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A description of the 1997 Atlantic cod fishery in NAFO Division 3Ps from port sampling and fishery observer records with a comparison to the sentinel and food fisheries

by

D. W. Kulka, T. Inkpen
Department of Fisheries and Oceans
P. O. Box 5667
St. John's, Newfoundland, Canada A1C 5X1

and

M. O'Connor
National Sea Products
Lunenburg
Nova Scotia, Canada A1C 5X1

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Abstract

Length, maturity and ageing samples were collected from the inshore trap, gillnet, line trawl and handline fisheries and the offshore otter trawl fishery by port samplers and fishery observers. While there were significant differences in size of fish caught by different gears, fish size generally showed little variation among areas and months within each gear type. Differences were found between time periods for the 3Psh otter trawl fishery, and between the 3Psc sampling quadrants for trap and linetrawl samples. Placentia Bay fish tended to be slightly larger than in other areas for linetrawl and handline, and catches showed a higher percentage of older fish. Otter trawl catches from the shallow southern portion of St. Pierre Bank and From the Halibut channel were very large averaging 72 cm. Inshore trap catches, at the other end of the scale averaged only 52 cm. An analysis of maturities of the catch indicates that the first part of the fishery in Placentia Bay took place during the peak spawning period in late May and early June. Analysis of the observed offshore fishing locations shows that three areas were fished, 1) northwest corner of St. Pierre Bank where fishing was limited and catch rates were low, 2) south Halibut Channel where catch rates were moderate and 3) south central St. Pierre Bank centred on Lat. 45 35, Long 55 41 where catch rates were highest averaging 5 tonnes per hour. Many sets have the same starting position indicating that the same area was repeatedly trawled. The effort covered 110 km^2 but where catch rates exceeded 5 t per hour covered only 65 km^2. This suggested that the fished cod consisted of a rather small but dense school. This school is even smaller than the 6 by 18 km dimension since over the period of the fishery, it was moving, with the fishing effort following it. The other two observed offshore areas fished, to the southeast in the Halibut Channel and to the northwest south of the Hermitage Channel comprised even smaller, lower density schools although high catch rates (average 7 t per hour) were achieved for a period of five days in late Nov. and early Dec. in Halibut Channel.

Résumé

Des échantillons pour la détermination de la longueur, de la maturité et de l'âge ont été prélevés par des échantillonneurs à quai ou des observateurs des pêches à partir des captures de la pêche côtière au piège, au filet maillant, à la palangre et à la ligne à main et de celles de la pêche hauturière au chalut. En dépit d'écarts appréciables de la taille des poissons capturés par les divers engins, la taille présentait généralement, pour chaque type d'engin, peu de variation entre les zones et les mois. Des écarts temporels ont été notés au sein des échantillons de la pêche au chalut de 3Psh et entre les quadrants d'échantillonnage de 3Psc pour la pêche au piège et à la palangre. Les poissons capturés à la palangre et à la ligne à main dans la baie Placentia avaient tendance à être légèrement plus gros que ceux des autres zones et les captures contenaient un pourcentage plus élevé de poissons plus âgés. Les poissons capturés au chalut dans la partie sud peu profonde du banc Saint-Pierre et dans le chenal Halibut étaient très gros, leur longueur moyenne atteignant 72 cm. Au contraire, les poissons capturés par les pièges côtiers n'atteignaient en moyenne que 52 cm de longueur. Une analyse du taux de maturité des captures a montré que la première partie de la pêche dans la baie Placentia s'est déroulée pendant la période de pointe du frai, à la fin de mai et au début de juin. L'analyse des lieux de pêche en haute mer montre que trois zones ont été exploitées : 1) le coin nord-ouest du banc Saint-Pierre où la pêche a été limitée et les taux de capture faibles, 2) le sud du chenal Halibut où les taux de capture ont été moyens et 3) le centre sud du banc Saint-Pierre (lat. 45° 35'; long. 55°41') où les taux de capture ont été les plus élevés atteignant en moyenne 5 tonnes à l'heure. Bon nombre de traits avaient le même point de départ ce qui indique que la même zone a fait l'objet d'un chalutage répété. L'effort de pêche couvrait 110 km^2 mais lorsque les taux de capture dépassaient 5 t à l'heure, la zone diminuait à 65 km^2. Cela porte à croire que les morues exploitées se limitaient à un banc plutôt petit mais dense. Ce banc ne couvrait même pas une zone de 6 sur 18 km car il se déplaçait au cours de la saison de pêche, tout comme l'effort de pêche. Les deux autres zones de pêche hauturière observées, situées au sud-est, dans le chenal Halibut, et au nord-ouest, au sud du chenal Hermitage, abritaient des bancs encore plus restreints et de densité plus faible, mais des taux de capture élevés (moyenne de 7 t à l'heure) ont été atteints pendant une période de cinq jours, à la fin novembre et au début décembre, dans le chenal Halibut.

Introduction

Subdiv. 3Ps cod, commonly referred to as the 'St Pierre Bank Bank' stock is distributed from Cape St Mary's to just west of Burgeo Bank, over St. Pierre Bank, most of Green Bank and includes Hermitage, Fortune and Placentia Bay (refer to Fig.1). However, Shelton *et al.* (1996) noted that the distribution of fish does not conform well to management boundaries and the stock is considered to be a complex mixture of sub-components. Traditionally, fisheries employing the all of the common fixed and mobile gears covered the length of the coastline and several offshore grounds. Between 1959 and 1995, total annual catches ranged between 638 t (1995) and 86,824 t (1961). Catches feel of quite rapidly 1991.

The 1992 assessment of this stock (Bishop and Murphy 1992) estimated 3+ biomass at the beginning of 1991 at about 300,000 t, among the highest observed in the time series. However, both the Canadian and French surveys indicated substantial declines in the minimum trawlable biomass by the winter of 1992. Based on these survey results and a poor fishery, the Fisheries Resource Conservation Council (FRCC) in 1993 recommended that the 3Ps cod fishery be discontinued. A moratorium was instituted. After closure in 1993, until 1997, the only fishing for cod in 3Ps was by a sentinel survey started in 1995 and a food fishery in 1994, 1996 and 1997. The sentinel fishery was initiated with the objective of actively involving fishers in collecting data using traditional gears in the inshore. Preliminary results from the sentinel fishery were reported in Davis and Jarvis (1996). Kulka (1996) reported the food fishery findings.

Based in part on the results of the sentinel survey, a limited commercial fishery was re-instituted in 1997. Historically, the fishery offshore was prosecuted offshore primarily by mobile gear and inshore primarily by fixed gear. It was decided that a quota of 10,000 t would be divided among the historical participants. As specified in the 1972 Agreement between Canada and France on their Mutual Fishing Relations, 15.6% or 1,560 t was allocated to France. The French Conservation Harvesting Plan allocated 468 t to the inshore while the other 1,092 t was fished by two Canadian vessels for processing in St. Pierre. The remainder of the quota was allocated to Canada: 414 t for the mobile gears < 65 ft. (otter trawlers) and 6,338 t for the fixed gear sector. A total of 1,688 t was set aside for by-catch and experimental fisheries. The fixed gear allocation was split among trap, gillnet, linetrawl and handline gears. Three separate fishing periods were set up for the inshore sector, each occurring during May-June, August and September through November. About 1,200 fishers participated in the inshore fishery leading to very short periods if fishing at the start of the three seasons.

In light of the uncertainties regarding the level of recovery of this stock, it was judged appropriate to carefully monitor the fishery. Part of this monitoring effort included thorough biological sampling (catch lengths, maturities and otoliths). This effort was fairly intensive covering six unit areas, three inshore and three offshore (refer to Fig. 1). Placentia Bay was monitored on the basis of four quadrants. Samples were collected from five gears and during all months fished. As well, fishery observers deployed on 100% of the offshore effort and a portion

of the inshore gillnet effort. The purpose of this paper is to report the sampling results of the re-instituted fishery.

Methods

Both an inshore and an offshore component prosecuted the 1997 fishery for cod in NAFO DIV. 3Ps. Thus, a combination of port samplers working on shore and observers on fishing vessels at sea were employed to collect length and maturity data and aging materials. Observers also collected detailed information on the catch as specified in Kulka and Firth (1987).

In response to a requirement for detailed monitoring of catches during the fishery, Conservation and Protection Branch of Fisheries and Oceans instituted a Dockside Monitoring Program for NAFO Div. 3Ps. Under this program, 16 traditionally high volume landing sites were subject to full time monitoring and an additional 27 sites were subject to part time monitoring. Biological sampling locations were chosen from these ports to maximize sampling opportunities and geographical coverage (refer to Fig. 27). The sampling locations were also adjusted during the fishery based on weather conditions and landing patterns, determined through consultation with dockside monitoring personnel. Conservation & Protection of Fisheries & Oceans determined levels of coverage at sea and vessels to be targeted by fishery observers.

Six port samplers were teamed with 15 fishery observers to monitor both the inshore and the offshore fishery. For the inshore sector, data was collected from three unit areas, 3Psa (west of Pass Isl.), 3Psb (Fortune Bay), and 3Psc (Placentia Bay). Offshore landings from unit areas 3Psd (northwest St. Pierre Bank), 3Psf (northeast St. Pierre Bank) and 3Psh (southeast St. Pierre Bank and the Halibut Channel) were sampled. Refer to Fig. 1 for a spatial definition of unit areas. In addition, Placentia Bay was divided into four quadrants to intensify sampling and sites were assigned to cover each quadrant. During the 1997 cod fishery in NAFO division 3Ps, 86,789 fish (216 t) were measured from the catches of the inshore trap, gillnet, linetrawl and handline and the offshore otter trawl fisheries. This included a portion of the French quota fished by Canadian vessels (Table 1 and 2). Maturity data was collected from a sub-sample of 2,631 fish caught in the Placentia Bay (3Psc) fishery. Gutting at sea prevented maturity determination for landed samples from other areas. A total of 6,522 otoliths were collected for ageing purposes.

For all samples, sample and turnout weight was obtained from the dockside monitor or company weigh-master. In rare cases (i.e. retention of fish for personal use at unmonitored sites), the entire catch was measured and the weight estimated using a length weight regression taken from Shelton *et al.* (1996). Each length frequency was weighted to the vessel turnout weight prior to summation by area and month.

In addition to biological sampling, fishery observers collected catch and effort data at sea covering two components. Five observers were deployed to cover a portion of the gillnet effort and 100% of the offshore otter trawl effort. The latter was French quota fished by two Canadian vessels. The fishing effort and catch rate data collected were analyzed spatially and compared to the log records as recorded by the two offshore vessels. As well, other narrative information

including opinions on the fishery and the stock status were recorded. Otoliths were collected from a subset of measured fish in each length group. Both the catch and effort and the length data were compiled and compared by subarea (and quadrant in the case of Placentia Bay).

Results

Table 1 summarizes the length frequency results (mean, modal, minimum, maximum, standard deviation) obtained for each gear type, unit area and month. Overall average size of fish in the commercial catches, as illustrated in Fig. 2 and 3 was largest for otter trawl gear (72 cm), followed by gillnet (66 cm), linetrawl (58 cm), handline (58 cm) and trap (52 cm). The total observed length range of the catches was 25 to 134 cm. Table 2 shows similar type of information broken out by quadrant and month within Placentia Bay.

The otter trawl fishing effort offshore, carried out by two Canadian vessels fishing French quota, was restricted primarily to NAFO unit areas 3Psh (Halibut Channel) and 3Psf (south central bank) with a few sets prosecuted in 3Psd, 3Pse and 3Psg (refer to Table 2 and Fig. 26). The largest mean lengths of any gear, 74 cm in 3Psh and 72 cm in 3Psf were observed. While the average catch size increased in 3Psh from 73 cm. in November to 78 cm. in December, sample size was small (n=190). No significant differences were observed between months for 3Psf otter trawl samples. Length frequency distributions for these areas are presented in Figs. 4 and 5.

Fig. 6 shows the length distribution for Placentia Bay (3Psc) trap samples. Overall mean and modal lengths, as well as the shape of the distributions, were consistent for May, June and July. Average size among quadrants in Placentia Bay, shown in Table 2, was fairly consistent, with observed values of 55 cm, 50 cm, and 52 cm for quadrants 1,3, and 4. However, the distributions presented in Fig. 7 show a higher percentage of 60 to 80 cm fish for quadrant 1. As well, seen in Table 2, both mean and modal length increased significantly (by 12 cm and 13 cm, respectively) in this quadrant between the June and July quota periods.

Gillnet samples from the offshore areas (refer to Table 1, areas 3Psh and 3Psf), tended to yield fish larger than those from the inshore. This may not necessarily be due to larger size of fish offshore but rather to differing selectivity by the gear used. Offshore mesh sizes ranged from 152 - 165 mm, while smaller meshed 140–152 mm nets were used inshore. Figs. 10 to 12 show the length distributions by area and month for the three inshore areas. Mean and modal lengths were similar although 3Psa yielded a higher percentage of older fish (frequency distribution with a longer tail to the right, Fig. 12). The frequencies by quadrant for 3Psc are presented in Fig. 13.

Overall mean lengths from linetrawl catches for 3Psc, 3Psb, and 3Psa were 61, 58, and 58 cm respectively. The total length frequency plots for 3Psb (Fig. 15) and 3Psa (Fig. 16) show a much stronger degree of kurtosis (narrowness in the frequency) compared to 3Psc (Fig. 14) indicating a narrow range of ages in the catches. In Placentia Bay, a significant drop was observed in both the mean (-10 cm) and modal (-22 cm) lengths from May to October. As seen in Table 2, this decline was consistent across the quadrants sampled in the area. The total length frequency plots presented in Fig. 17 show, on average, linetrawl catch size was +8 cm larger in quadrant 4

compared to quadrant 2.

The observed length distributions for handline samples for areas 3Psc, 3Psb and 3Psa are shown in Figs. 18, 19 and 20. Placentia Bay fish were slightly larger than those in Fortune Bay (3Psb) or the south coast (3Psa). As well, the relative strength of the 65–80 cm length groups is noticeably higher. This appears to be due largely to quadrant 1 fish, shown in Fig. 21.

Fig. 22 presents overall maturity data for Placentia Bay for the months of May, June and July. Peak spawning appears to have occurred during late May and early June at the height of the fishery. The percentage of maturing or partly spent males was observed to decline from 74.6% to 20.6% over this period. A similar pattern was seen for the females, where the percentage decreased from 62.0% to 22.5%. Figs. 23–25 illustrate the maturity data for quadrants 1,3 and 4. No data is available to determine whether fishing took place during the spawning period in Fortune Bay or the south coast.

Analysis of the observed offshore fishing locations shows that 226 sets at three locations were fished, 1) northwest corner of St. Pierre Bank where fishing was limited and catch rates were low, 2) south Halibut Channel where catch rates were moderate and 3) a shallow part of St. Pierre Bank centred on Lat. 45^0 35', Long. 55^0 41' (Fig. 26).

The area fished south of the near Hermitage Channel constituted only a few scattered sets with poor catch rates. In the Halibut Channel catch rates were low except for five days of fishing in late Nov. and early Dec. An average 7 t per hour was achieved during 29 sets but only over an area of 22 km^2. Good catch rates were sustained over a longer period at the southern St. Pierre Bank location where the average was 4.7 tonnes per hour. The depth fished was very shallow averaging only 44 m (42-57 m). Many sets of a total of 194 were recorded with the same starting position. Here, the same ground was repeatedly trawled. The effort here covered 110 km^2 (6 by 18 km.) but where catch rates exceeded 5 t per hour the area fished extended over only 65 km^2. A time series analysis of the catch (Fig.27) shows that the effort occurred over a narrow latitudinal band (Fig. 26) and shifted due east by 5 km from Aug. 26 to mid Sept. Fishing effort shifted a further 7 km from mid Oct. to Nov. 23. The average daily catch rates were quite variable over the period of the fishery averaging about 5 t per hour until late Oct. then dropping to 3 t average thereafter. During five days up to mid Oct., catch rates exceeded 8 t per hour tending to elevate the average during this period. Also, there were some days in mid October where catch rates were above average. The extent of the area fished at other two offshore locations was also small and in addition, catch rates were much lower at these two grounds.

Log records were obtained for the two National Sea vessels fishing the French offshore quota. A comparison with fishery observer records showed that the two data sources were quite similar where the directed species was cod. Table 3 shows that both vessels interspersed their cod directed fishery with sets aimed at capturing witch and redfish, particularly with respect to the Cape Fortune. Some but not all of the sets directed for other species appeared in the log records. Only six sets, four with catch were found in the log records with no corresponding observed sets. Where cod was directed, the catch differences were fairly small. Estimates of total catch (cod directed) from observer data were 3% higher than the log records on both vessels amounting to 39 t.

Discussion

Given that there has been no fishery in NAFO Subdiv. 3Ps for four years, comparison of catch sizes from recent years is not possible. However, a comparison with sentinel catches for 1997 (B. Davis, pers. comm.) shows that the commercial data is very consistent with that observed in the sentinel fishery. Mean and modal lengths by area and gear are similar, as is the general shape of the length frequencies. A slight difference was observed in the 3Psc linetrawl and handline catches, where the commercial data shows a higher percentage of fish 55 cm and larger. The 1997 commercial handline results are, as well, very similar to the overall size distributions seen during the 1997 food fishery except in quadrant 2. The commercial fishery caught a wider range of sizes. Note that the food fishery was restricted to two weekends in September.

One strategy in managing fisheries is to avoid fishing the stock while spawning is occurring. The May-June period of the fishery occurred at the peak of spawning based on sampling of maturities taken in Placentia Bay. Assuming spawning occurred at the same time in other parts of 3Ps, a significant portion of the 1997 fishery removed spawning fish.

The offshore fishery consisting of French quota fished by two Canadian vessels occurred at three locations covering less than 180 km^2 in total, the largest being 6 by 18 km. Rose (1993) measured schools of spawning and migrating cod off eastern Newfoundland and found that that they extended over about 2.5 km to 20 km. This would suggest that at each of the three offshore grounds, small schools of fish were targeted. The central St. Pierre Bank school was even smaller than the 6 by 18 km dimension of the total area fished since effort shifted due east by a total of 12 km over the period of the fishery, presumably following a school of fish. Average catch rate at this location tended to be sustained over time although catch rates in Nov. at the end of the fishery were low. Thus, if emigration from this school in Nov. did not occur, there is the possibility of cropping down due to fishing on the school over time. Due to the very limited area fished over the 15 week period, the relatively high observed catch rates alone is not indicative of a large biomass offshore. It only shows the presence of two very small but dense schools on which limited effort was expended.

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Table 1 - Summary length frequency data from the 1997 3Ps commercial cod fishery. Weighted sample size refers to the number of measurements after bump up to turnout weights.

Gear	Unit Area	Month	Turnout Weight (kg)	Sample Weight (kg)	Mean Length (cm)	St. Dev.	Minimum Length (cm)	Maximum Length (cm)	Modal Length (cm)	Sample Size (Actual)	Sample Size (Weighted)
Otter Trawl	3Psh	November	19,854	1,171	73	7.18	51	102	66	415	6,952
		December	8,200	805	78	4.82	51	105	81	190	1,935
		All	28,054	1,976	74	7.95	51	105	74	605	8,887
	3Psf	August	20,830	4,234	74	9.88	38	104	75	1,075	4,929
		September	31,030	5,670	71	10.83	43	107	74	1,572	8,608
		October	83,150	7,224	71	10.20	42	119	72	1,990	22,683
		November	11,600	809	72	8.98	46	129	65	318	4,554
		All	146,610	17,937	72	10.76	38	129	73	4,955	40,775
	3Ps Total	All	174,664	19,913	72	10.49	38	129	74	5,560	49,662
Trap	3Psc	May	25,988	9,475	53	7.45	34	93	50	5,213	14,269
		June	99,900	10,609	52	6.77	32	102	48	5,979	53,863
		July	81,093	6,612	51	8.15	30	91	48	3,345	37,681
		All	206,981	26,696	52	7.55	30	102	48	14,537	105,813
	3Ps Total	All	206,981	26,696	52	7.55	30	102	48	14,537	105,813
Gillnet	3Psh	May	11,468	805	74	2.76	50	100	73	230	3,335
		June	19,618	5,453	73	3.81	43	98	73	1,107	3,702
		All	31,086	6,258	73	4.24	43	100	73	1,337	7,036
	3Psd	October	9,909	912	81	4.56	53	99	80	186	2,021
		All	9,909	912	81	4.56	53	99	80	186	2,021
	3Psc	May	67,880	31,082	66	6.75	41	120	64	12,254	27,212
		July	31,848	12,165	64	8.56	41	113	64	4,186	11,924
		September	862	862	64	6.77	45	90	61	354	354
		October	7,892	1,576	65	3.61	44	99	65	596	2,963
		All	108,528	45,780	65	7.57	41	120	64	17,405	42,468
	3Psb	June	7,472	6,134	65	4.65	41	118	62	2,458	2,935
		July	4,791	1,776	63	5.51	45	99	60	633	1,180
		August	14,473	11,299	64	8.35	35	123	60	4,095	5,417
		September	788	788	68	10.56	35	100	67	123	123
		October	8,391	6,670	63	8.71	33	121	62	2,527	3,268
		All	35,915	26,667	64	8.95	33	123	60	9,836	12,923
	3Psa	May	1,664	1,664	69	10.51	42	114	63	525	525
		June	1,960	1,949	67	9.15	43	124	63	697	700
		August	1,181	1,181	69	11.76	41	121	63	355	355
		October	3,655	3,655	67	11.07	44	134	63	1,005	1,005
		All	8,460	8,449	68	10.35	37	134	63	2,582	3,048
	3Ps Total	All	193,898	88,066	66	8.87	33	134	64	31,346	67,496
Linetrawl	3Psc	May	4,311	3,588	69	1.03	38	134	72	858	1,064
		October	8,716	5,974	59	9.19	36	121	50	2,701	4,012
		All	13,027	9,562	61	10.37	36	134	50	3,559	5,076
	3Psb	June	3,109	2,426	59	5.81	37	104	56	1,266	1,628
		July	140	140	56	11.35	41	92	53	112	112
		August	3,986	2,991	56	8.55	37	112	53	1,600	2,197
		October	21,647	10,092	57	8.89	31	118	55	4,196	9,512
		November	10,816	1,640	61	10.21	44	125	56	673	4,394
		All	39,698	17,289	58	10.11	31	125	55	7,847	17,843
	3Psa	May	8,078	6,493	64	9.67	32	111	60	2,310	2,774
		June	10,300	7,923	61	7.20	35	105	60	2,720	3,336
		August	6,342	5,302	56	8.37	32	105	56	1,803	2,130
		September	4,999	2,717	56	8.80	29	114	52	1,185	2,267
		October	16,178	11,025	55	9.30	25	110	56	5,205	6,868
		November	742	742	55	8.81	40	102	56	430	430
		All	46,639	34,202	58	10.40	25	114	56	13,653	17,805
	3Ps Total	All	100,272	61,665	58	10.74	25	134	55	25,328	41,122
Handline	3Psc	May	2,786	2,786	59	9.55	38	101	54	1,514	1,514
		July	12,407	5,103	59	8.69	36	103	57	2,326	7,479
		October	3,298	2,857	60	7.77	34	103	52	1,307	1,461
		All	18,491	10,747	59	9.27	34	103	57	5,147	10,454
	3Psb	August	4,382	3,959	56	7.04	30	102	51	2,286	2,524
		All	4,382	3,959	56	7.04	30	102	51	2,286	2,524
	3Psa	June	226	203	56	13.79	43	92	51	143	159
		August	2,885	2,885	55	10.67	36	99	48	1,445	1,445
		October	2,485	1,723	58	4.90	33	101	56	663	954
		All	5,596	4,811	56	7.86	33	101	53	2,251	2,559
	3Ps Total	All	28,819	19,866	58	9.56	30	103	51	9,684	15,862
All Gears	3Ps Total	All	704,634	216,206	60	12.10	25	134	50	86,789	279,955

Table 2 - Summary length frequency data by Placentia Bay quadrants from the 1997 3Ps commercial cod fishery. Weighted sample size refers to the number of measurements after bump up to turnout weights.

Gear	Quadrant	Month	Turnout Weight (kg)	Sample Weight (kg)	Mean Length (cm)	St. Dev.	Minimum Length (cm)	Maximum Length (cm)	Modal Length (cm)	Sample Size (Actual)	Sample Size (Weighted)
Trap	1	June	274	274	44	5.82	34	74	39	361	361
		July	14,550	1,870	56	9.66	37	91	52	420	3,847
	3	All	14,824	2,144	55	10.02	34	91	46	781	4,208
		May	1,123	373	48	4.47	39	72	46	368	1,108
		June	32,931	1,155	51	5.99	38	93	48	551	12,754
		July	1,722	427	47	7.45	30	82	38	387	1,561
		All	35,776	1,955	50	6.38	30	93	48	1,306	15,423
	4	May	11,969	4,628	55	7.98	39	91	50	2,665	6,042
		June	41,664	3,397	52	6.42	33	102	51	2,605	31,874
		July	24,761	1,601	51	5.89	37	81	50	1,026	10,972
		All	78,394	9,626	52	6.89	33	102	51	6,296	48,889
Total		All	128,994	13,725	52	7.30	30	102	50	16,766	68,520
Gillnet	1	May	23,740	5,173	65	5.19	43	97	62	2,132	9,846
		July	16,928	5,354	66	5.78	42	109	65	1,811	5,657
		October	3,529	765	64	4.03	51	90	61	315	1,452
		All	44,197	11,292	65	6.12	42	109	62	4,258	16,956
	2	May	24,909	15,220	64	6.23	41	120	61	6,398	10,589
		July	11,138	3,195	61	8.61	41	105	64	1,379	5,206
		September	862	862	64	6.77	45	90	61	354	354
		October	4,363	811	66	2.05	44	99	65	281	1,511
		All	41,272	20,088	64	7.84	41	120	64	8,412	17,660
	3	May	2,612	285	67	3.30	56	86	62	105	956
		July	689	535	64	17.13	43	113	60	207	267
		All	3,301	820	66	4.74	43	113	62	312	1,222
	4	May	16,619	10,403	68	6.02	46	101	65	3,619	5,821
		July	551	539	63	6.09	51	92	61	235	240
		All	17,170	10,942	68	6.08	46	101	65	3,854	6,062
Total		All	105,940	43,143	65	7.54	41	120	64	33,672	41,899
Linetrawl	2	May	509	571	64	25.51	41	108	64	225	201
		October	7,511	4,768	58	8.62	36	113	50	2,251	3,562
		All	8,020	5,339	59	8.22	36	113	50	2,476	3,763
	4	May	3,802	3,017	70	3.04	38	134	72	633	863
		October	1,205	1,205	60	12.73	37	121	56	450	450
		All	5,007	4,222	67	8.30	37	134	72	1,083	1,313
Total		All	13,027	9,562	61	10.37	36	134	50	7,118	5,076
Handline	1	July	7,399	3,292	62	8.48	38	96	54	1,177	3,078
		October	1,998	1,561	66	9.46	43	103	61	533	685
		All	9,397	4,853	63	8.62	38	103	61	1,710	3,763
	2	May	2,294	2,294	59	9.33	38	101	54	1,233	1,233
		July	1,021	1,021	56	9.58	36	103	47	654	654
		October	1,300	1,296	55	8.98	34	91	52	774	776
		All	4,615	4,611	57	9.48	34	103	54	2,661	2,663
	3	May	492	492	56	10.20	40	100	52	281	281
		All	492	492	56	10.20	40	100	52	281	281
Total		All	14,504	9,956	60	9.55	34	103	54	9,304	6,707
Total		All	262,465	76,386	57	9.99	30	134	50	66,860	122,202

Table 3 - List of sets observed for two National Sea vessels in NAFO Div. 3Ps in 1997 with acomparison to vessel log records. Light shade shows observed sets where there were no log sets, dark, log but no observed sets.

							Observer Data			NatSea Data			Catch	CPUE
CFV	Lat	Long	Month	Day	GMT	Dir. Species	Duration	Catch (t)	CPUE	Duration	Catch (t)	CPUE	Difference	Difference
4025	4531	5537	9	23	2055	Cod	1.0	0.230	0.230	1.0	0.272	0.272	-0.042	-0.042
4025	4535	5541	9	23	2230	Cod	1.0	1.950	1.950	1.0	1.906	1.906	0.044	0.044
4025	4536	5536	9	24	0005	Cod	1.7	3.850	2.265	1.7	3.811	2.287	0.039	-0.022
4025	4536	5542	9	24	0220	Cod	1.3	3.770	2.900	1.3	3.485	2.788	0.285	0.112
4025	4536	5536	9	24	0410	Cod	1.4	3.993	2.852	1.4	3.920	2.767	0.073	0.085
4025	4536	5541	9	24	0800	Cod	1.1	1.664	1.513	1.1	1.633	1.508	0.031	0.005
4025	4536	5536	9	24	0945	Cod	1.1	4.630	4.209	1.1	4.356	4.021	0.274	0.188
4025	4536	5542	9	24	1120	Cod	1.2	4.430	3.692	1.2	4.138	3.547	0.292	0.145
4025	4536	5536	9	24	1305	Cod	1.7	1.940	1.141	1.7	1.851	1.111	0.089	0.030
4025	4536	5542	9	24	1515	Cod	1.2	4.300	3.583	1.2	4.029	3.454	0.271	0.130
4025	4536	5536	9	24	1700	Cod	1.4	1.550	1.107	1.3	1.525	1.143	0.025	-0.036
4025	4535	5542	9	24	1850	Cod	1.0	9.700	9.700	1.0	9.256	9.256	0.444	0.444
4025	4535	5536	9	24	2015	Cod	2.3	5.800	2.522	2.3	5.445	2.420	0.355	0.102
4025	4536	5536	9	24	2300	Cod	2.2	4.160	1.891	2.2	3.920	1.809	0.240	0.082
4025	4536	5537	9	25	0145	Cod	1.9	2.770	1.458	1.9	2.613	1.363	0.157	0.095
4025	4536	5542	9	25	0540	Cod	2.4	2.329	0.970	2.4	2.287	0.946	0.042	0.024
4025	4535	5541	9	25	0835	Cod	2.4	4.700	1.958	2.3	4.356	1.867	0.344	0.091
4025	4535	5535	9	25	1130	Cod	1.3	1.350	1.039	1.3	1.307	1.045	0.043	-0.007
4025	4536	5536	9	25	1315	Cod	1.3	1.350	1.039	1.3	1.307	1.045	0.043	-0.007
4025	4536	5541	9	25	1455	Cod	2.1	3.660	1.743	2.1	3.485	1.673	0.175	0.070
4025	4535	5542	9	25	1730	Cod	1.0	2.670	2.670	1.0	2.722	2.722	-0.052	-0.052
4025	4535	5537	9	25	1905	Cod	0.4	0.010	0.025				NA	NA
4025	4535	5541	9	25	2020	Cod	1.0	1.100	1.100	1.0	1.633	1.633	-0.533	-0.533
4025	4535	5536	9	25	2200	Cod	2.2	3.100	1.409	2.2	2.178	1.005	0.922	0.404
4025	4646	5712	10	2	0350	Cod	1.2	0.060	0.050				NA	NA
4025	4632	5703	10	2	0905	Cod	1.5	0.030	0.020	1.5	0.027	0.018	0.003	0.002
4025	4536	5542	10	2	1825	Cod	1.2	4.450	3.708	1.2	4.356	3.733	0.094	-0.025
4025	4536	5536	10	2	2005	Cod	1.4	8.650	6.179	1.3	2.722	2.042	5.928	4.137
4025	4536	5542	10	2	2155	Cod	2.4	5.320	2.217	2.3	1.633	0.700	3.687	1.517
4025	4536	5541	10	3	0040	Cod	2.5	6.875	2.750	2.5	6.860	2.744	0.015	0.006
4025	4536	5542	10	3	0335	Cod	2.7	7.400	2.741	2.7	7.187	2.695	0.213	0.046
4025	4536	5541	10	3	0645	Cod	2.4	3.660	1.525	2.4	8.167	3.379	-4.507	-1.854
4025	4536	5542	10	3	0950	Cod	0.5	1.160	2.320	0.5	1.525	3.049	-0.365	-0.729
4025	4535	5535	10	3	1155	Cod	1.4	3.380	2.414	1.4	6.316	4.458	-2.936	-2.044
4025	4536	5542	10	3	1350	Cod	1.3	3.660	2.815	1.3	3.485	2.788	0.175	0.028
4025	4536	5536	10	3	1530	Cod	1.4	2.150	1.536	1.3	2.287	1.715	-0.137	-0.179
4025	4535	5542	10	3	1710	Cod	1.3	6.050	4.654	1.3	5.880	4.704	0.170	-0.050
4025	4537	5537	10	3	1845	Cod	1.2	2.875	2.396	1.2	2.722	2.334	0.153	0.062
4025	4534	5536	10	3	1935	Cod	0.7	0.890	1.271				NA	NA
4025	4536	5542	10	3	2020	Cod	1.3	4.880	3.754	1.3	4.029	3.223	0.851	0.531
4025	4536	5536	10	3	2200	Cod	2.3	4.150	1.804	2.3	4.791	2.129	-0.641	-0.325
4025	4535	5536	10	4	0035	Cod	2.8	3.825	1.366	2.8	3.702	1.346	0.123	0.020
4025	4536	5537	10	4	0350	Cod	2.2	3.216	1.462	2.2	3.158	1.458	0.058	0.004
4025	4535	5536	10	4	0630	Cod	1.7	3.660	2.153	1.7	3.593	2.156	0.067	-0.003
4025	4537	5537	10	4	0850	Cod	1.5	6.240	4.160	1.5	5.989	3.993	0.251	0.167
4025	4537	5545	10	4	1045	Cod	1.8	16.970	9.428	1.8	16.552	9.458	0.418	-0.030
4025	4535	5536	10	4	1525	Cod	1.6	3.990	2.494	1.6	3.920	2.476	0.070	0.018
4025	4536	5545	10	4	1800					0.4	0.817	1.960	NA	NA
4025	4535	5536	10	4	1935					1.7	3.920	2.352	NA	NA
4025	4535	5536	10	4	2230	Cod	1.6	6.655	4.159	1.6	6.534	4.126	0.121	0.033
4025	4536	5545	10	5	0040	Cod	1.0	6.955	6.955	1.0	6.479	6.479	0.476	0.476
4025	4622	5813	11	8	0610	Redfish	3.0	0.680	0.227				NA	NA
4025	4613	5806	11	8	0950	Redfish	2.5	1.180	0.472				NA	NA

Table 3 - List of sets observed for two National Sea vessels in NAFO Div. 3Ps in 1997 with acomparison to vessel log records. Light shade shows observed sets where there were no log sets, dark, log but no observed sets.

							Observer Data			NatSea Data			Catch	CPUE
CFV	Lat	Long	Month	Day	GMT	Dir. Species	Duration	Catch (t)	CPUE	Duration	Catch (t)	CPUE	Difference	Difference
4025	4620	5811	11	8	1310	Redfish	3.0	0.840	0.280				NA	NA
4025	4610	5802	11	8	1650	Redfish	3.0	0.680	0.227				NA	NA
4025	4602	5750	11	8	2030	Redfish	3.0	0.250	0.083				NA	NA
4025	4556	5738	11	9	0005	Redfish	3.0	0.570	0.190				NA	NA
4025	4546	5733	11	9	0330	Redfish	3.0	1.680	0.560				NA	NA
4025	4538	5724	11	9	0715	Redfish	3.0	0.840	0.280				NA	NA
4025	4533	5718	11	9	1100	Redfish	2.0	0.680	0.340				NA	NA
4025	4540	5714	11	9	1330	Redfish	1.5	3.820	2.547				NA	NA
4025	4545	5716	11	9	1540	Redfish	2.0	0.680	0.340				NA	NA
4025	4541	5711	11	9	1820	Redfish	1.9	3.040	1.600				NA	NA
4025	4545	5715	11	9	2110	Redfish	3.0	2.450	0.817				NA	NA
4025	4546	5718	11	10	0045	Redfish	4.0	2.050	0.513				NA	NA
4025	4542	5724	11	10	0525	Redfish	4.0	2.300	0.575				NA	NA
4025	4536	5718	11	10	0700	Redfish	3.0	0.500	0.167				NA	NA
4025	4545	5716	11	10	1005	Redfish	2.1	0.680	0.324				NA	NA
4025	4541	5710	11	10	1250	Redfish	2.0	1.020	0.510				NA	NA
4025	4545	5718	11	10	1525	Redfish	3.1	1.860	0.600				NA	NA
4025	4537	5719	11	10	1910	Redfish	3.0	1.770	0.590				NA	NA
4025	4544	5730	11	10	2300	Redfish	3.6	1.300	0.361				NA	NA
4025	4543	5713	11	11	0315	Redfish	3.0	0.250	0.083				NA	NA
4025	4546	5716	11	11	1040	Redfish	1.6	1.860	1.163				NA	NA
4025	4543	5713	11	11	1305	Redfish	1.5	3.000	2.000				NA	NA
4025	4546	5716	11	11	1520	Redfish	1.4	1.090	0.779				NA	NA
4025	4547	5716	11	11	1720	Redfish	3.2	3.400	1.063				NA	NA
4025	4536	5536	11	12	0415	Cod	1.2	2.990	2.492	1.2	2.940	2.520	0.050	-0.029
4025	4536	5542	11	12	0555	Cod	1.6	6.540	4.088	1.6	6.425	4.058	0.115	0.030
4025	4536	5536	11	12	0755	Cod	1.3	3.100	2.385	1.4	3.049	2.152	0.051	0.232
4025	4536	5542	11	12	0940	Cod	1.3	6.600	5.077	1.3	5.445	4.083	1.155	0.993
4025	4536	5535	11	12	1125	Cod	1.6	8.300	5.188	1.6	8.167	5.158	0.133	0.029
4025	4536	5536	11	12	1420	Cod	2.6	5.500	2.115	2.6	5.445	2.108	0.055	0.008
4025	4536	5535	11	12	1725	Cod	2.3	6.000	2.609	2.3	5.445	2.334	0.555	0.275
4025	4536	5537	11	12	2015	Cod	2.0	5.500	2.750	2.0	5.445	2.722	0.055	0.028
4025	4536	5536	11	12	2240	Cod	2.3	9.500	4.130	2.3	8.167	3.500	1.333	0.630
4025	4536	5537	11	13	0130	Cod	1.5	6.650	4.433	2.5	6.534	2.613	0.116	1.820
4025	4536	5536	11	13	0525	Cod	2.6	7.500	2.885	2.6	8.276	3.204	-0.776	-0.319
4025	4536	5536	11	13	0735	Cod	2.3	8.500	3.696	2.3	10.889	4.667	-2.389	-0.971
4025	4502	5504	11	23	1225	Cod	1.8	0.887	0.493	1.8	0.871	0.498	0.016	-0.005
4025	4536	5535	11	23	1735	Cod	0.9	0.010	0.011	0.8	0.000	0.000	0.010	0.011
4025	4536	5542	11	23	1850	Cod	1.1	0.333	0.303	1.1	0.327	0.302	0.006	0.001
4025	4536	5536	11	23	2025	Cod	1.9	0.335	0.176	1.9	0.327	0.170	0.008	0.006
4025	4508	5526	11	24	0115	Cod	2.0	2.217	1.109	2.0	1.470	0.735	0.747	0.373
4025	4502	5533	11	24	0330	Cod	2.3	4.547	1.977	1.9	4.465	2.329	0.082	-0.352
4025	4502	5533	11	24	0625	Cod	2.4	1.330	0.554	2.4	1.307	0.541	0.023	0.014
4025	4505	5525	11	24	0940	Cod	1.5	5.990	3.993	1.5	5.880	3.920	0.110	0.073
4025	4504	5530	11	24	1140	Cod	1.2	13.870	11.558	2.2	13.612	6.282	0.258	5.276
4025	4506	5526	11	24	1645	Cod	1.9	11.090	5.837	1.9	10.889	5.681	0.201	0.155
4025	4503	5525	11	24	2230	Cod	1.2	11.100	9.250	1.2	10.889	9.334	0.211	-0.084
4025	4505	5526	11	25	0120	Cod	2.5	11.200	4.480	2.5	10.889	4.356	0.311	0.124
4025	4503	5525	11	25	0530	Cod	1.3	11.200	8.615	1.3	10.889	8.711	0.311	-0.096
4025	4506	5527	11	25	0810	Cod	1.1	11.200	10.182	1.1	10.889	10.052	0.311	0.130
4025	4503	5524	11	25	1030	Cod	1.0	11.300	11.300	1.0	10.889	10.889	0.411	0.411
4025	4548	5728	11	28	1410	Redfish	3.9	0.640	0.164				NA	NA
4025	4539	5717	11	28	1855	Redfish	3.2	2.410	0.753				NA	NA

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CFV	Lat	Long	Month	Day	GMT	Dir. Species	Duration	Catch (t)	CPUE	Duration	Catch (t)	CPUE	Difference	Difference
4025	4539	5710	11	28	2300	Redfish	1.8	1.180	0.656				NA	NA
4025	4540	5711	11	29	0150	Redfish	4.0	0.773	0.193				NA	NA
4025	4557	5729	11	29	0655	Redfish	4.0	0.545	0.136				NA	NA
4025	4558	5729	11	29	1200	Redfish	3.8	3.690	0.971				NA	NA
4025	4544	5706	11	29	1845	Redfish	3.3	3.870	1.173				NA	NA
4025	4524	5628	11	30	0110	Witch	2.0	0.045	0.023				NA	NA
4025	4502	5523	11	30	0200	Cod	1.0	13.864	13.864				NA	NA
4025	4514	5624	11	30	0345	Witch	2.8	0.045	0.016				NA	NA
4025	4513	5629	11	30	0745	Witch	2.8	0.070	0.025				NA	NA
4025	4458	5549	11	30	1230	Witch	2.0	0.010	0.005				NA	NA
4025	4502	5515	11	30	2145	Cod	1.1	3.882	3.529				NA	NA
4025	4505	5516	11	30	2330	Cod	2.0	2.770	1.385				NA	NA
4025	4507	5527	12	1	0425	Cod	1.3	12.200	9.385	1.3	6.534	4.900	5.666	4.484
4025	4503	5525	12	1	0615					1.0	10.889	10.889	NA	NA
4025	4506	5527	12	1	0930					1.3	12.523	10.018	NA	NA
4025	4506	5527	12	1	1300	Cod	0.5	11.090	22.180	0.5	10.889	21.779	0.201	0.401
4025	4502	5524	12	1	1520	Cod	1.2	11.100	9.250	1.2	13.612	11.667	-2.512	-2.417
4025	4503	5515	12	1	1730	Cod	1.2	2.770	2.308				NA	NA
4025	4505	5511	12	1	2015	Witch	0.9	0.010	0.011				NA	NA
4025	4509	5508	12	1	2225	Witch	1.0	0.020	0.020				NA	NA
4025	4509	5507	12	1	2355	Witch	2.3	0.040	0.017				NA	NA
4025	4514	5516	12	2	0245	Witch	2.8	0.100	0.036				NA	NA
4025	4520	5526	12	2	0640	Witch	3.2	0.120	0.038				NA	NA
4025	4513	5518	12	2	1030	Witch	2.8	0.070	0.025				NA	NA
4025	4526	5530	12	2	1430	Witch	0.8	0.100	0.125				NA	NA
4025	4530	5630	12	6	0700	Witch	3.0	0.365	0.122	3.0	0.136	0.045	0.229	0.077
4025	4539	5636	12	6	1030	Witch	3.0	0.184	0.061	3.0	0.218	0.072	-0.034	-0.011
4025	4529	5630	12	6	1410	Witch	2.5	0.190	0.076	2.5	0.054	0.021	0.136	0.055
4025	4523	5625	12	6	1720	Witch	2.5	0.140	0.056	2.5	0.054	0.022	0.086	0.034
4025	4531	5632	12	6	2030	Witch	3.0	0.100	0.033	3.0	0.027	0.009	0.073	0.024
4025	4540	5642	12	7	0005	Witch	3.0	0.030	0.010	3.0	0.000	0.000	0.030	0.010
4025	4539	5640	12	7	0430	Witch	3.0	0.136	0.045	3.0	0.027	0.009	0.109	0.036
4025	4530	5631	12	7	0810	Witch	3.0	0.360	0.120	3.0	0.000	0.000	0.360	0.120
4025	4520	5624	12	7	1145	Witch	2.8	0.270	0.096	2.8	0.027	0.010	0.243	0.087
4025	4509	5618	12	7	1530	Witch	3.0	0.060	0.020	3.0	0.033	0.011	0.027	0.009
4025	4455	5608	12	7	1920	Cod	1.3	1.360	1.046	1.3	1.334	1.067	0.026	-0.021
4025	4451	5604	12	7	2130	Cod	1.5	0.040	0.027	1.5	0.000	0.000	0.040	0.027
4025	4454	5546	12	7	2345	Cod	1.7	0.050	0.029	1.7	0.000	0.000	0.050	0.029
4025	4455	5545	12	8	0200	Cod	2.0	3.200	1.600	2.0	0.082	0.041	3.118	1.559
4025	4502	5533	12	8	0440	Cod	1.1	1.700	1.546	1.1	1.742	1.608	-0.042	-0.063
4025	4506	5527	12	8	0620	Cod	1.2	9.980	8.317	1.2	9.800	8.401	0.180	-0.084
4025	4503	5525	12	8	1015	Cod	0.8	8.200	10.250	0.8	8.167	10.889	0.033	-0.639
4025	4503	5515	12	8	1210	Cod	1.3	9.200	7.077	1.3	0.000	0.000	9.200	7.077
4025	4502	5522	12	8	1430	Cod	0.5	7.600	15.200	0.5	8.167	16.334	-0.567	-1.134
4025	4503	5525	12	8	1700	Cod	0.4	9.400	23.500	0.4	9.800	23.521	-0.400	-0.021
4025	4506	5527	12	8	1915	Cod	0.8	6.200	7.750	0.8	13.612	16.334	-7.412	-8.584
4027	4509	5431	8	25	2250	Cod	2.4	0.020	0.008	2.3	0.016	0.007	0.004	0.001
4027	4504	5440	8	26	0150					2.3	0.000	0.000	NA	NA
4027	4505	5448	8	26	0540					1.0	0.000	0.000	NA	NA
4027	4508	5449	8	26	0735	Cod	1.4	0.017	0.012	1.3	0.016	0.013	0.001	0.000
4027	4519	5513	8	26	1000	Cod	1.4	0.020	0.014	1.4	0.027	0.019	-0.007	-0.005
4027	4513	5521	8	26	1230	Cod	0.8	0.030	0.038	0.8	0.027	0.036	0.003	0.001
4027	4536	5539	8	26	1610	Cod	1.5	13.300	8.867	1.5	12.958	8.639	0.342	0.228

Table 3 - List of sets observed for two National Sea vessels in NAFO Div. 3Ps in 1997 with acomparison to vessel log records. Light shade shows observed sets where there were no log sets, dark, log but no observed sets.

						Dir.	Observer Data			NatSea Data			Catch	CPUE
CFV	Lat	Long	Month	Day	GMT	Species	Duration	Catch (t)	CPUE	Duration	Catch (t)	CPUE	Difference	Difference
4027	4536	5546	8	26	2110	Cod	0.7	4.500	6.429	0.7	4.628	6.942	-0.128	-0.513
4027	4536	5538	8	27	0020	Cod	0.9	5.300	5.889	0.9	5.336	5.821	-0.036	0.068
4027	4536	5546	8	27	0155	Cod	1.4	3.189	2.278	1.4	3.131	2.210	0.058	0.068
4027	4540	5606	8	27	0515	Cod	1.7	0.471	0.277	1.7	0.463	-0.278	0.008	-0.001
4027	4535	5552	8	27	0835	Cod	1.9	17.190	9.047	1.9	16.851	8.792	0.339	0.255
4027	4536	5537	8	27	1520	Cod	1.5	1.400	0.933	1.5	1.388	0.926	0.012	0.008
4027	4536	5545	8	27	1815	Cod	0.8	5.030	6.288	0.8	4.900	6.534	0.130	-0.246
4027	4536	5542	8	27	1920	Cod	0.7	2.670	3.814	0.7	2.641	3.961	0.029	-0.147
4027	4535	5553	8	27	2120	Cod	2.1	3.890	1.852	2.1	3.593	1.725	0.297	0.128
4027	4536	5542	8	27	2355	Cod	0.4	0.330	0.825	0.4	0.027	0.065	0.303	0.760
4027	4536	5544	8	28	0130	Cod	1.5	2.220	1.480	1.7	1.987	1.192	0.233	0.288
4027	4536	5554	8	28	0510	Cod	0.4	0.943	2.358	0.3	0.926	2.777	0.017	-0.419
4027	4535	5553	8	28	0850	Cod	1.8	3.600	2.000	1.8	3.267	1.782	0.333	0.218
4027	4535	5539	8	28	1245	Cod	0.6	2.500	4.167	0.8	2.423	2.907	0.077	1.259
4027	4536	5538	8	28	1530	Cod	1.0	2.270	2.270	1.0	2.178	2.178	0.092	0.092
4027	4536	5546	8	28	1825	Cod	1.0	0.250	0.250	2.0	0.218	0.109	0.032	0.141
4027	4540	5606	8	28	2150	Cod	1.3	0.100	0.077	1.3	0.109	0.087	-0.009	-0.010
4027	4645	5737	8	29	0840	Cod	1.7	0.002	0.001				NA	NA
4027	4644	5725	8	29	1200	Cod	2.0	0.002	0.001				NA	NA
4027	4645	5710	8	29	1510	Cod	1.1	0.004	0.004				NA	NA
4027	4536	5543	8	30	1615	Cod	1.0	3.380	3.380	1.0	3.267	3.267	0.113	0.113
4027	4536	5542	8	30	1800	Cod	0.3	0.035	0.117	0.3	0.218	0.218	-0.183	-0.101
4027	4529	5528	9	5	2030	Cod	1.4	2.220	1.586	1.4	0.163	0.115	2.057	1.470
4027	4536	5538	9	5	2310	Cod	0.8	4.990	6.238	0.8	4.628	6.170	0.362	0.067
4027	4536	5538	9	6	0050	Cod	0.8	4.550	5.688	0.8	4.628	5.554	-0.078	0.134
4027	4536	5542	9	6	0210	Cod	2.3	5.270	2.291	2.3	5.091	2.263	0.179	0.029
4027	4536	5542	9	6	0500	Cod	2.7	8.623	3.194	2.7	8.466	3.175	0.157	0.019
4027	4536	5542	9	6	0805	Cod	2.8	3.160	1.129	2.8	3.131	1.138	0.029	-0.010
4027	4536	5542	9	6	1125	Cod	2.4	3.350	1.396	2.4	3.240	1.340	0.110	0.055
4027	4536	5542	9	6	1430	Cod	2.0	1.800	0.900	2.0	1.770	0.885	0.030	0.015
4027	4537	5544	9	6	1700	Cod	0.4	9.450	23.625	0.3	9.256	27.768	0.194	-4.143
4027	4539	5545	9	6	2030	Cod	0.3	4.720	15.733	0.3	3.512	14.047	1.208	1.686
4027	4536	5544	9	6	2125	Cod	0.4	17.500	43.750	0.4	19.056	45.735	-1.556	-1.985
4027	4536	5542	9	7	0135	Cod	0.7	2.100	3.000	0.7	1.851	2.777	0.249	0.223
4027	4536	5542	9	7	0305	Cod	2.2	3.300	1.500	2.2	3.240	1.495	0.060	0.005
4027	4536	5542	9	7	0545	Cod	2.5	2.828	1.131	2.5	2.777	1.111	0.051	0.020
4027	4536	5542	9	7	0840	Cod	2.5	5.185	2.074	2.5	5.091	2.036	0.094	0.038
4027	4536	5542	9	10	2215	Cod	1.1	3.710	3.373	1.1	3.593	3.317	0.117	0.056
4027	4536	5542	9	11	0010	Cod	1.2	2.770	2.308	1.2	2.695	2.310	0.075	-0.002
4027	4536	5542	9	11	0210	Cod	1.4	2.770	1.979	1.3	2.695	2.022	0.075	-0.043
4027	4536	5542	9	11	0415	Cod	1.3	1.373	1.056	1.3	1.348	1.078	0.025	-0.022
4027	4536	5542	9	11	0615	Cod	1.3	3.700	2.846	1.3	3.593	2.875	0.107	-0.029
4027	4536	5542	9	11	0815	Cod	1.3	2.150	1.654	1.3	2.137	1.710	0.013	-0.056
4027	4536	5542	9	11	1020	Cod	1.1	2.750	2.500	1.1	2.695	2.488	0.055	0.012
4027	4536	5542	9	11	1230	Cod	1.1	2.950	2.682	1.1	2.926	2.702	0.024	-0.020
4027	4536	5542	9	11	1420	Cod	1.2	3.800	3.167	1.2	3.716	3.185	0.084	-0.018
4027	4536	5542	9	11	1620	Cod	1.2	3.200	2.667	1.2	3.144	2.695	0.056	-0.028
4027	4536	5542	9	11	1815	Cod	1.3	1.400	1.077	1.3	1.348	1.078	0.052	-0.001
4027	4536	5542	9	11	2035	Cod	2.4	2.770	1.154	2.4	2.695	1.115	0.075	0.039
4027	4536	5542	9	11	2330	Cod	2.8	4.250	1.518	2.8	4.165	1.515	0.085	0.003
4027	4536	5542	9	12	0235	Cod	2.6	4.007	1.541	2.6	3.934	1.523	0.073	0.018
4027	4536	5542	9	12	0555	Cod	2.4	4.353	1.814	2.4	4.274	1.768	0.079	0.045
4027	4536	5542	9	12	0850	Cod	2.4	6.200	2.583	2.4	6.071	2.512	0.129	0.071

Table 3 - List of sets observed for two National Sea vessels in NAFO Div. 3Ps in 1997 with acomparison to vessel log records. Light shade shows observed sets where there were no log sets, dark, log but no observed sets.

						Dir.	Observer Data			NatSea Data			Catch	CPUE
CFV	Lat	Long	Month	Day	GMT	Species	Duration	Catch (t)	CPUE	Duration	Catch (t)	CPUE	Difference	Difference
4027	4536	5542	9	12	1150	Cod	2.1	1.500	0.714	2.1	1.470	0.706	0.030	0.009
4027	4536	5542	9	12	1430	Cod	2.1	1.450	0.691	2.1	1.361	0.653	0.089	0.037
4027	4536	5544	9	12	1705	Cod	0.4	7.600	19.000	0.4	7.187	17.249	0.413	1.751
4027	4536	5542	9	12	1815	Cod	2.3	2.220	0.965	2.3	2.137	0.950	0.083	0.016
4027	4536	5544	9	12	2125	Cod	0.4	5.550	13.875	0.4	5.989	14.374	-0.439	-0.499
4027	4536	5544	9	12	2230	Cod	0.5	1.800	3.600	0.5	1.103	2.205	0.697	1.395
4027	4536	5542	9	12	2335	Cod	2.4	2.200	0.917	2.4	2.137	0.884	0.063	0.032
4027	4536	5542	9	13	0230	Cod	2.5	1.373	0.549	2.5	1.348	0.539	0.025	0.010
4027	4536	5542	9	13	0535	Cod	2.4	3.203	1.335	2.4	3.144	1.301	0.059	0.033
4027	4536	5542	9	13	0840	Cod	2.2	2.700	1.227	2.2	2.178	1.005	0.522	0.222
4027	4536	5544	9	13	1125	Cod	0.4	7.870	19.675	0.4	8.711	20.907	-0.841	-1.232
4027	4536	5544	9	13	1235	Cod	0.4	5.000	12.500	0.3	3.376	10.127	1.624	2.373
4027	4536	5544	9	13	1555	Cod	0.1	6.750	67.500	0.1	5.431	65.172	1.319	2.328
4027	4536	5544	9	13	1640	Cod	0.4	3.700	9.250	0.3	2.450	7.350	1.250	1.900
4027	4536	5544	9	13	1730	Cod	0.2	2.800	14.000	0.2	2.450	14.701	0.350	-0.701
4027	4536	5541	9	13	1805	Cod	2.3	1.550	0.674	2.3	1.348	0.599	0.202	0.075
4027	4536	5542	9	13	2145	Cod	2.5	1.550	0.620	2.5	1.348	0.539	0.202	0.081
4027	4536	5542	9	14	0055	Cod	2.4	1.550	0.646	2.3	1.348	0.578	0.202	0.068
4027	4536	5534	10	10	0705	Cod	1.1	3.596	3.269	1.6	3.593	2.269	0.003	1.000
4027	4536	5542	10	10	0835	Cod	2.8	5.000	1.786	2.3	5.009	2.226	-0.009	-0.441
4027	4536	5542	10	10	1200	Cod	2.2	9.000	4.091	2.2	10.748	4.961	-1.748	-0.870
4027	4535	5543	10	10	1440	Cod	3.0	6.000	2.000	3.7	6.534	1.782	-0.534	0.218
4027	4536	5534	10	10	1850	Cod	0.7	5.448	7.783	0.6	7.623	13.067	-2.175	-5.284
4027	4536	5544	10	10	2000	Cod	0.5	12.000	24.000	0.4	9.419	22.606	2.581	1.394
4027	4536	5542	10	10	2325	Cod	2.3	6.500	2.826	2.3	4.192	1.863	2.308	0.963
4027	4535	5542	10	11	0215	Cod	2.2	3.462	1.574	2.2	3.403	1.571	0.059	0.003
4027	4536	5544	10	11	0500	Cod	0.4	3.877	9.693	0.6	3.811	6.534	0.066	3.159
4027	4536	5542	10	11	0600	Cod	2.7	5.000	1.852	2.7	4.628	1.736	0.372	0.116
4027	4536	5542	10	11	0910	Cod	2.7	3.500	1.296	2.5	2.995	1.198	0.505	0.098
4027	4536	5546	10	11	1215	Cod	0.4	3.000	7.500	0.4	2.913	6.991	0.087	0.509
4027	4536	5544	10	11	1315	Cod	0.3	0.100	0.333	0.3	0.000	0.000	0.100	0.333
4027	4536	5542	10	11	1525	Cod	2.3	5.500	2.391	2.3	5.336	2.287	0.164	0.105
4027	4535	5541	10	11	1830	Cod	1.2	36.000	30.000	1.2	35.635	30.544	0.365	-0.544
4027	4535	5537	10	12	0200	Cod	0.3	2.000	6.667	0.4	1.851	4.443	0.149	2.224
4027	4535	5538	10	12	0245	Cod	0.7	4.237	6.053	0.7	2.777	4.165	1.460	1.888
4027	4535	5542	10	17	1810	Cod	1.1	3.000	2.727	1.0	2.777	2.777	0.223	-0.049
4027	4536	5536	10	17	1940	Cod	1.1	9.000	8.182	1.0	10.889	10.889	-1.889	-2.707
4027	4536	5542	10	17	2105	Cod	2.4	8.600	3.583	2.3	7.623	3.267	0.977	0.317
4027	4535	5541	10	18	0010	Cod	2.3	11.000	4.783	2.7	10.045	3.767	0.955	1.015
4027	4536	5542	10	18	0310	Cod	2.3	6.865	2.985	2.3	6.860	2.940	0.005	0.045
4027	4536	5542	10	18	0645	Cod	2.3	5.029	2.187	2.3	5.025	2.154	0.004	0.033
4027	4536	5542	10	18	0930	Cod	2.5	22.000	8.800	2.5	22.078	8.831	-0.078	-0.031
4027	4535	5541	10	18	1640	Cod	1.3	15.000	11.539	1.3	14.401	11.521	0.599	0.018
4027	4535	5542	10	18	2010	Cod	1.0	31.000	31.000	1.1	30.000	27.693	1.000	3.307
4027	4535	5541	10	19	0330	Cod	0.5	7.532	15.064	0.5	7.405	14.809	0.127	0.255
4027	4536	5542	10	19	0440	Cod	2.3	8.945	3.889	2.3	8.793	3.768	0.152	0.121
4027	4536	5542	10	19	0955	Cod	1.5	3.300	2.200	1.4	3.240	2.287	0.060	-0.087
4027	4535	5539	10	19	1200	Cod	0.4	2.500	6.250	0.5	2.314	4.628	0.186	1.622
4027	4535	5539	10	19	1255	Cod	0.3	6.000	20.000	0.3	5.880	23.521	0.120	-3.521
4027	4535	5533	10	25	0925	Cod	1.4	8.000	5.714	1.4	7.623	5.380	0.377	0.334
4027	4536	5542	10	25	1125	Cod	2.3	9.000	3.913	2.1	8.929	4.286	0.071	-0.373
4027	4536	5542	10	25	1405	Cod	2.6	6.500	2.500	2.7	6.534	2.450	-0.034	0.050
4027	4536	5542	10	25	1705	Cod	1.0	2.500	2.500	1.0	1.633	1.633	0.867	0.867

Table 3 - List of sets observed for two National Sea vessels in NAFO Div. 3Ps in 1997 with acomparison to vessel log records. Light shade shows observed sets where there were no log sets, dark, log but no observed sets.

						Dir.	Observer Data			NatSea Data			Catch	CPUE
CFV	Lat	Long	Month	Day	GMT	Species	Duration	Catch (t)	CPUE	Duration	Catch (t)	CPUE	Difference	Difference
4027	4536	5546	10	25	1905	Cod	1.1	5.000	4.546	0.5	5.118	10.236	-0.118	-5.690
4027	4536	5542	10	25	2045	Cod	2.4	8.500	3.542	2.3	8.779	3.763	-0.279	-0.221
4027	4536	5542	10	25	2335	Cod	2.7	5.000	1.852	2.8	4.723	1.718	0.277	0.134
4027	4536	5542	10	26	0240	Cod	2.1	3.814	1.816	2.1	3.811	1.829	0.003	-0.013
4027	4536	5544	10	26	0515	Cod	0.4	2.724	6.810	0.4	2.722	6.534	0.002	0.276
4027	4535	5546	10	26	0620	Cod	2.2	7.627	3.467	2.3	7.623	3.267	0.004	0.200
4027	4536	5542	10	26	0915	Cod	0.5	2.000	4.000	0.5	1.946	3.893	0.054	0.107
4027	4535	5541	10	26	1040	Cod	2.4	6.000	2.500	2.4	5.962	2.467	0.038	0.033
4027	4535	5541	10	26	1335	Cod	2.5	3.500	1.400	2.4	3.485	1.442	0.015	-0.042
4027	4535	5541	10	26	1625	Cod	2.3	4.500	1.957	2.3	4.356	1.936	0.144	0.020
4027	4535	5541	10	26	1905	Cod	1.3	2.000	1.539	1.3	2.055	1.644	-0.055	-0.106
4027	4548	5632	10	27	0005	Cod	1.1	0.500	0.455	1.1	0.436	0.402	0.064	0.053
4027	4535	5542	10	27	0515	Cod	2.6	7.191	2.766	2.6	7.187	2.782	0.004	-0.016
4027	4535	5542	10	27	0815	Cod	2.9	3.500	1.207	2.9	3.485	1.195	0.015	0.012
4027	4536	5542	10	27	1135	Cod	2.2	3.600	1.636	2.2	3.593	1.658	0.007	-0.022
4027	4535	5541	10	27	1410	Cod	2.2	3.800	1.727	2.2	3.811	1.759	-0.011	-0.032
4027	4536	5544	10	27	1650	Cod	0.5	1.500	3.000	0.5	1.633	3.267	-0.133	-0.267
4027	4536	5544	10	27	1750	Cod	0.4	2.500	6.250	0.4	2.641	6.338	-0.141	-0.088
4027	4535	5541	10	27	1945	Cod	2.8	3.000	1.071	2.8	2.695	0.980	0.305	0.091
4027	4535	5541	10	27	2255	Cod	2.8	9.000	3.214	2.8	8.534	3.103	0.466	0.111
Total, all sets														
Cape Fortune (4025)							**289.7**	**534.095**		**170.8**	**465.632**		**0.208**	**0.134**
Cape Chidley (4027)							**201.4**	**629.475**		**200.6**	**609.150**		**0.159**	**0.065**
Combined							**491.1**	**1163.570**		**371.4**	**1074.781**		**0.180**	**0.095**
Total, cod directed sets														
Cape Fortune (4025)							**144.1**	**480.1**		**142.0**	**465.1**		**18.9**	**12.5**
Cape Chidley (4027)							**201.4**	**629.5**		**200.6**	**609.1**		**20.3**	**8.4**
Combined							**344.3**	**1106.8**		**342.6**	**1074.2**		**39.2**	**20.9**
Average, all sets														
Cape Fortune (4025)							**1.957**	**3.609**	**2.696**	**1.691**	**4.610**	**3.640**		
Cape Chidley (4027)							**1.537**	**4.805**	**5.216**	**1.543**	**4.686**	**5.191**		
Combined							**1.760**	**4.171**	**3.879**	**1.608**	**4.653**	**4.513**		
Average, cod directed sets														
Cape Fortune (4025)							**1.537**	**5.132**	**4.031**	**1.582**	**5.022**	**3.934**		
Cape Chidley (4027)							**1.537**	**4.805**	**5.216**	**1.543**	**4.686**	**5.191**		
Combined							**1.507**	**93.460**	**16.385**	**1.322**	**3.542**	**4.705**		

Cape Fortune # sets observed = 152
Cape Chidley # sets observed = 133

Cape Fortune # sets from log data = 102
Cape Chidley # sets from log data = 129

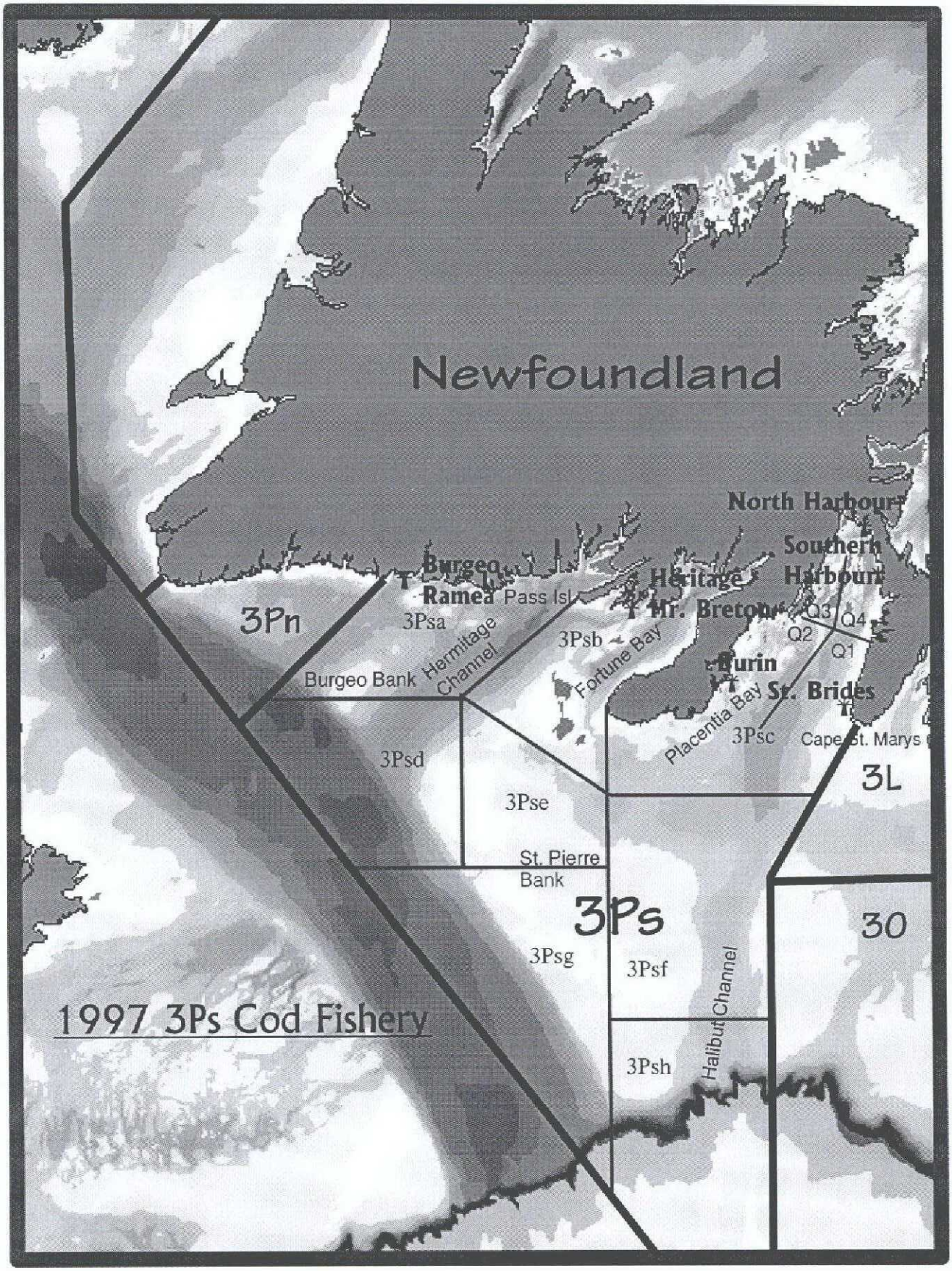


Figure 1 - NAFO Subdivision 3ps showing the unit area location, banks and channels

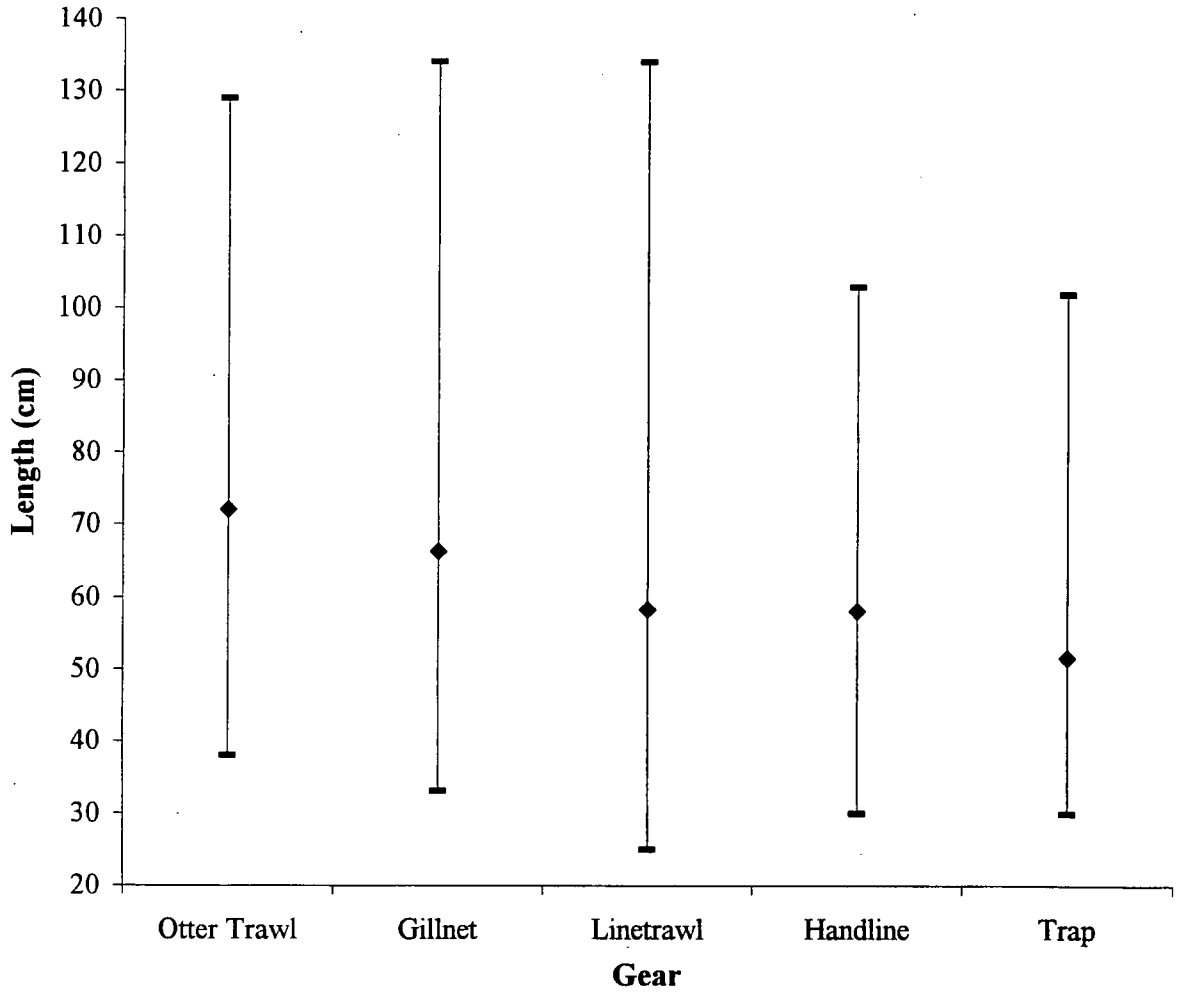


Figure 2 - Overall mean length by gear type during the 1997 3Ps cod fishery. Bars indicate observed minimum and maximum lengths. All areas and periods are combined.

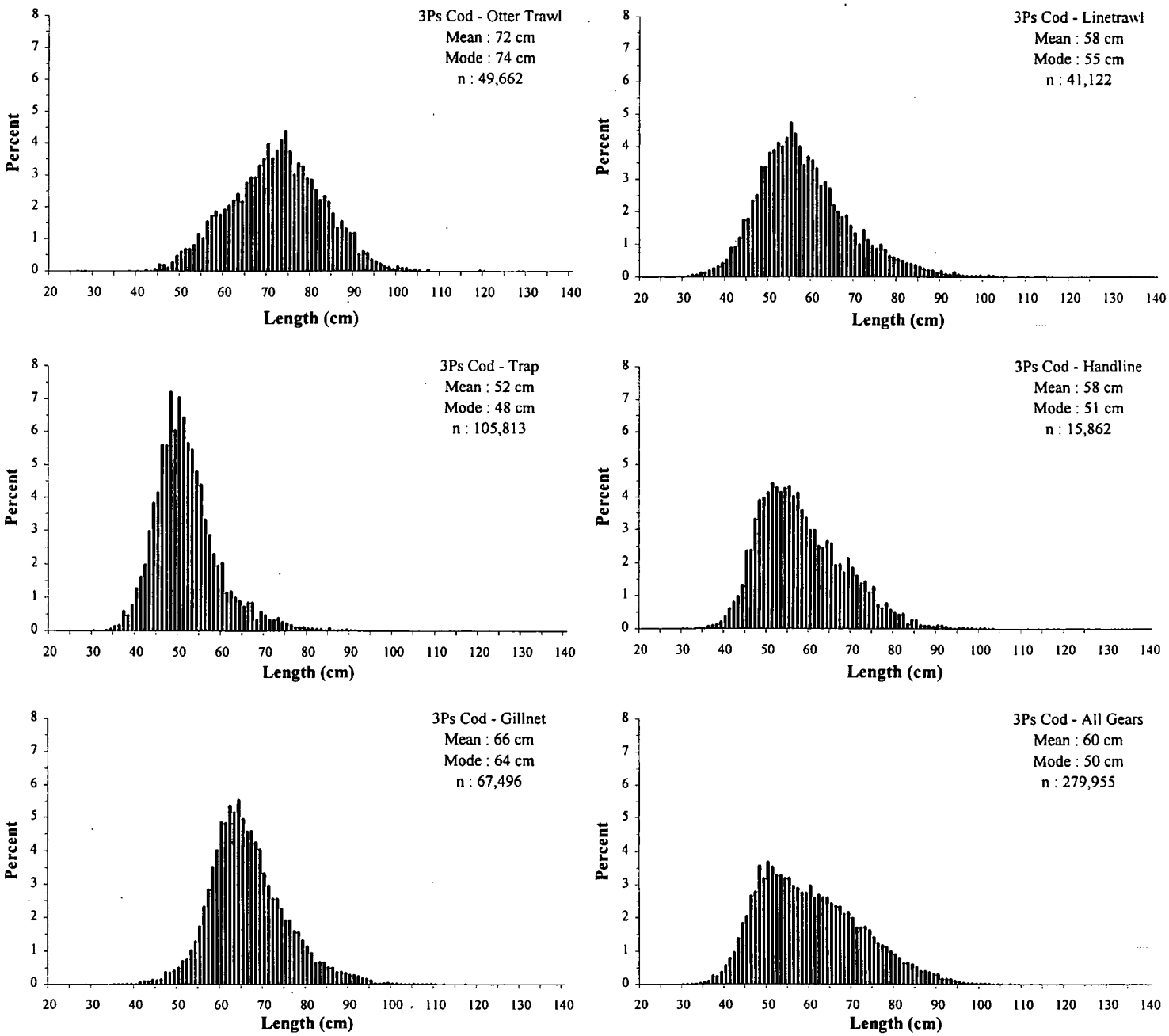


Figure 3 - Length frequency distributions by gear type for the 1997 3Ps commercial cod fishery. All areas and periods are combined for each gear. Individual frequencies have been weighted to the vessel turnout weight.

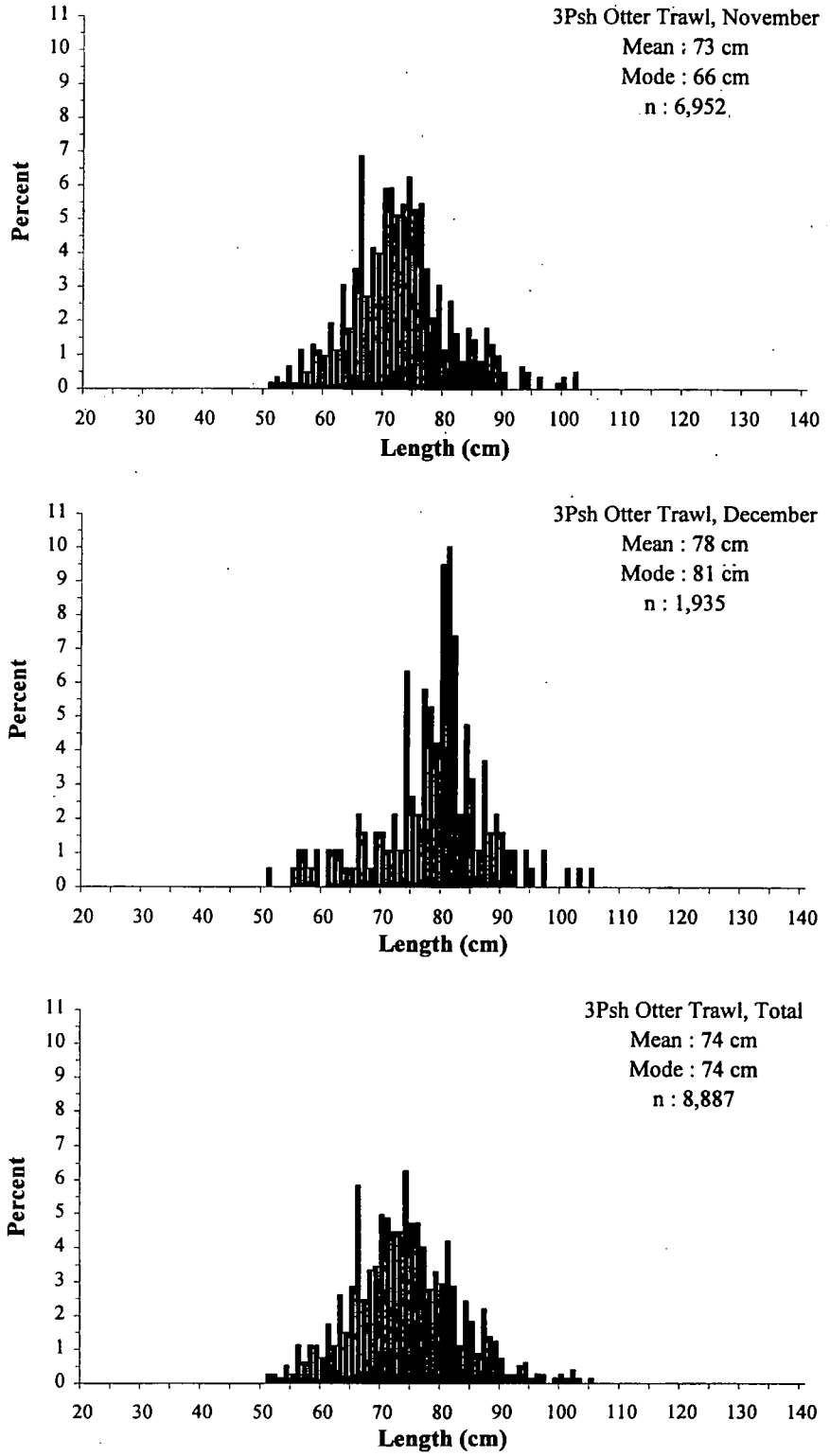


Figure 4 - Summary monthly and total length frequency distributions for otter trawl samples from NAFO unit area 3Psh. Individual frequencies have been weighted to the vessel turnout weight.

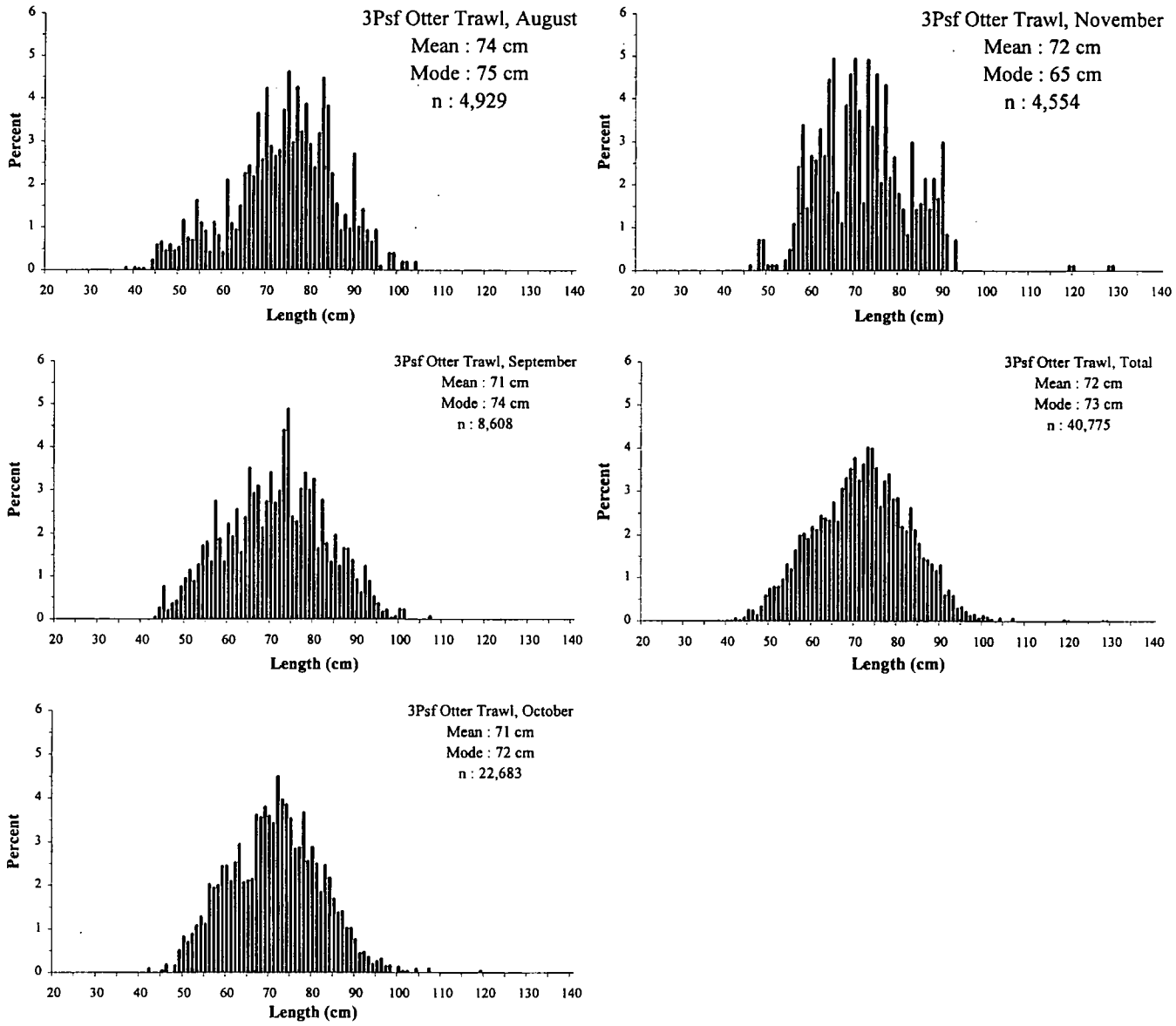


Figure 5 - Summary monthly and total length frequency distributions for otter trawl samples from NAFO unit area 3Psf. Individual frequencies have been weighted to the vessel turnout weight.

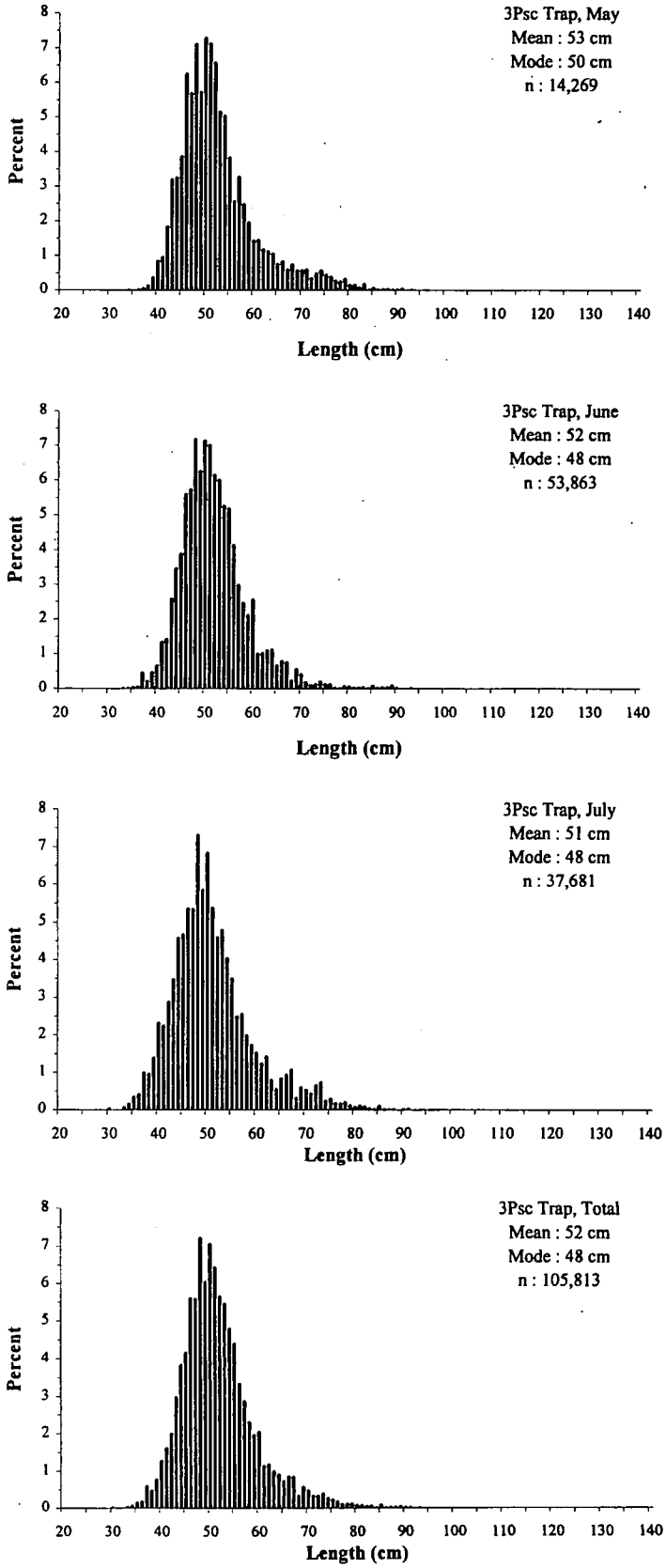


Figure 6 - Summary monthly and total length frequency distributions for trap samples from NAFO unit area 3Psc (Placentia Bay). Individual frequencies have been weighted to the vessel turnout weight.

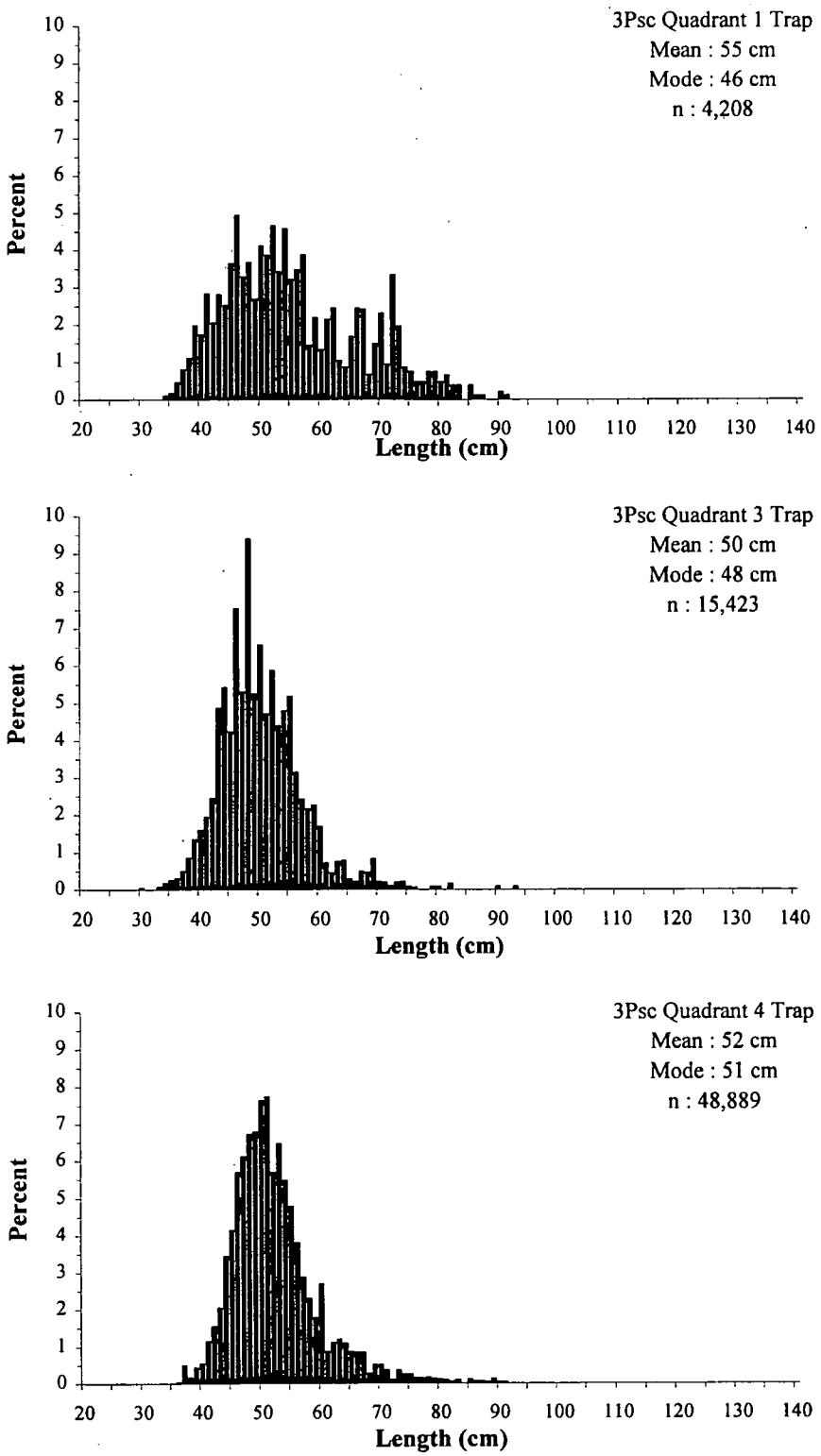


Figure 7 - Summary length frequency distributions by quadrant for 3Psc (Placentia Bay) trap samples. Individual frequencies have been weighted to the vessel turnout weight. Refer to Figure 1 for location of the 4 quadrants.

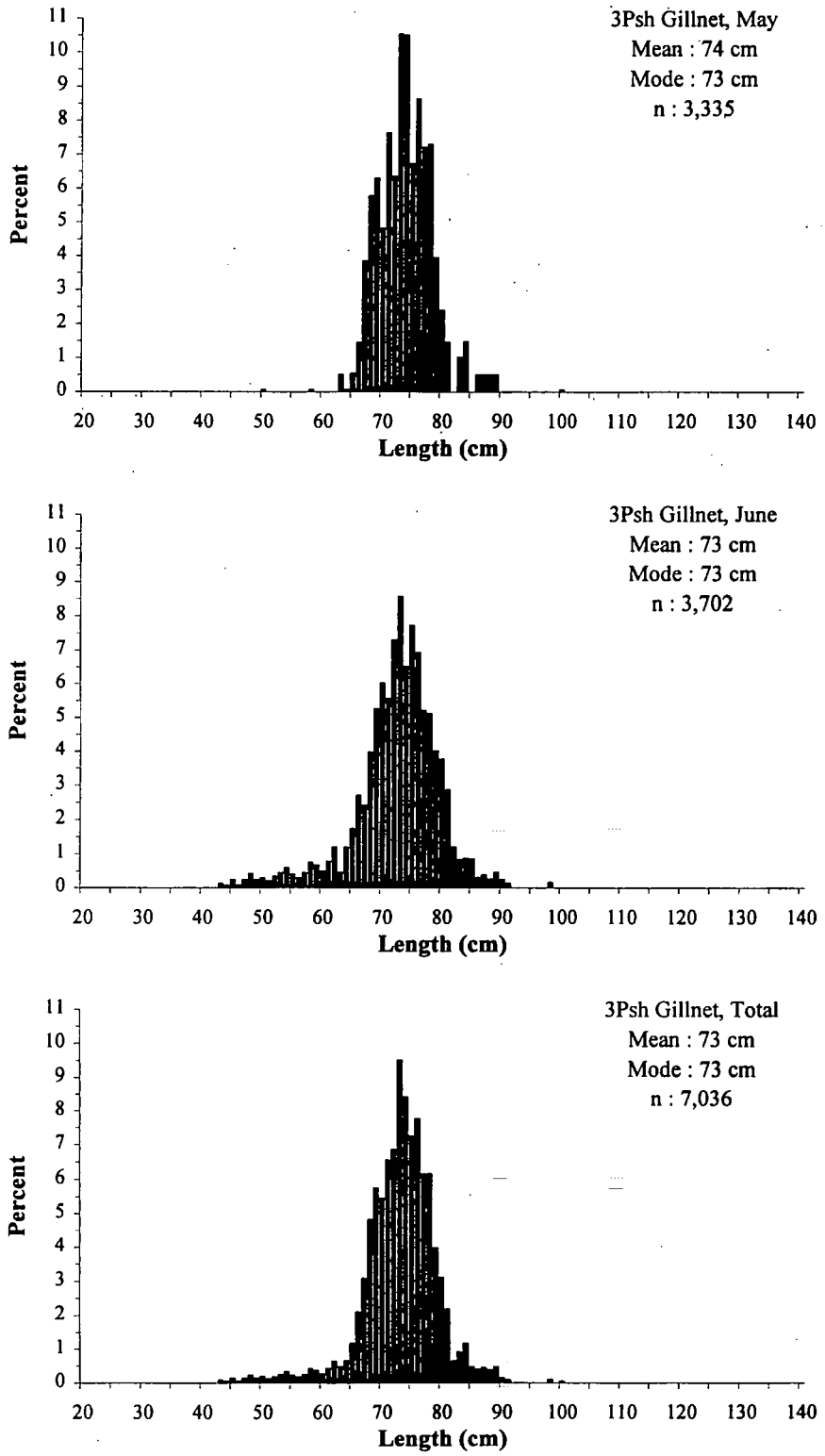


Figure 8 - Monthly and total length frequency distributions for gillnet samples from NAFO unit area 3Psh. Individual frequencies have been weighted to the vessel turnout weight.

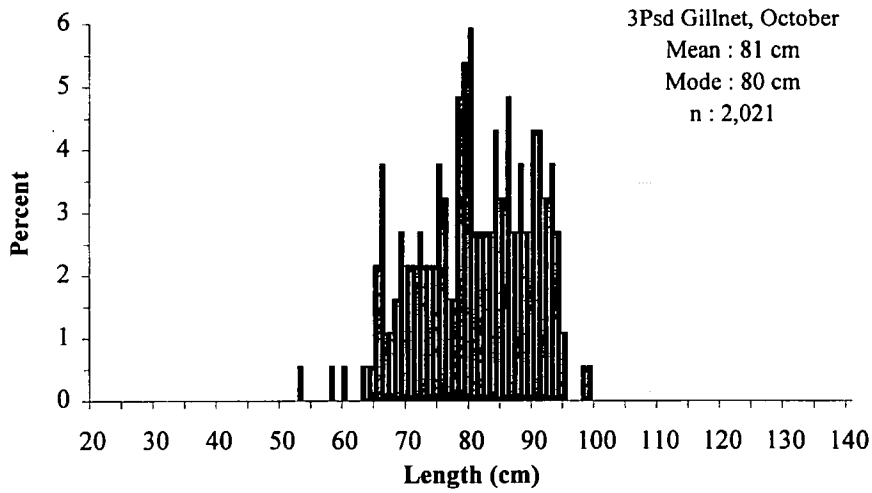


Figure 9 - Summary length frequency distribution for gillnet samples from NAFO unit area 3Psd. Individual frequencies have been weighted to the vessel turnout weight. No data available for other months.

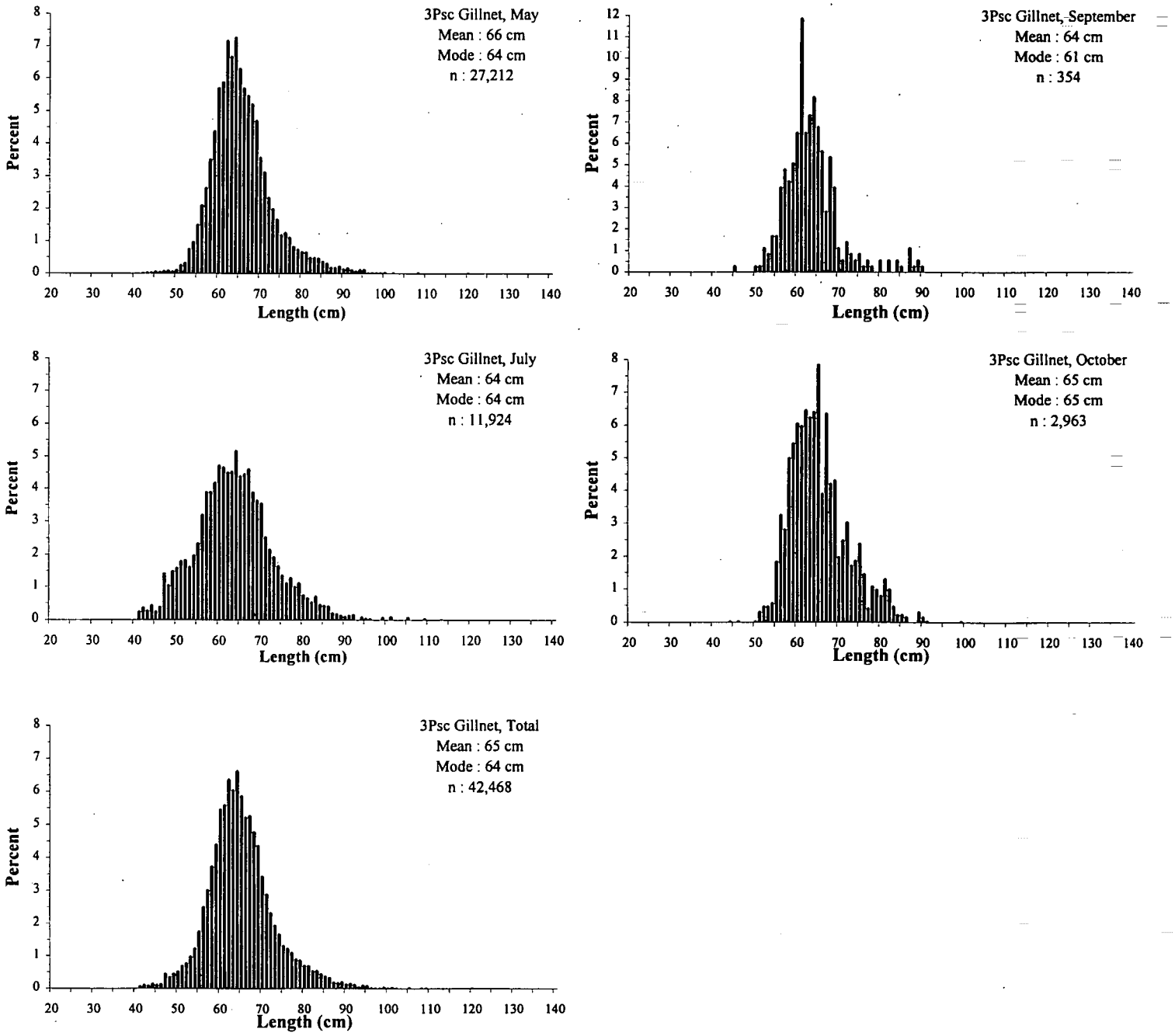


Figure 10 - Summary monthly and total length frequency distributions for gillnet samples from NAFO unit area 3Psc (Placentia Bay). Individual frequencies have been weighted to the vessel turnout weight.

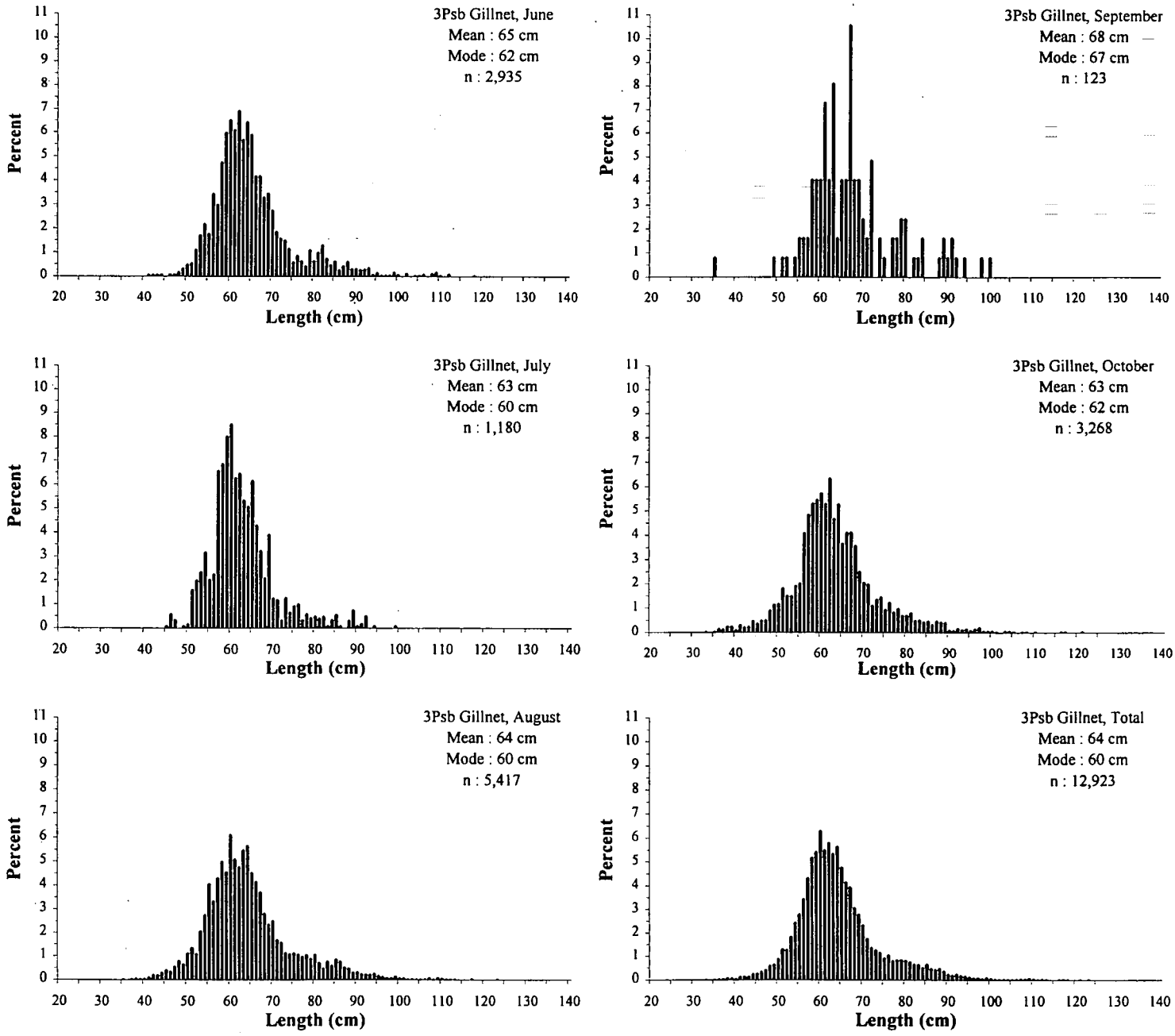


Figure 11 - Summary monthly and total length frequency distributions for gillnet samples from NAFO unit area 3Psb (Fortune Bay). Individual frequencies have been weighted to the vessel turnout weight.

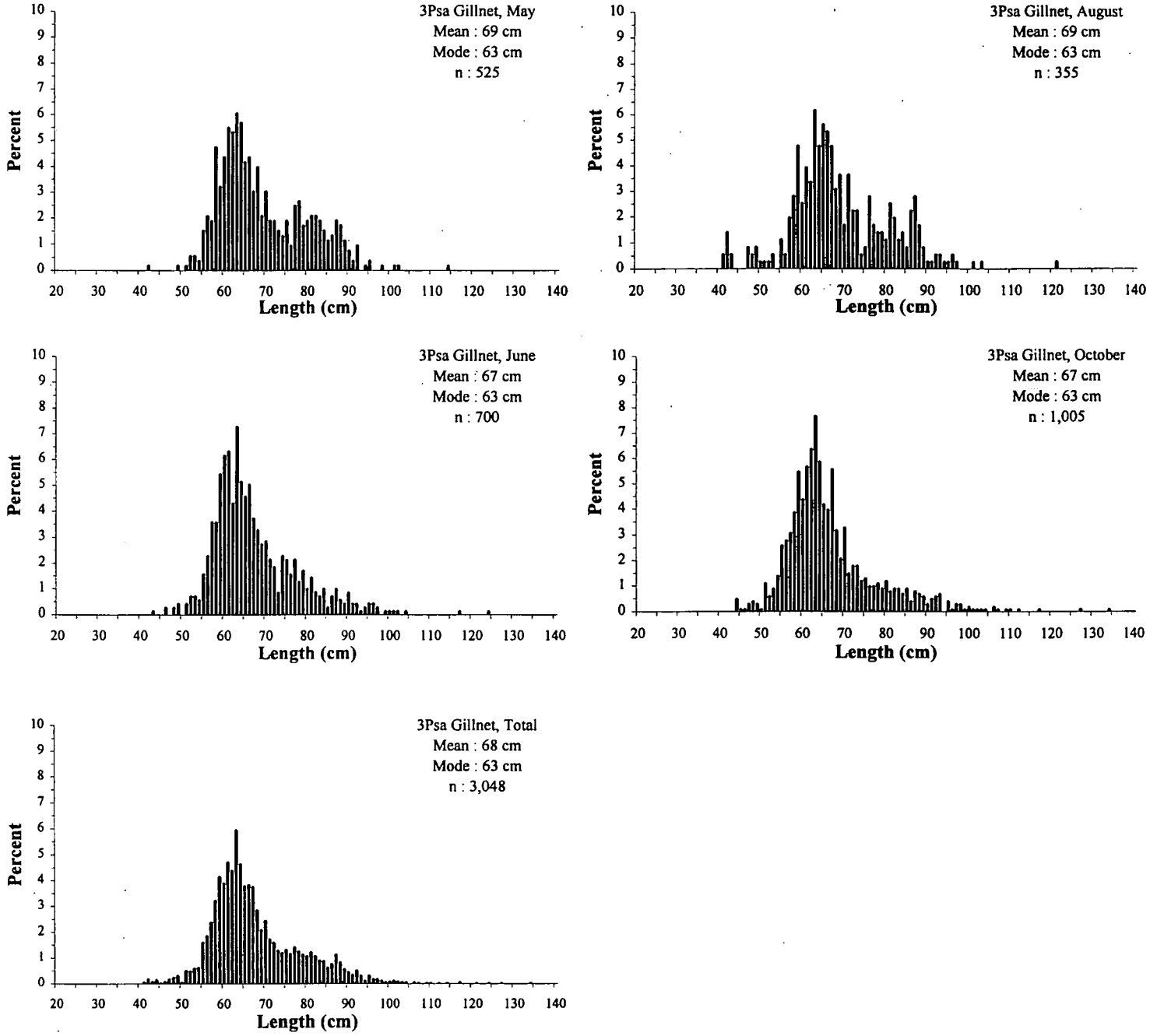


Figure 12 - Summary monthly and total length frequency distributions for gillnet samples from NAFO division 3Psa (south coast). Individual frequencies have been weighted to the vessel turnout weight.

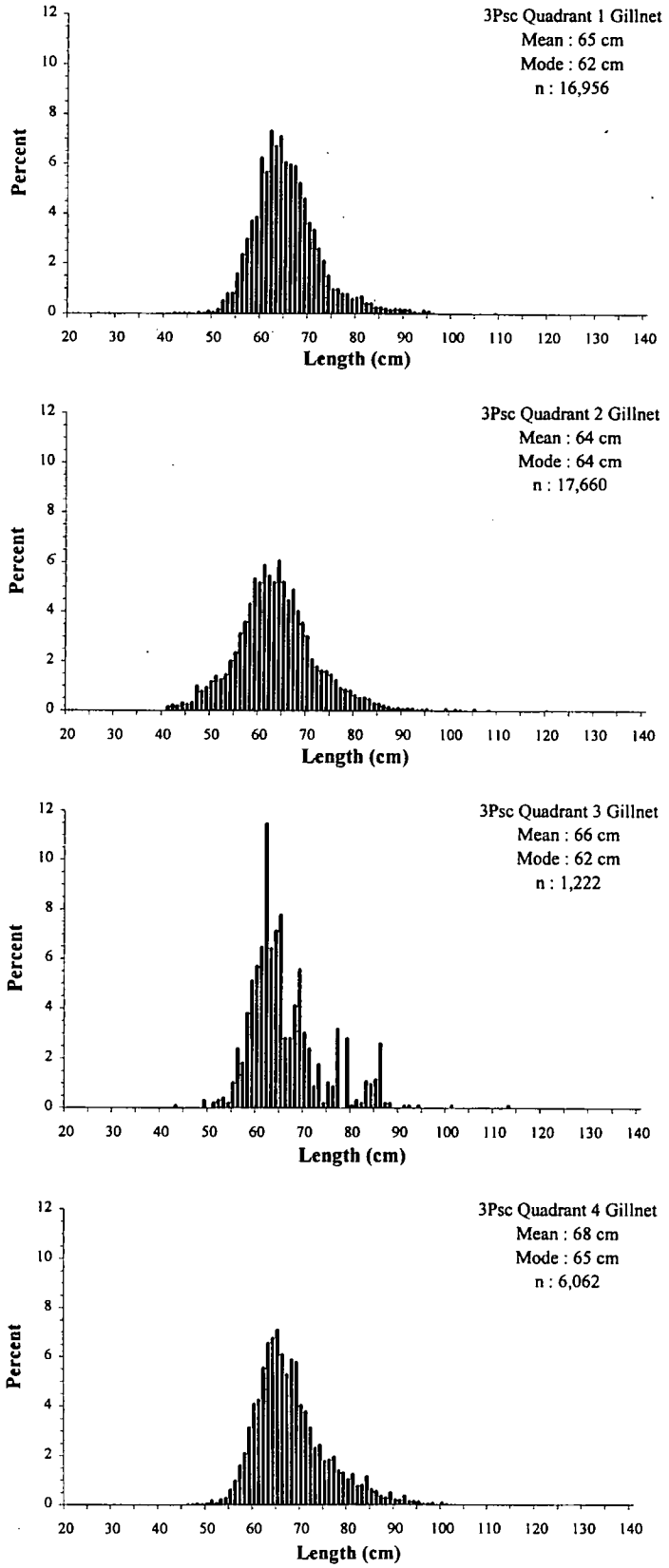


Figure 13 - Summary length frequency distributions by quadrant for 3Psc (Placentia Bay) gillnet samples. Individual frequencies have been weighted to the vessel turnout weight. Refer to Figure 1 for location of the 4 quadrants.

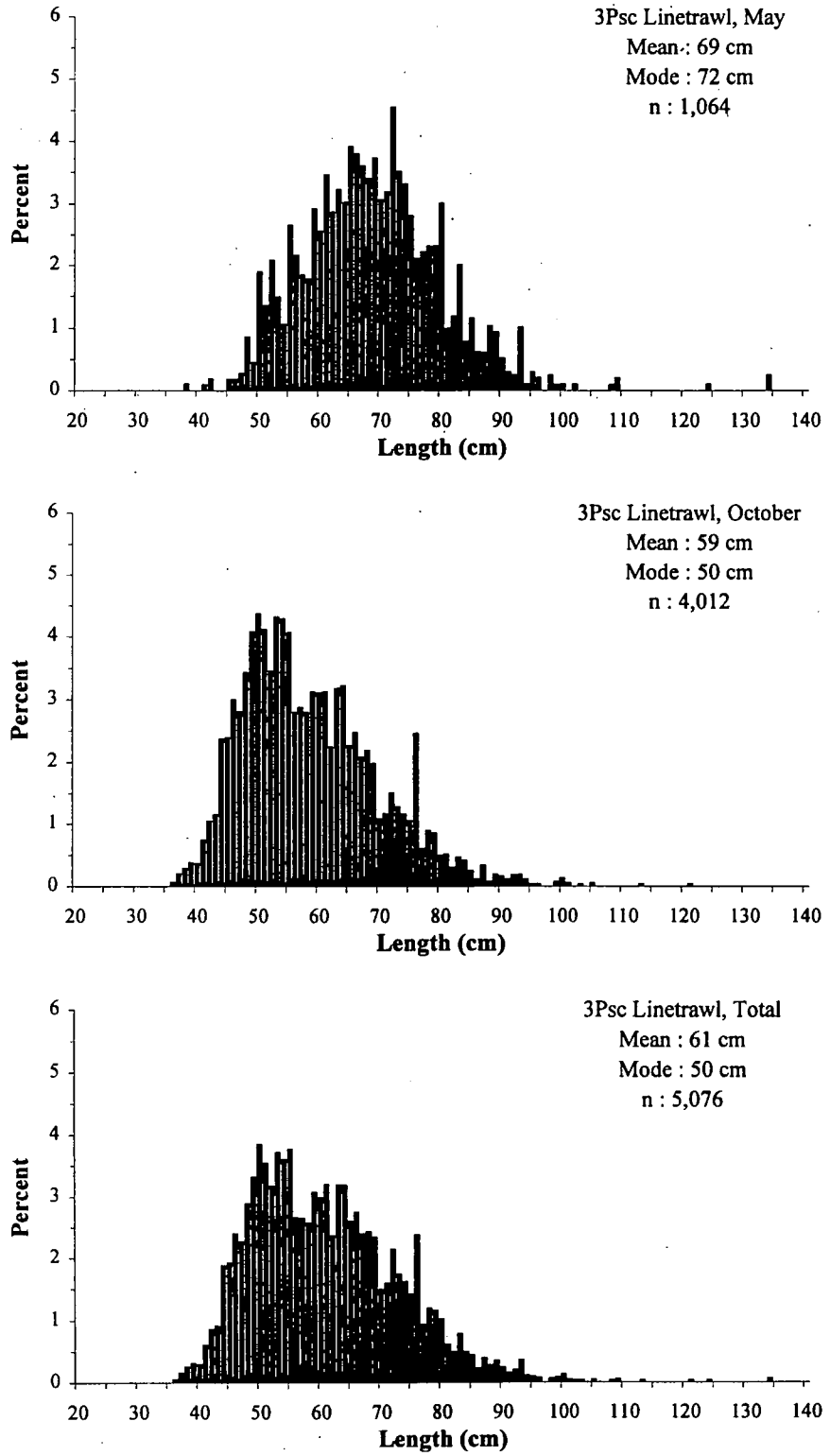


Figure 14 - Summary monthly and total length frequency distributions for linetrawl samples from NAFO unit area 3Psc (Placentia Bay). Individual frequencies have been weighted to the vessel turnout weight.

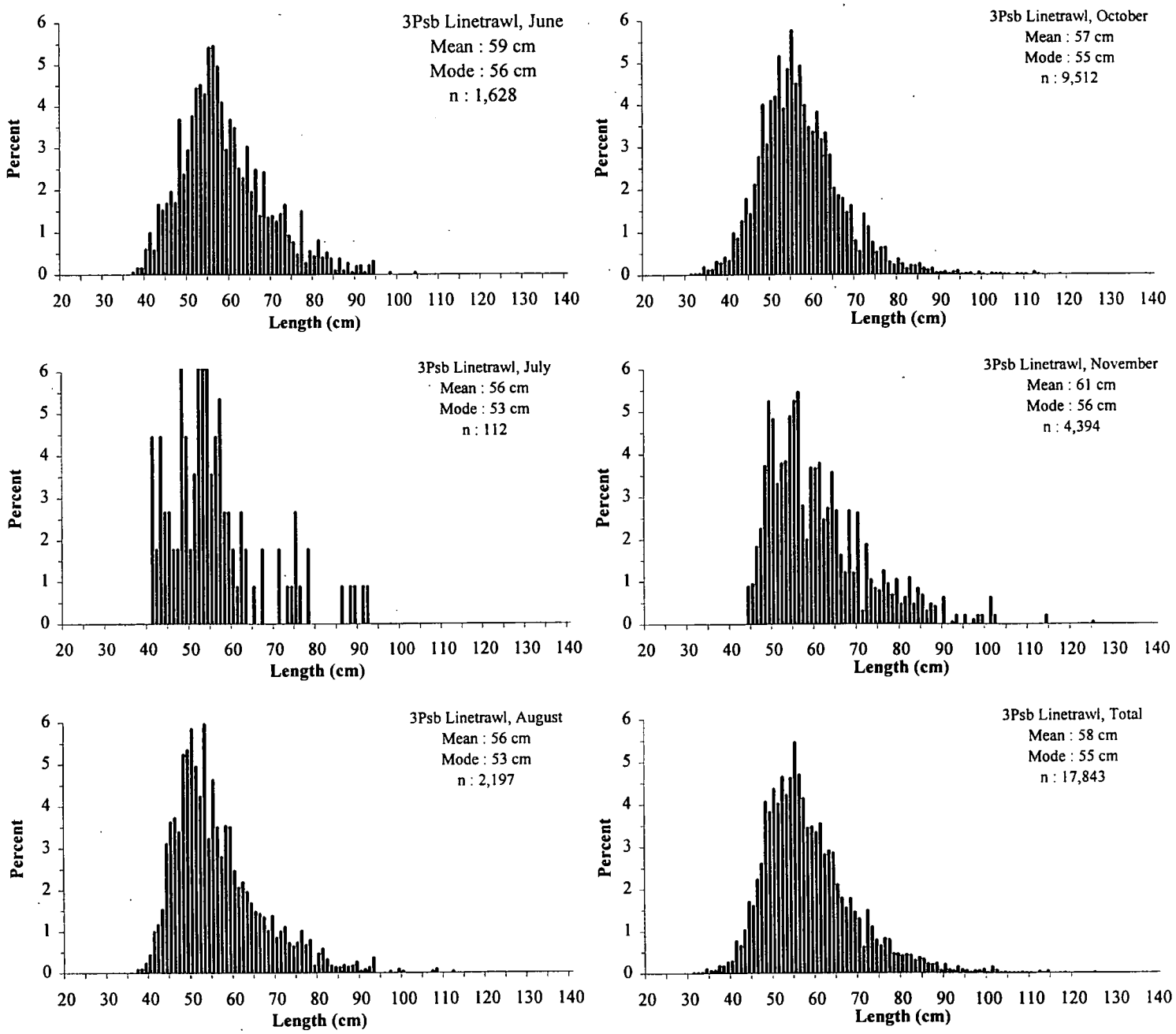


Figure 15 - Summary monthly and total length frequency distributions for linetrawl samples from NAFO unit area 3Psb (Fortune Bay). Individual frequencies have been weighted to the vessel turnout weight.

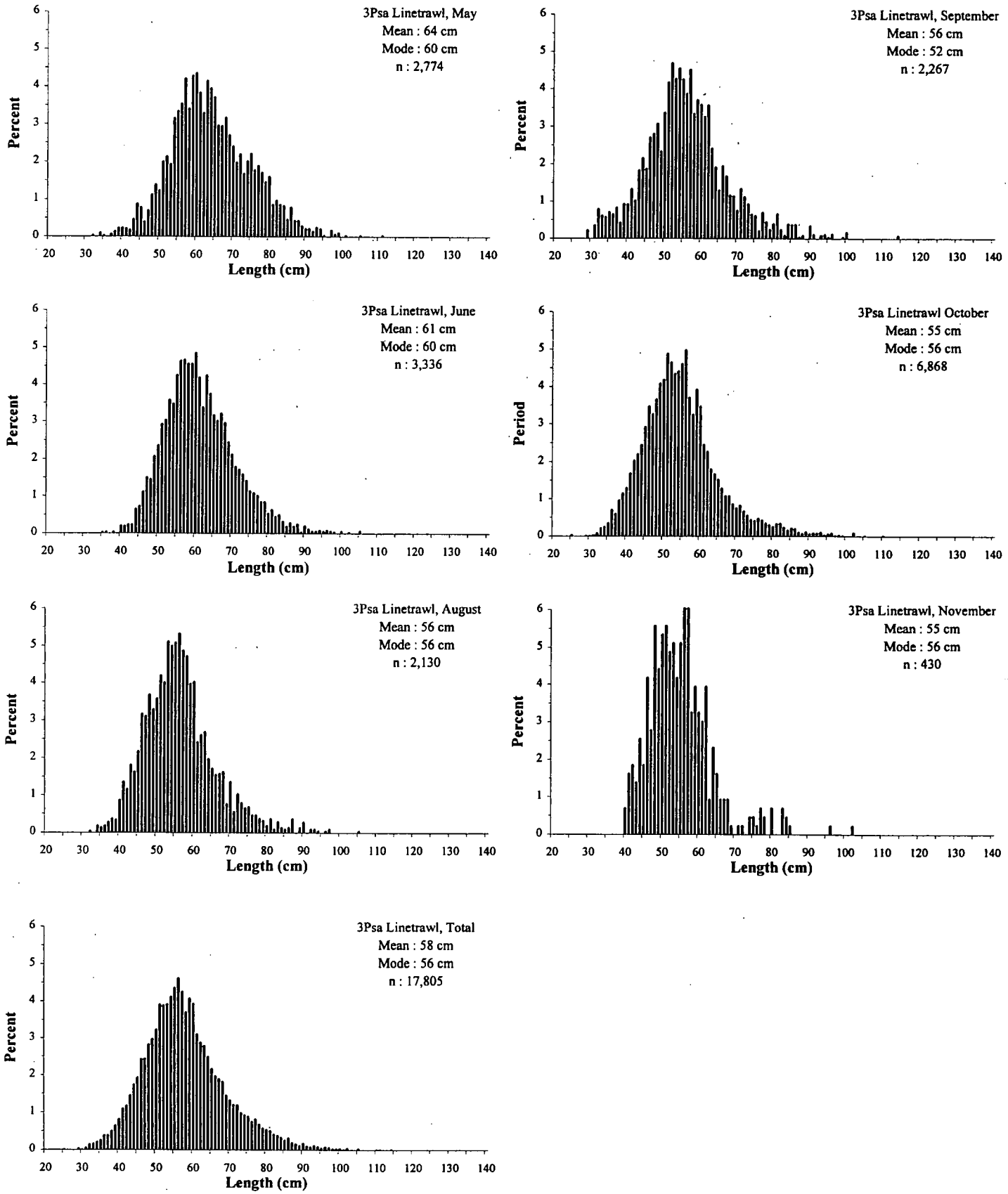


Figure 16 - Summary monthly and total length frequency distributions for linetrawl samples from NAFO unit area 3Psa (south coast). Individual frequencies have been weighted to the vessel turnout weight.

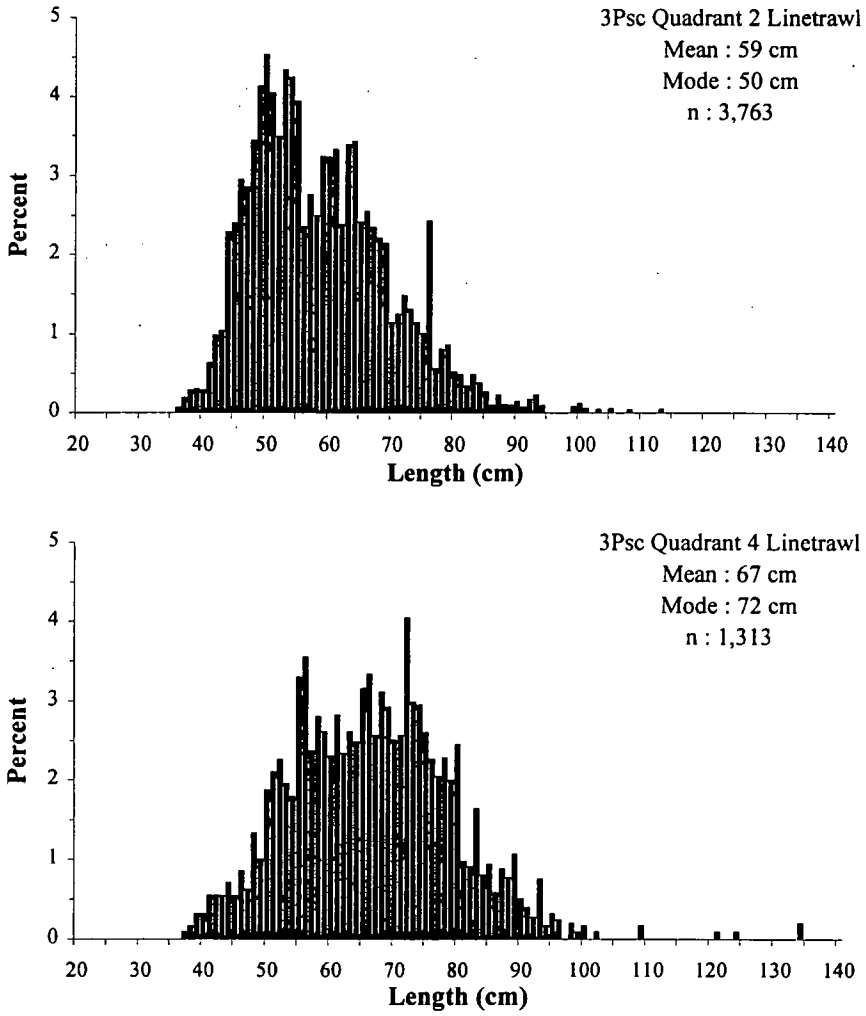


Figure 17 - Summary length frequency distributions by quadrant for 3Psc (Placentia Bay) linetrawl samples. Individual frequencies have been weighted to the vessel turnout weight. Refer to Figure 1 for location of the 4 quadrants.

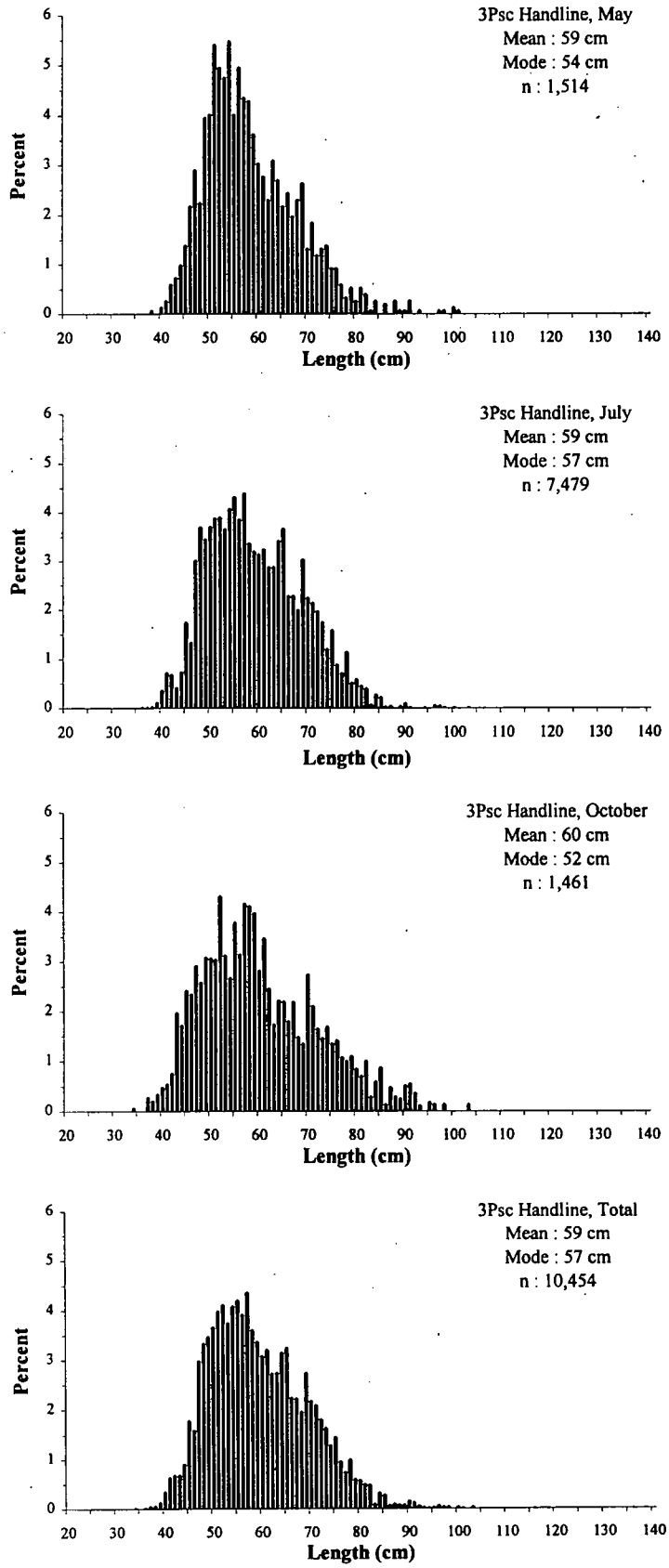


Figure 18 - Summary length frequency distributions for handline samples from NAFO unit area 3Psc (Placentia Bay). Individual frequencies have been weighted to the vessel turnout weight.

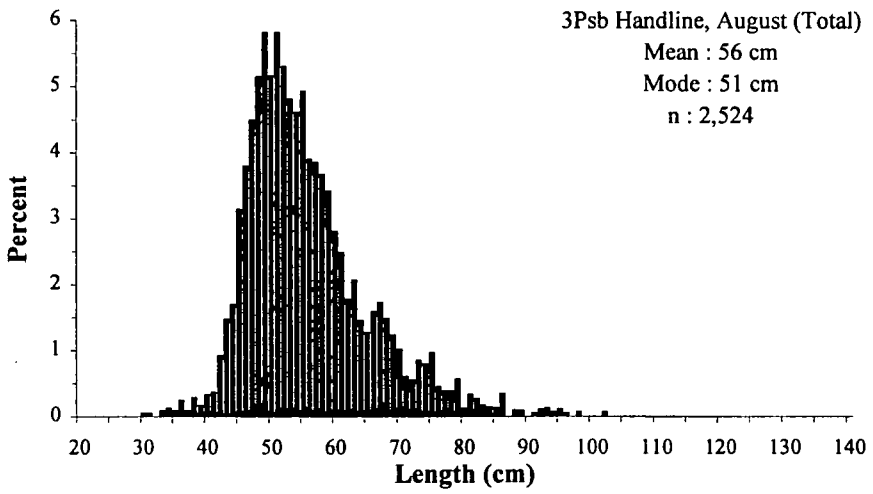


Figure 19 - Summary length frequency distribution for handline samples from NAFO unit area 3Psb (Fortune Bay). Individual frequencies have been weighted to the vessel turnout weight.

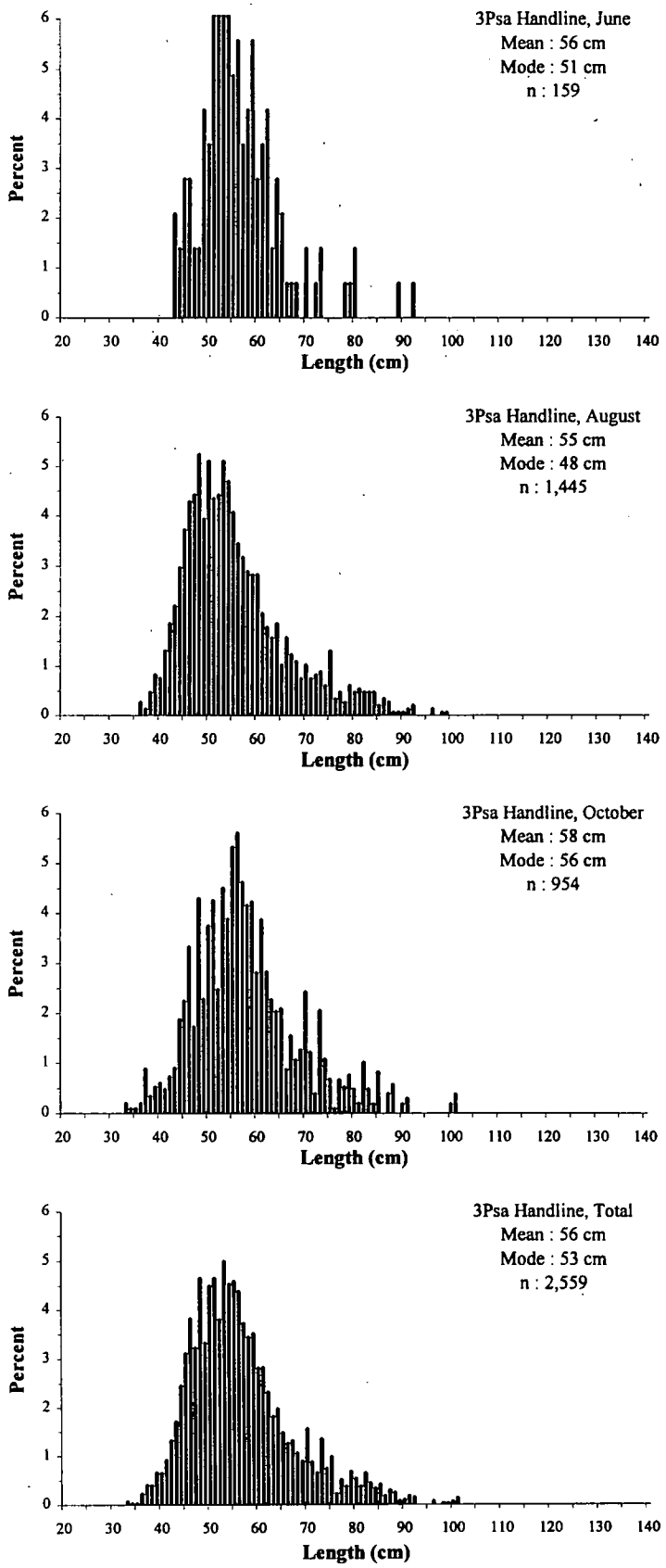


Figure 20 - Summary length frequency distributions for handline samples from NAFO unit area 3Psa (south coast). Individual frequencies have been weighted to the vessel turnout weight.

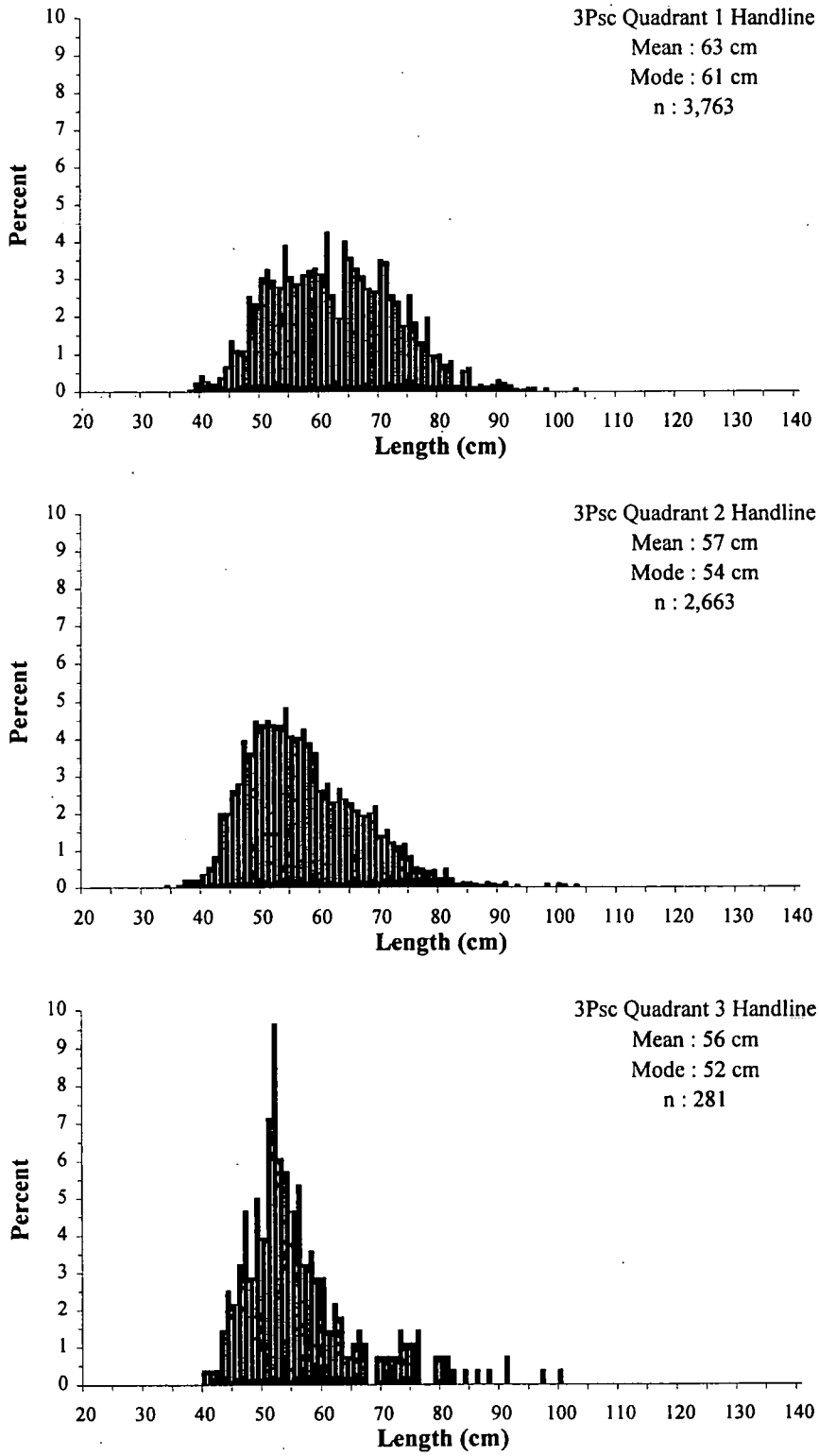
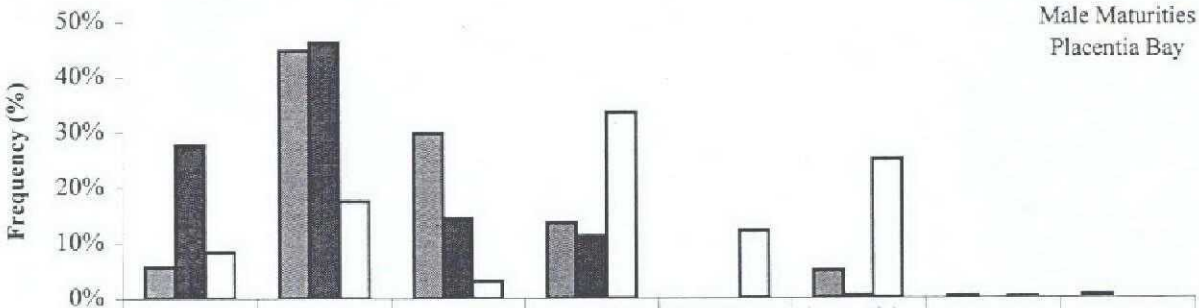
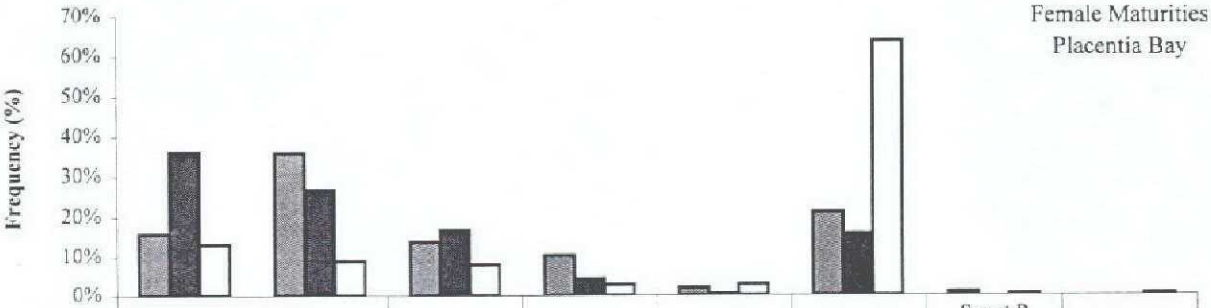


Figure 21 - Summary length frequency distributions by quadrant for 3Psc (Placentia Bay) handline samples. Individual frequencies have been weighted to the vessel turnout weight. Refer to Figure 1 for location of the 4 quadrants.

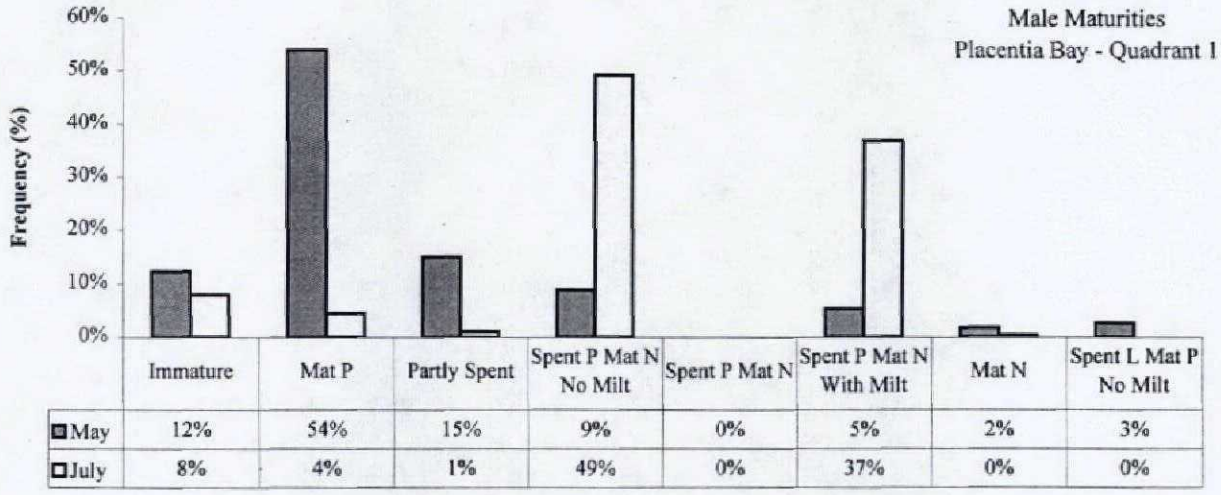


	Immature	Mat P	Partly Spent	Spent P Mat N No Milt	Spent P Mat N	Spent P Mat N With Milt	Mat N	Spent L Mat P
May	5.8%	44.7%	29.9%	13.7%	0.0%	5.0%	0.4%	0.6%
June	27.7%	46.1%	14.5%	11.2%	0.0%	0.5%	0.0%	0.0%
July	8.4%	17.6%	3.0%	33.5%	12.2%	25.1%	0.2%	0.0%

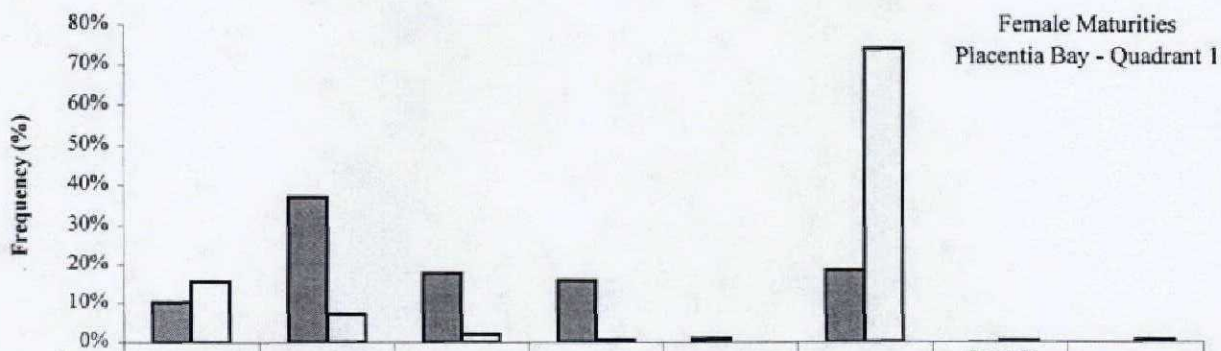


	Immature	Mat AP	Mat BP	Mat CP	Partly Spent	Spent P	Spent P Mat AN	Mat AN
May	15.9%	35.8%	13.8%	10.4%	2.0%	21.2%	0.8%	0.0%
June	36.1%	26.8%	16.8%	4.2%	0.3%	15.8%	0.0%	0.0%
July	13.2%	8.9%	8.0%	2.8%	2.8%	63.7%	0.2%	0.4%

Figure 22 : Cod maturities by month for Placentia Bay during the 1997 3Ps commercial fishery. Samples from all ports have been combined for each month. Based on sample sizes of 539, 401 and 427 (males) and 491, 310 and 463 (females) for May, June, and July respectively.

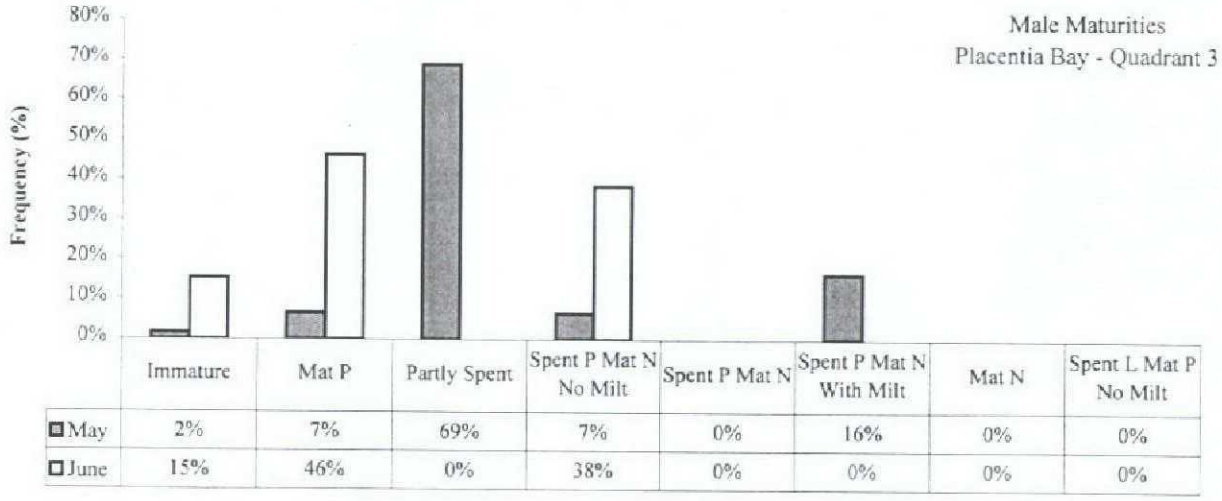


	Immature	Mat P	Partly Spent	Spent P Mat N No Milt	Spent P Mat N	Spent P Mat N With Milt	Mat N	Spent L Mat P No Milt
May	12%	54%	15%	9%	0%	5%	2%	3%
July	8%	4%	1%	49%	0%	37%	0%	0%

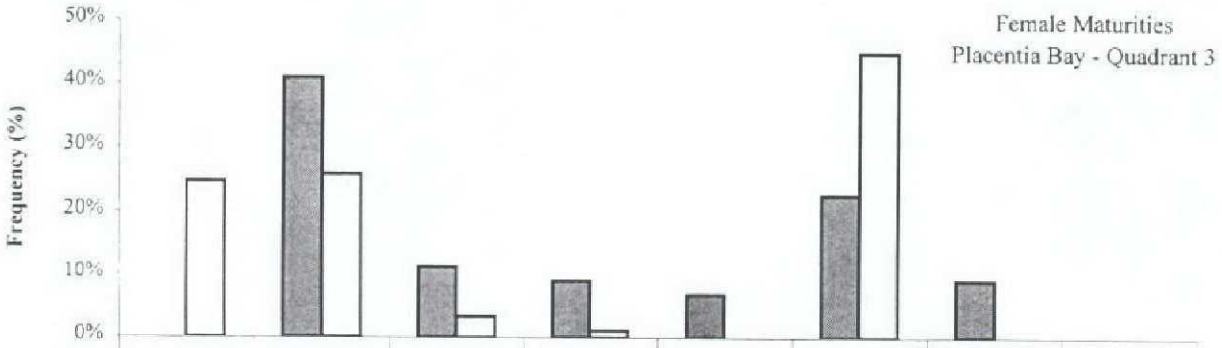


	Immature	Mat AP	Mat BP	Mat CP	Partly Spent	Spent P	Spent P Mat AN	Mat AN
May	10%	37%	18%	16%	1%	19%	0%	0%
July	15%	7%	2%	1%	0%	74%	0%	1%

Figure 23 : Cod maturities by month for Quadrant 1 in Placentia Bay during the 1997 3Ps commercial fishery. Based on sample sizes of 113, 290 (males) and 108, 349 (females) for May and July, respectively.

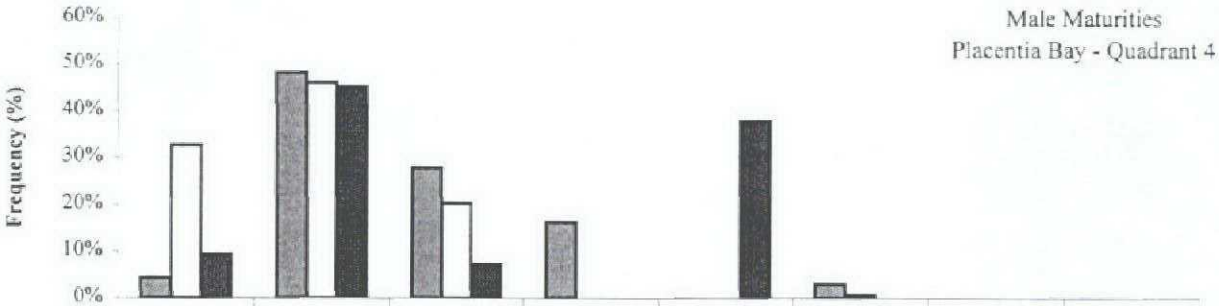


	Immature	Mat P	Partly Spent	Spent P Mat N No Milt	Spent P Mat N	Spent P Mat N With Milt	Mat N	Spent L Mat P No Milt
May	2%	7%	69%	7%	0%	16%	0%	0%
June	15%	46%	0%	38%	0%	0%	0%	0%

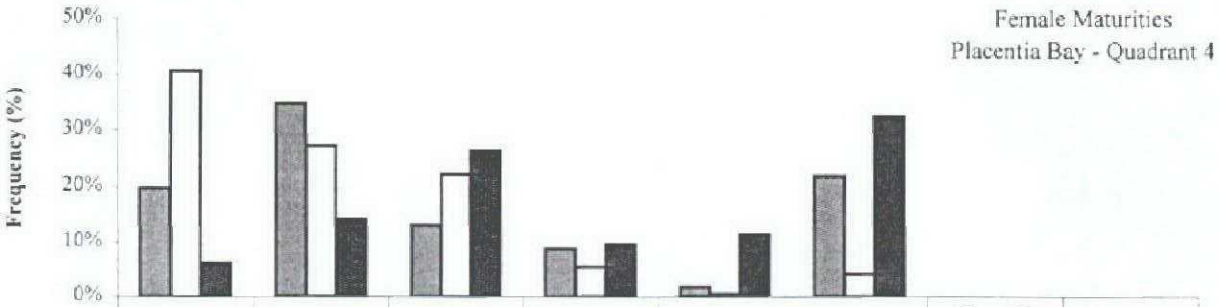


	Immature	Mat AP	Mat BP	Mat CP	Partly Spent	Spent P	Spent P Mat AN	Mat AN
May	0%	41%	11%	9%	7%	23%	9%	0%
June	25%	26%	3%	1%	0%	45%	0%	0%

Figure 24 : Cod maturities by month for Quadrant 3 in Placentia Bay during the 1997 3Ps commercial fishery. Based on sample sizes of 61, 117 (males) and 44, 89 (females) for May and June, respectively.



	Immature	Mat P	Partly Spent	Spent P Mat N No Milt	Spent P Mat N	Spent P Mat N With Milt	Mat N	Spent L Mat P No Milt
May	4%	48%	28%	16%	0%	3%	0%	0%
June	33%	46%	20%	0%	0%	1%	0%	0%
July	9%	45%	7%	0%	38%	0%	0%	0%



	Immature	Mat AP	Mat BP	Mat CP	Partly Spent	Spent P	Spent P Mat AN	Mat AN
May	20%	35%	13%	9%	2%	22%	0%	0%
June	41%	27%	22%	5%	0%	4%	0%	0%
July	6%	14%	26%	10%	11%	32%	0%	0%

Figure 25 : Cod maturities by month for Quadrant 4 in Placentia Bay during the 1997 3Ps commercial fishery. Based on sample sizes of 365, 284, 137 (males) and 339, 221, 114 (females) for May and June, respectively.

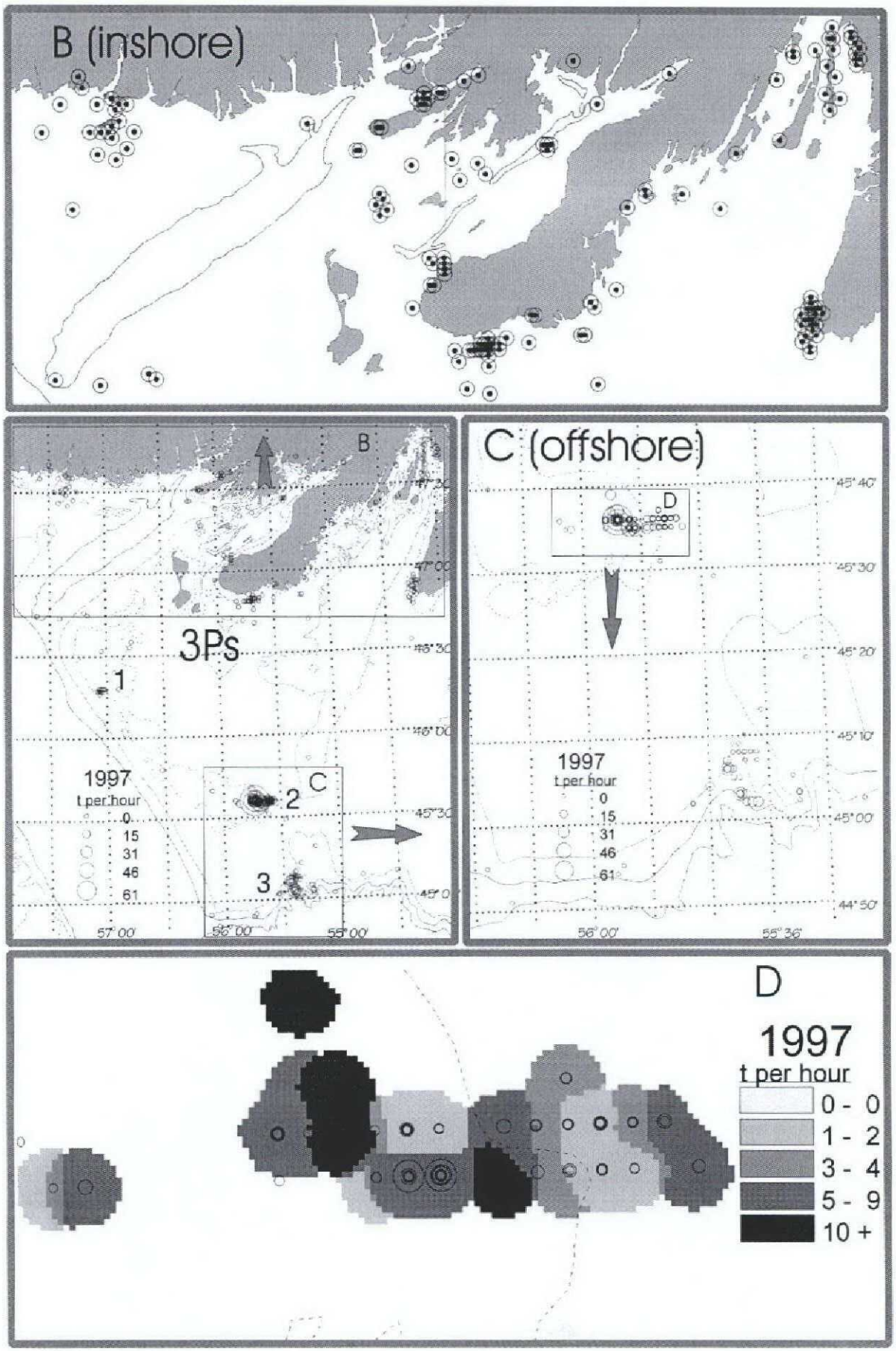


Figure 26 - Plot of the observed inshore and offshore fishing grounds in 1997. Panel A illustrates the entire area of NAFO SubDiv. 3ps and delineates the inshore (B) and offshore (C) blowups. Panel B zooms in on the observed inshore effort locations. Panel C zoomes in on three offshore fishing locations. Panel D shows the southeast St. Pierre Bank ground where catch rates were highest.

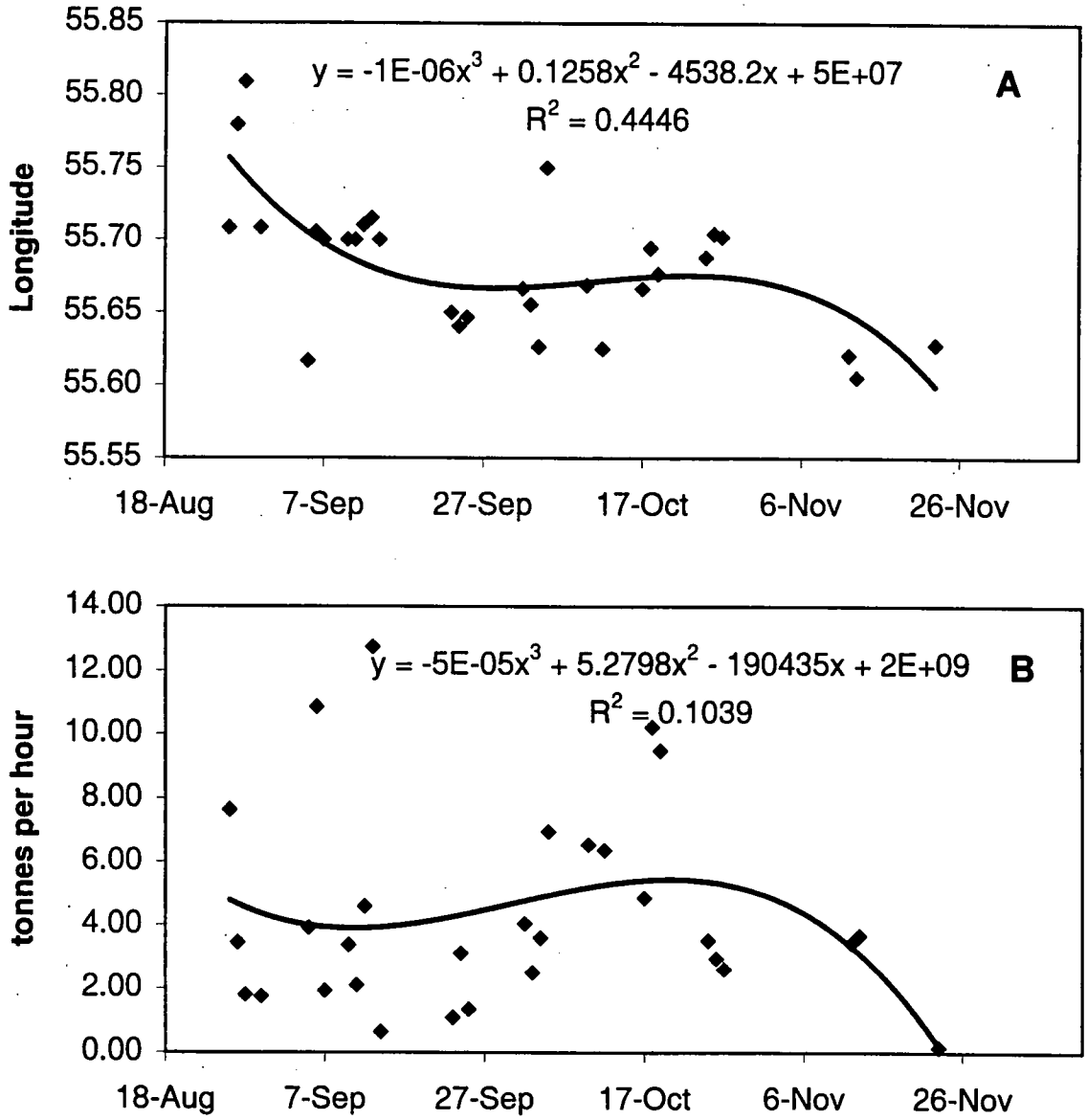


Figure 27 - Daily plot from Aug. 28 to Nov. 23 of A. fishing position (longitude) and B. catch rate (t per hour) for the offshore fishing ground shown on Fig. 26d.