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EXECUTIVE SUMMARY

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This report describes the results of a relative abundance survey of blue cod (*Parapercis colias*) off north Otago carried out using cod pots in January 2005.

Thirty-four stations were successfully surveyed (6 pots per station = 204 pot lifts) from three inshore and two offshore strata. During phase 1, 150 pot lifts were completed (74%) with 54 in phase 2.

The total blue cod catch was 2079 kg, consisting of 3519 fish. The overall mean catch rate for the survey was 10.2 kg per lift. For fish of all sizes, catch rates ranged from 7.45 kg per pot per hour in the southern inshore stratum off Shag Point to 14.5 kg per pot per hour for the southern offshore stratum, also off Shag Point. For blue cod 30 cm total length and over (minimum legal size), catch rates by strata mirrored those of all fish, ranging from 5.41 to 11.73 kg per pot per hour with an overall mean catch rate and c.v. of 8.2 kg per pot per hour and 5.3% (Table 4).

The results of this survey provide the first abundance index of blue cod around north Otago. The overall c.v. of 5.4% for all blue cod is remarkable given that there were no previous surveys on which to optimise allocation of stations. The mean catch rates varied among all strata but were highest in both offshore strata. North Otago had the highest catch rates recorded from any area surveyed to date including the Marlborough Sounds, Banks Peninsula, Dusky Sound, and Kaikoura.

Blue cod from the three inshore strata had similar size structures. This contrasts with fish from the two offshore strata, which were about 3-4 cm longer on average with fewer small fish. Males were longer than females in all strata and overall mean male length was 33.2 cm and female length 28.2 cm. Sixty-two percent of the 3518 blue cod caught exceeded the minimum legal size (30 cm and over). It is likely that the difference between relative abundance and size structure of these populations is a result of heavier fishing pressure on the more accessible inshore stocks.

Occurrence of spent gonad stages indicates that some spawning had occurred before the survey began in mid January 2005.

1. INTRODUCTION

The 2002 survey of marine recreational fishing found blue cod (*Parapercis colias*) to be the third most frequently landed finfish species nationally, and the most frequently landed species in the South Island (Boyd *et al.* 2002). More specifically, in the recent north Otago Marine Recreational Fishing Survey 2002/2003 (Project REC2001/02), blue cod was the target species for 94% of trips, and made up 63% of the total recreational catch. Blue cod is also an important species for Maori customary fishers, but the catch is unknown. Recreational take in BCO 3 was estimated at 175 t and 245 t in 1994 and 1996. A smaller amount (150–160 t) of blue cod is landed annually by commercial fishers in BCO 3. The “reef” area off north Otago supporting blue cod is not extensive, but consists of both inshore and offshore areas.

Recreational fishers around north Otago are concerned about declines in catches and sizes of blue cod, along with apparent increases in the number of private recreational and charter boats operating in the area. To promote sustainability of the fishery, local fishing clubs have recently introduced a voluntary reduction in daily bag limits, which has apparently met with widespread support.

Detailed information on relative abundance and population structure about the blue cod populations off north Otago is lacking. An initial survey of the relative abundance of blue cod off North Otago was undertaken in January 2005 (this report). It is envisaged that further surveys will be undertaken in the future, and a time series of relative abundance indices will be developed as a means to monitor the status of blue cod stocks in this area and gauge the effectiveness of the current and future management regimes.

2. METHODS

2.1 Timing

A potting survey was carried out off North Otago between 12 and 27 January 2005. January was chosen as the optimum time to conduct the survey because weather conditions then are generally settled off the east coast of the South Island and because blue cod are likely to spawn about this time of year.

2.2 Survey area

The survey area was defined after discussions with local fishers, Ministry of Fisheries Dunedin, and the South Recreational Advisory Committee. Fishers were given charts of the area and asked to mark discrete locations around north Otago where blue cod are most commonly caught. The survey area was divided arbitrarily into three inshore and two offshore strata between Oamaru and Bobbys Head (Figure 1). The outer boundaries of the inshore and offshore strata were defined by the 30 m and 50 m depth contours, respectively.

Each of the five strata was assumed to contain equal and random distributions of fowl and the area (km²) within each stratum was taken as a measure of available habitat for blue cod.

2.3 Survey design

The survey used a two-phase stratified random station design (Francis 1984), adapted to allow for the use of pots (Beentjes & Carbines 2005). Before the survey, a minimum of 10 stations or sampling sites per stratum were marked on charts as described above, ensuring that they were at least 300 m apart. As

no previous data are available for north Otago, an equal sampling allocation was used initially between strata and five stations per stratum were randomly selected for phase 1.

The total survey design consisted of 5 strata, 34 stations, and 204 pot sets. In phase 1, about three-quarters of the stations were allocated (74%) and the remainder (26%) allocated to phase 2. Allocation of phase 2 stations was based on the mean catch rate (kg per pot per hour) of all blue cod per stratum and optimised using the “area mean squared” method of Francis (1984). In this way, stations were assigned iteratively to the stratum in which the expected gain is greatest, where expected gain is given by:

$$\text{expected gain}_i = \text{area}_i^2 \text{mean}_i^2 / (n_i(n_i+1))$$

where for the i th stratum mean_i is the mean catch rate of blue cod per pot, area_i is the area of the stratum, and n_i is the number of pots. Pots were always allocated in groups of 6 which equates to one set.

2.4 Vessel and gear

The survey was conducted from *Suzanne* (registration number 7586), a Moeraki-based commercial vessel equipped to set and lift rock lobster and blue cod pots. The vessel was chartered by NIWA and skippered by the owner.

Six custom designed and built cod pots were used on the survey. Pot specifications are: length 1200 mm, width 900 mm, depth 500 mm, synthetic inner mesh, 30 mm diameter; 50 mm cyclone wire outer mesh, 4 entrances. Pots were marked with a number from 1 to 6, and baited with paua guts. These are the same pots used for the blue cod surveys of Banks Peninsula in 2002 and 2005 (Beentjes & Carbines 2003, 2006), Dusky Sound in 2002 (Carbines & Beentjes 2003), and North Canterbury in 2004–05 (Carbines & Beentjes 2006).

2.5 Sampling methods

At each station six pots were set and left to fish (soak) for 1 h during daylight hours. Soak time was standardised to be consistent with previous potting surveys in the Marlborough Sounds (Blackwell 1997, 1998, 2002), Banks Peninsula (Beentjes & Carbines 2003, Beentjes & Carbines 2006), Fiordland (Carbines & Beentjes 2003), and North Canterbury (Carbines & Beentjes 2006). The six pots were set in clusters, separated by about 100 m to avoid pots competing for the same fish. Once on station, the position of each of the six pots was determined by the skipper using local knowledge and the vessel sounder to locate a suitable area of fowl. After a station was completed (six pot lifts) the next closest station in the stratum was fished and no allowance was made for time of day or tides. The order that strata and stations were surveyed was dependent on the prevailing weather conditions, as exposed strata such as 3 and 5 could be surveyed only during calm weather.

As each pot was set, a record was made on customised forms of pot number, latitude and longitude from GPS, depth and bottom type from the sounder, and time of day. Pots were lifted aboard using the vessel’s hydraulic pot lifter, emptied, and the contents sorted by species. Total weight per pot was recorded for each species to the nearest 10 g using 5 kg Seaway scales, except for octopus and hagfish. The number of individuals of each species per pot was also recorded. Total length down to the nearest centimetre, sex, and maturity were recorded for all blue cod, and otoliths were removed from a representative size range of males and females, from which weight of each fish was recorded. Sex and maturity were determined by dissection and macroscopic examination of the gonads (Carbines 1998). Gonads were recorded as one of five stages as follows: 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.

2.6 Data analysis

For each stratum and for all strata combined catch rates for all blue cod and for legal sized blue cod (over 30 cm) were estimated as the mean kilogram per pot per hour. Coefficients of variation (c.v.) for each stratum were determined from:

$$cv_i = se_i / mean_i$$

where for the i th stratum se_i is the standard error, and $mean_i$ is the mean catch rate (kg per pot per hour) .

The overall weighted mean catch rate for all strata was determined by weighting each stratum mean by the stratum area ($area_i$) divided by the sum of all strata areas ($area_{total}$).

$$mean_{overall} = \sum((mean_i * area_i) / area_{total})$$

The overall weighted mean standard error of the means was determined by squaring each standard error times its weighting, summing them, and then taking the square root.

$$se_{overall} = SQRT (\sum(se_i * (area_i / area_{total}))^2)$$

The overall coefficient of variation for the survey was then determined from the overall mean and standard errors providing a weighted c.v.

$$cv_{overall} = se_{overall} / mean_{overall}$$

Length frequency for blue cod for each sex is presented by individual stratum and all strata combined. Length frequency data were not scaled as the area fished by a pot is unknown. Mean length for each sex was calculated for individual stratum and overall for all strata combined.

The length-weight relationship was determined from the linear regression model $\ln W = b(\ln L) + \ln a$, where W = weight (g), L = length (cm), and a and b are the regression coefficients. Weights of individual blue cod that were not weighed were calculated from the length-weight relationship (see Results). Individual fish weights were used to determine catch rates of blue cod 30 cm and over (minimum legal size).

3. RESULTS

3.1 Stations surveyed

Thirty-four stations (= sets) were surveyed (6 pots per station = 204 pot lifts) from three inshore strata and two offshore strata off the north Otago coast between 12 and 27 January 2005 (Table 1, Figure 1, Appendix 1). Of the 34 stations, 25 were carried out in phase 1 (5 per stratum) and 9 allocated throughout strata 2, 3, and 5 in phase 2. Depth ranged from about 12 to 45 m.

3.2 Catch

A total of 2147 kg of catch was taken on the survey, of which 2076 kg (97%) was blue cod, consisting of 3518 fish (Table 2). Bycatch included 9 fish, 1 shark, and 1 octopus species. The five most common bycatch species by weight were octopus (*Octopus cordiformis*), scarlet wrasse (*Pseudolabrus miles*), sea perch (*Helicolenus percooides*), school shark (*Galeorhinus australis*) and leather jacket (*Parika scaber*).

Mean catch rates of blue cod (all sizes, and 30 cm and over) were higher in the offshore strata. For fish of all sizes catch rates ranged from 7.45 kg per pot per hour in inshore stratum 4 off Shag Point to 14.5 kg per pot per hour for the offshore stratum 5, also off Shag Point. Overall mean catch rate and c.v. were 10.1 kg per pot per hour and 5.4% (Table 3). For blue cod 30 cm and over (minimum legal size), catch rates by strata mirrored those of all fish, ranging from 5.41 to 11.73 kg per pot per hour with an overall mean catch rate of 8.2 kg per pot per hour and c.v. of 5.3% (Table 4).

3.3 Biological and length frequency data

Of the 3518 blue cod caught on the survey, 3517 were sexed and measured for length, and of those, otoliths were taken from 381 fish and stored. The sex ratio ranged from 1.6:1 (males: females) (stratum 1) to 4.4:1 (stratum 5), and 2.6:1 overall (Table 5). Length frequency distributions for all five strata were similar with a single modal peak between about 31 and 35 cm (Figure 2). Mean lengths of males were larger than females in all strata and overall mean male length was 33.2 cm, whereas female length was 28.2 cm (Table 5). Of the 3518 blue cod caught on the survey, 62% were of legal minimum size (30 cm and over).

Of 3517 blue cod examined, about half of both sexes had gonad stages indicative of spawning, with 15% of females and 14% of males in the running ripe stage (stage 4) (Table 6).

Before calculating the length weight relationship for blue cod, the data were examined for outliers, which were excluded from the analysis leaving 118 females (range 17–43 cm) and 239 males (range 18–54 cm). Using the derived model $W = aL^b$, the length-weight parameters are as follows: males – $a = 0.00641$, $b = 3.2743$, and $R^2 = 0.95$; females – $a = 0.00421$, $b = 3.4013$, and $R^2 = 0.97$.

4. DISCUSSION

The results of this survey provide the first abundance index of blue cod around north Otago. The overall c.v. of 5.4% for all blue cod is remarkable given that there were no previous surveys on which to optimise allocation of stations. The mean catch rates varied between strata and were highest offshore in strata 3 and 5. Catch rates appear similar to those for blue cod in Motunau (North Canterbury, Carbines & Beentjes 2006) but fish were 3 - 4 cm longer on average in north Otago. Both Motunau and north Otago had the highest catch rates recorded from any area surveyed, including the Marlborough Sounds (Blackwell 1997, 1998, 2002), Banks Peninsula (Beentjes & Carbines 2003, 2006), Dusky Sound (Carbines & Beentjes 2003), and Kaikoura (Carbines & Beentjes 2006). These results suggest that north Otago generally contains the greatest proportion of large blue cod surveyed to date.

Blue cod catches do not appear to be affected by time of day, but can be influenced by the state of the tide in areas where tidal flow is high, such as in Foveaux Strait (Warren et al. 1997). In our sampling design it was not practical to allow for the effect that tide might have on catch rates, and we cannot rule out the possibility that some catch rates may have been affected, although compared to Foveaux Strait, tidal flow around north Otago is low.

Blue cod from the three inshore strata had similar size structure. This contrasts with fish from the two offshore strata, which were about 3 - 4 cm longer on average with fewer small fish (Table 5, see Figure 2). Blue cod from all strata of north Otago were dominated by males. It is likely that the difference between relative abundance and size structure of these populations is a result of heavier fishing pressure on the more accessible inshore stocks. Similar conclusions were reached for blue cod in the Marlborough Sounds, where catch rates appear to be inversely proportional to recreational fishing effort (Blackwell 1998, 2002)

Southland blue cod spawn mainly between September and November, but continue through to January (Carbines 1998). In the north Otago survey both sexes had gonad stages indicative of spawning with 15% of females and 14% of males in the running ripe stage (stage 4). Occurrence of spent gonad stages (stage 5) indicates that some spawning had occurred before the survey began in mid January 2005 (Table 6).

5. ACKNOWLEDGMENTS

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Table 1: Stratum coastline length, number of phase 1 and 2 stations, pot lifts, and depth.

Stratum	Area of strata (km ²)	Number of sets		Number of pot lifts	Depth (m)	
		Phase 1	Phase 2		Mean	Range
1	153.1	5		30	24.3	15–32
2	243.5	5	5	60	20.4	12–26
3	149.9	5	2	42	38.8	22–43
4	115.9	5		30	19.1	12–25
5	200.1	5	2	42	38.1	27–45
Total	862.5	25	9	204	28.2	12–45

Table 2: Catch weights and/or numbers of blue cod and bycatch species caught on the survey and percentage of total weight. *Estimated weight using average weight of 6.5 kg for octopus (the mean of 2 weighed octopus), and 0.4 kg for hagfish (Beentjes & Carbines 2003).

Common name	Scientific name	Catch (kg)	Number	Percent of total catch
Blue cod	<i>Parapercis colias</i>	2075.90	3518	96.70
Octopus	<i>Octopus cordiformis</i> *	45.50	7	2.12
Scarlet wrasse	<i>Pseudolabrus miles</i>	6.88	20	0.32
Sea perch	<i>Helicolenus percoides</i>	4.41	5	0.21
School shark	<i>Galeorhinus australis</i>	3.95	1	0.18
Leather jacket	<i>Parika scaber</i>	3.73	9	0.17
Girdled wrasse	<i>Notolabrus cinctus</i>	2.29	6	0.11
Banded wrasse	<i>Notolabrus fucicola</i>	1.77	5	0.08
Spotty	<i>Notolabrus celidotus</i>	0.87	3	0.04
Tarakihi	<i>Nemadactylus macropterus</i>	0.65	2	0.03
Hagfish	<i>Eptatretus cirrhatus</i> *	0.40	1	0.02
Blue moki	<i>Latridopsis ciliaris</i>	0.32	1	0.01

Table 3: Mean blue cod catch rate, standard error, and c.v. per strata and overall for all blue cod.

Stratum	Pot lifts (N)	Mean (kg/lift)	s.e.	c.v. (%)
1	30	8.46	1.06	12.58
2	60	7.89	1.08	13.74
3	42	11.74	1.14	9.72
4	30	7.45	1.00	13.40
5	42	14.50	1.43	9.88
Overall	204	10.14	0.54	5.40

Table 4: Mean blue cod catch rate, standard error, and c.v. per strata and overall for blue cod 30 cm and over.

Stratum	Pot lifts (N)	Mean (kg/lift)	s.e.	c.v. (%)
1	30	6.78	0.89	13.13
2	60	5.46	0.58	10.56
3	42	11.66	1.17	10.06
4	30	5.41	0.77	14.18
5	42	11.73	1.27	10.85
Overall	204	8.22	0.44	5.30

Table 5: Mean lengths of blue cod by strata and sex.

Strata	Sex	Mean length	
		N	(cm)
1	m	302	33.0
	f	140	28.6
	u	1	
2	m	557	31.5
	f	351	28.2
3	m	605	34.9
	f	194	29.2
4	m	309	32.3
	f	122	26.4
5	m	765	33.6
	f	172	28.0
Overall	m	2538	33.2
	f	979	28.2
	u	1	–

Table 6: Gonad stages of blue cod. 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.

	Gonad stage (%)					N
	1	2	3	4	5	
Males	0.8	53.1	25.2	15.2	5.7	2538
Females	1.5	43.2	39.0	14.1	2.1	979

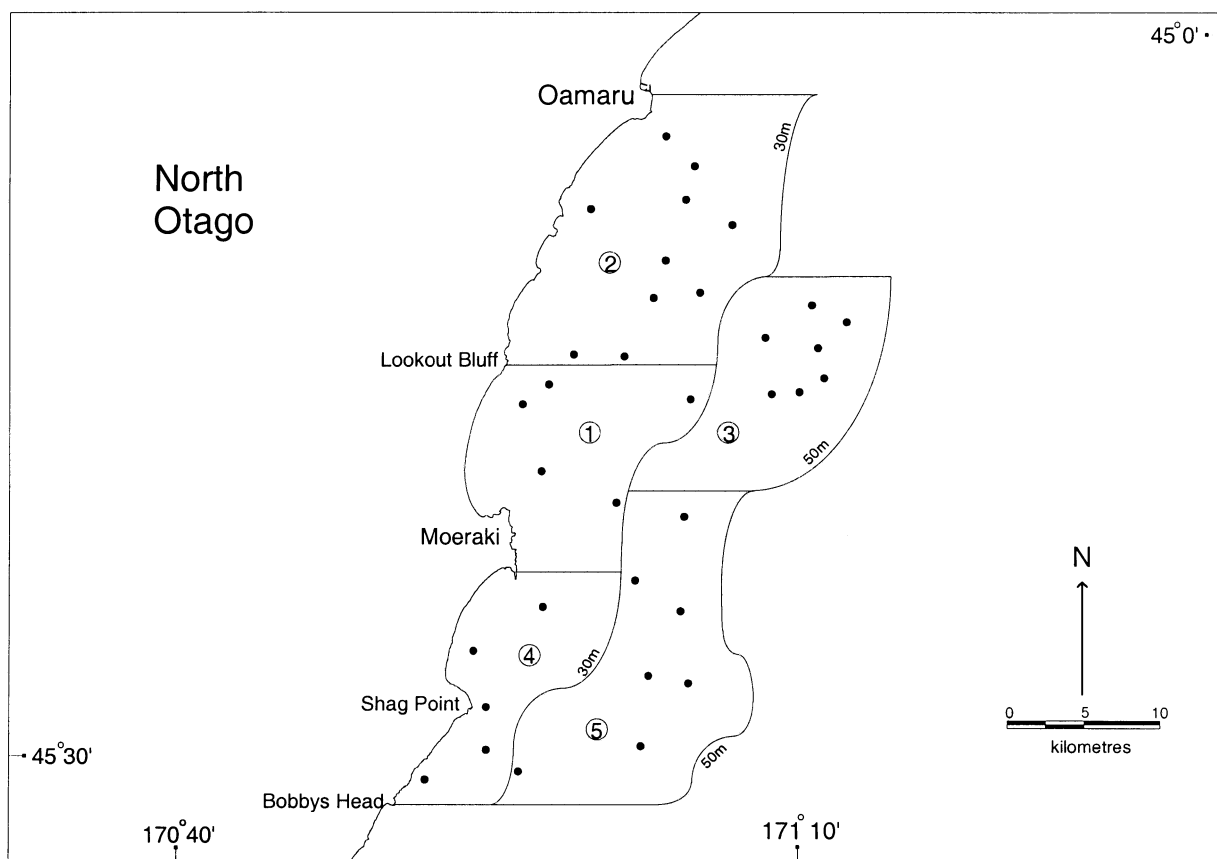


Figure 1. Map of north Otago coast showing the survey area, strata, and stations where pots were set.

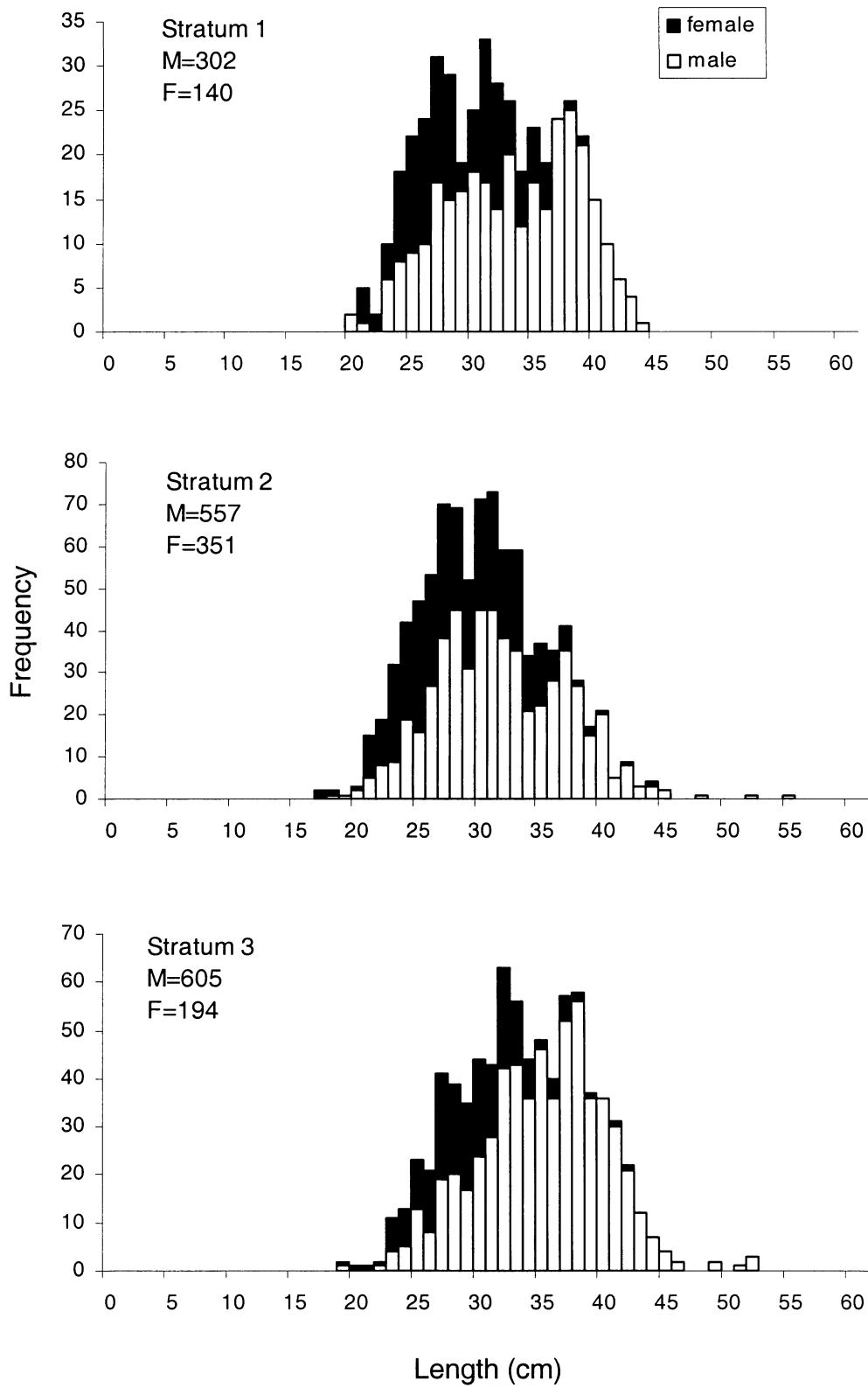


Figure 2: Length frequency distributions of blue cod for each stratum (1–5) and all strata combined.

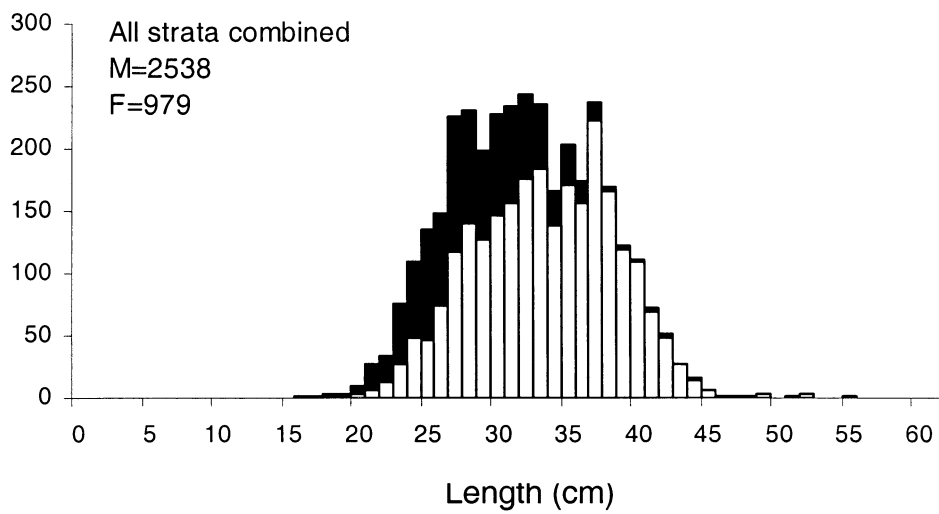
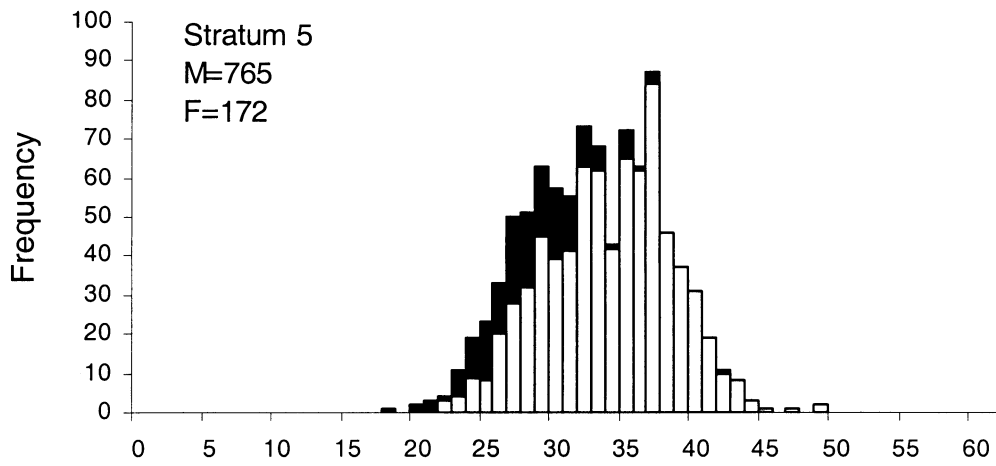
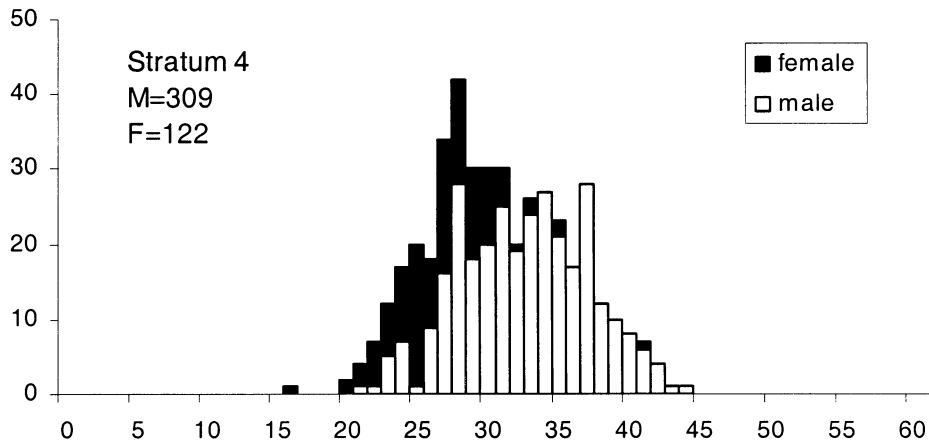


Figure 2 – continued

Appendix 1: Summary of pot lift station data.

Set	Date	Phase	Stratum	Pot lift		Time set	Pot label	Catch of blue cod	
				station	Depth (m)			Weight (kg)	Number of fish
1	12-Jan-05	1	1	1A	29.2	0812	E	2.6	6
1	12-Jan-05	1	1	1A	29.0	0815	F	2.5	5
1	12-Jan-05	1	1	1A	30.0	0820	L	12.0	21
1	12-Jan-05	1	1	1A	29.4	0825	P	19.0	39
1	12-Jan-05	1	1	1A	30.0	0829	B	8.5	21
1	12-Jan-05	1	1	1A	30.0	0835	T	11.1	21
2	12-Jan-05	1	1	1B	31.5	1017	T	2.7	6
2	12-Jan-05	1	1	1B	31.5	1020	B	7.6	15
2	12-Jan-05	1	1	1B	32.5	1023	P	8.1	12
2	12-Jan-05	1	1	1B	32.0	1025	L	6.9	13
2	12-Jan-05	1	1	1B	32.0	1028	F	14.8	27
2	12-Jan-05	1	1	1B	31.0	1030	E	5.0	6
3	12-Jan-05	1	2	2E	22.0	1226	E	6.3	11
3	12-Jan-05	1	2	2E	21.5	1230	F	16.8	32
3	12-Jan-05	1	2	2E	22.0	1233	L	2.3	6
3	12-Jan-05	1	2	2E	21.0	1238	P	4.2	8
3	12-Jan-05	1	2	2E	22.0	1242	B	5.4	13
3	12-Jan-05	1	2	2E	22.0	1244	T	2.1	4
4	13-Jan-05	1	2	2A	22.0	0817	E	12.8	28
4	13-Jan-05	1	2	2A	23.0	0821	F	7.4	13
4	13-Jan-05	1	2	2A	22.0	0825	L	31.4	84
4	13-Jan-05	1	2	2A	22.5	0833	P	7.0	15
4	13-Jan-05	1	2	2A	23.0	0840	B	32.9	90
4	13-Jan-05	1	2	2A	22.0	0845	T	14.0	32
5	13-Jan-05	1	2	2B	22.0	1026	T	11.6	28
5	13-Jan-05	1	2	2B	23.0	1031	B	2.8	7
5	13-Jan-05	1	2	2B	23.5	1034	P	5.2	13
5	13-Jan-05	1	2	2B	23.0	1037	L	7.7	21
5	13-Jan-05	1	2	2B	22.0	1040	F	6.6	14
5	13-Jan-05	1	2	2B	21.0	1042	E	7.0	18
6	13-Jan-05	1	2	2C	21.0	1219	E	1.4	3
6	13-Jan-05	1	2	2C	20.5	1224	F	4.1	9
6	13-Jan-05	1	2	2C	22.0	1227	L	1.7	4
6	13-Jan-05	1	2	2C	19.5	1232	P	2.9	8
6	13-Jan-05	1	2	2C	18.5	1235	B	44.5	77
6	13-Jan-05	1	2	2C	20.0	1240	T	9.3	16
7	13-Jan-05	1	2	2D	17.5	1400	T	2.2	6
7	13-Jan-05	1	2	2D	17.7	1404	B	7.6	16
7	13-Jan-05	1	2	2D	16.7	1406	P	3.4	7
7	13-Jan-05	1	2	2D	18.2	1410	L	1.5	5
7	13-Jan-05	1	2	2D	19.0	1414	F	0.9	3
7	13-Jan-05	1	2	2D	19.0	1418	E	7.3	17
8	14-Jan-05	1	3	3A	36.0	0754	F	8.5	11
8	14-Jan-05	1	3	3A	37.5	0757	E	4.0	4
8	14-Jan-05	1	3	3A	38.0	0800	L	8.9	25
8	14-Jan-05	1	3	3A	36.0	0804	P	5.3	7
8	14-Jan-05	1	3	3A	36.5	0807	B	5.1	9

Set	Date	Phase	Stratum	Pot lift		Time set	Pot label	Catch of blue cod	
				station	Depth (m)			Weight (kg)	Number of fish
9	14-Jan-05	1	3	3B	40.0	0928	T	6.0	7
9	14-Jan-05	1	3	3B	40.5	0930	B	29.5	31
9	14-Jan-05	1	3	3B	41.7	0933	P	10.9	16
9	14-Jan-05	1	3	3B	41.5	0935	L	17.0	18
9	14-Jan-05	1	3	3B	41.5	0938	E	27.0	36
9	14-Jan-05	1	3	3B	42.0	0942	F	10.5	15
10	14-Jan-05	1	3	3C	43.0	1111	F	22.9	30
10	14-Jan-05	1	3	3C	22.0	1113	E	16.9	23
10	14-Jan-05	1	3	3C	40.0	1115	L	21.2	36
10	14-Jan-05	1	3	3C	41.0	1117	P	20.4	25
10	14-Jan-05	1	3	3C	41.0	1119	B	24.1	30
10	14-Jan-05	1	3	3C	42.0	1121	T	16.8	24
11	14-Jan-05	1	3	3D	39.0	1247	T	1.2	2
11	14-Jan-05	1	3	3D	40.0	1249	B	17.5	29
11	14-Jan-05	1	3	3D	38.5	1251	P	12.7	16
11	14-Jan-05	1	3	3D	40.0	1253	L	23.7	30
11	14-Jan-05	1	3	3D	40.0	1255	E	21.6	30
11	14-Jan-05	1	3	3D	41.0	1259	F	15.0	19
12	14-Jan-05	1	3	3E	37.5	1436	F	8.6	14
12	14-Jan-05	1	3	3E	36.0	1440	E	14.8	33
12	14-Jan-05	1	3	3E	37.0	1443	L	21.7	31
12	14-Jan-05	1	3	3E	37.0	1448	P	4.7	6
12	14-Jan-05	1	3	3E	36.5	1453	B	13.8	20
12	14-Jan-05	1	3	3E	37.0	1458	T	8.8	15
13	15-Jan-05	1	1	1C	25.0	0658	T	11.2	14
13	15-Jan-05	1	1	1C	25.0	0703	B	11.0	19
13	15-Jan-05	1	1	1C	24.0	0707	P	9.6	16
13	15-Jan-05	1	1	1C	24.0	0711	L	15.7	21
13	15-Jan-05	1	1	1C	23.5	0717	E	10.9	15
13	15-Jan-05	1	1	1C	23.0	0722	F	11.7	22
14	15-Jan-05	1	1	1D	15.0	0838	F	2.9	6
14	15-Jan-05	1	1	1D	15.0	0840	E	21.2	30
14	15-Jan-05	1	1	1D	15.0	0845	L	4.4	5
14	15-Jan-05	1	1	1D	15.0	0848	P	0.1	1
14	15-Jan-05	1	1	1D	15.0	0854	B	3.1	5
14	15-Jan-05	1	1	1D	15.0	0858	T	8.0	12
15	15-Jan-05	1	1	1E	21.0	1015	T	4.0	9
15	15-Jan-05	1	1	1E	20.0	1019	B	3.9	9
15	15-Jan-05	1	1	1E	21.0	1020	P	4.5	5
15	15-Jan-05	1	1	1E	21.0	1023	L	5.0	11
15	15-Jan-05	1	1	1E	22.0	1026	E	22.9	44
15	15-Jan-05	1	1	1E	22.0	1030	F	3.3	7
16	18-Jan-05	1	4	4A	25.0	0651	T	8.8	19
16	18-Jan-05	1	4	4A	24.5	0655	B	16.3	30
16	18-Jan-05	1	4	4A	23.0	0700	P	18.1	29
16	18-Jan-05	1	4	4A	23.0	0705	L	13.4	22
16	18-Jan-05	1	4	4A	23.5	0710	E	12.9	29
16	18-Jan-05	1	4	4A	24.0	0717	F	13.8	28
17	18-Jan-05	1	4	4B	13.0	0843	F	0.0	0

Set	Date	Phase	Stratum	Pot lift		Time set	Pot label	Catch of blue cod	
				station	Depth (m)			Weight (kg)	Number of fish
17	18-Jan-05	1	4	4B	13.5	0848	L	8.1	17
17	18-Jan-05	1	4	4B	14.5	0850	P	13.4	21
17	18-Jan-05	1	4	4B	14.5	0852	B	12.8	19
17	18-Jan-05	1	4	4B	13.0	0855	T	10.8	17
18	18-Jan-05	1	4	4C	21.0	1019	T	11.3	23
18	18-Jan-05	1	4	4C	21.5	1021	B	7.4	13
18	18-Jan-05	1	4	4C	18.0	1023	P	4.0	8
18	18-Jan-05	1	4	4C	21.0	1025	L	2.7	8
18	18-Jan-05	1	4	4C	19.3	1028	E	0.0	0
18	18-Jan-05	1	4	4C	21.0	1030	F	0.5	1
19	18-Jan-05	1	4	4D	12.0	1213	F	9.0	20
19	18-Jan-05	1	4	4D	13.0	1215	E	14.2	29
19	18-Jan-05	1	4	4D	15.0	1217	L	9.6	19
19	18-Jan-05	1	4	4D	16.5	1219	P	9.1	21
19	18-Jan-05	1	4	4D	17.5	1222	B	0.5	1
19	18-Jan-05	1	4	4D	18.0	1225	T	4.3	8
20	22-Jan-05	1	4	4E	20.0	0744	T	6.4	13
20	22-Jan-05	1	4	4E	21.0	0746	B	5.0	10
20	22-Jan-05	1	4	4E	22.0	0748	P	1.2	4
20	22-Jan-05	1	4	4E	22.0	0750	L	6.0	14
20	22-Jan-05	1	4	4E	25.0	0752	F	0.1	1
20	22-Jan-05	1	4	4E	22.0	0754	E	0.9	1
21	22-Jan-05	1	5	5A	34.0	0913	E	7.8	13
21	22-Jan-05	1	5	5A	35.0	0915	F	3.3	5
21	22-Jan-05	1	5	5A	36.5	0916	L	8.0	15
21	22-Jan-05	1	5	5A	36.0	0918	P	6.3	10
21	22-Jan-05	1	5	5A	36.0	0920	B	5.5	9
21	22-Jan-05	1	5	5A	36.0	0923	T	3.1	5
22	22-Jan-05	1	5	5B	43.0	1111	T	20.5	29
22	22-Jan-05	1	5	5B	43.0	1113	B	12.0	20
22	22-Jan-05	1	5	5B	42.0	1115	P	4.6	8
22	22-Jan-05	1	5	5B	43.5	1117	L	0.0	0
22	22-Jan-05	1	5	5B	42.6	1120	F	12.8	18
22	22-Jan-05	1	5	5B	42.5	1124	E	10.9	17
23	22-Jan-05	1	5	5C	40.0	1249	E	18.1	25
23	22-Jan-05	1	5	5C	38.0	1252	F	4.9	11
23	22-Jan-05	1	5	5C	38.0	1255	L	24.7	43
23	22-Jan-05	1	5	5C	27.5	1258	P	13.6	22
23	22-Jan-05	1	5	5C	37.5	1300	B	9.9	16
23	22-Jan-05	1	5	5C	37.5	1304	T	13.0	17
24	24-Jan-05	1	5	5D	45.0	0742	E	12.3	19
24	24-Jan-05	1	5	5D	45.0	0745	F	14.7	18
24	24-Jan-05	1	5	5D	45.0	0747	L	16.7	20
24	24-Jan-05	1	5	5D	44.0	0750	P	12.1	16
24	24-Jan-05	1	5	5D	43.0	0752	B	20.1	26
24	24-Jan-05	1	5	5D	44.0	0755	T	20.1	30
25	24-Jan-05	1	5	5E	39.0	0924	T	22.5	28
25	24-Jan-05	1	5	5E	38.0	0925	B	17.4	27

Set	Date	Phase	Stratum	Pot lift		Time set	Pot label	Catch of blue cod	
				station	Depth (m)			Weight (kg)	Number of fish
25	24-Jan-05	1	5	5E	38.5	0929	L	21.5	30
25	24-Jan-05	1	5	5E	38.0	0928	P	27.6	29
25	24-Jan-05	1	5	5E	38.0	0931	F	17.7	27
25	24-Jan-05	1	5	5E	38.0	0933	E	20.1	36
26	25-Jan-05	2	5	5F	35.0	0655	E	49.2	79
26	25-Jan-05	2	5	5F	35.0	0700	F	16.2	23
26	25-Jan-05	2	5	5F	35.0	0705	L	16.8	36
26	25-Jan-05	2	5	5F	35.0	0710	P	17.2	38
26	25-Jan-05	2	5	5F	35.0	0715	B	26.3	42
26	25-Jan-05	2	5	5F	35.0	0720	T	18.2	31
27	25-Jan-05	2	5	5G	35.0	0848	T	6.3	12
27	25-Jan-05	2	5	5G	35.0	0851	B	29.7	38
27	25-Jan-05	2	5	5G	34.0	0852	P	15.0	21
27	25-Jan-05	2	5	5G	34.0	0855	L	4.4	10
27	25-Jan-05	2	5	5G	35.0	0900	F	7.8	18
27	25-Jan-05	2	5	5G	35.0	0905	E	0.0	0
28	25-Jan-05	2	3	3F	41.0	1130	E	20.2	26
28	25-Jan-05	2	3	3F	41.0	1134	F	3.4	5
28	25-Jan-05	2	3	3F	41.5	1136	L	20.0	33
28	25-Jan-05	2	3	3F	40.0	1138	P	6.4	11
28	25-Jan-05	2	3	3F	42.0	1140	B	6.2	12
28	25-Jan-05	2	3	3F	41.5	1145	T	17.7	32
29	25-Jan-05	2	3	3G	37.5	1312	T	0.7	1
29	25-Jan-05	2	3	3G	37.5	1315	B	0.0	0
29	25-Jan-05	2	3	3G	37.0	1318	P	12.5	26
29	25-Jan-05	2	3	3G	37.0	1320	L	8.7	20
29	25-Jan-05	2	3	3G	37.0	1324	F	7.5	10
29	25-Jan-05	2	3	3G	37.5	1328	E	5.7	12
30	26-Jan-05	2	2	2F	17.0	0650	E	4.0	6
30	26-Jan-05	2	2	2F	16.5	0656	F	0.6	1
30	26-Jan-05	2	2	2F	16.0	0702	L	3.4	6
30	26-Jan-05	2	2	2F	16.0	0708	P	3.1	6
30	26-Jan-05	2	2	2F	15.0	0713	B	11.3	14
30	26-Jan-05	2	2	2F	16.0	0718	T	0.4	2
31	26-Jan-05	2	2	2G	12.0	0851	T	4.2	7
31	26-Jan-05	2	2	2G	12.0	0854	B	3.2	6
31	26-Jan-05	2	2	2G	16.0	0856	P	1.3	3
31	26-Jan-05	2	2	2G	16.0	0900	L	3.9	6
31	26-Jan-05	2	2	2G	16.0	0905	F	2.4	5
31	26-Jan-05	2	2	2G	16.0	0909	E	8.6	12
32	26-Jan-05	2	2	2H	26.0	1105	E	8.9	21
32	26-Jan-05	2	2	2H	26.0	1108	F	4.9	10
32	26-Jan-05	2	2	2H	26.0	1110	L	7.6	13
32	26-Jan-05	2	2	2H	26.0	1112	P	3.7	5
32	26-Jan-05	2	2	2H	26.0	1115	B	5.0	8
32	26-Jan-05	2	2	2H	26.0	1120	T	3.4	5
33	27-Jan-05	2	2	2I	24.0	0812	T	9.2	16
33	27-Jan-05	2	2	2I	24.0	0817	B	9.8	14
33	27-Jan-05	2	2	2I	24.0	0823	P	10.5	15

Set	Date	Phase	Stratum	Pot lift		Time set	Pot label	Catch of blue cod	
				station	Depth (m)			Weight(kg)	Number of fish
33	27-Jan-05	2	2	2I	23.8	0830	L	6.0	9
33	27-Jan-05	2	2	2I	23.0	0835	F	9.0	11
33	27-Jan-05	2	2	2I	22.5	0840	E	5.4	8
34	27-Jan-05	2	2	2J	19.0	0956	E	3.8	8
34	27-Jan-05	2	2	2J	19.0	0959	F	6.4	12
34	27-Jan-05	2	2	2J	18.5	1001	L	14.3	29
34	27-Jan-05	2	2	2J	18.5	1002	P	9.1	19
34	27-Jan-05	2	2	2J	18.5	1005	B	3.6	6
34	27-Jan-05	2	2	2J	18.5	1009	T	12.2	17