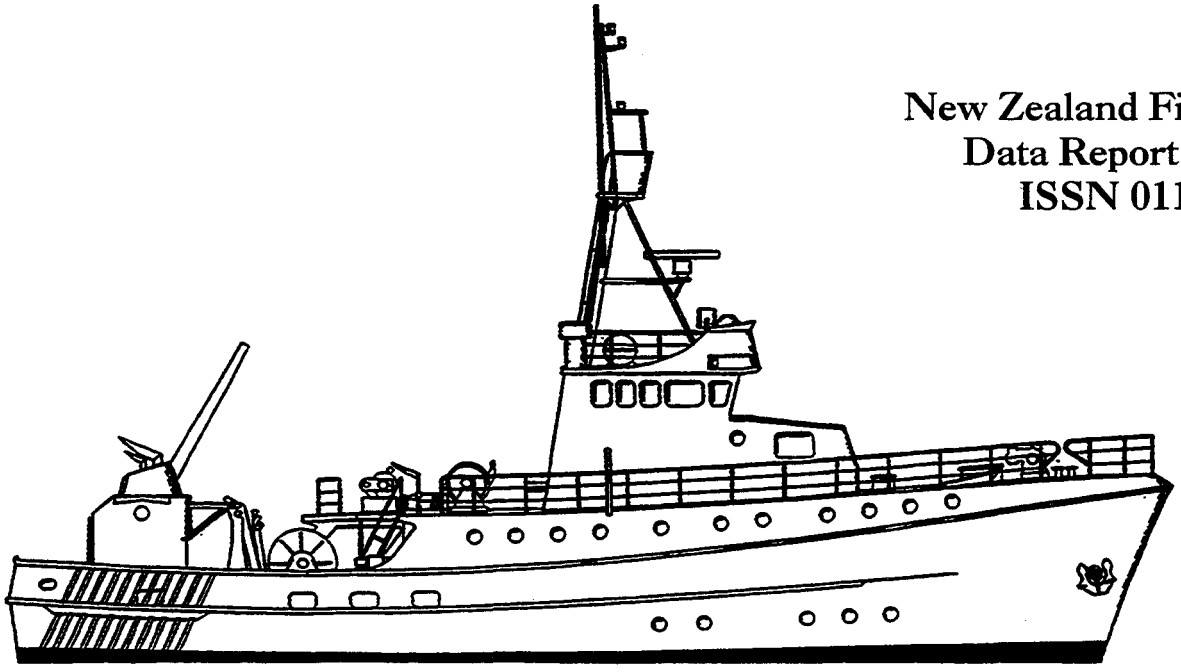
NIWA
Taihoro Nukurangi

Inshore trawl survey of the west coast South Island and Tasman and Golden Bays, March-April 1994 (KAH9404)

Kim L. Drummond
Michael L. Stevenson



New Zealand Fisheries
Data Report No. 64
ISSN 0113-2288
1995

Inshore trawl survey of the west coast South Island and Tasman and Golden Bays, March–April 1994 (KAH9404)

Kim L. Drummond
Michael L. Stevenson

New Zealand Fisheries Data Report No. 64
1995

Published by NIWA
Wellington
1995

Inquiries to:
Publication Services, NIWA
PO Box 14-901, Wellington, New Zealand

The *New Zealand Fisheries Data Report* series
continues the *Fisheries Research Division Occasional Publication: Data Series.*

ISBN 0-478-04646-4

Contents

Introduction

This report presents results from the second in a time series of stratified random trawl surveys in depths between 20 and 400 m off the west coast of the South Island, and within Tasman and Golden Bays. The pilot *Kaharoa* trawl survey of this area (March-April 1990) was described by Drummond & Ryan (1992), and the first of the standardised time series of surveys (March-April 1992) by Drummond & Stevenson (1995).

The principal aim of the time series is to estimate the relative abundance of the species that are both important to the inshore fishery and are vulnerable to bottom trawl within the survey area over the survey period. The main species that meet these criteria are giant stargazer (*Kathetostoma giganteum*), red cod (*Pseudophycis bachus*), red gurnard (*Chelidonichthys kumu*), and tarakihi (*Nemadactylus macropterus*). A standardised index of relative abundance estimates for key inshore species from this time series will assist with stock assessment and management strategies.

This report describes the survey design and methods and provides stock assessment data for commercially important Individual Transferable Quota (ITQ) and non-ITQ species. The survey was carried out using RV *Kaharoa* between 18 March and 20 April 1994.

Project objectives

1. To determine the distribution and develop a time series of relative abundance indices for species caught in the inshore waters of the west coast of the South Island and Tasman and Golden Bays.
2. To provide parameter inputs for the stock assessment of the primary species caught by collecting and analysing biological data, i.e., length and age frequency, weight, reproductive condition, and fecundity.

Survey objectives

1. To obtain relative biomass data for giant stargazer, red cod, red gurnard, tarakihi, and other commercially important species sampled by bottom trawl in the inshore waters of the west coast of the South Island and Tasman and Golden Bays.
2. To collect data on the length, sex, and reproductive condition of giant stargazer, red cod, red gurnard, and tarakihi.
3. To collect otoliths from giant stargazer and red gurnard in support of an adaptive management programme for these species (*see* Francis & Hurst 1991).
4. To collect data on the length and sex of all other Individual Transferable Quota (ITQ) and selected non-ITQ species taken during the survey.
5. To tag lively school shark as part of a national study on the growth and movement of this species.
6. To collect rig and school shark vertebrae and elephantfish spines in support of an ageing study on these species.

Project and voyage personnel

The project leader was K. Drummond. The survey was divided into two sections (18 March to 5 April, 6–20 April), with a changeover of vessel crew and scientific staff at the halfway stage. K. Drummond was the voyage leader and A. Aberdein the skipper during the first half. J. Hadfield and M. Stevenson shared the voyage leader role for the second leg and A. Muir was the skipper.

Methods

Survey area

The survey area covered depths of 20–400 m off the west coast of the South Island from Farewell Spit to Haast River mouth (25–400 m south of Karamea), and within Tasman and Golden Bays, inside a line drawn between Farewell Spit and Stephens Island (Figure 1). The 1994 survey area totalled 25 600 km^2, about 41% of the 62 500 km^2 inside the 400 m depth contour within the Challenger Fishery Management Area (QMA7).

The depth range trawled reflected the distribution of the main species of interest. The area covered was the same as that surveyed in 1992 and stratum boundaries were retained (Figure 2). Within the survey area 85% of the ground was trawlable.

Survey design

The survey used a two-phase stratified random design (*after* Francis 1984). The two-phase methodology was applied separately to the west coast and the Tasman and Golden Bay zones in recognition of the geographic separation of the two areas and the variable weather patterns anticipated on the west coast. All strata used during the 1992 survey were retained.

Before the survey began sufficient trawl stations to cover both first and second phase stations within each stratum were randomly generated by the computer programme 'rand_stn v2.1' (*see* Vignaux 1994). The stations were required to be a minimum of 5.6 km (3 n. miles) apart, and each tow was 1 h long in daylight. Non-trawlable ground was identified before the voyage from data collected during previous trawl surveys in the area by RVs *W. J. Scott* (1981–83), *James Cook* (1983–84), and *Kaharoa* (1990). The distribution of the non-trawlable ground is given in Table 1.

For the two-phase methodology, giant stargazer, red cod, red gurnard, and tarakihi were designated as the target species. In total 80 stations were assigned to phase 1, with a minimum of 3 stations per stratum. The balance of phase 1 stations was allocated to minimise the variance of the expected catch rates of the target species, where the expected catch rates were assumed to be the combined catch rates obtained during the 1992 survey. Consequently, in 1994 more phase 1 effort was directed towards the Cape Foulwind to Greymouth area, and less from Greymouth to Okarito than in 1992. Phase 2 stations were aimed at improving the precision of biomass estimates for the target species and were allocated after phase 1 had been completed.

Vessel and gear

RV *Kaharoa*, a 28 m stern trawler with a beam of 8.2 m, a displacement of 302 t, and engine power of 522 kW, is capable of trawling to depths of 500 m. The two-panel trawl net used during the survey was designed and constructed in 1991 specifically for South Island inshore trawl surveys. The net is based on an 'Alfredo' design, and is similar to one used during the 1980s for GRV *W. J. Scott* South Island surveys. The net was fitted with a 74 mm (inside measurement) knotless codend. Details of the net design were given by Drummond & Stevenson (1995).

Doorspread measurements were estimated from net trials conducted in 10–200 m during 1991–94 using the method of Koyama (1974). Estimates of doorspread ranged from 63 to 92 m, with an overall mean of about 79 m. Headline height was recorded from a netsonde for each tow during the survey, and varied between 4 and 5 m.

Trawling procedure

All tows were undertaken in daylight and three to five tows a day were planned. For each tow the vessel steamed to the station position and, if necessary, the bottom was checked with the depth sounder. Once the tow was considered safe the gear was set away so that the midpoint of the tow would coincide as nearly as possible with the station position. The direction of the tow was influenced firstly by the combination of weather conditions and bottom contours, and secondly by the location of the next tow (to minimise steaming between stations).

If the station was in an area of foul or the depth was out of the stratum range, an area within 5 km of the station was searched and the station occupied if possible. If the search for clear ground was unsuccessful, the station was abandoned and the next station on the list was chosen. Standard tows were of 1 h at a speed over the ground of 3 kn: the distance covered was measured by GPS. The tow was deemed to have started when the netsonde showed that the net was on the bottom, and was completed when hauling began.

A minimum of 250 m of warp was used during towing. In depths below 60 m a reducing warp to depth ratio was employed, starting at 4 : 1 and dropping to 3 : 1 for depths below 150 m.

On station 12 the sweeps and bridles were damaged and were replaced. The original survey net was completely replaced after coming fast on station 15 (which was subsequently abandoned). The back-up net was then used for the rest of the survey.

Surface temperatures

The surface temperature at each station was recorded from a hull-mounted sensor. The calibration of the sensor was uncertain, so surface temperatures are only relative. Bottom temperatures were not recorded because the sensor on the net monitor was not functioning.

Catch and biological sampling

The catch was sorted into species on deck and weighed on 100 kg electronic motion-compensating Seaway scales to the nearest 0.1 kg. The weight of tagged school shark was estimated from the length weight coefficients given in Appendix 1.

Length, to the nearest whole centimetre below the actual length, and sex were recorded for all ITQ species, either for the whole catch or a randomly selected subsample of up to 200 fish per tow. Biological data were collected from a sample of up to 20 fish per tow for giant stargazer, red cod, red gurnard, and tarakihi, as well as kahawai, snapper, and turbot when they were caught, and consisted of individual fish length and weight, otoliths for ageing (giant stargazer and red gurnard), and gonad stages. The gonad stages were: 1, immature or resting; 2, maturing (oocytes visible in females); 3, mature (hyaline oocytes in females, milt expressible in males); 4, running ripe (eggs and milt free flowing); 5, spent.

Length weight coefficients were determined for giant stargazer, red cod, red gurnard, and tarakihi using the geometric mean functional relationship.

Lively school shark were measured, sexed, and tagged using a single dart tag, and released within minutes of being removed from the codend. For each tagged school shark a release factor was assigned on a scale of 1–3, with 1 corresponding to the fish swimming away slowly, 2 freely, and 3 vigorously. A handling factor, on the same 1–3 scale, was also recorded to assess the liveliness of individual sharks before release.

Data analysis

Relative biomass was estimated by the area-swept method described by Francis (1981, 1989) using the Trawlsurvey Analysis Program described by Vignaux (1994).

The following assumptions were made.

1. The area swept during each tow equalled the distance between the doors multiplied by the distance towed (doorspread was estimated at 79 m from gear trials and distance towed was usually 3 n. miles).
2. Vulnerability was 1.0. This assumes that all fish in the volume swept were caught and there was no escapement.
3. Vertical availability was 1.0. This assumes that all fish in the water column were below the headline height and available to the net.
4. Areal availability was 1.0. This assumes that the fishstock being sampled was entirely within the area sampled at the time of the survey.
5. Within the survey area, fish were distributed evenly over both trawlable and non-trawlable ground.

Although these assumptions are unlikely to be correct, their adoption provides the basis for a time series of relative biomass estimates. All assumptions are consistent with those of Drummond & Stevenson (1995).

A combined biomass and length frequency analysis was used for species for which biomass above and below a specific size was required, and for deriving weighted length frequency distributions. The length weight coefficients used are given in Appendix 1. All length frequencies were scaled by the percentage of catch sampled, area swept (function of doorspread and distance towed), and stratum area using the Trawlsurvey Analysis Program.

All stations where the gear performance code was 1 or 2 were used for biomass estimation. This excluded 1 of the 117 stations completed and a station that was abandoned early in the tow after the net came fast.

Results

Trawl stations

Seventy-eight phase 1 stations and 38 phase 2 stations were successfully completed (Figure 1, Table 1, Appendix 2). Of the 80 planned phase 1 stations, 1 in stratum 13 was not completed and 1 in stratum 2 was occupied during phase 2 instead. Only 1 day was lost to bad weather during the voyage. There were short breaks in the programme to repair nets and to unload the catch. At least three stations were completed in all 16 strata. An overall station density of one per 221 km^2 was achieved.

Catch composition

A total of 86.2 t of fish was caught during the 116 successful tows at an average of 735 kg per tow (range 68–4039 kg). Amongst the wetfish catch, 1 agnathan, 21 elasmobranchs, and 63 teleosts were recorded, together with 3 cephalopods and 4 crustaceans (other than crabs). Other bivalves and crabs were caught, but not always identified. Southern spiny dogfish and barracouta made up 35% of the catch by weight (Table 2, Appendix 3).

Giant stargazer, red cod, red gurnard, and tarakihi made up 6.8, 12.9, 1.7, and 5.3% of the catch, respectively. Southern spiny dogfish, barracouta, arrow squid, and witch flounder were each caught in over 90% of the tows.

Catch rates and species distribution

Distributions and catch rates for all species combined are shown in Figure 4. (N.B., catch rates are given in terms of $kg.km^{-2}$, hence a catch rate of 1000 $kg.km^{-2}$ equates to a catch of 440 kg in a standard tow as it covers 0.44 km^{-2} on average.) All total catch rates over 5000 $kg.km^{-2}$ were made south of Greymouth, as were most of the catch rates over 2000 $kg.km^{-2}$.

Catch rates for the 11 most abundant ITQ species in the catch and the most abundant species overall (southern spiny dogfish) are shown in Figure 2. The catch rates for the 20 most abundant species are given in Table 3.

Biomass estimation

Relative biomass estimates for the top 20 species in the catch are given by subarea in Table 4. For species subject to a regulatory or processing size limit, estimates above a given size are provided. For red cod the processing size varies between years (38 cm in 1992, 45 cm in 1994, and 40 cm in 1995). The 38 cm size limit is used as the minimum size of recruited red cod in this report. The relative biomass estimates for the four target species are broken down by stratum in Table 5.

Surface temperature

Surface water temperatures are shown in Figure 3 and included in Appendix 2.

School shark tagging

One hundred and thirty-one school shark (52 male and 79 female) were tagged and released. The total length of tagged school shark ranged from 53 to 150 cm.

Length frequency and biological data

The numbers of length frequency and biological samples taken during the survey are given in Table 6. The scaled length frequency distributions for the 11 most abundant ITQ species, together with blue cod, blue warehou, hake, jack mackerel (three species separately), and silver warehou are given Figure 4.

Length weight relationships for the four target species are given in Appendix 1.

Target species

Giant stargazer. Virtually all (99%) of the relative biomass estimate of 1634 t (*c.v.* = 17%) was south of Cape Foulwind, and 65% was within the 100–200 m depth range (*see* Table 5). The sex ratios were 0.85 : 1 inside 100 m, 1.57 : 1 in 100–200 m, and 1.13 : 1 in 200–400 m (Figure 21). Virtually all female stargazer below 50 cm were immature or had resting gonads. Above this size most had maturing gonads (*see* Table 7).

Red cod. Of the estimated total biomass of 3587 t (*c.v.* = 18%), 2871 t (*c.v.* = 20%) was recruited biomass (≥ 38 cm) (*see* Table 4). Most (91%) of the biomass was inside 200 m on the west coast. The length frequency data show two dominant cohorts present at the time of the survey, aged 1+ and 2+ years. The sex ratio in Tasman and Golden Bays favoured females (0.31 : 1), while on the west coast it favoured males at all depths (1.43 : 1 inside 100 m, 2.41:1 in 100–200 m, and 7.29 : 1 in 200–400 m) (*see* Figure 4). Most female red cod examined had immature or resting gonads, with some large fish on the west coast at later stages of reproductive development (*see* Table 7).

Red gurnard. The relative biomass estimate of 605 t (*c.v.* = 15%) was almost equally divided between Tasman and Golden Bays (48%) and the west coast (52%) (*see* Table 5). The recruited biomass estimate (≥ 30 cm) was 519 t (*c.v.* = 16%). Virtually all red gurnard biomass was inside 100 m. The sex ratio was 0.85 : 1 in Tasman and Golden Bays and 2.34 : 1 on the west coast (*see* Figure 4). On the west coast female gonads were generally well developed or running ripe. In Tasman and Golden Bays female gonads were typically spent or developing (*see* Table 7).

Tarakihi. The relative biomass of tarakihi (all sizes) was 1672 t (*c.v.* = 13%), with 87% (*c.v.* = 12%) recruited (≥ 24 cm) (*see* Table 4). The length frequency data for Tasman and Golden Bays consisted of three successive cohorts of ages 1–3 years, confirming that these bays are important nursery areas for tarakihi. Of these year classes only the 3 year old fish were present on the west coast. In total, 88% of the tarakihi biomass was on the west coast, and most of this (72%) was in 100–200 m depth (*see* Table 5). The sex ratios in this area were 0.47 : 1 inside 100 m, 0.55 : 1 in 100–200 m, and 2.74 : 1 in 200–400 m (*see* Figure 4). There was little reproductive development in tarakihi below 30 cm, but for bigger fish a full range of gonad stages was recorded (*see* Table 7). A high proportion of tarakihi gonads

sampled in southern waters (south of Greymouth) were at late stages of maturity or running ripe.

Discussion

Favourable weather conditions and improved definition of untrawlable ground contributed to the overall success of the 1994 survey. For the second successive survey the *c.v.*s for the four target species (giant stargazer, red cod, red gurnard, and tarakihi) were below 20%. This result suggests that the survey design provides satisfactory indices of abundance for each of these species. For giant stargazer, the length frequency data suggest that pre-recruits are not well sampled by this survey, hence the relative abundance estimate mainly applies to recruited fish.

The best precision (*c.v.* = 7%) was associated with the relative biomass estimate for southern spiny dogfish, which was also the species caught in the greatest quantity (16.9 t or 19.6% of the total catch).

The completion of a third survey in 1995 will establish a time series of relative abundance estimates and should allow meaningful conclusions to be drawn on recent trends in size distribution and abundance for a number of these species. Improved monitoring of trawl net performance will further enhance the value of these surveys.

Doorspread is known to vary with depth and bottom conditions, but the biomass estimates presented in this report assume a constant spread of 79 m. For the 1995 survey, Scanmar sensors will be fitted to allow doorspread to be monitored throughout each tow and the relationship between doorspread and depth to be established. Biomass estimates and scaled length frequency distributions for the 1992 and 1994 surveys should then be recalculated.

Acknowledgments

We thank the two masters of *Kaharoa*, A. Muir and the late A. Aberdein, and their respective crews for their active cooperation and enthusiastic assistance during the trawl survey, and all MAF Fisheries staff who assisted with data collection. We also thank M. Ryan and J. Hadfield for their help with survey planning.

References

Annala, J. H. (Comp.) 1995: Report from the Fishery Assessment Plenary, May 1995: stock assessments and yield estimates. 277 p. (Unpublished report held in NIWA library, Wellington.)

Drummond, K. L. & Ryan, M. P. 1992: A bottom trawl survey of inshore waters within the Challenger Fishery Management Area, March–April 1990. Central Fisheries Region Internal Report No. 17. 47 p. (Unpublished report held in Ministry of Fisheries library, Nelson.)

Drummond, K. L. & Stevenson, M. 1995: Inshore trawl survey of Tasman and Golden Bays and the west coast South Island, March–April 1992 (KAH9204). *N.Z. Fisheries Data Report No. XX.* XX p.

Francis, M. P. & Hurst, R. J. (Convenors) 1991: Report from the Middle Depth and Inshore 2 Fishery Assessment Working Groups: proposed monitoring techniques for stocks whose TACCs were increased under "adaptive management" proposals. N.Z. Fisheries Assessment Working Group Report 91/2. 7 p. (Unpublished report held in NIWA library, Wellington.)

Francis, R. I. C. C. 1981: Stratified random trawl surveys of deep-water demersal stocks around New Zealand. *Fisheries Research Division Occasional Publication No. 32.* 28 p.

Francis, R. I. C. C. 1984: An adaptive strategy for stratified random trawl surveys. *N.Z. Journal of Marine and Freshwater Research 18*: 59–71.

Francis, R. I. C. C. 1989: A standard approach to biomass estimation from bottom trawl surveys. N.Z. Fisheries Assessment Research Document 89/3. 3 p. (Unpublished report held in NIWA library, Wellington.)

Koyama, T. 1974: Study on the stern trawl. *Bulletin of Tokai Regional Fisheries Research Laboratory* 77: 174–247. (In Japanese, English translation held in NIWA library, Wellington.)

Vignaux, M. 1994: Documentation of Trawlsurvey Analysis Program. MAF Fisheries Greta Point Internal Report No. 225. 44 p. (Unpublished report held in NIWA library, Wellington.)

Table 1: Stratum depth ranges, survey area, non-trawlable area, number of successful phase 1 and phase 2 stations, and station density.

Stratum	Depth (m)	Area (km^2)	Non-trawlable area (km^2)	Number of stations		Station density (no. per km^2)
				Phase 1	Phase 2	
1	20–100	1 345	98	3	0	1:448
2	100–200	4 302	303	3	7	1:430
5	25–100	1 224	0	3	0	1:408
6	100–200	3 233	238	3	4	1:461
7	25–100	927	0	6	1	1:132
8	100–200	2 354	214	5	5	1:235
9	200–400	1 877	1 456	3	0	1:626
11	25–100	1 438	63	10	2	1:120
12	100–200	1 948	338	11	3	1:139
13	200–400	1 206	693	9	0	1:134
14	25–100	851	35	4	2	1:141
15	100–200	905	215	6	7	1:70
16	200–400	295	13	3	2	1:59
17	20–33	307	27	3	0	1:102
18	20–42	949	9	3	3	1:158
19	20–70	2 431	125	3	2	1:486
Total (average)		25 592	3 827	78	38	1:221

able 2: Species caught, total weight, and number of stations out of 117 at which species occurred

ɔmmon name	Scientific name	Code	Catch (kg)	% of total catch	Occurrence
ɔiny dogfish	*Squalus acanthias*	SPD	16 932.0	20	107
arracouta	*Thyrsites atun*	BAR	13 024.4	15	108
ed cod	*Pseudophycis bachus*	RCO	11 088.9	13	93
attails	Macrouridae	RAT	7 415.2	9	75
iant stargazer	*Kathetostoma giganteum*	STA	5 911.1	7	83
arakihi	*Nemadactylus macropterus*	TAR	4 553.0	5	98
rrow squid	*Nototodarus sloanii*	SQU	3 016.7	3	116
oki	*Macruronus novaezelandiae*	HOK	2 722.5	3	54
hool shark	*Galeorhinus galeus*	SCH	2 212.4	3	91
arpet shark	*Cephaloscyllium isabella*	CAR	1 755.1	2	98
ed gurnard	*Chelidonichthys kumu*	GUR	1 479.9	2	48
ng	*Genypterus blacodes*	LIN	1 416.8	2	63
ark ghost shark	*Hydrolagus novaezelandiae*	GSH	1 403.5	2	41
a perch	*Helicolenus* spp.	SPE	1 288.9	1	81
nooth skate	*Raja innominata*	SSK	1 259.7	1	49
g	*Mustelus lenticulatus*	SPO	1 211.2	1	67
itch	*Arnoglossus scapha*	WIT	945.6	1	106
aly gurnard	*Lepidotrigla brachyoptera*	SCG	890.0	1	95
ɔmmon roughy	*Paratrachichthys trailli*	RHY	840.5	< 1	9
ephantfish	*Callorhynchus milii*	ELE	606.3	< 1	14
ɔugh skate	*Raja nasuta*	RSK	569.1	< 1	53
ınd flounder	*Rhombosolea plebeia*	SFL	565.7	< 1	18
ake	*Merluccius australis*	HAK	425.4	< 1	46
urphy's mackerel	*Trachurus murphyi*	JMM	415.1	< 1	51
eatherjacket	*Parika scaber*	LEA	314.1	< 1	14
lectric ray	*Torpedo fairchildi*	ERA	287.0	< 1	16
ɔotty	*Notolabrus celidotus*	STY	272.2	< 1	11
orthern spiny dogfish	*Squalus blainvillei*	NSD	267.6	< 1	37
lue warehou	*Seriolella brama*	WAR	265.1	< 1	39
emfish	*Rexea solandri*	SKI	252.5	< 1	15
ck mackerel	*Trachurus declivis*	JMD	248.4	< 1	61
.Z. sole, common sole	*Peltorhamphus novaezelandiae*	ESO	236.9	< 1	19
emon sole	*Pelotretis flavilatus*	LSO	216.8	< 1	60
orse mackerel	*Trachurus novaezelandiae*	JMN	173.3	< 1	22
ucumber fish	*Clorophthalmus nigripinnis*	CUC	147.2	< 1	40
lver warehou	*Seriolella punctata*	SWA	127.2	< 1	48
lue cod	*Parapercis colias*	BCO	123.4	< 1	13
lver dory	*Cyttus novaezelandiae*	SDO	107.4	< 1	18
onger eel	*Conger* spp.	CON	105.2	< 1	13
hn dory	*Zeus faber*	JDO	102.0	< 1	22
ostfish	*Lepidopus caudatus*	FRO	101.6	< 1	30
apro dory	*Capromimus abbreviatus*	CDO	99.5	< 1	41
apuku	*Polyprion oxygeneios*	HAP	96.2	< 1	12
lender smoothhound	*Gollum attenuatus*	SSH	93.9	< 1	7
ellow-eyed mullet	*Aldrichetta forsteri*	YEM	56.4	< 1	6
velinfish	*Lepidorhynchus denticulatus*	JAV	47.7	< 1	16
harpsnouted sevengill shark	*Heptranchias perlo*	HEP	46.9	< 1	2
napper	*Pagrus auratus*	SNA	46.4	< 1	5
lue shark	*Prionace glauca*	BWS	44.1	< 1	1

Table 2—*continued*

Common name	Scientific name	Code	Catch (kg)	% of total catch	Occurrence
Silverside	*Argentina elongata*	SSI	40.2	< 1	60
Deepsea flathead	*Hoplichthys haswelli*	FHD	39.8	< 1	6
Pufferfish	*Sphoeroides* spp.	PUF	36.3	< 1	6
Stingray	*Dasyatis* spp.	STR	35.0	< 1	1
Red mullet	*Upeneichthys lineatus*	RMU	25.3	< 1	6
Orange perch	*Lepidoperca* spp.	OPE	22.6	< 1	1
Seal shark	*Scymnorhinus licha*	BSH	21.8	< 1	1
Sixgill shark	*Hexanchus griseus*	HEX	19.1	< 1	2
Numbfish	*Typhlonarke* spp.	BER	18.4	< 1	5
Turbot	*Colistium nudipinnis*	TUR	15.1	< 1	5
Octopus	*Octopus maorum*	OCT	14.5	< 1	18
Trevally	*Pseudocaranx dentex*	TRE	14.4	< 1	4
Bluenose	*Hyperoglyphe antarctica*	BNS	13.3	< 1	2
Brill	*Colistium guntheri*	BRI	9.2	< 1	5
Sprat	*Sprattus* spp.	SPR	9.1	< 1	23
Longtailed skate	*Arhtnchobaris asperrimus*	LSK	7.9	< 1	4
Swollenheaded conger	*Bassanago bulbiceps*	SCO	6.9	< 1	2
Thresher shark	*Alopias vulpinus*	THR	6.7	< 1	2
Broad squid	*Sepioteuthis australis*	BSQ	6.3	< 1	6
Lookdown dory	*Cyttus traversi*	LDO	6.0	< 1	2
Spotted stargazer	*Genyagnus monopterygius*	SPZ	6.0	< 1	3
Kahawai	*Arripis trutta*	KAH	4.7	< 1	2
Eagle ray	*Myliobatis tenuicaudatus*	EGR	4.3	< 1	1
Pigfish	*Congiopodus leucopaecilus*	PIG	3.8	< 1	12
Dredge oyster	*Tiostrea chilensis*	OYS	2.8	< 1	5
Prawn killer	*Ibacus alticrenatus*	PRK	2.6	< 1	17
Bluntnosed skate	*Bathyraja* spp.	BTH	2.5	< 1	2
Ahuru	*Auchenoceros punctatus*	PCO	2.3	< 1	13
Redbait	*Emmelichthys nitidus*	RBT	2.3	< 1	8
Northern bastard cod	*Pseudophycis breviuscula*	BRC	2.0	< 1	1
Spiny sea dragon	*Solegnathus spinosissimus*	SDR	1.9	< 1	8
Yellowbelly flounder	*Rhombosolea leporina*	YBF	1.7	< 1	2
Hagfish	*Eptatretus cirrhatus*	HAG	1.3	< 1	1
Scallop	*Pecten novaezelandiae*	SCA	1.3	< 1	5
Crab	Crustacea	CRB	0.8	< 1	6
Rock lobster	*Jasus edwardsii*	CRA	0.7	< 1	1
Quinnat salmon	*Oncorhynchus tshawytscha*	SAM	0.7	< 1	1
Yellow boarfish	*Pentaceros decacanthus*	YBO	0.7	< 1	2
Anchovy	*Engraulis australis*	ANC	0.6	< 1	6
Opalfish	*Hemerocoetes* spp.	OPA	0.5	< 1	6
Unidentified crustacean	Crustacea	CRU	0.4	< 1	5
Toadfish	*Neophrynichthys latus*	TOD	0.4	< 1	3
Yellow cod	*Parapercis gilliesi*	YCO	0.4	< 1	1
Scampi	*Metanephrops challengeri*	SCI	0.3	< 1	3
Pilchard	*Sardinops neopilchardus*	PIL	0.2	< 1	2
Unidentified fish	Unidentified telost	UNI	0.2	< 1	1
Porcupine fish	*Allomycterus jaculiferus*	POP	0.0	< 1	7
			86 241.3		

Table 3: Mean catch rates (to the nearest whole kg.km^{-2}) for the 20 most abundant species by stratum*

ITQ species

West coast		Species code										
Stratum	Depth (m)	BAR	RCO	STA	TAR	SQU	HOK	SCH	GUR	LIN	SPO	ELE
1	20–100	283	9	4	0	39	0	13	42	0	9	0
5	25–100	954	89	2	0	92	0	3	14	0	23	4
7	25–100	124	556	0	1	9	0	34	88	27	87	94
11	25–100	268	494	59	39	90	43	50	25	27	36	53
14	25–100	220	445	11	36	13	0	44	131	12	77	15
2	100–200	31	78	1	31	33	0	44	1	0	3	0
6	100–200	91	123	6	53	39	0	199	1	0	2	0
8	100–200	232	61	132	112	67	23	44	1	2	5	0
12	100–200	577	113	268	192	107	342	47	0	11	10	0
15	100–200	254	495	253	124	47	103	31	0	46	25	0
9	200–400	65	0	5	11	30	0	6	0	0	0	0
13	200–400	44	59	188	214	109	78	2	0	81	8	0
16	200–400	88	72	688	170	60	166	32	0	247	6	0
Tasman and Golden Bays												
17	20–33	137	23	4	36	42	0	11	112	5	101	0
18	20–42	563	194	2	170	33	1	23	157	0	19	0
19	20–70	291	13	1	11	70	0	32	45	0	20	0

Non-ITQ species

West coast		Species code								
Stratum	Depth (m)	SPD	RAT	CAR	GSP	SPE	SSK	WIT	SCG	RHY
1	20–100	407	70	50	1	7	17	2	30	0
5	25–100	418	536	44	0	0	10	3	32	0
7	25–100	195	160	49	0	0	0	14	3	0
11	25–100	440	161	47	0	0	0	16	21	0
14	25–100	267	5	21	1	0	5	78	8	0
2	100–200	297	0	30	71	14	10	0	26	0
6	100–200	370	355	30	108	12	33	0	19	0
8	100–200	700	49	56	45	46	13	2	12	0
12	100–200	576	166	31	0	46	18	13	13	6
15	100–200	321	514	17	2	25	50	59	56	70
9	200–400	0	0	26	0	1	1	0	0	0
13	200–400	118	23	70	32	103	37	7	1	107
16	200–400	18	32	33	190	64	221	10	0	4
Tasman and Golden Bays										
17	20–33	73	1	3	0	11	0	41	0	0
18	20–42	305	0	6	0	3	0	24	3	0
19	20–70	85	0	8	0	12	0	6	12	0

* Species codes are given in Table 2.

Table 4: Relative doorspread biomass estimates of the 20 most abundant species by sub–area

Common name	Tasman and Golden Bays		West coast		Total survey area	
	Biomass (t)	*c.v.* (%)	Biomass (t)	*c.v.* (%)	Biomass (t)	*c.v.* (%)
Southern spiny dogfish	519	22	7 781	7	8 300	7
Barracouta	1 283	33	4 766	17	6 049	15
Red cod	222	37	3 365	19	3 587	18
Red cod (38+ cm)	156	54	2 716	21	2 871	20
Rattails	1	56	3 222	42	3 223	42
Tarakihi	201	59	1 472	13	1 672	13
Tarakihi (25+ cm)	29	74	1 433	12	1 461	12
Giant stargazer	6	47	1 628	17	1 634	17
Arrow squid	213	25	1 195	10	1 408	9
School shark	102	32	1 241	45	1 343	41
Hoki	1	93	1 020	50	1 021	50
Hoki (65+ cm)	0		92	21	92	21
Dark ghost shark	0		859	14	859	14
Carpet shark	26	35	827	9	853	9
Red gurnard	293	16	312	25	605	15
Red gurnard (30+ cm)	219	17	300	25	519	16
Ling	2	44	314	21	316	21
Sea perch	35	78	475	18	510	18
Scaly gurnard	32	68	400	20	432	19
Rig	99	24	322	11	421	10
Smooth skate	0		410	18	411	18
Witch	51	22	206	26	256	21
Common roughy	0		206	62	206	62
Elephantfish	0		181	33	181	33

Table 5: Estimates of relative biomass (to the nearest whole tonne) for the four target species by stratum

		Red cod		Giant stargazer		Red gurnard		Tarakihi	
Stratum	Depth (m)	Biomass (t)	% of total	Biomass (t)	% of total	Biomass (t)	% of total	Biomass (t)	% of total
West coast									
1	20–100	13	0	6	0	57	9	0	0
5	20–100	109	3	2	0	17	3	0	0
7	20–100	516	14	0	0	81	13	1	0
11	20–100	711	20	84	5	36	6	55	3
14	20–100	379	11	9	1	112	18	30	2
2	100–200	337	9	3	0	4	1	133	8
6	100–200	397	11	20	1	4	1	172	10
8	100–200	144	4	311	19	2	0	264	16
12	100–200	220	6	523	32	0	0	375	22
15	100–200	448	12	229	14	0	0	112	7
9	200–400	0	0	10	1	0	0	21	1
13	200-400	72	2	227	14	0	0	258	15
16	200-400	21	1	203	12	0	0	50	3
	Subtotal	3 365	94	1 628	100	312	52	1 472	88
Tasman and Golden Bays									
17	20–33	7	0	1	0	34	6	11	1
18	20–42	184	5	2	0	149	25	162	10
19	20–70	32	1	3	0	110	18	28	2
	Subtotal	222	6	6	0	293	48	201	12
	Total	3 587		1 634		605		1 672	

Table 6: Number of length frequency and biological samples collected

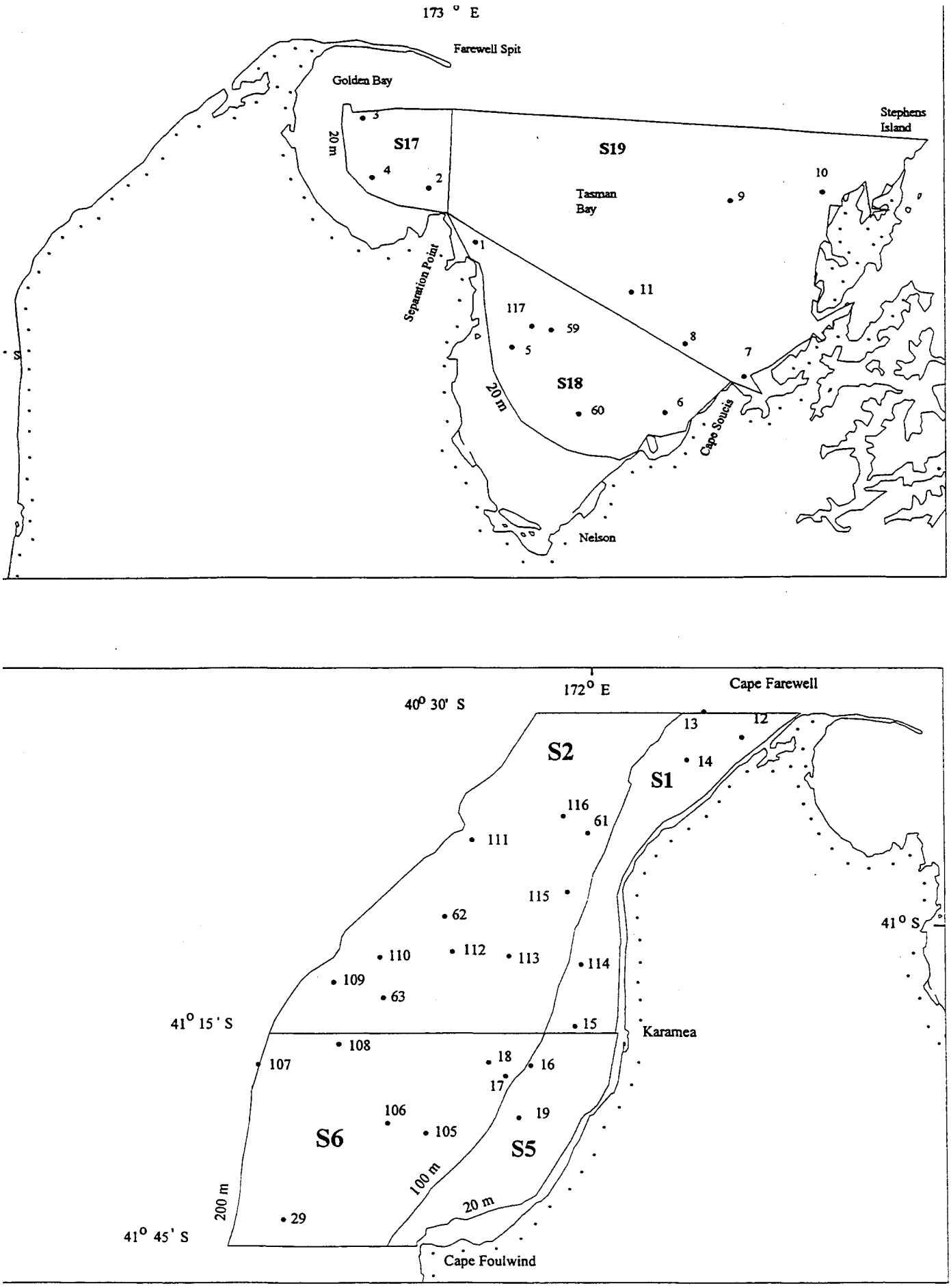
	Length frequency		Biological data	
	No. of samples	No. of fish	No. of samples	No. of fish
Barracouta	109	6 346	0	0
Blue cod	14	311	0	0
Bluenose	2	2	0	0
Brill	6	12	0	0
Broad squid	2	4	0	0
Elephantfish	15	198	0	0
English sole	20	791	0	0
Dark ghost shark	41	1 228	0	0
Red gurnard	48	2 875	47	657
Hake	44	1 905	3	48
Hapuku	13	16	1	1
Hoki	55	7 946	0	0
John dory	23	82	0	0
Jack mackerel	62	368	0	0
Murphy's mackerel	52	374	0	0
Horse mackerel	23	525	0	0
Kahawai	2	2	2	2
Ling	64	814	0	0
Lemon sole	60	902	0	0
Red cod	92	7 965	92	1 713
Common roughy	2	112	0	0
Quinnat salmon	1	1	0	0
School shark	87	809	0	0
Sand flounder	16	1 376	0	0
Gemfish	16	97	0	0
Snapper	6	10	5	10
Rig	68	601	0	0
Spotted stargazer	4	7	0	0
Arrow squid	113	5 515	0	0
Giant stargazer	82	1 480	82	860
Silver warehou	49	698	0	0
Tarakihi	99	4 724	94	1 501
Thresher shark	1	1	0	0
Trevally	5	7	0	0
Turbot	6	8	0	0
Blue warehou	39	394	0	0
Yellowbelly flounder	3	4	0	0

Table 7: Numbers of the four primary species sampled at each reproductive stage

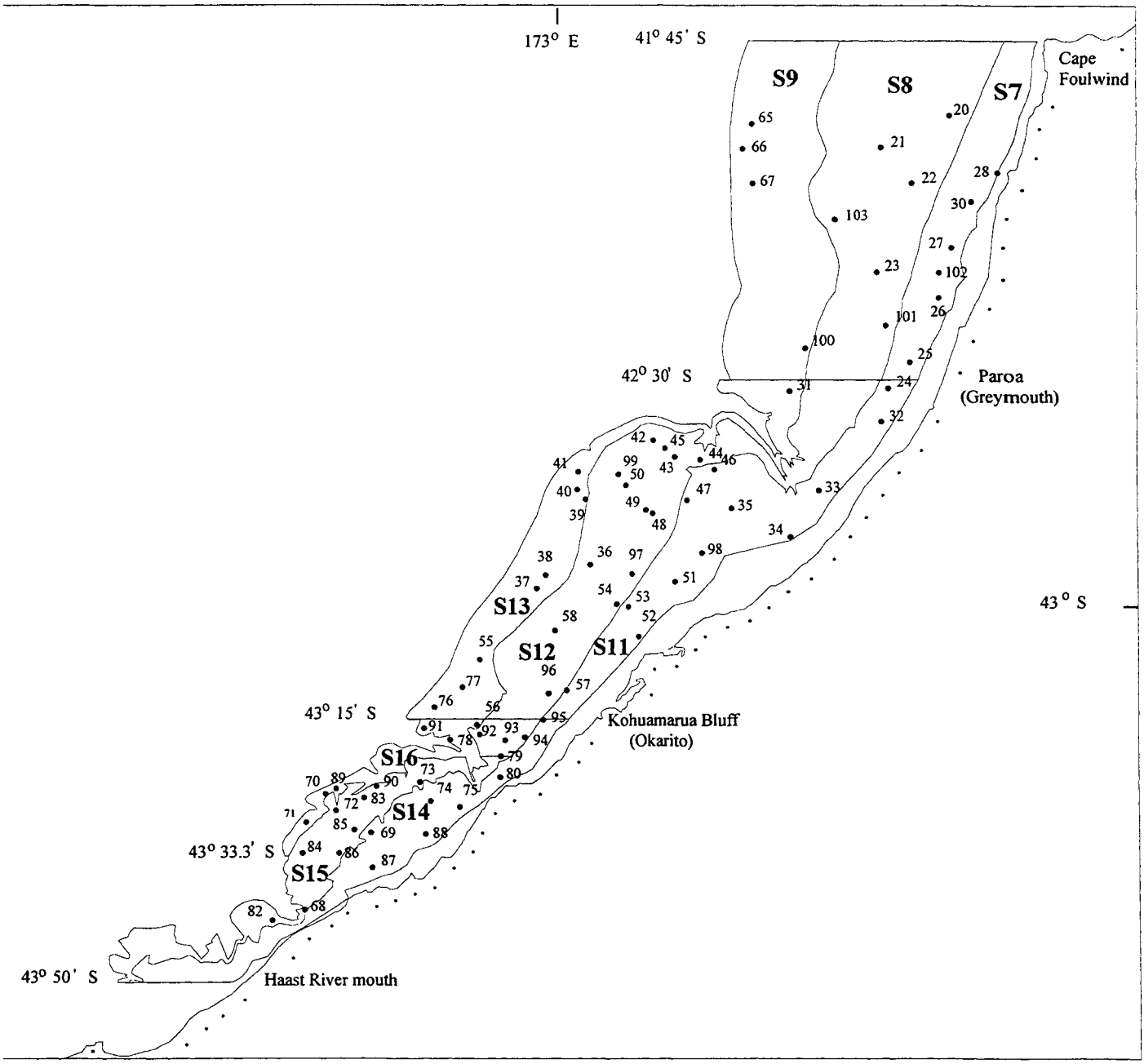
Total length (cm)	Males Gonad stage 1	2	3	4	5	Females Gonad stage 1	2	3	4	5	
Giant stargazer											
West coast											
11–20	1	0	0	0	0	1	0	0	0	0	
21–30	23	0	0	0	0	18	0	0	0	0	
31–40	30	8	1	0	0	15	0	0	0	0	
41–50	28	63	35	5	2	22	2	1	0	0	
51–60	18	91	71	5	0	40	46	4	0	5	
61–70	2	24	10	0	0	16	176	38	1	6	
71–80	0	1	0	0	0	1	25	5	0	2	
Total	102	187	117	10	2	113	249	48	1	13	842
Tasman and Golden Bays											
11–20	2	0	0	0	0	2	0	0	0	0	
21–30	3	0	0	0	0	3	0	0	0	0	
31–40	4	0	0	0	0	2	0	0	0	0	
41–50	1	0	0	0	0	1	0	0	0	0	
Total	10	0	0	0	0	8	0	0	0	0	18
Red cod											
West coast											
11–20	4	0	0	0	0	6	0	0	0	0	
21–30	202	8	7	1	0	80	0	1	0	1	
31–40	193	38	34	17	2	108	0	1	0	0	
41–50	126	53	37	31	2	123	1	0	0	0	
51–60	33	44	53	45	3	154	25	9	0	9	
61–70	3	0	3	0	0	59	11	9	0	8	
71–80	0	0	0	0	0	0	0	1	0	0	
Total	561	143	134	94	7	530	37	21	0	18	1 545
Tasman and Golden Bays											
11–20	2	0	0	0	0	6	0	0	0	0	
21–30	17	0	0	0	0	18	0	0	0	0	
31–40	17	0	0	0	0	52	0	0	0	0	
41–50	2	0	0	0	0	18	0	0	0	0	
51–60	0	1	0	0	0	13	0	0	0	0	
61–70	0	0	0	0	0	17	0	0	0	2	
71–80	0	0	0	0	0	0	0	0	0	1	
Total	38	1	0	0	0	124	0	0	0	3	166

Table 7—*continued*

Fork length (cm)	Males Gonad stage 1	2	3	4	5	Females Gonad stage 1	2	3	4	5	
Red gurnard											
West coast											
11–20	0	0	0	0	0	0	0	0	0	0	
21–30	12	19	3	0	0	0	0	0	0	0	
31–40	37	136	15	11	7	3	14	37	14	19	
41–50	3	9	1	1	0	0	20	25	8	9	
51–60	0	0	0	0	0	0	0	0	0	1	
Total	52	164	19	12	7	3	34	62	22	29	404
Tasman and Golden Bays											
11–20	1	0	0	0	0	0	0	0	0	0	
21–30	37	11	0	0	0	19		2	0	19	
31–40	9	21	0	0	0	30	5	2	0	63	
41–50	2	1	0	0	0	4	3	2	0	22	
Total	49	33	0	0	0	53	8	6	0	104	253
Tarakihi											
West coast											
11–20	2	0	0	0	0	4	0	0	0	0	
21–30	119	3	4	1	11	117	8	0	0	2	
31–40	32	25	39	80	25	101	231	15	12	24	
41–50	1	12	14	26	9	29	273	43	14	20	
51–60	0	1	0	0	0	0	1	0	0	0	
Total	154	41	57	107	45	251	513	58	26	46	1 298
Tasman and Golden Bays											
11–20	42	0	0	0	0	35	0	0	0	0	
21–30	44	0	0	0	0	390	1	0	0	0	
Total	86	0	0	0	0	425	1	0	0	0	512



ure 1a: Stratum boundaries (west coast north of Cape Foulwind and Tasman and Golden Bays) with station positions and numbers.



igure 1b: Stratum boundaries (south of Cape Foulwind) with station positions and numbers.

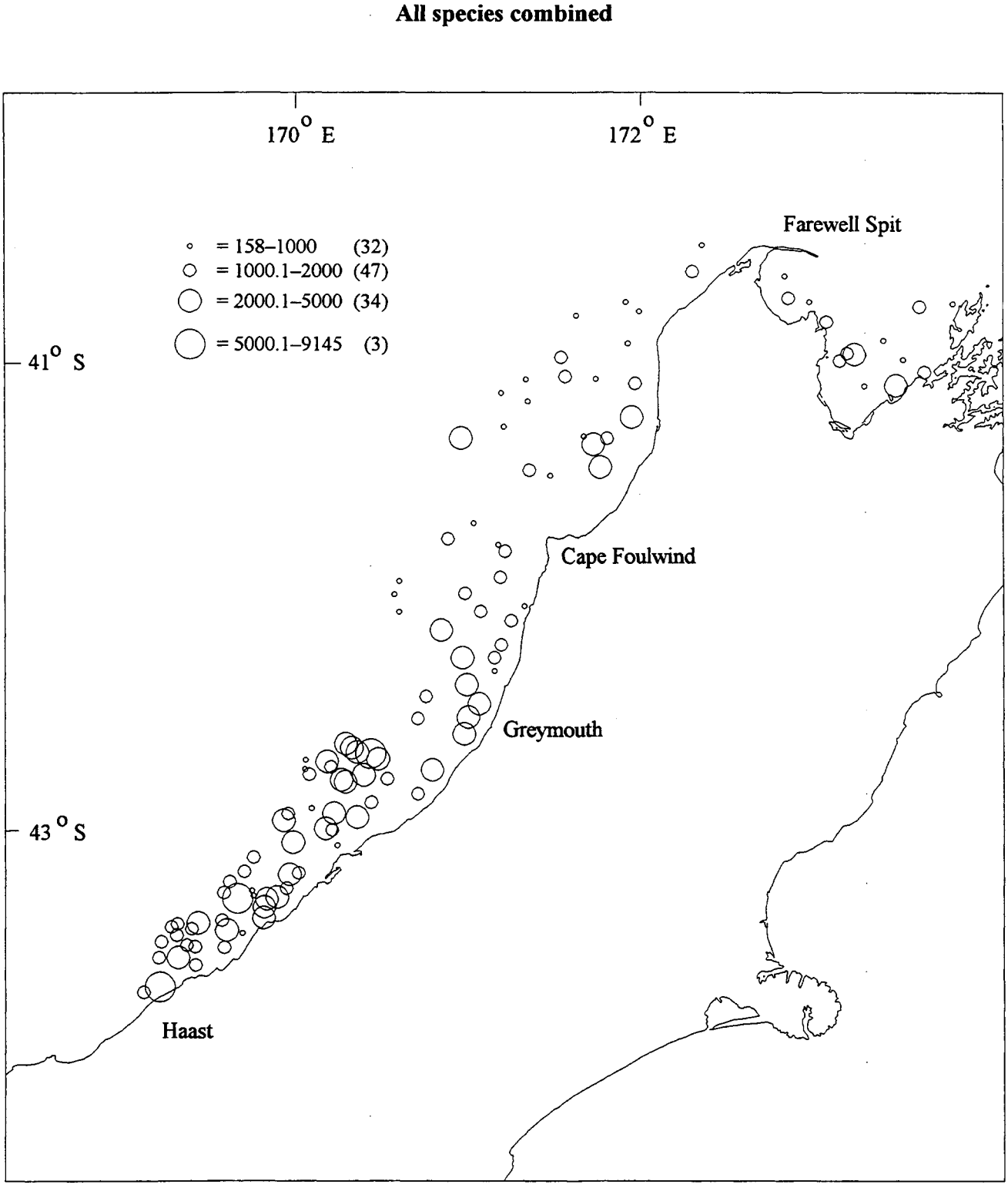


Figure 2: Catch rates (kg.km^{-2}) for all species combined and of the major species for stations used for biomass estimates (numbers in parentheses are the number of stations at the given catch rate).

Arrow squid

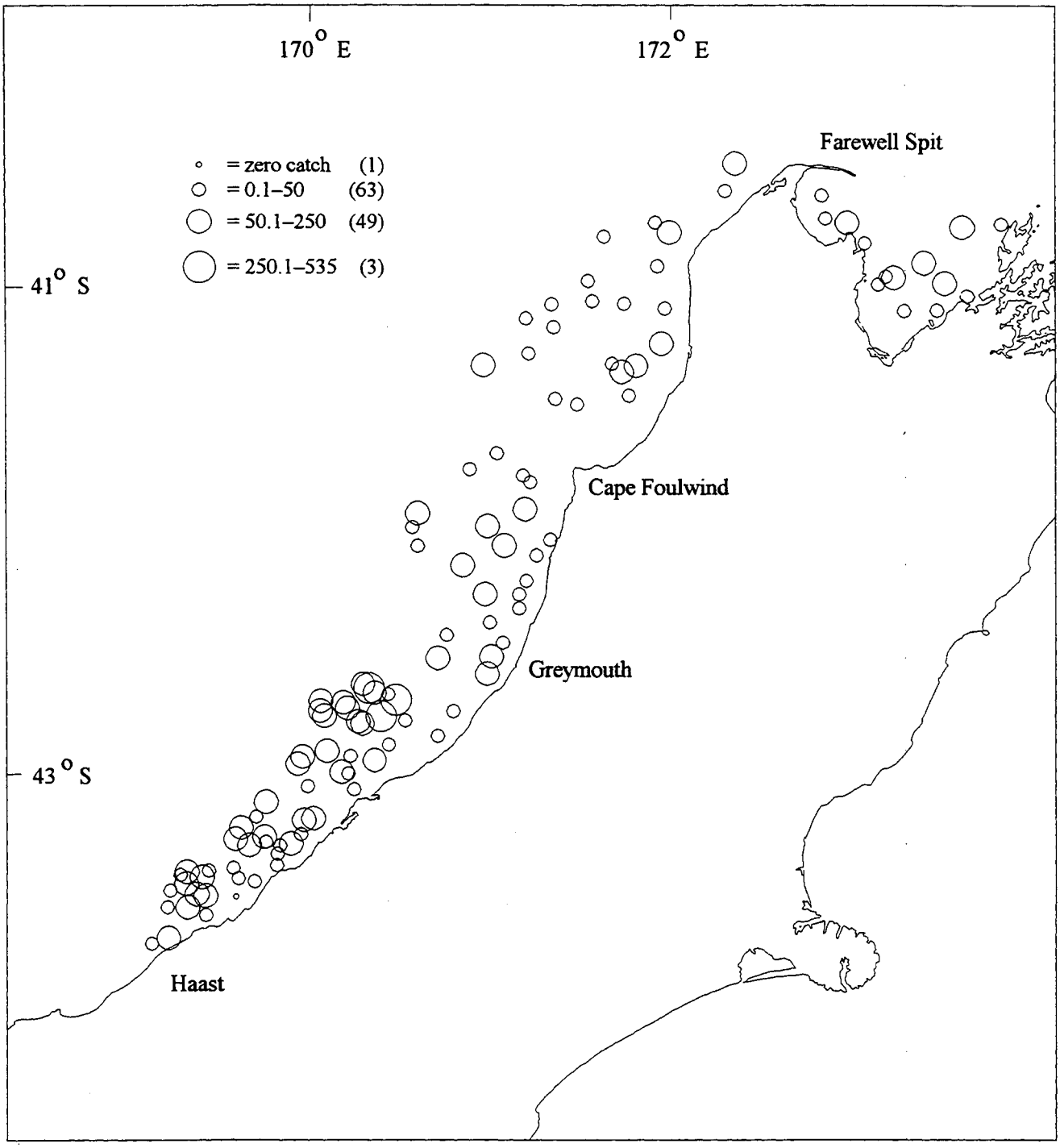


Figure 2—*continued*

Barracouta

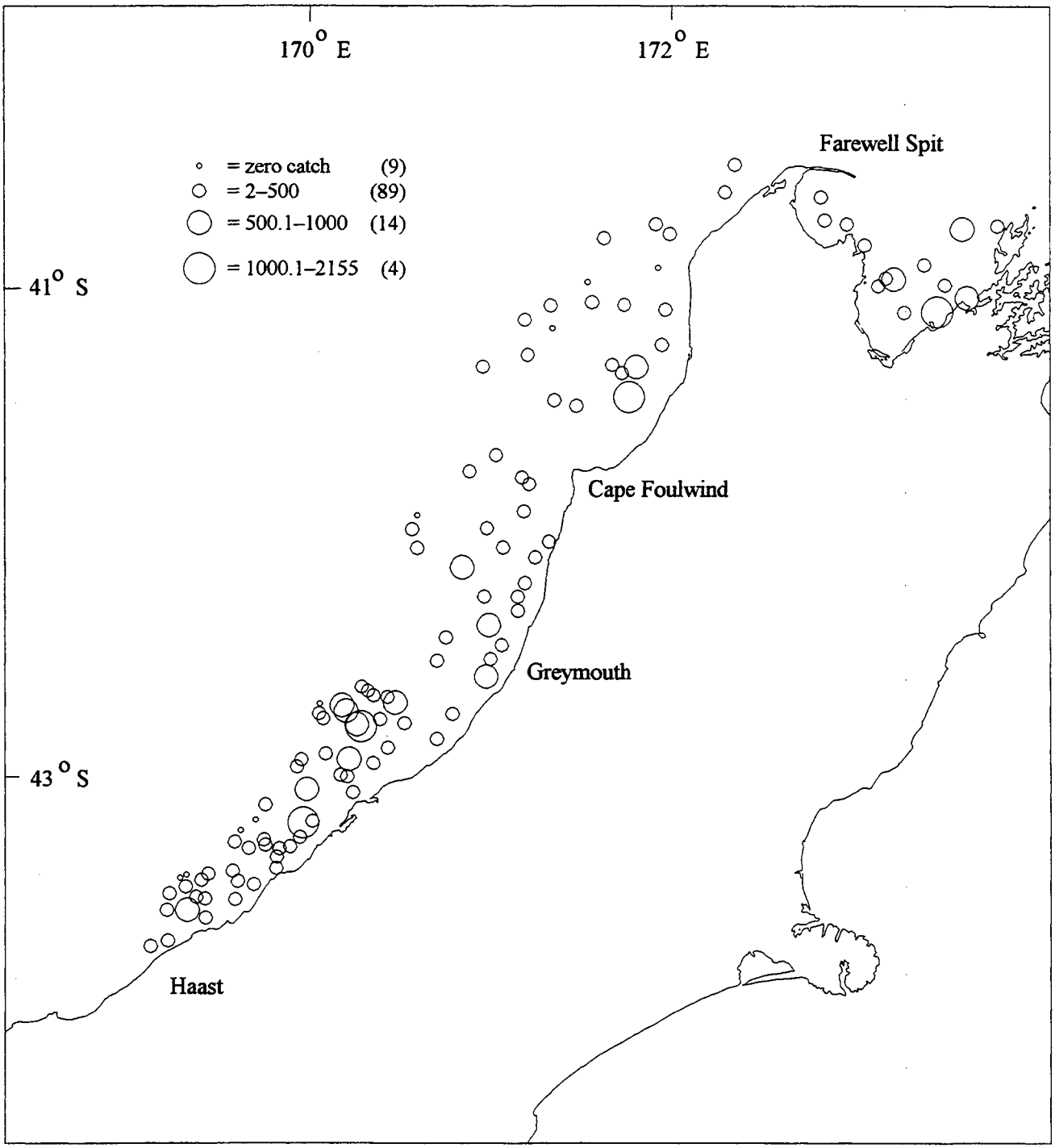


Figure 2—*continued*

Giant stargazer

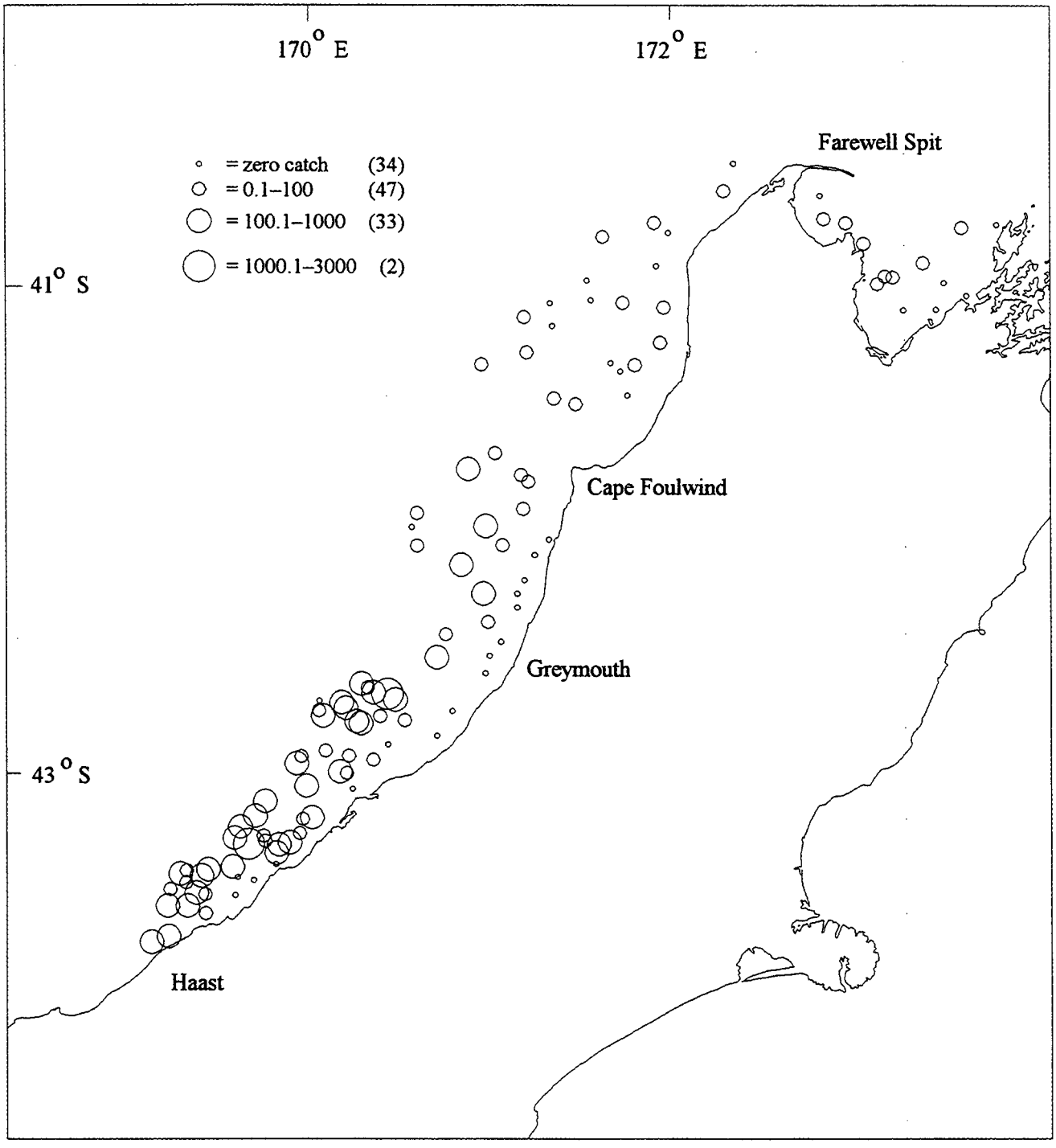


Figure 2— ***continued***

Rig

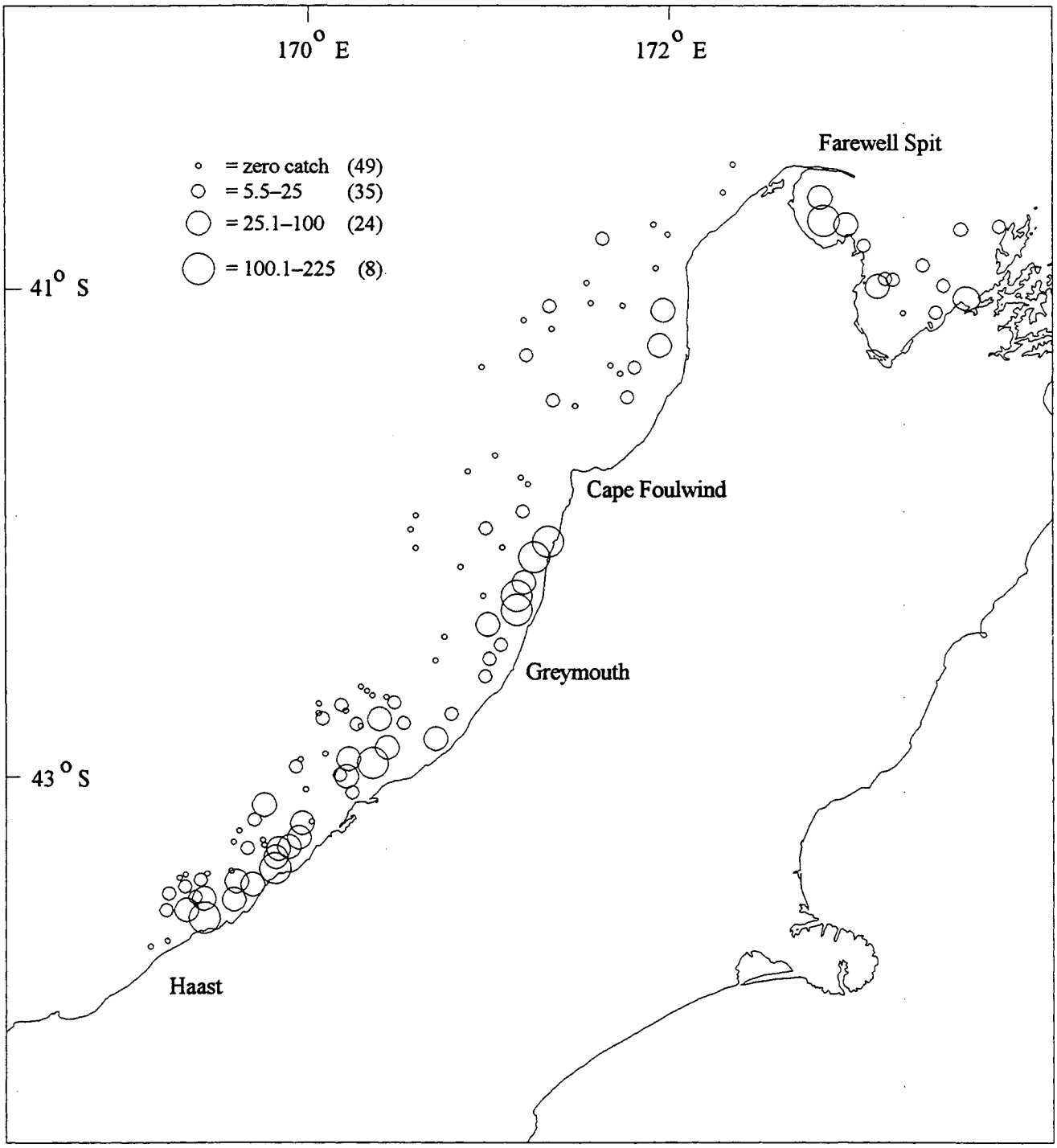


Figure 2— ***continued***

School shark

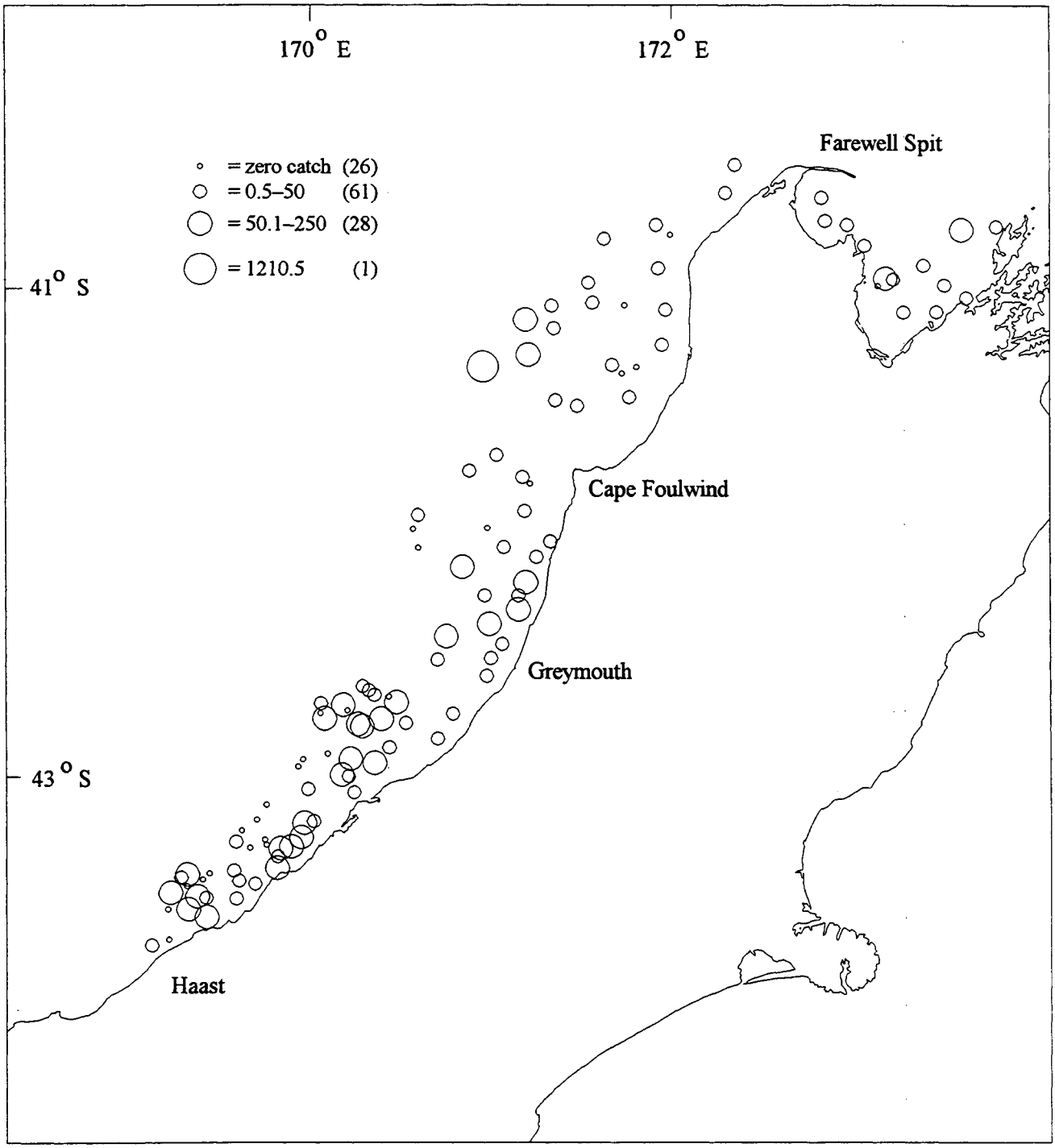


Figure 2— ***continued***

Southern spiny dogfish

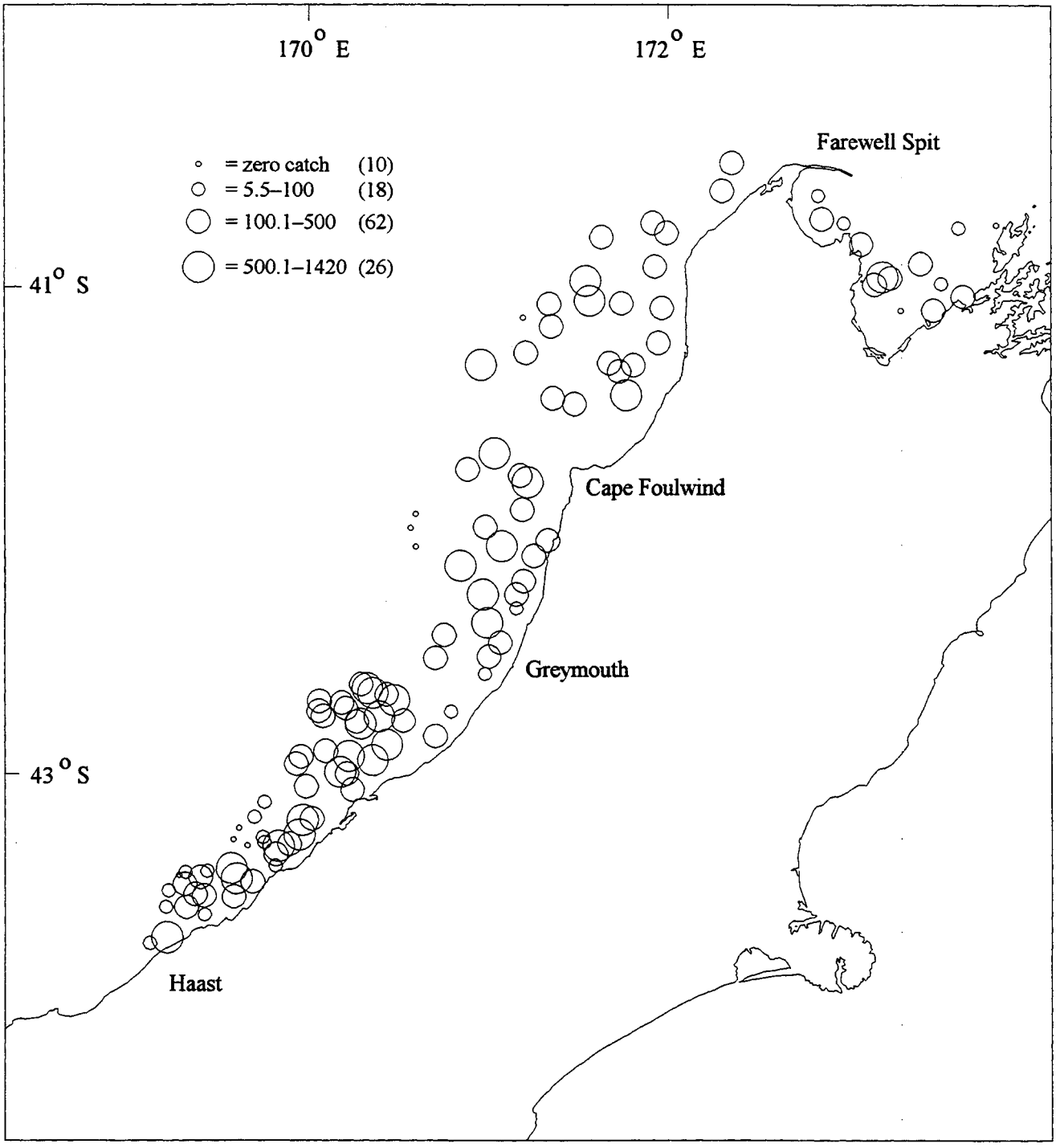


Figure 2—*continued*

Tarakihi

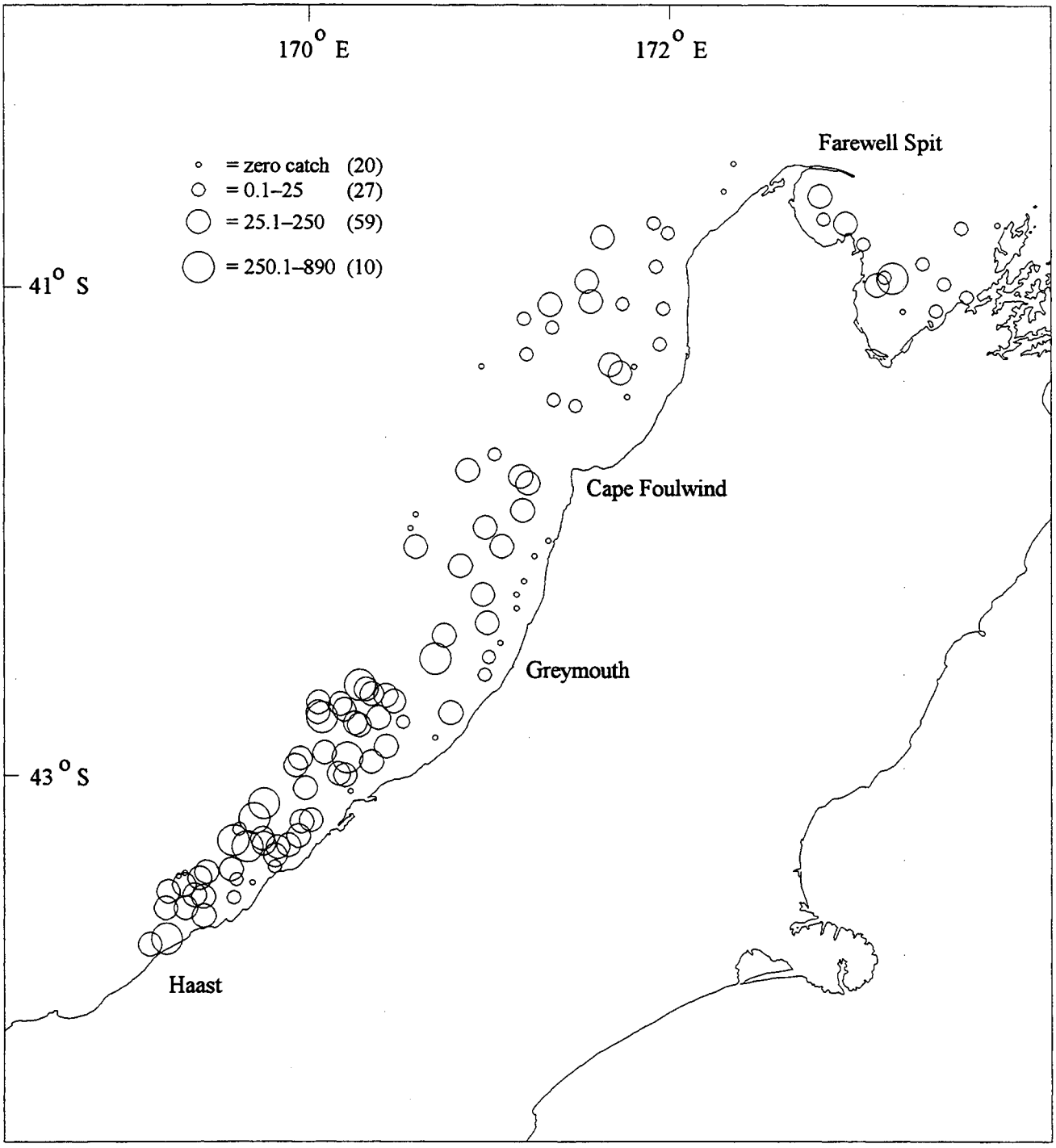


Figure 2—*continued*

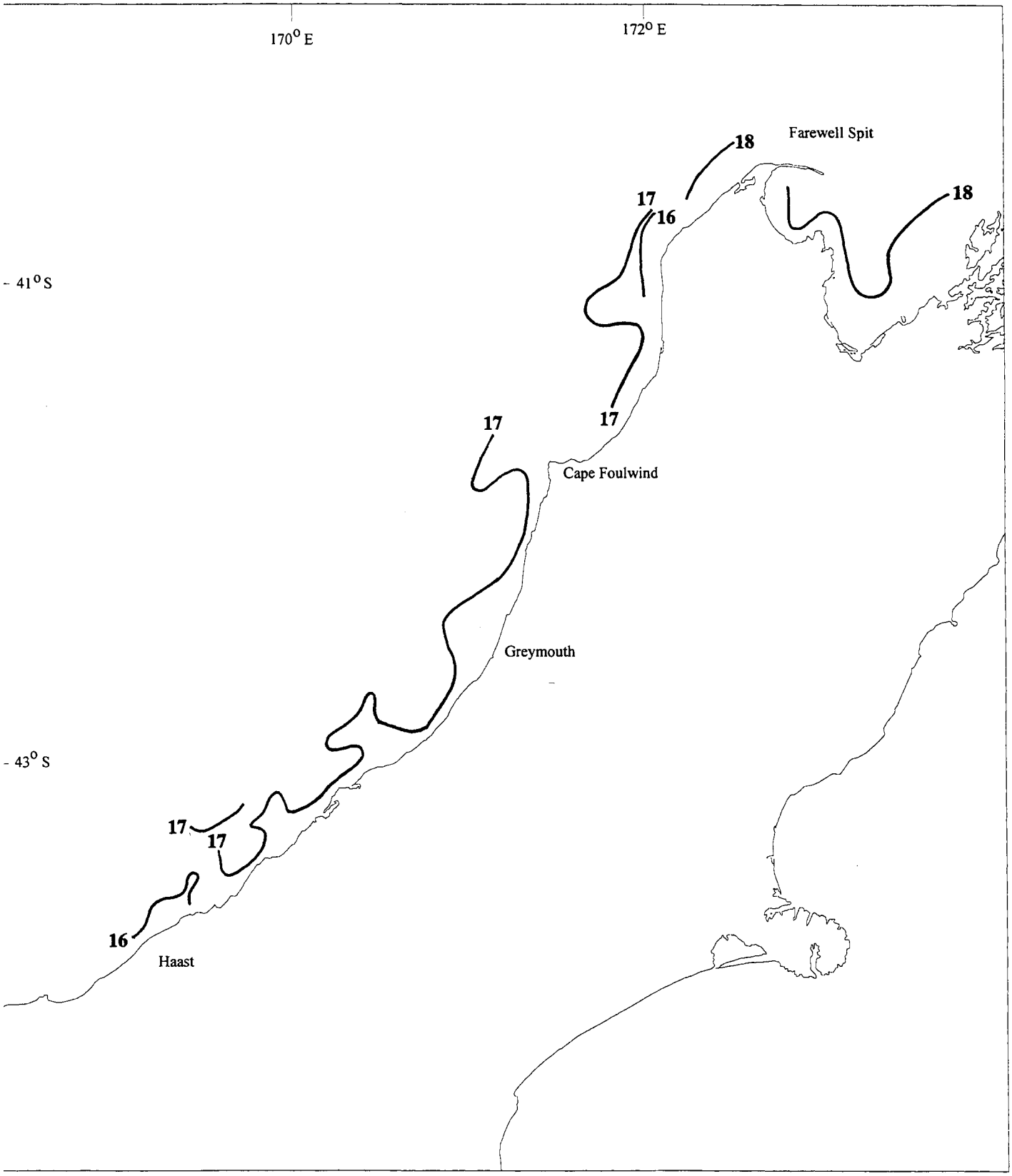


Figure 3: Sea surface temperatures (^{o}C)

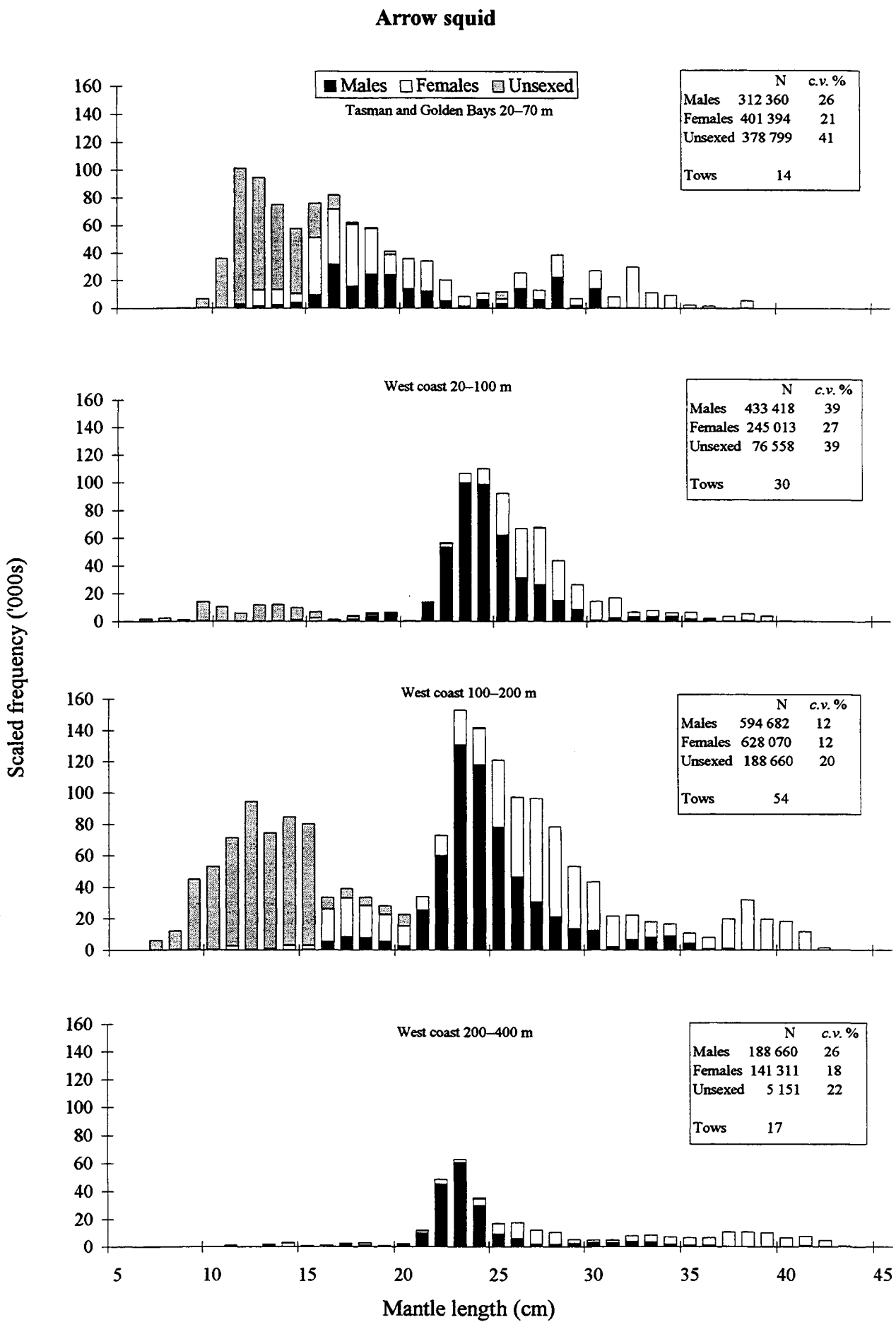


Figure 4: Scaled length frequency distribution for the 11 most abundant ITQ species by subarea and other important species (N = estimated population, Tows = number of stations where species was caught).

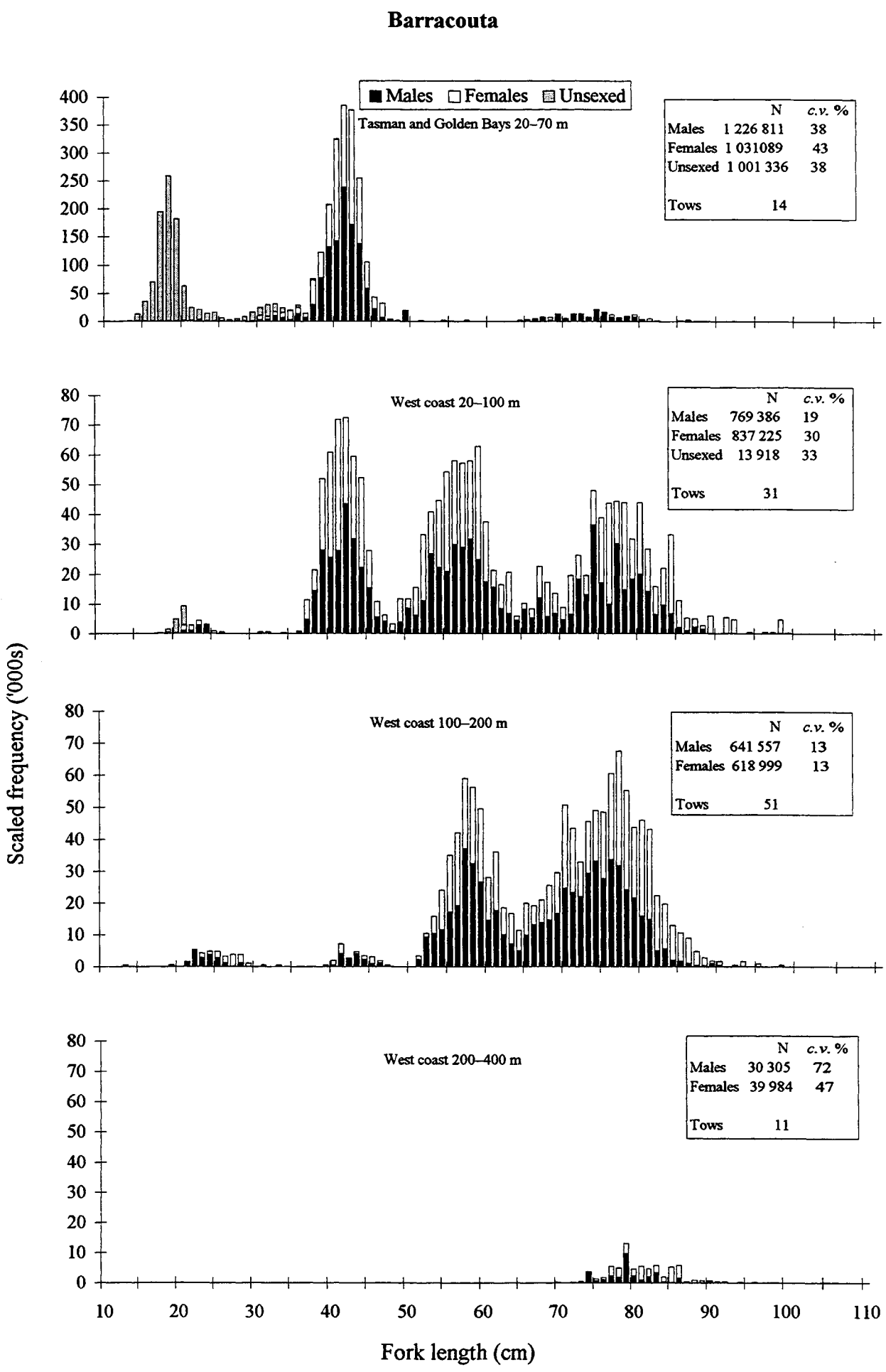


Figure 4—*continued*

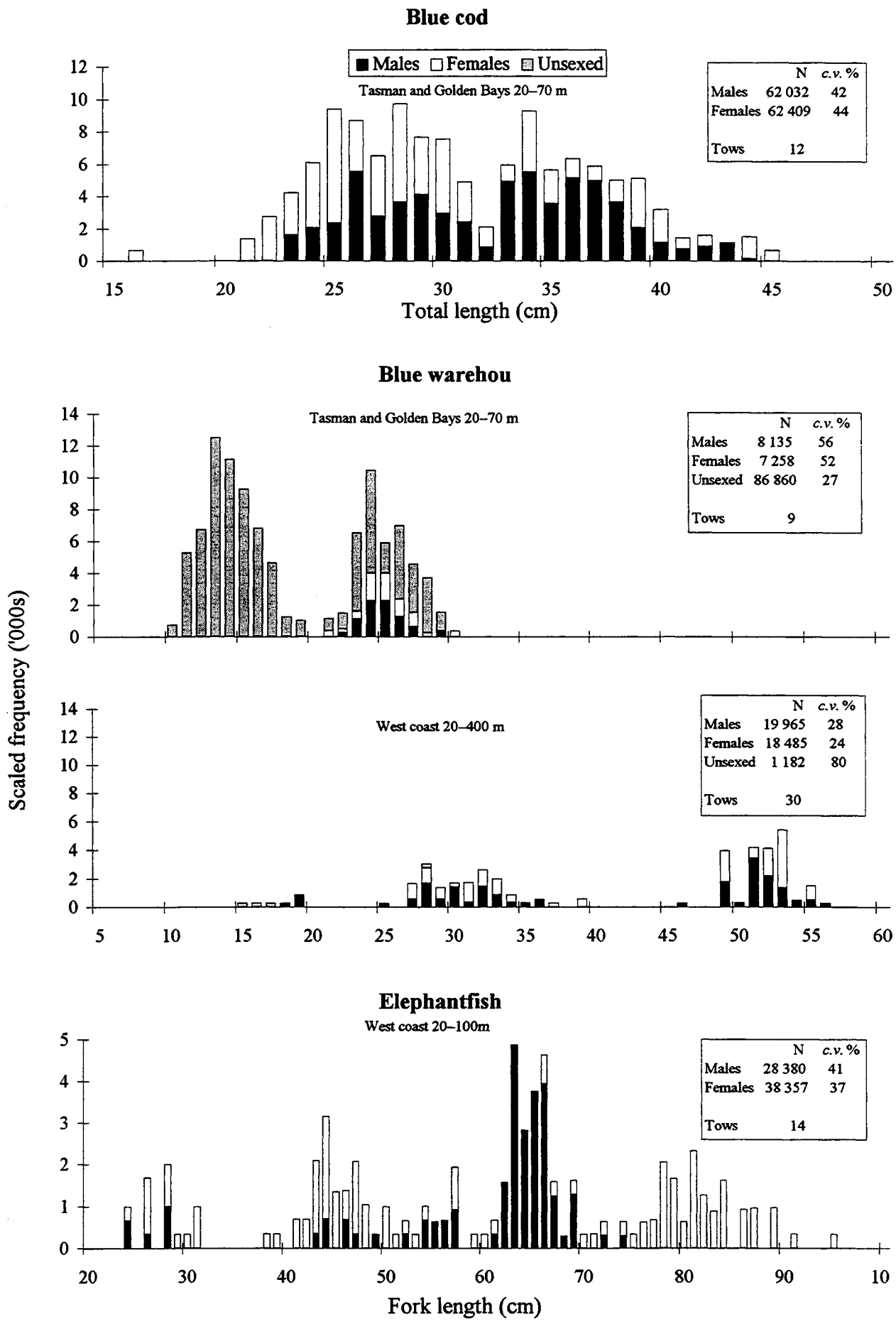


Figure 4—*continued*

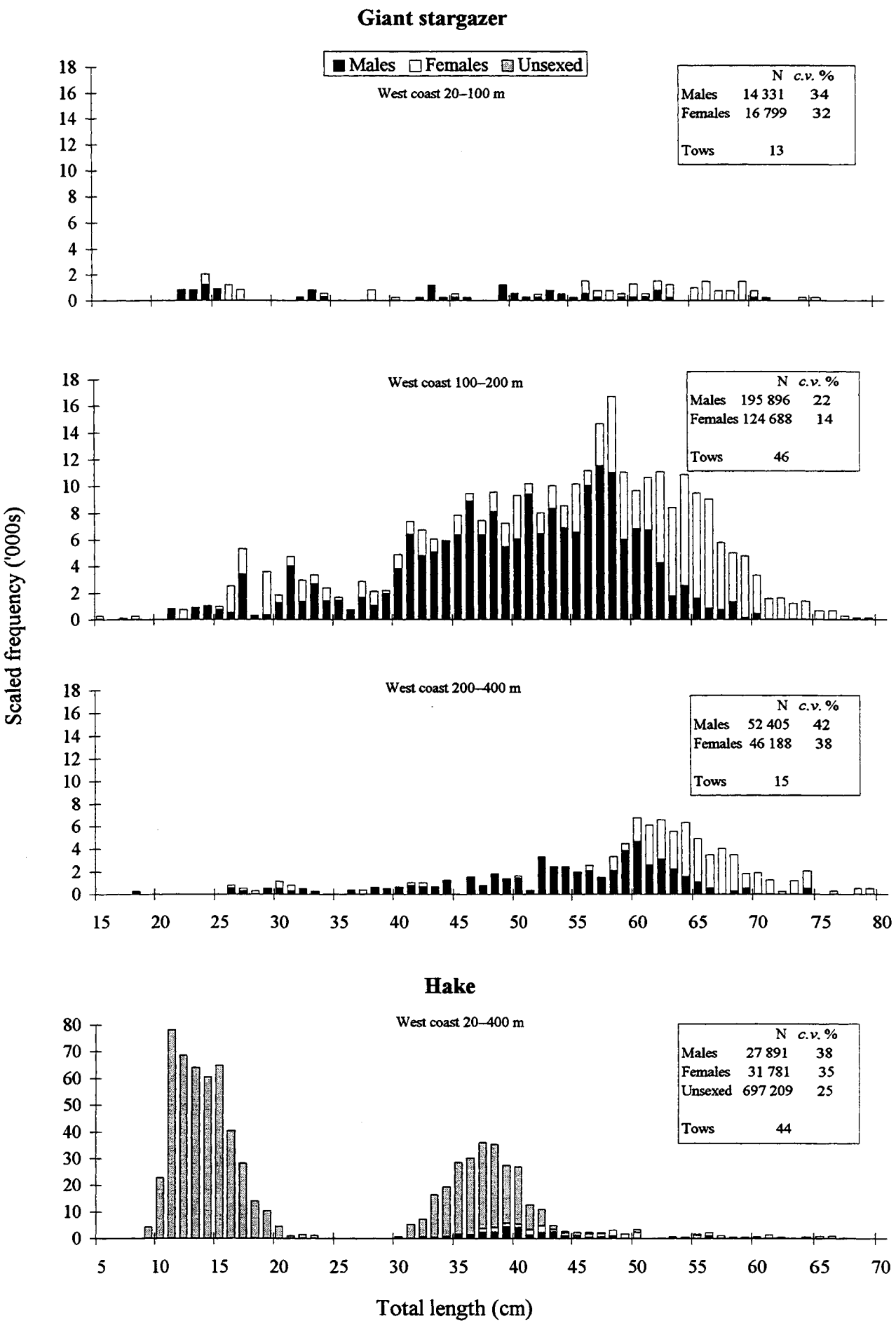


Figure 4—*continued*

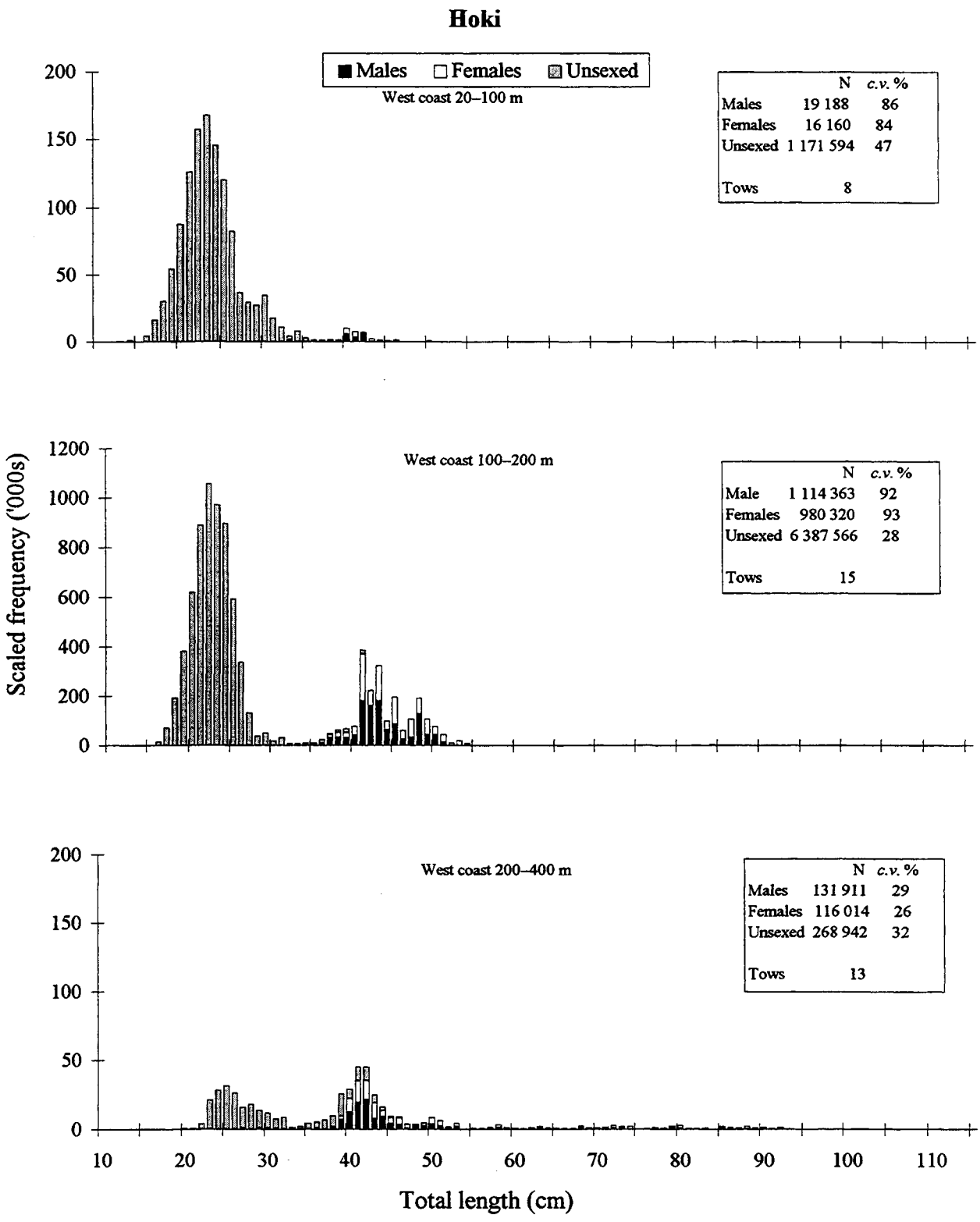
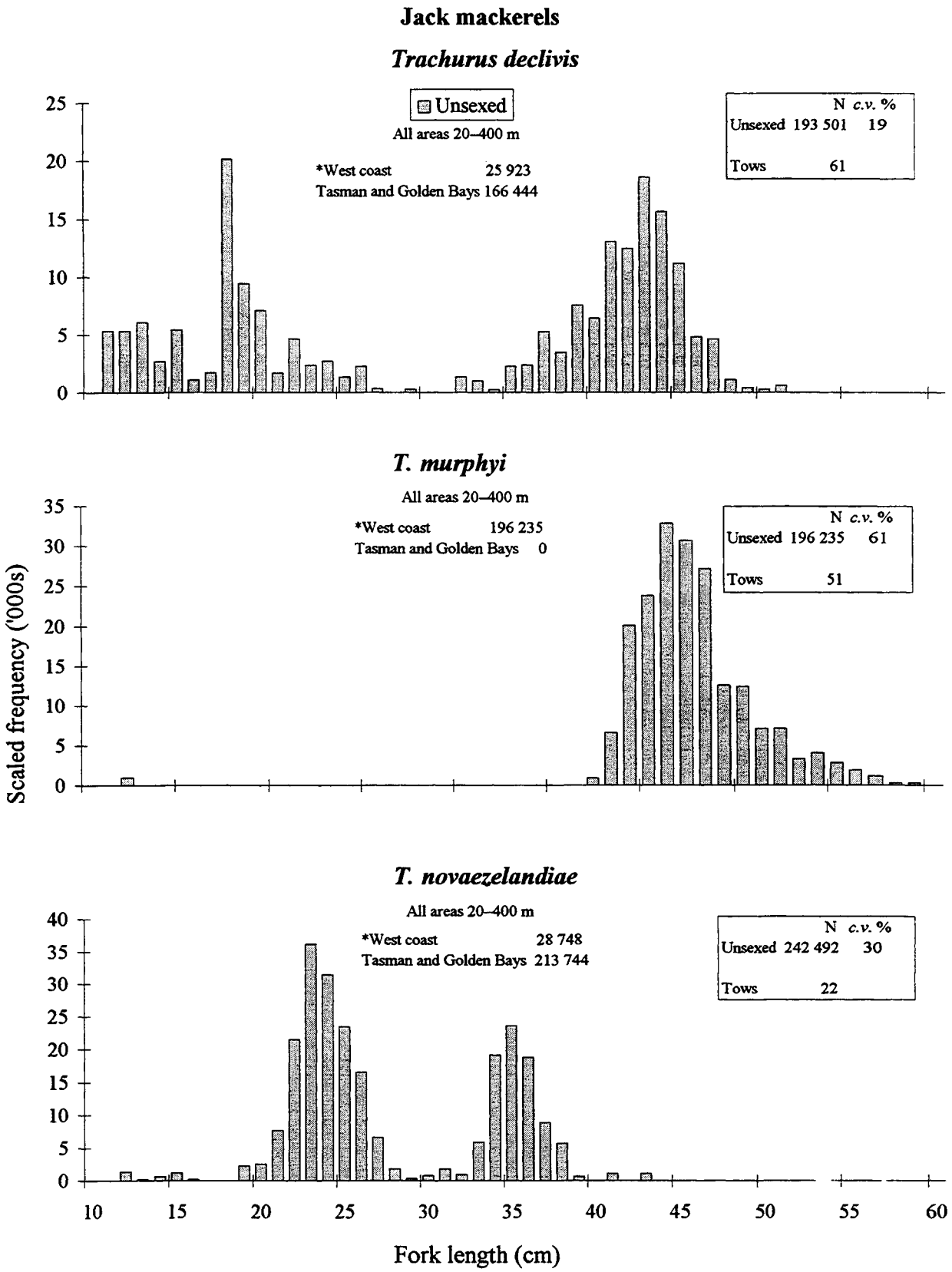


Figure 4—*continued*



*Estimated population size for each subarea

Figure 4—*continued*

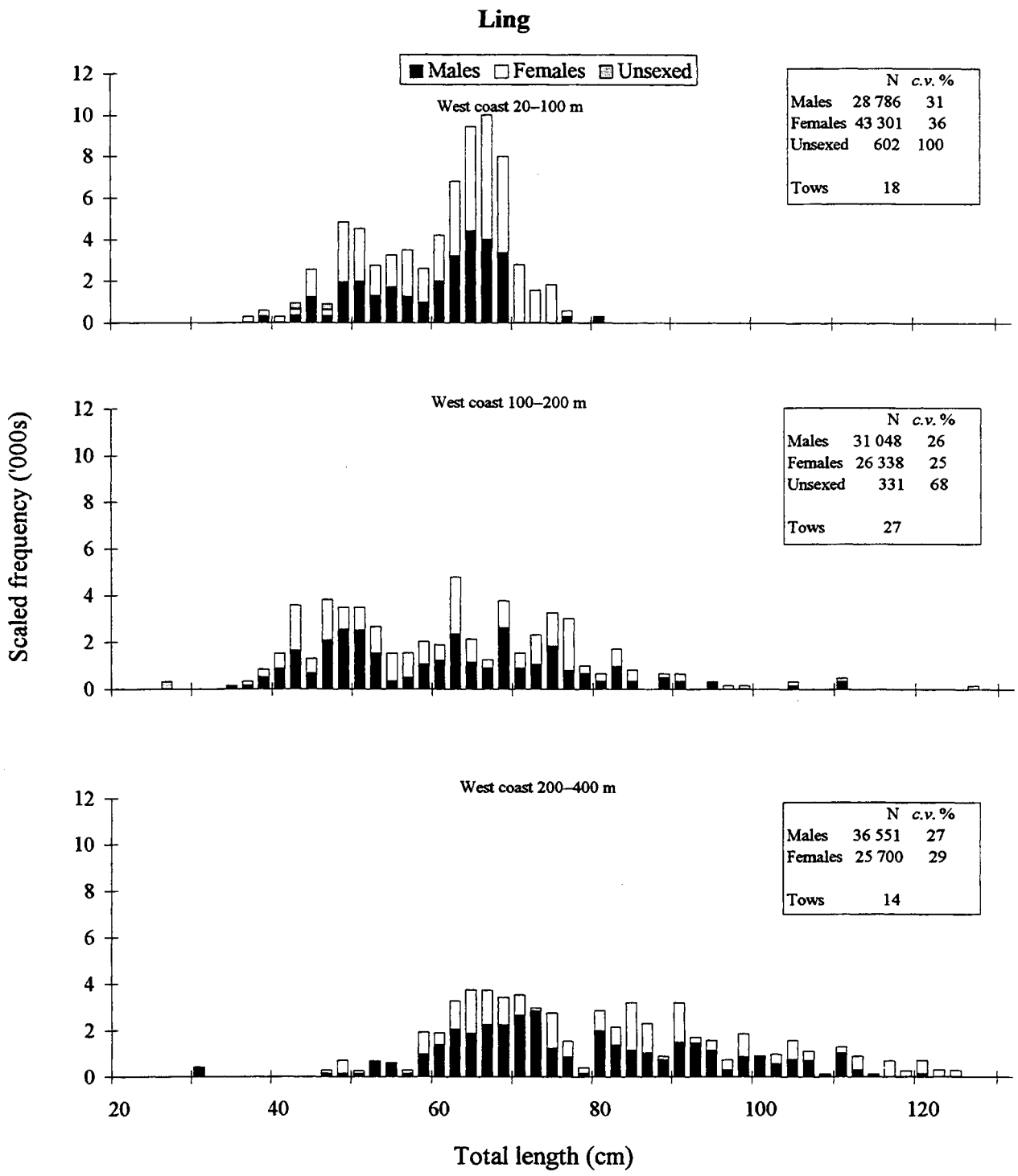


Figure 4—*continued*

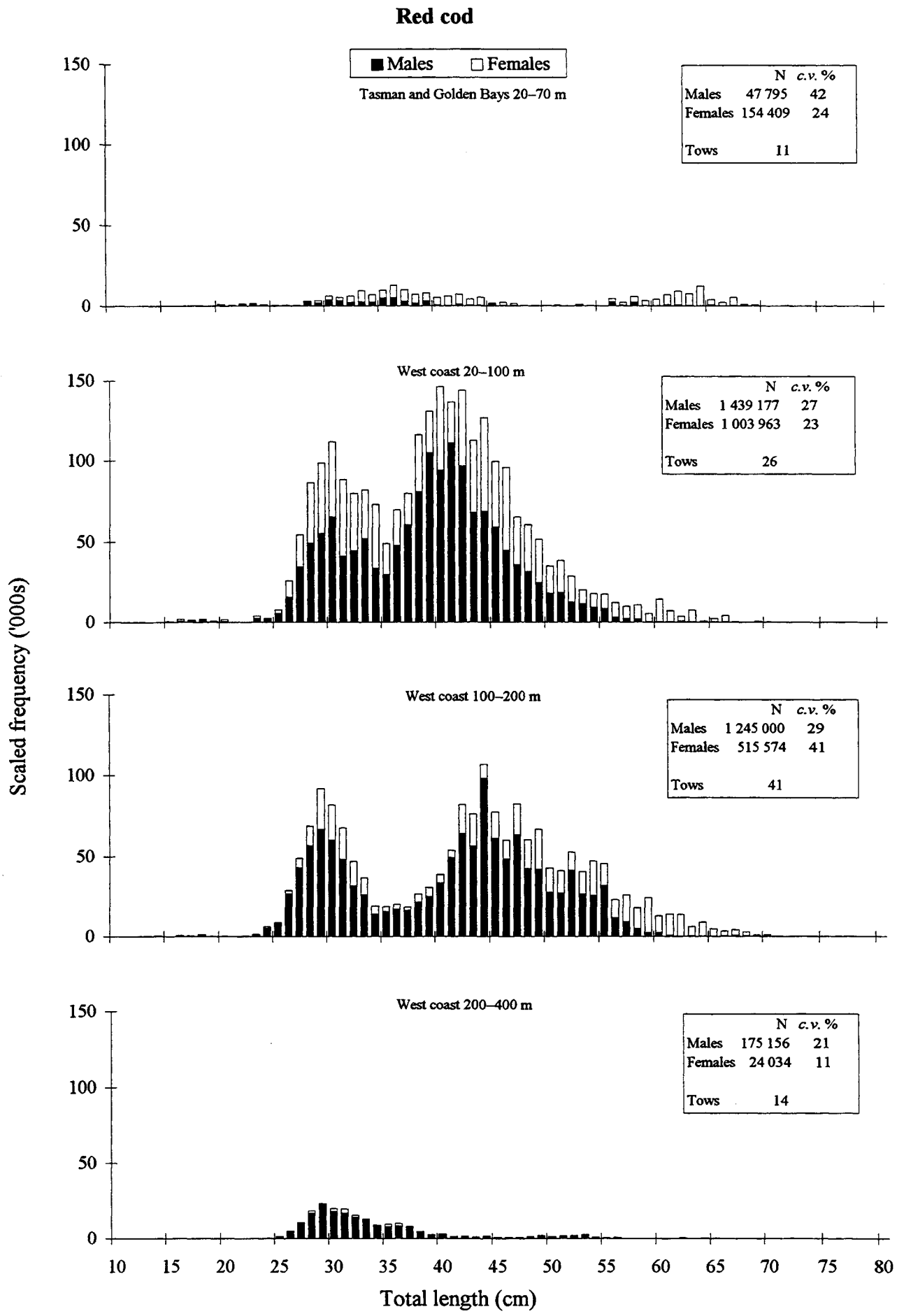


Figure 4—*continued*

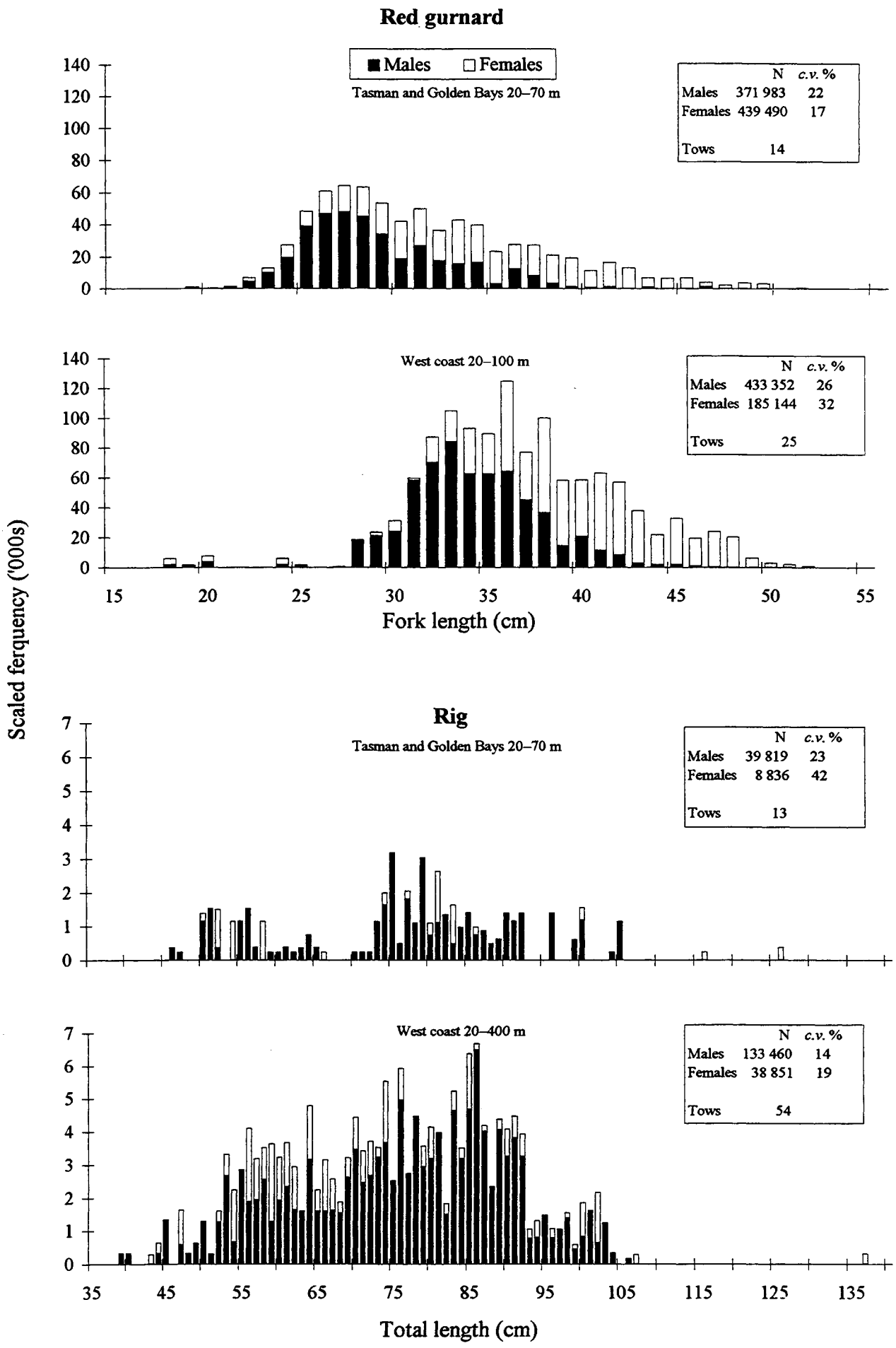


Figure 4—*continued*

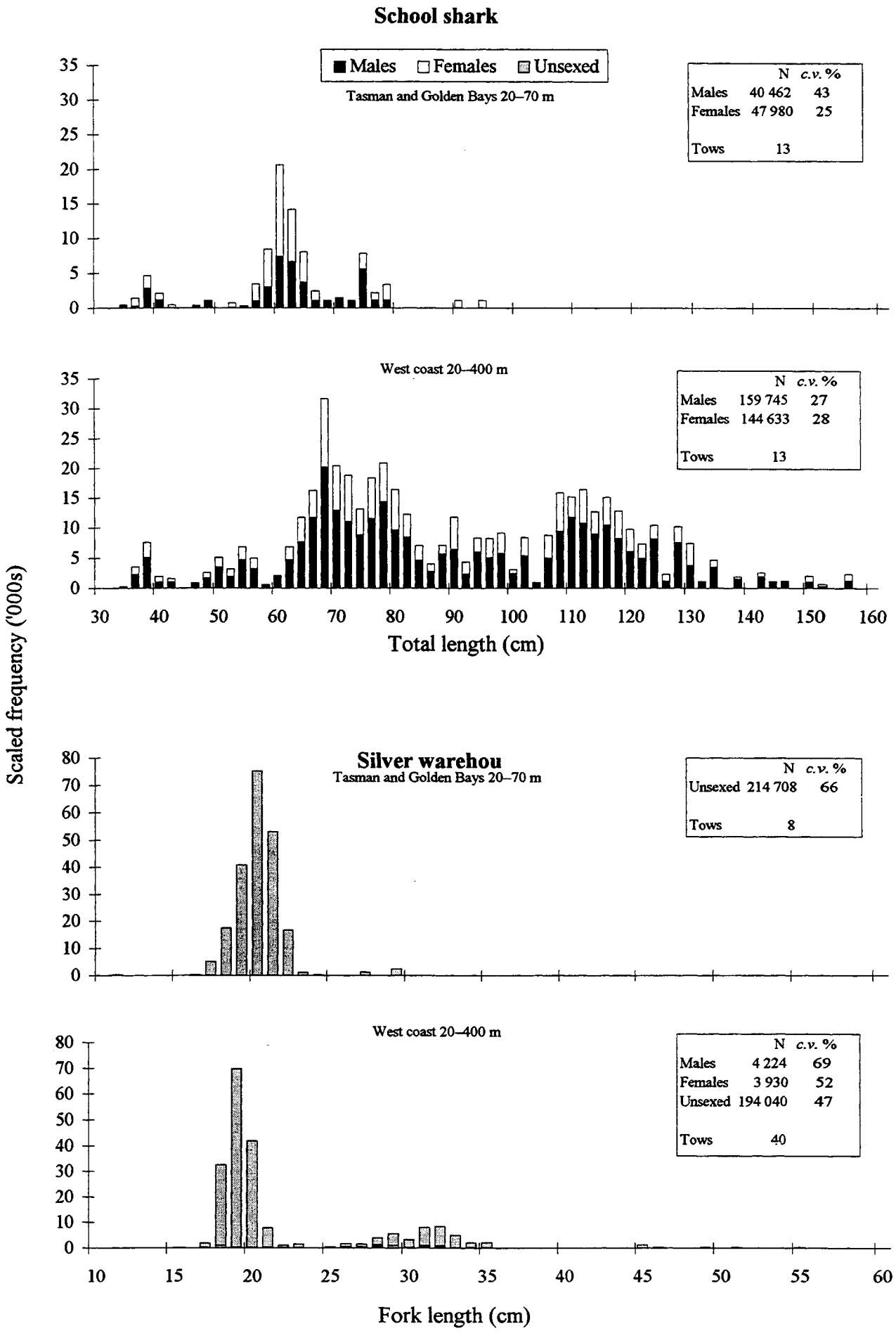


Figure 4—*continued*

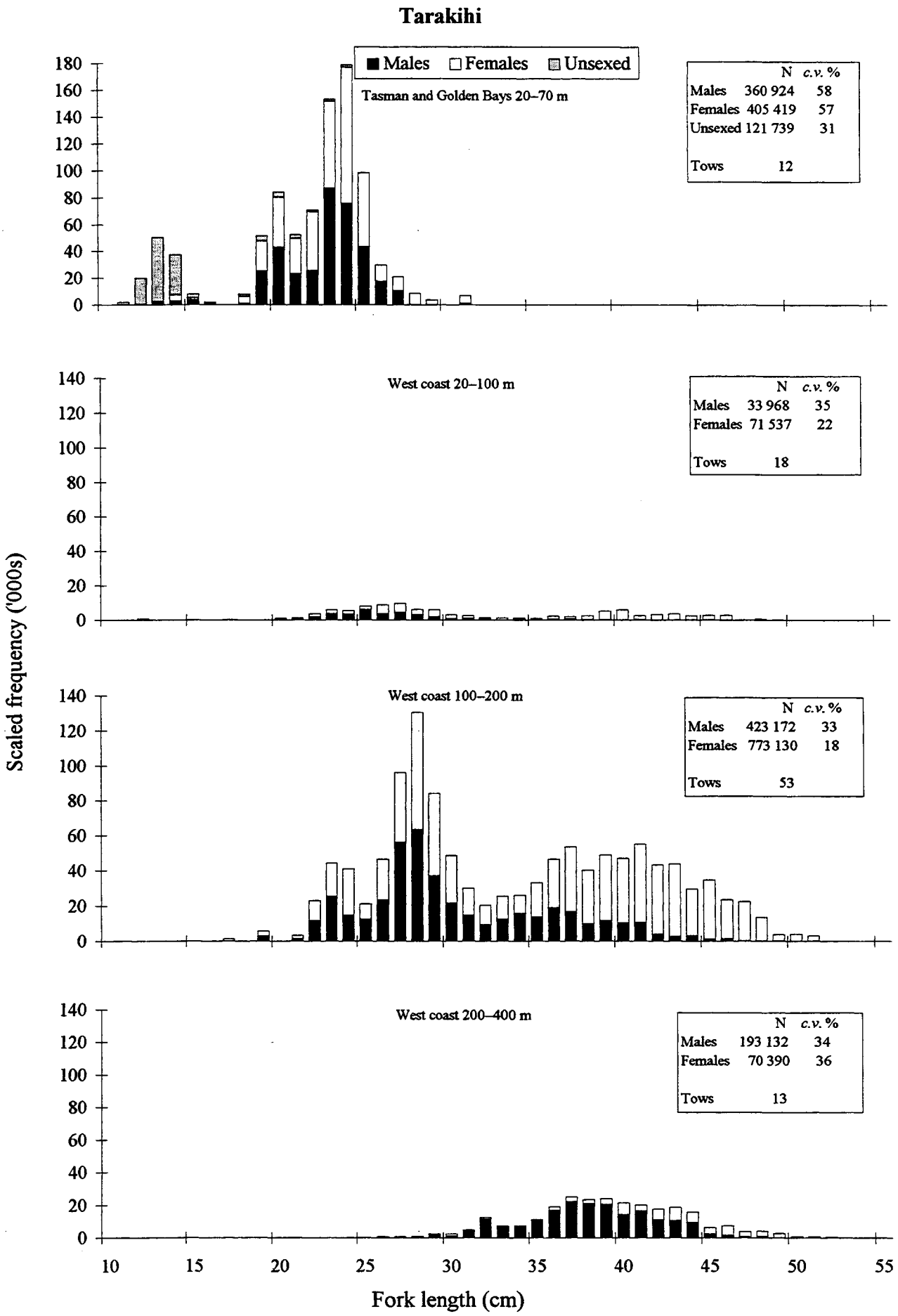


Figure 4—*continued*

Appendix 1a: Length-weight coefficients *a* and *b* calculated using the geometric mean functional relationship from data collected during the 1994 survey, and used to scale length frequencies and calculate biomass above a minimum size*

	a	*b*	*N*	Range (cm)
Giant stargazer	0.0169	3.06	859	14–78
Red cod	0.0461	2.62	1 712	13–71
Red gurnard	0.0048	3.24	657	17–51
Tarakihi	0.0329	2.89	1 500	10–51

Appendix 1b: Additional length-weight coefficients *a* and *b* used to scale length frequencies and calculate biomass above a minimum size*

	a	*b*	Source	*N*	Range (cm)
Arrow squid	0.0290	3.00	Annala (1995)	–	> 11
Blue cod	0.0076	3.20	TAN9301	75	27–59
Blue warehou	0.0191	3.03	TAN9301	281	29–67
Barracouta	0.0052	2.98	TAN9301	919	15–96
Elephantfish	0.0105	2.99	TAN9301	62	58–92
Hoki	0.0046	2.88	SHI8301	525	22–110
Hake	0.0018	3.31	TAN9401	444	39–125
Ling	0.0010	3.36	SHI8302	398	45–135
Rig	0.0005	3.47	Francis (unpub.)	120	65–137
School shark	0.0070	2.91	Seabrook-Davidson (unpub.)	804	30–166
Silver warehou	0.1398	3.08	TAN9401	160	22–56
Trachurus declivis	0.0165	2.93	COR9001	200	15–53
T. murphyii	0.0255	2.77	TAN9301	90	44–62
T. novaezelandiae	0.1630	2.92	COR9001	200	15–40

* Determined from $W = aL^b$, where W = weight (g), L = length (cm); N = sample size.

Appendix 2: Summary of station data

Station	Stratum	Date	Start of tow			End of tow		Gear depth (m)		Distance trawled	Surface temp
			Time	° ' S	° ' E	° ' S	° ' E	Min.	Max.	(n. miles)	(°C)
1	18	19-Mar-94	0907	40 49.58	173 03.28	40 49.27	173 30.26	28	39	3.02	18.4
2	17	19-Mar-94	1136	40 44.42	172 57.44	40 41.42	172 57.63	32	36	3.00	18.2
3	17	19-Mar-94	1345	40 37.74	172 49.05	40 37.77	172 53.05	30	32	3.03	18.0
4	17	20-Mar-94	0631	40 43.42	172 50.25	40 40.44	172 49.62	25	27	3.00	17.4
5	18	20-Mar-94	1013	40 59.64	173 07.78	41 02.44	173 09.14	28	28	2.98	18.5
6	18	20-Mar-94	1254	41 05.98	173 27.04	41 04.02	173 29.93	32	36	2.96	18.6
7	19	20-Mar-94	1448	41 02.51	173 36.83	41 00.43	173 33.94	37	44	3.02	18.5
8	19	21-Mar-94	0644	40 59.37	173 29.60	40 57.83	173 26.22	45	47	2.98	18.3
9	19	21-Mar-94	0919	40 45.66	173 35.32	40 43.16	173 37.51	54	59	3.00	18.1
10	19	21-Mar-94	1146	40 44.83	173 46.85	40 46.85	173 43.91	58	60	3.01	18.6
11	19	21-Mar-94	1446	40 54.44	173 22.89	40 51.72	173 21.43	48	50	2.93	18.1
12 *	1	22-Mar-94	0626	40 43.40	172 27.55	40 34.15	172 26.31	68	71	1.17	17.6
13	1	22-Mar-94	1409	40 29.78	172 20.74	40 32.02	172 18.05	94	96	3.02	18.1
14	1	22-Mar-94	1550	40 36.59	172 17.57	40 38.60	172 16.04	49	67	2.32	13.0
15	5	23-Mar-94	0641	41 14.04	171 56.42	41 16.82	171 54.89	63	69	3.01	17.1
16	5	23-Mar-94	0902	41 19.50	171 47.98	41 22.33	171 46.66	86	98	2.99	17.5
17	6	23-Mar-94	1050	41 21.00	171 43.20	41 23.66	171 41.60	111	114	2.92	17.5
18	6	23-Mar-94	1337	41 19.07	171 40.06	41 21.62	171 38.43	123	123	2.93	17.6
19	5	23-Mar-94	1544	41 26.83	171 45.68	41 29.48	171 43.87	59	62	2.98	17.4
20	8	24-Mar-94	0704	41 54.91	171 11.06	41 55.74	171 07.33	136	156	2.90	17.1
21	8	24-Mar-94	0942	41 59.14	170 58.77	42 01.38	170 56.64	178	182	2.68	17.1
22	8	24-Mar-94	1150	42 03.90	171 04.24	42 06.38	171 02.06	146	150	2.96	17.2
23	8	24-Mar-94	1421	42 15.73	170 57.92	42 18.57	170 57.22	140	144	2.89	17.3
24	7	25-Mar-94	0630	42 31.12	170 59.84	42 28.35	171 01.17	75	76	2.94	16.7
25	7	25-Mar-94	0820	42 27.66	171 03.71	42 24.83	171 04.73	44	49	2.93	16.6
26	7	25-Mar-94	1019	42 19.16	171 09.05	42 16.40	171 10.54	37	37	2.97	16.9
27	7	25-Mar-94	1157	42 12.48	171 11.33	42 09.78	171 12.76	43	45	2.90	17.1
28	7	25-Mar-94	1405	42 02.50	171 19.52	41 59.57	171 20.45	27	37	3.01	17.1
29	6	26-Mar-94	1310	41 41.18	171 01.84	41 44.17	171 02.77	160	160	3.03	17.7
30	7	26-Mar-94	1650	42 06.32	171 14.88	42 08.66	171 12.53	46	51	2.92	17.3

Appendix 2—*continued*

			Start of tow			End of tow		Gear depth (m)		Distance trawled	Surface temp
Station	Stratum	Date	Time	° ' S	° ' E	° ' S	° ' E	Min.	Max.	(n. miles)	(°C)
31	13	27-Mar-94	0633	42 31.52	170 42.29	42 34.49	170 41.01	249	298	3.11	17.3
32	11	27-Mar-94	0922	42 35.49	170 58.55	42 38.07	170 56.49	55	57	2.99	17.0
33	11	27-Mar-94	1131	42 44.70	170 47.41	42 46.41	170 44.06	60	61	3.01	17.3
34	11	28-Mar-94	1418	42 50.88	170 42.32	42 51.83	170 38.48	27	28	2.98	17.3
35	11	28-Mar-94	1611	42 47.07	170 31.64	42 45.12	170 28.51	44	64	3.02	17.4
36	12	28-Mar-94	0631	42 54.55	170 05.59	42 56.95	170 03.11	172	174	3.00	17.4
37	13	28-Mar-94	0831	42 57.72	169 55.95	42 59.95	169 53.24	234	277	3.00	17.2
38	13	28-Mar-94	1057	42 55.96	169 57.58	42 53.89	169 59.99	256	190	2.73	17.5
39	12	28-Mar-94	1415	42 45.86	170 04.81	42 43.61	170 06.96	166	193	2.75	17.3
40	13	29-Mar-94	0647	42 44.58	170 03.36	42 41.72	170 04.66	245	259	3.01	17.1
41	13	29-Mar-94	0858	42 42.19	170 03.53	42 39.86	170 05.97	286	298	2.93	17.0
42	12	29-Mar-94	1131	42 38.03	170 17.34	42 38.46	170 13.31	155	198	3.01	17.1
43	12	29-Mar-94	1345	42 40.22	170 21.36	42 42.15	170 19.23	127	132	3.00	17.2
44	12	29-Mar-94	1553	42 40.60	170 26.00	42 40.16	170 27.61	170	310	1.26	17.4
45	12	30-Mar-94	0627	42 39.08	170 19.53	42 37.79	170 23.24	139	157	3.02	17.0
46	11	30-Mar-94	0834	42 41.94	170 28.59	42 43.52	170 25.22	94	100	2.94	17.0
47	11	30-Mar-94	1036	42 45.97	170 23.58	42 48.72	170 22.18	97	98	2.94	17.1
48	12	30-Mar-94	1303	42 47.74	170 17.18	42 45.73	170 19.58	119	128	2.75	17.2
49	12	30-Mar-94	1458	42 47.29	170 15.94	42 48.90	170 12.56	134	148	2.97	17.3
50	12	1-Apr-94	0635	42 43.99	170 12.22	42 46.04	170 09.30	149	159	2.97	17.4
51	11	1-Apr-94	0918	42 56.83	170 21.28	42 59.11	170 18.61	50	53	3.00	17.1
52	11	1-Apr-94	1125	43 04.08	170 14.45	43 06.48	170 11.98	26	30	3.01	17.2
53	11	1-Apr-94	1323	43 00.16	170 12.56	42 57.57	170 14.66	93	100	3.01	17.5
54	12	1-Apr-94	1518	42 59.77	170 10.40	43 01.85	170 07.37	114	123	3.04	17.5
55	13	2-Apr-94	0633	43 07.09	169 45.52	43 08.94	169 44.21	207	244	2.08	17.3
56	13	2-Apr-94	0848	43 15.78	169 44.99	43 12.80	169 46.17	202	219	3.10	17.4
57	11	2-Apr-94	1118	43 11.16	170 01.20	43 08.74	170 03.84	88	95	3.09	17.3
58	12	2-Apr-94	1314	43 03.28	169 59.18	43 00.74	169 57.20	162	178	2.92	17.4
59	18	4-Apr-94	0350	40 58.00	173 12.87	41 00.96	173 12.74	34	38	2.96	17.8
60	18	4-Apr-94	0915	41 06.05	173 16.26	41 09.04	173 16.62	23	31	3.00	18.0

Appendix 2—*continued*

			Start of tow			End of tow		Gear depth (m)		Distance trawled	Surface temp
Station	Stratum	Date	Time	° ' S	° ' E	° ' S	° ' E	Min.	Max.	(n. miles)	(°C)
61	2	6-Apr-94	0812	40 46.87	171 59.15	40 49.85	171 57.78	114	115	3.10	15.8
62	2	6-Apr-94	1148	40 58.69	171 32.18	41 01.44	171 30.56	155	162	3.01	17.4
63	2	6-Apr-94	1428	41 10.05	171 20.58	41 13.09	171 19.27	163	163	3.19	17.7
64	8	7-Apr-94	0707	41 45.11	170 52.97	41 47.96	170 51.27	196	199	3.12	17.5
65	9	7-Apr-94	1024	41 56.02	170 35.68	41 59.02	170 34.19	382	390	3.19	17.6
66	9	7-Apr-94	1223	41 59.35	170 34.02	42 02.27	170 33.78	378	380	2.92	17.6
67	9	7-Apr-94	1408	42 03.95	170 35.76	42 02.33	170 37.53	272	318	2.72	18.2
68	15	8-Apr-94	0701	43 40.35	169 13.55	43 38.01	169 16.20	115	122	3.02	15.8
69	14	8-Apr-94	1037	43 30.13	169 25.74	43 27.64	169 28.27	91	95	3.09	15.9
70	16	8-Apr-94	1326	43 24.99	169 17.51	43 26.87	169 14.71	338	352	2.80	16.4
71	16	8-Apr-94	1535	43 28.75	169 13.95	43 31.07	169 11.30	263	269	3.00	16.5
72	15	9-Apr-94	0659	43 27.16	169 19.39	43 25.17	169 22.48	133	136	2.98	16.5
73	15	9-Apr-94	1228	43 23.40	169 34.70	42 22.67	169 36.84	103	103	1.73	17.0
74	14	9-Apr-94	1348	43 25.92	169 36.54	43 28.10	169 33.69	53	54	3.00	17.4
75	14	9-Apr-94	1549	43 26.68	169 41.77	43 25.27	169 45.42	29	33	3.00	17.3
76	13	10-Apr-94	0703	43 13.41	169 37.31	43 10.43	169 37.38	338	395	2.96	17.1
77	13	10-Apr-94	0913	43 10.74	169 42.38	43 13.77	169 42.62	229	234	3.03	17.0
78	16	10-Apr-94	1119	43 17.76	169 40.12	43 19.21	169 43.88	274	297	3.07	17.1
79	15	10-Apr-94	1349	43 19.97	169 49.31	43 22.23	169 46.79	100	112	2.91	17.2
80	14	10-Apr-94	1616	43 22.76	169 49.16	43 22.30	169 53.29	20	45	3.04	17.0
81	8	11-Apr-94	1440	41 48.26	171 12.84	41 51.15	171 11.26	144	147	3.12	17.4
82	15	12-Apr-94	0701	43 41.75	169 07.78	43 43.41	169 04.23	110	110	3.06	16.2
83	15	12-Apr-94	1517	43 25.52	169 24.49	43 23.76	169 29.17	130	186	2.62	17.0
84	15	13-Apr-94	0706	43 32.87	169 13.23	43 30.75	169 16.22	132	136	3.02	16.8
85	15	13-Apr-94	0909	43 29.73	169 22.69	43 32.10	169 20.05	113	119	3.03	16.9
86	15	13-Apr-94	1101	43 32.86	169 19.89	43 35.51	169 17.90	109	116	3.01	16.7
87	14	13-Apr-94	1305	43 34.79	169 25.91	43 33.62	169 29.76	33	50	3.02	16.3
88	14	13-Apr-94	1507	40 30.31	16935.59	43 28.46	169 38.96	31	32	3.07	16.8
89	16	14-Apr-94	0704	43 24.28	169 19.44	43 22.66	169 22.90	312	325	3.00	17.0
90	15	14-Apr-94	0901	43 23.97	169 26.77	43 22.71	169 30.51	172	200	3.00	16.6

Appendix 2—*continued*

Station	Stratum	Date	Start of tow			End of tow			Gear depth (m)		Distance trawled (n. miles)	Surface temp (°C)
			Time	° ' S	° ' E	° ' S	° ' E		Min.	Max.		
91	16	14-Apr-94	1121	43 16.23	169 35.44	43 15.42	169 39.54		249	320	3.09	17.0
92	15	14-Apr-94	1336	43 17.02	169 45.49	43 14.14	169 46.69		191	197	3.01	16.7
93	15	14-Apr-94	1529	43 17.83	169 50.14	43 16.36	169 53.75		115	133	3.01	16.4
94	15	15-Apr-94	0703	43 17.43	169 53.74	43 14.99	169 56.26		100	105	3.05	16.1
95	11	15-Apr-94	0915	43 15.08	169 57.01	43 12.75	169 59.66		53	89	3.03	16.3
96	12	15-Apr-94	1117	43 11.59	169 57.98	43 09.17	170 00.42		129	133	3.00	16.5
97	12	15-Apr-94	1414	42 55.80	170 13.30	42 53.33	170 15.72		117	120	3.04	15.3
98	11	15-Apr-94	1623	42 52.99	170 26.23	42 52.02	170 30.06		35	48	2.98	16.4
99	12	16-Apr-94	0705	42 42.56	170 10.87	42 41.31	170 14.61		150	153	3.02	16.4
100	8	16-Apr-94	1114	42 25.82	170 45.13	42 24.28	170 48.61		183	200	2.99	17.1
101	8	16-Apr-94	1328	42 22.79	170 59.44	42 20.46	171 10.95		117	128	2.98	16.7
102	7	16-Apr-94	1541	42 15.82	171 09.06	42 12.98	171 10.35		51	51	2.99	16.7
103	8	17-Apr-94	0713	42 08.71	170 50.48	42 06.65	170 53.49		196	200	3.03	17.0
104	8	17-Apr-94	1053	4146.64	171 10.34	41 44.14	171 12.52		150	154	2.98	16.9
105	6	17-Apr-94	1413	41 29.07	171 28.36	41 26.95	171 31.14		135	136	2.97	17.2
106	6	17-Apr-94	1629	41 27.64	171 21.17	41 25.80	171 24.36		143	145	3.01	17.1
107	6	18-Apr-94	0721	41 19.38	171 57.40	41 18.68	171 01.28		189	198	3.01	17.7
108	6	18-Apr-94	0931	41 16.52	171 12.20	41 15.49	171 15.89		173	173	2.97	17.2
109	2	18-Apr-94	1147	41 07.89	171 11.38	41 04.83	171 11.29		188	199	3.05	17.5
110	2	18-Apr-94	1343	41 04.37	171 19.95	41 04.42	171 23.89		167	177	2.98	17.3
111	2	18-Apr-94	1655	40 47.88	171 37.38	40 45.40	171 39.64		160	176	3.01	17.6
112	2	19-Apr-94	0710	41 03.65	171 33.54	41 03.38	171 37.67		134	145	3.13	17.2
113	2	19-Apr-94	0856	41 04.27	171 44.07	41 04.59	171 48.07		118	129	3.04	16.8
114	1	19-Apr-94	1057	41 05.41	171 57.67	41 05.74	172 01.66		65	87	3.03	16.0
115	2	19-Apr-94	1328	40 55.20	171 55.18	40 52.59	171 53.49		114	124	2.89	17.0
116	2	19-Apr-94	1534	40 44.51	171 54.58	40 41.45	171 55.22		141	141	3.09	17.2
117	18	20-Apr-94	0753	40 57.66	173 10.35	41 00.76	173 10.71		42	44	3.11	17.5

*, Station not used for biomass calculations

Appendix 3: Catch (kg) at each station of the 10 most abundant commercial species (species codes are given in Table 2).

Station	SPD	BAR	RCO	STA	TAR	SQU	HOK	SCH	GUR	LIN	Total	All species
1	140.7	67.1	258.9	0.4	3	16.8	0.1	1.2	96.8	1.2	586.2	850.9
2	6	18.8	8	3.8	22.8	22	0	5.2	40.2	0.2	127.0	299.9
3	13.6	43.8	7.7	0	20.3	19.7	0	6.7	44.4	3.6	159.8	412.7
4	77.3	117.9	14.2	0.9	4.7	13.7	0	2.1	62.8	2.2	295.8	528.9
5	209.6	70	54.5	2.1	84.6	11.3	0	0	76.8	0	508.9	675.6
6	73.7	639.6	12.8	0	0.1	8.6	0	1	55.9	0	791.7	926.5
7	53.4	284.4	22.2	0	2	12.9	0	8.1	37.9	0	420.9	530.4
8	32.9	40.4	6.4	0	9.4	34.3	0	10.1	8.7	0	142.2	181.9
9	21.7	298.1	0	0.6	9.7	62.5	0	31.1	2.1	0	425.8	582.0
10	0	1.4	0	0	0	10.4	0	16.3	40.6	0	68.7	203.9
11	77.6	14.8	0	2.4	3.8	31.8	0	3.5	10.1	0	144.0	219.6
12	38.1	6.9	116.9	5.1	5.2	4.1	0	16.3	2.6	0	195.2	252.2
13	134.9	87	0	0	0	30.6	0	10.4	0	0	262.9	317.6
14	160.4	93	0	4.1	0	3.9	0	0.6	39.3	0	301.3	339.7
15	145.2	67.4	117.6	0.5	0.4	26.5	0	2.3	18.5	0	378.4	1 170.3
16	93.9	243.7	0	1.9	0	81.2	0	0	0	0.5	421.2	505.2
17	63.3	55.6	59.2	0	75.5	34.8	0	0	0	0	288.4	1439.0
18	61.7	97	24.5	0	66.7	21.3	0	3.3	0.7	0.5	275.7	376.8
19	309.5	938.1	0	0	0	12.6	0	1	0	0	1 261.2	1 302.1
20	210.6	99.3	24.8	0.8	14.6	43	0	4.3	0	0	397.4	509.0
21	98.1	30.7	0	183.9	20.2	49.4	0	0	2.5	2.3	387.1	453.5
22	343.1	43.7	8.6	29.3	22.1	37.5	0	14	0	0.7	499.0	577.8
23	418.9	100.3	132	73.8	53.1	77.4	0.1	14.5	1.4	0	871.5	1 037.6
24	141.6	24.3	85.3	0	3.4	21.7	0.8	1.3	20.3	0.8	299.5	917.9
25	77.8	72.7	763.1	0	0	1.4	0	10.2	42.9	6.9	975.0	1 249.1
26	22.1	44.4	16.5	0	0	0.1	0	23.4	57.8	0	164.3	351.4
27	54.2	191.5	43.1	0	0	0.6	0	33.2	61.5	0	384.1	584.7
28	53.4	3.7	40.9	0	0	0.1	0	9.3	48.1	0.9	156.4	262.9
29	285.5	3.3	0	1.8	3.9	16.6	0	8.4	0	0	319.5	379.2
30	122.1	8.2	390.6	0	0	2.9	0	12.7	20.9	62.3	619.7	781.3
31	59.8	44.3	26.7	363.6	160.8	31.2	18.2	3.2	0	31.9	739.7	902.2
32	43.6	357.6	147	0	10.7	26.5	0	7.3	2.9	1	596.6	878.3
33	27.3	215.2	694.9	0	23	2.6	0	2.7	10.1	0	975.8	1 294.7
34	119.3	33.1	463.9	0	0	1.1	0	7.6	8.3	19.2	652.5	720.0
35	211.1	90.3	0	22.8	2.2	3.7	0	5.8	57.8	0	393.7	519.5
36	57.4	21	34.2	8.7	17.7	56.6	20.1	0	0	8.6	224.3	428.9
37	172.8	70.9	29.3	44.2	34.5	89.2	54	0	0	2.8	497.7	1 193.3
38	54.3	14	28.1	36.1	23.4	88.4	46.7	0	0	9.9	300.9	653.3
39	55.9	96.4	21.9	204.4	102	37.2	0.2	21.4	0	0	539.4	659.7
40	66.2	2.7	23.6	28.4	84.5	35	64.3	0	0	8.1	312.8	363.2
41	47.6	0	9.9	0	26	34	57	5.3	0	105.2	285.0	426.3
42	194.8	194.4	143.6	92.9	391.8	31.7	0	3.2	0	0	1 052.4	1 131.3
43	329.7	154	73.2	72.2	75.5	92.3	11.9	14	0	0	822.8	878.3
44	51.9	2.6	31	225.4	18	7.7	689.5	0	0	19.6	1 045.7	1 154.1
45	609.3	59.5	64.2	18.9	109.3	116.6	6.4	9.6	0	7.1	1 000.9	1 070.5
46	303.7	218.4	37.7	118.3	37.1	228.7	65.6	40.3	0	0.7	1 050.5	1 168.5
47	368.2	173.2	74.4	32.1	21.2	109.7	21	95	2.5	0	897.3	1 057.5
48	331.7	472.1	33.5	59.3	35	57.2	35.1	40.4	0	0	1 064.3	1 262.4
49	163.9	338.9	40.4	143.9	32.4	43.9	36.4	28.9	0	0	828.7	969.4
50	62.2	344	48.9	124	69.4	36.2	20.8	0	0	0	705.5	779.1
51	246.2	169	772.1	29.4	31.5	31.1	0	34.6	11.1	18.1	1 343.1	1 542.5
52	59.5	1.3	118.3	0	0	1.7	0	5	8.1	41.8	235.7	323.3
53	207.4	25.3	36.3	39	26.1	19.4	4.3	12.8	0.8	0.9	372.3	551.4
54	491.1	170.7	40.7	78.4	49.7	38	81.9	71.8	0	0.9	1 023.2	1 217.6
55	25.1	29	38.9	81.2	173.5	48.1	1.4	0	0	4.5	401.7	558.7
56	19.8	2	30.9	28.6	81.8	23.1	4.5	0	0	5.4	196.1	268.7
57	205.3	40.7	31.4	54.7	11.5	32.6	71.5	8.8	0	3.7	460.2	787.4
58	48.2	362.2	32.5	112.4	44.6	21.2	73.3	11.5	0	4.4	710.3	879.2
59	102.9	388.1	100	0.7	280	32	0	2.4	74.7	0	980.8	1 311.5
60	0	146.9	20.6	0		9	0	0.3	53.4	0	230.2	349.8
61	155.9	73	0	0	6	27.6	0	0	0	0	262.5	327.3
62	222.7	0	344.6	0	14.3	9.1	0	14.7	0	0	605.4	645.1
63	126.6	0	0	0	9.2	18.3	0	11.9	0	0	166.0	279.4
64	199.8	8.3	1.4	138.7	37.7	4.7	0	6.7	0	0	397.3	469.8
65	0	0	0	2.2	0	28.1	0	7.9	0	0	38.2	123.2
66	0	4.9	0	0	0	9.6	0	0	0	0	14.5	67.6
67	0	72.9	0	4.4	13.1	3.4	0	0	0	0	93.8	138.6
68	247.9	130.7	1 537.1	272.7	194.4	29.8	72.5	0	0	8.4	2 493.5	4 039.2
69	188.6	222.9	7	26.7	25.2	27.1	0.7	9.4	1.1	0	508.7	636.3
70	0	0	7.8	79.8	0	18.9	109.7	9.3	0	204.9	430.4	619.2
71	30.4	106.9	99.6	25.7	28.6	16.9	17.6	23.9	0	31	380.6	814.5
72	66.6	63.3	126.8	36.9	61.9	22.1	11.6	0	0	0	389.2	495.8
73	181.4	33.5	26.3	42.3	8.5	9	1.7	7.3	0	1.6	311.6	352.2

Appendix 3—*continued*

Station	SPD	BAR	RCO	STA	TAR	SQU	HOK	SCH	GUR	LIN	Total	All species
74	330.3	54.5	452.3	0	8.3	3	0.6	13	122.8	0	984.8	1 240.4
75	46.3	4.4	109.4	0	0	0.6	0	4	4.7	8.2	177.6	241.5
76	0	0	6.2	61.9	5.8	36.9	56.5	0	0	141.9	309.2	477.6
77	7.6	0	23.3	72.9	184.8	15.4	0	0	0	3.3	307.3	587.1
78	0	5.4	35.6	1 345.8	210.7	36.8	85.7	0	0	161.3	1 881.3	2 314.0
79	189.9	117.1	112	112.8	31	16.2	59.7	5.8	0	6	650.5	1 354.6
80	34.2	211.6	36.2	0	3.2	2.5	0	35.1	161	0	483.8	972.2
81	528.5	63.4	10.8	2	37.4	7.6	6.9	0	0	0.7	657.3	786.3
82	43.9	49.4	141.1	104.7	85.1	9.5	47.7	13.8	0	23.5	518.7	821.1
83	129	96.9	51.6	127.6	23.8	39.2	30.3	0	0	34.9	533.3	742.7
84	29.3	69.3	95.4	140.1	60.2	17.3	48.2	0	0	19.2	479.0	723.8
85	143.6	200.9	47.5	122.1	24.8	32.5	13.1	36.2	0	2.3	623.0	778.6
86	214.9	415.2	332.1	45.5	34.3	28.3	36.2	23.9	0	1.5	1 131.9	1 343.5
87	26.1	26.6	299.3	2.7	56.8	1.2	0	46.2	53.8	2.6	515.3	617.1
88	87	69.6	278	0	1.4	0	0	8.7	4.6	22.6	471.9	532.5
89	8.6	0	10.5	27.6	0	30.9	138.9	25.9	0	93.9	336.3	639.9
90	30.5	16.1	152.1	203.5	17.8	6.3	121.5	0	0	138.9	686.7	1 223.4
91	0	82.5	3.8	56.7	142.6	29.5	6.8	11.3	0	42.3	375.5	675.4
92	2.5	40.3	68.5	8.3	74.4	10.9	7.2	0	0	0.9	213.0	291.0
93	223.4	162.3	46.7	124.4	65.9	9.6	81.5	49.7	0	5.1	768.6	1 176.2
94	178.7	17.8	71.1	55.4	16.1	25.3	51.2	38.4	0	12.3	466.3	998.6
95	282.7	67.5	9.8	11.9	12.5	10.9	63.5	29.7	0	2.9	491.4	717.8
96	621.8	599	17.7	43.8	26.3	40.6	135.3	30.6	0	1.7	1 516.8	1 720.0
97	251.8	235.4	19.4	40.3	111.4	22.2	13.4	22.6	0	1.1	717.6	968.6
98	239.6	11.7	214.9	0	26.4	0.6	0	12.6	30.1	52.7	588.6	796.1
99	173.9	434.6	44.3	85.6	64.1	36.3	21.9	30.7	0	0	891.4	1 061.7
100	204.2	124.8	9.1	20.6	87.6	9.5	4.9	39.4	0	0	500.1	599.7
101	388.1	267	27.7	31.8	96	12.9	50.5	48.1	0	1.1	923.2	1 129.7
102	118.4	28	336.5	0	0	0.3	0	13.7	12.9	11.4	521.2	720.8
103	469.4	270	49.1	78.7	102	28.6	40.4	55.4	0	1.7	1 095.3	1 283.3
104	199.7	4	0.3	1.3	19	13.6	0	9.3	0	0	247.2	390.1
105	155.1	31.2	11.9	2.8	1.3	5.2	0	17.6	0	0	225.1	328.3
106	204.8	75.4	279.9	3.1	5.9	10	0	6.1	0	0.7	585.9	683.2
107	319.5	8.1	0	11.6	0	26.7	0	533.1	0.7	0	899.7	1 127.3
108	46.2	4.3	0	0.2	6.6	3.7	0	45.6	1.9	0	108.5	204.9
109	0	22.7	0	2.8	1.1	2	0	96.9	1.1	0	126.6	222.6
110	46.7	2.8	0	0	14.9	4.4	0	13.7	1.1	0	83.6	174.0
111	122.7	2.5	0	0.2	21.6	18.5	0	13.2	0	0	178.7	390.2
112	285.8	10.9	0	0	55.6	15.5	0	17	1.5	0.3	386.6	480.7
113	119	24.4	0	0.3	6.9	11.5	0	0	0	0	162.1	247.4
114	195.8	167.7	12.4	0.3	0.1	16.7	0	6.5	4.8	0	404.3	621.9
115	82.8	0	0	0	1.7	19.3	0	10.9	0	0	114.7	252.9
116	169.4	4.6	0	0.3	7.8	19.8	0	16.5	0	0	218.4	302.5
117	283.3	163.2	65.9	1.1	2.2	8.4	1.7	57.7	55.3	0	638.8	814.6
Total	16 932.0	13 024.4	11 088.9	5 911.1	4 553.0	3 016.7	2 722.5	2 212.4	1 479.9	1 416.8	62 357.7	86 304.2

New Zealand Fisheries Data Reports

(Prices do not include GST. New Zealand purchasers please add GST at the current rate.)

DR40. CLARK, M.R. & TRACEY, D.M. 1994: Trawl survey of orange roughy, black oreo, and smooth oreo in southern New Zealand waters, August-September 1992 (TAN9208). 37 p. $10.00

DR41. CHATTERTON, T.D. & HANCHET, S.M. 1994: Trawl survey of hoki and associated species in the Southland and Sub-Antarctic areas, November-December 1991 (TAN9105). 55 p. $12.00

DR42. GRIMES, P. 1994: Trawl survey of orange roughy between Cape Runaway and Banks Peninsula, March-April 1992 (TAN9203). 36 p. $10.00

DR43. HORN, P.L. 1994: Trawl survey of hoki and middle depth species on the Chatham Rise, December 1991-January 1992 (TAN9106). 38 p. $10.00

DR44. HORN, P.L. 1994: Trawl survey of hoki and middle depth species on the Chatham Rise, December 1992-February 1993 (TAN9212). 43 p. $12.00

DR45. SCHOFIELD, K.A. & LIVINGSTON, M.E. 1994: Trawl survey of hoki and associated species in the Southland and Sub-Antarctic areas, April-May 1992 (TAN9204). 38 p. $10.00

DR46. SCHOFIELD, K.A. & LIVINGSTON, M.E. 1994: Trawl survey of hoki and associated species in the Southland and Sub-Antarctic areas, September-October 1992 (TAN9209). 43 p. $12.00

DR47. SCHOFIELD, K.A. & LIVINGSTON, M.E. 1994: Trawl survey of hoki and associated species in the Southland and Sub-Antarctic areas, May-June 1993 (TAN9304). 39 p. $10.00

DR48. BEENTJES, M.P. & WASS, R.T. 1994: Inshore trawl survey of the Canterbury Bight and Pegasus Bay, May-June 1991 (KAH9105). 49 p. $12.00

DR49. McMILLAN, P.J. & HART, A.C. 1994: Trawl survey of oreos and orange roughy on the south Chatham Rise, October-November 1990 (COR9004). 46 p. $12.00

DR50. McMILLAN, P.J. & HART, A.C. 1994: Trawl survey of oreos and orange roughy on the south Chatham Rise, October-November 1991 (TAN9104). 45 p. $12.00

DR51. McMILLAN, P.J. & HART, A.C. 1994: Trawl survey of oreos and orange roughy on the south Chatham Rise, October-November 1992 (TAN9210). 45 p. $12.00

DR52. HURST, R.J. & BAGLEY, N.W. 1994: Trawl survey of middle depth and inshore bottom species off Southland, February-March 1993 (TAN9301). 58 p. $12.00

DR53. SCHOFIELD, K.A. & HORN, P.L. 1994: Trawl survey of hoki and middle depth species on the Chatham Rise, January 1994 (TAN9401). 54 p. $12.00

DR54. MICHAEL, K.P., CRANFIELD, H.J., DOONAN, I.J., & HADFIELD, J.D. 1994: Dredge survey of surf clams in Clifford Bay, Marlborough. 14 p. $10.00

DR55. BEENTJES, M.P. 1995: Inshore trawl survey of the Canterbury Bight and Pegasus Bay, May-June 1992 (KAH9205). 58 p. $12.00

DR56. BEENTJES, M.P. 1995: Inshore trawl survey of the Canterbury Bight and Pegasus Bay, May-June 1993 (KAH9306). 56 p. $12.00

DR57. BAGLEY, N.W. & HURST, R.J. 1995: Trawl survey of middle depth and inshore bottom species off Southland, February-March 1994 (TAN9402). 50 p. $12.00

DR58. DAVIES, N.M. & WALSH, C. 1995: Length and age composition of commercial snapper landings in the Auckland Fishery Management Area, 1988–94. 85 p. $14.00

DR59. SCHOFIELD, K.A. & LIVINGSTON, M.E. 1995: Trawl survey of hoki and middle depth species on the Chatham Rise, January 1995 (TAN9501). 53 p. $12.00

DR60. McMILLAN, P.J. & HART, A.C. 1995: Trawl survey of oreos and orange roughy on the south Chatham Rise, October-November 1993 (TAN9309). 49 p. $12.00

DR61. LANGLEY, A.D. 1995: Trawl survey of snapper and associated species in the Hauraki Gulf, October-November 1994 (KAH9411). 34 p. $10.00

DR62. WALSH, C., HARTILL, B., & DAVIES, N.M. 1995: Length and age composition of commercial snapper landings in the Auckland Fishery Management Area, 1994–95. 36 p. $10.00

DR63. DRUMMOND, K.L. & STEVENSON, M.L. 1995: Inshore trawl survey of the west coast South Island and Tasman and Golden Bays, March-April 1992 (KAH9204). 58 p. $12.00

DR64. DRUMMOND, K.L. & STEVENSON, M.L. 1995: Inshore trawl survey of the west coast South Island and Tasman and Golden Bays, March-April 1994 (KAH9404). 55 p. $12.00

DR65. LANGLEY, A.D. 1995: Trawl survey of snapper and associated species off the west coast of the North Island, October 1994 (KAH9410). 34 p. $10.00