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An Assessment of the Canadian Offshore Lobster Fishery (LFA 41) for 1986-87

By

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Abstract

Catch, and effort data, changes in the size of lobsters in the catch and data on lobster movements are presented. The fishery has caught 99% of the TAC since the new management plan was introduced in 1985. Since 1982 landing trends have generally followed changes in effort. CPUE's were stable on Southwest Browns and in Georges Basin over the 1985-87 period, declined in Crowell Basin from a high in 1985, and rose on Southeast Browns and Georges Bank from a low in 1982 and 1983 respectively. Landings and effort were down in the fall of 1987 due to an apparent lack of the usual influx of lobsters to Crowell and Georges Basins. Analysis of market size groups in the landed catch shows an increase in the proportion of the catch in the 1-3 lb (0.5-1.4 kg) size group since 1984. Fishermen are concentrating on those grounds with smaller lobsters, but on individual grounds the increase in smaller lobsters was also observed. It is too soon to determine if the trend is the result of changes in the lobster population size structure or is related to changes in gear design introduced in 1983. To date the fishery has had no measurable effect on the offshore stock or the inshore fisheries of Nova Scotia.

Resume

On présente des données sur les prises de homard et sur l'effort de pêche ainsi que sur les changements de taille et sur les mouvements de homards. Depuis l'introduction du nouveau plan de gestion, en 1985, les pêcheurs ont capturé 99 p. 100 du TPA. Depuis 1982, la tendance des débarquements a généralement suivi les changements survenus dans l'effort. De 1985 à 1987, les prises par unité d'effort dans le sud-ouest du banc Browns et dans le bassin Georges ont été stables, tandis qu'elles ont chuté dans le bassin Crowell par rapport aux hauts niveaux atteints en 1985 et ont augmenté dans le sud-est du banc Browns et sur le banc Georges, où elles avaient été basses en 1982 et en 1983 respectivement. Les débarquements et l'effort ont chuté à l'automne de 1987, l'afflux habituel de homard vers les bassins Crowell et Georges ne s'étant apparemment pas produit. L'analyse des groupes de homard de taille commerciale dans les prises débarquées depuis 1984 révèle un accroissement de la proportion de homards du groupe des 1 à 3 livres (0,5 à 1,4 kg). Les pêcheurs concentrent leurs activitiés sur les bancs de petits homards, mais même sur d'autres bancs on a observé une augmentation du nombre de homards de petite taille. Il est trop tôt pour déterminer si cette tendance est le résultat d'un changement dans la taille de l'ensemble de la population de homard ou si elle est reliée aux modifications apportées aux engins en 1983. Jusqu'ici, la pêcherie n'a pas eu d'effet mesurable sur le stock hauturier ou sur les pêches côtières en Nouvelle-Ecosse.

Introduction

Historical Outline

The Canadian offshore lobster fishery operates in LFA 41 (Figure 1; Appendix 1,2) along the edge of the Scotian Shelf, from below Baccaro Bank to Truxton Swell in the Gulf of Maine, and along the outer edge of Georges Bank as far south as Corsair Canyon . The fishery began in 1971 when licences were made available to the 56 vessels displaced by the closure of the swordfish fishery. Five licences were issued in 1972, and the fleet expanded to eight before new entries were stopped in 1975. The history of catch, effort, and management methods between 1971 and 1986 are reviewed in Pezzack and Duggan 1985 and 1987.

A 3 year experimental Offshore Lobster Management Plan was introduced in 1985. The major points of the plan were: 1) the introduction of Enterprise Allocations (EAs); 2) a Total Allowable Catch (TAC) of 720 t was applied to 4X and 5Ze, and equally divided between licences; and 3) a TAC season was set from August 1 to July 31 (later changed to Oct 16 to Oct 15).

The new TAC was based on the old 4X quota of 408 t, plus 212 t (the mean 5Ze landings for 1978-1984), plus 100 t, derived from a conservative estimate of American landings from the area prior to the ICJ decision. The new 720 t TAC was 225 t higher than the average landings during the 1980-84 period and 36 t higher then the previous highest landings in 1978.

The TAC season was changed from Jan. 1-Dec. 31 to Aug. 1- July 31 at the request of the licence holders. The season allows industry to better match catch with market demands. Landings taken prior to August 1, 1985, were not included against the 1985-86 TAC. The season was again changed in 1986, at industry's request, to October 16 -October 15. To facilitate this change the 1985-86 season was extended and the TAC for the 14.5 mo. season was set at 870 t.

The increased TAC, introduction of EAs, and change in season were introduced to increase the profitability of the existing fishery, which economic analyses indicated was low (pers. Comm. J. Nelson Economics Branch, DFO Halifax). No new licences were issued. The EAs, TACs, and the number of licences were to be examined during the review of the experimental management plan in 1988-89. The management plan was superceded on January 1, 1988, when the proposal for four new licences[1] and a change in the quota system were announced (Table 1).

Table 1: Quota changes resulting from new licences

		4X/5Ze	4W*	TOTAL	#Vessels
	1987	720 t	0 t	720 t	8
	1988	720 t	360 t	1080 t	12
	Licence Holder				
1987	Existing 8 licences	90 t	0 t	90 t	
NEW	Existing 8 licences	75 t	15 t	90 t	
	4 new licences	30 t	60 t	90 t	

* Prior to 1988 the 720 t TAC applied to all of LFA 41 (5Ze, 4VWX)

[1] New licences have yet to be issued. The proposed experimental fishery was suspended on April 29, 1988, until further studies are completed and the old management plan reinstated.

The new lobster licences will not increase the total catch in 4X/5Ze. All increased landings are to be taken in 4W. Thirty metric tons or 33% of the new licence quota is allocated to 4X/5Ze, while the existing licences have 15 t or 17% of their quota allotted to 4W.

Unlike most TAC-managed fisheries, we are unable to estimate the population size, fishing mortality, or recruitment rate. Evaluating population size frequency distribution or changes in it is also difficult because it is at present impossible to obtain size-frequency data independent of the bias introduced by the trap and lobster behavior (Caddy 1977; Lovewell and Addison 1986; Miller pers.comm (Biol. Sc. Br.,DFO, Halifax)). Without additional biological information, caution must be observed in any TAC increases. The data presented in this paper examine the catch effort and size trends in light of recent scientific work. The management of the offshore fishery is strongly influenced by the potential link with the larger inshore fishery of southwestern Nova Scotia. The original hypothesis of Stasko (1978) continues to influence the management, even though the hypothesized link between them has never been proven; and the potential for a direct stock recruitment relationship has been questioned (Pezzack 1987).

Catch/Effort Trend - 1986-87

TAC Season

In 1985-86 and 1986-8, 97 and 99% of the quota were taken respectively. In both seasons 50% of the TAC was taken by March (Figure 2). Early landings (Oct.-Dec.) for the 1987-88 season are 100 t lower than the same period in 1986.

Annual Landings and Effort

Annual landings have been reported since the fishery began, but since the new TAC year was introduced in 1985 they are no longer directly related to the TAC or the fleet's fishing strategy. Annual landings will continue to be reported for continuity with past reports and until there is a sufficient time series of TAC year data.

Annual landings (Table 2, Figure 3) and effort peaked in 1986 at 799 t, and 268,000 trap hauls (TH) (Tables 2 and 3). Annual landings declined to 618 t in 1987 for two reasons: 1) the high fall landings in 1986 resulted in a large percentage of the 1986-87 TAC being taken in 1986 and a small percentage in the Jan-Oct period of 1987; and 2) high fall landings did not occur in 1987.

Landings track closely with changes in effort (Figure 4). The major exceptions were on Southeast and Southwest Browns Bank, and Georges Bank in 1982 and on Georges Bank 1983. Both effort and landings were down on Southeast Browns in 1986 and 1987, caused to a large extent by a shift of effort to the Northeast Channel area (Crowell and Georges Basin, and Southwest Browns) where the lobsters are smaller (with a higher price per kilogram), the bottom is easier to fish, and the quality of lobsters higher (hard shell, survival during holding and shipping). Decreased effort and landings in Crowell and Georges Basin in 1987 were due to an absence of the usual large fall influx of lobsters to these areas.

CPUE's for 1985-87 rose on the outer shelf (Southeast Browns and Georges Bank), while CPUE's remained relatively constant on Southwest Browns, and in Georges Basin, but declined in Crowell Basin (Figure 5).

Table 2. Annual Canadian offshore lobster landings (t) and total effort

Year	No. of vessels	West Browns	Southeast Browns	Total 4X	Georges Bank (5Ze)	Total	Landed Value ($,000)	Total Effort THx1000
1971	5	0	8	8	92	100	177	-
1972	6	22	158	180	154	334	785	-
1973	7	136	181	317	176	493	1,166	68
1974	6	132	149	281	135	416	1,059	135
1975	8	171	201	372	173	545	1,527	200
1976	7	378	118	496	182	678	2,167	238
1977	8	290	68	358	277	635	1,971	240
1978	8	297	84	381	303	684	2,249	230
1979	8	215	158	373	236	609	2,175	217
1980	8	147	210	357	192	549	2,066	185
1981	7	136	247	383	189	572	2,348	162
1982	8	135	142	277	173	450	2,232	210
1983	8	200	114	314	156	470	2,659	228
1984	7	153	118	271	164	435	2,634	197
1985	8	366	210	576	201	777	5,407	262
1986	8	408	170	578	221	799		268
1987	7	350	115	465	152	618		192

Table 3: Catch (C) (kg), effort (E).(Trap Hauls x1,000) and CPUE (kg/TH)

Year	CROWELL BASIN			SW BROWNS			GEORGES BASIN			SE BROWNS			GEORGES BANK		
	C	*E*	*CPUE*	*C*	*E*	*CPUE*	*C*	*E*	*CPUE*	*C*	*E*	*CPUE*	*C*	*E*	*CPUE*
1981	0	0	-	121.9	44.4	2.8	13.9	8.1	1.7	246.5	60.6	4.1	181.3	46.9	3.9
1982	26.3	10.5	2.5	105.4	56.2	1.9	7.8	3.7	2.1	140.1	77.5	1.8	166.0	61.0	2.7
1983	51.7	20.9	2.5	137.1	62.6	2.2	13.9	12.8	1.1	115.0	51.6	2.2	156.6	81.8	1.9
1984	43.2	11.5	3.8	93.4	50.6	1.8	34.5	18.7	1.8	112.5	47.3	2.4	145.9	67.6	2.2
1985	49.8	11.4	4.4	138.7	47.0	3.0	267.5	86	3.1	207.8	74.2	2.8	133.8	43.2	2.6
1986	95.4	27.5	3.5	143.5	53.8	2.7	235.3	83.3	2.8	169.3	51.5	3.3	155.8	52.1	3.0
1987	40.4	14.1	2.9	119.8	38.6	3.1	190.3	67.8	2.8	114.9	32.0	3.6	152.2	40.1	3.8

Movement

Tag recapture locations from offshore tagging studies are given in Figures 6-8. Only lobsters at large >30 days and which moved >50km are shown.

Corsair Canyon (Figure 6)

Lobsters tagged in Corsair Canyon continue to be recovered predominantly by American trawlers on the shoal areas of Georges Bank. There has been little recorded movement to Browns Bank or the Scotian Shelf.

Georges Basin (Figure 7)

Movement from Georges Basin to Georges Bank has been observed, which is contrary to last year's report (Pezzack and Duggan 1987). The relationship between Georges and Browns Banks will not be understood until more fall and winter tag releases occur.

Northeastern Georges Bank (Figure 8)

Lobsters tagged on the northeastern edge of the Bank moved predominantly south and southwest. One was recaptured on Southwest Browns fishing grounds and another near the coast of Maine.

Lobster Size Trends

Market Size Groups

Long-term and seasonal trends in the size of lobsters landed were examined by analyzing market size groups. Lobsters are divided by buyers into five market categories when landed; 1-3 lb (0.5-1.4 kg), 3-8 lb (1.4-3.6 kg), +8 lb (+3.6 kg), and 1-3 lb and +3 lb culls (missing claws, deformed claws, shell damage). This information is recorded on sales slips submitted to the Department of Fisheries and Oceans. Sales slip data exist from 1973.

The overall shift in the proportion of the size groups were due in part to gear changes and shifts in effort between grounds with different mean sizes. The increase in the 1-3 lb class during the early 1970s (Figure 9) was due to changes from top entry conical to side-entry lobster traps, and the increased effort on Browns Bank with its smaller mean size of lobster. The proportion of 1-3 lb lobsters declined in the late 1970s coincided with increased effort on Georges Bank, as a result of the 4X quota introduced in 1977, and increased effort on Southeast Browns, which like Georges Bank, has a lower proportion of smaller lobsters.

The proportion of the catch landed in the 1-3 lb class has increased dramatically since 1983. The reasons may be: 1) a change in gear selectivity, 2) the shift of effort away from Southeast Browns and Georges Banks to Crowell Basin and the Georges Basin, areas with their smaller lobsters, and 3) an actual change in the size structure of the lobsters on specific grounds.

Gear changes occurred in the early 1980s. The smaller single-parlour trap, which in the early 1980s represented 20-25% of the traps in use, were phased out. As well modifications in the trap head and entry designs were introduced in 1983, in an attempt to increased overall catch and in particular the catch of the smaller lobsters. No data exist to confirm or deny the claims of higher catch rates and smaller lobsters.

Effort shifted from Southeast Browns to Crowell Basin, when catches declined dramatically in the summer of 1982. A further shift of effort from Southeast Browns and Georges Bank occurred in the fall of 1984, following the ICJ decision which opened up Georges Basin, an area of high catch rates and smaller lobsters. Industry has also encouraged the shift of effort to areas with the higher valued smaller lobsters.

The increase in the proportion of 1-3 lb lobsters in the catch may also be the result of changes in the population structure on the various fishing grounds, but this is difficult to identify in light of the gear changes. The ratio of size groups varies with depth, month, and year. Figure 10 illustrates the changes in the ratio of 1-3 lb:3-8 lb lobsters on Southeast Browns since 1978. At all depths there has been an increase in the 1-3 lb size, but the change was largest in the shallow depths. This is not surprising as the proportion of smaller lobster has always been higher in summer in the shallow water. The increase in smaller lobsters began in 1984, shortly after the introduction of new traps to the fishery.

The ratio of 1-3 lb to 3-8 lb lobsters in the important new Georges Basin area was higher during all months in 1985-87 than in 1978-80 (Figure 11). The cause of the change is not clear. Heavy American effort occurred in the early 1980s, but the increase in the smaller sizes was not restricted to the Basin alone and follows the introduction of new traps. It is too early to say if the change in catch size frequency represents a change in population size structure or simply a change in gear selectivity.

Implications to the Fishery

The shift to smaller lobsters results in a greater number of lobsters being taken each year. However, if the shift in size is due to a change in gear selectivity, fewer of the large mature lobster will be taken. The long-term implications of this on population structure and on Yield and Egg/Recruit basis is being examined. The present difficulty is that we do not know the true size structure of the population, as all size data are biased by trap selectivity. Population simulations will have to be used to model the population and the effects of the new fishing strategy.

Summary

4X/5Ze

The 1985 increase in the 4X/5Ze TAC was not expected to have a short-term impact on the stock, and it is too soon to evaluate long term impacts. The 84% increase in catch between 1984-87 was balanced to an unknown degree by the removal of the American catch.

The present fishery is targeting areas with small, newly mature animals and reducing effort in the areas with large mature animals. The result is that more individual lobsters are being removed. It is too soon to say if the observed increase of smaller lobsters on individual fishing grounds is caused by the changes in gear design, or represent a real change in population size structure.

Short and long-term shifts in lobster distribution and availability may be responsible for the changes in the CPUE. It is important that the factors affecting distribution and availability are understood so that longer term decline in the population size can be distinguished from the short-term variations in availability.

4V/W

The present 360 t TAC for 4W is pre-emptive in nature and cannot be evaluated until fishing occurs. Because of the virgin nature of the fishery, and our lack of information on its relationship to other lobster areas, no increase should be considered until more information exists on size frequency distribution, movements, geographic range and catch rates. The only practical way of obtaining this information from the active fishery.

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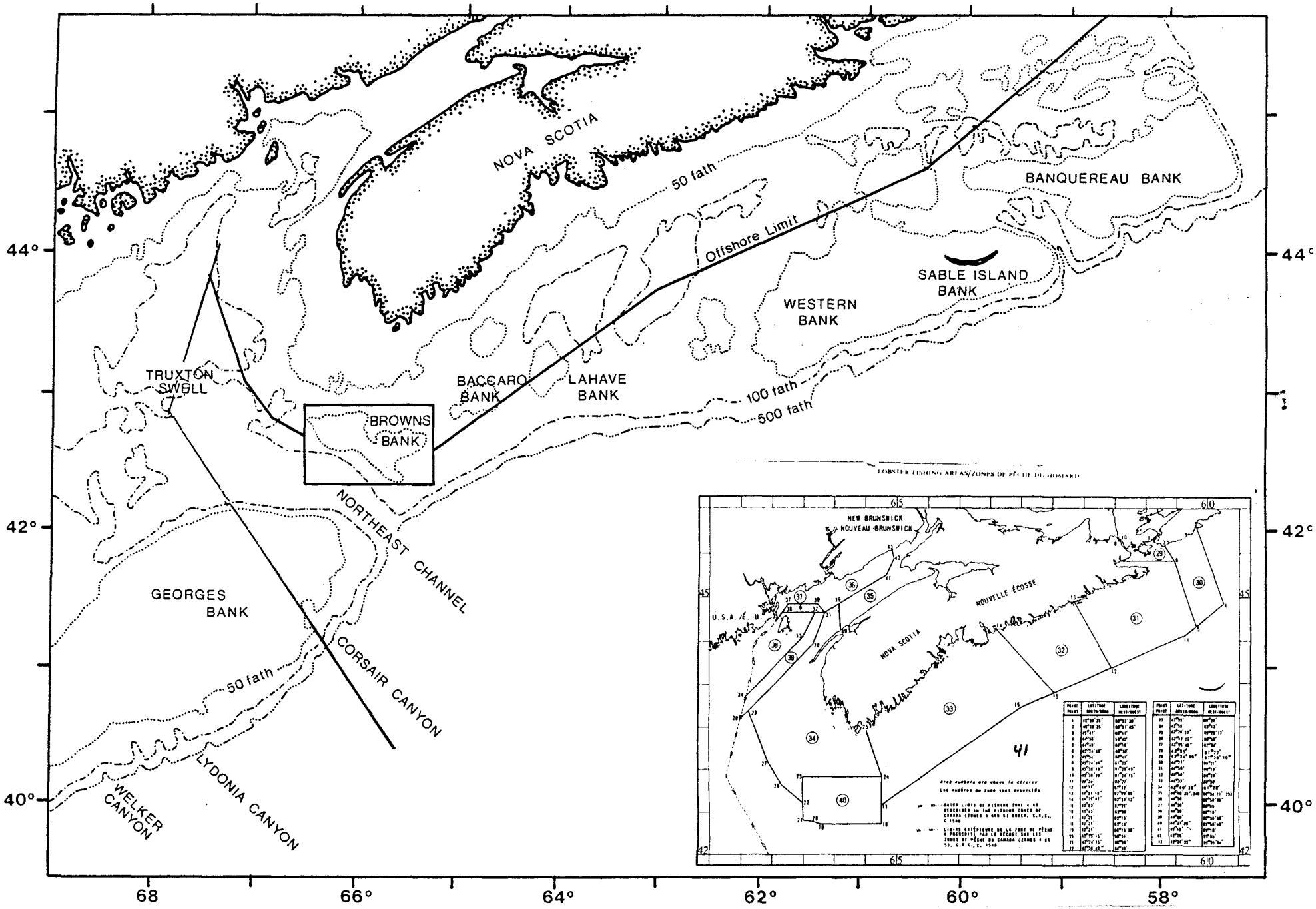
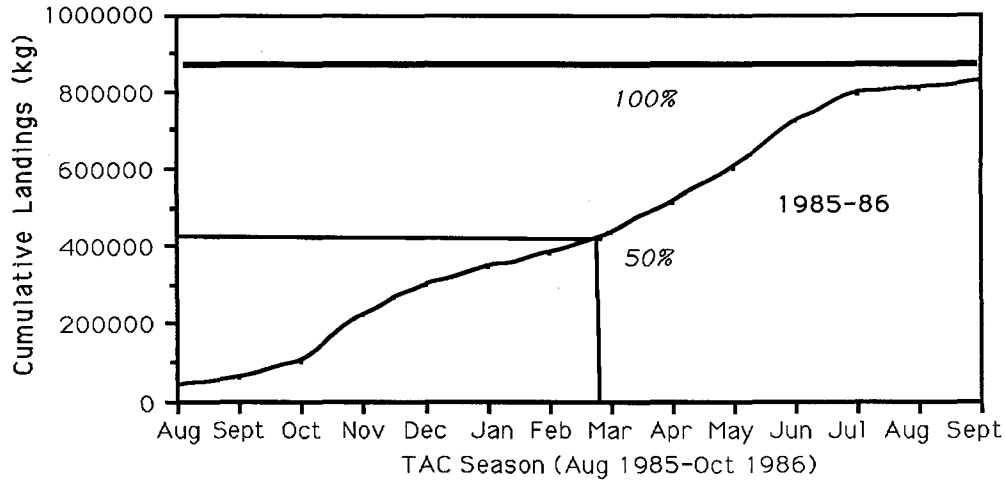


Fig. 1. Offshore Lobster District 41, showing Canadian offshore fishing areas.



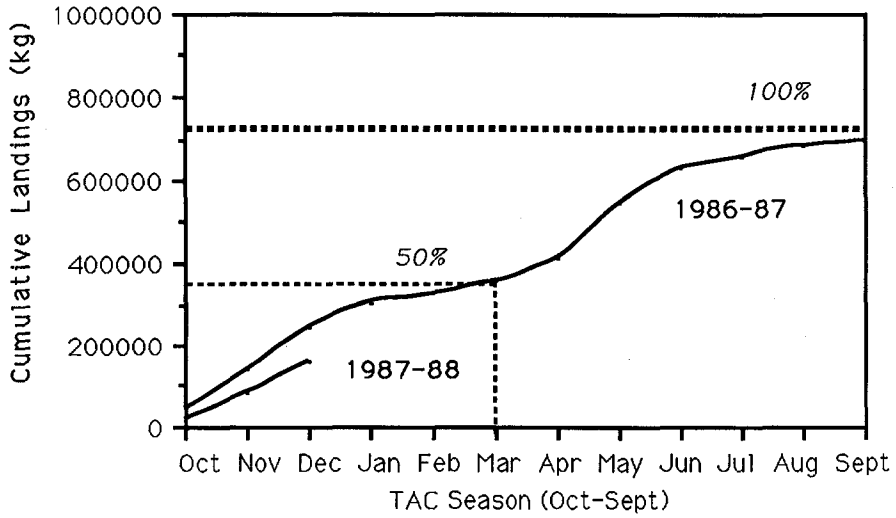


Figure 2: Cumulative landings - 1985-86, 1986-87, and 1987-88 (Oct.-Dec.) seasons

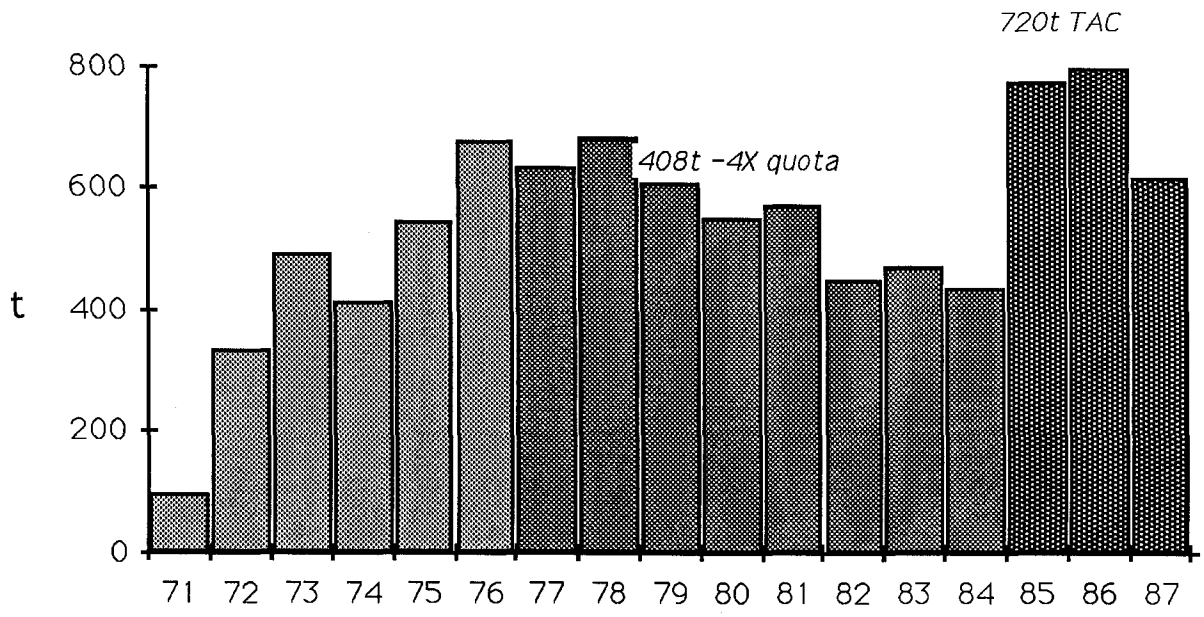


Figure 3: Total annual offshore landings.

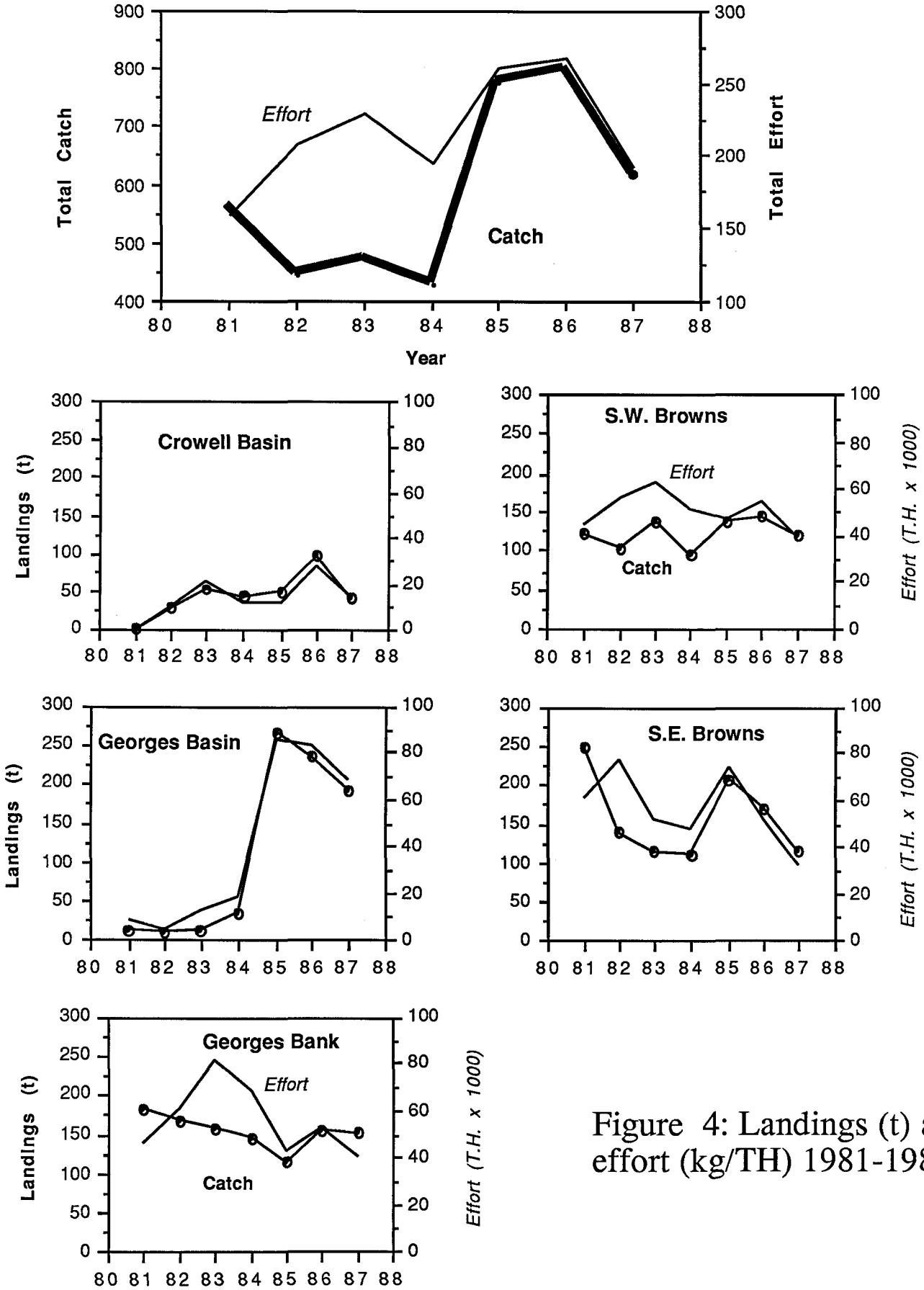


Figure 4: Landings (t) and effort (kg/TH) 1981-1987

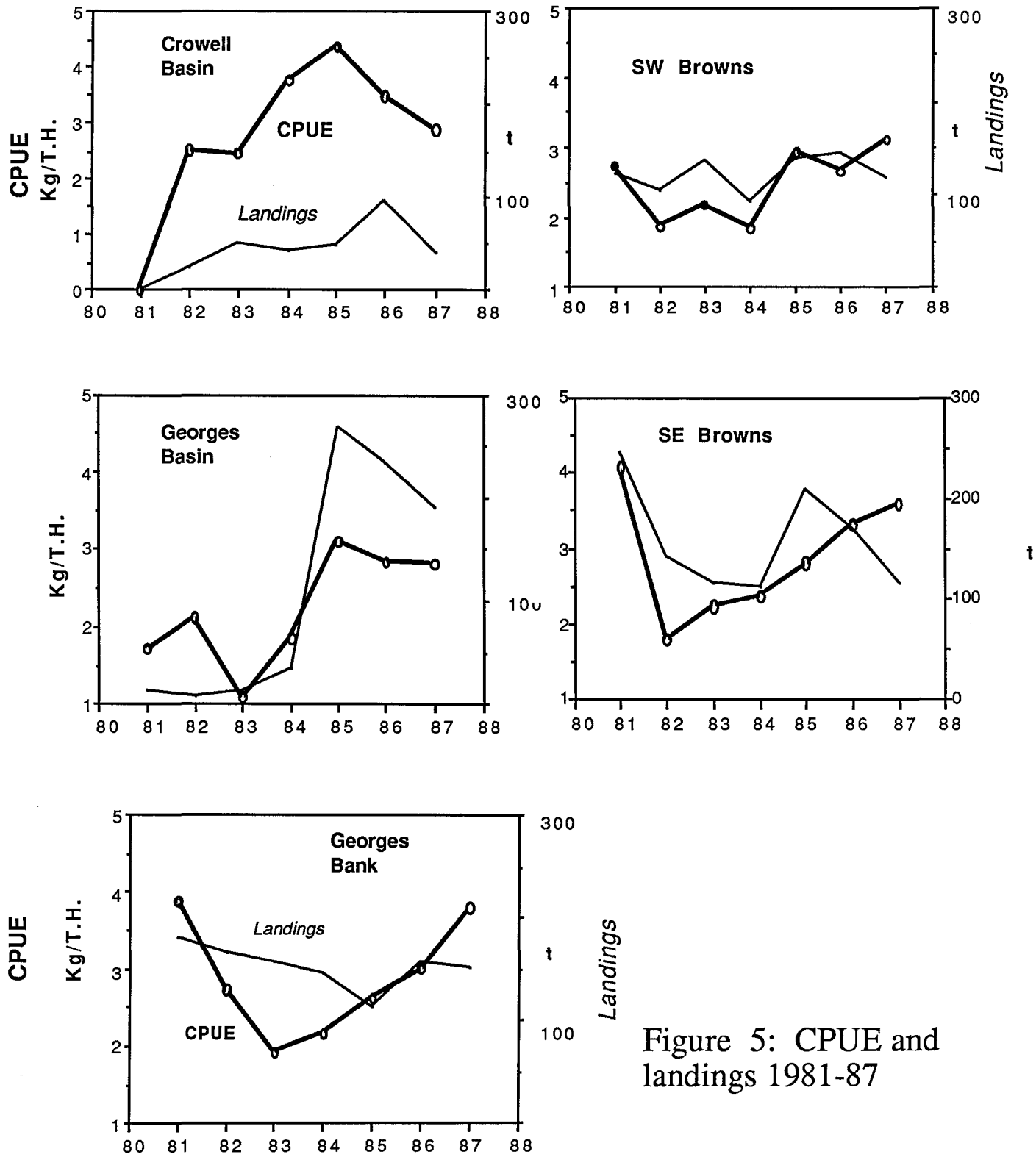


Figure 5: CPUE and landings 1981-87

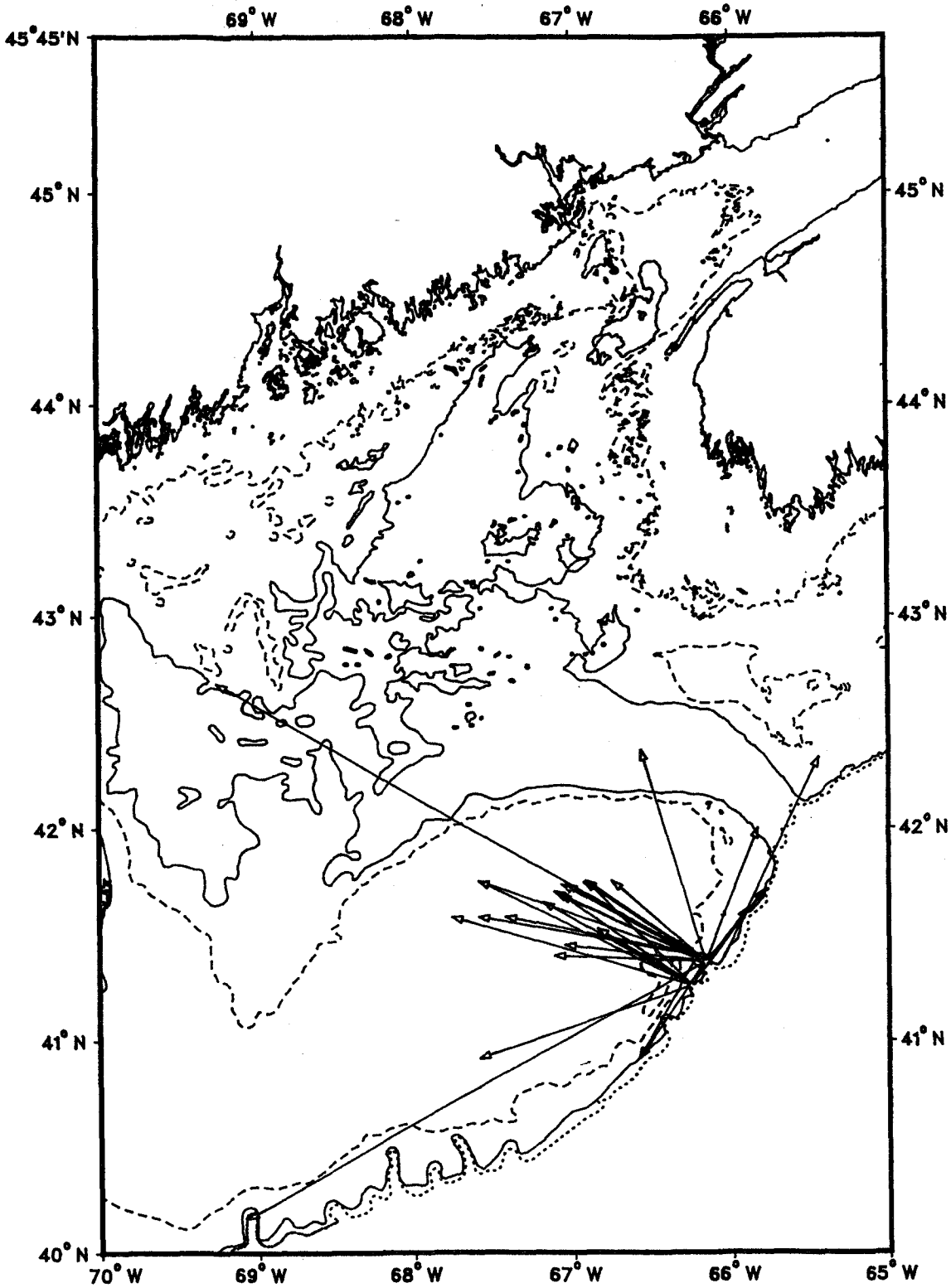


Figure 6: Lobster tag returns (Δ) recaptured >50 km from release sites in Corsair Canyon and at large >30 days.

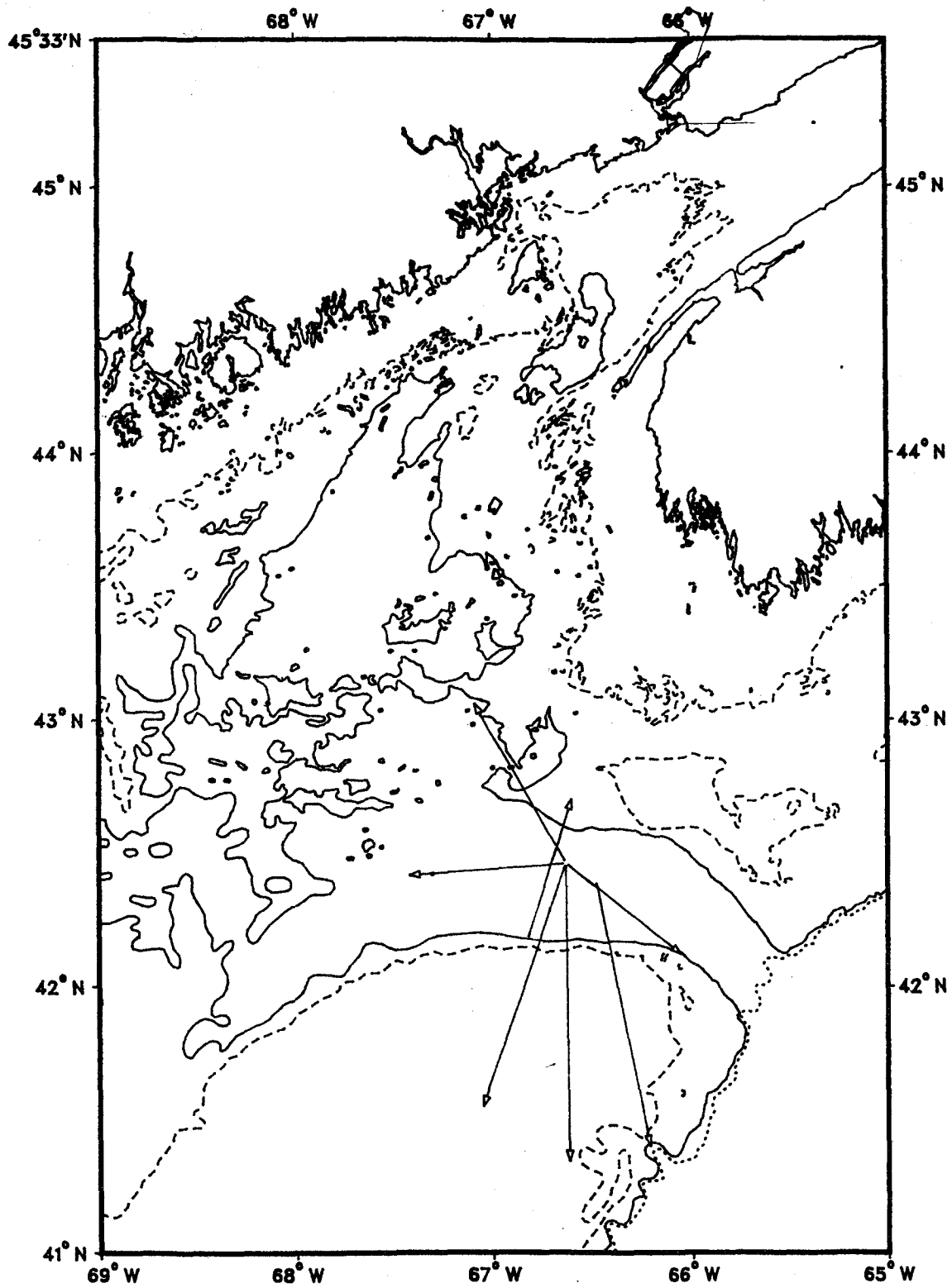


Figure 7: Lobster tag returns (Δ) recaptured >50 km from release sites in Georges Basin and at large >30 days

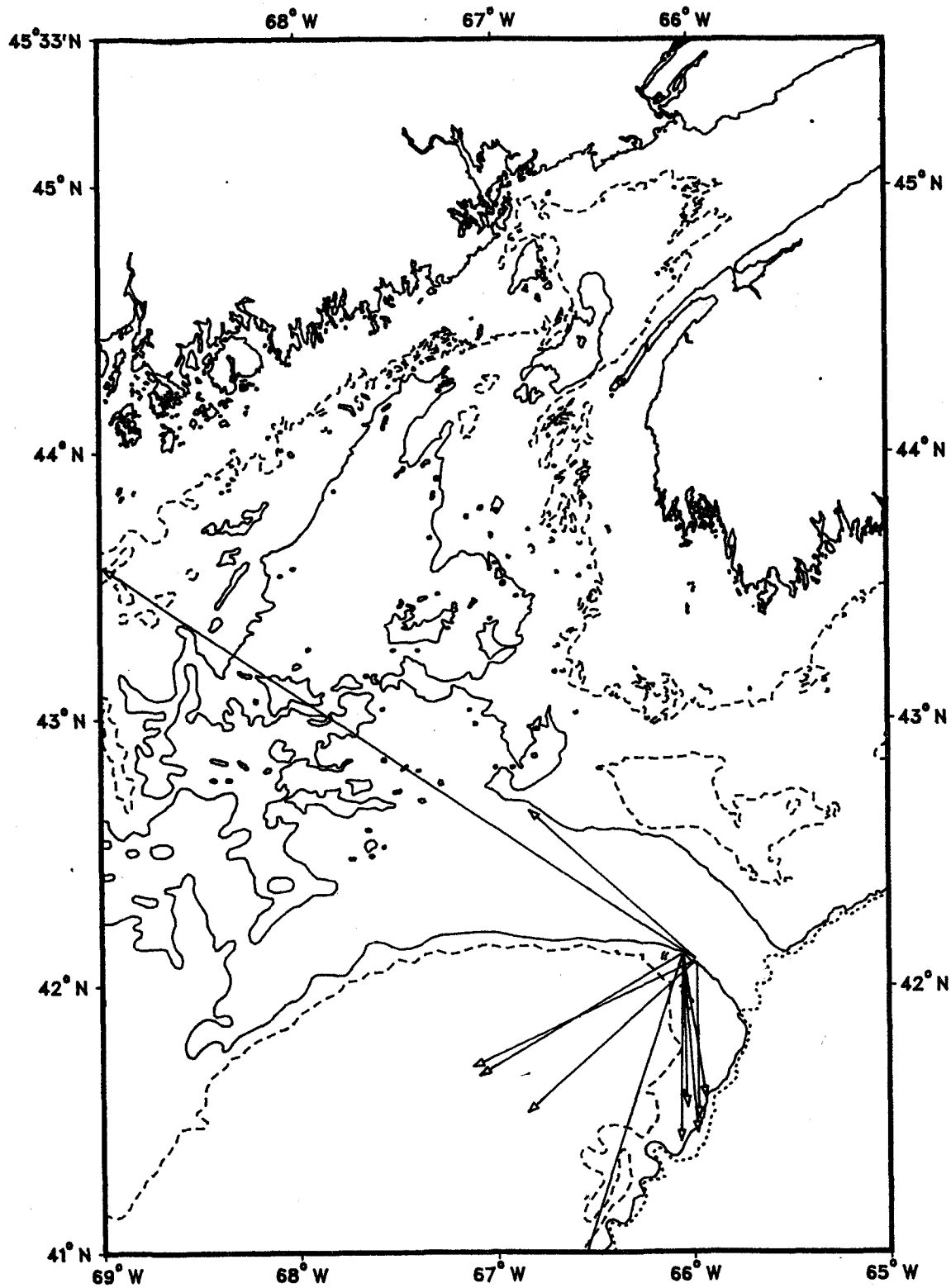


Figure 8: Lobster tag returns (Δ) recaptured >50 km from release sites on the Northeast edge of Georges Bank and at large >30 days

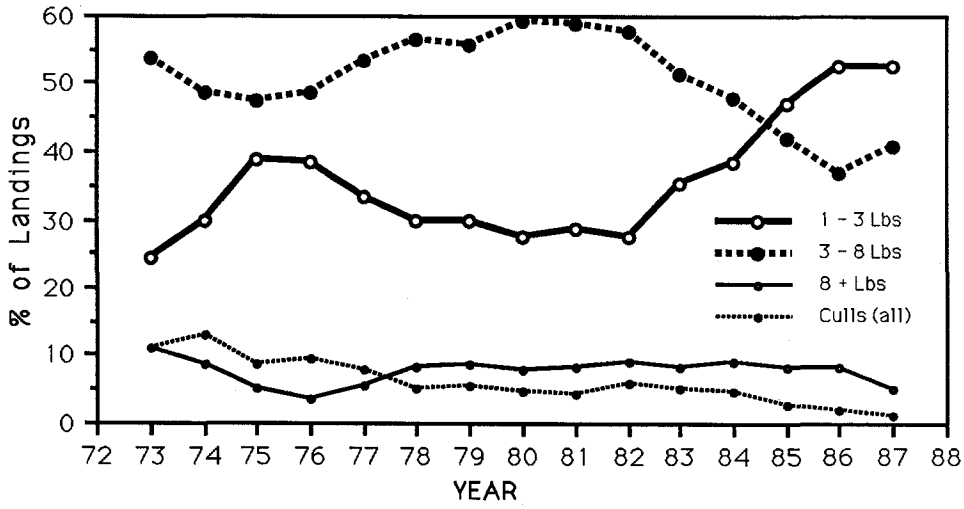


Figure 9: Proportion of size groups in the total landed catch - 1973-87

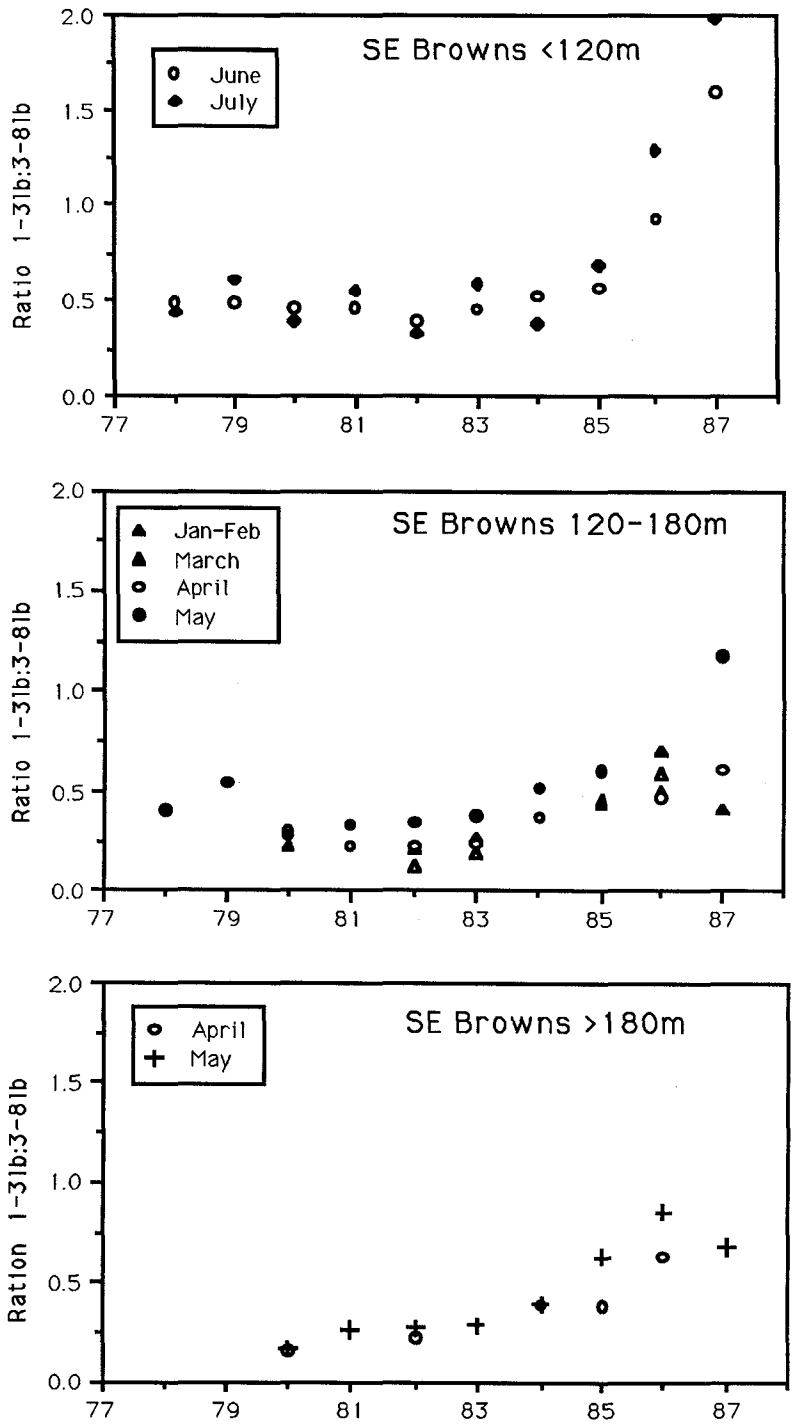


Figure 10: Ratio of 1-3 lb:3-8 lb lobsters in the landings from Southeast Browns-1977-87

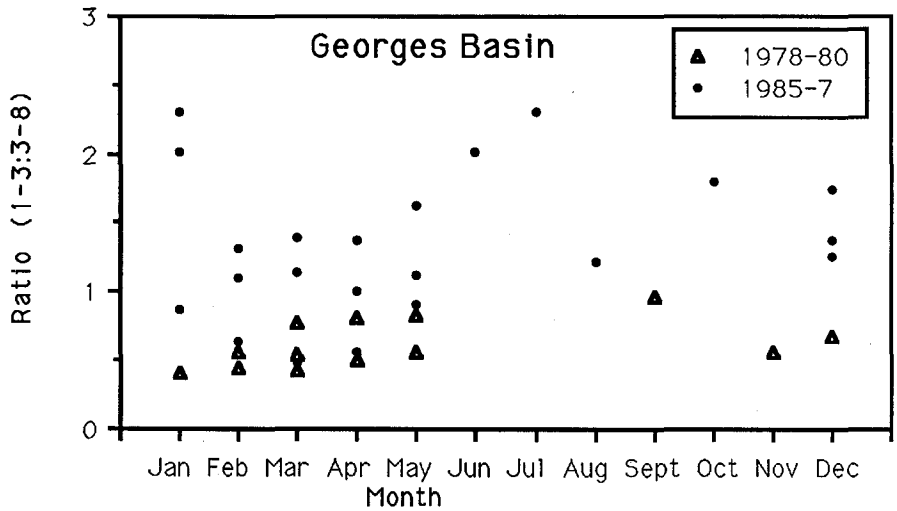
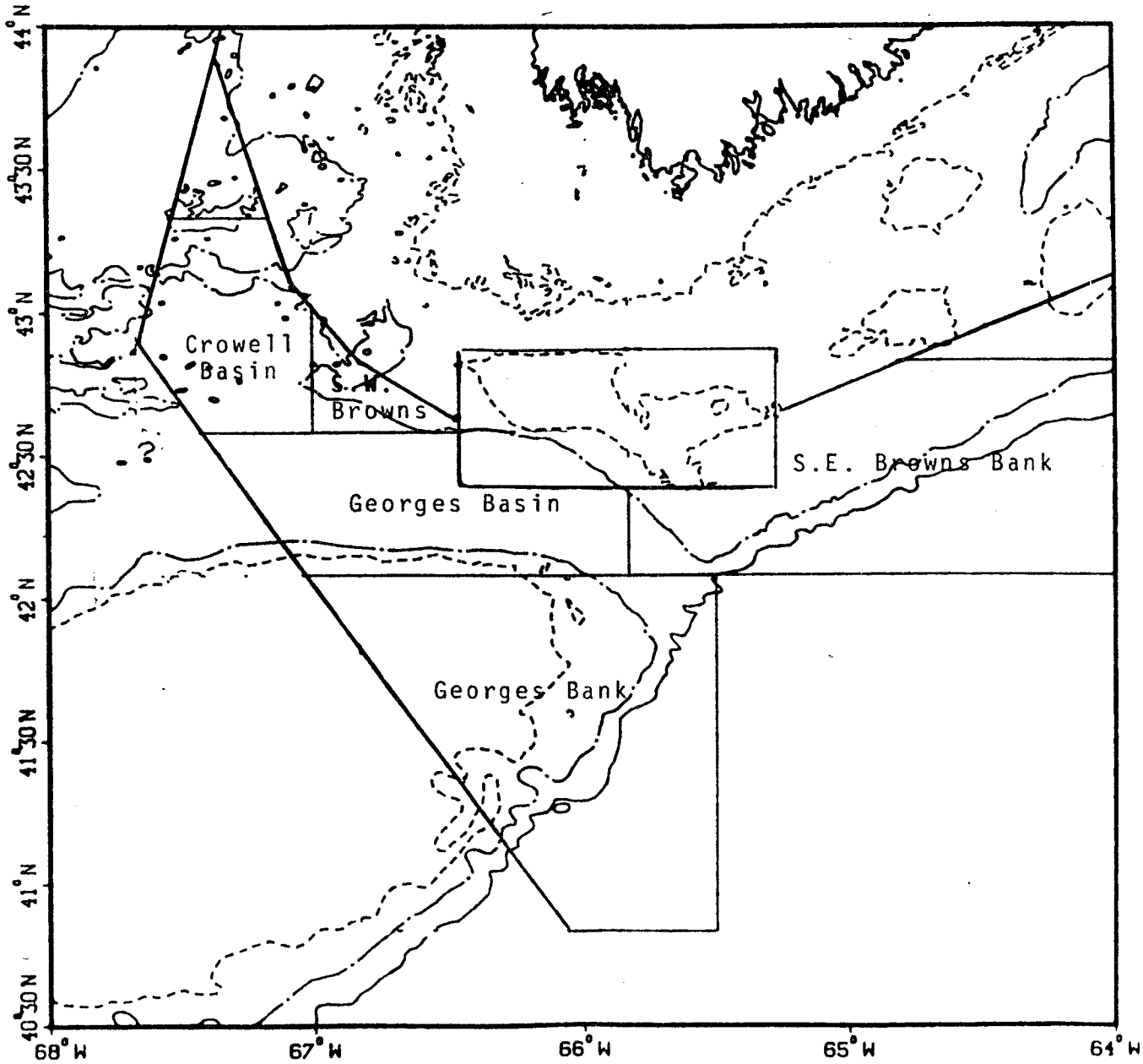


Figure 11: Ratio of 1-3 lb:3-8 lb size groups in the landed catch from Georges Basin

Appendix

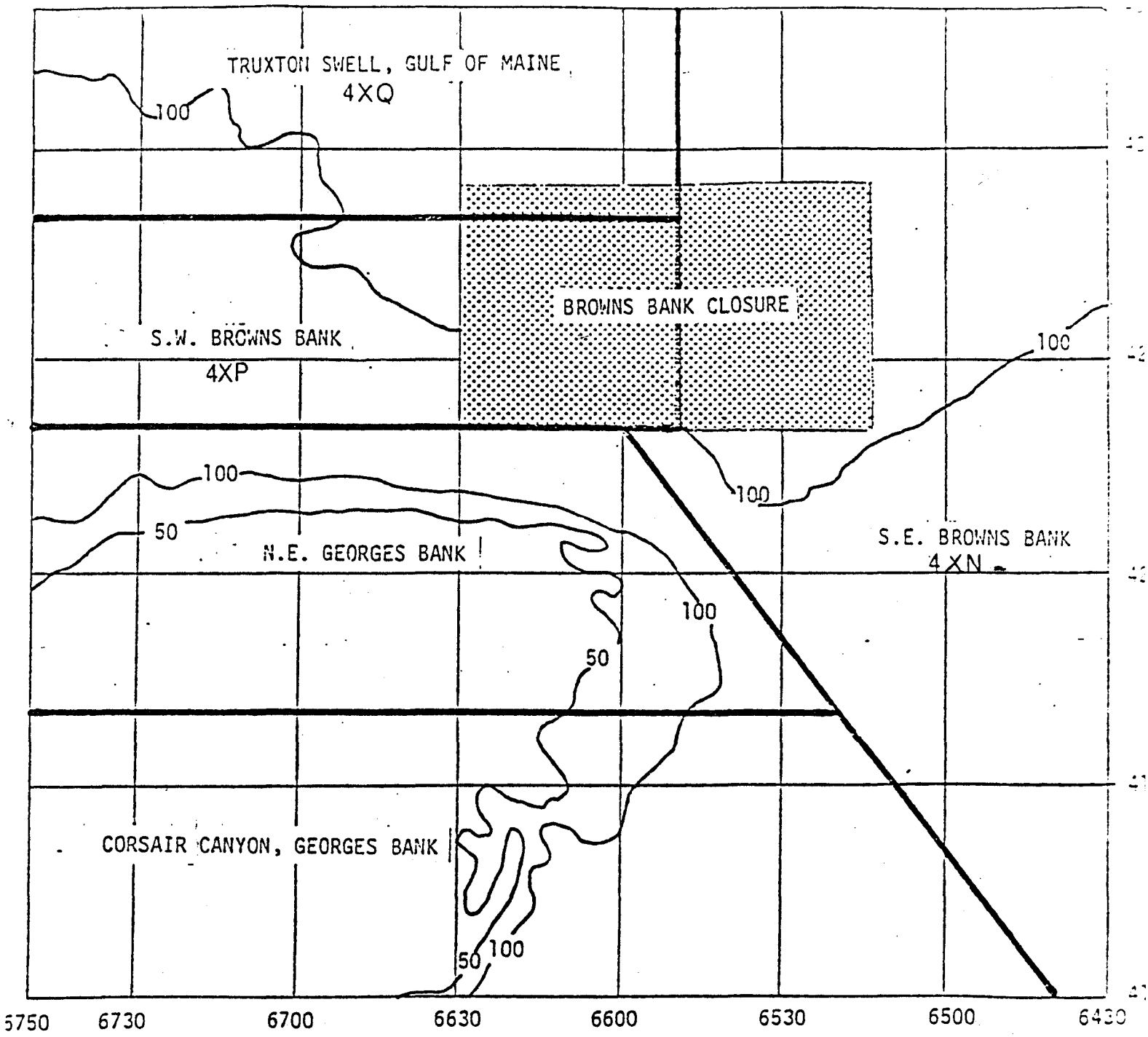
1. Map of statistical areas areas used offshore

2. Map of fishing distribution



Appendix 1: Offshore lobster fishing areas

OFFSHORE LOBSTER AREAS

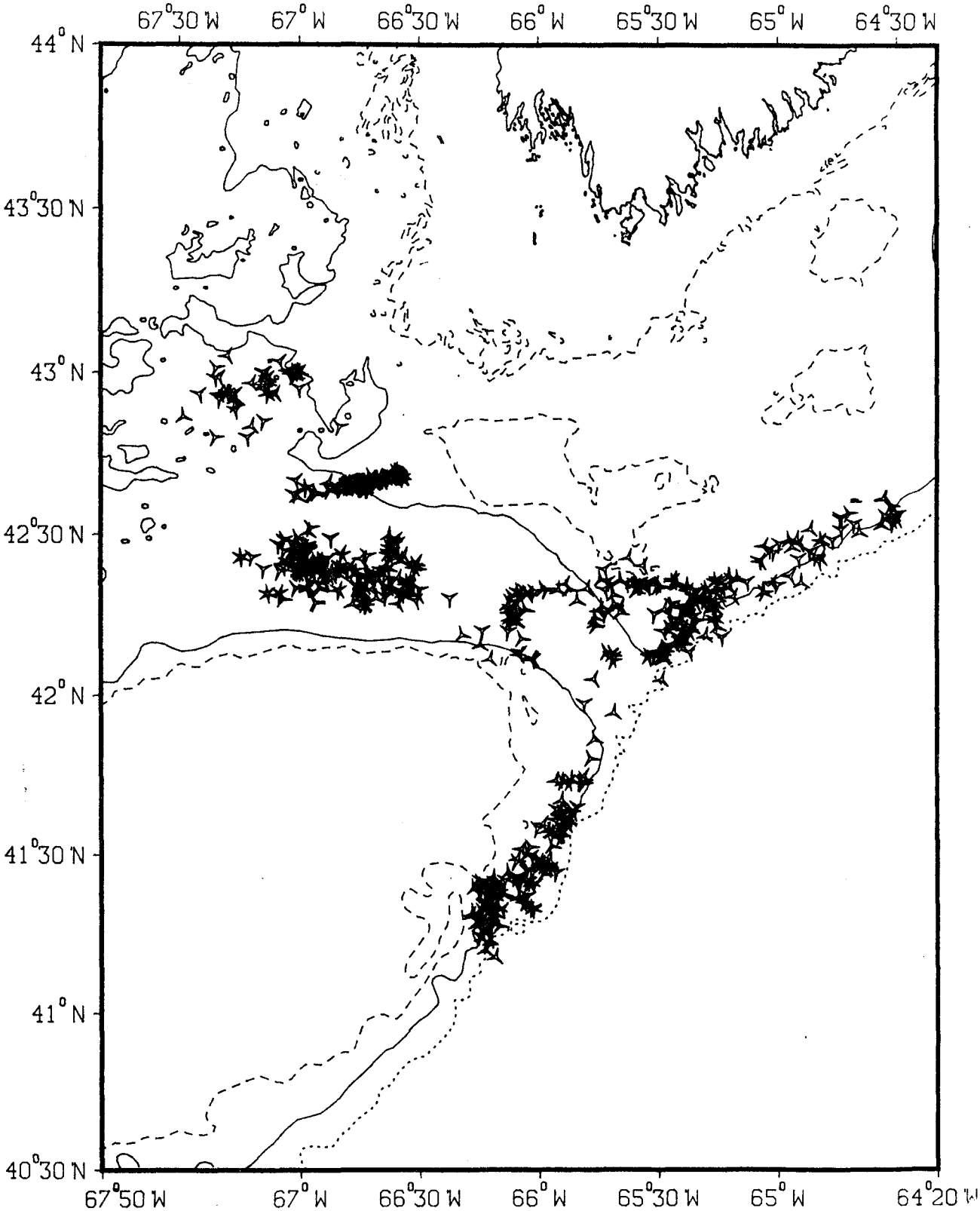


Truxton Swell, Gulf of Maine
S.W. Browns Bank
S.E. Browns Bank
N.E. Georges Bank
Corsair Canyon, Georges Bank

W. Browns

Georges

Old offshore lobster fishing areas.



Appendix 2: Offshore lobster fishing distribution 1986