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Assessment of 4X Haddock in 1989

by

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ABSTRACT

The nominal catch of 4X haddock in 1989 was 6,700 t, an overrun of nearly 140% of the TAC. CHP management was the main contributing factor to the overrun and to the increased reliability of the 1989 catch statistics relative to previous years. RV surveys indicate extremely low abundance and high exploitation rate, a situation similar to the previous two years. Reduction in the age range of the population for the third consecutive year was also evident in both the survey and commercial catch. Abundances of the 1985 and 1986 year classes appear to be very low. The abundance of the 1987 year class (age 2) in 1989 appears to be average. Estimation of stock size using the ADAPT formulation was not possible due to a number of problems that indicated inadequacies in either the model, the data or both. There has been no improvement in the status of the 4X haddock stock since the last assessment and it is recommended that there be no directed fishery for 4X haddock and that bycatch be kept at the lowest possible level. It should be noted that this advice is incompatible with the CHP management system which allows a directed fishery.

RESUME

Les prises nominales d'aiglefin dans la division 4X se sont établies à 6 700 t en 1989, ce qui représente un dépassement de près de 140 % du TPA. Le phénomène est imputable à la gestion des espèces morue-aiglefin-goberge et à la plus grande fiabilité des statistiques sur les prises par rapport à l'année précèdente. Les missions effectuées par des navires scientifiques révèlent une très faible abondance et un taux d'exploitation élevé, situation comparable à celle des deux dernières années. Pour la troisième année de suite, la réduction de la fourchette d'âges de la population est manifeste, comme en témoignent les résultats des missions de recherche et les prises commerciales. L'abondance des classes de 1985 et 1986 est très faible, tandis la classe de 1987 (âgée de deux ans) est moyennement abondante. On n'a pu estimer la grosseur du stock par la méthode ADAPT en raison de diverses lacunes soit dans le modèle, soit dans les données, soit dans les deux. Il apparaît néanmoins que l'état du stock d'aiglefin de la division 4X ne s'est pas amélioré depuis la dernière évaluation. Aussi recommande-t-on qu'il n'y ait pas de pêche directe de l'aiglefin dans cette division et que les prises accidentelles de cette espèce soient réduites au minimum. Il faut noter que cette recommandation va à l'encontre du régime de gestion des espèces morue-aiglefin-gorberge, qui permet une pêche directe.

INTRODUCTION

This document contains an evaluation of the NAFO Division 4X haddock stock. As in the past, haddock caught in unit area 4Xs were not included in the analysis because they are believed to be part of the 5Y stock (Halliday 1974).

Two majors developments in the 1989 4X haddock fishery occurred that were different from previous years. The inshore mobile gear fleet caught most of its quota by the end of June resulting in a mid-year closure of the fishery and a combined quota involving cod, haddock and pollock in NAFO areas 4X+5 (Figure 1) was established, which appeared to reduce the frequency of misreporting in the region.

The Fishery

Annual Trends in Reported Landings

The long-term (1930-83) annual catch of haddock in NAFO Division 4X has averaged about 20,000 t. This level was greatly surpassed once during the 1960s and again during the 1980s when landings peaked above 30,000 t (Figure 2). The former peak, fueled by the strong 1963 year-class, resulted in high exploitation rates and low spawning stock biomass and was thus instrumental in the imposition in 1970 of a quota system and a spawning area closure (Halliday, 1988) under ICNAF. The 1970 TAC was set at 18,000 t, but was dropped to 9,000 t in 1972 and ICNAF recommended closure of the fishery in 1974 (Table 1). Catches and TACs subsequently increased to a peak in 1981-1982. Catches were lower than TACs set during 1982-84. Total catch has been below the long-term average since 1984 with restrictive quotas in place since 1985.

Quota allocations for the stock since 1976 are given in Table 2. There has been a general tendency over time for finer and finer subdivisions of the TAC by fleet sector and season. During 1982-87, the fishery was regulated on the basis of 5 gear sectors: 1) mobile gear <65 ft; 2) mobile gear 65-100 ft; 3) mobile gear >100 ft; 4) fixed gear <65 ft; 5) fixed gear 65-100 ft. In 1988, gear sectors <65 ft were further subdivided into < and > 45 ft ie. fixed gear A1 and A2 and mobile gear C1 and C2. In 1989, mobile gear <45 ft (C1s) were further split into generalists and specialists. Since 1986, the allocation to the mobile gear (C1 and C2) was further subdivided into three 4-month trimesters to extend the fishery over the year. These fine-scale allocations resulted in significant enforcement problems and resulted in the implementation of an aggregate cod/haddock/pollock (CHP) allocation in 1989 for the <65 ft fleets. During 1989, the mobile gear sector (C1 specialists and C2) decided to forego the trimester allocation system, exceeded their total allocation and were shut down in mid-June (Figure 3). The fixed gear sectors were shut down in October. Mobile gear <45 ft (C1) caught 150% of their total allocation, mobile gear 45-65 ft (C2) caught 130% of their total allocation and fixed gear <65 ft caught 187% of their allocation. Landings by vessels >65 ft were insignificant.

Discussions with industry representatives have indicated that substantial misreporting occurred during 1985-88 and this was corroborated by anecdotal reports which suggested that misreporting occurred anytime in the past when quotas have been restrictive. However we are unable to quantify the level. In 1989, anecdotal reports indicated that misreporting was generally low compared to

previous years at least until May, when the fishery was relatively unrestricted. Appendix 1 contains a listing of weekly highlights of the fishery.

Landings by the mobile gear fleet >100 ft dropped to 1% of the total in 1989 (Table 3). This fleet was once a major participant in the fishery; however the mobile gear fleet <65 ft expanded substantially during the mid-1970's recovery period of the 4X haddock resource. Landings by the mobile gear fleet >100 ft dropped to 10% by 1983, and have been relatively insignificant since that time.

Sampling

As exploitation by the inshore fleet expanded during the 1977-81 period, the landings per sample ratio increased relative to previous levels (Table 3). Since then, sampling has been generally good with rates of approximately one sample per 200-300 t landed. Although sampling intensity in 1989 was good (156 t per sample), the number of otoliths collected was low (n=935) due to the low level of landings. Despite this and the problems associated with sampling during the compressed fishery in 1989, sampling was adequate to construct the catch-at-age.

The catch-at-age prior to 1988 was the same as that used in the last assessment (O'Boyle et al. 1989). It was necessary to adjust the 1988 catch-at-age due to the use of inappropriate parameters in the length/weight relationship for some keys. The changes to the catch-at-age were negligible.

The 1989 catch-at-age was reconstructed using gear, area and quarter for stratification (Table 4) consistent with previous practices established by O'Boyle et al. (1983). As a result, a total of 26 keys were used to construct the 1989 catch-at-age (Table 5).

Catch Numbers and Weight at Age

The catch numbers and weight at age data for 1970-89 are shown in Table 6. In recent years, there has been a tendency for the landings to be dominated by fewer and fewer age groups. In 1982-83, five age groups (3-7) each contributed over 10% by weight to the total yield. In the following two years, four age groups dominated. During 1986-89, only three age groups have contributed significantly to the annual landings, and similar to last year, two year-classes have contributed >30% each by weight to the total yield (Table 6). Since 1985, ages 7+ fish have contributed less than 15% by weight and the oldest age fish in the 1989 catch was age 10.

The 1989 observed catch-at-age showed relatively poor agreement with the catch-at-age projected from the last assessment of this stock (Figure 4). Catches of ages 5 and less were underestimated while those 6 and older were overestimated. The greatest discrepancy was seen at age 4. Possible reasons for these differences are: a majority of the catch came from the first half of the year while in 1989 the predicted catch was calculated for a full year fishery; that the reported catch exceeded the quota by a factor of 1.5; and that misreporting levels were believed to be low in 1989 compared to previous years.

Trends in the average age and weight of haddock in the catch were examined in order to provide an indication of the long-term level of exploitation experienced by the stock. These trends are shown relative to the levels expected in a population exploited at $F_{0.1}$ and F_{MAX} (Figure 5). The average age and weight in the 1989 catch was 5.1 yrs and 1.6 kg respectively, both of which were near the F_{MAX} level. Trends in these parameters are to be expected as year-class size varies. However, the long-term average level of these parameters is more dependent on the long-term exploitation rate. Since 1972, both the average age and the average weight in the catch have been below that expected, not only of a population exploited at $F_{0.1}$, but also at F_{MAX}, indicating that the resource is being heavily exploited.

To summarize the production dynamics of the 4X haddock stock, a cohort analysis using the software of Rivard (1982) was conducted based on last year's assessment (O'Boyle et al. 1989). Total catch has exceeded surplus production since 1979, particularly during 1986-88 when the catch was twice the surplus production (Figure 6). This implies negative net production and therefore erosion of stock biomass. Biomass (growth + recruitment) has been declining since 1984. The size of the 1985-86 year classes estimated at age 1 (4.3 and 6.0 million respectively) are very low relative to the long term geometric mean of 24 million (O'Boyle et al. 1989) and will have a significant impact on the yield for the next two to four years.

Abundance Indices

Commercial Catch Rates

Because of high and variable levels of misreporting in recent years, the commercial CPUE is not considered to be a reliable index of haddock abundance in NAFO Division 4X.

Groundfish Bottom Trawl Survey

The July groundfish research survey on the Scotian Shelf from 1970-89 was used to evaluate the status of the resource. The mean numbers at age per tow, weighted by stratum area, and the associated standard errors and coefficients of variation are shown in Table 7, while mean weight per tow and mean individual weights are shown in Table 8. The arithmetic mean catch rates across strata from 1970-89 for ages 2-5, ages 6-9 and all age groups combined exhibit large inter-annual variability (Figure 7). In general, total abundance was low during the early 1970s and high during the early-mid 1980s. Abundance dropped sharply during 1985-1988 and has remained low in 1989. The catch of 2 year olds in 1989 is encouraging given its magnitude and low CV. There has also been a reduction in recent years in the number of ages seen in the survey (oldest age = 7 in 1989), a trend consistent with the commercial fishery. Trends in weight per tow paralleled catch in number per tow (Figure 8).

Total mortality (Z) for ages 2 thru 8, 2+ and age groups considered to be fully recruited (5-7/6-8) to the survey gear were calculated from the 1970-1989 summer survey data (Table 9) using Paloheimo's method and the software of Rivard (1982). If natural mortality has been constant at 0.2, then these calculations indicate that exploitation rates (smoothed using a 3 yr running mean) varied around 0.5 during 1970-83 and since 1985 have been in excess of 1 (Figure 9).

Estimation of stock size

Attempts were made to estimate population size using the adaptive framework. The Sequential Population Analysis (SPA) was calibrated with the RV data. The ADAPT formulation suffered a number of problems that indicated inadequacies in either the model, the data or both. First, the retrospective pattern in the fishing mortalities (i.e. underestimation of F in the current year) was particularly strong. This could not be resolved with even the most extremely domed partial recruitment pattern input in 1989. The survey calibration coefficients generally increased monotonically with age, contrary to expectations. The wide scale misreporting of catch during 1985-88 followed by good reporting in 1989 is a further source of model and indeed data problems. In addition, the strong seasonal nature of the fishery requires a model formulation which takes this into account.

The inconsistencies encountered when attempting to calibrate the SPA suggest that fish are dying faster than can be accounted for by the catch at age. Several factors in addition to those mentioned above could contribute to this. Larger, older haddock could be migrating out of the stock area or could be experiencing higher natural mortality. Tagging results and our understanding of haddock life history are not consistent with these possibilities; however they cannot be ruled out.

We concluded that these problems in the catch at age and/or the ADAPT formulation need to be resolved before it can be used as the basis for harvest advice. Detailed examination of the calculations was, therefore, not warranted. Thus the survey indices were used to indicate trends in stock abundance and exploitation rates.

Assessment results

The population is experiencing very high fishing mortalities as shown by the reduction in the age range in both the survey (Table 7) and the commercial catch (Table 6), fishing mortalities >1 from the research vessel surveys (Table 9), and poor year classes in 1985 and 1986 as estimated from the analysis by O'Boyle et al. (1989) and the 1989 RV survey (see Figure 6 and Table 7 respectively). Every possible step should be taken to conserve the 4X haddock resource.

Without reliable commercial catch rate indices for the 4X haddock stock the alternative, traditional analytical procedures are limited. This situation and other events in the fishery (e.g. industry's concern over science credibility and several related issues identified in the Haché Task Force report) make it appropriate to look deeper into the survey data in order to define additional areas for possible closure to the haddock fishery. These areas could be based on a definition of juvenile nursery areas (e.g., see Chouinard and Sinclair; 1989) or persistent concentrations of adult haddock occurring independently of cod and pollock concentrations.

Possible Alternatives

Evaluation of Closed Areas

We used the seasonal stratified random groundfish survey data to determine areas in 4X where haddock abundance was consistently high. The stratification scheme used in these surveys is shown in Figure 10 and indicates the depth ranges of the strata. The spring surveys were conducted in March 1979-85, the summer surveys in July 1970-89, and the fall surveys in October 1979-84. Mean numbers per tow by stratum are shown in Table 10 for the summer survey and in Table 11 for the spring and fall surveys. The grand mean of stratified mean numbers per tow for each of the spring, summer and fall survey series was calculated. These values were used to determine the frequency of above average catches in a stratum for each survey series. These frequencies are shown in Figure 11 (note that strata are grouped by depth range). In the spring survey series, strata 80 (Browns Bank) and 77 (the 50-100 fm zone off the back of Browns, Bacarro and LaHave Banks) had the highest frequencies. Strata 80 and 90 (off the mouth of St. Mary's Bay and including Trinity and Lurcher Ledges and an area called the Rip) had the highest frequencies in the summer survey while strata 80, 73 (LaHave Bank) and 81 (the flanks of Browns Bank) were highest in the fall.

To evaluate the distribution of ages across strata, the analysis was repeated age by age using mean numbers at age per tow by stratum and the grand mean of stratified mean numbers at age per tow. The results are summarized in Table 12, and age related changes in distribution are evident. Due to the importance of strata 73, 74, 75, 77, 80, 81 and 90 in the age aggregated analysis, frequency histograms for these strata are shown in Figure 12. Stratum 80 (Browns Bank) had high scores for all ages in all three seasons although spring numbers of immature ages were lower, as were fall numbers of mature ages. Stratum 90 (off the mouth of St. Mary's Bay) showed moderate to high scores in the summer and fall, particularly for immature ages, but zero scores in the spring because immature fish had moved into the strata of moderate depth and mature fish had aggregated on and around the spawning ground on Browns Bank. Stratum 77 (the 50-100 fm zone off the back of Browns, Bacarro and LaHave banks) had moderate to high scores for all mature ages in the spring, likely related to prespawning aggregations, and only moderate to low scores in the summer and fall (moderate scores for immature ages). The pattern for stratum 81 (surrounding Browns Bank) was similar to Stratum 77. Strata 73, 74 and 75 (Bacarro, Roseway and LaHave banks respectively) showed moderate scores for the immature ages in spring, and moderate to high scores for all ages in summer and fall. Note that scores for older fish dropped in these strata in the fall but increased in strata 82-85 as these fish migrate into deeper water. Note also the consistently low scores in strata 70 and 71, 78 on the shelf break, and 91 and 95 in the Bay of Fundy (Table 12). These results demonstrate some potential for closing areas to fishing in order to reduce the catch of haddock in Division 4X. Seasonal shifts in distribution in the age structured analysis suggest that seasonal closure of areas should be considered.

In 1970, ICNAF instituted a seasonal spawning area closure for haddock in 4X. The area surrounding Browns Bank was closed to fishing from March 1 to May 31. The present closed area is shown in Figure 13. This closure was implemented because spawning area closures were one of a limited set of regulatory measures available under the ICNAF Convention (Halliday 1988). The objective was to reduce haddock catches during this period and supplement total catch limitations by spreading catches throughout the year; a reasonable expectation since the area and time corresponded to peak commercial catch rates.

Recent studies in the Fisheries Ecology Program (e.g., Hurley and Campana 1989, Page and Frank 1989) showed that the existing closed area and time are adequate as a spawning closure, if there is any benefit from such closures. Our analysis here indicates that, from the standpoint of reducing haddock catches, there are other areas that if closed, would also aid in reducing catches. Extending the existing area closure throughout the year would further protect haddock, particularly immature fish (Figure 12). Extending the existing closure to the east to include strata 73, 74, 75 and 77, would also provide protection to the haddock stock. Interestingly, ICNAF expanded the closed area to the east in 1975 to include most of the area covered by these strata (Figure 13), but strong resistance at ICNAF particularly by the USSR resulted in a return to the smaller area. Closure of stratum 90 (off the mouth of St. Mary's Bay) would have little effect during the spring, but would protect immature fish during summer and fall.

The question of what effect closures would have on catches of cod and pollock was examined using the summer survey data. The results suggest that the strata that score highest for pollock are generally the lowest for haddock (Figure 14). There is a large degree of overlap between cod and haddock, with strata 80 and 90 scoring highest for both species in the summer survey; however the Bay of Fundy strata (91-95; see Figure 13) show moderate scores for cod compared to zero scores for haddock. Analysis of the spring and fall surveys for cod and pollock are not yet completed.

Additional research

Seasonal patterns of abundance based on past survey data shows persistent, high abundance of age 1 haddock on all of the offshore banks, particularly Browns Bank, with relatively high concentrations also evident in the approaches to St. Mary's Bay (Figures 15 and 16). This information has been used in planning for haddock juvenile surveys in 4X that began in June 1988. These studies are ongoing and are intended to develop a methodology to estimate the magnitude of incoming haddock year classes.

In addition to the haddock juvenile surveys that are underway in 4X and our attempts to define closed areas, we are exploring ways to quantify the area over which the haddock stock is distributed from the summer survey data and examining how this relates to stock abundance. Stock area was calculated in a manner similar to that of Crecco and Overholtz (1990) by summing, for each summer survey, the stratum areas that equalled or exceeded the grand mean of the stratified mean numbers per tow. The index of stock area and mean numbers per tow exhibited a strong positive correlation (Figure 17). A similar relationship was obtained using population estimates from O'Boyle et al (1989) instead of the survey abundance indices (Figure 18). These preliminary results are consistent with

those obtained for Georges Bank haddock (see Crecco and Overholtz 1990) and suggest that further analysis should be undertaken on the spatial distribution of haddock.

Conclusions

It is apparent that there has been no improvement in the status of the 4X haddock stock since the last assessment of O'Boyle et al. (1989). In keeping with the advice given in the previous assessment, it is recommended that there be no directed fishery for 4X haddock and that bycatch be kept at the lowest possible level. It should be noted, however, that this advice is incompatible with the CHP management system which allows a directed fishery. Under the present harvesting strategy, recovery of this stock is highly unlikely.

References

Chouinard, G.A. and A. F. Sinclair. 1989. Assessment of the 4T and 4Vn (Jan.-Apr.) cod stock for 1989. CAFSAC Res. Doc. 89/51. 50 p.

Crecco, V. and W.J. Overholtz. 1990. Causes of density-dependent catchability for Georges Bank haddock Melanogrammus aeglefinus. Can. J. Fish. Aquat. Sci. 47: 385-394.

Halliday, R.G. 1974. Current status of the ICNAF Div. 4X haddock stock. ICNAF Res. Doc. 74/91. 24 p.

Halliday, R.G. 1988. Use of Seasonal spawning area closures in the management of haddock fisheries in the northwest Atlantic. NAFO Sci. Coun. Studies 12: 27-36.

Hurley, P.C.F. and S.E. Campana. 1989. Distribution and abundance of haddock (Melanogrammus aeglefinus and Atlantic cod (Gadus morhua) eggs and larvae in the waters off southwest Nova Scotia. Can. J. Fish. Aquat. Sci. 46 (Suppl. 1): 103-112.

O'Boyle, R.N., L. Cleary and J. McMillan. 1983. Determination of the size composition of the landed catch of haddock from NAFO Division 4X during 1968-81, p. 217-234. In W.G. Doubleday and D. Rivard (ed.) Sampling commercial catches of marine fish and invertebrates. Can. Spec. Publ. Fish. Aquat. Sci. 66.

O'Boyle, R.N., K. Frank and J. Simon. 1989. An evaluation of the population dynamics of 4X haddock during 1962-88 with yield projected to 1990. CAFSAC Res. Doc. 89/58. 59 p.

Page, F.H. and K.T. Frank. 1989. Spawning time and egg stage duration in Northwest Atlantic haddock (Melanogrammus aeglefinus) stocks with emphasis on Georges and Browns Bank. Can. J. Fish. Aquat. Sci. 46 (Suppl. 1): 68-81.

Rivard, D. 1982. APL programs for stock assessment (revised). Can. Tech. Rep. Fish. Aquat. Sci. 1091: 146 p.

Table 1. Reported nominal catch (t round) of haddock from NAFO Division 4X (excluding unit area 4Xs) by country. The numbers in brackets represent the number of commercial samples collected in that year.

Year	Canada (MQ)	Canada (Nfld)	USA	USSR	Spain	Other	Total	TAC
1970	15560 (26)	-	1638	2	370	12	17582	18000
1971	16067 (29)	-	654	97	347	1	17166	18000
1972	12391 (36)	-	409	10	470	1	13281	9000
1973	12535 (30)	-	265	14	134	6	12954	9000
1974	12243 (25)	-	660	35	97	-	13035	-
1975	15985 (56)	-	2111	39	7	2	18144	15000
1976	16293 (45)	-	972	-	95	5	17365	15000
1977	19555 (79)	-	1648	2	-	12	21217	15000
1978	25299 (62)	114	1135	2	-	27	26577	21500
1979	24275 (49)	268	70	3	-	15	24631	26000
1980	28209 (56)	71	257	38	-	37	28612	28000
1981	30148 (82)	117	466	-	-	15	30746	27850
1982	23201 (92)	28	854	-	-	4	24087	32000
1983	24428 (119)	44	494	17	-	7	24990	32000
1984	19402 (97)	23	206	-	-	-	19631	32000
1985	14902 (86)	-	25	-	-	1	14928	15000
1986	14986 (78)	-	38	10	-	-	15034	15000
1987	13538 (82)	-	17[1]	-	-	-	13555	15000
1988	10921 (79)	-	2[2]	53[2]	-	-	10976	12400
1989	6666 (43)	-	1[2]	33[2]	-	-	6700	4600

Long-term averages: 1930 - 60 = 16854 t
1961 - 83 = 25217 t
1930 - 83 = 20127 t

1 - NAFO SCS Doc. 88/18
2 - NAFO Circular Letters

Table 2. Recent Canadian fishery allocations and the respective reported catch (t) of 4X haddock. Information from Atlantic Quota Reports (AQR).

Year	Report Date	Fleet	Allocation	Reported[1] Catch	%	CLOSURE DATES
1976		All vessels	13300	15715	118	
1977		All vessels	13400	20220	151	
1978		All vessels	21500	25518	119	
1979		Vessels < 125'	17500	17949	103	
		Vessels > 125'	8500	6471	76	
		Total	26000	24420		
1980		Vessels < 125'	22500	23585	105	
		Vessels > 125'	5500	5095	93	
		Total	28000	28680		
1981	31/12	Vessels < 125'	22350	25102	112	24/10 - 31/12
		Vessels > 125'	5500	5380	98	02/05 - 31/12
		Total	27850	30482		
1982	31/12	FG.<65'	8850	8168	92	
		MG.<65'	15000	12909	86	
		FG. 65-100'	100	124	124	23/05 - 31/12
		MG. 65-100'	1000	567	57	
		MG.>100'	7050	2829	40	
		Total	32000	24597		
1983	31/12	FG.<65'	9050	9179	101	
		MG.<65'	15000	12991	87	
		FG. 65-100'	100	108	108	12/04 - 31/12
		MG. 65-100'	800	177	22	
		MG.>100'	7050	2438	35	
		Total	32000	24893		
1984	31/12	FG.<65'	8850	6958	79	
		MG.<65'	15000	12359	82	
		FG. 65-100'	100	3	3	
		MG. 65-100'	1000	44	4	
		MG.>100'	7050	648	9	
		Total	32000	20012		

Table 2. (Continued).

Year	Report Date	Fleet	Allocation	Reported[1] Catch	%	CLOSURE DATES
1985	31/12	FG.<65'	4000	4496	112	16/11 - 31/12
		MG.<65'	10000	10214	102	13/08 - 31/12
		FG. 65-100'	100	1	1	
		MG. 65-100'	100	61	61	
		MG.>100'	800	541	68	
		Total	15000	15313		
1986	31/12	FG.<65'	5000	5446	109	
		MG.<65' 1/1-30/4	2700			13/03
		1/5-31/8	4000			18/07
		1/9-31/12	2300	9202	102	
		FG. 65-100'	100	0	0	
		MG. 65-100'	100	118	118	15/02, 15/11
		MG.>100'	800	680	85	
		Total	15000	15446		
1987	31/12	FG.<65'	5000	4747	95	
		MG.<65' 1/1-30/4	2700	2998	111	08/04, trip limits
		1/5-31/8	4000	3481	87	28/07, 13/08, trip limits
		1/9-31/12	2300	1380	60	20/11, 08/12, trip limits
		FG. 65-100'	100	49	49	
		MG. 65-100'	100	121	121	24/03, revoked 31/03
		MG.>100'	800	487	61	
		Total	15000	13263	88	
1988	31/12	FG.<65'	4126	3455	84	
		FG. 65-100'	75	0	0	
		MG.<45' 1/1-30/4	1200	1037	86	Trip limits
		1/5-31/8	1800	1540	86	Trip limits
		1/9-31/12	978	839	86	21/10
		MG. 45-65' 1/1-31/8	2500	2708	108	Trip limits
		1/9-31/12	976	962	99	21/10
		MG. 65-100'	85	15	17	
		MG. >100'	660	408	62	
		Total	12400	10964		

Table 2. (Continued).

Year	Report Date	Fleet	Allocation	Reported[1] Catch	%	CLOSURE DATES
1989	13/12	FG.<45' (A1)	1540	2884	187	11/10; 2 options of trip limits,
		FG. 45-65' (A2)				19/10; A1, 1500kg/10% bycatch; A2, no permits
						03/11; A2, 0 kg/10% bycatch
						09/11; A1, 2 options of trip limits
		FG.<100	25	0	0	
		MG<45' (C1)				
		1/1-30/4	450	1363	303	22/2; closed
		1/5-31/8	670	799	119	23/2; revoked
		1/9-31/12	400	125	31	16/3; closed
						22/3; revoked
						28/3; 9000 kg trip limit
						11/4; 1500 kg trip limit
						13/4; 9000 kg trip limit
						14/6; closed to cod, haddock, pollock (CHP) in 4X, 5, except generalists
						Generalists; 3300 lbs CHP/trip
						19/7; 2000 lbs CHP/trip
						4/8; 3300 lbs CHP trip, 2 trips/wk or 10% CHP/trip
						27/9; 2000 lbs CHP/trip
						22/11; generalists closed
		MG 45-65' (C2)				
		1/1-30/4	370	1273	344	22/2; closed
		1/5-31/8	560	357	64	23/2; revoked
		1/9-31/12	320	0	0	16/3; closed
						22/3; revoked
						14/06; closed to CHP in 4X, 5
		MG<100'	25	9	36	
		MG>100'	240	56	23	
		Total	4600	6899	149	

1 These figures are based on hail information and thus are unofficial and not comparable to those in Table 1.

Table 3 Reported nominal catch (t round) of haddock from NAFO Division 4X (excluding unit areas 4Xs) landed in the Maritimes split by tonnage class and gear type. The numbers in brackets represent the mean weight landed per age/size sample collected.

	Tonnage Class					
	TC 1-3			TC 4+		
Year	MG (OT)	FG (LL)	Misc.[1]	MG (OT)	FG	Misc.
1970	4894 (1224)	3281	767	6501 (296)	114	3
1971	4289 (858)	3475 (1158)	499	7711 (367)	94	0
1972	2742 (686)	4396 (440)	439	4750 (216)	63	0
1973	1822 (304)	6090 (677)	324	4228 (282)	70	0
1974	3949 (494)	6364 (530)	251	1622 (324)	55	0
1975	6085 (320)	5193 (577)	271	4408 (157)	26	0
1976	4347 (1087)	5305 (884)	445 (223)	6144 (186)	46	6
1977	6178 (1030)	4328 (481)	550	8343 (130)	117	35
1978	9413	6814 (568)	1084 (542)	7888 (164)	97	0
1979	10171 (5086)	5127 (394)	600 (600)	8317 (252)	57	0
1980	13043 (1186)	6911 (384)	1127 (376)	7045 (294)	82	0
1981	14765 (328)	7846 (302)	993 (331)	6475 (809)	70	0
1982	11670 (243)	7581 (345)	945 (79)	2972 (297)	32	0
1983	12563 (224)	8533 (225)	754 (75)	2535 (195)	15	0
1984	11828 (208)	6769 (226)	193 (193)	609 (76)	0	0
1985	9834 (173)	4360 (182)	142	565 (113)	1	0
1986	9201 (192)	5336 (184)	240	209 (209)	0	0
1987	7952 (169)	4854 (270)	231 (21)	501 (84)	0	0
1988	7074 (131)	3353 (152)	118 (118)	376 (188)	0	0
1989	3656 (130)	2699 (245)	222	89 (22)	0	0

1 - Gillnets (set, drift), traps, unspecified.

Table 4. Summary of commercial sampling for the 4X haddock fishery in 1989. Tons landed is followed by sampling information in parentheses. The first number represents the number of fish measured and the second the number of otoliths read. The boxes represent the aggregation used in age/length formation.

Otter Trawls

	4Xmnop		4Xqr	
Quarter	TC 1-3	TC 4+	TC 1-3	TC 4+
1	2121 (4053-355)	34 (650-68)	143	0
2	501 (1067-90)	8	587 (499-65)	3
3	46	2	253 (225-26)	0
4	2	42 (192-31)	3 (135-0)	0

Longliners

	4Xmnop		4Xqr	
Quarter	TC 1-3	TC 4+	TC 1-3	TC 4+
1	916 (441-68)	0	9	0
2	216	0	59	0
3	1023 (1286-163)	0	36	0
4	440 (400-68)	0	0	0

Miscellaneous*

	4Xmnop		4Xqr	
Quarter	TC 1-3	TC 4+	TC 1-3	TC 4+
1	36	0	0	0
2	55	0	1	0
3	65	0	1	0
4	64	0	0	0

* Longline samples applied to miscellaneous landings

Table 5. Individual keys used to construct the catch at age for the 1989 4X haddock fishery by gear, area, quarter and tonnage class. A's and B's taken from O'Boyle et al. (1983).

GEAR	AREA	QUARTER	TONNAGE CLASS	A's	B's	Catch at Age															
						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
OTB	MNOP	1	1-3	0.007668	3.07669	0	3	46	187	539	466	117	13	2	0	0	0	0	0	0	0
			4+	0.007668	3.07669	0	0	1	3	9	7	2	0	0	0	0	0	0	0	0	0
		2	1-3	0.007709	3.07669	0	0	6	56	175	89	15	1	0	0	0	0	0	0	0	0
			4+	0.007709	3.07669	0	0	0	1	3	1	0	0	0	0	0	0	0	0	0	0
		3	1-3	0.007758	3.07669	0	0	1	5	16	8	1	0	0	0	0	0	0	0	0	0
			4+	0.007758	3.07669	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
		4	1-3	0.007804	3.07669	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			4+	0.007804	3.07669	0	3	8	9	7	3	0	0	0	0	0	0	0	0	0	0
	QR	1	1-3	0.009166	3.03027	0	0	12	37	18	14	8	0	0	0	0	0	0	0	0	0
		2	1-3	0.009388	3.03027	0	1	49	147	73	55	32	1	0	0	0	0	0	0	0	0
			4+	0.009388	3.03027	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
		3	1-3	0.009654	3.03027	0	0	25	33	58	18	0	0	0	0	0	0	0	0	0	0
		4	1-3	0.009908	3.03027	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
LL/LHP	MNOP	1	1-3	0.007668	3.07669	0	0	13	45	194	253	98	9	1	1	0	0	0	0	0	0
		2	1-3	0.007709	3.07669	0	1	13	49	61	21	1	0	0	0	0	0	0	0	0	0
		3	1-3	0.007758	3.07669	0	6	61	230	287	97	3	0	1	0	0	0	0	0	0	0
		4	1-3	0.007804	3.07669	0	3	14	73	104	38	2	0	0	0	0	0	0	0	0	0
	QR	1	1-3	0.009166	3.03027	0	0	0	0	2	3	1	0	0	0	0	0	0	0	0	0
		2	1-3	0.009388	3.03027	0	0	3	13	16	6	0	0	0	0	0	0	0	0	0	0
		3	1-3	0.009654	3.03027	0	0	2	8	10	3	0	0	0	0	0	0	0	0	0	0
MISC.	MNOP	1	1-3	0.007668	3.07669	0	0	1	2	8	10	4	0	0	0	0	0	0	0	0	0
		2	1-3	0.007709	3.07669	0	0	3	12	16	5	0	0	0	0	0	0	0	0	0	0
		3	1-3	0.007758	3.07669	0	0	4	15	18	6	0	0	0	0	0	0	0	0	0	0
		4	1-3	0.007804	3.07669	0	0	2	11	15	6	0	0	0	0	0	0	0	0	0	0
	QR	23	1-3	0.009388	3.03027	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
FOREIGN	MNOP	3	4+	0.007758	3.07669	0	0	0	4	12	6	1	0	0	0	0	0	0	0	0	0
					Total	0	17	264	941	1644	1115	285	24	4	1	0	0	0	0	0	0

Table 6. Annual landings numbers (A), weight at age (B), percent by number (C), and percent by weight (D) of NAFO Division 4X haddock. Note that age 13 represents all individuals 13 and over.

(A)

TOTAL ANNUAL LANDINGS (000s) AT AGE OF HADDOCK CAUGHT IN 4Xmnopqr

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0	0	41	150	1	37	18	2	0	0	16	1	0	0	2	0	0	0	0	0
2	1055	788	22	3077	694	2175	1296	1285	75	81	161	1182	491	64	708	198	290	39	28	17
3	724	1617	3434	113	4653	4568	1644	3126	3354	1158	2445	2215	3639	3294	1108	1956	1170	913	311	264
4	1502	788	1841	2247	309	5164	4261	2019	7014	6709	3008	6219	2474	5476	4680	2261	4378	2868	1342	941
5	379	1422	509	1067	1779	485	3682	3193	2094	3881	5413	4199	4628	3733	3439	4516	3923	4186	2854	1644
6	524	404	645	527	509	1103	434	2881	2832	1070	3499	3195	1703	2232	2396	1463	1476	1931	1935	1115
7	4536	69	90	600	189	247	807	360	1040	1244	527	1163	1457	940	948	464	246	252	453	285
8	1863	3316	57	322	269	172	154	389	137	263	623	357	340	395	340	132	116	56	76	24
9	133	1020	1166	259	186	62	71	107	107	57	169	323	183	187	110	53	40	2	14	4
10	96	163	512	614	269	32	95	72	26	68	34	97	94	119	77	16	28	2	3	1
11	175	181	26	55	552	165	39	23	9	11	21	14	45	69	36	6	9	5	4	0
12	27	146	193	13	24	229	103	8	6	1	3	23	16	25	20	1	4	0	0	0
13+	37	105	92	6	4	11	157	87	48	18	10	9	14	25	12	1	2	0	0	0

(B)

MEAN ANNUAL WEIGHT (KG) AT AGE OF HADDOCK CAUGHT IN 4Xmnopqr

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	.290	.290	.290	.270	.180	.230	.230	.280	.290	.290	.160	.230	.000	.000	.250	.000	.000	.000	.000	.000
2	.570	.500	.450	.510	.460	.520	.520	.460	.440	.510	.522	.593	.493	.394	.527	.553	.523	.615	.491	.566
3	.900	.960	.900	.750	.820	.820	.810	.710	.870	.870	.882	.887	.907	.758	.785	.787	.726	.733	.789	.877
4	1.050	1.250	1.350	1.250	1.100	1.200	1.190	1.220	1.330	1.330	1.326	1.260	1.294	1.141	1.069	1.043	1.050	1.003	1.125	1.214
5	1.160	1.400	1.600	1.800	1.700	1.550	1.600	1.720	1.850	1.840	1.777	1.721	1.653	1.714	1.411	1.392	1.397	1.356	1.488	1.492
6	1.430	1.500	1.750	2.000	2.300	2.250	2.100	2.200	2.330	2.360	2.355	2.219	2.130	2.146	1.932	1.942	1.867	1.800	1.877	1.858
7	1.650	1.750	1.900	2.200	2.500	2.850	2.950	2.940	2.700	2.830	2.906	2.654	2.577	2.607	2.287	2.460	2.480	2.473	2.296	2.379
8	1.950	1.950	2.100	2.300	2.600	3.000	3.500	3.300	3.390	3.300	3.278	3.134	2.947	2.869	2.683	2.901	2.615	3.077	3.001	3.068
9	2.300	2.300	2.300	2.500	2.800	3.200	3.600	3.570	3.770	4.030	3.811	3.608	3.470	3.108	3.054	3.341	3.399	4.095	3.614	4.268
10	2.820	2.650	2.800	2.700	2.950	3.450	3.800	3.770	4.170	4.150	4.332	3.688	4.033	3.550	3.431	3.244	3.540	4.410	3.287	3.410
11	2.800	3.250	3.000	3.300	3.200	3.500	4.100	3.690	4.030	4.960	4.200	4.546	3.946	3.630	3.841	4.162	3.037	3.980	4.495	.000
12	2.850	3.000	3.700	3.400	3.800	3.700	4.000	3.940	3.620	6.000	4.963	4.823	4.033	3.780	4.114	4.300	3.110	.000	.000	.000
13+	3.600	3.000	3.300	4.200	3.900	4.400	4.200	3.910	4.630	5.680	5.711	4.680	4.908	4.064	4.000	5.700	4.410	.000	.000	.000

(C)

Percent Landings at Age by Numbers

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	10	8	0	34	7	15	10	9	0	1	1	6	3	0	5	2	2	0	0	0
3	7	16	40	1	49	32	13	23	20	8	15	12	24	20	8	18	10	9	4	6
4	14	8	21	25	3	36	33	15	42	46	19	33	16	33	34	20	37	28	19	22
5	3	14	6	12	19	3	29	24	13	27	34	22	31	23	25	41	34	41	41	38
6	5	4	7	6	5	8	3	21	17	7	22	17	11	13	17	13	13	19	28	26
7	41	1	1	7	2	2	6	3	6	9	3	6	10	6	7	4	2	2	6	7
8	17	33	1	4	3	1	1	3	1	2	4	2	2	2	2	1	1	1	1	1
9	1	10	14	3	2	0	1	1	1	0	1	2	1	1	1	0	0	0	0	0
10	1	2	6	7	3	0	1	1	0	0	0	1	1	1	1	0	0	0	0	0
11	2	2	0	1	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	1	2	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0
13+	0	1	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0

(D)

Percent Landings at Age by Weight

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	4	2	0	13	2	7	4	3	0	0	0	2	1	0	2	1	1	0	0	0
3	4	10	24	1	29	22	7	11	11	4	8	6	14	10	4	10	6	5	2	3
4	10	6	19	23	3	36	27	12	35	36	14	25	13	25	25	16	31	21	14	17
5	3	12	6	16	23	4	32	27	14	29	34	23	32	26	25	42	36	42	39	37
6	5	4	9	9	9	14	5	31	25	10	29	23	15	19	24	19	18	26	33	31
7	46	1	1	11	4	4	13	5	10	14	5	10	16	10	11	8	4	5	9	10
8	22	40	1	6	5	3	3	6	2	4	7	4	4	5	5	3	2	1	2	1
9	2	14	21	5	4	1	1	2	2	1	2	4	3	2	2	1	1	0	0	0
10	2	3	11	14	6	1	2	1	0	1	1	1	2	2	1	0	1	0	0	0
11	3	4	1	2	14	3	1	0	0	0	0	0	1	1	1	0	0	0	0	0
12	0	3	5	0	1	5	2	0	0	0	0	0	0	0	0	0	0	0	0	0
13+	1	2	2	0	0	0	4	2	1	0	0	0	0	0	0	0	0	0	0	0

Table 7. 4X Haddock mean numbers at age per standard tow (A), standard error of the mean (B), and coefficients of variation by age (C) in 1970-89 summer RV surveys.

A

SUMMER SURVEY - STRATIFIED MEAN NUMBERS PER STANDARD TOW

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
0	.000	.000	.000	.000	.000	.000	.069	.025	.012	.523	.029	.678	.271	.349	.307	.000	.121	.000	.082	.005
1	5.899	.117	5.822	6.781	11.530	6.970	6.425	6.401	6.325	1.748	21.946	41.014	13.052	6.858	4.684	6.637	3.838	.943	7.172	5.781
2	4.719	11.116	.260	19.354	23.084	3.744	6.119	33.567	5.039	13.428	6.856	28.799	28.737	4.538	23.382	6.779	8.723	.897	1.863	9.442
3	1.405	4.722	3.314	.634	31.804	4.876	3.866	38.796	10.300	10.040	15.330	7.055	12.807	14.449	12.381	24.828	9.808	3.615	1.948	2.999
4	2.605	2.081	1.389	3.060	.954	7.952	4.228	11.334	3.107	10.680	8.036	8.651	4.678	5.828	17.691	19.104	16.462	6.652	4.140	2.454
5	1.114	2.914	.880	1.467	4.093	.427	7.562	11.511	1.305	4.987	12.726	3.188	6.685	3.558	5.537	11.710	9.432	5.233	5.267	3.335
6	2.639	1.376	.915	.461	.892	1.945	.574	6.650	2.527	1.978	4.377	3.398	2.547	2.351	3.176	3.089	2.558	1.771	1.851	.633
7	5.775	2.112	.605	.611	.494	.531	.679	.789	1.073	3.061	1.662	1.115	2.510	.962	1.554	.952	.570	.442	.263	.022
8	.807	5.181	.882	.464	.585	.422	.127	1.031	.029	1.162	1.348	.243	.334	.322	.557	.095	.241	.003	.075	.000
9	.343	.757	1.241	.275	.344	.176	.024	.143	.000	.248	.640	.437	.205	.292	.444	.000	.069	.000	.140	.000
10	.283	.093	.043	.375	.246	.110	.037	.129	.000	.030	.240	.279	.060	.209	.080	.040	.017	.000	.000	.000
11	.084	.045	.006	.025	.338	.301	.000	.015	.029	.000	.043	.142	.038	.090	.033	.000	.017	.000	.000	.000
12	.031	.061	.005	.000	.000	.269	.254	.069	.039	.000	.000	.036	.000	.069	.030	.030	.000	.000	.000	.000
13+	.000	.000	.000	.015	.000	.000	.109	.279	.193	.165	.050	.005	.000	.070	.041	.034	.078	.457	.148	.050

B

SUMMER SURVEY - STRATIFIED STANDARD ERROR OF MEAN NUMBERS PER STANDARD TOW

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
0	.000	.000	.000	.000	.000	.000	.055	.000	.000	.249	.032	.464	.266	.235	.122	.000	.055	.000	.063	.000
1	1.488	.055	2.584	2.382	6.582	2.813	1.592	1.829	2.226	.896	14.040	23.825	5.132	2.255	2.152	1.707	.475	.249	2.869	1.274
2	1.394	2.831	.130	7.648	8.187	1.091	1.393	12.202	1.554	1.575	2.871	12.613	8.186	1.627	11.221	1.340	2.444	.367	1.043	2.898
3	.330	1.437	.933	.230	10.049	1.418	.565	23.918	3.064	.804	5.911	3.348	3.424	4.399	4.506	8.115	2.620	.843	.460	.799
4	.765	.703	.265	.616	.255	2.173	.688	6.787	.822	2.370	2.500	1.557	1.061	1.025	6.052	8.775	3.813	1.150	.675	.400
5	.447	.998	.148	.170	1.052	.138	1.146	5.104	.385	1.391	3.858	.470	1.365	.567	1.408	3.965	2.029	.830	.702	.748
6	1.066	.484	.148	.084	.263	.572	.077	2.569	.799	.493	1.238	.509	.439	.349	.628	.507	.693	.302	.414	.224
7	1.915	.797	.100	.100	.138	.179	.089	.232	.277	.773	.381	.219	.511	.145	.300	.195	.219	.100	.095	.000
8	.290	1.742	.155	.110	.170	.138	.000	.367	.000	.279	.245	.063	.095	.063	.100	.032	.089	.000	.045	.000
9	.126	.259	.214	.071	.100	.071	.000	.032	.000	.110	.130	.118	.063	.071	.095	.000	.045	.000	.134	.000
10	.130	.055	.000	.095	.071	.063	.000	.045	.000	.000	.055	.122	.032	.055	.032	.000	.000	.000	.000	.000
11	.032	.000	.000	.000	.071	.105	.000	.000	.000	.000	.000	.055	.000	.000	.000	.000	.000	.000	.000	.000
12	.000	.032	.000	.000	.000	.084	.089	.045	.000	.000	.000	.000	.000	.032	.000	.000	.000	.000	.000	.000
13+	.000	.000	.000	.000	.000	.000	.032	.063	.071	.055	.045	.000	.000	.032	.000	.032	.063	.358	.130	.032

C

SUMMER SURVEY - COEFFICIENTS OF VARIATION

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
0	0	0	0	0	0	0	79	0	0	48	109	68	98	67	40	0	45	0	77	0
1	25	47	44	35	57	40	25	29	35	51	64	58	39	33	46	26	12	26	40	22
2	30	25	50	40	35	29	23	36	31	12	42	44	28	36	48	20	28	41	56	31
3	23	30	28	36	32	29	15	62	30	8	39	47	27	30	36	33	27	23	24	27
4	29	34	19	20	27	27	16	60	26	22	31	18	23	18	34	46	23	17	16	16
5	40	34	17	12	26	32	15	44	29	28	30	15	20	16	25	34	22	16	13	22
6	40	35	16	18	29	29	13	39	32	25	28	15	17	15	20	16	27	17	22	35
7	33	38	17	16	28	34	13	29	26	25	23	20	20	15	19	20	38	23	36	0
8	36	34	18	24	29	33	0	36	0	24	18	26	28	20	18	33	37	0	60	0
9	37	34	17	26	29	40	0	22	0	44	20	27	31	24	21	0	65	0	96	0
10	46	59	0	25	29	57	0	35	0	0	23	44	53	26	40	0	0	0	0	0
11	38	0	0	0	21	35	0	0	0	0	0	39	0	0	0	0	0	0	0	0
12	0	52	0	0	0	31	35	65	0	0	0	0	0	46	0	0	0	0	0	0
13+	0	0	0	0	0	0	29	23	37	33	89	0	0	45	0	93	81	78	88	63

Table 8. 4X Haddock mean biomass (kg) at age (A) per standard tow and average weight (kg) per fish by age (B) in 1970-89 summer RV surveys.

A SUMMER SURVEY - STRATIFIED MEAN WEIGHT (KG) PER STANDARD TOW

I	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
0	.000	.000	.000	.000	.000	.000	.000	.000	.000	.002	.000	.004	.001	.002	.002	.000	.000	.000	.000	.000
1	.554	.011	.467	.635	1.087	.765	.629	.694	.434	.132	1.798	3.408	.778	.475	.482	.499	.292	.071	.731	.497
2	1.894	2.880	.052	5.543	7.224	1.397	2.226	15.385	2.077	4.837	2.745	11.382	6.411	1.178	6.872	1.681	2.372	.178	.717	3.220
3	1.034	3.609	2.055	.314	21.331	3.630	2.724	31.641	8.886	8.087	11.376	5.561	8.501	8.242	5.748	12.648	5.026	1.705	1.298	2.079
4	2.643	2.266	1.682	3.939	.924	9.576	5.075	13.907	4.260	13.972	10.428	9.906	5.805	6.326	14.310	15.194	12.369	5.485	3.863	2.716
5	1.491	4.125	1.364	2.500	7.019	.732	12.069	19.908	2.360	8.378	23.005	5.533	10.383	5.723	6.965	14.330	12.099	7.085	7.183	5.279
6	4.057	2.185	1.690	1.002	1.969	4.331	1.216	13.678	5.310	4.442	9.473	7.397	5.179	4.576	5.901	6.519	4.422	3.165	3.701	1.353
7	11.214	3.694	1.136	1.347	1.217	1.488	1.777	2.208	2.723	7.890	4.199	2.891	6.136	2.326	3.410	2.621	1.448	.995	.696	.075
8	1.904	11.022	2.028	1.111	1.543	1.226	.310	3.096	.096	3.357	3.689	.708	1.001	.847	1.351	.275	.691	.008	.291	.000
9	.860	1.971	3.327	.703	.908	.533	.073	.541	.000	.989	2.081	1.408	.663	.809	1.378	.000	.237	.000	.493	.000
10	.881	.354	.140	1.032	.668	.372	.118	.394	.000	.096	.796	1.117	.273	.616	.277	.127	.076	.000	.000	.000
11	.289	.163	.022	.083	1.200	.998	.000	.048	.075	.000	.162	.566	.130	.225	.124	.000	.076	.000	.000	.000
12	.073	.205	.026	.000	.000	.862	.872	.234	.133	.000	.000	.160	.000	.258	.124	.114	.000	.000	.000	.000
13+	.000	.000	.000	.056	.000	.000	.408	1.053	.583	.685	.204	.027	.000	.385	.128	.008	.309	.340	.189	.155

B SUMMER SURVEY - AVERAGE WEIGHT (KG) OF AN INDIVIDUAL

I	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
0	.000	.000	.000	.000	.000	.000	.000	.000	.000	.004	.000	.006	.004	.006	.007	.000	.000	.000	.000	.000
1	.094	.094	.080	.094	.094	.110	.098	.108	.069	.076	.082	.083	.060	.069	.103	.075	.076	.075	.102	.086
2	.401	.259	.200	.286	.313	.373	.364	.458	.412	.360	.400	.395	.223	.260	.294	.248	.272	.198	.385	.341
3	.736	.764	.620	.495	.671	.744	.705	.816	.863	.805	.742	.788	.664	.570	.464	.509	.512	.472	.666	.693
4	1.015	1.089	1.211	1.287	.969	1.204	1.200	1.227	1.371	1.308	1.298	1.145	1.241	1.085	.809	.795	.751	.825	.933	1.107
5	1.338	1.416	1.550	1.704	1.715	1.714	1.596	1.729	1.808	1.680	1.808	1.736	1.553	1.608	1.258	1.224	1.283	1.354	1.364	1.583
6	1.537	1.588	1.847	2.174	2.207	2.227	2.118	2.057	2.101	2.246	2.164	2.177	2.033	1.946	1.858	2.110	1.729	1.787	1.999	2.137
7	1.942	1.749	1.878	2.205	2.464	2.802	2.617	2.798	2.538	2.578	2.526	2.593	2.445	2.418	2.194	2.753	2.540	2.251	2.646	3.409
8	2.359	2.127	2.299	2.394	2.638	2.905	2.441	3.003	3.310	2.889	2.737	2.914	2.997	2.630	2.425	2.895	2.867	2.667	3.880	.000
9	2.507	2.604	2.681	2.556	2.640	3.028	3.042	3.783	.000	3.988	3.252	3.222	3.234	2.771	3.104	.000	3.435	.000	3.521	.000
10	3.113	3.806	3.256	2.752	2.715	3.382	3.189	3.054	.000	3.200	3.317	4.004	4.550	2.947	3.463	3.175	4.471	.000	.000	.000
11	3.440	3.622	3.667	3.320	3.550	3.316	.000	3.200	2.586	.000	3.767	3.986	3.421	2.500	3.758	.000	4.471	.000	.000	.000
12	2.355	3.361	5.200	.000	.000	3.204	3.433	3.391	3.410	.000	.000	4.444	.000	3.739	4.133	3.800	.000	.000	.000	.000
13+	.000	.000	.000	3.733	.000	.000	3.743	3.774	3.021	4.152	4.080	5.400	.000	5.500	3.122	.235	3.962	.744	1.277	3.100

Table 9. Total mortality estimates (Z) for ages 2 to 8, 2+ and fully recruited ages (5-7/6-8) from 1970-89 summer RV survey.

ESTIMATES OF TOTAL MORTALITIES (Z)

	1970	1971	1972	1973	1974	1975	1976	1977	1978
2	-.001	1.210	-.891	-.497	1.555	-.032	-1.847	1.181	-.689
3	-.393	1.224	.080	-.409	1.386	.143	-1.076	2.525	-.036
4	-.112	.861	-.055	-.291	.804	.050	-1.002	2.162	-.473
5	-.211	1.158	.647	.498	.744	-.296	.129	1.516	-.416
6	.223	.822	.404	-.069	.519	1.052	-.318	1.824	-.192
7	.109	.873	.265	.043	.158	1.431	-.418	3.303	-.080
2+	-.064	1.025	.075	-.121	.861	.391	-.755	2.085	-.314
5-7/6-8	.094	.980	.446	.253	.637	.744	.040	1.653	-.234

	1979	1980	1981	1982	1983	1984	1985	1986	1987
2	-.132	-.029	.810	.688	-1.004	-.060	-.369	.881	-.776
3	.223	.572	.411	.787	-.202	-.434	.411	.388	-.136
4	-.175	.925	.258	.274	.051	.413	.706	1.146	.233
5	.130	1.320	.224	1.045	.114	.584	1.521	1.673	1.039
6	.174	1.368	.303	.974	.414	1.205	1.690	1.756	1.907
7	.820	1.923	1.205	2.053	.546	2.795	1.374	5.247	1.774
2+	.173	1.013	.535	.970	-.013	.750	.889	1.848	.674
5-7/6-8	.305	1.373	.357	1.173	.262	.909	1.542	1.735	1.224

	1988
2	-.476
3	-.231
4	.216
5	2.119
6	4.432
7	.000
2+	1.212
5-7/6-8	2.488

Table 10. 4X haddock mean numbers per standard tow by stratum in the 1970-1989 summer RV surveys.

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
70	3.937	.583	5.677	5.134	.411	4.200	.700	273.934	5.750	38.250
71	.000	.000	2.471	.000	.000	.553	.000	.437	.456	.553
72	13.718	37.799	15.863	12.562	28.856	49.179	35.250	14.917	10.527	32.552
73	89.869	9.975	82.216	51.916	53.905	11.501	113.457	169.737	26.390	81.260
74	55.725	25.609	28.957	39.501	75.434	88.726	76.847	26.003	103.579	303.430
75	78.138	53.879	21.970	57.628	105.675	27.124	137.037	24.938	81.001	77.825
76	.000	80.500	12.383	.000	41.534	53.236	1.312	554.500	53.784	.000
77	45.401	34.124	24.515	31.915	132.000	6.301	66.939	31.068	45.544	44.470
78	1.750	1.750	.700	.584	2.524	3.208	10.500	9.187	6.152	2.522
80	101.796	240.458	98.510	191.432	262.161	179.520	64.127	628.143	91.657	88.725
81	63.263	30.887	35.986	146.874	271.843	49.718	55.846	7.874	72.484	84.584
82	2.333	3.314	.000	.000	5.834	3.062	4.690	9.751	8.401	20.544
83	2.526	.000	4.083	.000	1.853	2.101	30.332	9.964	1.750	11.053
84	.000	.524	.000	.369	.350	.389	6.116	.412	.583	14.868
85	52.162	11.777	.000	9.883	9.291	17.999	14.774	34.484	13.878	10.871
90	30.430	56.876	.525	70.775	323.401	60.514	150.501	189.191	63.480	437.063
91	4.157	.000	11.392	3.917	21.050	3.013	2.580	21.303	11.514	5.206
95	16.799	13.557	9.329	4.000	20.189	.840	7.411	33.920	48.000	31.462

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
70	3.281	6.089	.000	35.791	12.579	.973	38.603	6.611	6.462	4.791
71	2.917	2.863	4.890	3.890	.461	.000	.515	2.574	.000	.000
72	248.911	192.034	141.201	39.750	49.035	73.403	73.088	28.209	34.726	37.785
73	31.419	10.600	135.883	34.219	60.703	189.097	174.073	80.294	12.010	12.325
74	27.176	119.460	135.367	57.810	-	134.501	52.611	3.153	1.544	1.797
75	71.198	45.523	47.982	53.937	254.509	100.854	159.045	14.126	13.897	22.103
76	23.099	14.841	5.499	62.337	8.750	369.873	22.389	25.032	9.095	9.206
77	16.334	84.000	94.153	86.471	150.809	92.132	120.409	43.994	59.482	42.016
78	1.750	.667	2.941	16.770	16.728	20.417	9.479	25.392	11.323	.000
80	224.055	180.809	73.738	93.290	172.055	117.449	97.597	52.541	84.961	175.586
81	169.638	47.251	170.296	41.817	70.772	18.678	168.470	31.931	25.722	29.258
82	25.844	9.923	23.335	8.579	20.903	1.458	2.059	31.633	22.734	18.186
83	23.500	32.225	70.037	5.662	33.423	14.584	13.004	11.485	20.588	1.544
84	2.333	1.667	6.042	1.279	4.118	2.935	.686	.000	1.367	.972
85	65.917	15.014	24.849	11.285	26.444	80.434	35.573	2.970	9.679	1.863
90	311.149	1479.700	485.533	234.972	773.650	160.559	31.559	44.660	128.406	149.128
91	15.371	15.480	30.463	32.012	29.261	16.342	2.745	1.030	.257	.000
95	6.750	8.683	37.553	14.843	3.088	5.220	.000	.000	.975	.000

Table 11. 4X haddock mean numbers per standard tow by stratum in the spring (1979-1985)(a); and fall (1979-1984)(b) RV surveys.

A SPRING SURVEY - MEAN NUMBERS PER STANDARD TOW BY STRATUM

	1979	1980	1981	1982	1983	1984	1985
70	76.603	1.848	58.677	137.743	12.450	20.658	7.291
71	44.501	2.303	1.458	4.208	.921	.515	.000
72	-	74.517	22.133	28.477	261.246	124.078	105.486
73	-	170.188	48.124	14.224	199.869	129.064	67.389
74	-	4.605	253.442	2.500	213.750	31.173	17.500
75	-	64.401	49.253	47.812	299.197	113.457	49.097
76	10.930	74.357	136.672	85.348	53.063	72.334	74.862
77	-	156.875	340.600	238.539	1039.001	233.019	186.181
78	6.016	1.544	2.500	43.188	19.728	.648	3.241
80	1223.457	292.665	234.436	24.874	135.847	232.092	100.417
81	255.262	19.194	176.086	137.631	82.007	194.063	73.889
82	.461	.000	.000	.230	.486	7.720	10.208
83	.000	.417	-	-	.000	.000	-
84	1.944	3.793	-	.771	1.009	.686	23.332
85	198.601	9.965	.000	59.298	61.894	193.611	12.639
90	.000	.000	-	1.750	37.444	5.104	.000
91	.254	.000	-	12.767	10.267	55.089	-
95	.584	-	-	.614	.921	.000	-

B FALL SURVEY - MEAN NUMBERS PER STANDARD TOW BY STRATUM

	1979	1980	1981	1982	1983	1984
70	17.053	6.562	.000	9.006	5.148	2.059
71	2.764	7.916	10.751	13.995	1.823	1.520
72	66.257	291.882	271.387	17.284	68.899	115.074
73	174.285	250.993	79.292	161.875	177.688	150.637
74	888.999	3.334	49.792	67.427	25.765	35.729
75	154.486	140.921	222.997	125.903	72.059	71.763
76	12.539	32.317	99.288	63.929	67.030	32.627
77	40.541	372.650	89.606	240.712	69.079	100.367
78	.686	1.544	.000	9.823	6.863	13.039
80	427.272	236.001	205.018	268.930	460.734	231.216
81	130.328	512.112	140.324	85.541	64.529	173.721
82	18.195	24.238	37.430	48.611	11.552	3.089
83	42.500	16.101	10.938	13.381	3.603	19.063
84	10.937	8.167	58.676	10.645	1.677	8.750
85	17.500	102.395	59.012	20.143	20.165	31.623
90	66.500	288.750	252.140	97.806	70.086	149.786
91	-	15.114	5.281	29.166	6.481	3.051
95	-	5.000	1.663	3.938	18.556	10.487

Table 12. Percent frequency of occurrence of above average haddock catches by age in the 4X area for the spring (a) summer (b), and fall (c) RV surveys.

a

4X HADDOCK - SPRING SURVEY

	0	1	2	3	4	5	6	7	8	9	10	11	12	13
70	0	0	14	29	43	29	0	0	0	0	29	0	0	0
71	0	0	14	0	0	0	0	0	0	0	14	14	0	0
72	0	33	50	67	50	33	0	0	0	0	17	17	0	0
73	0	33	67	67	33	0	0	0	0	0	0	17	17	0
74	0	33	33	17	17	0	0	0	0	0	0	0	0	0
75	0	33	83	67	33	17	33	17	0	17	0	17	17	0
76	0	29	43	57	29	14	0	14	14	14	29	14	0	0
77	0	33	67	100	100	100	100	83	67	67	50	50	17	17
78	0	0	14	0	0	0	0	0	0	0	0	0	0	0
80	0	29	43	71	71	71	71	86	57	71	29	43	14	29
81	0	43	57	43	43	71	71	57	29	14	14	29	0	29
82	0	0	0	0	0	0	0	0	0	0	0	0	0	0
83	0	0	0	0	0	0	0	0	0	0	0	0	0	0
84	0	0	0	0	0	0	0	0	0	17	0	17	0	0
85	0	14	29	57	57	14	0	14	14	0	0	0	0	14
90	0	17	0	0	0	0	0	0	0	0	0	0	0	0
91	0	0	0	20	20	0	0	0	0	0	0	0	0	0
95	0	0	0	0	0	0	0	0	0	0	0	0	0	0

b

4X HADDOCK - SUMMER SURVEY

	0	1	2	3	4	5	6	7	8	9	10	11	12	13
70	0	0	10	10	20	15	20	20	10	15	15	10	10	10
71	10	0	0	0	0	0	0	0	0	0	0	0	0	0
72	15	35	40	30	50	30	30	35	10	15	25	15	10	0
73	15	10	15	35	55	60	80	70	60	50	55	50	30	15
74	20	35	15	25	35	35	50	55	50	55	55	45	30	15
75	10	55	35	35	40	60	55	55	35	40	25	25	15	15
76	5	10	20	35	25	25	40	25	30	25	20	30	15	10
77	10	55	55	25	30	40	30	25	15	15	15	15	10	5
78	0	0	0	0	15	10	0	0	0	10	5	0	5	5
80	25	80	80	75	80	90	65	50	35	35	40	30	20	15
81	35	55	45	35	35	45	60	40	45	35	30	25	25	25
82	0	0	0	0	5	25	55	25	15	25	15	5	10	15
83	0	0	0	0	0	25	45	45	45	50	40	45	35	35
84	0	0	0	0	0	0	5	5	5	10	15	10	15	10
85	0	0	0	5	20	30	60	55	35	45	30	30	35	15
90	5	55	70	70	60	50	50	25	30	25	25	15	5	25
91	5	0	0	15	15	25	10	5	20	20	25	20	10	20
95	0	0	5	15	10	0	0	10	20	20	10	15	5	10

c

4X HADDOCK - FALL SURVEY

	0	1	2	3	4	5	6	7	8	9	10	11	12	13
70	0	0	0	0	0	0	0	0	0	0	0	0	0	0
71	0	0	0	0	0	0	0	0	0	0	0	0	0	0
72	33	33	33	83	67	67	33	17	33	17	0	0	33	17
73	33	50	83	83	100	100	100	50	50	33	33	17	17	17
74	33	33	17	17	33	33	50	33	33	33	17	0	17	0
75	50	33	67	50	67	33	33	17	17	17	17	17	17	0
76	0	17	33	33	50	33	17	33	17	0	17	17	17	0
77	67	50	33	67	33	33	33	17	17	0	0	0	0	0
78	0	0	0	0	0	0	0	0	0	0	0	0	0	0
80	100	100	83	83	50	50	17	17	17	17	17	0	17	0
81	50	83	67	50	33	33	17	17	17	0	0	0	17	0
82	0	0	0	0	33	50	33	17	17	33	17	33	33	50
83	0	0	0	0	0	17	83	67	83	83	50	17	33	50
84	0	0	0	0	0	17	50	33	67	50	17	33	33	33
85	0	0	0	33	50	83	50	50	50	17	0	0	17	33
90	17	33	83	100	50	50	33	33	17	17	0	0	0	0
91	0	0	0	0	0	33	0	17	0	0	0	0	0	33
95	0	0	0	0	0	0	0	0	0	0	0	0	0	0

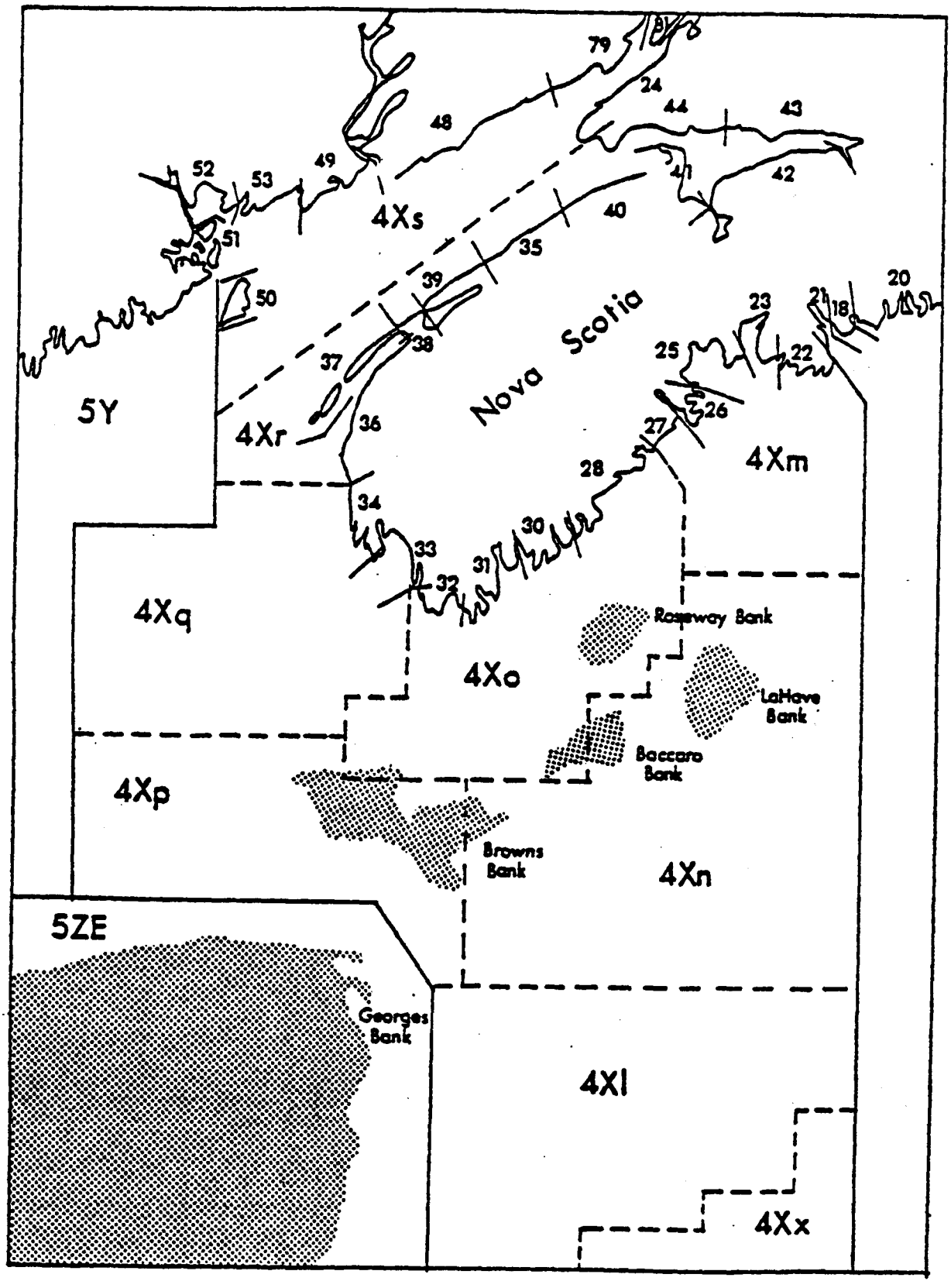


Figure 1. Canadian fisheries statistical unit areas in NAFO Division 4X

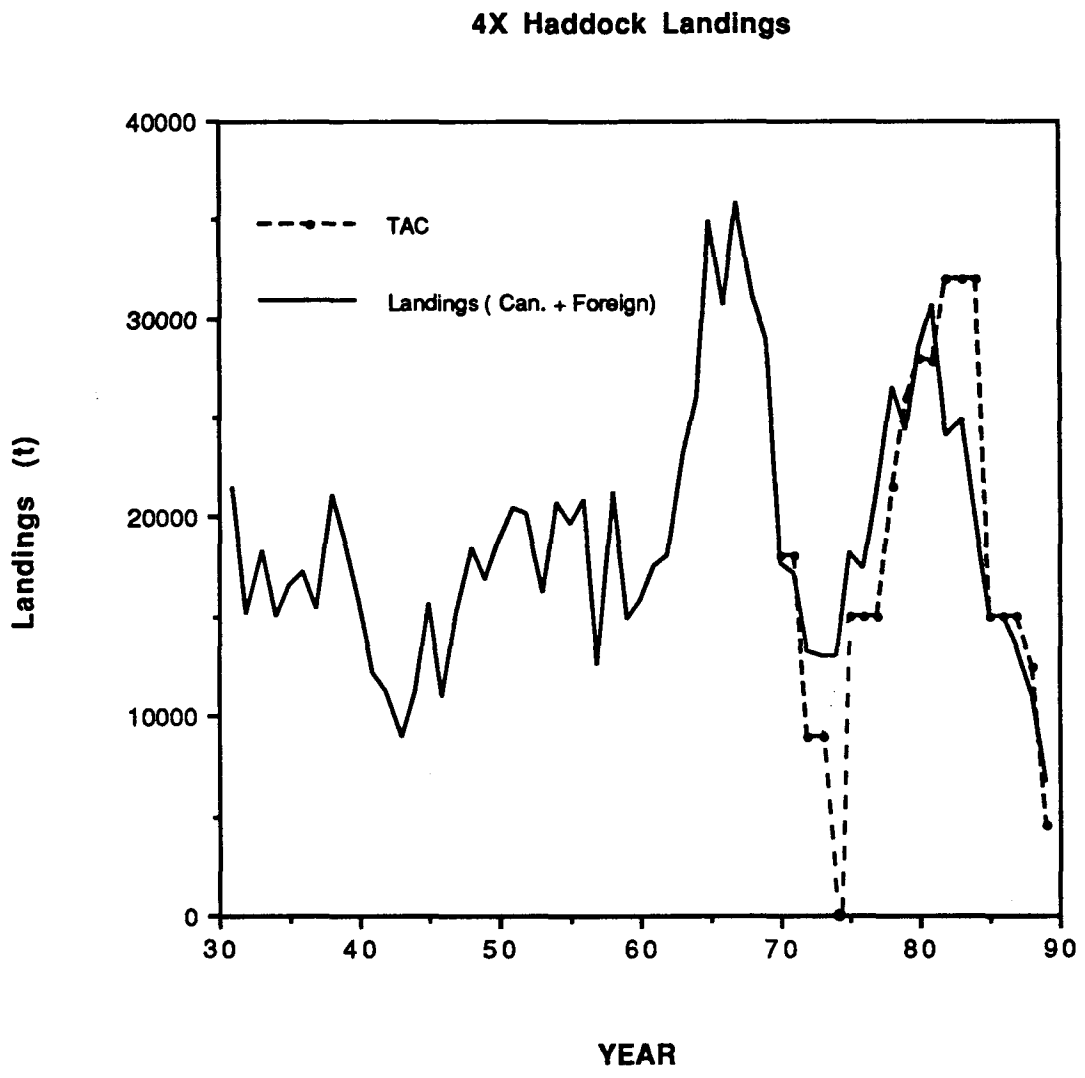


Figure 2. Long-term trends in 4X haddock landings, along with TACs since 1970.

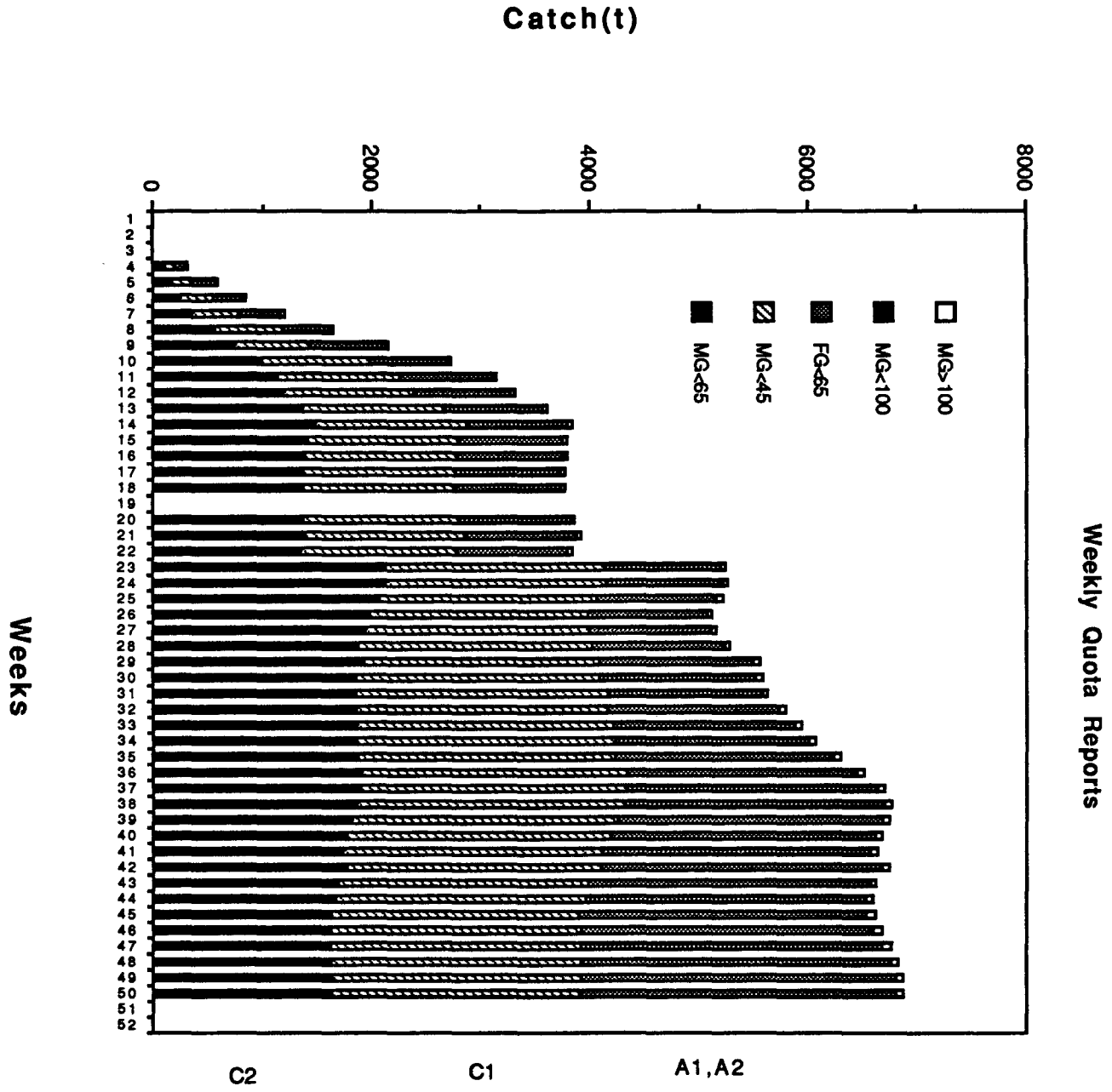


Figure 3. Weekly cumulative catch by gear sector of the 4X haddock stock (from quota reports).

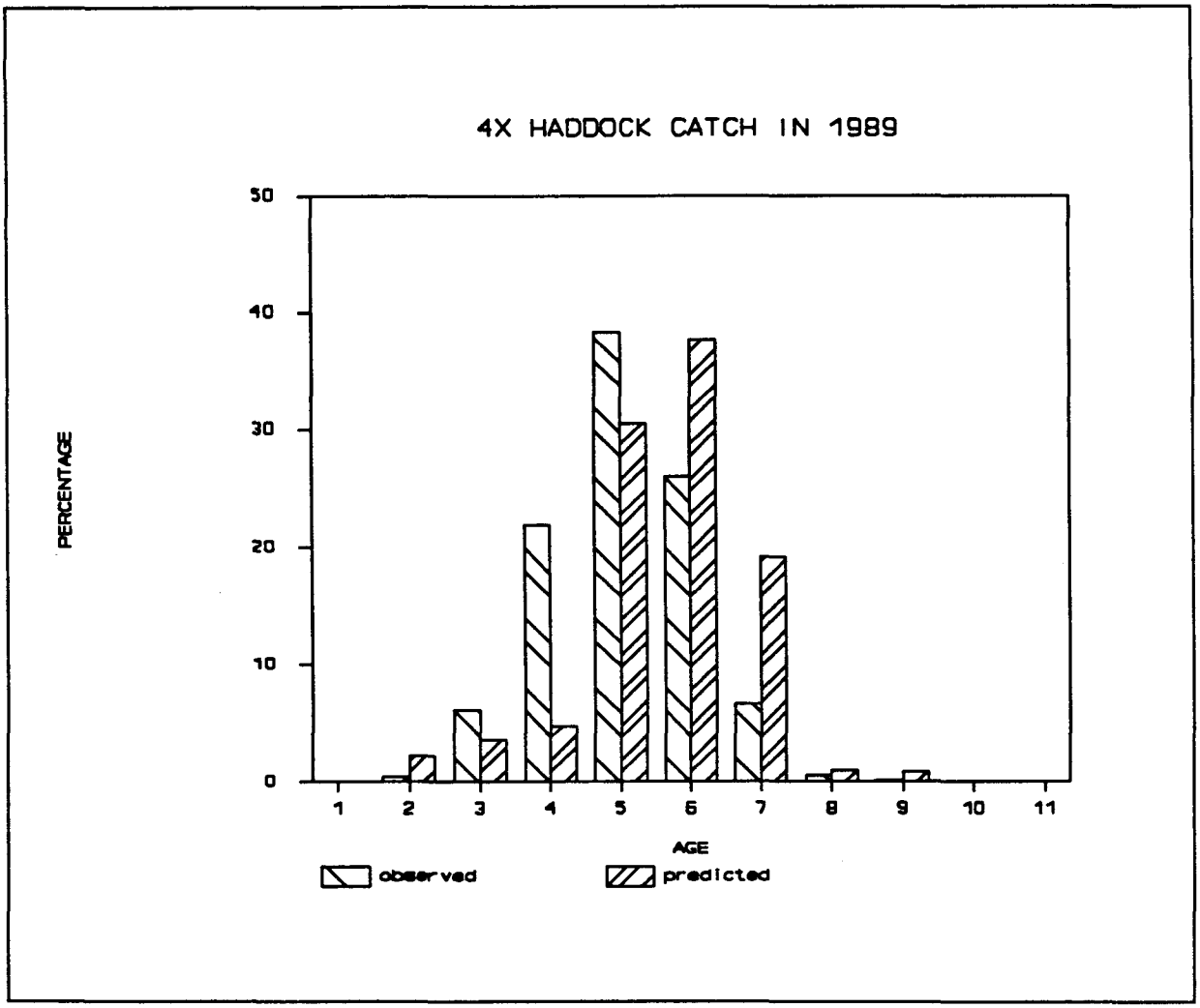
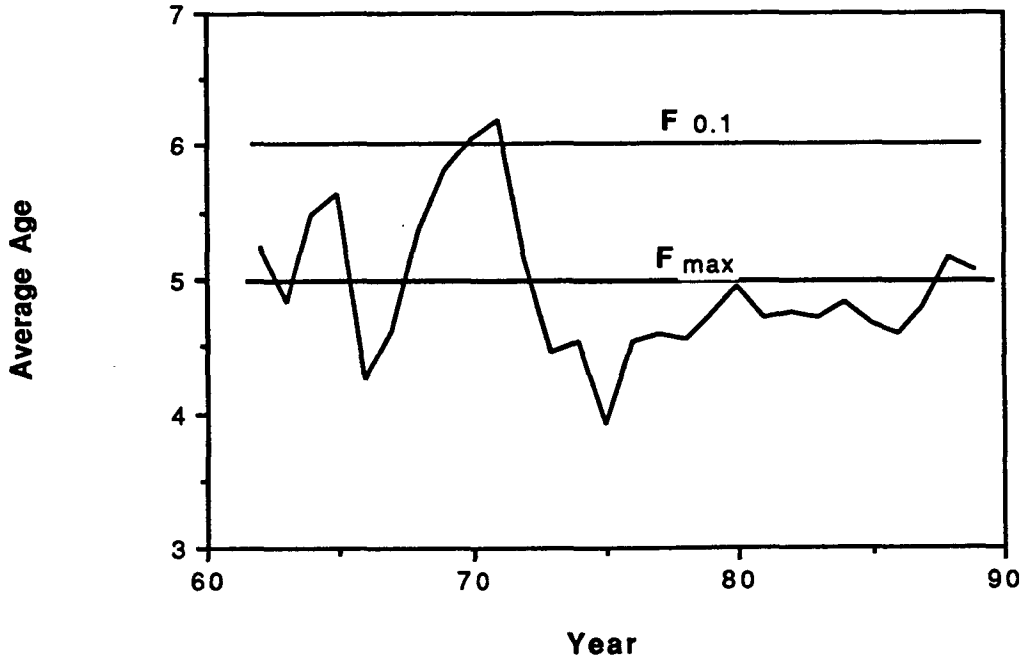


Figure 4. Comparison of observed 1989 catch numbers at age with those projected using 4600 t in 1989, by O'Boyle et al. (1989).

(A)



(B)

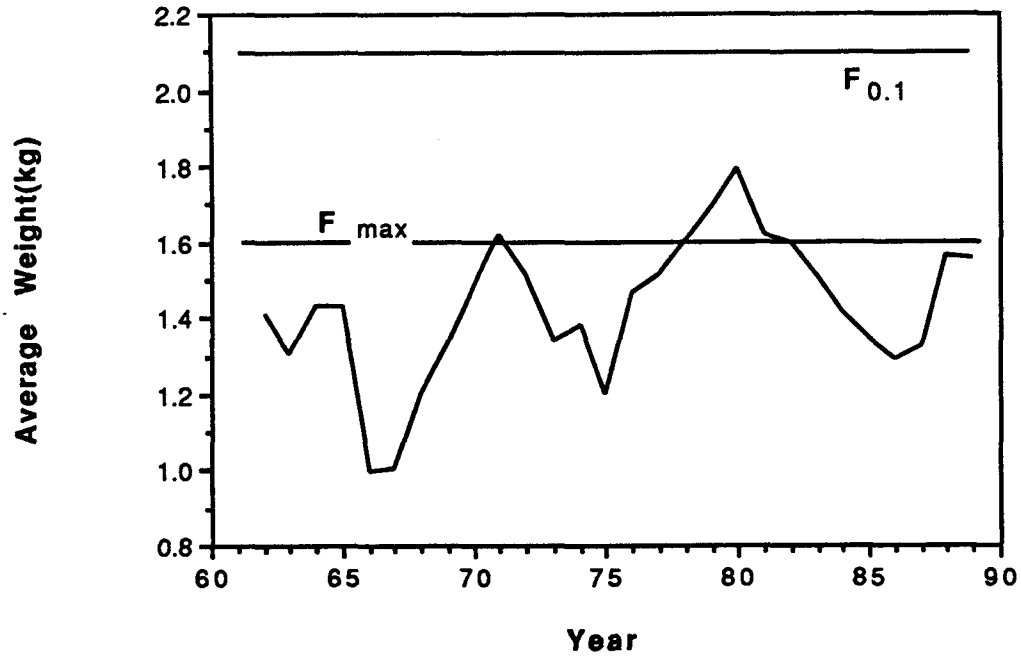


Figure 5. Age-size characteristics of landings of 4X haddock. (A) Average age of 4X haddock in landings; (B) Average weight (kg) of 4X haddock in landings. Top and bottom line in each figure indicates levels of these parameters in equilibrium populations harvested at $F_{0.1}$ and F_{max}, respectively.

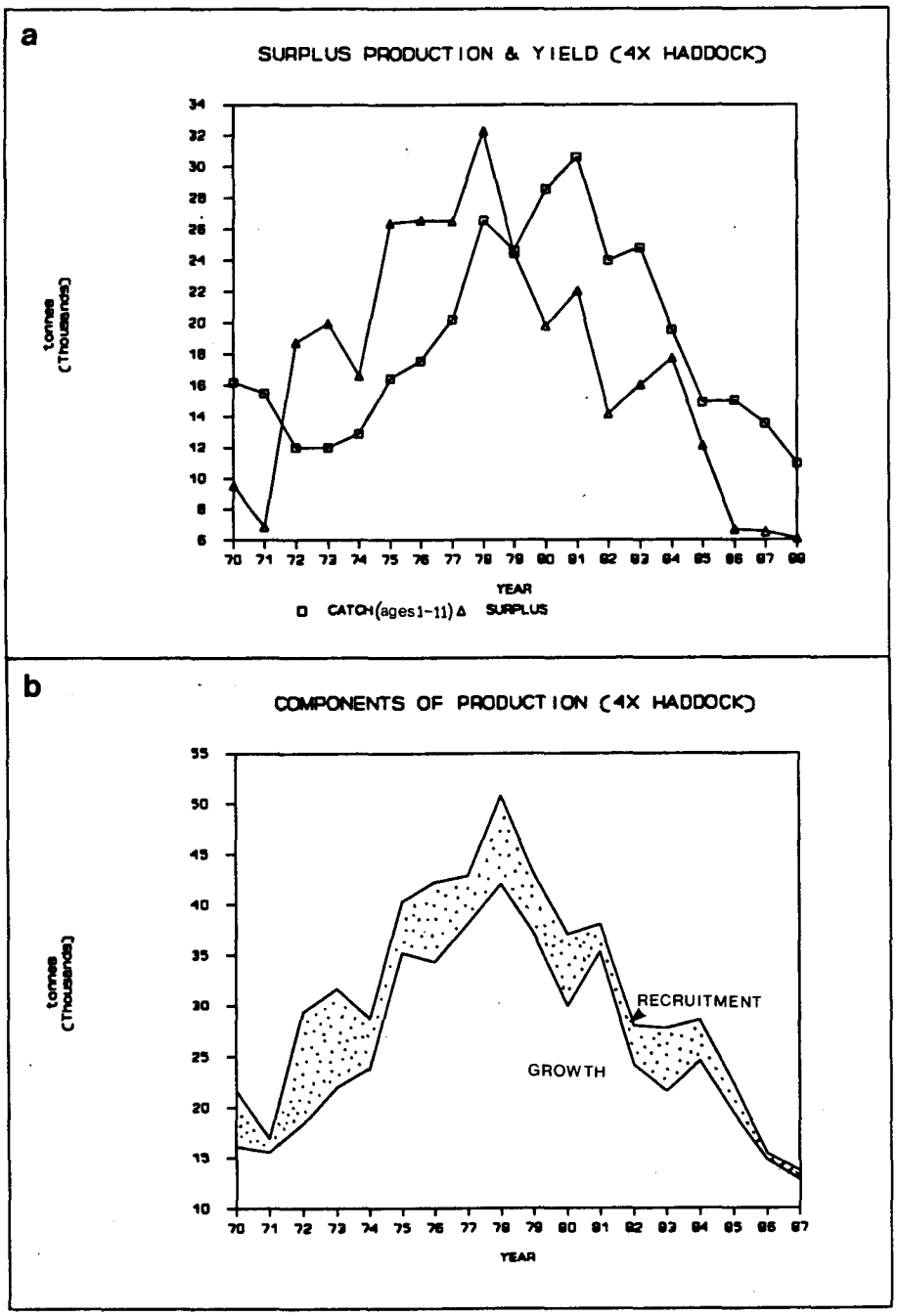


Figure 6. Catch (loss through fishing) and surplus production (a) and total production (b) for the 4X haddock stock 1970-1988. Calculation based on results in O'Boyle et al. (1989).

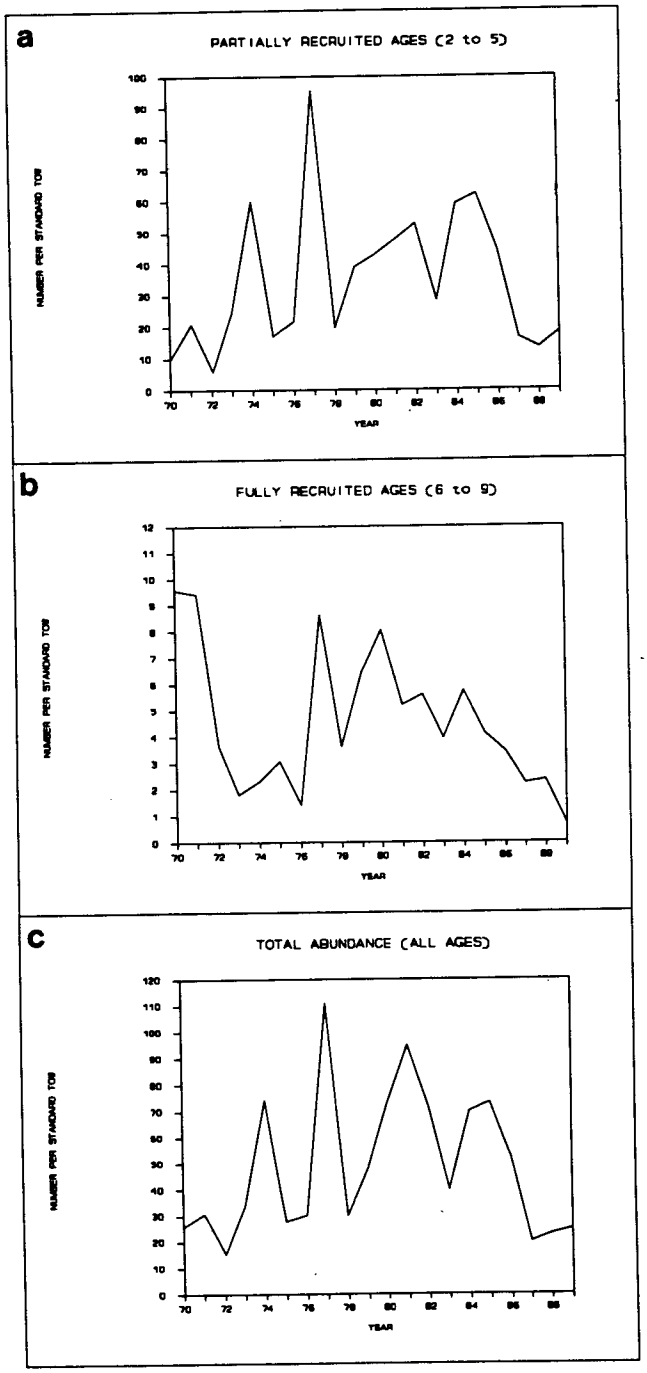


Figure 7. Survey arithmetric mean catch rate (nos./tow) of haddock from 4X during 1970-89 for ages (a) 2-5, (b) 6-9, and (c) all age groups combined.

Figure 8. Survey arithmetric mean catch rate (biomass/tow) of haddock from 4X during 1970-89 for ages (a) 2-5, (b) 6-9, and (c) all age groups combined.

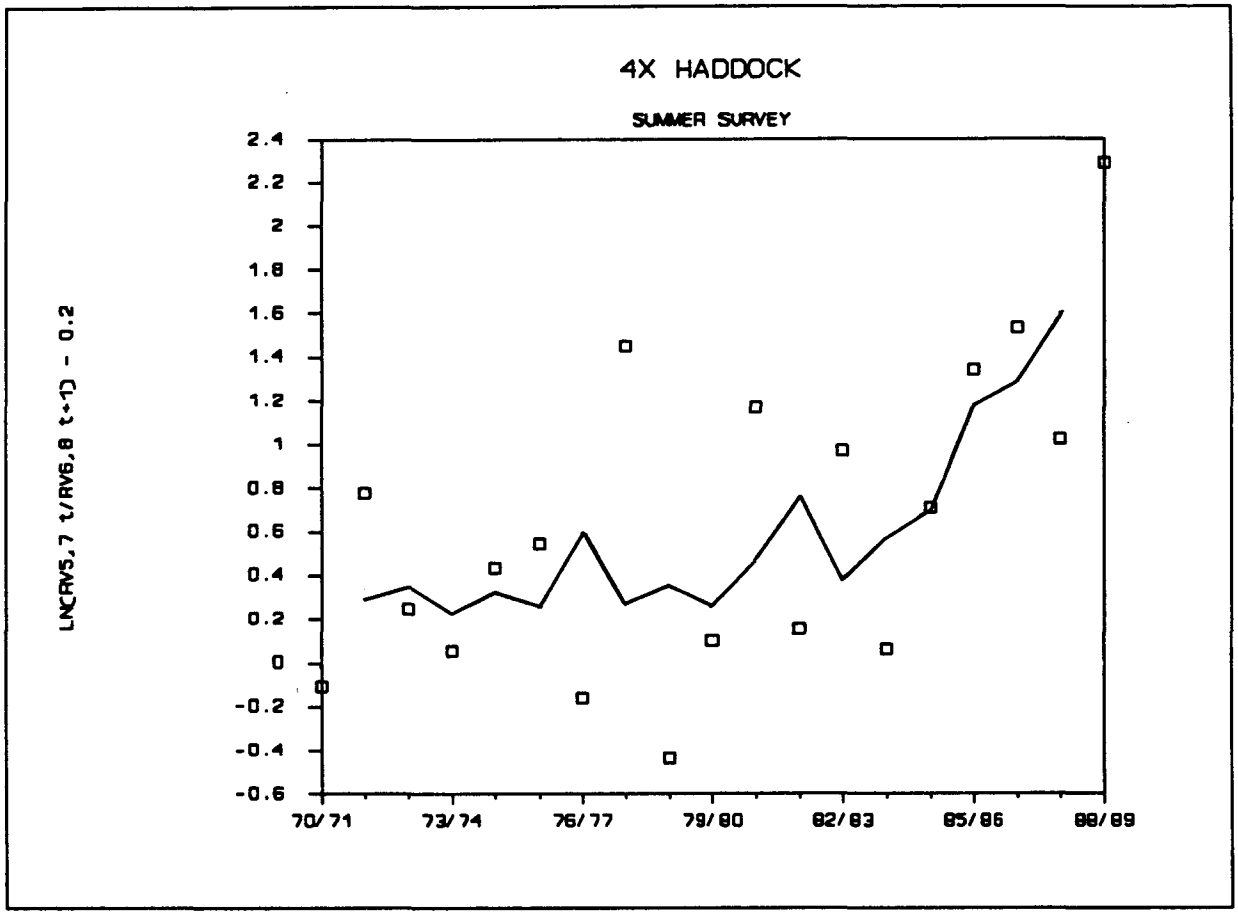


Figure 9. Mortality (F) estimated for fully recruited ages (5-7/6-8) from the RV survey data, 1970-1989 . Natural mortality assumed equal to 0.2. Squares are annual estimate and line shows 3-yr. running mean.

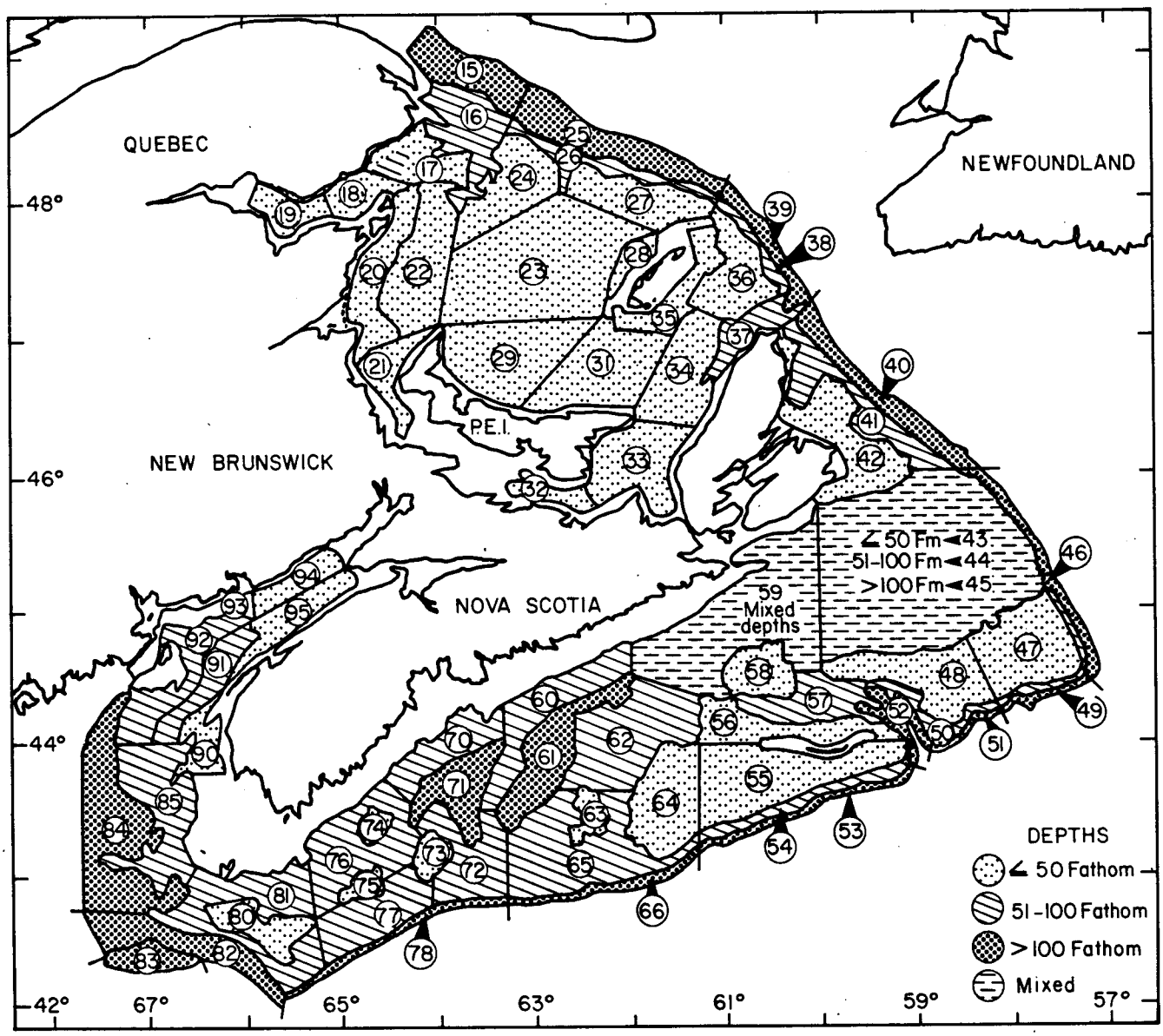


Figure 10. Stratification scheme used in the seasonal groundfish surveys.

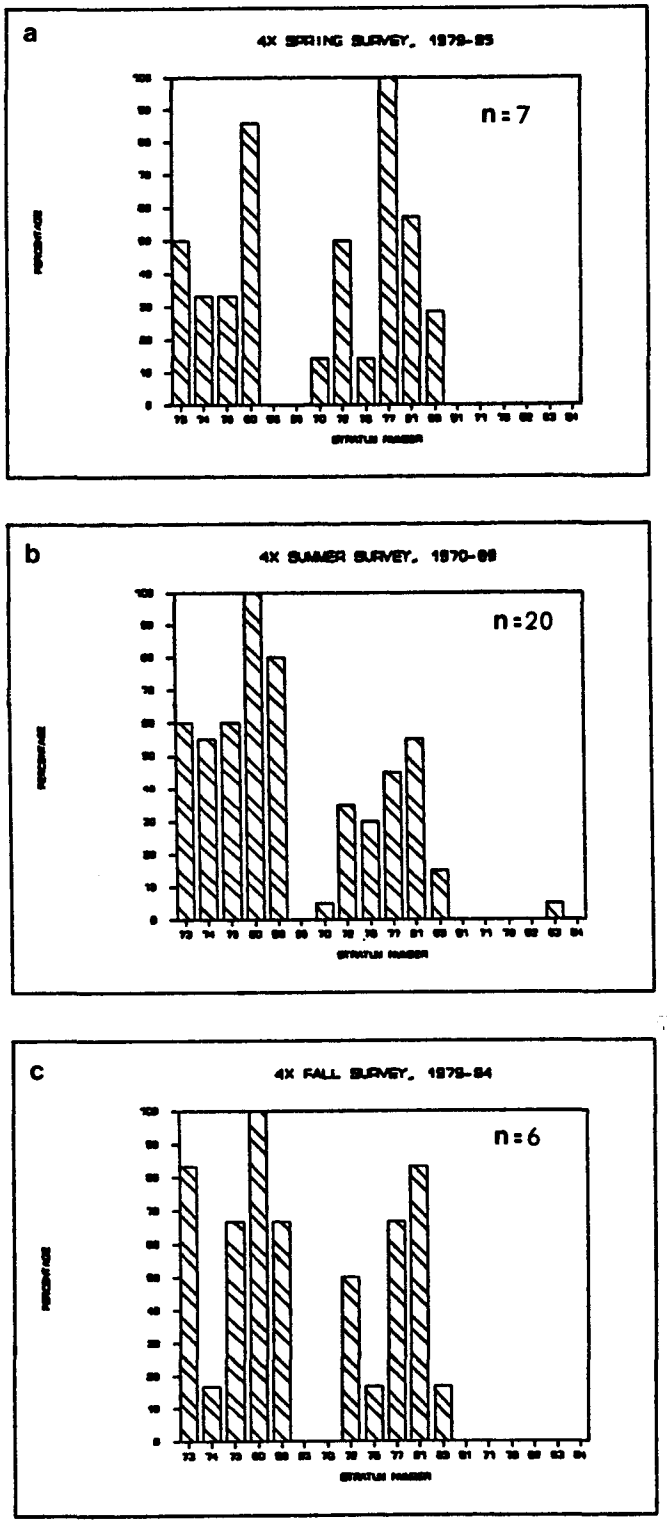


Figure 11. Histogram showing frequency of occurence of above average haddock catches (expressed as mean numbers (all ages) per tow) by stratum in the 4X area for the spring (a), summer (b) and fall (c). Stratum numbers are grouped by depth: < 50 fm - 73, 74, 75, 80, 90, 95; 50-100 fm - 70, 72, 76, 77, 81, 85, 91; > 100 fm - 71, 78, 82, 83, 84.

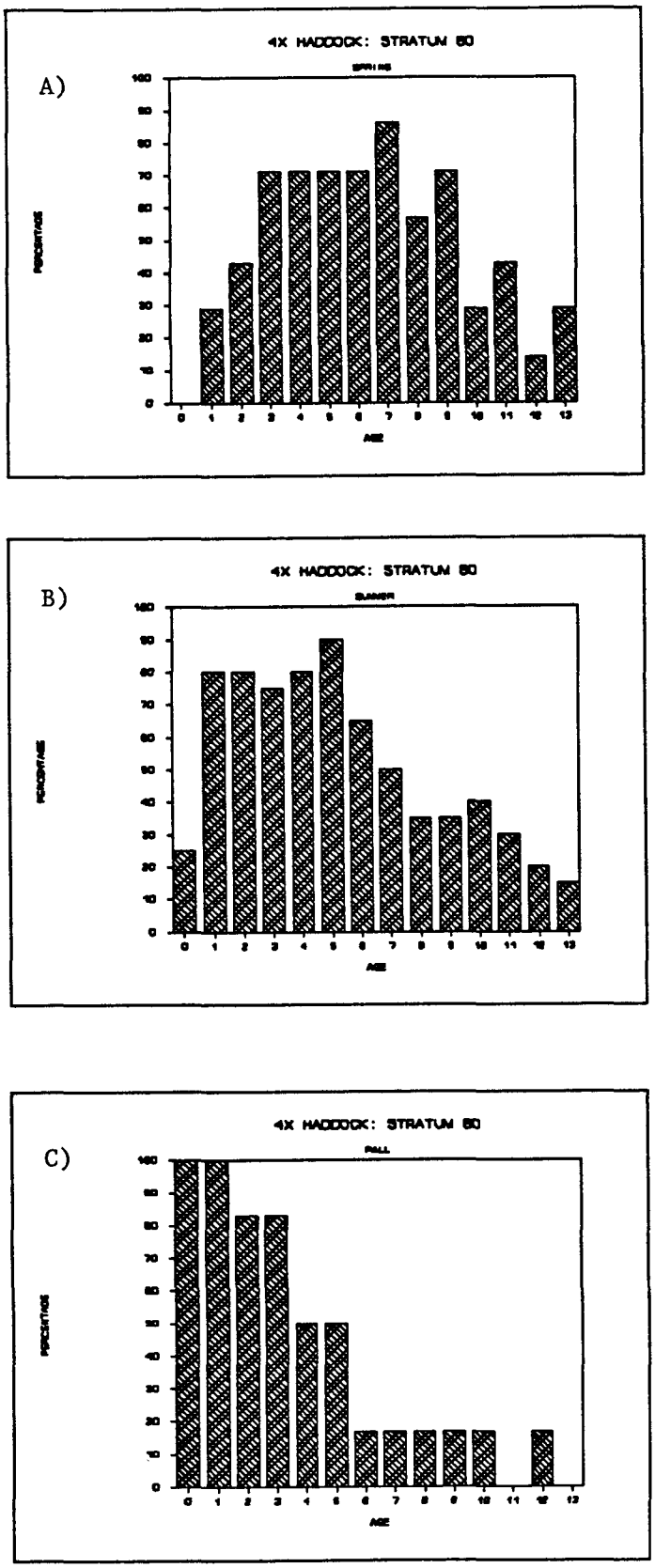


Figure 12. Histograms showing frequency of occurrence of above average haddock catches by age in stratum 80 for the spring (a), summer (b) and fall (c) RV surveys.

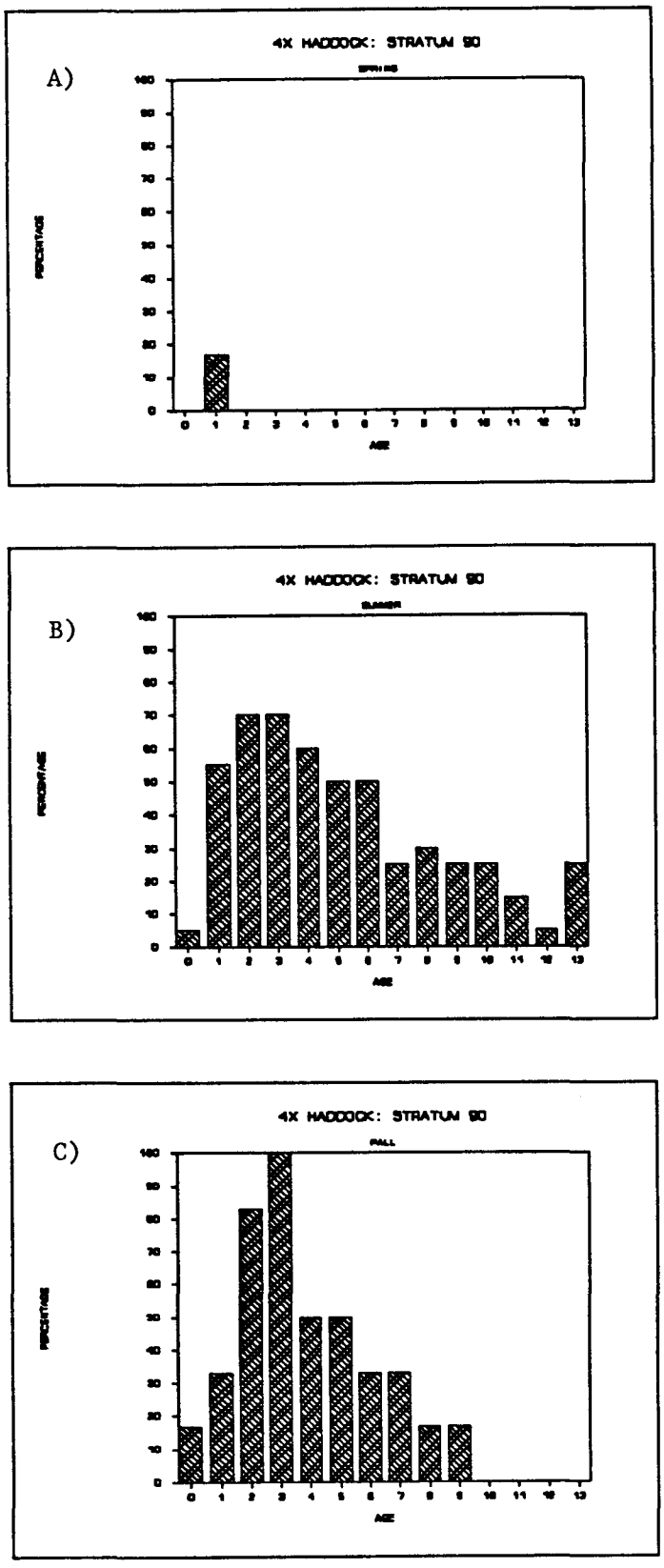


Figure 12. cont'd (stratum 90).

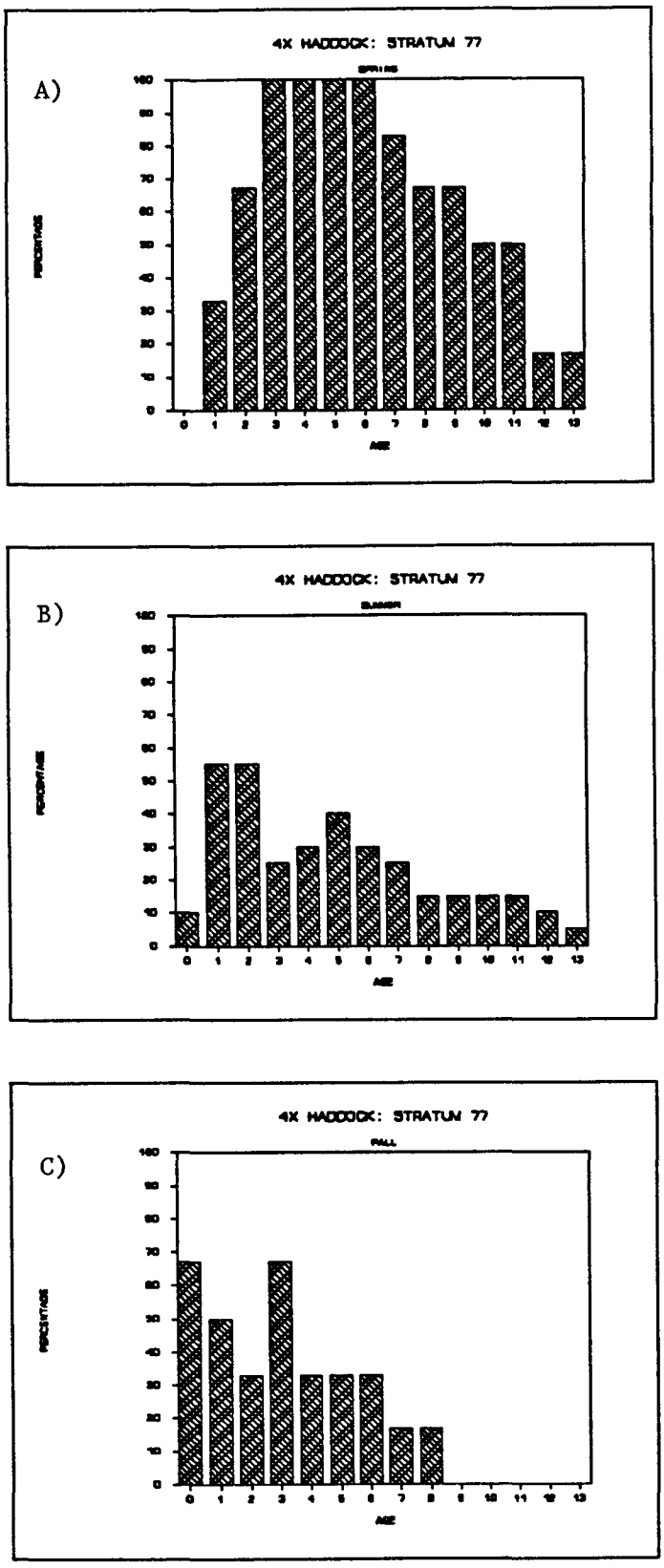


Figure 12. cont'd (stratum 77).

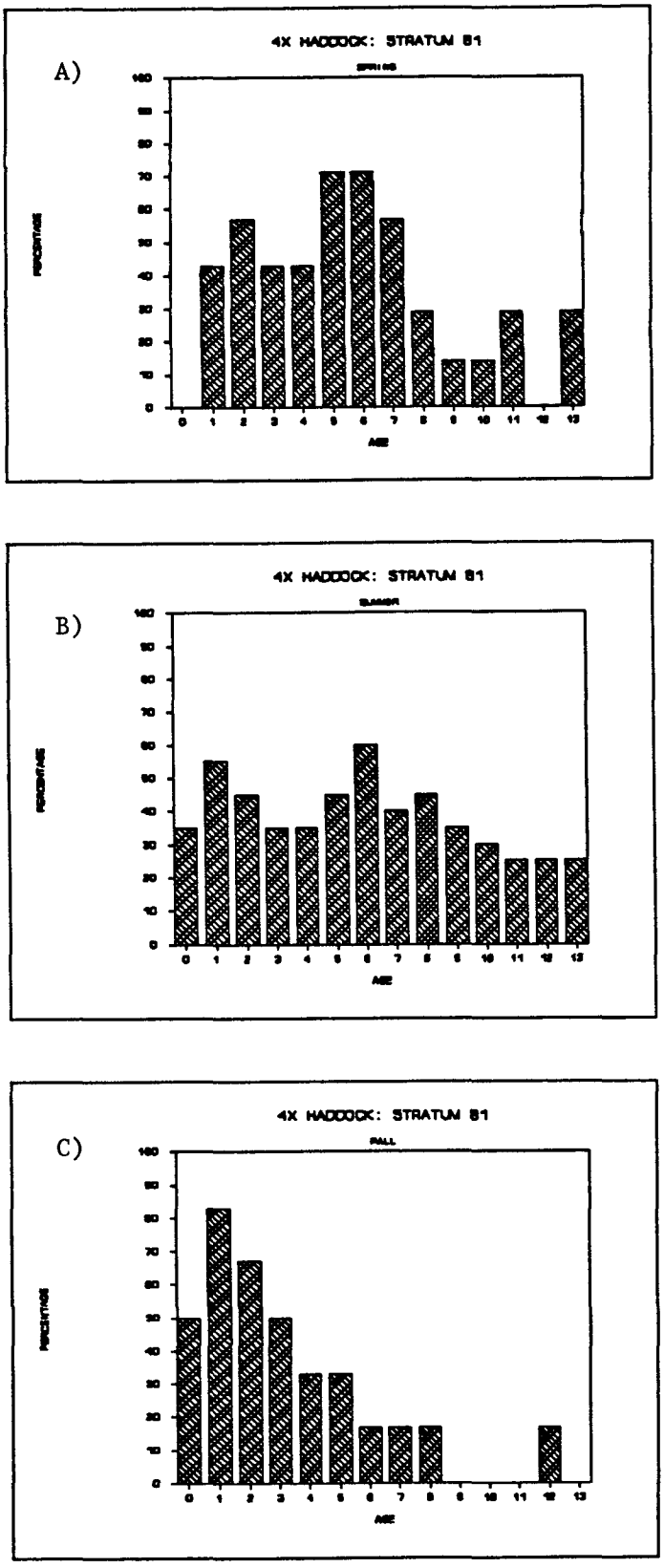
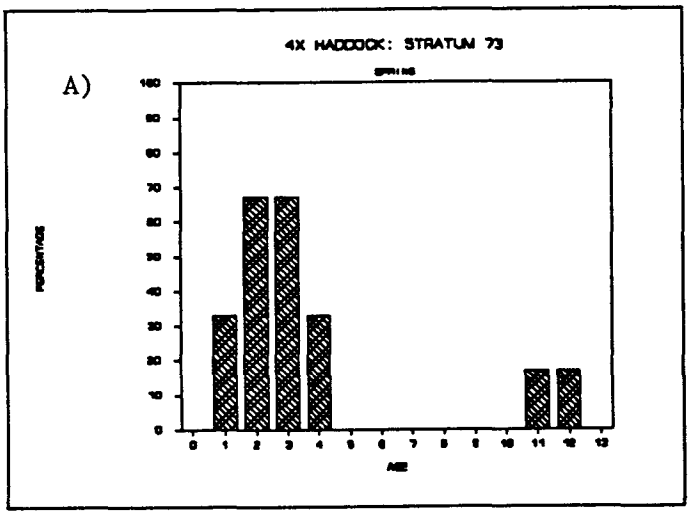
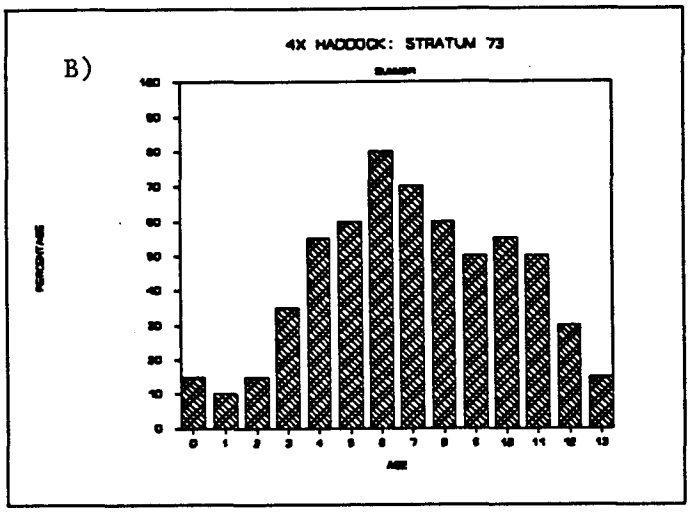


Figure 12. cont'd (stratum 81).





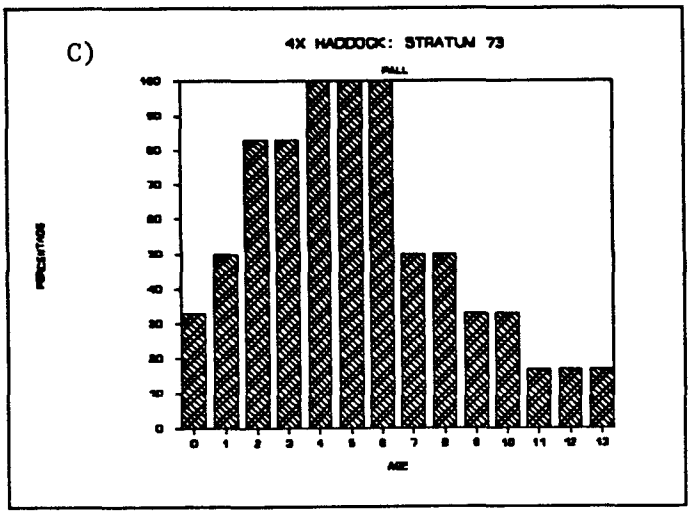
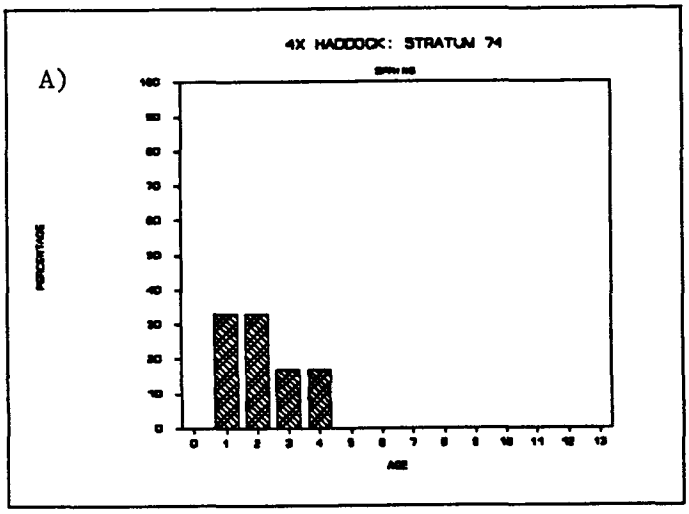
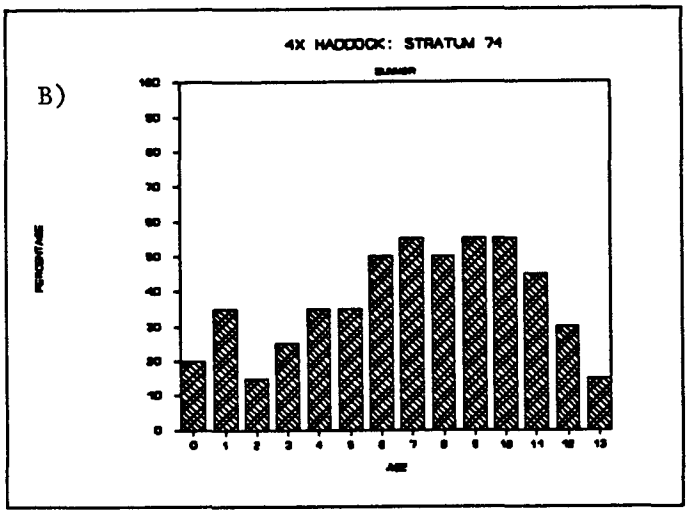


Figure 12. cont'd (stratum 73).





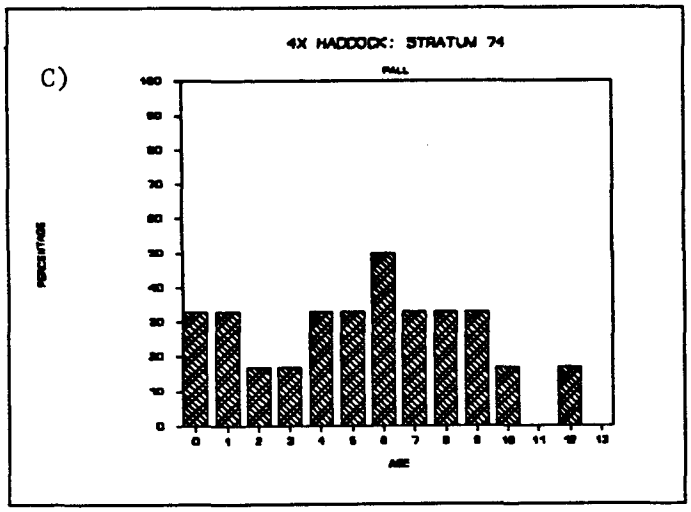


Figure 12. cont'd (stratum 74).

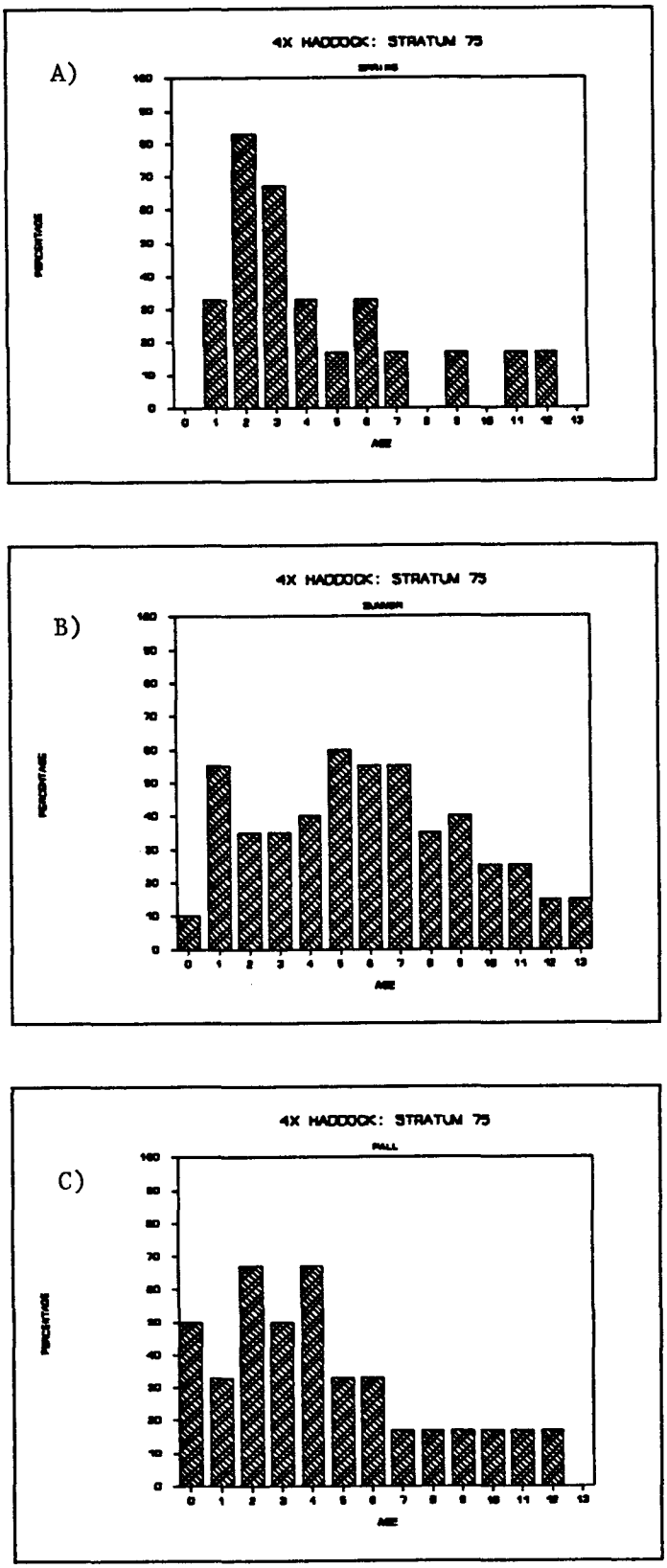


Figure 12. cont'd (stratum 75).

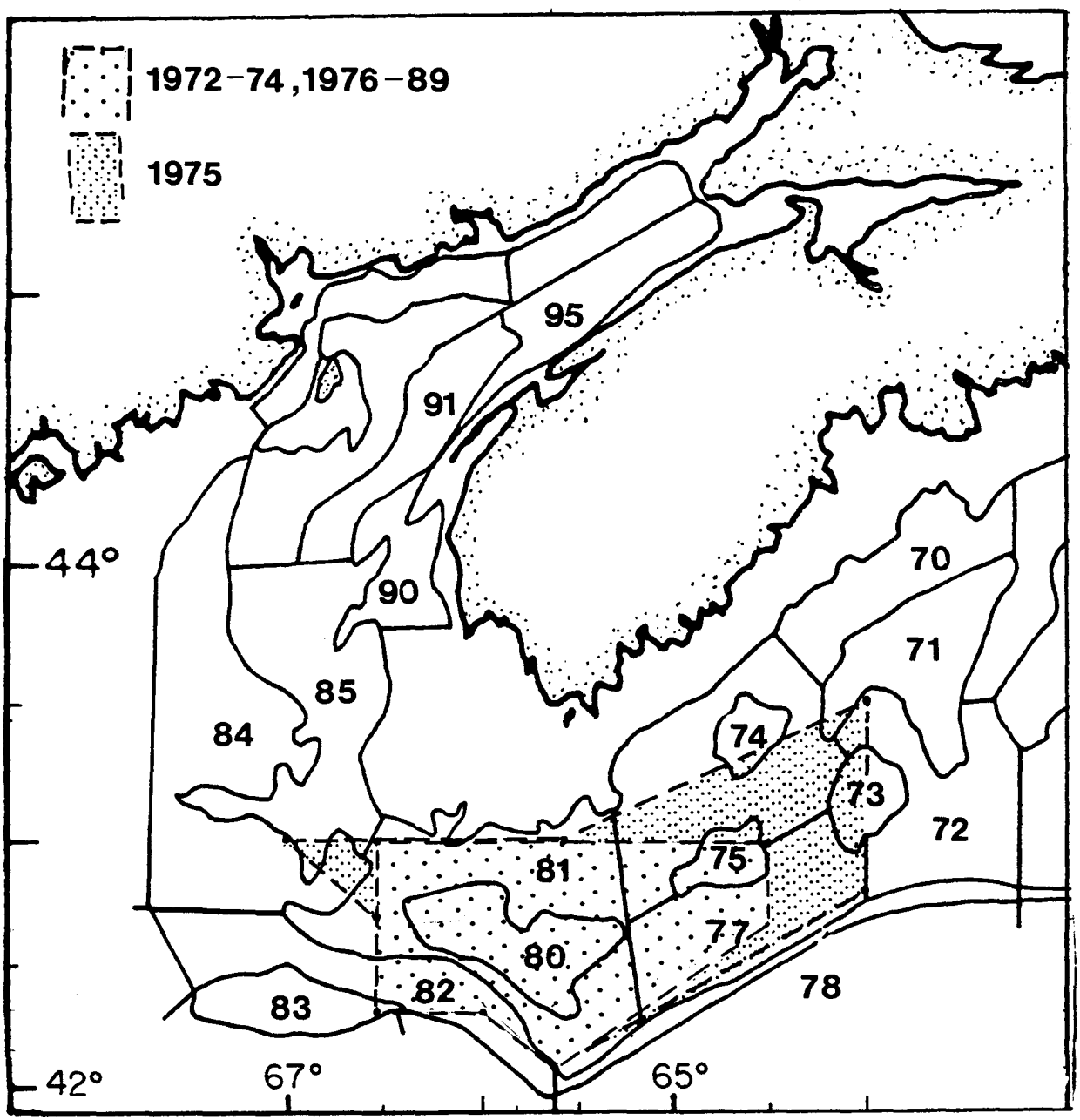


Figure 13. Map of NAFO Subarea 4X showing stratum locations and existing closed area boundaries (in effect from March 1-May 31).

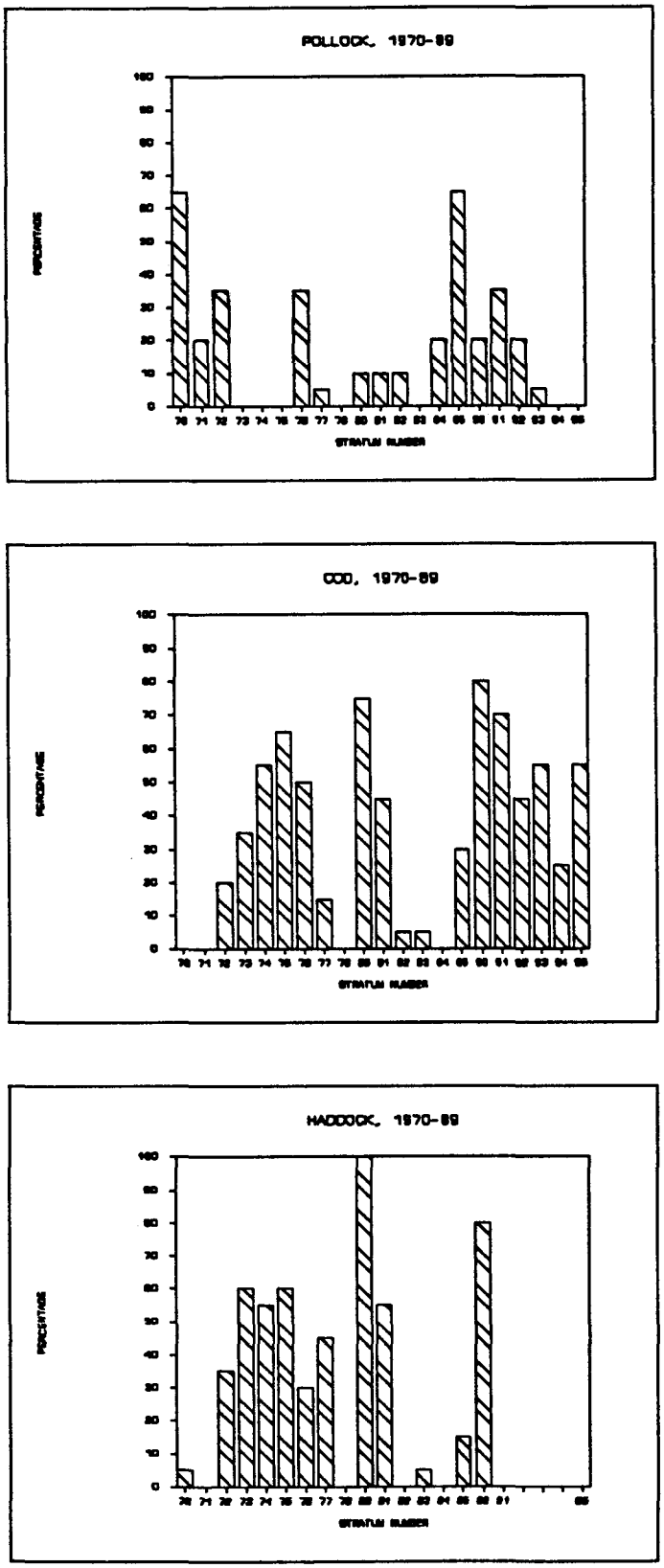


Figure 14. Histograms showing frequency of occurrence of above average catches of pollock (a), cod (b) and haddock (c), expressed as mean numbers (all ages) per tow by stratum, in the 4X area for the 1970-1989 summer survey.

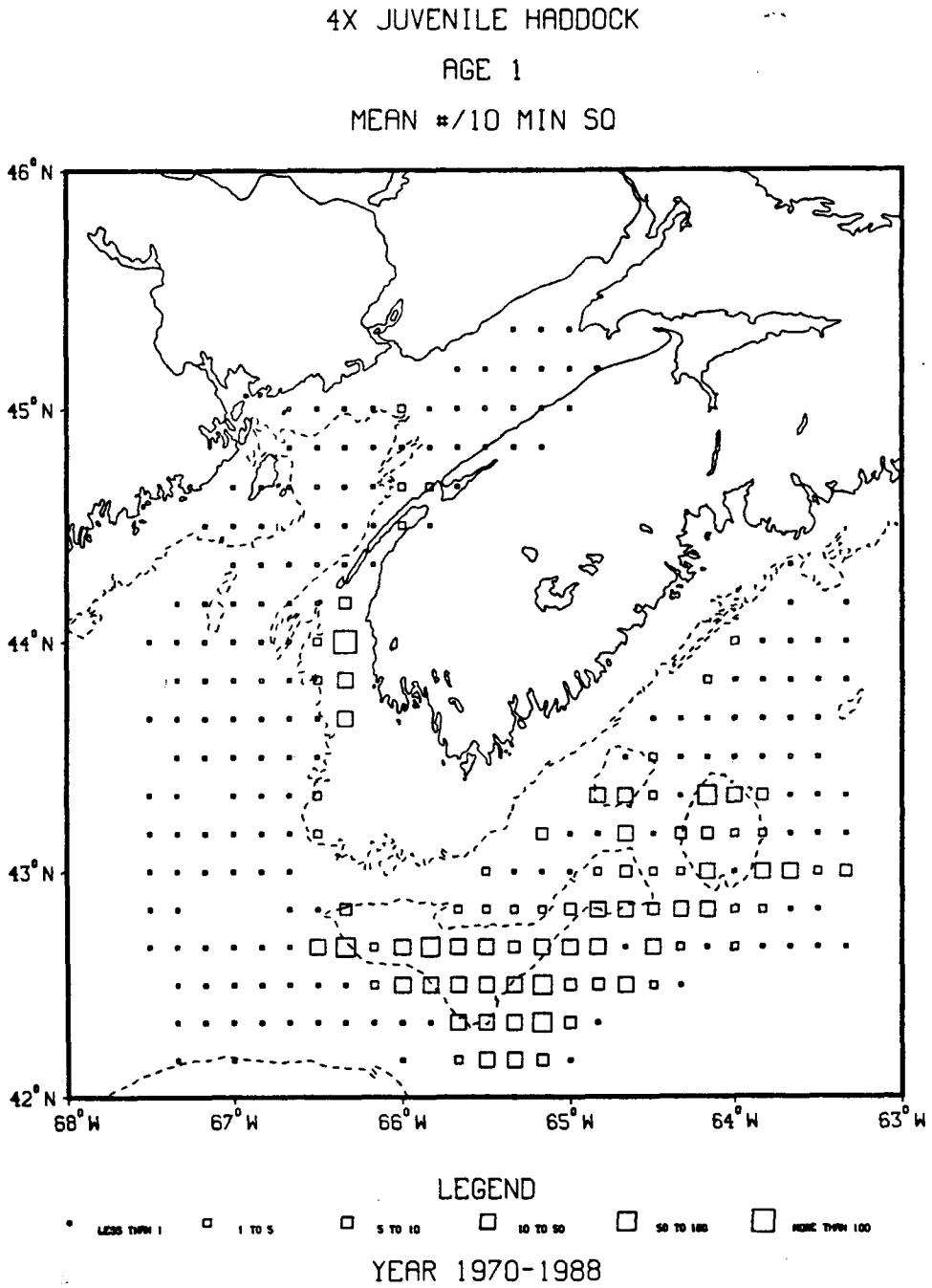
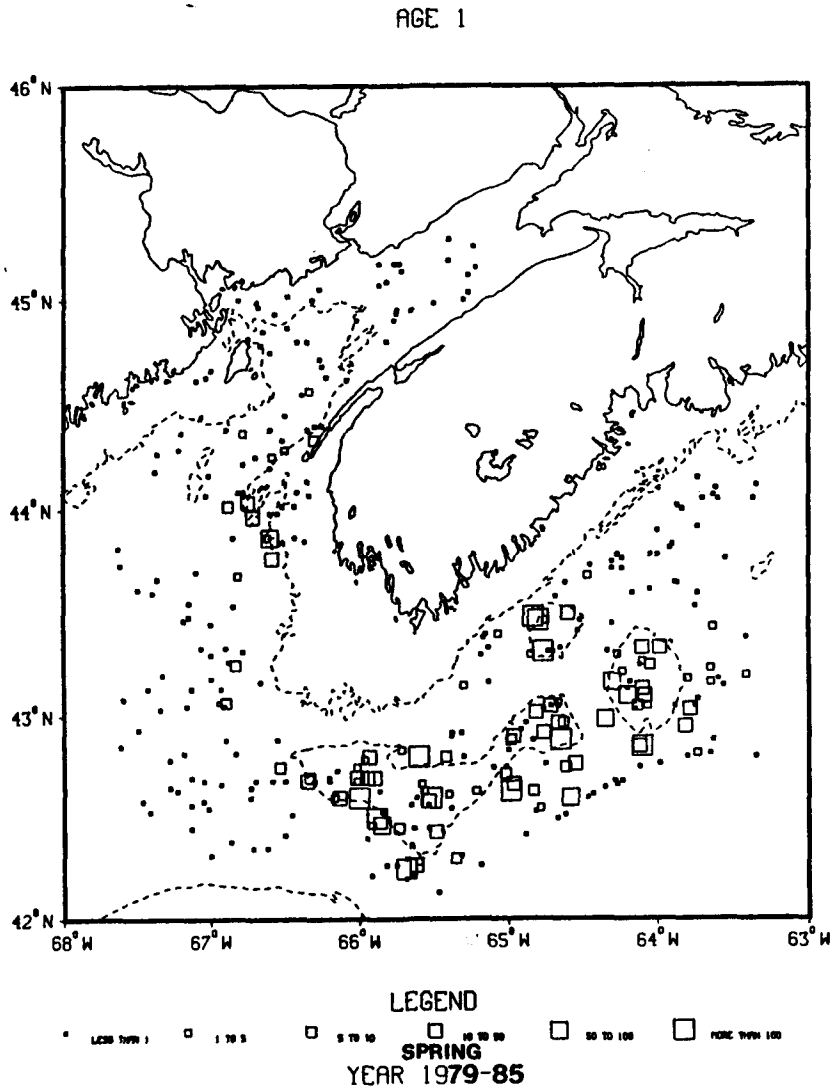


Figure 15. Mean-catch(nos.) per tow by 10 minute square of age 1 haddock from the summer groundfish RV surveys, 1970-88 combined.



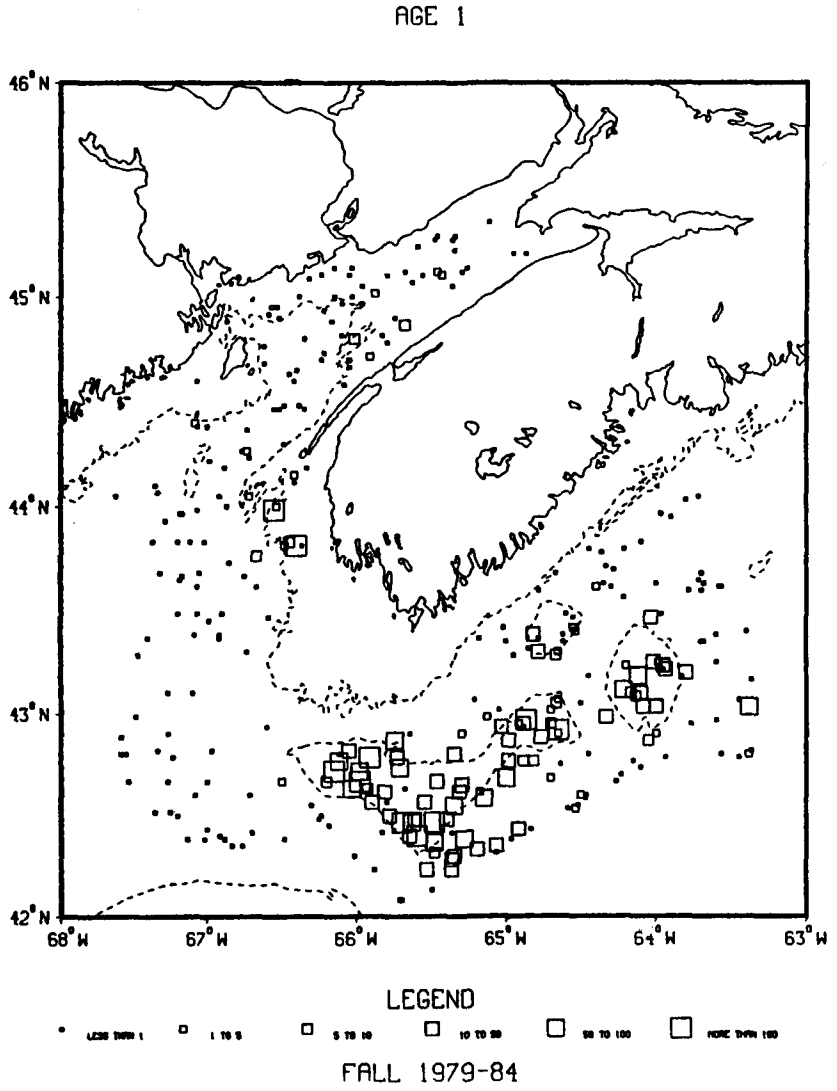


Figure 16. Mean catch per tow of age 1 haddock from the spring (a) groundfish survey 1979-85 combined and the fall (b) groundfish survey 1979-84 combined.

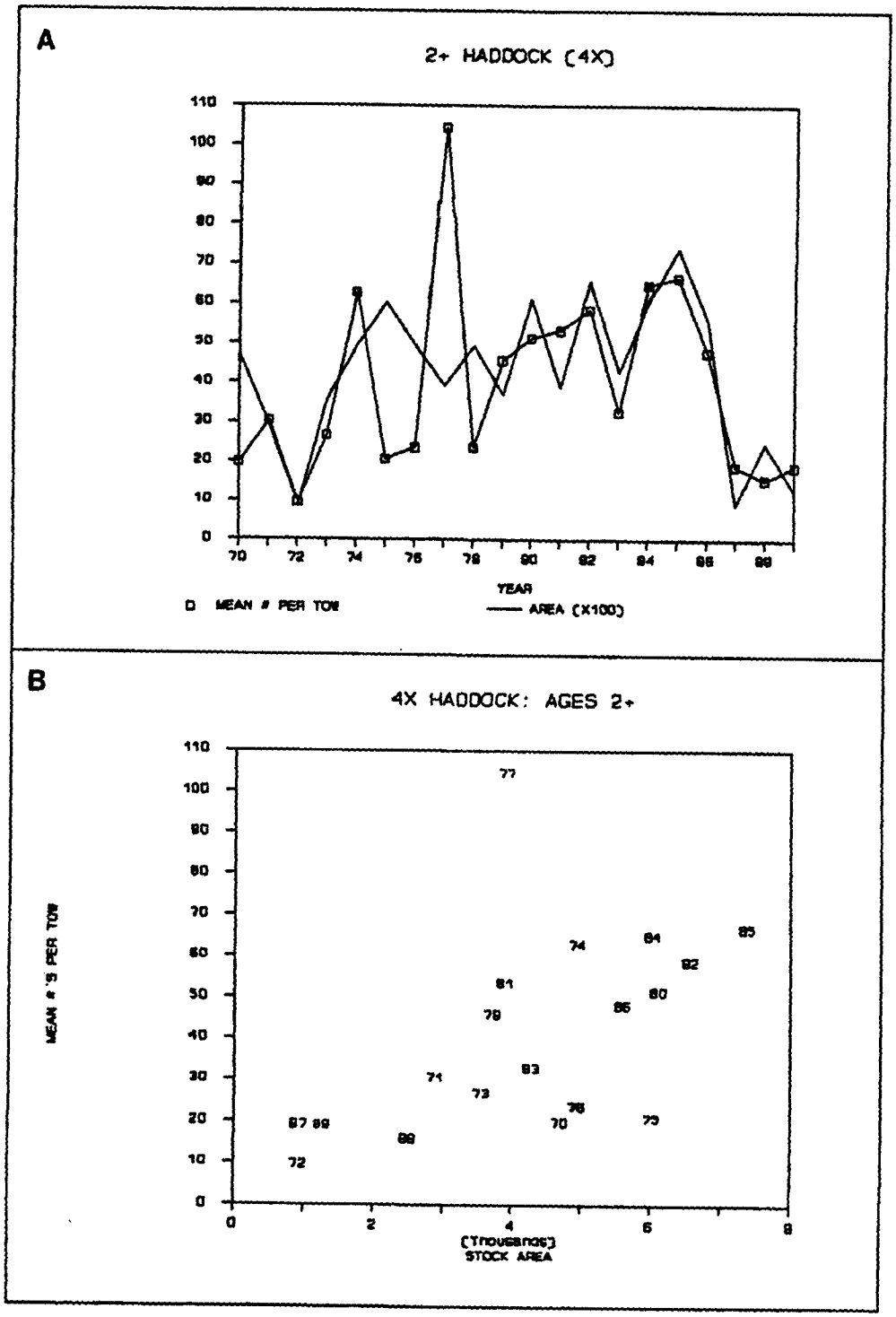


Figure 17. 4X haddock stratified mean number per tow (ages 2+) and relative stock area (n mi.^{2}) from the 1970-89 summer RV surveys: time trend (A) and bivariate plot points labelled as last 2 digits of survey year (B).

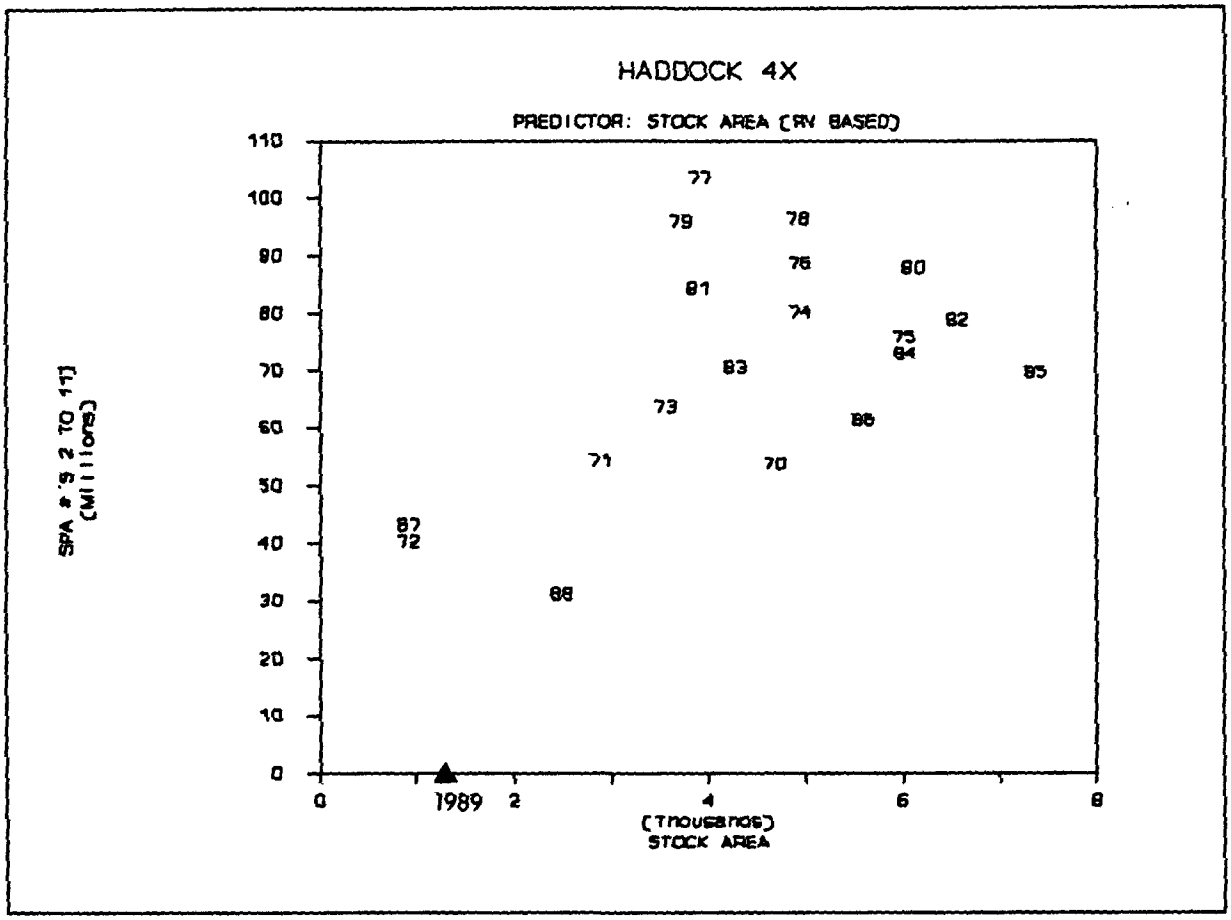


Figure 18. Relationship between 4X haddock stock size (from O'Boyle et al. 1989) and haddock stock area (nmi.^{2}) from 1970 to 1988. Stock area from 1989 summer survey is shown.

Appendix I. Weekly summary of fishing activity and anecdotal information in 4X, 5Z for 1989.

Week		Comments
Jan.	1 - 7	
Jan.	8 - 14	Draggers on Heart (4XO) and Back of Browns, Haddock scarce and cod are small.
	15 - 21	Digby draggers in Shelburne, all getting cod on Browns but few haddock.
	22 - 28	Trip limits on OT's restricting fishing.
	29 - Feb. 4	All draggers out, steak cod on Georges Bank, No haddock around.
Feb.	5 - 11	Most boats in 4Xnp for haddock, Lots of pollock being dumped.
	12 - 18	Mostly pollock fishing near Browns, pollock are small.
	19 - 25	Good catches of cod and pollock on Browns & Georges.
	26 - Mar 4	Good catches on Browns of steak cod & haddock, C1 C2 fishery closes
Mar.	5 - 11	Quotas reopen with trip limits.
	12 - 18	
	19 - 25	Many draggers tied up due to trip limits.
	26 - Apr. 1	Some draggers fishing Bay of Fundy for scrod cod off the Rip.
Apr.	2 - 8	Good cod catches in Bay of Fundy, Haddock in 4XN on Fence
	9 - 15	Most boats on German Bank for pollock.
	16 - 22	Boats west of Browns for small pollock, some flounder fishing in 4Xr.
	23 - 29	No haddock anywhere, LL find mostly dogfish 4X-5Z.
	30 - May 6	Dragger return from 4W with very small (<17") haddock.
May	7 - 13	N.S.P. in Lockeport to close.
	14 - 20	Lobster catches good, mackeral fishery starts, Good Redfish catches.
	21 - 27	Only LL & HL are fishing.
	28 - June 3	Georges opens but Browns remains closed, Lots of mackeral.
June	4 - 10	Some misreporting, 2 cm cod noticed in twine of several draggers.
	11 - 17	Browns opens and closes same day, misreporting 4X -> 4W.
	18 - 24	More dogfish, Lots of cod on Browns and pollock on German.
	25 - July 1	Small trips, some misreporting of M.G. to F.G.
July	2 - 8	
	9 - 15	
	16 - 22	G.N. on Georges, Inshore boats rigging for swordfish.
	23 - 29	Most M.G. swordfishing, LL in gully between Browns & Georges.
	30 - Aug 5	Hagfish 45¢/lbs, Dogfish being processed by NSP in Lockeport.
Aug	6 - 12	
	13 - 19	Herring spawning in Bay of Fundy, no dragger and very few GN or LL due to dogfish.
	20 - 26	
	27 - Sept 2	Tuna fishery takes off, some GN fishing for cod on Georges.
Sept	3 - 9	Some misreporting 4X to 4VW. Good swordfishing by LL.
	10 - 16	Herring roe fishery begins.
	17 - 23	LL in 4X fishing cusk & white hake. Some draggers fishing illegally.
	24 - 30	Windy, herring season almost ended.
Oct	1 - 7	LL in Fundian gully for 1/2 haddock, 1/2 shack
	8 - 14	Inshore LL halibut fishing in 4Xopq, LL < 65' finished Oct. 8.
	15 - 21	
	22 - 28	Deer season ends most fishing effort in 4X.
	29 - Nov 4	A couple of small draggers in Bay of Fundy
Nov	5 - 11	
	12 - 18	Most fishermen getting ready for lobster season.
	19 - 25	
	26 - Dec. 2	Lobster season begins, LL report lots of small cod in 4XO.
Dec	3 - 9	Very windy but lobster catches good.
	10 - 16	Small cod & medium sized haddock reported in 4XO, Johnny & Sisters III lost at sea.
	17 - 23	Small trips nearshore by LL, Very cold weather reduces lobster effort.
	24 - 31	Ice in some ports.