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Update of the Scotian Shelf Shrimp Fishery - 1992

By

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ABSTRACT

The Scotian Shelf shrimp fishery covers three areas with depths greater than 200 m, referred to as SFA13 (Shrimp Fishing Area) or Louisbourg Hole, SFA14 or Misaine Hole, and SFA15 or Canso Hole. Prior to 1991 these areas had traditionally been fished by Gulf-based vessels. With the introduction of the Nordmøre grate and participation of Scotia-Fundy based vessels, landings are rising with 1992 the highest on record.

In 1992 Scotia-Fundy boats accounted for 77% of the total catch landed with Gulf boats, the remaining 23%. Effort from Gulf based boats increased 58% from 1991. There was a slight decrease in the standardised catch-rate. By-catch species were somewhat less frequent and lower than in previous years for Gulf based boats. Scotia-Fundy boats had no by-catch; they use the Nordmøre separator grate.

For the last five years, advice was given for a TAC at 2,580 t. The CPUE patterns are very similar throughout that time. Increased effort allowed quotas to be reached in both Canso and Misaine holes. Considering the important changes taking place in this fishery, it would be advisable to keep the same TAC and monitor the rising effort levels.

RESUME

Sur le plateau néo-écossais la pêche à la crevette se poursuit dans trois endroits à des profondeurs supérieures à 200 m, les cuvettes de Louisbourg ou Région de Pêche à la Crevette 13 (RPC), Misaine (RPC 14), et Canso (RPC 15). Avant 1991 des navires provenant de la région du Golfe ont traditionnellement pêché ces endroits. Avec l'introduction de la grille Nordmøre et la participation de bateaux de Scotia-Fundy les débarquements augmentent, 1992 étant une année record.

En 1992, les navires de Scotia-Fundy représentent 77% du total des débarquements alors que les navires du Golfe, ce qui reste, 23%. L'effort pour les navires du Golfe a augmenté de 58 % depuis 1991. Il y a eu une légère baisse dans le taux de capture standardisé. Les prises accidentelles ont été moins fréquentes et plus basses que précédemment pour les navires du Golfe. Les navires de Scotia-Fundy n'avaient pas de prise accidentelle; ils devaient utiliser un chalut à crevettes avec une grille Nordmøre.

Pour les cinq dernières années on avait suggéré un TPA de 2,580 t. Durant cette période les PPUEs sont très semblables. Un effort accru a permis d'atteindre le quota dans les cuvettes de Canso et Misaine. Etant donné les changements importants opérant sur cette pêche, il serait indiqué de garder le même TPA et de surveiller l'effort de pêche grandissant.

INTRODUCTION

The Scotia-Fundy shrimp (*Pandalus borealis*) fishery has been concentrated primarily in three holes with depths >200m on the Eastern Scotian Shelf (NAFO Areas 4V and 4W) over the last 12 years. These areas are referred to as SFA13 (Shrimp Fishing Area) or Louisbourg Hole, SFA14 or Misaine Hole and SFA15 or Canso Hole (Figure 1). In 1992, about 1,830 t of shrimps were caught, the highest landings on record (Table 1). This amount represented approximately 71% of a quota of 2,580 t. Boats from Scotia-Fundy are actively participating in the fishery for the second year. Scotia-Fundy boats landed 77% of the total catch while the Gulf based boats landed the remaining 23%. The Eastern Scotian Shelf catch can be assigned as 62 t from Louisbourg, 1,168 t from Misaine, and 599 t from Canso according to log and sales slip information (Table 2). Effort for the Gulf based boats increased 58%, from that of 1991. The percentage of shrimp in relation to by-catch for the Gulf based boats has increased approximately 2 % over 1991. The use of the Nordmøre separator grate (Butler and Robert, 1991) by the Scotia-Fundy boats has completely eliminated the fish by-catch. Approximately 1.5 t was landed from SFA16 (NAFO area 4X) in 1992.

METHODS

Fishery Data

The commercial fishery data was extracted from logs completed and submitted by the fishermen. Commercial catch figures in Table 2 are from both the Scotia-Fundy and Gulf Statistics Branches and Foreign and Domestic Quota Monitoring (Fisheries Operations Branch, Halifax). In 1992, shrimps caught on the Eastern Scotian Shelf were fished by boats from both Scotia-Fundy regular and exploratory licensed vessels using the Nordmøre separator grate and Gulf based boats from eastern New Brunswick. The regular licenses or limited entry licenses are issued on a yearly basis along with a groundfish and other licenses. The fisherman must have held or banked the licenses the previous year to be issued licenses for the current year. The exploratory licenses are a limited number of permits issued once and valid only until the end of that year. Certain conditions apply to these permits (Butler and Robert, 1992). The Gulf based boats landed in both Scotia-Fundy and Gulf ports. To obtain reasonably accurate shrimp catch figures, the catches recorded by both the Scotia-Fundy and the Gulf Region Statistics Branches must be combined.

Statistics Branches in both regions compile their figures by NAFO areas and subareas although it might not always be the best way to sectorise the fisheries for different species. Historically, the three holes fished have been referred to as NAFO subarea 4Vn or SFA 13 for Louisbourg, 4Vs or SFA 14 for Misaine, and 4Wd or SFA15 for Canso. Unfortunately as these fishing holes may overlap NAFO areas and subareas (Butler-Connolly and Robert 1990), Loran bearings or latitude and longitude from the logged catch locations must be used to confirm the area in which the catch should be listed from.

A Yankee 36 trawl was used during the previous shrimp surveys (Etter and Mohn 1989). The commercial data had to be standardized for the comparison with results from past years. For comparisons of commercial gear types the effort also had to be standardized. Each gear type for the Gulf based boats was standardized to a Yankee 36 trawl and the correction factors used to standardize the effort before calculating the catch-rates. Effort from the Scotia-Fundy regular and exploratory boats cannot be standardized as the required information, height and wingspread (width) of the trawl, is not available for each boat. Each fisherman uses a trawl that has been modified to maximize catches for his boat. All catch rates for the Scotia-Fundy boats are unstandardized as the effort is not corrected for a Yankee 36 trawl.

In 1992 the Gulf based commercial vessels used five types of gear, a Labrador Shrimp trawl, a Sputnik trawl, a Nord Sea 938 trawl, a modified Terra Nova trawl, and an I.C. trawl. When they are standardized to a Yankee 36 the correction factors vary from 3.0 to 5.0 (Table 3).

Table 3 indicates slight differences in catch-rates between gear types. This could be attributed to the difference in size of the trawls, the number of days fished or, as had been indicated in past years, an overcorrection when standardizing for a Yankee 36 which is a much smaller trawl than the ones used commercially. There has been a tendency towards fishing with trawls that are much larger than the Yankee 36 in the past few years.

RESULTS

The Scotia-Fundy Region issued 25 regular shrimp licenses in 1992 (Table 4). All the licenses issued were for boats <19.8m L.O.A. (length over all). The licenses were limited to fishing in specific areas. There were 5 licenses issued for NAFO areas 4V and 4W; 16 licenses issued for NAFO area 4X only; and 4 licenses issued for areas 4V, 4W and 4X. The number of licenses had increased slightly in 1991. This can be attributed to the on-going interest in the shrimp fishery, the use of the Nordmøre separator grate and continued decrease in groundfish availability. These licenses are usually renewed along with other licenses each year. In 1992, 6 of these licenses actively directed for shrimp. There were 14 'exploratory' shrimp licenses issued in 1992. All 14 licenses actively participated in the fishery (Table 5); a sizable increase from 1991. A condition of the license is the use of the Nordmøre separator grate. The definition of active participation is fishing for a minimum of five days, landing the shrimp and submitting a log detailing the trip and/or the issuance of a sales slip recording landed catch.

The Gulf Region issued 22 shrimp licenses in New Brunswick in 1992 (Table 6). These licenses were issued for eastern Scotian Shelf areas 4Vn, 4Vs, and 4W (Shrimp Fishing Areas 13, 14, and 15). Of that number, 5 licenses were issued for boats <19.8m L.O.A. and 17 licenses issued for boats 19.8m to 30.5m L.O.A. The number of licenses has remained constant from 1984 to the present. In recent years only the 19.8m to 30.5m L.O.A. have landed shrimps from the Scotian Shelf. In 1992, 4 of these licenses from the Gulf region actively directed for shrimps.

The shrimp fishery continues to maintain catches below the yearly TAC. Until 1992, the catches had generally stayed below 1,000 t. The 1992 catches were the highest on record (Figure 2). The 1992 catches have increased by 227% over the 1991 figure mainly due to concentrated fishing by the Scotia-Fundy boats. Fishing effort for the Gulf based boats has increased, almost 58% from 1991. The Scotia-Fundy boats had a substantial rise in effort, approximately 314% from 1991. More fishing trips and a greater number of active boats (Scotia-Fundy) have contributed to higher effort levels.

Historically the Gulf based shrimp boats have fished every year on the eastern Scotian Shelf. Until 1991, the Gulf boats had caught between 91% and 100% of the shrimp landed while the Scotia-Fundy boats caught from 1 % to 9 % of the landings according to log and sales slip information (Table 7). The 10% by-catch limit was a major factor against Scotia-Fundy involvement in that fishery. The issuance of exploratory licenses and the introduction of the Nordmøre separator grate to the Scotia-Fundy license holders brought drastic changes. In 1991 the Scotia-Fundy boats landed the majority of the catch. In 1992 they landed 77% of the catch, while the Gulf based boats landed the remaining 23%. The lack of groundfish also contributed.

In 1992, the Scotia-Fundy boats directed their activity fishing both the Canso and Misaine holes with a minimum of fishing in Louisbourg hole at the end of the season (Table 7). The Canso hole was targeted until the TAC was reached (in this case exceeded) and the area closed. Then, effort shifted to Misaine hole until that quota was reached. Figure 3 indicates fishing locations when available for the Scotia-Fundy boats. The Gulf boats concentrated their activities in the Misaine hole, fishing Louisbourg hole as a second choice and with no reported fishing in Canso hole (Table 8). Available fishing locations for the Gulf-based vessels are indicated in Figure 4. The Misaine hole had a catch of 1,168 t, the highest catch on record. The Canso hole a catch of 599 t,

and the Louisbourg hole a catch of 62 t (combined landings from Scotia-Fundy and Gulf boats, Table 2).

Boats from New Brunswick in the 19.8m to 30.5m L.O.A. category logged catches in the Eastern Shelf areas. These boats accounted for 23% of the total catch. Of an Eastern Scotian Shelf total of 423 t, 44 t were logged catches reported from Louisbourg hole, 379 t logged catches from Misaine hole and no catches reported from the Canso hole (Table 8). Monthly fishery statistics according to logged catches for Gulf boats are in Table 9. The average yearly catch-rate for the Cape Breton area was 43.8 kg/h corrected for a Yankee 36 trawl. This was a minimal decrease from the 1991 catch-rate of 45.6 kg/h. The yearly catch-rate uncorrected for 1992 was 176.3 kg/h. This was a decrease from the 1991 uncorrected catch-rate of 197.9 kg/h. The yearly CPUE has been relatively constant from 1989 to 1991 with the slight decrease in 1992 (Figure 5). This may be attributed to the increase in number of boats fishing, their larger fishing trawls and the increased effort of the Scotia-Fundy fleet.

The Louisbourg hole had a yearly catch-rate of 52.8 kg/h from fishing in May and June. Misaine's yearly catch-rate was 43.0 kg/h from fishing May, June, July and August. There was no fishing in Canso hole (Table 9). The decrease in the Misaine catch-rate, from 51.2 kg/h in 1991, might be attributed to the increased fishing effort of the Scotia-Fundy fleet. All values were calculated using effort corrected for gear type from the Gulf based boats.

Scotia-Fundy boats in the <19.8m L.O.A. category accounted for 77% of the shrimp landed in 1992. Of a total of 1,406 t, the exploratory boats landed 841 t and the regular boats landed 565 t. According to logged catches the exploratory boats fished 17 t from Louisbourg hole. There were no reported landings from Louisbourg for the regular boats. Approximately 789 t were landed from Misaine hole, the exploratory boats contributed 570 t and the regular boats 218 t. Approximately 599 t were landed from Canso hole, exploratory boats accounted for 253 t and the regular boats landed 346 t (Table 8). Fishery statistics for the logged catches of the Scotia-Fundy exploratory and regular boats are in Tables 10 and 11. The average yearly unstandardized catch-rate from the exploratory boats was 143.9 kg/h (Table 10), a slight increase from 1991 (Butler and Robert, 1992). The unstandardized catch-rate for the regular boats was 126.8 kg/h (Table 11), a slight increase from 1991 (Butler and Robert, 1992). The difference in the catch-rates might be attributed to the limited fishing activities of the regular boats and the increased number of exploratory boats active in the fishery.

The monthly CPUEs for the Gulf based boats for the years 1987 through 1992 are shown in Figure 6. The general trend indicates low catch-rates during the early months of the year, peaking during June and July, and decreasing toward the end of the year. This may be attributed to increased fishing effort during peak months. In some cases monthly CPUE has been based on only a few fishing days in a particular fishing area in that month; this may also account for higher or lower values before and after those peak months. The month of July in 1988 when CPUE decreased below that of either June or August is an exception to the general trend but then a minimum of commercial fishing took place during those particular months. Months with no reported fishing activity (zero CPUE in graphs) have varied over the years.

Unstandardized catch-rates for exploratory boats followed similar trends as the standardised rates for Gulf based boats. Intraseasonal trends are illustrated in Figure 7 for five of the Scotia-Fundy boats that fished the season. The catch-rates peak in June (3 boats out of 5) and then steadily decrease as the year progresses. High values for Boat 2 in July and Boat 4 in September are due to fishing only a few days of each of these months in a particular area.

The percentage of shrimp versus by-catch for Gulf based boats in the 1992 monthly catch profile (Table 12) increased from the similar period in 1991 and is much higher than that of 1990. The percentage composition of the by-catch showed a decrease again, this year, in the primary species, cod and redfish. This might be attributed to the continued lack of availability of groundfish in 1992. It could also be due to the efficiency of larger gear. The captains could also be directing more for shrimp. Some of the by-catch species are usually found only in specific areas, on a seasonal basis.

The Scotia-Fundy boats indicated that there was very little or no by-catch associated with the shrimp landings when using the Nordmøre separator grate. Fishermen reported that the small amount of by-catch usually consisted of juvenile fish which had gone through the grate to the codend.

During 1992 there was approximately 1.5 t shrimp landed from Shrimp Fishing Area 16 (NAFO area 4X).

DISCUSSION

The recommended TAC for shrimp in 1993 is 2,580 t (Table 1). This is the figure used for the past five years. The CPUEs for the Gulf based boats have been quite similar for the last five years. The CPUE's for the Scotia-Fundy boats have been quite similar for the past two years. This has been the case despite increased effort by both fleets. No research survey work has taken place since 1988 to obtain an independent biomass estimate. The stability of catch-rates would suggest that keeping the TAC at the same level has not been detrimental to the stock biomass in the recent past.

In the last two years this fishery has become quite important. The greater number of Scotia-Fundy license holders resulted in an increased participation in this fishery and the highest landings on record. In 1992, the landings from the Scotia-Fundy boats exceeded those for the Gulf boats although Gulf boats made a few more trips in 1992. Although the 10% by-catch limit is still in effect the use of the Nordmøre separator grate has eliminated by-catch problems. Some fishermen report that on rare occasions juvenile groundfish will get trapped in the codend after passing through the grate.

The slight increases in CPUE's in 1990 and 1991 and then the marginal decrease in 1992 should be interpreted with caution (Table 2). There was definitely an increase in effort. The Gulf based boats seemed to adhere to the 10% by-catch limit while directing for shrimp. More selective trawls and/or the lack of groundfish may have a contributing effect.

In 1992, the quotas in both Canso and Misaine holes were exceeded for the first time in the history of the fishery; the areas were closed prior to the end of the season. Considering the important changes taking place in this fishery and the potential for increased effort, it would be advisable to keep the TAC at the same level.

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Table 1. Shrimp quotas (t) and actual catches (t) for Scotian Shelf (Shrimp Fishing Areas 13, 14 and 15), (NAFO Area 4V and 4W) 1980-1992.

Year	Quotas (t)			Total	Actual Catch (t)
	SFA 13 (Louisbourg)	SFA 14 (Misaine)	SFA 15 (Canso)		
1980	1553	2382	1086	5021	984
1981	---	---	---	---	454
1982	1400	1800	1000	4200	569
1983	2000	2400	1400	5800	1010
1984	1800	2500	1400	5700	928
1985	1790	2420	1350	5560	133
1986	1460	1600	740	3800	126
1987	1070	860	210	2140	152
1988	1160	1050	370	2580	82
1989	1160	1050	370	2580	93
1990	1160	1050	370	2580	104
1991	1160	1050	370	2580	804
1992	1160	1050	370	2580	1829**
1993*	1160	1050	370	2580	

*Proposed values.

**Preliminary values.

Table 2. Eastern Scotian Shelf (NAFO 4V, 4W) commercial shrimp landings and CPUE.

Year	Catch (t)				CPUE (kg/h)*	
	Louisbourg	Misaine	Canso	Total	Unstd.	Std.**
1977	---	---	---	269	128.5	104.5
1978	---	---	---	306	121.9	97.3
1979	295	8	534	838	174.6	128.0
1980	491	133	360	984	130.9	97.3
1981	418	26	10	454	131.8	92.8
1982	316	52	201	569	128.0	80.4
1983	483	15	512	1010	127.7	81.2
1984	600	10	318	928	109.5	77.6
1985	118	---	15	133	75.4	40.7
1986	126	---	---	126	87.3	58.1
1987	148	4	---	152	90.7	39.9
1988	75	6	1	82	85.1	51.0
1989	91	2	---	93	133.4	44.4
1990	90	14	---	104	134.5	44.9
1991	81	583	140	804	197.9	45.6
1992***	62	1168	599	1829	176.3	43.8

* CPUE's are from Gulf based vessels.

** Standardized to a Yankee 36 trawl.

*** Preliminary Values.

Table 3. Corrected catch-rates (kg/h) for the Gulf based boats fishing off southeastern Cape Breton, 1992. All values are preliminary.

No. of boats	Gear type	Louisbourg Area	Misaine Area	Canso Area	Correction factor
1	I.C. Trawl	31.5	32.2	---	4.9
1	Nord Sea 938	54.9	58.9	---	3.0
1	Sputnik	50.9	46.5	---	3.0
1	Terra Nova (mod)	10.7	43.5	---	4.9

Table 4. Regular shrimp licenses issued in Scotia-Fundy for 1985 to 1992 according to designated fishing areas.

Year	NAFO Area			Total	Active
	4V, 4W	4X	4V, 4W, 4X		
1985	7	17	2	26	0
1986	6	18	3	27	0
1987	4	17	3	24	4
1988	5	15	3	23	4
1989	5	15	3	23	3
1990	4	14	3	21	1
1991	5	17	3	25	4
1992	5	16	4	25	6

Source: Licensing Unit, Department of Fisheries & Oceans, Scotia-Fundy Region.

Table 5. Exploratory shrimp licenses issued in Scotia-Fundy for 1990 to 1992.

Year	Issued	Active
1990	12	3
1991	9	6
1992	14	14

Source: Licensing Unit, Department of Fisheries & Oceans, Scotia-Fundy Region.

Table 6. Gulf shrimp licenses by boat length overall (L.O.A.) issued for Scotia-Fundy for 1984 to 1992.

Year	<19.8m LOA	19.8m-30.5m LOA	Active
1984	5	17	11
1985	5	17	4
1986	5	17	5
1987	5	17	3
1988	5	17	3
1989	5	17	2
1990	5	17	3
1991	5	17	5
1992	5	17	4

Source: Licensing Unit, Department of Fisheries & Oceans, Gulf Region.

Table 7. Proportion (%) of the catch by Gulf based and Scotia-Fundy based vessels from log and sales slip information.

Year	Gulf Region (%)	Scotia-Fundy (%)
1985	100.0	0.0
1986	100.0	0.0
1987	91.0	9.0
1988	96.0	4.0
1989	96.0	4.0
1990	99.0	1.0
1991	37.0	63.0
1992	23.0	77.0

Table 8. Catch (kg) for 1992 for the Gulf and Scotia-Fundy shrimp license holders by fishing area.

Area	Gulf	Scotia-Fundy		Total
		Exploratory	Regular	
Louisbourg	44,274	17,409	---	61,683
Misaine	378,956	570,216	218,498	1,167,670
Canso	---	252,936	346,542	599,478
Total	423,230	840,561	565,040	1,828,831

Table 9. Monthly commercial shrimp fishery statistics for Gulf based boats for the Louisbourg, Misaine and Canso areas in 1992. All values are preliminary.

		May	June	July	August	Total
Louisbourg:	Catch (kg)	23,029	21,245	---	---	44,274
	Effort (uncor)	147	98.5	---	---	245.5
	CPUE (kg/h)	156.7	215.7	---	---	180.3
	Effort (cor)	463.8	375.3	---	---	839.1
	CPUE (kg/h)	49.7	56.6	---	---	52.8
Misaine:	Catch (kg)	169,756	187,607	16,525	5,027	378,915
	Effort (uncor)	934	1,055	114	52	2,155
	CPUE (kg/h)	181.8	177.8	145.0	96.7	175.8
	Effort (cor)	3,970.5	4,143.5	433.2	254.8	8802.0
	CPUE (kg/h)	42.8	45.3	38.2	19.7	43.0
Canso:	Catch (kg)	---	---	---	---	---
	Effort (uncor)	---	---	---	---	---
	CPUE (kg/h)	---	---	---	---	---
	Effort (cor)	---	---	---	---	---
	CPUE (kg/h)	---	---	---	---	---
All areas:	Catch (kg)	192,785	208,852	16,525	5,027	423,189
	Effort (uncor)	1,081	1,153.5	114	52	2400.5
	CPUE (kg/h)	178.3	181.1	145.0	96.7	176.3
	Effort (cor)	4,434.3	4518.8	433.2	254.8	9641.1
	CPUE (kg/h)	43.5	46.2	38.1	19.7	43.8

Table 10. Monthly commercial unstandardized fishery statistics for Louisbourg, Misaine and Canso holes from the Scotia-Fundy exploratory boats in 1992. Landings are 840,561 kg. All values are preliminary.

Area		April	May	June	July	August	September	Total
Louisbourg	Catch(kg)	---	---	---	6,327	---	---	6,327
	Effort(h)				40			40
	CPUE(kg/h)				158.2			158.2
Misaine	Catch(kg)	12,161	35,525	107,579	139,965	32,007	28,952	356,189
	Effort(h)	69.5	241.0	684.0	924.5	231.1	221.0	2371.1
	CPUE(kg/h)	175.0	147.0	157.3	151.4	138.5	130.8	150.2
Canso	Catch(kg)	13,319	71,537	78,194	59,652	---	1,033	223,735
	Effort(h)	89.5	502	559.8	503.4		8	1,662.7
	CPUE(kg/h)	148.8	142.5	139.7	118.5		129.1	134.6
Total	Catch(kg)	25,480	107,062	185,773	205,944	32,007	29,985	586,251
	Effort(h)	159.0	743.0	1,243.8	1467.9	231.1	229.0	4073.8
	CPUE(kg/h)	160.3	144.1	149.4	140.3	138.5	130.9	143.9

Table 11. Monthly commercial unstandardized fishery statistics for Louisbourg, Misaine and Canso holes from the Scotia-Fundy regular boats in 1992. Landings are 565,040 kg. All values are preliminary.

Area		April	May	June	July	August	September	Total
Louisbourg	Catch(kg)	---	---	---	---	---	---	---
	Effort(h)							
	CPUE(kg/h)							
Misaine	Catch(kg)	---	10,588	37,991	71,718	31,813	3,436	155,546
	Effort(h)		97.0	191.5	598.5	330.3	32.0	1249.3
	CPUE(kg/h)		109.2	198.4	119.8	96.3	107.4	124.5
Canso	Catch(kg)	---	47,865	89,716	43,858	3,011	---	184,450
	Effort(h)		335.5	601.3	463.8	31.0		1,431.5
	CPUE(kg/h)		142.7	149.2	94.6	97.13		128.9
Total	Catch(kg)	---	58,453	127,707	115,576	34,824	3,436	339,996
	Effort(h)		432.5	792.8	1062.3	361.3	32.0	2,680.8
	CPUE(kg/h)		135.2	161.1	108.8	96.4	107.4	126.8

Table 12. Percentage of the catch composition of commercial shrimp trips (Gulf based boats) from Eastern Scotian Shelf on a monthly basis when available for the last 6 years (Etter and Mohn 1988, 1989, Butler-Connolly and Robert 1990, and Butler and Robert 1991, 1992). All values for 1992 are preliminary.

1987	Species	June	July	September
	Shrimp	56.7	69.8	49.1
	Cod	32.8	20.7	3.3
	Redfish	5.4	2.9	43.8
	Flatfish	3.1	2.0	1.8
	Hake	0.1	---	0.4
	Halibut	0.6	0.1	---
	Haddock	0.1	---	0.2
	Pollock	0.9	4.2	0.7
	Misc	0.3	0.4	0.8
	Total shrimp catch (kg)	14,889	34,766	11,793

1988	Species	June	July	August	September	November	December
	Shrimp	84.4	82.0	80.3	49.9	47.6	67.7
	Cod	12.3	3.5	4.3	49.3	14.1	32.3
	Redfish	0.8	7.6	7.8	0.8	38.4	---
	Flatfish	2.1	6.7	7.6	---	---	---
	Hake	---	---	---	---	---	---
	Halibut	---	0.2	---	---	---	---
	Haddock	---	---	---	---	---	---
	Pollock	0.4	---	---	---	---	---
	Misc	---	---	---	---	---	---
	Total shrimp catch (kg)	44,182	28,828	1,471	4,284	2,465	635

1989	Species	May	June	July
	Shrimp	71.8	88.2	87.4
	Cod	5.2	9.4	0.9
	Redfish	20.7	2.4	6.2
	Flatfish	0.8	---	0.6
	Hake	---	---	---
	Halibut	1.0	---	4.9
	Haddock	---	---	---
	Pollock	0.5	---	---
	Misc	---	---	---
	Total shrimp catch (kg)	10,083	52,268	16,231

Table 12. continued

1990	Species	May	July	August	September	
	Shrimp	91.2	92.8	89.5	82.7	
	Cod	8.0	4.0	6.9	11.7	
	Redfish	0.8	2.8	2.5	0.3	
	Flatfish	---	0.1	0.4	5.3	
	Hake	---	---	---	---	
	Halibut	---	0.3	0.7	---	
	Haddock	---	---	---	---	
	Pollock	---	---	---	---	
	Misc	---	---	---	---	
	Total shrimp catch (kg)	17,543	30,709	40,382	15,166	
1991	Species	May	June	July	August	September
	Shrimp	96.0	95.9	97.9	87.1	87.1
	Cod	3.0	2.4	0.5	---	---
	Redfish	---	0.2	0.3	12.7	12.7
	Flatfish	---	1.2	1.2	---	---
	Hake	---	---	---	---	---
	Halibut	0.4	0.1	0.1	0.3	0.3
	Haddock	---	---	---	---	---
	Pollock	---	---	---	---	---
	Misc	0.6	0.2	---	---	---
	Total shrimp catch (kg)	24,966	173,778	55,810	3,136	3,225
1992	Species	May	June	July	August	
	Shrimp	98.3	96.5	98.5	97.2	
	Cod	0.3	1.3	0.4	0.1	
	Redfish	0.1	0.1	---	---	
	Flatfish	0.8	1.8	1.1	2.7	
	Hake	---	---	---	---	
	Halibut	---	---	---	---	
	Haddock	---	---	---	---	
	Pollock	---	---	---	---	
	Misc	0.5	0.3	---	---	
	Total shrimp catch (kg)	154,612	108,930	16,525	5,027	

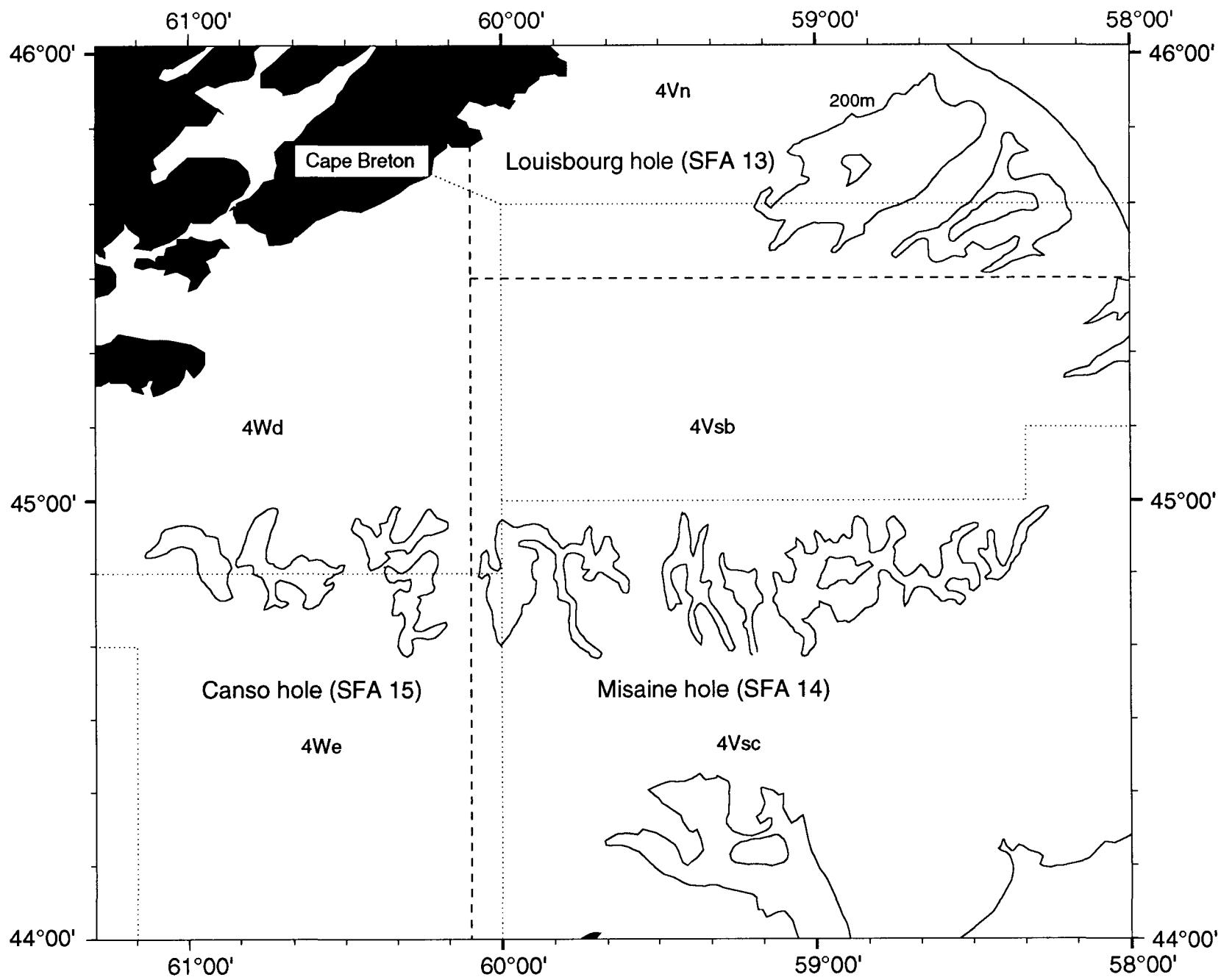


Figure 1. Eastern Scotian Shelf shrimp fishing areas (SFA noted by dashed lines, NAFO areas noted by dotted lines).

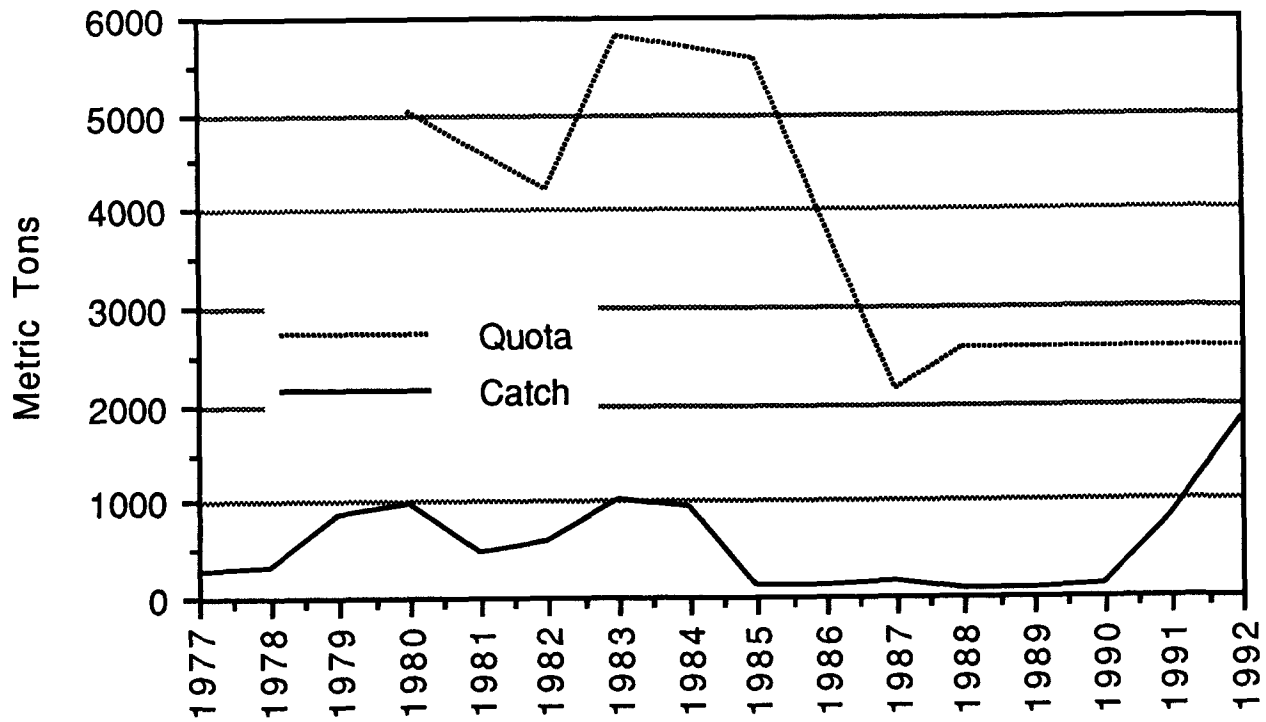


Figure 2. Eastern Scotian Shelf shrimp quotas (t) and catches (t) for the years 1987 to 1992 inclusive.

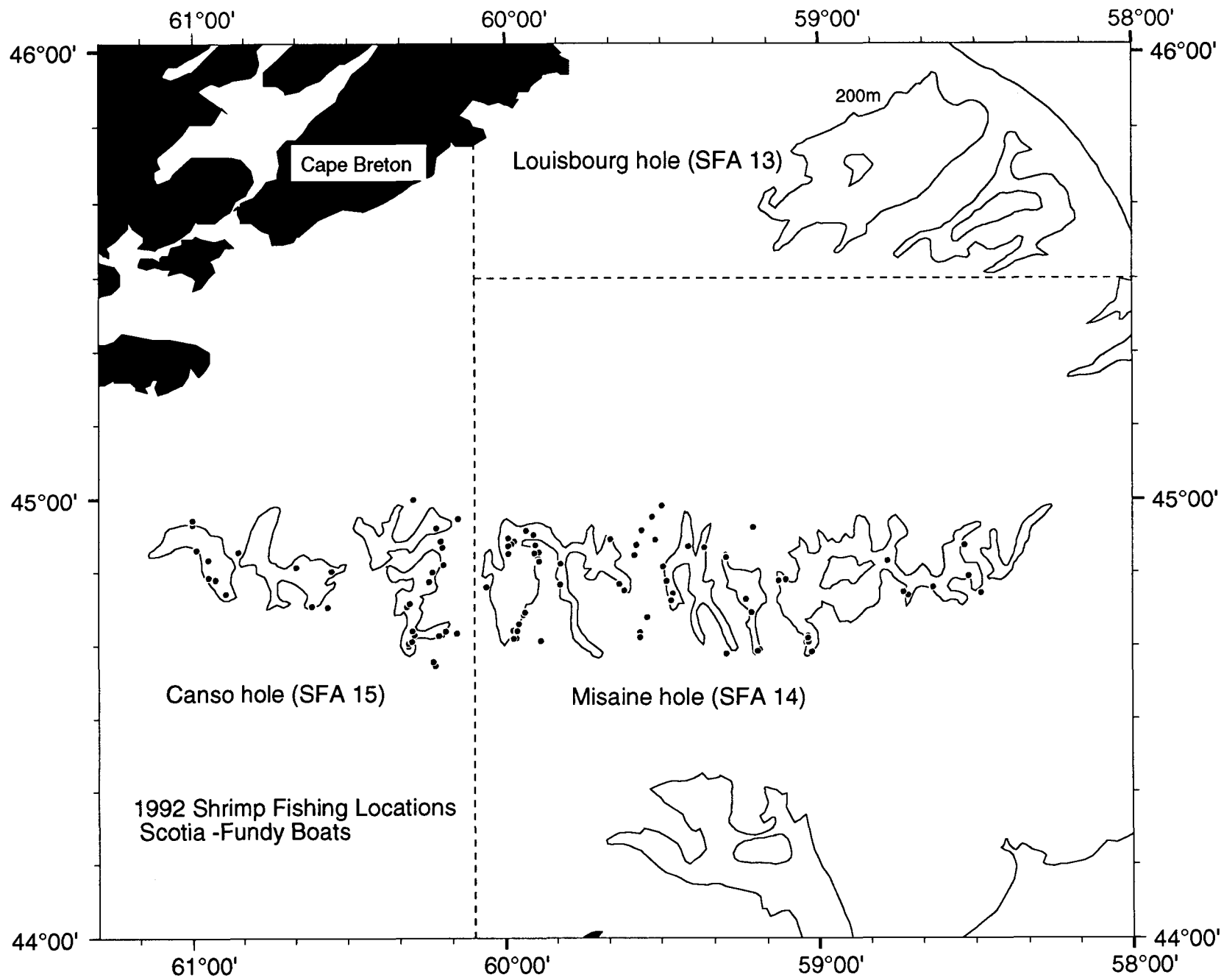


Figure 3. 1992 Eastern Scotian Shelf shrimp fishing locations for the Scotia - Fundy boats.

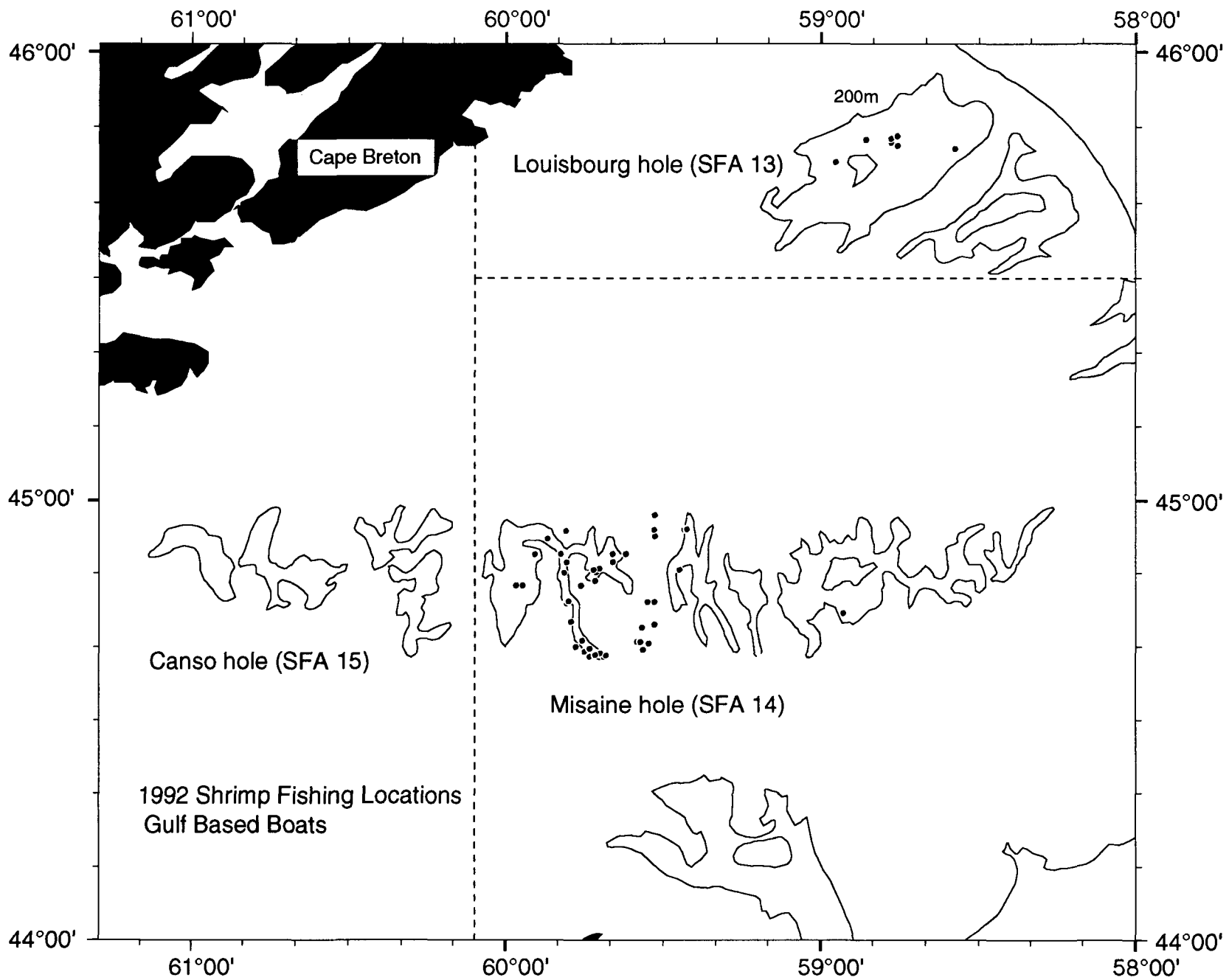


Figure 4. 1992 Eastern Scotian Shelf shrimp fishing locations for the Gulf boats.

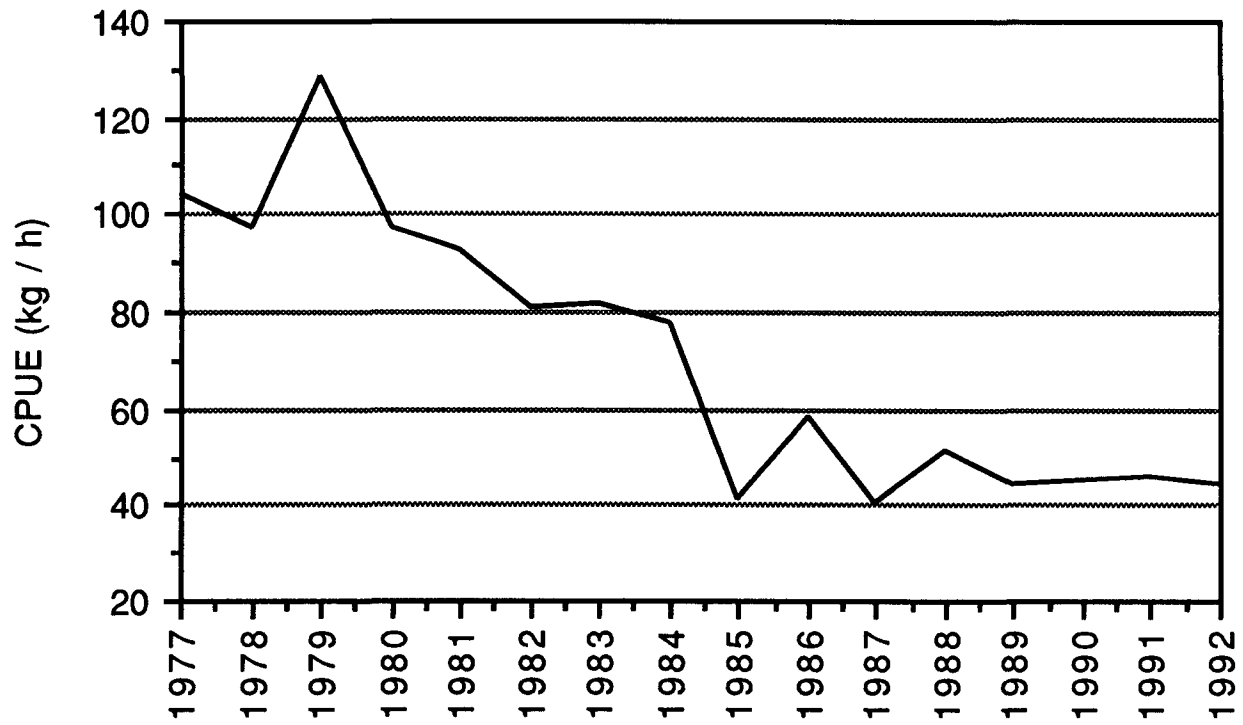


Figure 5. Eastern Scotian Shelf standardized shrimp CPUE (kg/h) from the Gulf boat from the years 1977 to 1992 inclusive.

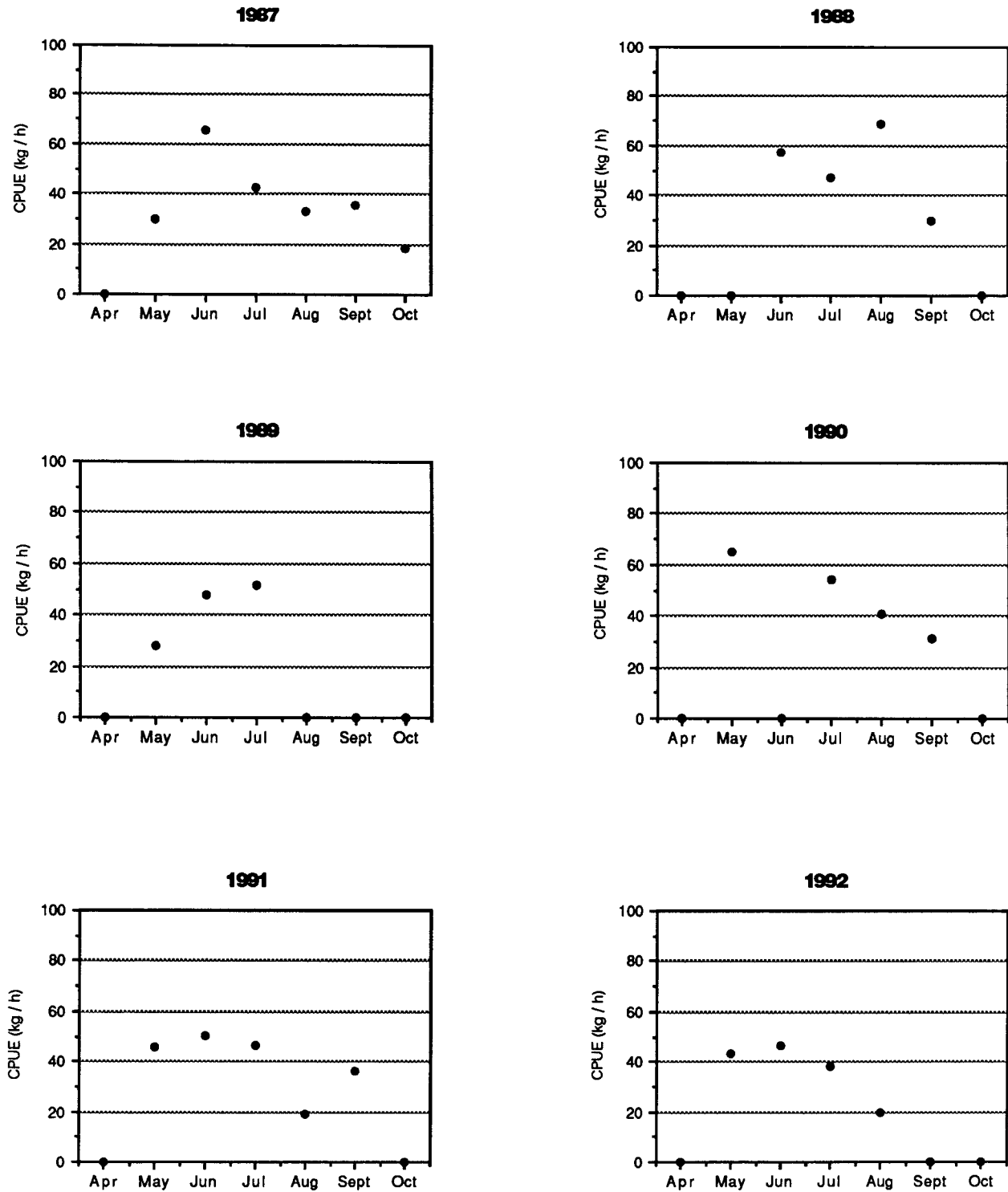


Figure 6. Monthly CPUE (kg / h) for the years 1987 to 1992 inclusive.

Seasonal Profile

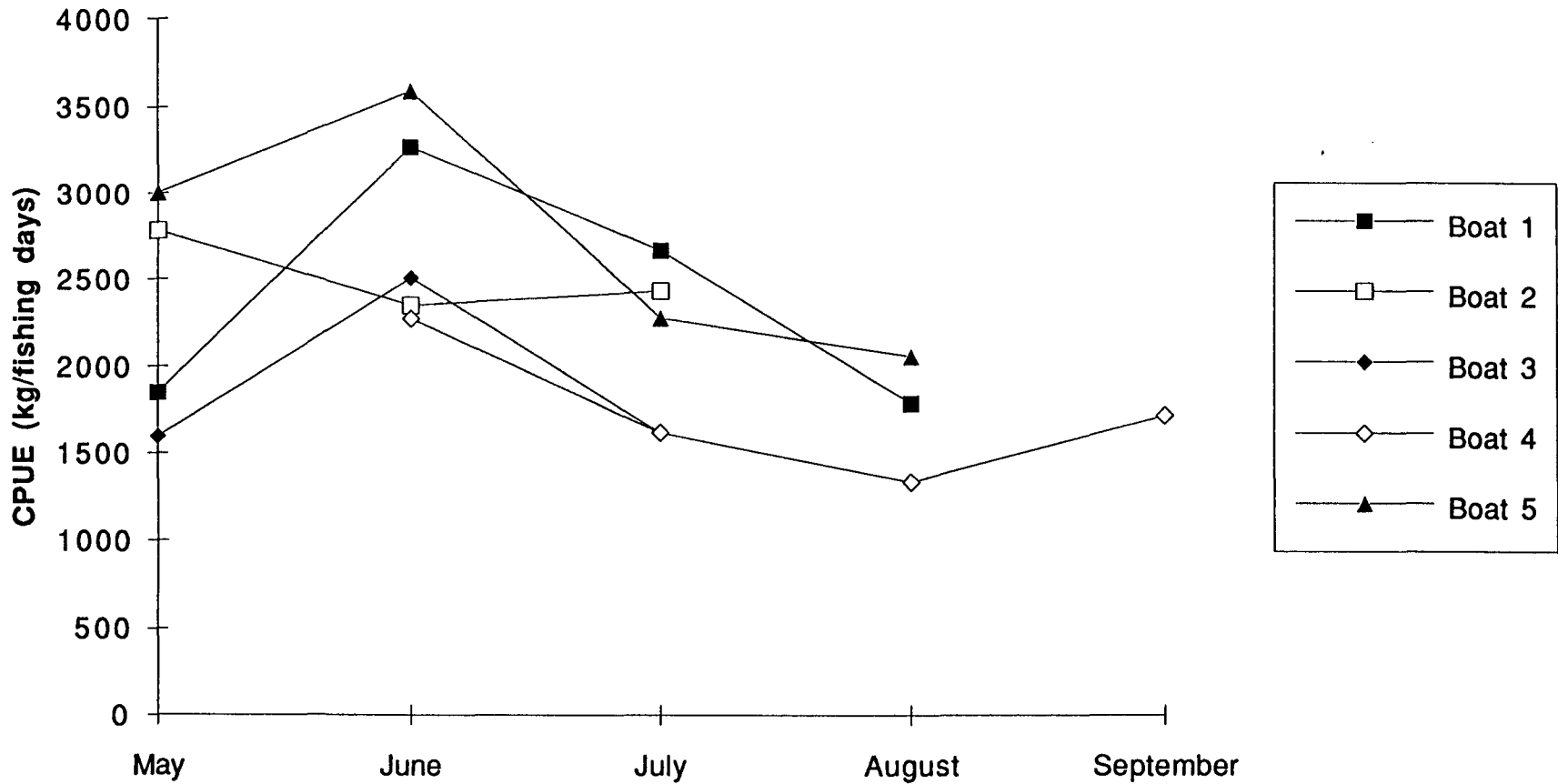


Figure 7. CPUE (kg/fishing day) seasonal profile of five Scotia - Fundy boats.