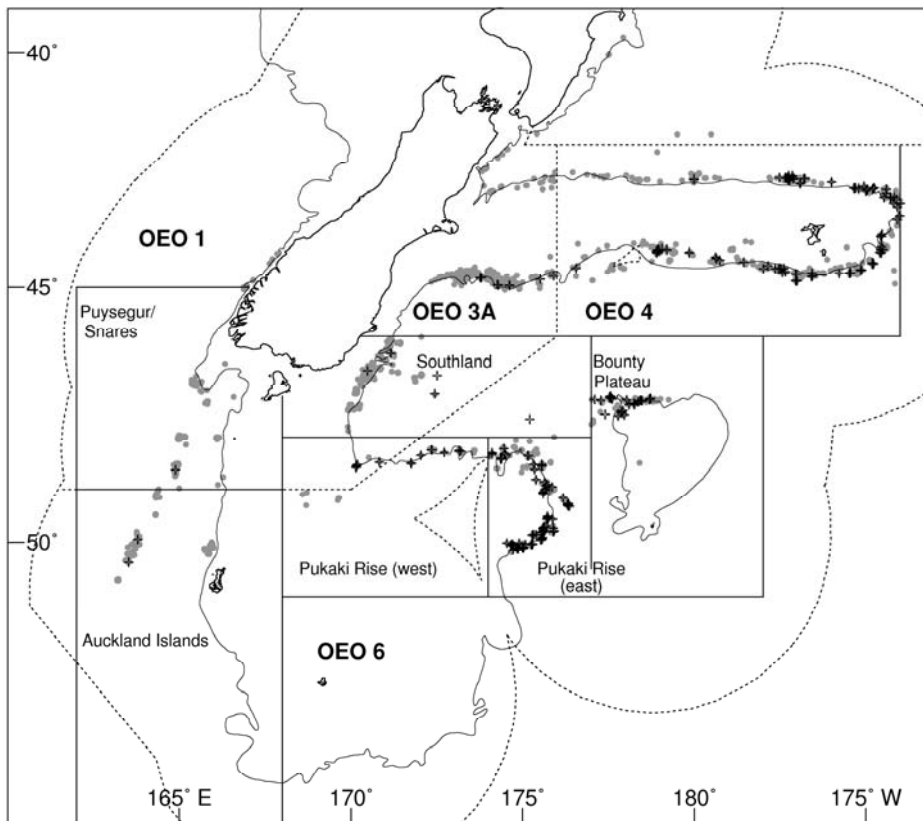


Figure 3: Fishing areas referred to in the report and all smooth oreo tow positions (fishing years 1979–1980 to 2006–07) from which observer biological data were taken. Tow positions are displayed as dots, 2006–07 as a cross.

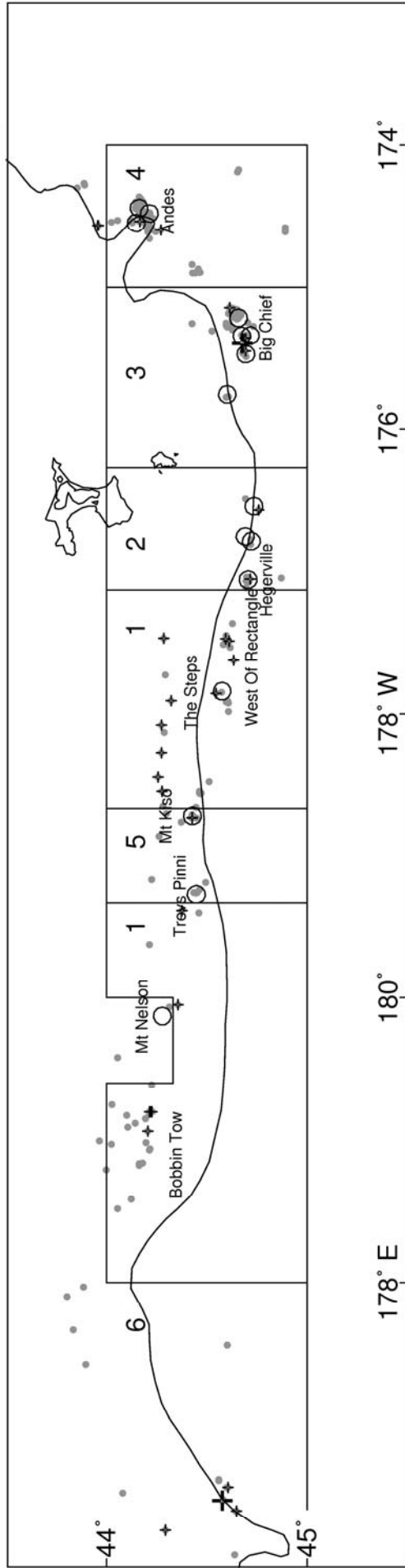


Figure 4: Sample areas defined for OEO 4 (1–6), with black oreo biological sample tow positions marked by grey dots, 2006–07 as a cross, and major hills denoted by open circles, and some other main fishing areas.

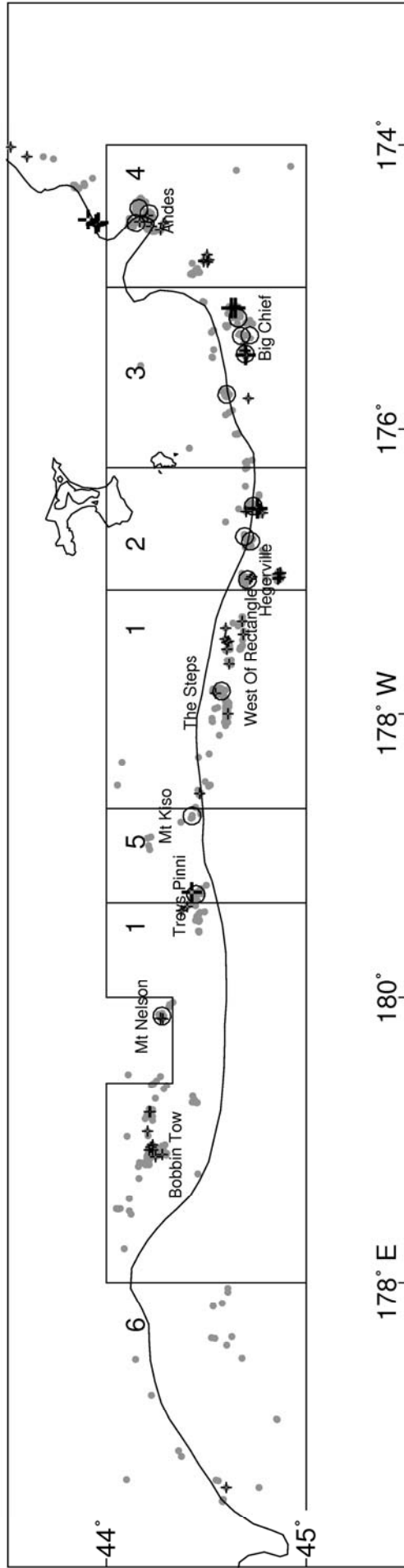


Figure 5: Sample areas defined for OEO 4 (1–6), with smooth oreo biological sample tow positions marked by grey dots, 2006–07 as a cross, and major hills denoted by open circle, and some other main fishing areas.