Fisheries and Oceans Canada | Pêches et Océans Canada

Canadian Stock Assessment Secretariat
Research Document 98/59

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Secrétariat canadien pour l'évaluation des stocks
Document de recherche 98/59

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Summary of the Food Fishery for Cod in NAFO Division 3Ps in 1997 with comparison to 1994 and 1996.

by

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ISSN 1480-4883
Ottawa, 1998
Canada

Abstract

The food fishery (previously referred to as recreational handlining) was restricted to NAFO Divs. 3Ps and 4R (the south and west coasts of Newfoundland) in 1997 whereas it was previously open in NAFO Divs. 2J, 3K, 3L, 3P and 4R along the coast of Newfoundland and Labrador in 1993, 1994 and 1996. The 1997 fishery was opened for two consecutive three-day weekends, Sept. 12-14 and Sept. 19-21, compared to two weekends in September in 1996, five weekends in August-September in 1994 and an unrestricted fishery in 1993. No fishery was permitted in 1995. This paper summarises the 1997 fishery in NAFO Div. 3Ps in terms of catch, catch rates and fish size and compares the results to earlier years. Landings estimated for NAFO Div. 3Ps from observations by fishery officers indicate a catch in the range 292t for 1997, more than twice the 1996 food fishery catch (140 t) in 3Ps. Catch rates were similar between the two weekly fishing periods in 3Psa, South coast (average 1.69 fish per hook per hour) and in 3Psb, Fortune Bay (average 1.59) but lower in the second week (1.49) than in the first (1.83) in 3Psc, Placentia Bay. The overall average of 1.64 for all areas and time periods is lower than the 2.1 fish per hook per hour observed in 1994 and 1996 indicating a reduction in the local density of fish from previous years during the fall fishery. These numbers are substantially lower than catch rates recorded from the northeast coast in 1996 (2.0 to 6.8). Size of fish was found to be similar between 3Psa and 3Psb (55 and 58 cm) for both weeks combined although more large fish (wider range) were found in 3Psc where the average size caught was 61 cm. The fish were of a similar size in 1997 and 1996 but larger than in 1994. However, different gear used in 1994 versus 1996 and 1997 may affect a comparison of size of fish. In 1994, both jiggers as well as baited hooks and lures were used while in 1996 and 1997, effort was restricted to lures and baited and feather hooks.

Résumé

La pêche à des fins alimentaires (antérieurement qualifiée de pêche récréative à la ligne à main) a été limitée aux divisions 3Ps et 4R de l'OPANO (côtes sud et ouest de Terre-Neuve) en 1997. En 1993, 1994 et 1996, elle était autorisée dans les divisions 2J, 3K, 3L, 3P et 4R, le long des côtes de Terre-Neuve et du Labrador. La pêche a été ouverte pendant deux fins de semaine consécutives de trois jours, soit du 12 au 14 et du 19 au 21 septembre en 1997 comparativement à deux en septembre 1996, à cinq en août et septembre 1994 et à une saison illimitée en 1993. Aucune pêche n'a été autorisée en 1995. Le présent article résume la pêche de 1997 dans la division 3Ps de l'OPANO. On y présente les captures, les taux de capture et la taille des poissons qui sont comparés aux valeurs correspondantes des années antérieures. Les débarquements estimés dans la division 3Ps à partir des observations des agents des pêches indiquent des captures de l'ordre de 292 t en 1997, soit plus de deux fois les captures de la pêche alimentaire de 1996 (140 t) dans cette division. Les taux de capture étaient semblables pour les deux fins de semaine de pêche en 3Psa, la côte sud (moyenne de 1,69 poisson par hameçon et par heure) et en 3Psb, baie Fortune (moyenne de 1,59 poisson), mais inférieurs au cours de la deuxième fin de semaine (1,49) par rapport à la première (1,83) en 3Psc, baie Placentia. La moyenne générale de 1,64 pour toutes les zones et périodes est inférieure à 2,1 poissons par hameçon et par heure notée pour 1994 et 1996, ce qui indique une baisse de la densité locale du poisson par rapport aux années antérieures, pour la pêche d'automne. Ces valeurs sont passablement inférieures aux taux de capture obtenus pour la côte nord-est en 1996 (de 2,0 à 6,8). La taille des poissons s'est avérée semblable en 3Psa et 3Psb (55 et 58 cm) pour les deux semaines combinées mais plus de gros poissons (gamme plus étendue) ont été capturés en 3Psc, où la taille moyenne était de 61 cm. Les poissons étaient de taille semblable en 1997 et 1996, mais plus gros qu'en 1994. Par ailleurs, les engins utilisés en 1994 différaient de ceux utilisés en 1996 et 1997 et cela peut influer sur les comparaisons des tailles effectuées. En 1994, tant des turluttes que des hameçons appâtés et des leurres ont été utilisés tandis qu'en 1996 et 1997, la pêche a été limitée aux leurres et aux hameçons appâtés et garnis de plumes.

Introduction

Since the moratorium imposed on the cod fishery in NAFO Div.'s 2J, 3K, 3L in 1992 and 3Ps in 1993, with exception of a limited commercial fishery in 3Ps in 1997, effort has been directed for cod only in the form of food fisheries in those areas (Kulka *et al.* 1995, Kulka 1997). Controlled recreational handlining (later referred to as the food fishery) first took place in 1993 without seasonal restriction. No fishery was permitted in 1995. Greater controls were placed on these fisheries in subsequent years. In 1994, based partly on the poor results of the previous season, to prevent large amounts of fish being taken (as was thought to be the case in 1993) and to facilitate better monitoring of the catches, the fishing was limited to five Friday/Saturday periods in August and September of 1994 and two weekends, Sept. 20-22 and Sept. 27-29 in 1996. After 1993, fishers were restricted to a maximum of 10 fish per day. The 1994 fishery was closed a week early apparently based on the small size and low numbers of fish in the catches but the 1996 fishery stayed open for the planned duration. Estimates of catches compiled by the Statistics Branch of Fisheries & Oceans amounted to about 9,000t for 1993, 1,550t for 1994 and xxxt for 1996. These numbers include all areas fished in those years, not just NAFO Div. 3Ps.

In 1997, the Minister of Fisheries & Oceans again opened a limited food fishery, this time restricted to the south and west coast of Newfoundland in NAFO Divs. 3Ps, 3Pn and 4R. Fishing was permitted during two consecutive three-day weekends, Sept. 12-14 and Sept. 19-21, a week earlier than in 1996. Similar to 1996, a boat limit of 10 fish per day per individual to a maximum of 50 fish per boat was imposed to limit the catch. Unlike 1993 and 1994, all effort was restricted to baited or feather hooks and lures. Jiggers were prohibited.

A requirement of Department of Fisheries & Oceans was that the 1997 limited food fishery be closely monitored. Science Branch in conjunction with Fisheries Management gathered catch, effort, length and age information from both periods and all of the areas fished. This paper summarizes the findings of the sampling program that covered the 1997 3Ps food fishery extending from Boar Island at western border of NAFO Div. 3Ps to Placentia Bay (including Hermitage and Fortune Bays) and compares these findings to the 1994 and 1996 fisheries. The paper summarises the 1997 fishery in NAFO Div. 3Ps in terms of catch, catch rates and fish size and compares the results to earlier years. A fairly intense sampling scheme allowed a comparison of fishery parameters among subareas in 3Ps, namely 3Psa (south coast east from Boar Isl. to Pass Isl.), 3Psb (Fortune Bay) and 3Psc (Placentia Bay). Refer to Figure 1 for sampling locations, areas and subareas.

Methods

Determination of landing locations was made by visiting communities and speaking to local people to find where the greatest concentrations of landings were likely to be. The sites were also chosen to maximize spatial coverage of the coastline by spreading out the locations. Areas where fish landings were highest in the 1994 and 1996 fisheries were targeted for sampling. The sampling locations were also adjusted during the fishery based on observed shifts in landing locations.

Six port samplers were teamed with 17 fishery observers to monitor three bays, Hermitage, Fortune and Placentia Bays plus Ramea. Placentia Bay was also divided into 4 quadrants and sampling sites were assigned to cover each quadrant. Placentia Bay was divided into 4 quadrants to intensify sampling and to provide a more detailed definition of catch rates and fish sizes in the bay. Table 1 lists the 25 sampled landing sites at which samplers were stationed during Sept. 12-14 and Sept. 19-21 with respect to subareas, quadrants and day. Fig. 1 illustrates those landing sites. The samplers also traveled, when appropriate to other sites in close proximity in order to increase spatial coverage. Each landing site was associated with many fishing locations that were positioned from close proximity to within about 8 km. of the landing site usually close to the coast. The result was a wider spatial coverage of the fishing effort along the shore. Only about 4% of the shoreline distance was sampled but effort was focussed on the most intensely fished areas and many parts of the coast were not fished. The aim was to obtain sufficient samples from as wide an area as possible to monitor catch and effort and size and age of fish in the catches. Sampling occurred throughout the day from dawn to dusk as the fish came ashore and thus all of the landing period was covered.

Catch and effort data (number of cod caught, number of vessels, number of persons fishing per vessel, number of hours fished, number of lines and number of hooks) was taken with each sample. Catch rates were determined by dividing number of cod caught by each person by number of person-hours per vessel. An average catch rate of observed vessels was calculated for each subarea and quadrant. As well, other narrative information including opinions on the fishery and the stock status were recorded.

In most cases, measurements of fork length were obtained from both morning and evening landings. In most cases, he entire catch of each fisher was measured. 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, Fig. 1, lower map). The results were also compared to earlier years.

Results

Table 2 lists by day, the estimated catch (kg.), number of vessels and fishers participating in the fishery as provided by Conservation & Protection branch of Fisheries & Oceans. It shows that both catch and effort were fairly similar among days and areas except for the last day, Sept. 21 where fishing effort was about 10% of what occurred on the other days. Proportion of landed weight varied somewhat differently depending on daily catch rates.

Table 3 summarises sampling effort in terms of number of fish measured and otoliths collected by subarea and fishing period. It also lists average, mode and range of the fish measured plus the estimated sample weight for the corresponding periods and areas. Samples were not weighed therefore sample weights were estimated using a regression of length and weight taken from Shelton *et al.* (1996). Table 4 lists the above items broken out by quadrant within Placentia Bay. Number of otoliths sampled is listed only in summary by subarea.

Figure 2 and Table 3 presents mean size and range of fish caught in 1997 in the three inshore 3Ps unit areas. Overall, fish were of similar size among areas, with the largest average length difference being 6 cm between Placentia and Fortune bays. Figure 3 illustrates the shape of the frequencies by subarea. It shows that while means were quite different (Placentia versus the other areas), modal lengths similar. Observed values were 54 cm, 53 cm, and 54 cm for Placentia Bay (3Psc), Fortune Bay (3Psb) and the South Coast (3Psa), respectively. The larger average size of fish in the Placentia Bay catches is due to a greater range of sizes in the upper end of the length distribution. The largest fish in the other two areas were 104 cm compared to 136 cm in Placentia Bay.

Figure 4 further breaks out length distribution by quadrant. Fish caught in quadrant 1 were, on average, 12 cm - 18 cm larger than those in quadrant 2 and 3 on the west side of the bay. The fish in quadrant 4 (northeast) were intermediate in size to those in the southeast and western side of the bay. Furthermore, the standard deviation of the length frequency data presented in Figure 3 for Placentia Bay was 11.24, as compared to 8.76 and 8.91 for Fortune Bay and the south coast respectively. This difference is the result of a higher percentage of fish measuring 65–95 cm in the Placentia Bay subarea, mainly from quadrant 1, to the southeast off St. Brides. Figure 5 presents the length data for the eastern and western quadrants combined. This plot shows that both sides contain smaller fish, as small as about 30 cm but the eastern side contained a larger proportion of fish in the 60 to 85 cm range.

Figure 6 shows the observed length frequencies by bay and fishing period. Quadrant 1 showed an increase in both mean and modal lengths (+6 cm and +7 cm, respectively) between the first and second weekend of the fishery (refer also to Table 2). As noted above, sampling in quadrant 1 was restricted to the port of St. Bride's. The observed length difference between fishing periods may be the result of fish migration, increased discarding of smaller fish in the second week, or increased knowledge of the fishing grounds by participants during the fishery and selection of locations in the second week yielding larger fish. The results from this quadrant were the only significant temporal length change observed during the 1997 fishery. The change in quadrant 3 (refer to Table 2) may not be due to an actual change in fish size. Rather, it may be due to the small sample size obtained over the first weekend (n = 93).

Summary length frequency distributions for 1994, 1996 and 1997 are shown in Figure 7. Both mean and modal length increased from 1994 to 1996 (+4 cm and +6 cm, respectively). Variation in gear type between these years, however, may be affecting the results. Between 1996 and 1997 there was no significant difference in mean or modal catch size. Variability within the distributions increased over time. Overall standard deviations for 1994, 1996, and 1997 were 8.47, 9.77, and 10.35 mainly due to a longer tail to the right. With this increase, the relative strengths of the 50–60 cm. length groups was notably higher in 1997. This appears to be due to the effect of the Fortune Bay catches on the overall distribution. Figure 8 displays the among year comparison of length data by bay and year. The Fortune Bay data shows a pronounced change from 1996 to 1997, with the standard deviation decreasing from 9.72 to 8.76 due to a more peaked distribution (greater kurtosis) in 1997. The south coast distribution also was more peaked in 1997 than in 1996 but to a lesser degree.

Table 5 lists by subarea and fishing period, the observed fishing effort (number of vessels observed and percent of all vessels that participated in the fishery), the mean CPUE (mean and modal number of fish per hook per hour), standard deviation and range. About 10% of the vessels that participated in the fishery were sampled for catch rate and fish sizes and this level of coverage was spread evenly over the subareas. As seen in Figure 9, these catch rates were very consistent between bays, averaging 1.6 to 1.7 fish per hook per hour among subareas. During the fishery, participants in most areas indicated that it took longer to catch the quota as the fishery progressed. This view is generally supported by the data presented in Figure 10. Mean daily catch rates tended to decline following the first fishing day of each week and was lower in the second week. The data for the third day of the second week should be viewed with caution, as high winds affected both the number of fishers, possibly the fishing efficiency (catchability).

In comparison to previous years, catch rates were significantly lower in 1997. Overall values for 3Ps were 2.15, 2.40 and 1.64 fish per hook per hour for 1994, 1996 and 1997 (Fig. 11). This represents a reduction of 23.7% and 31.7% in relation to the 1994 and 1996 rates. While the different gear allowance in 1994 may affect the catch rate, the 1996 and 1997 fisheries were subject to the same gear. Weather should not have had a negative effect on the 1997 results, since conditions were much more favourable as compared to 1996. Figure 12, comparing catch rate by bay and year, shows that the decline occurred in all subareas in 3Ps the decline was greatest to the west in subarea 3Psb.

Discussion

Data from the food fishery can provide some information about the condition of the stock along the coast. In 1997, an intensive sampling scheme facilitated a detailed areal analysis of the catches albeit over a very short period. A comparison of areas and times shows that the fish caught were consistent in size over much of the fished area from Ramea in 3Psa to the west side of Placentia Bay. In contrast, there were substantially larger fish taken from southeast corner of Placentia Bay and were large during both weeks of the fishery. The fish in this southeast corner of the stock area were an average 71 cm., about 15 cm. larger than other areas primarily due to wider range of sizes including a large proportion of older 65-95 cm. (7+) fish not seen elsewhere in NAFO Div. 3Ps in significant numbers. It is possible that these larger fish at the mouth of the bay have migrated into the area from the offshore or NAFO Div. 3L and mixed with the inshore fish. This ground is in close proximity to the 3L border.

A comparison among years shows that there were significant changes in both length distributions of the fish and in the catch rates for the food fishery in NAFO Division 3Ps. Overall, mean size of fish is similar between 1996 (Kulka, 1997) and 1997 but the fish in 1997 show a more peaked distribution (greater kurtosis) suggesting a narrower range of year classes. The size distribution difference between years is even more pronounced if the larger southeast Placentia fish are excluded from overall 1997 frequency. This suggests that there may have been limited recruitment and poor survival of older fish in the area leaving a greater proportion of mid-sized fish in 1997

compared to 1996 (and 1994). It should be noted that the food fishery followed a commercial fishery, the first since 1993 and this may have affected the larger sizes available to the food fishery if stock numbers were low enough that they had been cropped down by the earlier occurring commercial fishery.

Catch rates are a measure of local density. Differences in catch rates among years may not reflect abundance if there are confounding spatial changes in terms of extent of the stock among years (Kulka *et al.* 1996). However, coverage along the coast was fairly extensive in 1997 (and 1996) and thus it can be concluded that the density of the fish along the coast was significantly down in 1997 during the period of the food fishery. Catch rates were significantly lower in 1997 than 1996 (Kulka, 1997) or 1994 (Kulka *et al.* 1995). The same gear and fishing restrictions were placed on the fishery in 1996 and 1997. Immigration of non-resident fishers to 3Ps during the food fishery is unlikely to have affected catch rates. Such immigration would be concentrated in the Placentia Bay and eastern Fortune Bay areas, while the largest reduction was observed in 3Psa, the southwest part of the Division. The observed decline may be related to a cropping down effect of the commercial cod fishery in 3Ps during 1997. Also, a comparison of catch rates between the south coast of Newfoundland, NAFO Div. 3Ps and the northeast coast NAFO Div. 3K and 3L in 1996 (Kulka, 1997) shows that there were substantially higher catch rates recorded for the latter area, about four times higher.

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Table 1 - Detailed listing of sampling locations during the 1997 3Ps food fishery. Refer to Fig. 1 for the locations of the communities and the Placentia Bay quadrants.

NAFO Unit Area	Locality	Community	Sampling Dates
3Psc	Placentia Bay, Quadrant 1	St. Bride's	Sept. 12, 13, 14, 19, 20
3Psc	Placentia Bay, Quadrant 2	Allen's Island	Sept. 12, 14, 19
		At Sea	Sept. 13, 14
		Burin	Sept. 12
		Lawn	Sept. 13
		Lord's Cove	Sept. 13, 20
		Point au Gaul	Sept. 14, 20
		Point Crewe	Sept. 14
		Red Harbour	Sept. 14
		St. Lawrence	Sept. 12, 21
3Psc	Placentia Bay, Quadrant 3	Garden Cove	Sept. 14, 19, 20, 21
3Psc	Placentia Bay, Quadrant 4	Argentia	Sept. 14
		Arnold's Cove	Sept. 12, 13, 14, 19, 20, 21
		Dunville	Sept. 21
		Fox Harbour	Sept. 14, 19
		Jerseyside	Sept. 12, 13, 19, 20, 21
3Psb	Fortune Bay	Bay L'Argent	Sept. 19, 20
		Dantzic Point	Sept. 20
		English Harbour	Sept. 20
		Fortune	Sept. 12, 13, 14, 19, 20, 21
		Garnish	Sept. 13
		Grand Bank	Sept. 13, 14
		Harbour Breton	Sept. 12, 14, 19, 20
		Harbour Mille	Sept. 20
		Little Bay East	Sept. 14, 20, 21
		Seal Cove	Sept. 13, 20
		St. Bernard's	Sept. 19
3Psa	South Coast	Furby's Cove	Sept. 21
		Hermitage	Sept. 12, 13, 14, 19, 20, 21
		Ramea	Sept. 12, 13, 14, 19, 20, 21

Table 2 - Estimated participant levels and landings by day for the 1997 3Ps food fishery. All data provided by Conservation and Protection Division.

Date	NAFO Unit Area	Number of Vessels	Number of Fishers	Landed Weight (kg)
September 12	3Psa	482	1,822	44,589
	3Psb	440	1,320	11,267
	3Psc	960	2,543	30,658
	All Areas	**1,882**	**5,685**	**86,515**
September 13	3Psa	280	831	16,638
	3Psb	275	905	6,373
	3Psc	1,210	4,690	53,065
	All Areas	**1,765**	**6,426**	**76,076**
September 14	3Psa	185	550	5,443
	3Psb	391	1,024	13,510
	3Psc	623	2,217	23,170
	All Areas	**1,199**	**3,791**	**42,124**
September 19	3Psa	213	599	10,011
	3Psb	480	1,400	19,310
	3Psc	714	2,180	22,974
	All Areas	**1,407**	**4,179**	**52,295**
September 20	3Psa	222	567	5,593
	3Psb	460	1,230	13,608
	3Psc	501	1,602	13,374
	All Areas	**1,183**	**3,399**	**32,575**
September 21	3Psa	13	25	363
	3Psb	55	145	1,583
	3Psc	45	130	758
	All Areas	**113**	**300**	**2,704**
Grand Total		**7,549**	**23,780**	**292,288**

Table 3 - Summary of sampling effort from the 1997 Newfoundland food fishery.

Location	Fishing Period	Number of Measurements	Number of Otoliths	Estimated Sample Wt. (kg)	Mean Length (cm)	Modal Length (cm)	Min. Length (cm)	Max. Length (cm)
Placentia Bay (3Psc)	Sept. 12 - 14	5,086	n/a	10,761	60	55	33	136
	Sept. 19 - 21	3,357	n/a	7,782	61	56	31	111
	Total	**8,443**	**494**	**18,543**	**61**	**54**	**31**	**136**
Fortune Bay (3Psb)	Sept. 12 - 14	3,276	n/a	5,313	55	50	34	101
	Sept. 19 - 21	3,137	n/a	5,077	55	53	34	104
	Total	**6,413**	**186**	**10,390**	**55**	**53**	**34**	**104**
South Coast (3Psa)	Sept. 12 - 14	1,127	n/a	2,073	58	54	35	101
	Sept. 19 - 21	1,298	n/a	2,371	58	53	36	103
	Total	**2,425**	**101**	**4,444**	**58**	**54**	**35**	**103**
Grand Total		**17,281**	**781**	**33,377**	**58**	**54**	**31**	**136**

Table 4 - Summary of Placentia Bay sampling effort from the 1997 Newfoundland food fishery. Refer to Fig. 1 for the location of the four quadrants.

Location	Fishing Period	Number of Measurements	Number of Otoliths	Estimated Sample Wt. (kg)	Mean Length (cm)	Modal Length (cm)	Min. Length (cm)	Max. Length (cm)
Quadrant 1	Sept. 12 - 14	1,148	n/a	3,511	69	66	46	105
	Sept. 19 - 21	911	n/a	3,626	75	73	50	111
	Total	**2,059**	**n/a**	**7,137**	**71**	**71**	**46**	**111**
Quadrant 2	Sept. 12 - 14	1,373	n/a	2,209	55	53	33	104
	Sept. 19 - 21	586	n/a	908	55	54	38	85
	Total	**1,959**	**n/a**	**3,117**	**55**	**52**	**33**	**104**
Quadrant 3	Sept. 12 - 14	93	n/a	188	60	57	44	81
	Sept. 19 - 21	444	n/a	586	51	44	31	85
	Total	537	n/a	773	53	51	31	85
Quadrant 4	Sept. 12 - 14	2,472	n/a	4,853	59	55	34	136
	Sept. 19 - 21	1,416	n/a	2,662	58	56	37	105
	Total	3,888	n/a	7,515	59	56	34	136
Grand Total (3Psc)		**8,443**	**494**	**18,543**	**61**	**54**	**31**	**136**

Table 5 - Summary of catch per unit of effort (CPUE) data from the 1997 Newfoundland fishery. CPUE refers to the number of fish caught per hook per hour fished.

Location	Fishing Period	Number of Vessels Sampled	% Total Vessels	Mean CPUE	Modal CPUE	Standard Deviation	Minimum CPUE	Maximum CPUE
Placentia Bay (3Psc)	Sept. 12 - 14	186	7%	1.83	1.67	1.72	0.00	10.00
	Sept. 19 - 21	216	17%	1.49	1.67	1.95	0.00	20.00
	Total	**402**	**10%**	**1.65**	**1.67**	**1.85**	**0.00**	**20.00**
Fortune Bay (3Psb)	Sept. 12 - 14	121	11%	1.58	2.22	2.00	0.06	13.33
	Sept. 19 - 21	137	14%	1.60	2.50	1.76	0.00	12.00
	Total	**258**	**12%**	**1.59**	**2.22**	**1.87**	**0.00**	**13.33**
South Coast (3Psa)	Sept. 12 - 14	67	7%	1.72	1.67	1.39	0.24	7.50
	Sept. 19 - 21	65	15%	1.65	2.00	1.54	0.04	10.00
	Total	**132**	**9%**	**1.69**	**1.67**	**1.46**	**0.04**	**10.00**
All Areas Combined	Sept. 12 - 14	374	8%	1.73	1.67	1.76	0.00	13.33
	Sept. 19 - 21	418	15%	1.55	1.67	1.83	0.00	20.00
	Total	**792**	**10%**	**1.64**	**1.67**	**1.80**	**0.00**	**20.00**

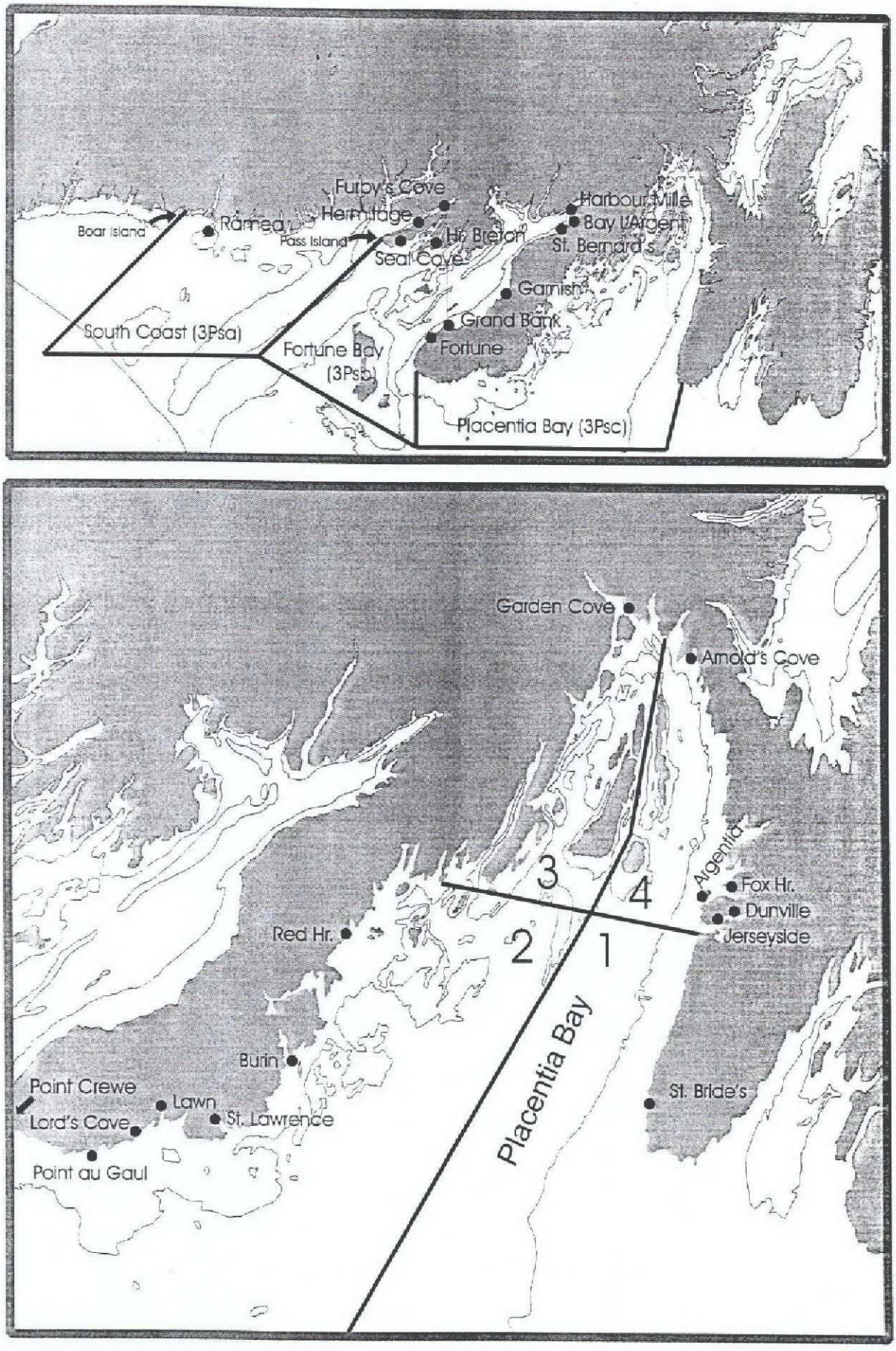


Figure 1 - Map of the south coast of Newfoundland (NAFO division 3Ps) showing the sampling locations, subareas and quadrants. The lower map details Pacentia Bay.

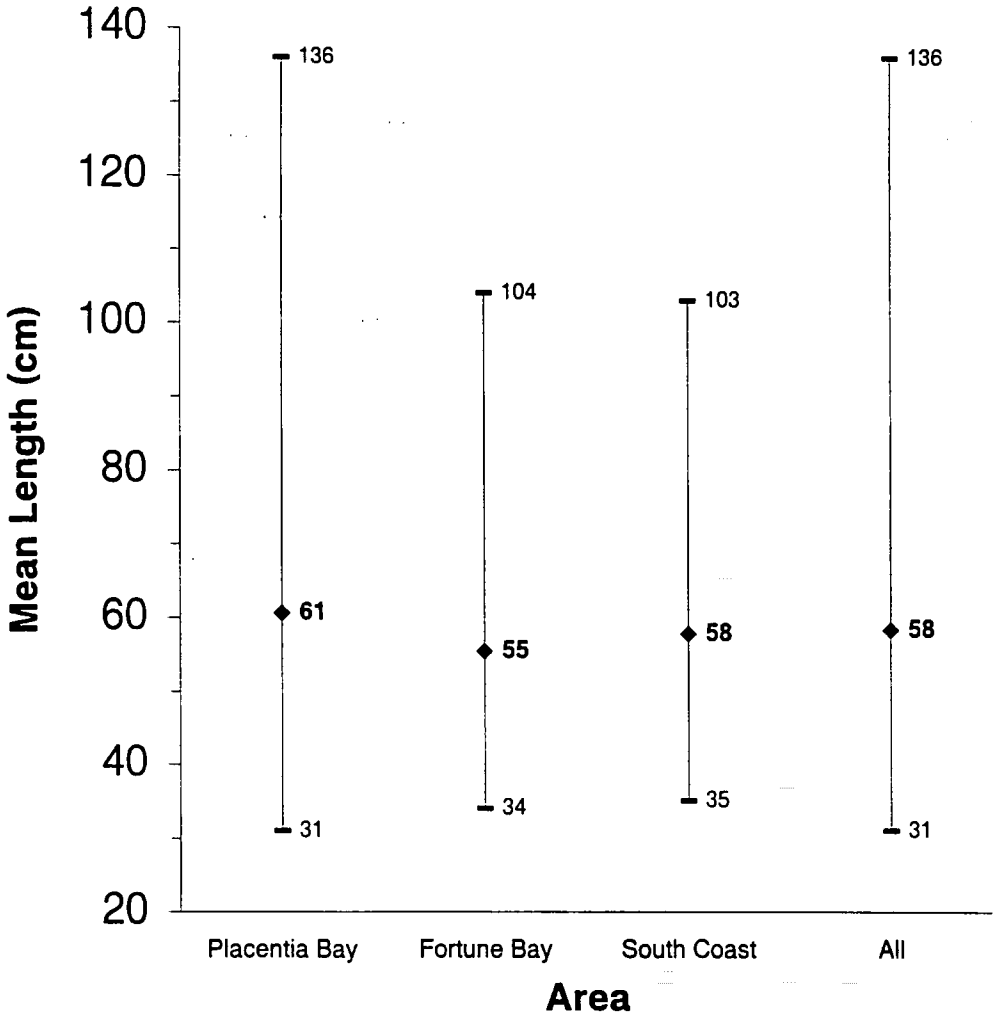
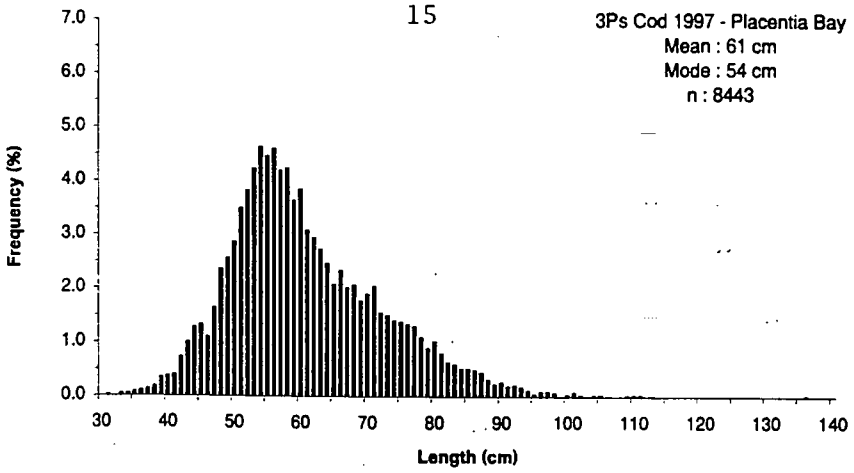
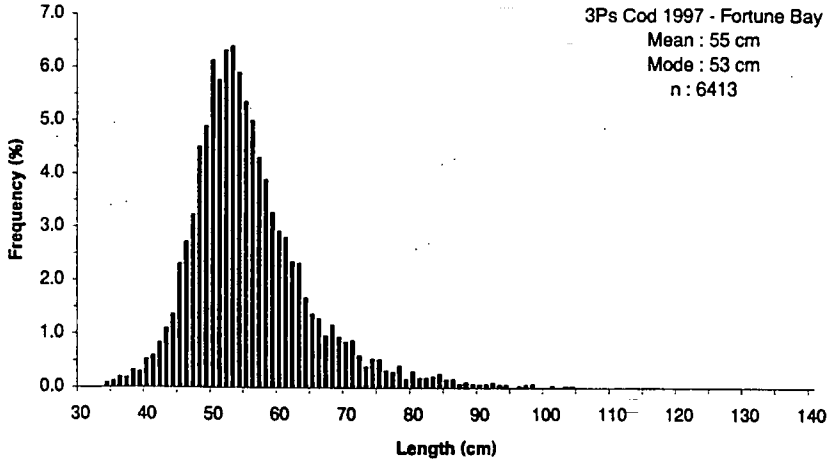
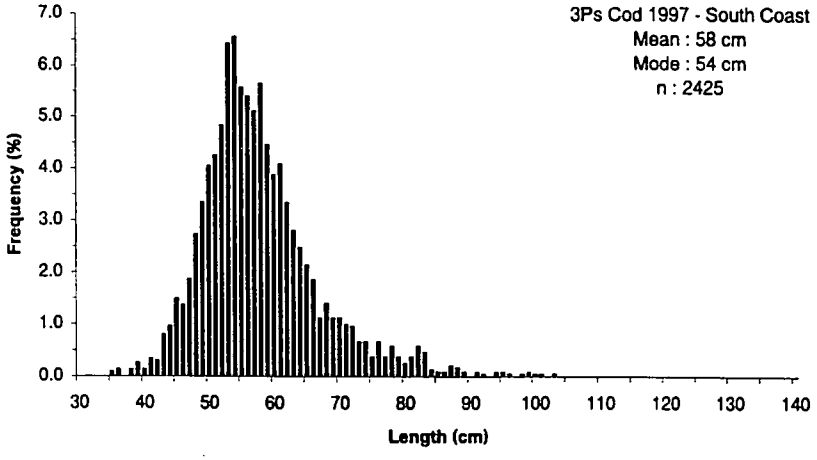


Figure 2 - Mean lengths by area for the 1997 3Ps food fishery. Bars indicate the observed length range.







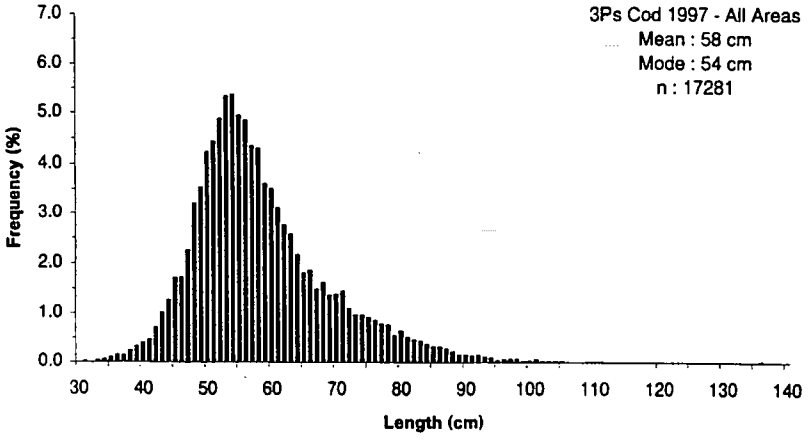
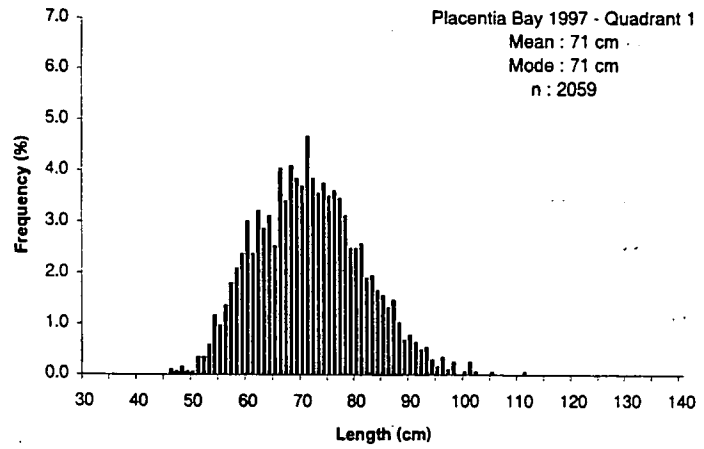
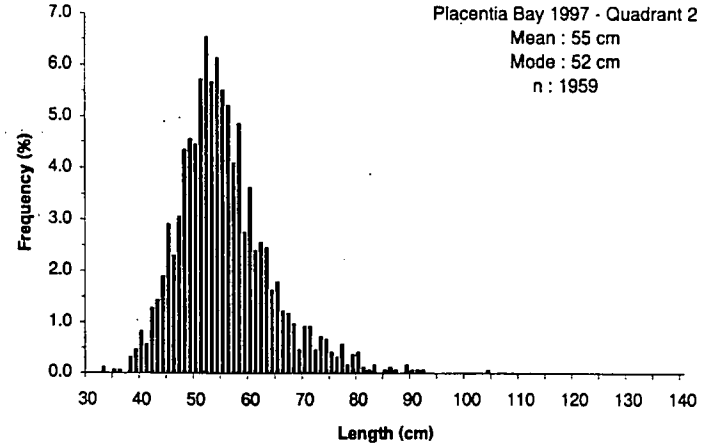
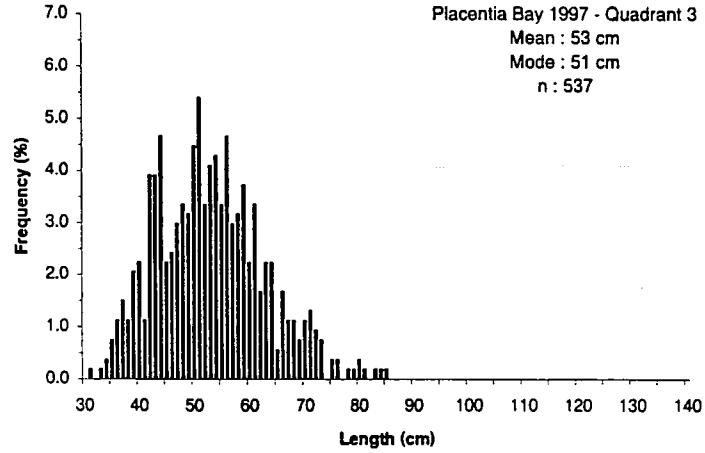


Figure 3 - Combined length frequency distributions for the two weekend fishing periods of the 1997 Newfoundland food fishery.







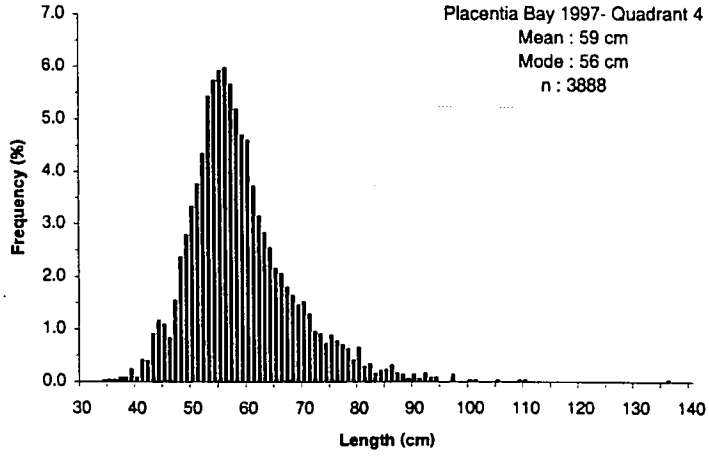


Figure 4 - Combined length frequency distributions by Placentia Bay quadrant for the two weekend fishing periods of the 1997 3Ps food fishery. Refer to Fig. 1 for the location of the quadrants.

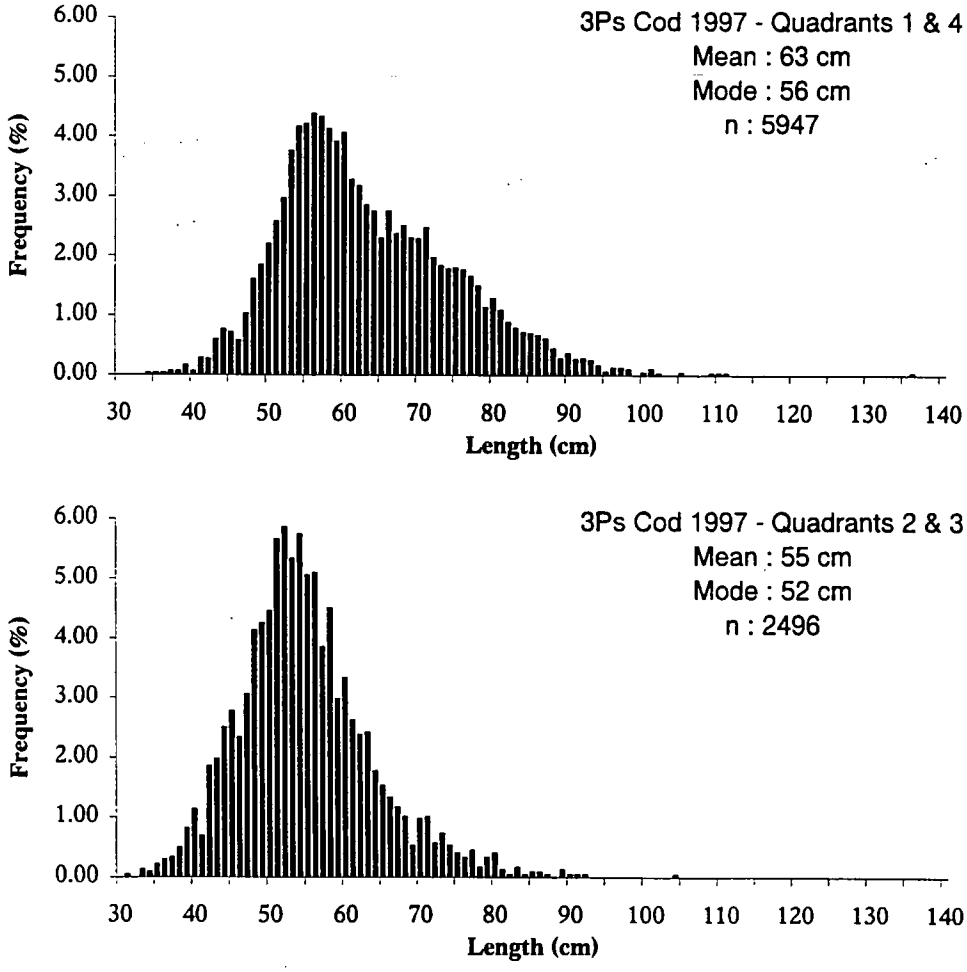


Figure 5 - Combined length frequency distributions for the eastern and western sampling quadrants of Placentia Bay during the 1997 3Ps food fishery.

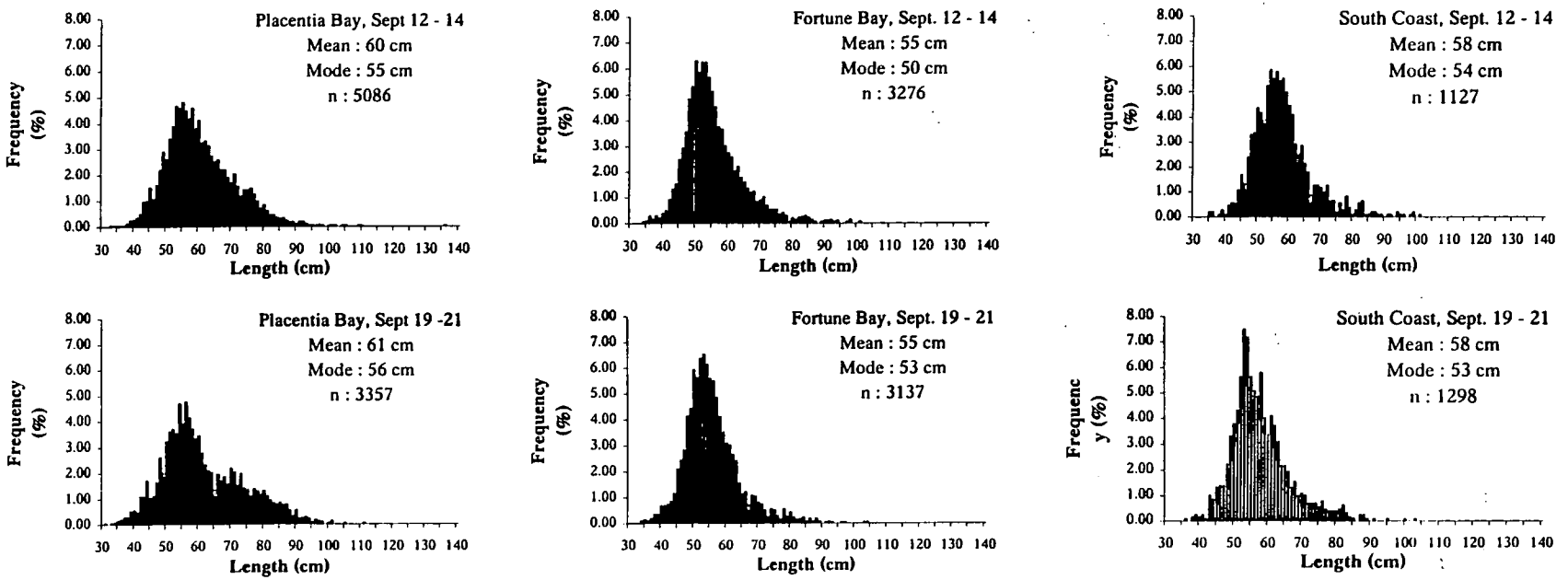


Figure 6 - Length frequency distributions by bay and fishing period for the 1997 3Ps food fishery. Placentia Bay, Fortune Bay and the South Coast correspond to NAFO areas 3Psc, 3Psb and 3Psa, respectively.

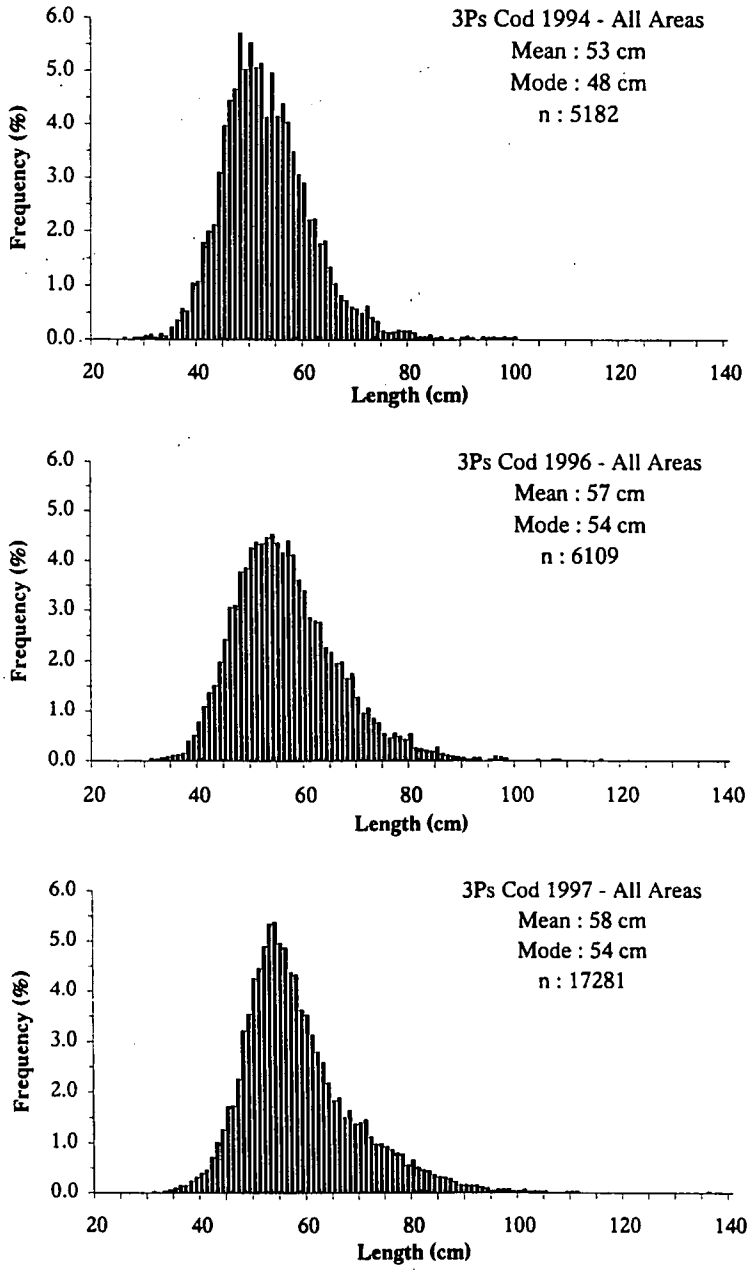


Figure 7 - Length frequency distributions by year for food fishery catches in NAFO division 3Ps. All areas and fishing periods are combined for each year.

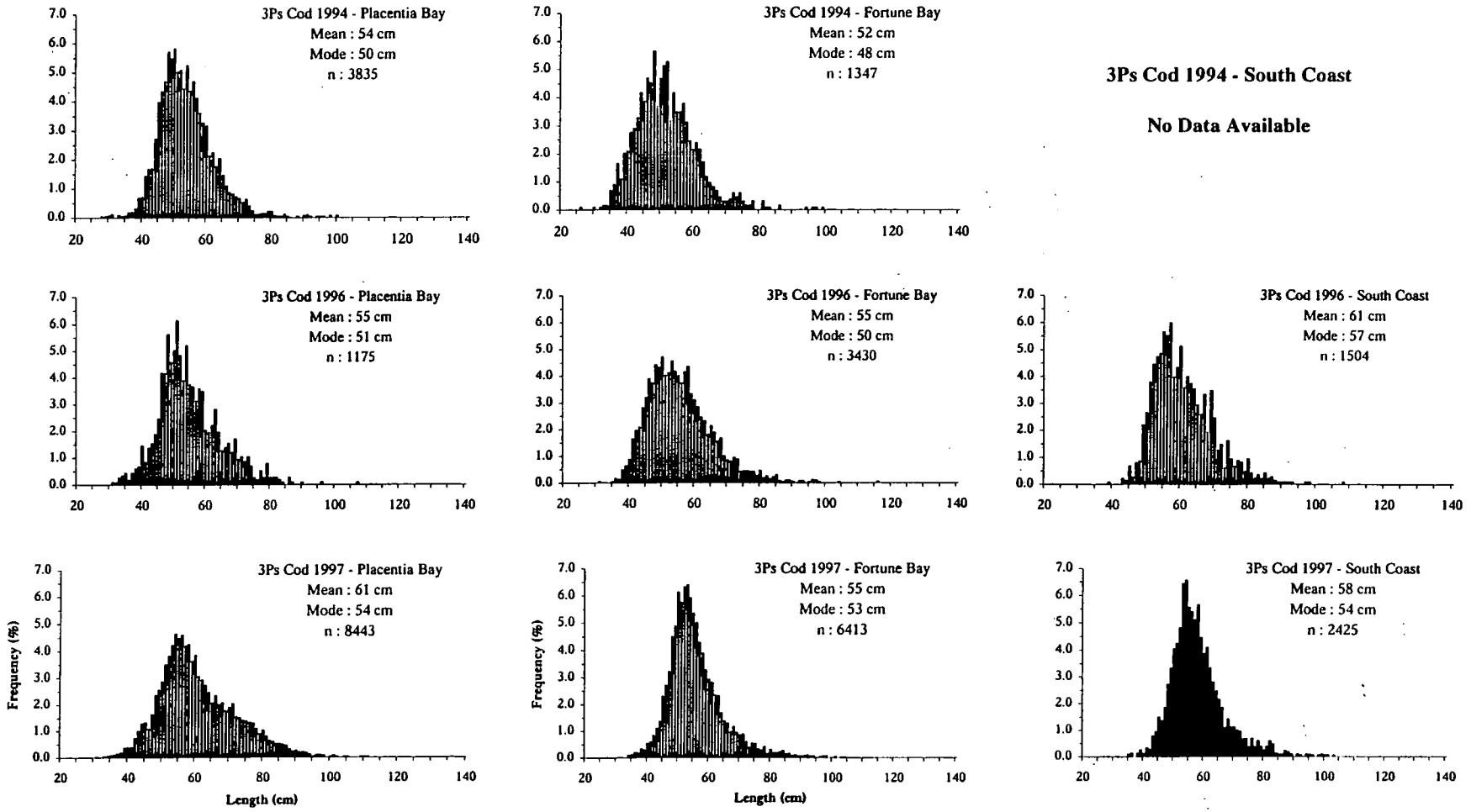


Figure 8 - Length frequency distributions by area and year for food fishery catches in NAFO division 3Ps. All fishing periods are combined for each year.

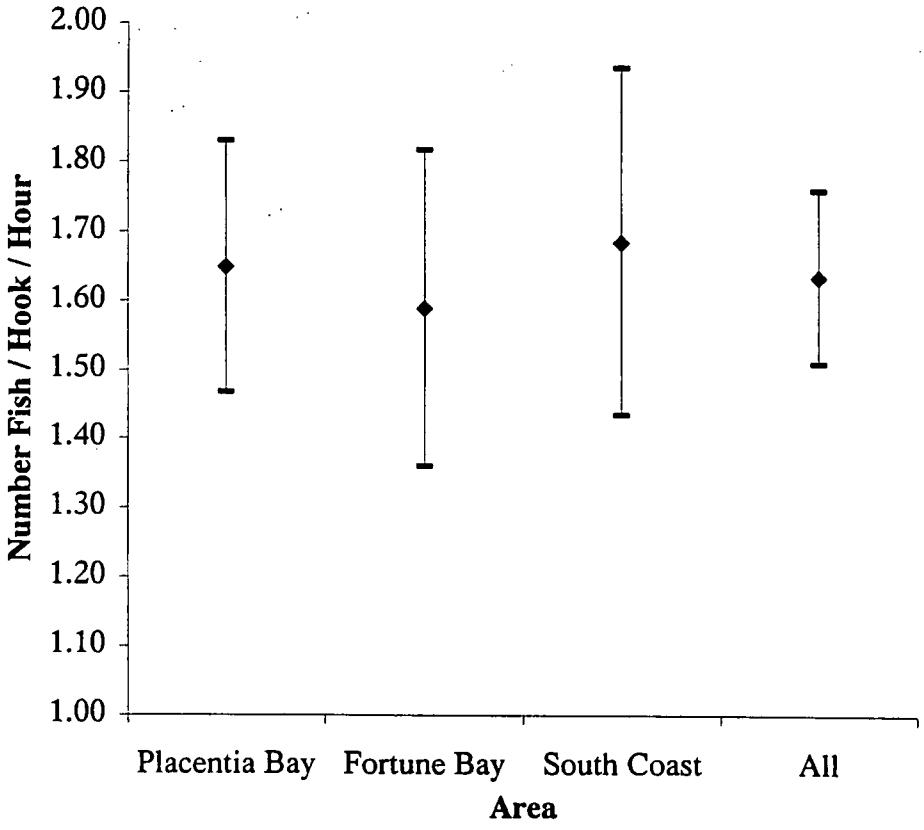
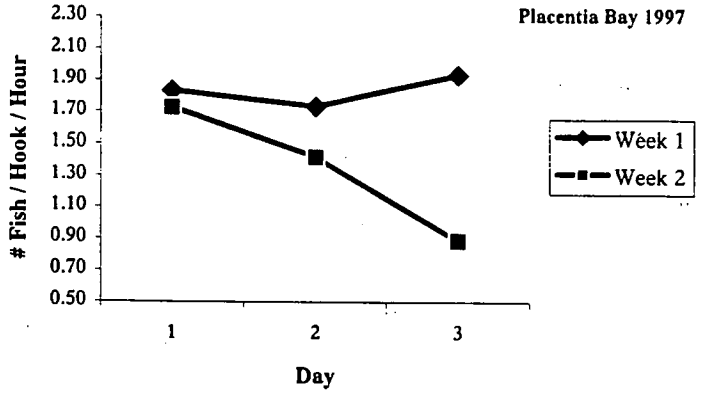
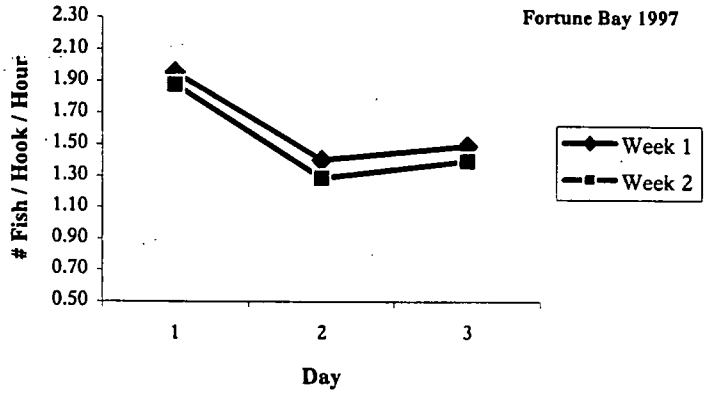
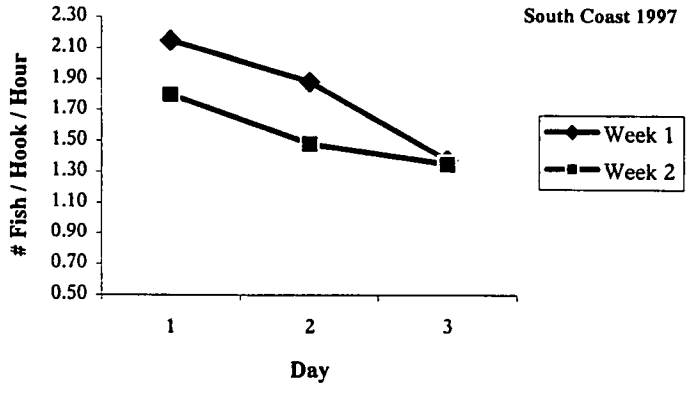


Figure 9 - Mean catch rates by area for the 1997 3Ps food fishery. Bars indicate 95% confidence intervals. Data from both fishing periods is combined.







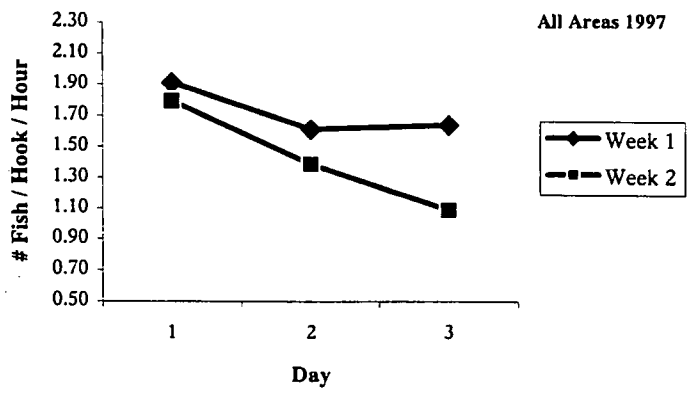


Figure 10 - Mean daily catch rates by area and week from the 1997 3Ps food fishery.

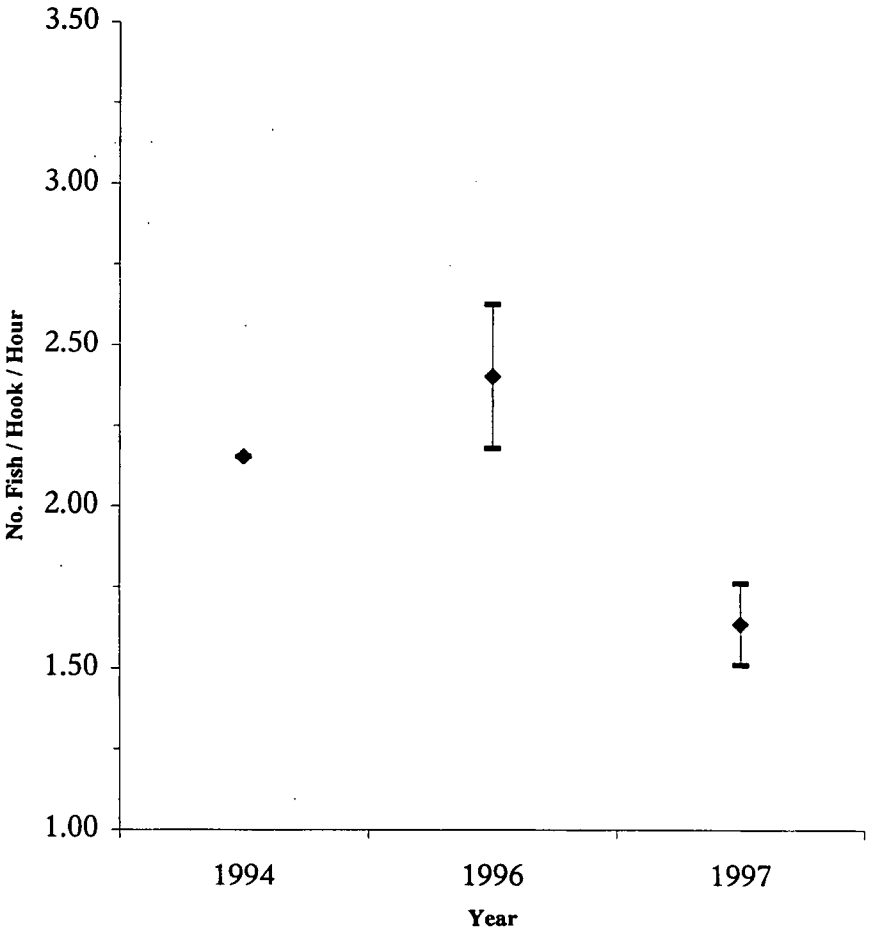


Figure 11 - Mean catch rates by year for the 3Ps food fishery. All fishing areas and periods are combined. Bars indicate 95% confidence intervals.

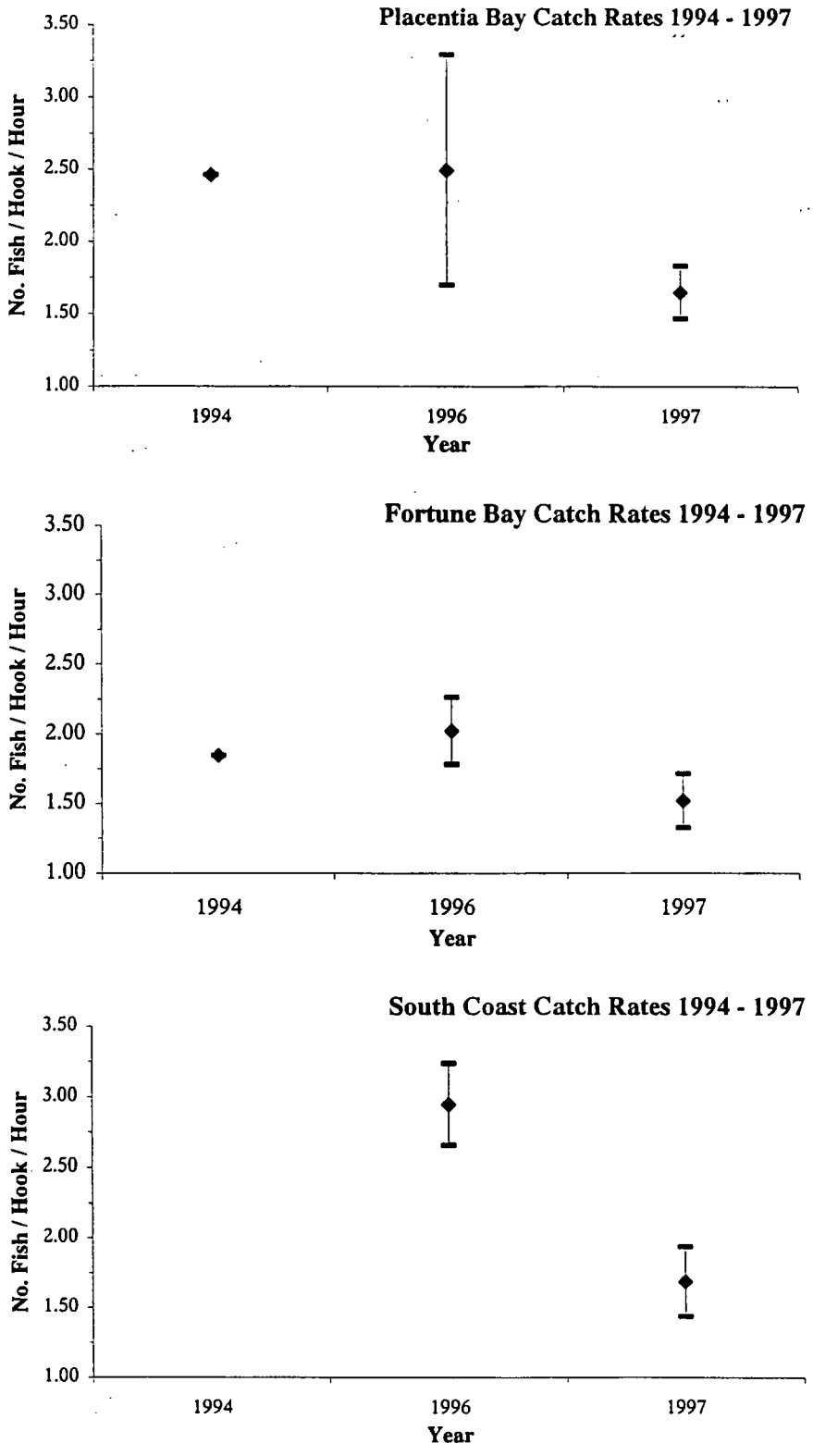


Figure 12 - Mean catch rates by area and year for the 3Ps food fishery. Bars indicate 95% confidence intervals (not available for the 1994 data).

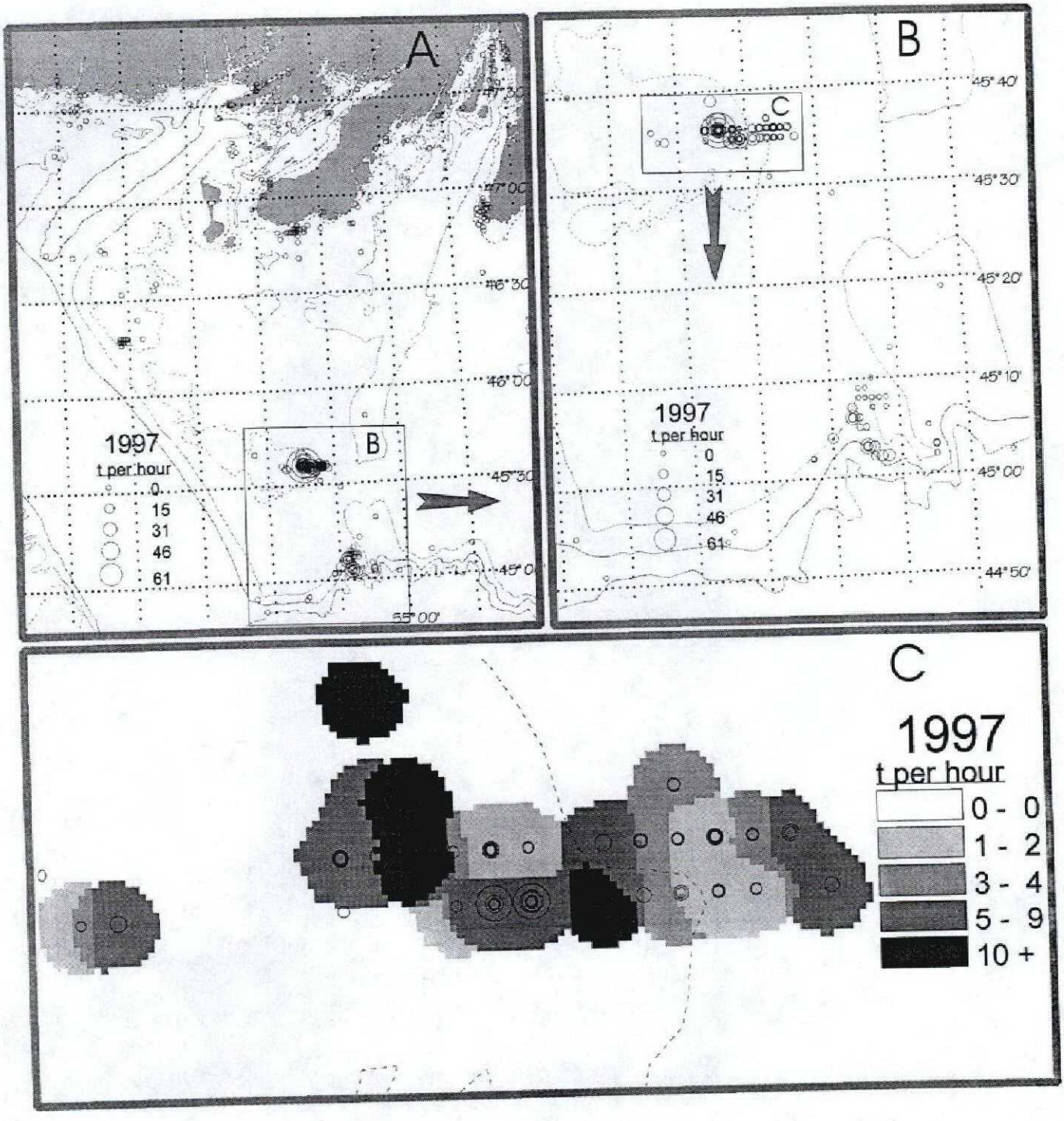


Figure 13 - Plot of the observed offshore fishing grounds in 1997. Panel A illustrates the entire area of NAFO SubDiv. 3Ps. Panel B zooms in on the two offshore fishing locations. Panel C shows the grounds where catch rates were highest.