DFO Atlantic Fisheries
Research Document 96/32

MPO Pêches de l'Atlantique
Document de recherche 96/32

An Update of the Status of 4VW Flatfish Stocks

by

C. Annand

and

D. Beanlands
Marine Fish Division
Bedford Institute of Oceanography
P.O. Box 1006, Dartmouth
Nova Scotia
B2Y 4A2

Abstract

Up to and including 1993, flounders in 4VWX were managed as one stock complex with a TAC of 14,000 t. In 1994, the management unit was divided into an eastern (4VW) and a western (4X) component and the overall TAC was reduced to 10,000 t with 4,500 t allocated to 4X and 5,500 t to 4VW, based on catch history. As well, winter flounder was included in the western component. The 1995 management plan set a TAC of 7,500 t which was partitioned between 4VW and 4X, giving the eastern component a TAC of 4,125 t and the western component a TAC of 3,375 t. ITQs for flatfish were implemented in August 1994 in 4X, and Eastern Nova Scotia (ENS) ITQ licence holders were given the option to choose an ITQ system or a competitive fishery for flounder in 1995. Landings data continue to be unreliable with unspecified flounder making up 39% of the total flounder landings in 4VW and 45% in 4X. Stock status evaluations were based on sampling the commercial landings for species size composition, the commercial catch rates and effort for combined flounders, and survey abundance indices and size compositions by species.

Total landings of 4VW flatfish in 1995 amounted to 2,325 t, a decrease from the 2,824 t taken in 1994. Commercial catch rates for the ITQ fleet remained relatively stable in 1995; however, effort for the entire fishery declined since 1992. In 4VW, both American plaice and yellowtail show a significant decline in survey abundance especially in the 4V area. Both the survey and the commercial fishery indicated fewer large fish than in the past, and average weight has also declined, indicating a shift of the population to a predominance of small fish. Survey abundance of witch flounder indicated an increase in mean numbers since 1990 while mean weight and the average weight per fish as declined since the 1970's. Surveys indicate some potential for improved recruitment although there are fewer large fish in the population. Winter flounder abundance in 4W remained relatively high. Given the declining biomass for all commercially exploited flounders in 4VW and an absence of large fish in both the survey and commercial fishery, catch in 1997 at or about the 1996 level would not likely promote recovery of this resource.

Résumé

Jusqu'à 1993 inclusivement, les plies des divisions 4VWX étaient considérées comme un complexe de stocks, administré en vertu d'un TAC de 14 000 t. En 1994, l'unité de gestion a été divisée en deux parties : la composante de l'est (4VW) et celle de l'ouest (4X); le TAC total a été réduit à 10 000 t, 4 500 t étant attribuées à 4X et 5 500 t à 4VW, d'après les antécédents de prises. De plus, la plie rouge a été incluse dans la composante de l'ouest. Le plan de gestion de 1995 incluait un TAC de 7 500 t qui a été divisé entre 4VW et 4X, soit 4 125 t pour la composante de l'est et 3 375 t pour celle de l'ouest. Des QIT ont été adoptés pour les poissons plats en août 1994 dans la division 4X, et les titulaires de permis de pêche des plies avec QIT de l'est de la Nouvelle-Écosse (ENS) ont eu la possibilité de choisir entre un régime de QIT ou une pêche pratiquée en concurrence en 1995. Les données sur les débarquements continuent d'être peu fiables, puisque des plies non identifiées composent 39 % des débarquements totaux de plies dans 4VW et 45 % dans 4X. L'état des stocks a été évalué à partir des échantillons de débarquements commerciaux prélevés en vue de mesurer la composition par taille des espèces, les taux de prises commerciales et l'effort pour toutes les plies, ainsi que les indices d'abondance des relevés et la composition par taille, selon les espèces.

Le total des débarquements de poissons plats dans les divisions 4VW en 1995 s'est chiffré à 2 235 t, soit une baisse par rapport aux 2 824 t de 1994. Le taux de prises commerciales de la flottille assujettie aux QIT est demeuré relativement stable en 1995; cependant, l'effort de l'ensemble des pêcheurs a diminué depuis 1992. Dans 4VW, la plie canadienne et la limande à queue jaune affichent une baisse importante, selon le relevé, surtout dans la division 4V. Les pêches commerciales et le relevé montrent une diminution des gros poissons, par rapport aux années antérieures; de plus, le poids moyen a aussi diminué, indiquant une prédominance des petits poissons au sein de la population. Le nombre moyen de plies grises, selon le relevé, aurait augmenté depuis 1990, tandis que le poids moyen global et le poids moyen par poisson ont diminué depuis les années 70. Les relevés affichent un certain potentiel d'amélioration du recrutement, bien qu'il y ait moins de gros poissons au sein de la population. L'abondance de la plie rouge dans la division 4W demeure relativement élevée. Étant donné la baisse de la biomasse de toutes les plies exploitées à des fins commerciales dans les divisions 4VW et l'absence de gros poissons dans les prises commerciales et celles des relevés, le maintien des prises, en 1997, au même niveau que 1996 ou presque ne faciliterait pas le rétablissement de cette ressource.

INTRODUCTION

Four species of flatfish, excluding halibut, are exploited commercially in 4VW. These include:

American plaice (*Hippoglossoides platessoides*)
Yellowtail flounder (*Limanda ferruginea*)
Witch flounder (*Glyptocephalus cynoglossus*)
Winter flounder (*Pseudopleuronectes americanus*)

Of these, only plaice, yellowtail, and witch were under quota management between 1973 and 1993. An initial combined flatfish TAC of 32,000 t for 4VWX flounder was established in 1973, based on yield per recruit calculations (Halliday 1973) and reduced to 28,000 t in 1976 (Halliday 1976). A TAC of 14,000 t was established in 1978 in response to the removal of the foreign fishing effort (Anon. 1977). Subsequent examinations of the stock status through to 1985 did not provide a basis to advise a modification to the TAC. FRCC advice for 1994 was to maintain the 14,000 t TAC.

Based on the analysis of biological parameters (Neilson *et al.* unpublished) it was recommended that the flatfish stock complex be divided into a western (4X) and an eastern (4VW) stock component (Appendix 1). Industry was in agreement with new stock components for 1994, especially with the imminent implementation of ITQs. Science and industry also supported the inclusion of winter flounder under quota management and the reduction of the TAC from 14,000 to 10,000 t in 1994, to reflect the decrease in overall landings by all fleet sectors since the mid 1980s. The reduced TAC was also put in place to prevent increased effort in 1994 due to the 4VW cod moratorium. As these actions significantly altered the previous management of the 4VWX flounder stocks, a review of the fleet sector shares was initiated in 1994. In the interim period (January 1 - March 31, 1994) the fleet operated on a quota cap, which was based on their 1991-1993 catch average, from January 1 - March 31. The ITQ fleet held the position that the TAC be divided among the different fleet sectors based on catch history (due to their dependence on the fishery since 1986), while the offshore insisted that traditional quota shares be maintained.

After the fleet sector review, the traditional sharing formula (established in the groundfish Management Plan for the 4VWX quota) was upheld and applied to the area quotas for the original three species, i.e. plaice, witch and yellowtail (PWY) (51% offshore and 49% inshore) in each area. This excluded winter flounder as it had not previously been under quota management. As this species had historically been fished only by the inshore in 4X, the entire amount was allocated to the inshore fleets. Thus, the Scotian Shelf TAC was composed of 7,000 t of plaice, witch and yellowtail and a 3,000 t 4X winter flounder quota (based on catch history) totalling 10,000 t for 4VWX. This was then further divided, using catch history, into the 5,500 t in 4VW consisting of PWY and the remaining 4,500 t for 4X consisted of 1,500 t PWY and 3,000 t of winter flounder. The 1,500 t in 4X of PWY was allocated using traditional shares. The remaining 3,000 t for winter flounder was allocated only to the inshore. Only traditional shares were used to allocate the 5,500 t in 4VW for all fleet sectors. Winter flounder is not fished to any great extent in 4VW and was not put under quota in 1994.

The new quotas in each area for the ITQ fleet were 3,614 t in 4X and 2,088 t in 4VW. For 4X this quota approximated their traditional catch but for the ITQ fleet in 4VW it represented only about 60% of their recent landings.

The 1995 Management Plan was set at a TAC of 7,500 which was again partitioned between 4X and 4VW giving the eastern component a TAC of 4,125 t. The FRCC recommended a reduction in TAC to 3,500 t for the 1996 fishery.

Data Problems

Management of the four species together under one TAC reflects the fact that it has to date, been impossible to obtain reliable statistics on landings for each species. A system initiated in the late 1960s, which assigned landings to species based on regional keys, which equated local names with official ones was abandoned in 1991 as being outdated. However, the system which replaced it (ITQ logs and dockside monitoring of landings was not successful in assigning landings to individual species except in a very limited way, because landings were not separated at weighout or were misidentified by the weighmaster (e.g. American plaice were called flounder). Separation by species, although requested formally by Statistics Branch in 1993 (letter to ITQ holders and weighmasters) was never enforced. The absence of reliable species specific landing statistics makes it impossible to determine the level of exploitation for each species.

For 1994, the FRCC recommended that more effort be put into obtaining better landings data by species and area. While the official move to separate stock areas and the implementation of ITQs addressed some of the problems, landings data by species, for flatfish are still considered to be unreliable. With the failure of the ITQ and weighmaster system to effectively capture the required landings information, it will be necessary to make it mandatory for fishermen to separate flounder by species.

In 1995 landings data were somewhat better, with unspecified flounder making up only 39% of the total landings in 4VW.

4VW flatfish

Description of the fishery

Total landings of 4VW flatfish increased from 10,000 t in 1961 to 52,000 t in 1968, and ranged between 16,000 and 33,000 t in the 1969 to 1976 period (Table 1, and Figs. 1, 2) with Canada and the USSR the major exploiters of the resource. However, USSR landings by species during that period are not considered to be reliable. Since 1977, only Canada has exploited the resource in a significant way (Table 2). Up until 1990 landings were in the 6,000 to 10,000 t range. In the late 1980s some of the landings were suspected to be other misreported groundfish, i.e. cod, haddock and pollock. Landings dropped to 4,500 t in 1991 and have declined since.

Figures 3 to 12 show the reported landings by area, species and gear and Tables 3, 4 and 5 give

the reported landings by area, season, gear and tonnage class. Total landings of flatfish in 4VW for 1995 amounted to 2,325 t, a decrease from 2,824 t taken in 1994. Unspecified flounder made up 39% of the total landings in 1995 compared to 50% in 1994. Landings have decreased for the <65' mobile gear fleet from 2,593 t in 1994 to 2,072 t in 1995. Over 90% of the flounder in 4VW were taken by the ITQ fleet fishing with danish seines, and to a lesser extent with small otter trawlers. This decrease in landings by the ITQ fleet may be due in part to the reduced TAC, however none of the fleet sectors took their full allocation in 1995, although the <65' mobile gear fleet fished offshore quotas through the use of the Temporary Vessel Replacement Plan.

For vessels >65', flatfish landings declined dramatically, dropping from 1,893 t in 1992 to 204 t in 1994 to 166 t in 1995. Restricted bycatch of cod and the small fish protocol caused the offshore to redirect effort to redfish since 1993. Quota reports listed the catch for the offshore as 731 t rather than the 166 t reported on the catch effort system. Therefore, for quota purposes, catch was counted against the appropriate allocation, while the catch effort data base reported the catch against the appropriate vessel length. This discrepancy is due to the use of TVRPs (Temporary Vessel Replacement Plan) by the offshore. During 1995 over 500 t of flatfish was caught by the <65' mobile gear fleet fishing flatfish under offshore allocations.

Fixed gear landings which have generally been in the 200-300 t range in recent years dropped to 159 t in 1993 and to 9 t in 1995. This may again be a result of fewer trips due to cod bycatch, small cod etc.

Management

The 4VW flatfish fishery is regulated by quotas on the following gear sectors: 1) fixed gear <65'; 2) sector overlap mobile gear <65'; 3) mobile gear < 65' ITQ fleet; and, 4) mobile gear 65-100', and 5) vessels >100'. Because the flatfish fishery has in the past been a bycatch fishery, trip limits and specific licence conditions were not required. Allocations for the gear sectors are reported in Table 6. Early in 1995, ITQ licence holders in ENS were permitted to choose ITQs or a competitive pool arrangement for flounder stocks. Ten fishers initially chose the competitive option but later changed to the ITQ option. For 1996 all ITQ licence holders will fish flounders under ITQ management.

Research Survey Data 4VW

Survey Catch Rates and Distribution

American Plaice

American plaice survey mean weight per tow in 1995 was among the lowest in the series.

Survey abundance indices for 4V are substantially higher than 4W and it is the 4V indices particularly weight per tow, which show the greatest decline while remaining relatively stable in 4W. (Table 7, 8 and Figs. 13, 14). Overall mean weight per tow is well below the longterm average and mean number per tow increased significantly in 1995 to about the longterm (1970-1994) average. To provide a view of the relative abundance of larger and smaller fish in the area where most of the fishery takes place (i.e. 4V) we examined the mean weight of plaice in 4V (mean weight per tow divided by the mean numbers per tow). Results indicate that the mean weight of an American plaice in the survey has declined since the late 1980s, remaining below 200 gm in 1995. Mean weight was generally between 300 and 400 gm prior to 1990 (Fig. 15).

Summer survey (Appendix 2) distribution maps for American plaice catches in 1994 and 1995 (Fig. 16) show a similar distribution to earlier years (Annand *et al. 1993*). However in the past major concentrations were found in the 4Vc area.

The spring 4VW survey (1986-1995) (Appendix 3) mean numbers per tow have declined since 1990 (Table 9, and Fig. 17a). The magnitude of the numbers per tow is lower in the spring survey by about half. Fishers have suggested that plaice may bury themselves in the substrate during winter months thus making them less available to the survey gear.

Length Frequencies

Survey length frequency distributions (1970-1995) in 4V alone and in 4VW indicate that there are fewer large fish in the survey in recent years, with relatively few fish over 40 cm caught in the survey. The 1994 and 1995 survey catches indicate that small fish are at a high abundance (Fig. 18). To examine this recent time period more closely, survey length frequencies for 1995 were compared to the 1990-1994 average and to the commercial length distributions. While results appear somewhat optimistic about the future with large numbers of small fish entering the population; a more pessimistic view indicates few fish over 40 cm. In spite of the potential recruitment the absence of large fish causes concern about a declining biomass. Spring survey length frequencies do not support the view that incoming recruitment has been average or better.

Yellowtail

Survey Catch Rates and Distribution

The summer RV survey (1970-1995) abundance estimates in 4V have declined since the late 1970s (Tables 7, 8 and Figs. 19, 20). Because the majority of the commercial fishery is prosecuted in 4V, we examined the mean weight of yellowtail in that area (mean weight per tow divided by the mean numbers per tow). Results indicate that the mean weight of yellowtail flounder from the survey was generally above 350 gms during the 1980s increased to 420 gms in 1990 and then declined to below 200 gms in 1995 (Fig. 21). The population is composed of older fish almost all in the size range exploited by the commercial fishery. In the past yellowtail have been smaller and more abundant in 4W, and generally not of commercial size. However in 1995 a single large set containing large numbers of small yellowtail were observed in 4V

causing total numbers to increase significantly. (Figs. 22a, b). Both weight and number per tow per tow have been decreasing in 4W since 1991. Tagging results indicate some movement between the two areas, mainly from 4W to 4V (Annand *et al 1995*).

The yellowtail summer 1994 and 1995 survey distributions (Fig. 23) indicate a change in distribution between 4V and 4W compared to earlier years (Annand *et al* 1993). Major concentrations were still noted in 4W, while most fishing activity occurs in 4V .

The 4VW spring survey abundance decreased between 1988 and 1992; however, the 1992 point may be anomalously low because large catches of yellowtail were caught in very deep water. Abundance increased for 1993, but returned to the lower levels observed during the late 1980s and early 1990s, in 1994 (Table 9, Fig. 17b), and declined further in 1995. Fishers have commented that yellowtail are not as available to the spring survey gear suggesting they bury themselves in the sand during winter months.

Length Frequencies

Comparing survey length frequency distributions (1970-1995) indicated some shift to a smaller size range in recent years (Fig. 24). Modal length for the survey has decreased in 4V and is now close to the minimum market size of 30 cm. In spite of one large set containing large numbers of small fish caught in the 1995 survey, recruitment in 4V continues to look poor. To examine the recent time period more closely survey length frequencies for 1995 were compared to the 1990-1994 average. Results indicated that while the upper size range has remained similar during the period, large numbers of small fish were present in 1995. Spring length frequencies did not show evidence of small fish in 4V.

Witch Flounder

Survey Catch Rates and Distribution

Witch flounder survey mean numbers per tow have been relatively stable with large numbers of small witch (<20 cm) observed in recent years particularly in the 1995 survey. Mean weight per tow has declined gradually since the early 1970s (Tables 7, 8 and Figs. 25, 26). In the past, small witch flounder were virtually absent in the survey, but since the early 1990's have been caught in increasingly large numbers. Segregation, by size, of juvenile witch at depths outside the normal survey range was thought to account for the lack of small witch flounder in survey catches (Powles, 1970). The presence of small witch in the recent surveys may be related to changes in distribution, perhaps due to temperature changes or to a change in abundance. The mean weight per fish has declined since the mid 1970s. This long decline is no doubt influenced by incoming recruitment especially since 1990. (Fig. 27).

Survey distributions indicate that witch flounder are widely distributed in 4VW but in low concentrations. Localized areas of abundance occur in the Gully and in deep holes north of Banquereau and in the 4Vn area (Fig 28). The summer survey does not cover the deep waters

of the Laurentian Channel and therefore may not cover the entire species distribution. These very localized areas may account for the variability in the survey estimates.

The 4VW spring survey weight per tow declined from 1987 to a low level in 1990 and has remained stable to 1995 while number per tow increased slightly in 1994 and more so in 1995 (Table 9, Fig. 17c). Spring distributions show very little witch flounder on the shelf, although larger catches were made in the deep waters of the Laurentian Channel.

Length Frequencies

Witch flounder summer survey length frequencies indicate a trend toward smaller fish in the latter half of the survey series (Fig 29). In recent years the survey appears to be picking up more <20 cm than in the past with commercial size fish declining in abundance. To examine the recent time period more closely survey length frequencies for 1995 were compared to the 1990-1994 average. Overall recent surveys are picking up relatively large numbers of small witch, indicating three apparent good incoming yearclasses, however fish >40 which were previously abundant, are no longer observed in the population in any significant numbers.

Spring survey length frequencies also indicate good incoming recruitment, while showing an almost total absence of large fish in recent years.

Winter Flounder

Survey Catch Rates and Distribution

The entire survey biomass for winter flounder is found in 4W with a large portion contained within the closed area. Coastal populations of winter flounder are not covered by the survey. Winter flounder is not fished commercially in 4VW and interrelationships with the coastal populations of winter flounder are unknown. The survey mean numbers and weights per tow in 4W were low to 1983 and have been stable or increasing since (Tables 7, 8 and Figs. 30, 31). The mean weight for winter flounder has shown some decline over time, possibly related to increased abundance of smaller fish (Fig. 32). The summer survey distributions continue to show increased concentrations to the west of Sable Island in 4W, on Sable Island and Western banks (Fig.33).

In the spring survey, numbers and weights per tow are very low and variable (Table 9, Fig. 17d). Winter flounder are known to bury themselves in the mud bottom during winter months. The survey distributions found no winter flounder east of Sable Island.

Length Frequencies

Survey length frequency distributions (1970-1995) indicated some shift to a smaller size range in recent years (Fig. 34). This shift may be related to the increased abundance of smaller winter flounder in the 4W area or movement of larger winter flounder to inshore spawning areas.

Survey length frequencies for 1995 were compared to the recent (1990-1994) period. No significant changes in length composition were noted.

Commercial data

Commercial Catch Rates

Directed catches for all stocks comprising the 4VW flatfish complex were variable and often at very low levels. The landings with effort, for each species were examined for the 1989 to 1995 time period. Landings in some years were less than 5 t. With the bycatch nature of the fishery, (though less so as other stocks decline), the ever increasing problem with unspecified flounder and the change in the way the statistics are reported, the use of commercial catch rates in assessing the status of the individual flatfish stocks is of limited value. Catch rates were derived for the individual flounder species and combined flounders, for the whole year for mobile gear <65'. This approach was used to try and get around the problems with species identification. Commercial catch rates for flounders for mobile gear <65' have been relatively stable since 1989 (Tables 10a, b and Fig 35). As well separate catch rates for the danish seine and otter trawl fleets were examined. Although variable from year to year catch rate trends were very similar. Because of reported changes in fishing practices it is difficult to look at effective effort. However, total effort has declined since 1992, likely due to the virtual absence of the >65' fleets in the flounder fishery and has declined since in the directed effort by the <65' fleet in 1995. Catch rates for witch flounder have remained relatively stable even though landings and total effort have declined significantly. (Fig. 36). Stable catch rates combined with smaller size may indicate that removals are up.

Fishery Distribution

Distribution was examined using available log information, which specified latitude, longitude and catch (Figs. 37-41). Unfortunately, most of this information pertains to unspecified flounder and only a small subset to individual species. If this subset detailing species catch distribution can be considered representative of the overall fishery distribution, it suggested that American plaice is fished in 4Vn and 4VSc. However, unspecified flounder distributions, corroborated by industry sources, indicated that American plaice is traditionally fished throughout 4V and to a limited extent in 4W.

Yellowtail commercial distributions indicated that the fishery is conducted almost entirely in 4Vc. Industry agreed that the yellowtail fishery is centred in 4Vc, somewhat in 4V as a whole, and very little in 4W.

The distribution of witch flounder appeared to be more ubiquitous, with more intense fishing activity in 4Vn. In the past, some fishing activity for witch was observed in the gully area.

Winter flounder is not directed for in 4VW and is considered a small bycatch fishery. Overall, in 4W commercial distributions indicated no apparent fishery for any flounder species in 1995.

Commercial Length Frequencies

Length frequencies of the commercial fishery landings indicated a shift toward smaller fish since 1990 for American plaice, and a shift toward smaller fish since 1993 for yellowtail flounder. Witch flounder also exhibit a trend toward smaller fish since 1993, although not as pronounced as for plaice and yellowtail (Fig. 42). Comparing the commercial length frequency with the survey length distribution for American plaice, indicates that the commercial fishery takes most of its catch at lengths considerably larger than those generally observed in the survey. Comparing the 4VW survey and commercial length frequencies for yellowtail flounder indicated that in 1990 few commercial fish were caught in the same size range as the survey, although recently the overlap has increased. In the past, yellowtail length frequencies in 4V indicated that the survey and the commercial fishery caught virtually the same size fish (Annand *et al*1995); however, as the abundance of larger yellowtail observed in the survey declined, the commercial fishery caught more fish at a size not observed in large numbers in the survey distributions. Witch flounder is somewhat different, in that the survey and the commercial fishery take fish in the same size range, and both ranges have declined in recent years. The number of samples associated with the commercial length frequencies are given in Table 11.

Conclusions

In the past few years all commercially exploited flatfish have shown a declining biomass and an absence of larger fish in both the survey and commercial fishery. In 4V, particularly 4Vc, these signs are most evident. This is especially true for yellowtail where even recruitment prospects are poor. Aside from some potential recruitment, resource status appears to have deteriorated over the last few years and is unlikely to improve substantially in the near future. Stable catch rates for flatfish coincident with the overall smaller size would indicate that removals are up. The absence of complete catch information by species, limits the guidance that we can provide on appropriate levels of fishing as well as the estimation of the present level of exploitation. What indicators there are suggest a decline in the resource. The shift to smaller fish in the commercial fishery, even with the introduction of larger mesh sizes, may result in increased discarding. It is noteworthy, however, that the 4W populations also showed some decline in abundance even in the absence of any significant level of fishing. This suggests that the declines observed in 4V may not be entirely related to fishing. Without any information on the exploitation rates, the relative contributions to the population declines by the fishery, or other related factors, cannot be determined.

Prognosis

The 1995 TAC was set at 4,125 t a substantial reduction from the 1994 level of 5,500 t, and with the present fleet allocations this reduced TAC resulted in catch levels in the 2,300 t range. Except for the improved recruitment possibilities the reduced catch did not result in any apparent improvement in stock status. The reduction in size range is an important factor suggesting that removals may still be too high and that any recruitment may be taken quickly.

The reduction in TAC in 1996 to 3,500 t will be restrictive to the <65' fleet and unless fleet utilizations, through the continued use of the Temporary Vessel Replacement Plan (TVRP) increase, should again result in catches in the 2,000 t range for 1996. However, it should be noted that both catch and effort could increase in 1996 if fleet allocations are taken through TVRP. Catch in 1997 at or above the 1996 level, may prevent recovery of this resource. As well strong protective measures should be taken to protect the potential recruitment observed in both witch and American plaice.

References

Annand, C. and A. Macdonald. 1995. An Update of the Status of 4VW and 4X Flatfish Stocks. DFO Atlantic Fisheries Research Doc.95/43

Annand, C. and D. Beanlands. 1993. An Update on the Status of 4VW and 4X Flatfish Stocks. DFO Atlantic Fisheries Research Doc. 93/57.

Anon. 1977. CAFSAC Advisory Doc. 77/4, 3 p.

Halliday, R.G. 1973. The flatfish fisheries of the Scotian Shelf. ICNAF Res. Doc. 73/102, 46 p.

Halliday, R.G. 1976. Scotian Shelf flatfish stocks implications of 1975 data. ICNAF Res. Doc. 76/VI/24, 5 p.

Powel, P.M. 1970 Depth Distribution of Various Stages of Witch Flounder (*Glyptocephalus cynoglossus*) off Nova Scotia and in the Gulf of St. Lawrence.

Table 1. Official Reported* Landings of 4VW Flatfish by Species.

	4VW					
	Plaice	Yellowtail Flounder	Witch Flounder	Winter Flounder	Unspecified**	Total
1961	1384	2908	5018	138	237	9685
1962	1485	3479	5777	127	761	11629
1963	2059	3888	7411	82	-	13440
1964	2570	5249	8372	31	194	16416
1965	7504	5880	12522	211	90	26207
1966	13480	4685	14288	89	30	32572
1967	9664	4971	7433	42	-	22110
1968	18319	12923	20947	38	29	52256
1969	12865	3625	13301	16	2	29809
1970	7723	3356	5241	52	9	16381
1971	13756	1557	16723	1601	0	33637
1972	10087	1321	10653	629	43	22733
1973	12093	1374	13434	1135	176	28212
1974	16314	703	6917	1782	101	25817
1975	11451	1357	8591	704	288	22391
1976	10838	674	7201	580	547	19840
1977	7308	1141	2010	235	46	10740
1978	6244	1241	2103	323	33	9944
1979	5526	1799	1781	241	91	9438
1980	6891	2236	1990	40	29	11186
1981	6258	2662	1279	37	21	10257
1982	5320	2411	890	92	11	8724
1983	5523	2102	1004	80	50	8759
1984	5793	2290	1340	7	8	9438
1985	4120	947	1746	29	10	6852
1986	3090	694	2383	6	68	6241
1987	4623	1041	2725	12	42	8443
1988	3087	989	2406	112	89	6683
1989	3365	1459	1765	187	93	6869
1990	1914	2931	1296	79	27	6247
1991	378	1331	1326	44	1481	4560
1992	463	1373	1023	5	1876	4740
1993	123	1647	523	2	1655	3959
1994	105	1035	275	2	1408	2824
1995	359	315	735	0	916	2325

* Landings by species are not considered reliable, due to lack of consistent species separation.

** Any mixture of winter, witch, yellowtail or American plaice.

Table 2. Official Reported Landings for 4VW.

	American Plaice					Yellowtail Flounder				
	Canada	USA	Russia	Other	Total	Canada	USA	Russia	Other	Total
1961	1358	26	-	-	1384	2908	-	-	-	2908
1962	1455	30	-	-	1485	3479	-	-	-	3479
1963	1958	17	84	-	2059	3759	-	129	-	3888
1964	2503	18	4	45	2570	5231	-	18	-	5249
1965	5253	9	2148	94	7504	5295	1	584	-	5880
1966	8666	3	4791	20	13480	3712	-	973	-	4685
1967	[1]9579	1	82	2	9664	4956	-	15	-	4971
1968	8961	-	9246	112	18319	5204	-	7708	11	12923
1969	8485	-	4304	76	12865	2383	-	1242	-	3625
1970	5725	5	1889	104	7723	735	1	2614	6	2256
1971	7088	3	6647	18	13756	825	2	728	2	1557
1972	6379	23	3553	132	10087	853	-	439	29	1321
1973	4873	2	7140	78	12093	303	-	1013	58	1374
1974	6664	4	9581	65	16314	378	-	119	206	703
1975	6361	10	5026	54	11451	909	29	400	19	1357
1976	6694	1	4057	86	10838	392	-	281	1	674
1977	7245	-	48	15	7308	1135	-	-	6	1141
1978	6190	-	29	25	6244	1226	-	-	15	1241
1979	5511	-	13	2	5526	1799	-	-	-	1799
1980	6824	-	26	41	6891	2235	-	-	1	2236
1981	6149	-	68	41	6258	2656	-	-	6	2662
1982	5310	-	6	4	5320	2409	-	-	2	2411
1983	5483	-	32	8	5523	2102	-	-	-	2102
1984	5719	-	65	9	5793	2284	-	-	6	2290
1985	4083	-	-	37	4120	941	-	-	6	947
1986	3061	-	6	23	3090	694	-	-	-	694
1987	4601	-	14	8	4623	1041	-	-	-	1041
1988	3061	-	17	9	3087	988	-	-	1	989
1989	3354	-	4	7	3365	1459	-	-	-	1459
1990	1854	-	45	20	1919	2930	-	-	1	2931
1991	237	-	113	28	378	1328	-	3	-	1331
1992	493	-	14	71	578	1373	-	-	-	1373
1993[(1)]	123	-	-	-	123	1648	-	-	-	1648
1994[(1)]	105	-	-	-	105	1035	-	-	-	1035
1995[(1)]	359	-	-	18	377	735	-	-	19	754

(1) Foreign catch is provisional, from International Observer Program and NAFO Circular Letters.

Note: Data from 1991 onward, is from DFO Statistics Branch.

Table 2 (Continued). Official Reported Landings for 4VW.

	Witch					Winter				
	Canada	USA	Russia	Other	Total	Canada	USA	Russia	Other	Total
1961	4915	103	-	-	5018	138	-	-	-	138
1962	5614	163	-	-	5777	127	-	-	-	127
1963	6943	124	344	-	7411	82	-	-	-	82
1964	8219	119	34	-	8372	31	-	-	-	31
1965	7654	45	4823	-	12522	134	1	76	-	211
1966	6966	-	7322	-	14288	60	-	29	-	89
1967	7205	-	227	1	7433	42	-	-	-	42
1968	8078	-	12817	52	20947	13	-	25	-	38
1969	5915	-	7338	48	13301	4	-	12	-	16
1970	4160	8	1059	14	5241	10	-	42	-	52
1971	6041	15	10661	6	16723	12	1	1588	-	1601
1972	5346	80	5112	115	10653	32	-	597	-	629
1973	5471	13	7900	50	13434	271	-	864	-	1135
1974	5457	27	1344	89	6917	570	-	1212	-	1782
1975	3125	-	5419	47	8591	187	-	517	-	704
1976	2181	1	3210	9	5401	212	-	368	-	580
1977	1905	-	98	7	2010	235	-	-	-	235
1978	1967	-	134	2	2103	323	-	-	-	323
1979	1774	-	3	4	1781	241	-	-	-	241
1980	1978	-	3	9	1990	40	-	-	-	40
1981	1266	-	-	13	1279	37	-	-	-	37
1982	884	-	2	4	890	92	-	-	-	92
1983	991	-	12	1	1004	80	-	-	-	80
1984	1306	-	28	6	1340	7	-	-	-	7
1985	1681	-	57	8	1746	29	-	-	-	29
1986	2329	-	54	-	2383	6	-	-	-	6
1987	2678	-	41	6	2725	12	-	-	-	12
1988	2294	-	111	1	2406	112	-	-	-	112
1989	1765	-	-	-	1795	187	-	-	-	187
1990	1304	-	-	-	1304	78	-	-	-	78
1991	1323	-	1	2	1326	43	-	-	-	43
1992	1025	-	4	2	1031	5	-	-	-	5
1993[1]	532	-	-	-	532	2	-	-	-	2
1994[1]	275	-	-	-	275	2	-	-	-	2
1995[1]	315	-	-	9	324	0	-	-	-	0

[1] Foreign catch is provisional, from International Observer Program and NAFO Circular Letters.

Note: Data from 1991 onward, is from DFO Statistics Branch.

Table 3a. American Plaice reported landings for divisions 4VWX, includes 5Y.

Year	4V	4W	4X	Total
1970	5242	2481	635	8358
1971	7765	5991	545	14301
1972	6912	3175	566	10653
1973	8686	3407	339	12432
1974	11363	4951	458	16772
1975	7336	4115	296	11747
1976	8488	2350	309	11147
1977	6716	592	449	7757
1978	5501	743	512	6756
1979	5028	498	828	6354
1980	6293	598	681	7572
1981	5677	581	514	6772
1982	4920	400	377	5697
1983	5095	428	584	6107
1984	5509	284	335	6128
1985	3915	205	317	4437
1986	2792	298	592	3682
1987	4224	399	262	4885
1988	2758	329	366	3453
1989	2966	399	481	3846
1990	1679	240	470	2389
1991	186	192	988	1366
1992	447	131	423	1001
1993[1]	39	84	9	132
1994[1]	96	9	82	187
1995[1]	359	0	27	386

Table 3b. Witch Flounder reported landings for divisions 4VWX, includes 5Y.

Year	4V	4W	4X	Total
1970	3282	1959	807	6048
1971	5640	11083	1141	17864
1972	4894	5759	698	11351
1973	6572	6862	535	13969
1974	4913	2004	498	7415
1975	3284	5307	331	8922
1976	2718	2683	341	5742
1977	1555	455	421	2431
1978	1540	563	188	2291
1979	1572	209	290	2071
1980	1801	189	331	2321
1981	1123	156	462	1741
1982	789	101	583	1473
1983	878	126	659	1663
1984	1191	149	593	1933
1985	1633	113	525	2271
1986	2221	162	631	3014
1987	2554	171	492	3217
1988	2185	221	541	2947
1989	1610	155	527	2292
1990	1158	146	645	1949
1991	1288	38	605	1931
1992	941	90	829	1860
1993[1]	513	19	373	905
1994[1]	271	4	391	666
1995[1]	309	6	306	621

[1] Foreign catch is provisional, from International Observer Program and NAFO Circular Letters.

Note: Data from 1991 onward, is from DFO Statistics Branch.

Table 3c. Yellowtail Flounder reported landings for divisions 4VWX.

Year	4V	4W	4X	Total
1970	670	2686	326	3682
1971	889	668	218	1775
1972	697	624	164	1485
1973	980	394	139	1513
1974	573	130	236	939
1975	1103	254	213	1570
1976	473	201	230	904
1977	1101	40	302	1443
1978	1085	156	387	1628
1979	1655	144	291	2090
1980	2158	78	255	2491
1981	2539	123	227	2889
1982	2360	51	212	2623
1983	2043	59	321	2423
1984	2239	51	172	2462
1985	932	15	73	1020
1986	672	22	111	805
1987	947	94	109	1150
1988	942	47	79	1068
1989	1385	74	50	1509
1990	2815	116	79	3010
1991	1313	18	144	1475
1992	1357	16	118	1491
1993[1]	1641	6	54	1701
1994[1]	1031	4	95	1130
1995[1]	732	3	133	868

Table 3d. Winter Flounder reported landings for divisions 4VWX.

Year	4V	4W	4X	Total
1970	8	44	1478	1530
1971	237	1364	1483	3084
1972	78	551	825	1454
1973	480	655	774	1909
1974	777	1005	974	2756
1975	179	525	670	1374
1976	235	345	717	1297
1977	226	9	1022	1257
1978	186	137	884	1207
1979	228	13	847	1088
1980	30	10	1134	1174
1981	26	11	1411	1448
1982	82	10	1144	1236
1983	72	8	915	995
1984	2	5	877	884
1985	27	2	795	824
1986	2	4	1034	1040
1987	9	3	1044	1056
1988	97	15	1460	1572
1989	147	40	1289	1476
1990	70	8	1886	1964
1991	28	16	602	646
1992	2	3	564	569
1993[1]	0	2	343	345
1994[1]	0	2	520	522
1995[1]	0	0	922	922

[1] Foreign catch is provisional, from International Observer Program and NAFO Circular Letters.

Note: Data from 1991 onward, is from DFO Statistics Branch.

Table 3e. Unspecified* Flounder reported landings for divisions 4VWX.

Year	4V	4W	4X	Total
1970	7	2	2	11
1971	-	-	1	1
1972	42	1	681	724
1973	64	112	806	982
1974	99	2	716	817
1975	5	283	834	1122
1976	61	486	496	1043
1977	27	19	898	944
1978	5	28	1027	1060
1979	40	51	1212	1303
1980	23	6	1858	1887
1981	17	4	1556	1577
1982	4	7	1763	1774
1983	30	20	2023	2073
1984	6	2	1995	2003
1985	3	7	2200	2210
1986	46	22	3234	3302
1987	33	9	2380	2422
1988	70	19	2205	2294
1989	15	78	976	1069
1990	10	22	3012	3044
1991	1275	206	3445	4926
1992	1798	85	3958	5841
1993[1]	1618	37	3232	4887
1994[1]	1400	8	2189	3597
1995[1]	909	6	1144	2059

* Any mixture of winter, witch, yellowtail and American plaice.

[1] Foreign catch is provisional, from International Observer Program and NAFO Circular Letters.

Note: Data from 1991 onward, is from DFO Statistics Branch.

Table 4. Reported landings by quarter of year for Div. 4V.

	American Plaice					Yellowtail Flounder					Witch Flounder					Winter Flounder				
Year	1st Quart.	2nd Quart.	3rd Quart.	4th Quart.	Total	1st Quart.	2nd Quart.	3rd Quart.	4th Quart.	Total	1st Quart.	2nd Quart.	3rd Quart.	4th Quart.	Total	1st Quart.	2nd Quart.	3rd Quart.	4th Quart.	Total
1970	2791	745	487	1006	5029	217	87	146	88	538	1257	872	409	728	3266	1	1	5	1	8
1971	2688	1892	711	1036	6327	77	519	74	57	727	1676	1526	422	601	4225	-	-	5	3	8
1972	2649	2032	440	502	5623	29	382	66	8	485	2093	1221	305	360	3979	2	0	2	12	16
1973	1765	1176	479	813	4233	3	206	11	1	221	1592	1408	279	412	3691	0	21	174	75	270
1974	3197	1992	452	571	6212	23	303	29	2	357	2896	1120	413	276	4705	0	122	339	10	471
1975	2764	1685	796	508	5753	1	690	194	8	893	907	837	292	206	2242	-	7	118	3	128
1976	2041	1809	1295	1124	6269	1	50	188	137	376	749	649	241	185	1824	0	14	156	23	193
1977	1407	2541	1942	811	6701	11	503	478	103	1095	614	459	265	145	1483	0	6	220	0	226
1978	830	2655	1382	607	5474	3	555	303	210	1071	595	508	272	156	1531	1	3	147	35	186
1979	979	1573	1123	1349	5024	0	540	695	425	1655	573	405	319	271	1568	1	3	145	79	228
1980	1195	2379	1567	1113	6254	0	1085	661	411	2157	608	660	316	208	1792	0	5	23	2	30
1981	1265	1705	1402	1261	5633	3	827	1410	293	2533	368	380	256	106	1110	0	9	2	15	26
1982	641	1573	1643	1059	4916	2	1033	920	405	2360	158	301	195	133	787	1	37	40	4	82
1983	936	1799	1874	485	5094	2	1047	977	17	2043	133	286	314	144	877	46	13	3	10	72
1984	575	2050	1722	1162	5509	133	1192	765	149	2239	119	354	455	259	1187	1	1	0	-	2
1985	681	980	1668	580	3909	8	154	624	146	932	171	516	661	281	1629	0	1	26	0	27
1986	349	1139	864	440	2792	4	352	227	89	672	358	1036	624	203	2221	0	0	2	0	2
1987	1361	1369	964	530	4224	4	404	441	98	947	428	1018	682	425	2553	0	1	1	7	9
1988	395	1123	968	272	2758	5	287	518	132	942	281	1104	548	252	2185	0	84	13	0	97
1989	375	1109	1286	193	2963	6	403	790	186	1385	214	861	363	172	1610	0	9	133	5	147
1990	457	574	470	178	1679	11	452	2033	319	2815	106	596	390	666	1158	-	4	49	17	70
1991	73	97	11	5	186	1	198	882	232	1313	217	674	245	150	1286	-	2	18	8	28
1992	100	120	131	96	447	2	153	1116	86	1357	73	517	222	129	941	1	0	1	0	2
1993[1]	10	26	2	1	39	5	193	1288	156	1642	3	248	188	73	512	-	-	-	-	-
1994[1]	19	48	18	11	96	-	285	664	83	1032	1	179	89	2	271	-	-	-	-	-
1995[1]	0	124	210	24	358	0	20	499	213	732	5	100	124	81	310	-	-	-	-	-

[1] Foreign catch is provisional, from International Observer Program and NAFO Circular Letters.

Note: Data from 1991 onward, is from DFO Statistics Branch.

Table 4. Reported landings by quarter of year for Div. 4W.

	American Plaice					Yellowtail Flounder					Witch Flounder					Winter Flounder				
Year	1st Quart.	2nd Quart.	3rd Quart.	4th Quart.	Total	1st Quart.	2nd Quart.	3rd Quart.	4th Quart.	Total	1st Quart.	2nd Quart.	3rd Quart.	4th Quart.	Total	1st Quart.	2nd Quart.	3rd Quart.	4th Quart.	Total
1970	220	186	142	148	696	95	69	11	22	197	295	296	148	155	894	-	-	1	1	2
1971	238	138	229	156	761	24	25	29	20	98	672	554	291	299	1816	-	1	-	3	4
1972	219	192	277	68	756	296	17	23	32	368	648	256	241	222	1367	8	0	0	8	16
1973	205	153	208	74	640	52	12	8	10	82	700	591	177	312	1780	0	0	0	1	1
1974	65	121	218	48	452	3	4	9	5	21	205	185	128	234	752	0	0	31	68	99
1975	133	197	239	39	608	-	15	1	-	16	257	458	53	115	883	-	6	44	9	59
1976	89	119	162	55	425	0	2	8	6	16	64	122	76	95	357	0	1	9	9	19
1977	88	185	199	72	544	8	18	3	11	40	152	131	79	60	422	4	2	2	1	9
1978	54	260	304	98	716	9	33	34	79	155	83	240	95	18	436	3	3	124	7	137
1979	32	293	144	18	487	2	89	28	25	144	72	130	2	2	206	0	5	8	0	13
1980	51	279	191	49	570	1	31	38	8	78	50	78	25	33	186	1	3	0	6	10
1981	37	264	162	53	516	8	80	26	9	123	30	92	9	25	156	4	4	1	2	11
1982	13	154	195	32	394	11	17	5	16	49	11	16	40	30	97	3	4	3	0	10
1983	8	210	148	23	389	11	34	7	7	59	19	55	25	15	114	1	4	3	0	8
1984	7	105	74	24	210	12	25	8	0	45	20	50	37	12	119	1	1	0	3	5
1985	2	63	96	13	174	3	3	1	2	9	6	12	19	15	52	0	1	1	0	2
1986	8	96	115	50	269	0	7	14	1	22	15	27	23	43	108	1	0	1	2	4
1987	20	137	162	58	377	0	32	60	2	94	0	39	39	47	125	0	1	2	0	3
1988	30	95	149	29	303	3	4	31	8	46	25	43	25	16	109	2	3	2	8	15
1989	11	103	203	74	391	0	24	29	21	74	10	79	38	28	155	1	12	14	13	40
1990	13	64	85	13	175	5	17	82	11	115	15	75	43	13	146	3	3	0	2	8
1991	2	5	28	16	51	1	1	9	4	15	6	14	14	3	37	0	0	9	6	15
1992	-	16	30	0	46	1	8	6	1	16	5	58	18	3	84	-	1	0	2	3
1993[1]	-	8	76	-	84	-	-	3	3	6	-	4	13	3	20	-	-	-	2	2
1994[1]	-	-	9	-	9	-	-	3	1	4	1	2	1	1	5	-	-	1	1	2
1995[1]	0	0	0	-	0	0	1	1	1	3	1	1	3	1	6	-	-	0	0	0

[1] Foreign catch is provisional, from International Observer Program and NAFO Circular Letters.

Note: Data from 1991 onward, is from DFO Statistics Branch.

Table 5a. Nominal reported flatfish landings for mobile gear in division 4VW for Canada (Maritimes, Quebec and Newfoundland).

	OTB TC 0 - 3						OTB TC 4+						Scottish & Danish Seine[2]					
Year	Plaice	Witch Flounder	Yellow Tail	Winter Flounder	Unspec. Flounder	Total	Plaice	Witch Flounder	Yellow Tail	Winter Flounder	Unspec. Flounder	Total	Plaice	Witch Flounder	Yellow Tail	Winter Flounder	Unspec. Flounder	Total
1970	79	93	-	4	-	176	4921	2290	716	4	-	7931	441	1765	17	2	-	2225
1971	251	263	-	-	-	514	5714	3650	785	5	-	10154	628	2126	37	1	-	2792
1972	132	46	-	10	-	188	5277	4038	836	18	33	10202	405	1257	12	1	-	1675
1973	127	90	-	235	1	453	3722	3889	278	1	-	7890	546	1464	21	1	-	2032
1974	209	9	-	461	-	679	5277	4174	359	-	8	9818	658	1221	17	97	9	2002
1975	139	4	1	137	-	281	4782	2033	855	-	6	7676	760	995	15	28	2	1800
1976	244	12	-	148	-	404	4832	1231	369	27	61	6520	1311	869	23	2	1	2206
1977	257	55	26	158	14	510	4933	901	992	2	7	6835	1632	838	116	4	12	2602
1978	263	38	5	281	10	597	3967	948	1051	10	8	5984	1300	930	84	8	12	2334
1979	210	15	19	199	13	456	3936	909	1659	1	7	6512	898	792	114	9	19	1832
1980	283	11	69	7	-	370	4476	1058	1874	6	15	7429	1580	866	281	20	8	2755
1981	186	53	92	7	3	341	4242	630	2401	22	-	7295	970	564	153	8	-	1695
1982	515	21	205	2	3	746	3002	346	2148	83	4	5583	760	511	51	5	1	1328
1983	453	12	67	-	3	535	2992	288	1860	73	24	5237	1065	678	165	7	4	1919
1984	429	30	156	1	4	620	3252	239	1802	2	-	5295	1303	1017	299	3	3	2625
1985	181	24	45	20	-	270	2398	423	597	3	1	3422	747	1200	220	4	-	2171
1986	438	163	113	2	43	759	1053	590	330	3	3	1979	682	1531	106	-	10	2329
1987	455	164	62	-	31	712	2293	666	437	-	-	3396	717	1776	103	9	-	2605
1988	530	105	91	75	42	843	908	702	297	-	1	1908	744	1405	130	29	37	2345
1989	1041	186	880	92	74	2273	615	232	213	0	-	1060	989	1299	291	80	4	2663
1990	557	134	2160	60	15	2926	607	257	212	0	0	1076	377	900	508	13	6	1804
1991[1]	19	72	514	15	157	777	136	402	209	5	630	1382	80	837	558	23	459	1957
1992[1]	4	32	215	1	162	414	424	272	279	2	916	1893	62	711	849	1	642	2265
1993[1]	1	19	346	-	371	737	108	34	8	-	173	323	14	471	1269	1	985	2740
1994[1]	37	12	235	-	336	604	27	3	30	-	144	204	41	258	765	-	925	1989
1995[1]	111	17	129	-	296	553	44	4	51	-	67	166	201	264	550	-	504	1519

[1] Data from DFO Statistics Branch.
[2] All tonnage classes combined.

5b. Nominal reported flatfish landings for fixed gear in division 4VW for Canada (Maritimes, Quebec and Newfoundland).

	4VW											
	LL, LHP[2]						GN AND OTHER[2]					
Year	Plaice	Witch Flounder	Yellow Tail	Winter Flounder	Unspec. Flounder	Total	Plaice	Witch Flounder	Yellow Tail	Winter Flounder	Unspec. Flounder	Total
1970	245	3	2	-	-	250	39	9	-	-	-	48
1971	443	-	3	4	-	450	52	2	-	2	-	56
1972	484	1	5	-	-	490	81	4	-	3	-	88
1973	402	-	4	2	-	408	76	28	-	32	-	136
1974	335	2	2	1	-	340	185	51	-	11	3	250
1975	342	19	1	2	-	364	338	74	37	20	-	469
1976	204	31	-	18	-	253	103	38	-	17	-	158
1977	333	93	1	-	-	427	90	18	-	71	2	181
1978	348	21	7	13	-	389	312	30	79	11	-	432
1979	392	46	6	30	49	523	75	12	1	2	2	92
1980	454	33	5	6	-	498	31	10	6	1	-	48
1981	734	19	9	-	17	779	17	-	1	-	-	18
1982	1022	6	5	2	-	1035	11	-	-	-	-	11
1983	955	10	10	-	2	977	18	3	-	-	-	21
1984	720	7	27	-	1	755	15	13	-	1	-	29
1985	739	31	79	1	-	850	18	3	-	1	3	25
1986	800	27	133	-	1	961	88	18	12	1	1	120
1987	1025	39	230	-	8	1302	111	33	209	3	1	357
1988	754	44	270	6	5	1079	125	38	200	2	4	369
1989	696	6	49	14	4	769	35	40	24	1	-	100
1990	295	2	37	2	1	337	18	11	13	3	3	48
1991[1]	1	3	41	0	126	171	1	10	8	1	42	62
1992[1]	0	4	29	0	133	166	3	6	1	1	29	40
1993[1]	-	4	12	1	56	73	-	4	13	-	69	86
1994[1]	-	1	4	2	1	8	-	2	1	1	2	6
1995[1]	1	-	0	-	1	2	-	1	1	0	5	7

[1] Data from DFO Statistics Branch.
[2] All tonnage classes combined.

Table 6. Management table for 4VW flatfish 1995.

Year	Fleet	Allocation	Reported catch	% Taken
1995	Fixed < 65'	272	5	2
	Mobile < 65' sector overlap	121	106 (Gulf, S-F)	88
	Mobile < 65' ITQ Fleet (competitive fishery)	1566	1447	92
	Mobile 65-100'	152	152	100
	Vessels > 100'	2014	579	29

Table 7. Mean numbers/tow, mean weights/tow and standard errors for 4VW flatfish for 1970 - 1995 (Summer Survey).

	Mean Numbers per Tow and Standard Errors								Mean Weights per Tow and Standard Errors							
	Plaice		Yellow-tail Flounder		Witch Flounder		Winter Flounder		Plaice		Yellow-tail Flounder		Witch Flounder		Winter Flounder	
Year	Mean #/Tow	Standard Error	Mean #/Tow	Standard Error	Mean #/Tow	Standard Error	Mean #/Tow	Standard Error	Mean Wts/Tow	Standard Error	Mean Wts/Tow	Standard Error	Mean Wts/Tow	Standard Error	Mean Wts/Tow	Standard Error
1970	50.18	6.69	32.10	9.69	4.91	0.82	1.03	0.54	12.64	1.66	7.12	1.69	2.07	0.30	0.16	0.08
1971	47.55	16.68	27.01	7.36	6.06	1.99	1.30	0.60	15.30	3.77	5.74	1.40	2.47	0.56	0.25	0.13
1972	42.33	8.18	28.43	5.37	4.26	0.87	3.18	2.54	11.72	1.80	7.52	1.35	1.99	0.38	1.00	0.85
1973	36.43	6.69	29.29	7.80	8.79	4.08	1.42	1.13	10.22	2.21	6.99	1.64	3.76	1.53	0.38	0.32
1974	71.42	11.44	42.51	10.35	19.26	12.60	0.98	0.67	19.84	4.44	10.29	1.92	8.31	4.85	0.29	0.19
1975	53.07	10.61	48.17	18.55	5.32	1.47	1.15	0.60	17.33	3.24	10.19	2.92	2.80	0.74	0.20	0.10
1976	59.05	21.51	34.24	7.43	3.04	0.80	0.34	0.18	20.90	6.70	8.70	1.61	1.49	0.43	0.11	0.05
1977	34.72	6.83	79.06	32.66	3.55	0.68	0.68	0.22	9.94	2.05	18.60	4.55	1.60	0.31	0.17	0.05
1978	38.22	9.04	19.88	5.81	3.10	0.84	0.20	0.12	11.21	2.61	6.11	1.95	1.30	0.32	0.05	0.03
1979	57.65	6.80	29.94	6.07	1.64	0.48	0.18	0.14	19.34	3.17	8.37	1.49	0.66	0.19	0.04	0.03
1980	57.49	21.40	20.09	3.91	3.44	1.25	0.55	0.28	21.38	8.11	5.97	0.91	1.46	0.45	0.20	0.09
1981	50.69	10.93	29.86	4.45	3.78	0.81	0.29	0.09	19.06	4.24	8.04	1.06	1.58	0.35	0.14	0.08
1982	49.29	7.57	40.24	13.64	3.44	0.56	0.85	0.42	14.94	2.27	12.72	4.41	1.49	0.25	0.30	0.14
1983	49.03	11.39	18.05	2.64	3.80	1.26	0.20	0.09	13.03	2.94	4.92	0.76	1.38	0.43	0.08	0.04
1984	52.25	11.98	21.85	4.50	3.44	0.84	2.33	1.03	13.68	3.17	5.25	0.96	1.20	0.24	0.69	0.33
1985	41.36	9.44	22.79	3.24	4.55	1.30	2.31	0.94	14.46	4.55	6.20	0.94	1.57	0.38	0.63	0.32
1986	36.28	6.46	18.47	3.52	5.67	1.39	1.63	0.67	8.37	1.35	4.00	0.76	2.13	0.44	0.31	0.13
1987	32.83	5.81	24.88	8.80	2.28	0.40	2.00	0.86	9.30	1.53	4.52	1.08	0.87	0.14	0.36	0.15
1988	28.32	4.69	18.21	1.92	2.96	0.44	1.67	0.58	7.18	1.04	4.79	0.55	0.99	0.20	0.45	0.21
1989	37.73	10.96	22.22	3.07	6.07	2.16	2.13	0.73	11.48	4.19	5.24	0.85	1.47	0.49	0.39	0.11
1990	43.61	8.20	33.42	7.09	2.02	0.41	4.69	1.38	10.05	2.28	5.57	0.85	0.56	0.14	0.71	0.21
1991	51.21	7.65	39.28	11.71	3.25	0.65	7.59	2.39	10.18	1.26	7.90	2.13	0.95	0.23	1.04	0.33
1992	29.97	3.23	31.31	6.67	2.97	0.77	1.74	0.48	7.12	0.92	6.08	1.28	0.67	0.14	0.44	0.13
1993	27.78	3.86	18.07	3.39	3.52	0.65	3.85	1.74	5.28	0.76	2.72	0.52	0.59	0.11	0.98	0.48
1994	28.21	5.02	16.76	2.98	5.59	1.77	1.86	0.52	4.11	0.58	2.55	0.58	0.87	0.40	0.35	0.12
1995	43.73	9.15	18.95	8.13	6.17	2.00	1.24	0.23	6.90	1.00	3.10	1.18	0.56	0.12	0.33	0.06

Table 7 Con't. Mean numbers/tow, mean weights/tow and standard errors for 4V flatfish (Summer Survey).

	Mean Numbers per Tow and Standard Errors								Mean Weights per Tow and Standard Errors							
	Plaice		Yellow-tail Flounder		Witch Flounder		Winter Flounder		Plaice		Yellow-tail Flounder		Witch Flounder		Winter Flounder	
Year	Mean #/Tow	Standard Error	Mean #/Tow	Standard Error	Mean #/Tow	Standard Error	Mean #/Tow	Standard Error	Mean Wts/Tow	Standard Error	Mean Wts/Tow	Standard Error	Mean Wts/Tow	Standard Error	Mean Wts/Tow	Standard Error
1970	74.26	12.85	22.73	6.51	7.99	1.75	0.00	0.00	20.97	3.42	7.06	2.51	3.43	0.63	0.00	0.00
1971	79.11	36.76	19.05	4.79	11.23	4.34	0.00	0.00	26.96	8.27	5.79	2.00	4.45	1.22	0.00	0.00
1972	70.30	17.10	31.45	9.57	6.46	1.92	0.00	0.00	21.27	3.87	9.97	2.65	2.88	0.66	0.00	0.00
1973	33.80	7.81	29.76	13.07	6.51	1.09	0.00	0.00	12.27	2.46	8.20	3.03	3.09	0.70	0.00	0.00
1974	98.04	20.12	40.22	14.64	34.64	26.69	0.00	0.00	30.72	8.24	11.10	3.11	14.40	10.24	0.00	0.00
1975	66.50	12.87	57.31	23.96	7.09	2.62	0.00	0.00	21.86	3.62	13.13	2.87	2.92	0.73	0.00	0.00
1976	111.62	51.55	20.26	4.68	3.34	1.00	0.00	0.00	39.75	15.67	6.81	1.25	1.28	0.46	0.00	0.00
1977	54.10	12.47	135.27	72.05	4.73	1.22	0.00	0.00	14.83	3.12	31.65	9.97	2.03	0.56	0.00	0.00
1978	26.68	6.22	15.06	6.98	1.44	0.40	0.00	0.00	10.78	2.47	5.06	2.33	0.67	0.21	0.00	0.00
1979	88.93	9.15	18.38	5.22	1.44	0.41	0.00	0.00	31.21	5.02	6.77	1.92	0.50	0.16	0.00	0.00
1980	115.83	47.27	23.20	6.99	3.21	0.83	0.00	0.00	44.93	17.97	7.72	1.69	1.55	0.38	0.00	0.00
1981	86.87	21.52	25.38	6.17	4.58	1.17	0.00	0.00	33.66	7.72	8.10	1.80	2.08	0.57	0.00	0.00
1982	87.99	16.16	30.88	9.16	5.45	0.96	0.00	0.00	29.34	4.91	11.55	3.69	2.53	0.49	0.00	0.00
1983	83.75	22.96	16.12	3.68	4.39	1.17	0.00	0.00	24.13	6.02	5.58	1.32	1.75	0.52	0.00	0.00
1984	93.58	25.05	12.33	3.98	6.03	1.81	0.00	0.00	24.63	6.59	4.56	1.50	2.10	0.50	0.00	0.00
1985	69.95	20.47	17.09	4.65	5.26	1.97	0.00	0.00	27.47	10.01	6.50	1.77	1.96	0.62	0.00	0.00
1986	48.07	10.32	6.84	3.02	7.81	2.77	0.01	0.01	14.08	2.65	2.78	1.19	3.14	0.88	0.06	0.06
1987	47.78	10.10	4.06	1.32	3.12	0.66	0.00	0.00	15.41	2.92	1.62	0.47	1.21	0.21	0.00	0.00
1988	32.08	5.70	11.70	2.53	2.86	0.81	0.00	0.00	11.23	2.02	4.61	0.92	1.11	0.26	0.00	0.00
1989	66.27	23.50	11.63	4.28	6.57	1.52	0.00	0.00	23.10	9.28	4.66	1.64	1.47	0.32	0.00	0.00
1990	62.37	16.24	4.79	1.41	3.71	0.84	0.00	0.00	17.13	4.75	2.01	0.58	1.11	0.30	0.00	0.00
1991	69.81	11.28	10.29	4.23	5.12	1.42	0.34	0.34	16.09	2.42	3.37	1.48	1.39	0.48	0.04	0.04
1992	45.44	6.42	12.23	5.93	5.08	1.66	0.00	0.00	12.88	1.96	4.34	2.07	1.11	0.28	0.00	0.00
1993	39.45	6.95	4.70	2.18	5.15	0.98	0.00	0.00	8.87	1.56	1.37	0.68	1.09	0.22	0.00	0.00
1994	44.66	10.74	5.77	4.67	10.45	3.88	0.00	0.00	6.90	1.20	1.41	1.15	1.70	0.87	0.00	0.00
1995	75.92	19.94	26.03	17.72	6.78	1.90	0.00	0.00	12.93	2.14	4.64	2.58	0.95	0.24	0.00	0.00

Table 7 Con't. Mean numbers/tow, mean weights/tow and standard errors for 4W flatfish Summer Survey.

	Mean Numbers per Tow and Standard Errors								Mean Weights per Tow and Standard Errors							
	Plaice		Yellow-tail Flounder		Witch Flounder		Winter Flounder		Plaice		Yellow-tail Flounder		Witch Flounder		Winter Flounder	
Year	Mean #/Tow	Standard Error	Mean #/Tow	Standard Error	Mean #/Tow	Standard Error	Mean #/Tow	Standard Error	Mean #/Tow	Standard Error	Mean #/Tow	Standard Error	Mean #/Tow	Standard Error	Mean #/Tow	Standard Error
1970	30.51	6.14	39.69	16.75	2.40	0.42	1.03	0.54	5.86	1.15	7.17	2.29	0.96	0.16	0.29	0.14
1971	21.55	3.16	33.52	12.81	1.81	0.56	1.30	0.60	5.72	1.04	5.70	1.95	0.84	0.23	0.46	0.23
1972	19.29	4.90	25.92	5.86	2.45	0.72	3.18	2.54	3.86	0.78	5.50	1.15	1.26	0.42	1.82	1.55
1973	34.44	14.46	28.87	9.30	10.66	7.37	1.42	1.13	8.54	3.49	5.99	1.66	4.32	2.72	0.69	0.59
1974	47.59	12.08	44.50	14.56	5.54	1.06	0.98	0.67	9.49	4.06	8.82	2.33	2.73	0.76	0.50	0.37
1975	41.96	16.16	40.59	27.43	3.87	1.58	1.15	0.60	13.60	5.10	7.77	4.78	2.69	1.21	0.37	0.18
1976	25.92	13.24	42.80	11.73	2.85	1.13	0.34	0.18	9.04	4.68	9.88	2.50	1.62	0.65	0.18	0.08
1977	18.74	7.04	32.75	5.35	2.58	0.72	0.68	0.22	5.92	2.70	7.87	1.25	1.25	0.32	0.30	0.09
1978	47.57	15.59	23.77	8.88	4.46	1.48	0.20	0.12	11.56	4.29	6.99	2.99	1.81	0.55	0.09	0.06
1979	31.86	9.83	39.41	10.19	1.80	0.81	0.18	0.14	9.58	4.04	9.68	2.22	0.80	0.33	0.08	0.06
1980	9.46	2.80	17.50	4.22	3.63	2.16	0.55	0.28	2.01	0.49	4.54	0.91	1.39	0.77	0.37	0.17
1981	20.89	9.13	33.51	6.31	3.13	1.12	0.29	0.09	7.05	4.41	7.99	1.24	1.17	0.42	0.25	0.14
1982	17.73	3.92	47.83	23.57	1.80	0.64	0.85	0.42	3.22	0.99	13.67	7.40	0.64	0.22	0.55	0.25
1983	20.73	8.77	19.61	3.74	3.32	2.09	0.20	0.09	3.99	2.10	4.38	0.88	1.09	0.66	0.14	0.07
1984	18.19	7.18	29.64	7.52	1.31	0.35	2.33	1.03	4.68	1.98	5.81	1.24	0.46	0.13	1.25	0.61
1985	17.80	3.50	27.44	4.50	3.97	1.72	2.31	0.94	3.76	0.94	5.96	0.91	1.24	0.47	1.15	0.57
1986	26.55	8.16	28.00	5.92	3.91	1.10	1.63	0.67	3.68	1.14	5.00	0.99	1.30	0.34	0.51	0.23
1987	20.50	6.56	41.96	15.98	1.59	0.47	2.00	0.86	4.28	1.40	6.91	1.93	0.59	0.19	0.66	0.27
1988	25.20	7.15	23.54	2.81	3.04	0.44	1.67	0.58	3.84	0.90	4.93	0.65	0.89	0.30	0.83	0.39
1989	14.22	3.77	30.91	4.34	5.66	3.72	2.13	0.73	1.93	0.44	5.71	0.79	1.47	0.85	0.70	0.20
1990	27.02	5.72	58.59	13.26	0.54	0.20	4.69	1.38	3.56	0.91	8.12	1.52	0.07	0.03	1.24	0.40
1991	36.01	10.40	62.82	20.94	1.72	0.26	7.59	2.39	5.37	1.15	11.58	3.67	0.59	0.13	1.85	0.60
1992	17.08	2.53	47.21	11.18	1.21	0.28	3.20	0.88	2.29	0.42	7.42	1.59	0.30	0.09	0.79	0.24
1993	18.19	4.11	29.07	5.92	2.17	0.86	7.02	3.17	2.33	4.11	3.84	0.77	0.17	0.10	1.79	0.87
1994	14.69	2.37	25.79	3.84	1.58	0.44	3.39	0.95	1.80	0.40	3.50	0.47	0.19	0.06	0.64	0.22
1995	17.26	2.99	13.12	2.67	5.66	3.24	2.25	0.11	1.94	0.45	1.83	0.59	0.24	0.07	0.59	0.11

Table 8. Minimum Biomass (t) estimates for Eastern Nova Scotia (4VW).

	Plaice		Yellowtail		Witch		Winter
	4V	4W	4V	4W	4V	4W	4W
1970	24999	8576	8404	10503	4087	1398	423
1971	32444	8376	6964	8339	5358	1232	670
1972	25602	5647	11994	8055	3464	1849	2674
1973	14765	12500	9866	8769	3715	6321	1004
1974	36975	13895	13360	12917	17334	3992	732
1975	26311	19901	15797	11378	3516	3940	536
1976	47526	13240	6272	14477	1570	2370	257
1977	17853	8670	38093	11518	2440	1832	441
1978	13153	16931	6077	10227	869	2648	138
1979	37562	14034	8153	14168	604	1167	112
1980	54075	2942	9286	6641	1862	2039	538
1981	40512	10323	9744	11697	2508	1716	362
1982	35064	4710	13762	20005	3019	939	807
1983	28781	5840	6648	6409	2080	1593	209
1984	29637	6844	5492	8512	2527	667	1827
1985	33065	5508	7822	8720	2359	1818	1682
1986	16949	5387	3350	7318	3775	1908	742
1987	18546	6259	1950	10119	1459	861	972
1988	13512	5625	5553	7220	1340	1299	1211
1989	27802	2819	5612	8354	1769	2159	1029
1990	20616	5209	2424	11893	1339	101	1816
1991	19241	7867	4018	16954	1669	862	2702
1992	15500	3357	5226	10868	1336	443	1156
1993	10671	3407	1648	5620	1313	249	2618
1994	8309	2640	1691	5121	2048	283	938
1995	15559	2836	5588	2676	1138	351	868

Table 9. Mean numbers/tow, mean weights/tow and standard errors for flatfish for 1986 - 1995(Spring 4VW Survey).

	Mean Numbers per Tow and Standard Errors								Mean Weights per Tow and Standard Errors							
	Plaice		Yellow-tail Flounder		Witch Flounder		Winter Flounder		Plaice		Yellow-tail Flounder		Witch Flounder		Winter Flounder	
Year	Mean #/Tow	Standard Error	Mean #/Tow	Standard Error	Mean #/Tow	Standard Error	Mean #/Tow	Standard Error	Mean Wts/Tow	Standard Error	Mean Wts/Tow	Standard Error	Mean Wts/Tow	Standard Error	Mean Wts/Tow	Standard Error
1986	20.04	3.77	15.95	3.62	4.19	1.40	0.04	0.02	5.24	1.09	3.77	0.81	1.51	0.60	0.01	0.01
1987	23.12	3.08	25.70	7.55	9.13	3.16	0.13	0.05	7.17	0.97	5.86	1.72	3.93	1.60	0.04	0.02
1988	21.22	5.67	34.87	9.85	5.43	2.05	0.08	0.04	6.40	2.03	6.76	1.64	2.67	1.36	0.02	0.02
1989	12.16	1.89	12.58	2.67	3.71	1.10	0.16	0.06	2.59	0.44	2.40	0.42	0.87	0.25	0.04	0.02
1990	22.78	2.76	10.76	2.38	1.76	0.40	0.07	0.02	4.07	0.55	1.86	0.42	0.26	0.09	0.03	0.01
1991	16.53	4.78	10.31	6.30	2.25	0.66	0.00	0.00	3.12	1.14	1.63	0.86	0.38	0.12	0.00	0.00
1992	13.42	2.00	2.72	0.78	1.93	0.54	0.01	0.01	2.68	0.46	0.46	0.18	0.40	0.17	0.00	0.00
1993	10.76	2.13	18.49	8.99	1.57	0.50	0.17	0.07	2.41	0.64	3.01	1.39	0.07	0.03	0.03	0.02
1994	12.47	2.61	10.16	2.43	2.65	0.78	0.29	0.09	2.30	1.04	1.46	0.37	0.37	0.19	0.06	0.02
1995	9.91	1.84	2.02	0.51	6.83	1.85	0.02	0.02	2.03	0.53	0.16	0.05	0.22	0.09	0.01	0.01

Table 10.

a). Flatfish individual and combined CPUE for Mobile Gear (TC 1-3) where one or any flatfish species was main species.

	Plaice	Yellowtail	Witch Flounder	Winter Flounder	Unspecified	Any Flatfish (MS)
4VW						
1989	.174	.203	.178	.443	.181	.245
1990	.137	.368	.138	.899	-	.342
1991	.099	.329	.167	.136	.142	.232
1992	.124	.344	.171	.130	.148	.246
1993	.075	.451	.165	.199	.214	.299
1994	.099	.312	.150	-	.198	.242
1995	.230	.456	.182	-	.221	.289

b). Flatfish combined CPUE for DS TC 1-3 and OTB TC 1-3 where one or any flatfish species was main species.

	DS			OTB		
	Catch	Effort	CPUE	Catch	Effort	CPUE
4VW						
1989	165	827	.199	542	2061	.263
1990	68	186	.369	764	2246	.340
1991	1683	7744	.217	658	2337	.282
1992	2001	7648	.262	312	1742	.179
1993	2586	7997	.323	653	2823	.231
1994	1968	7970	.247	548	2417	.227
1995	1454	5156	.282	542	1758	.309

Table 11. Mobile gear commercial samples for 4VW.

4VW			
	Plaice	Yellowtail	Witch
1990	6	5	1
1991	36	3	3
1992	4	3	3
1993	8	7	3
1994	16	17	6
1995	11	9	9

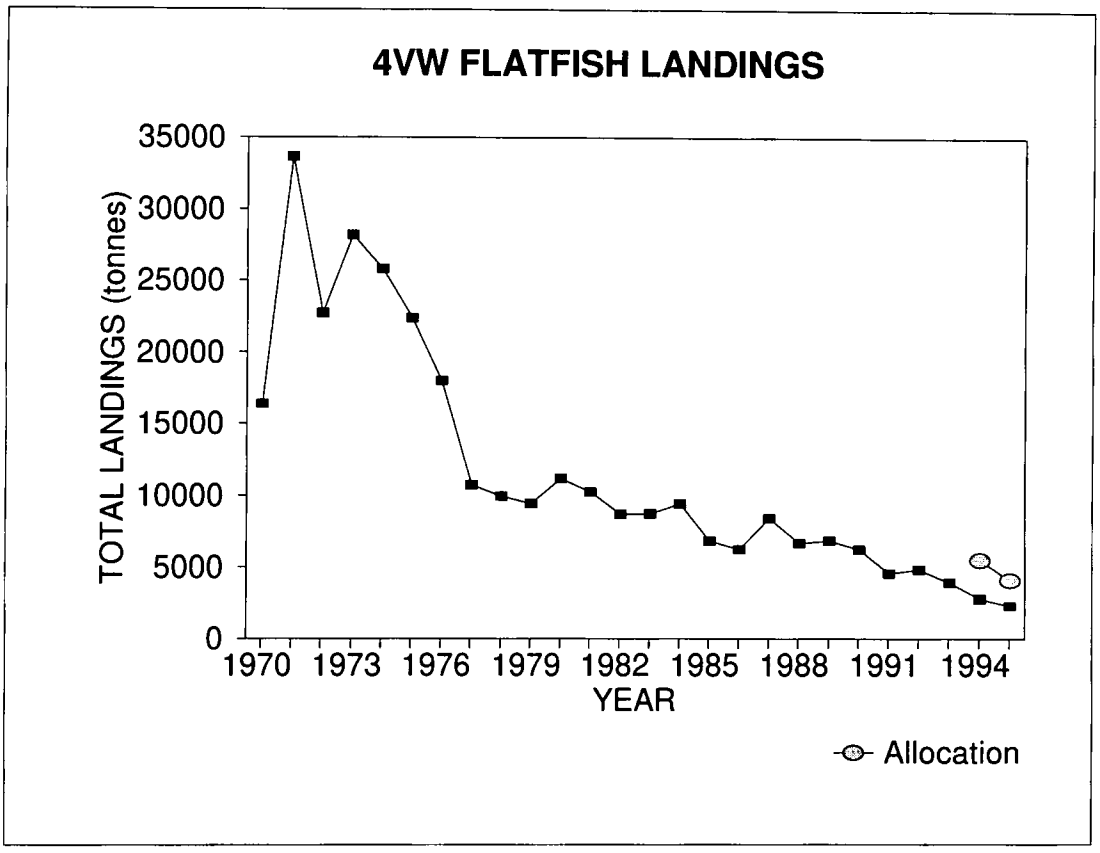

4VW FLATFISH LANDINGS
TOTAL LANDINGS (tonnes)
35000
30000
25000
20000
15000
10000
5000
0
1970 1973 1976 1979 1982 1985 1988 1991 1994
YEAR
Allocation

Fig. 1.

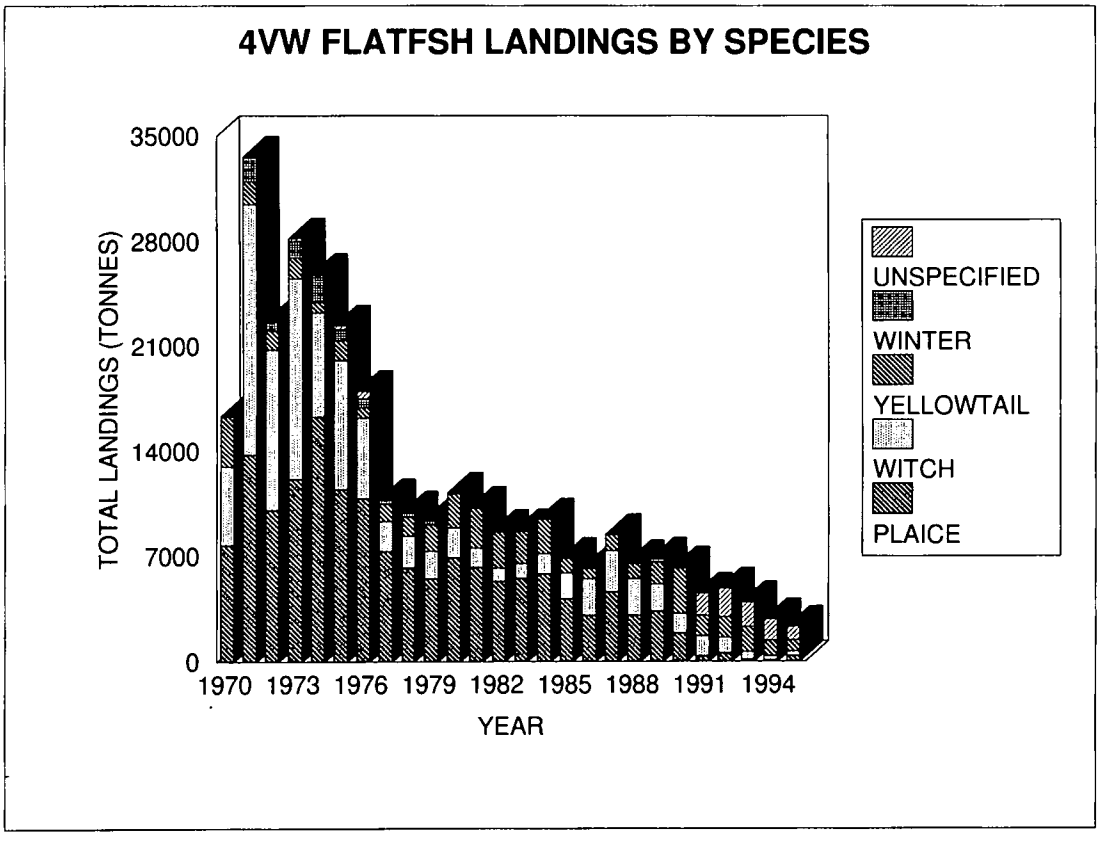

4VW FLATFSH LANDINGS BY SPECIES
TOTAL LANDINGS (TONNES)
35000
28000
21000
14000
7000
0
1970 1973 1976 1979 1982 1985 1988 1991 1994
YEAR
UNSPECIFIED
WINTER
YELLOWTAIL
WITCH
PLAICE

Fig. 2.

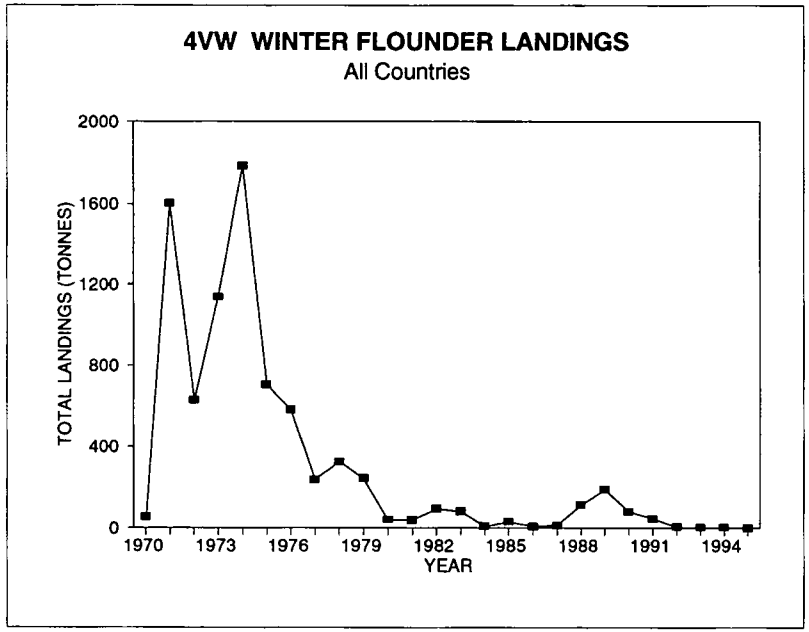


Fig. 3.

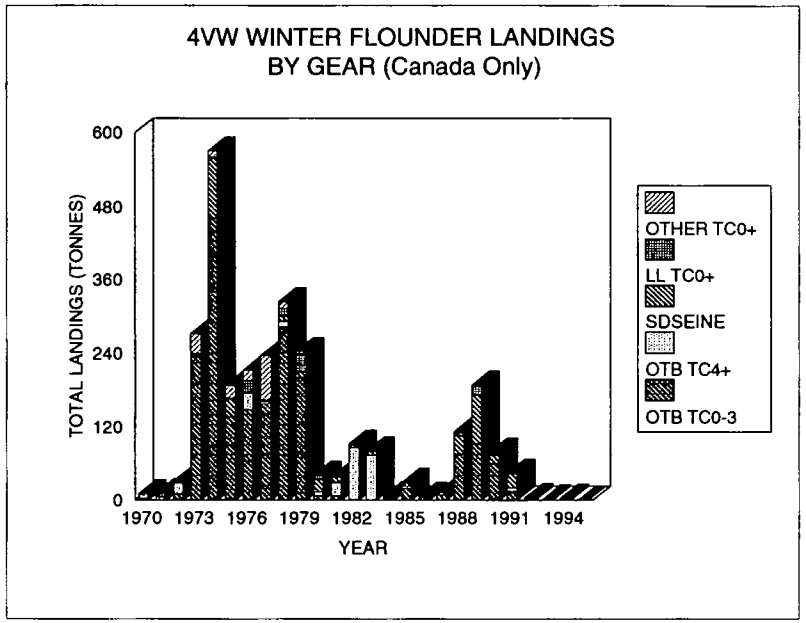


Fig. 4.

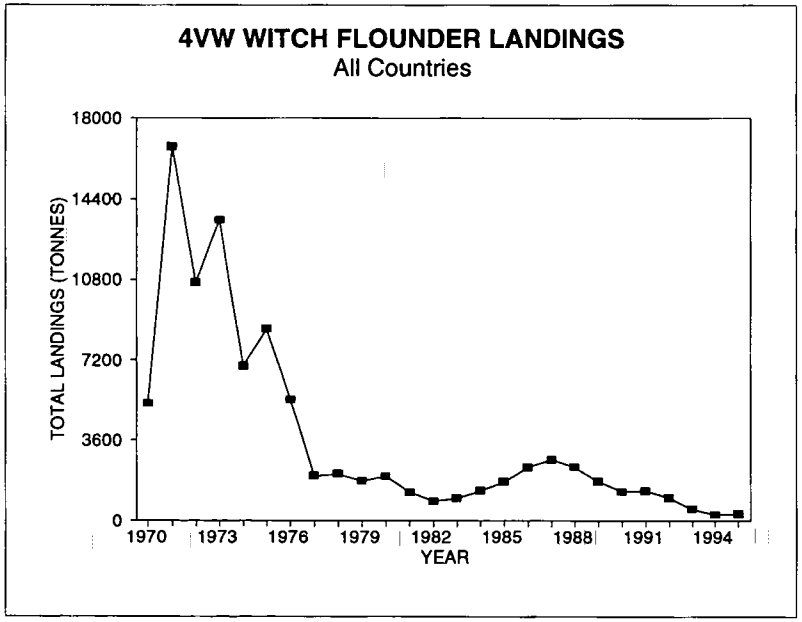


Fig. 5.

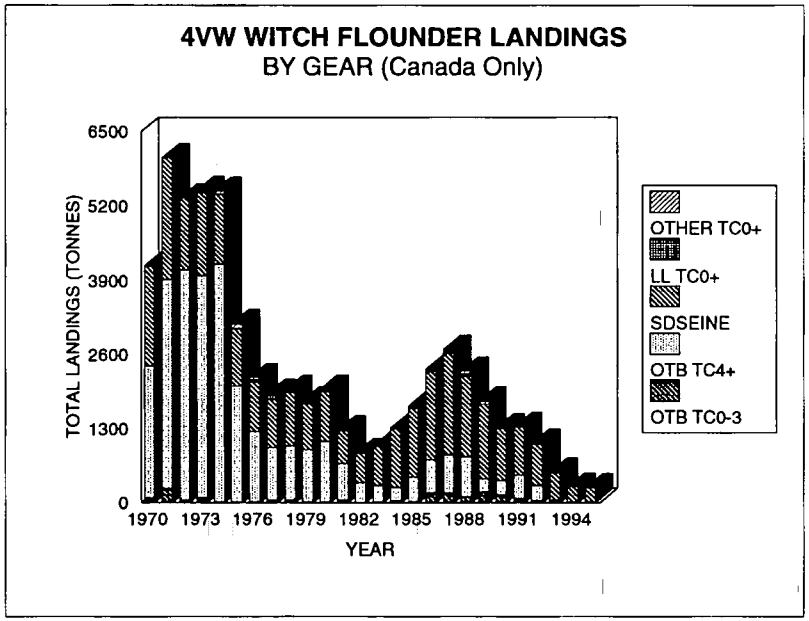


Fig. 6.

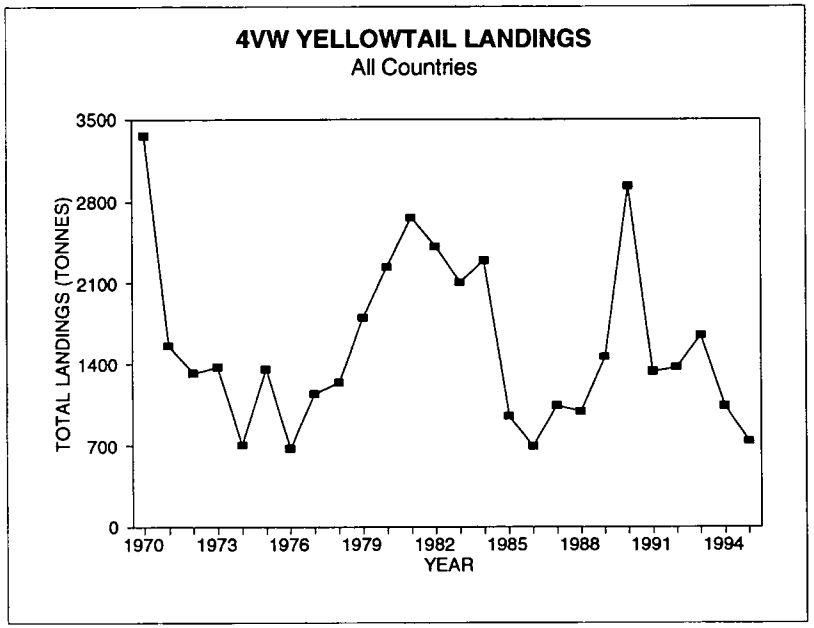


Fig. 7.

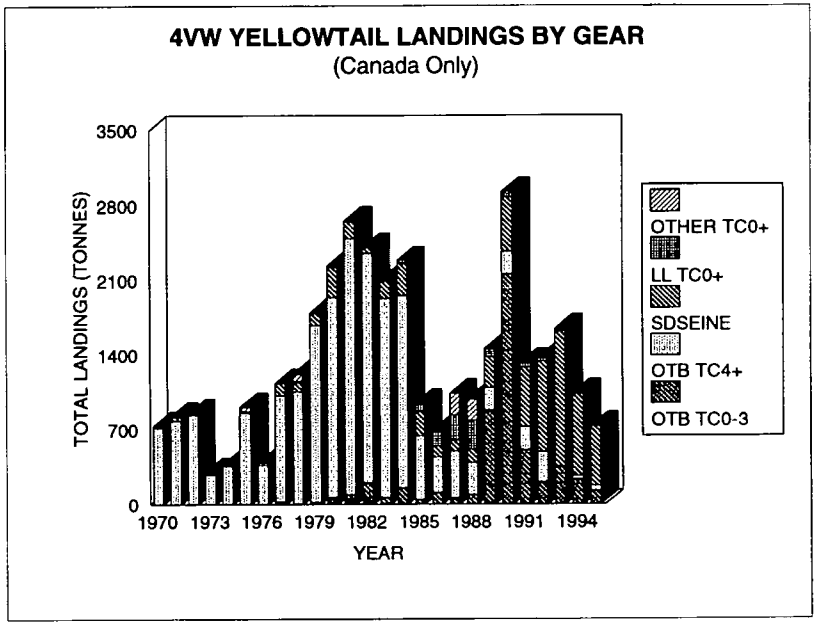


Fig. 8.

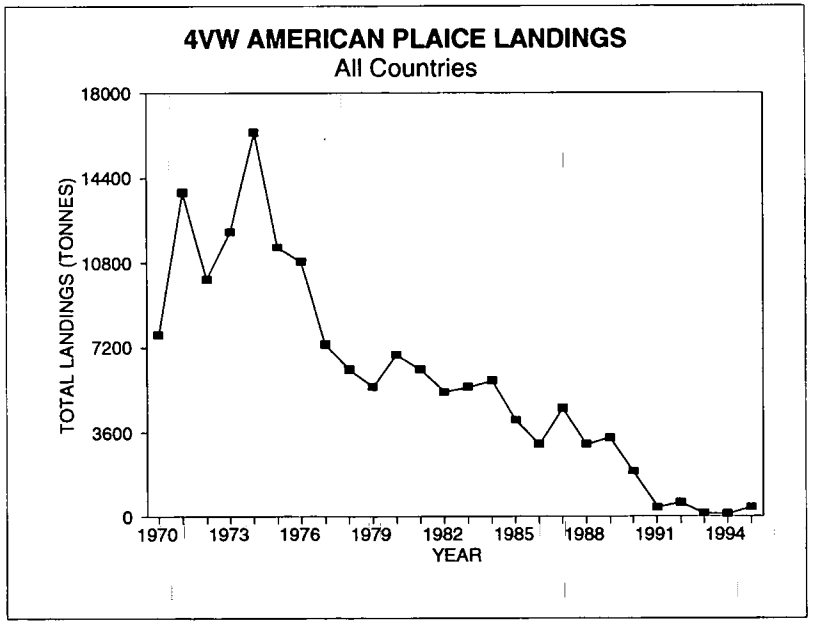


Fig. 9.

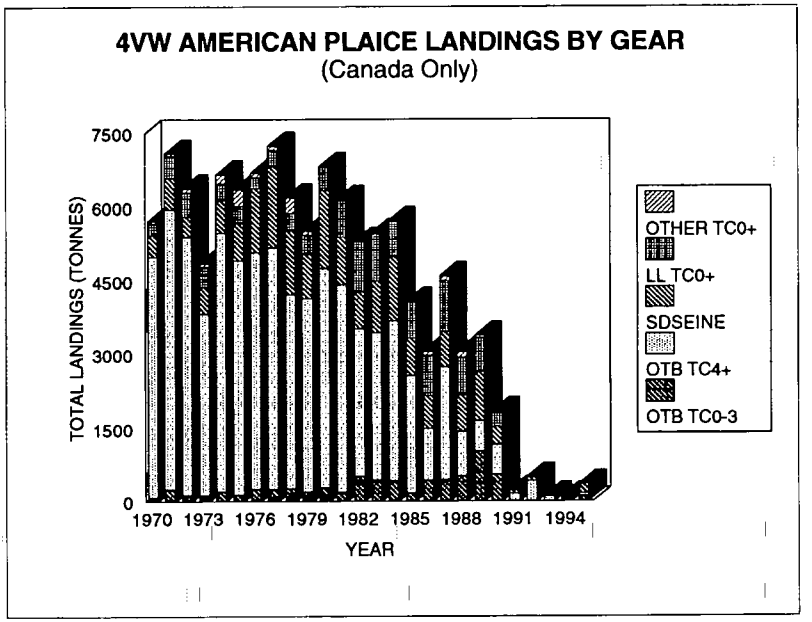


Fig. 10.

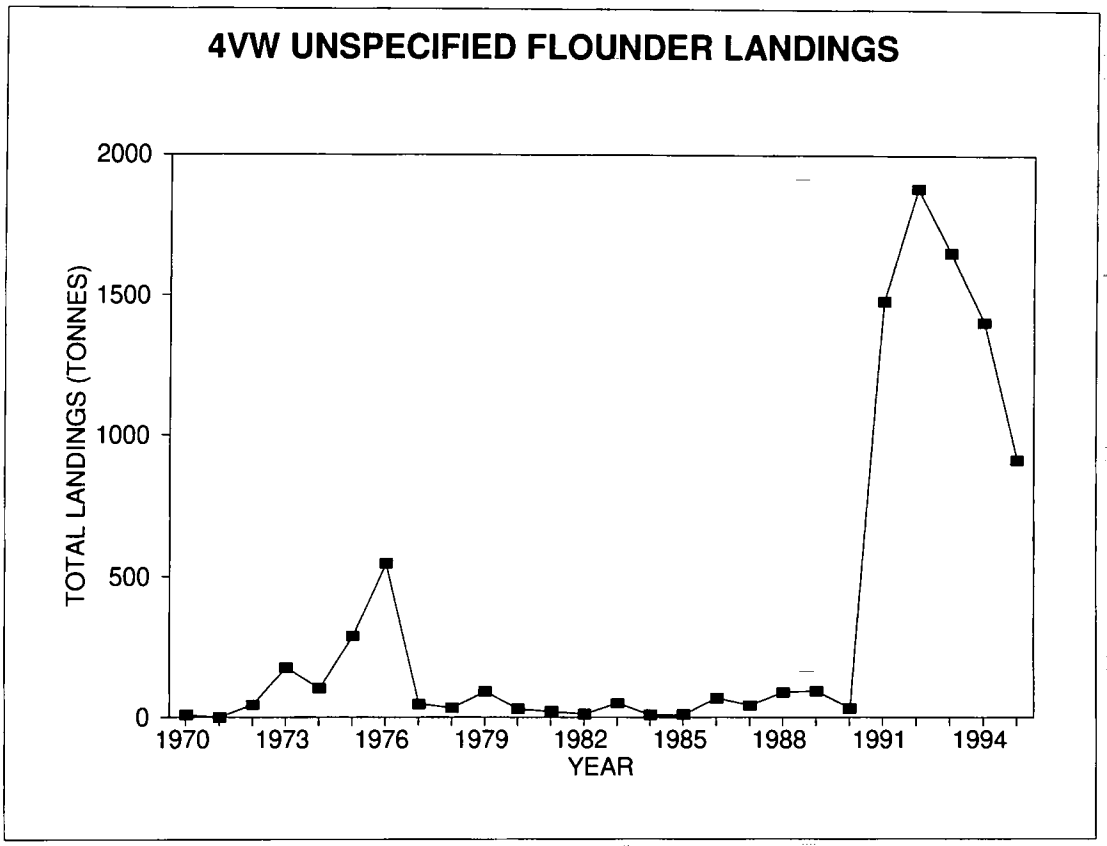

4VW UNSPECIFIED FLOUNDER LANDINGS
TOTAL LANDINGS (TONNES)
2000
1500
1000
500
0
1970
1973
1976
1979
1982
1985
1988
1991
1994
YEAR

Fig. 11.

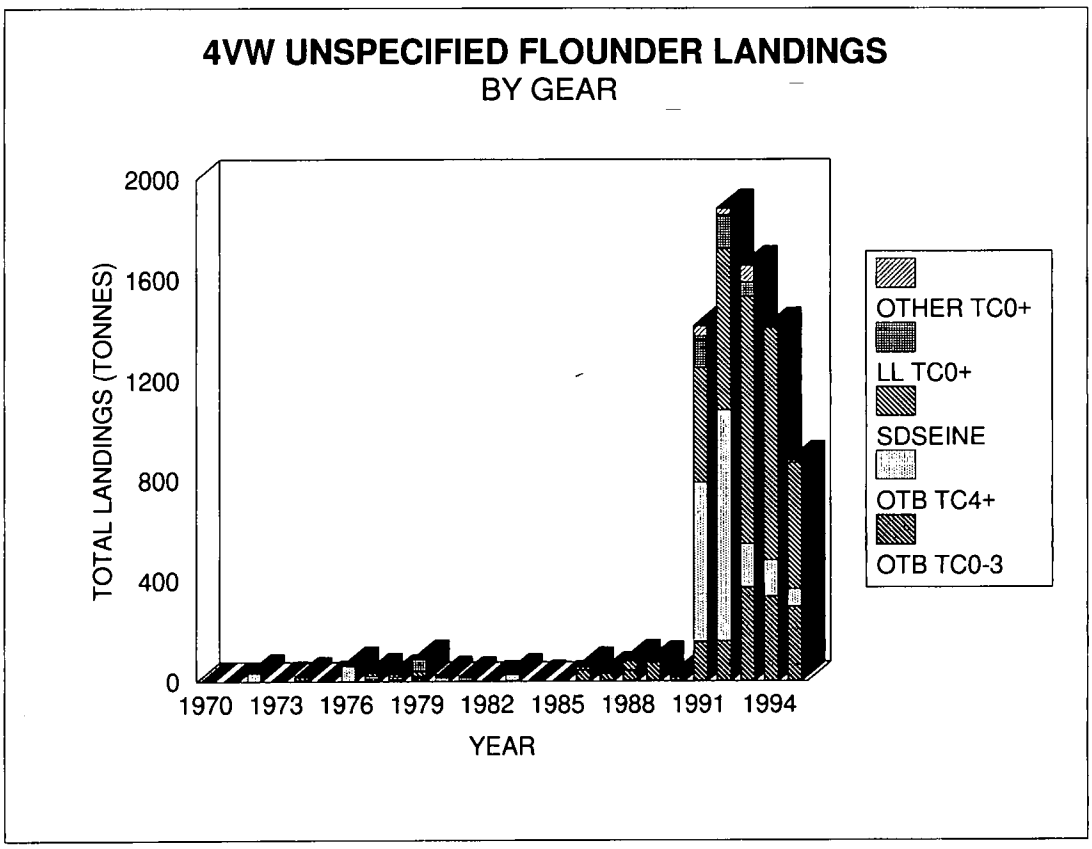

4VW UNSPECIFIED FLOUNDER LANDINGS
BY GEAR
TOTAL LANDINGS (TONNES)
2000
1600
1200
800
400
0
1970 1973 1976 1979 1982 1985 1988 1991 1994
YEAR
OTHER TC0+
LL TC0+
SDSEINE
OTB TC4+
OTB TC0-3

Fig. 12.

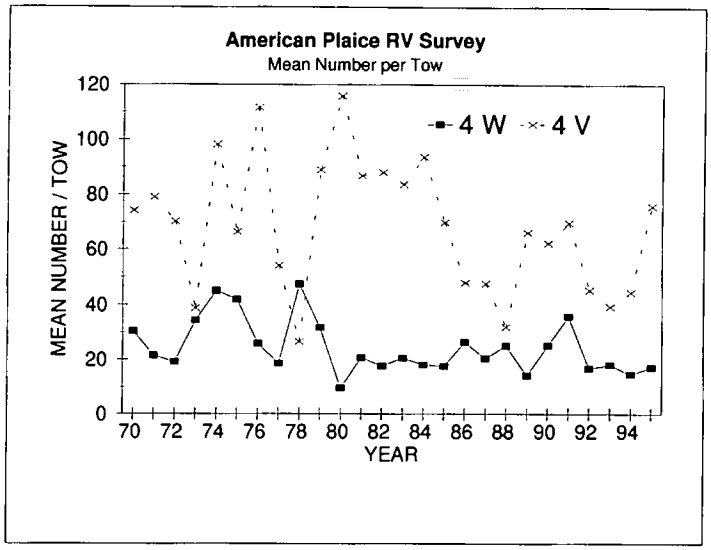


Fig. 13.

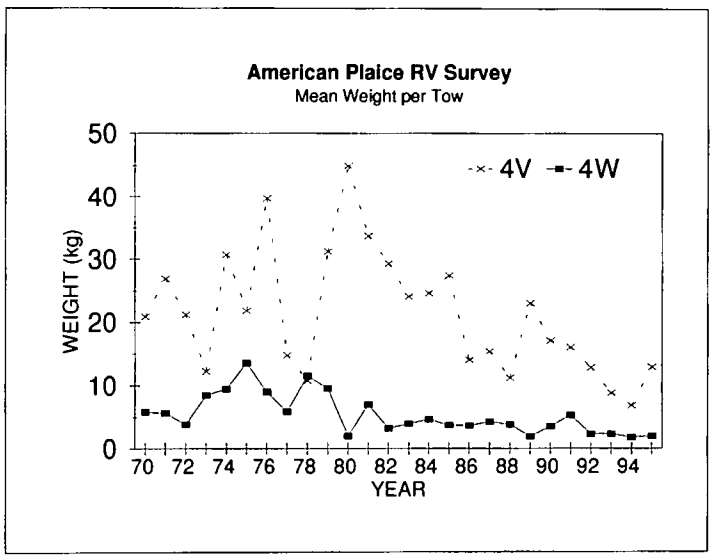


Fig. 14.

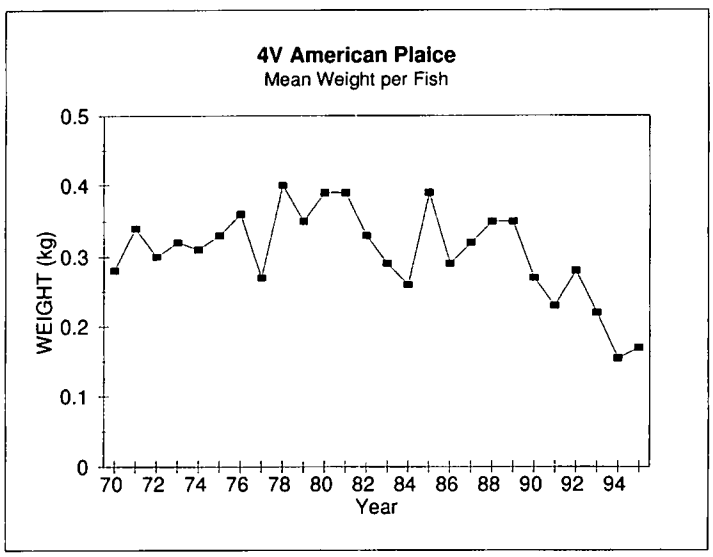
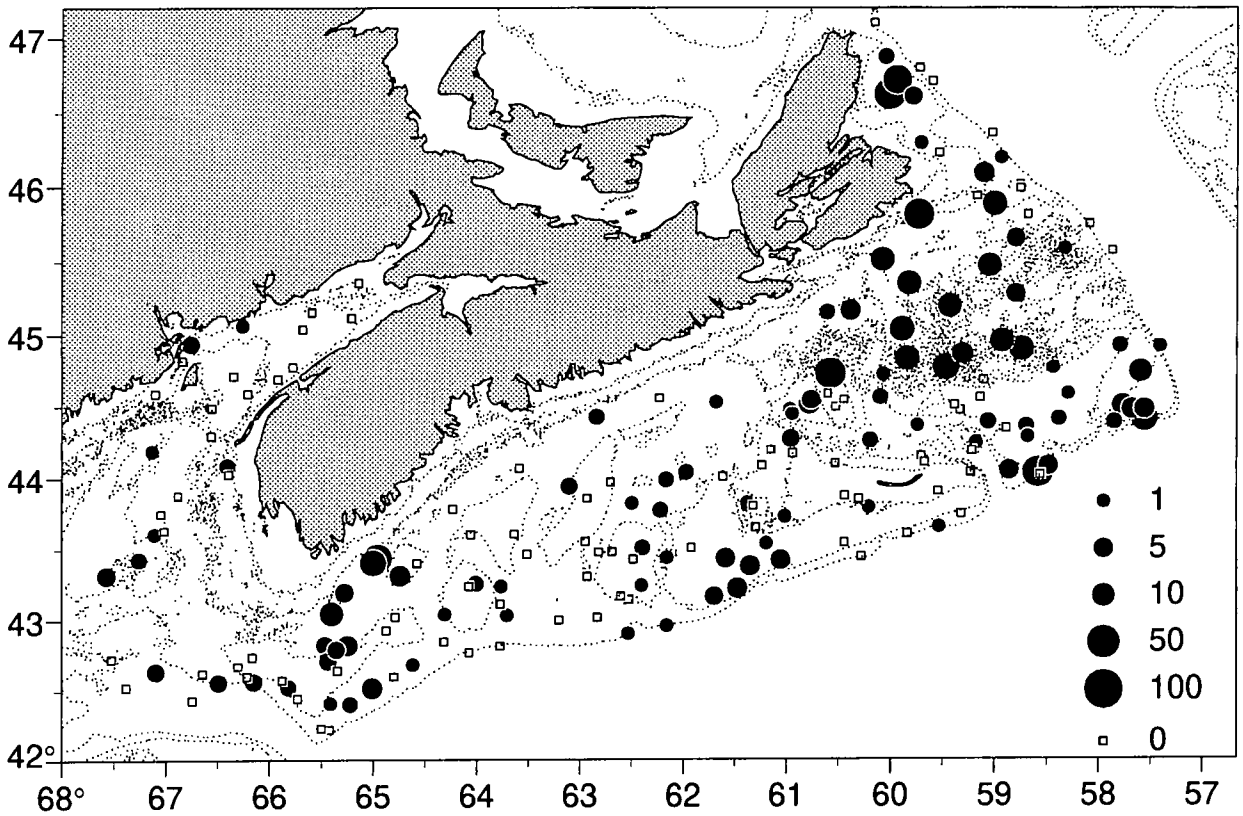


Fig. 15.


47
46
45
44
43
42°
68°
67
66
65
64
63
62
61
60
59
58
57
1
5
10
50
100
0
Summer Groundfish Survey
4VWX Plaice Biomass (kg/tow)
July 1994

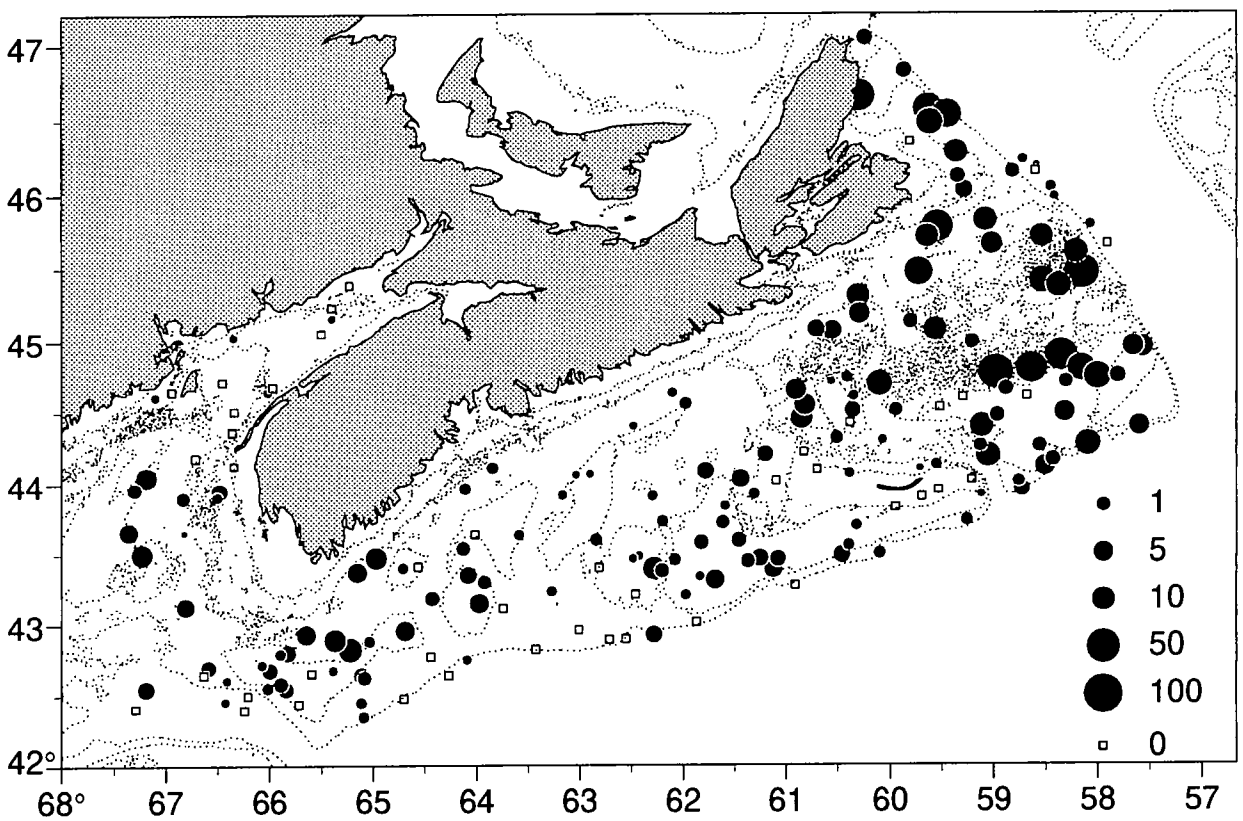

47
46
45
44
43
42°
68°
67
66
65
64
63
62
61
60
59
58
57
1
5
10
50
100
0
Summer Groundfish Survey
4VWX Plaice Biomass (kg/tow)
July 1995

Fig. 16.

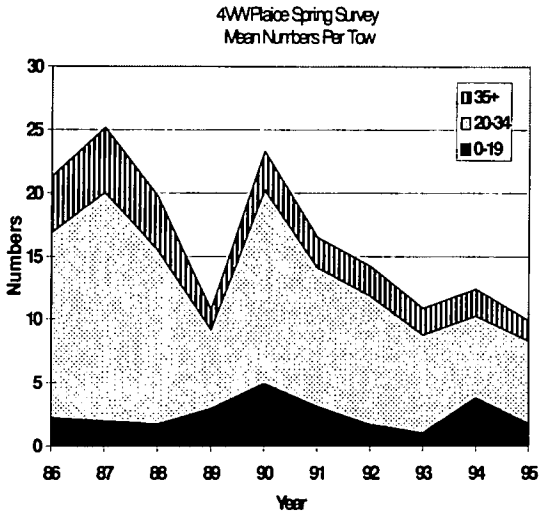


Fig. 17a.

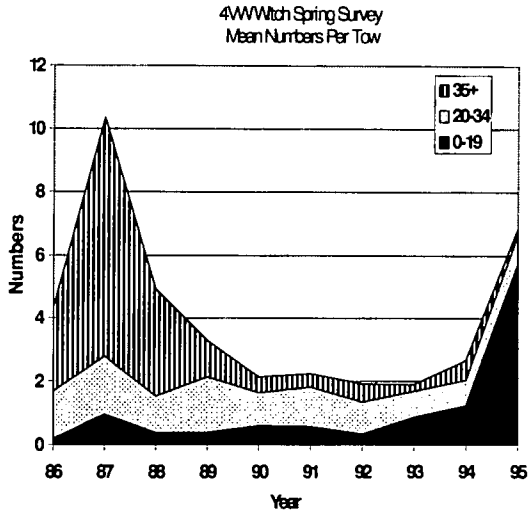


Fig. 17c.

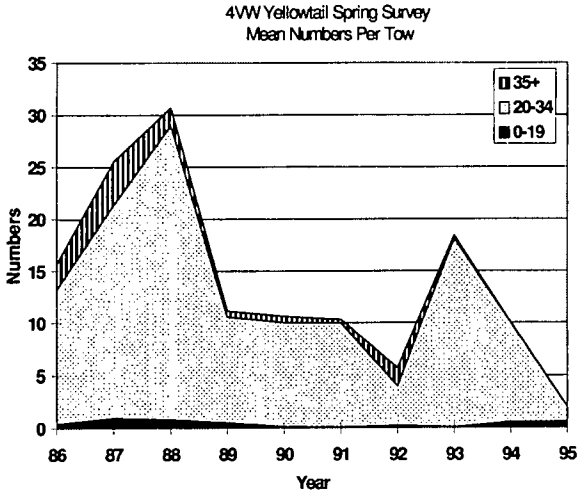


Fig. 17b.

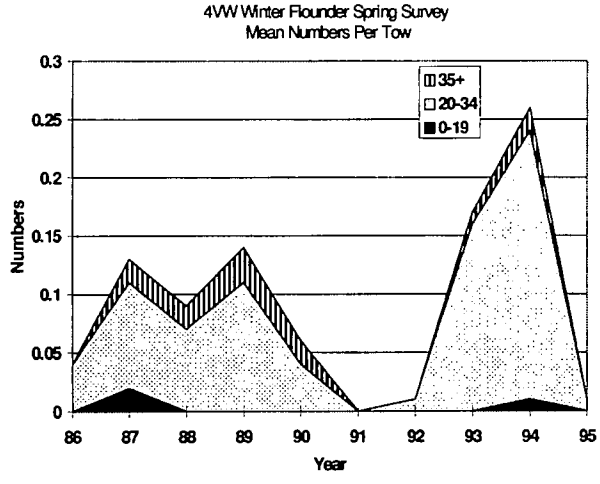
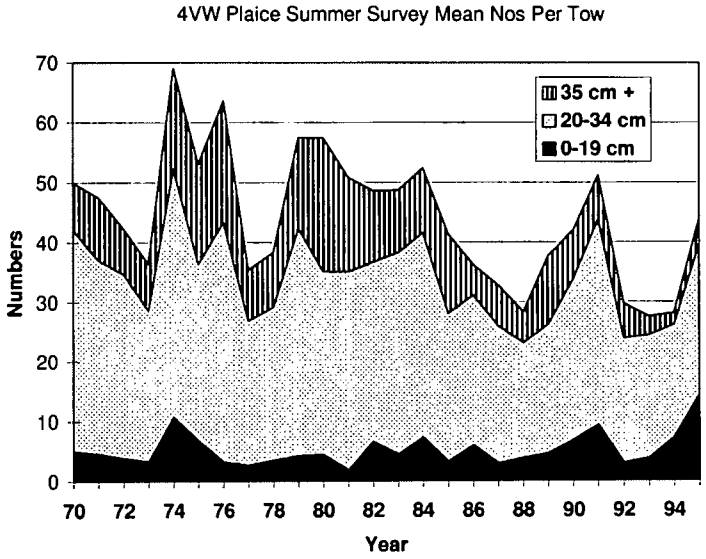
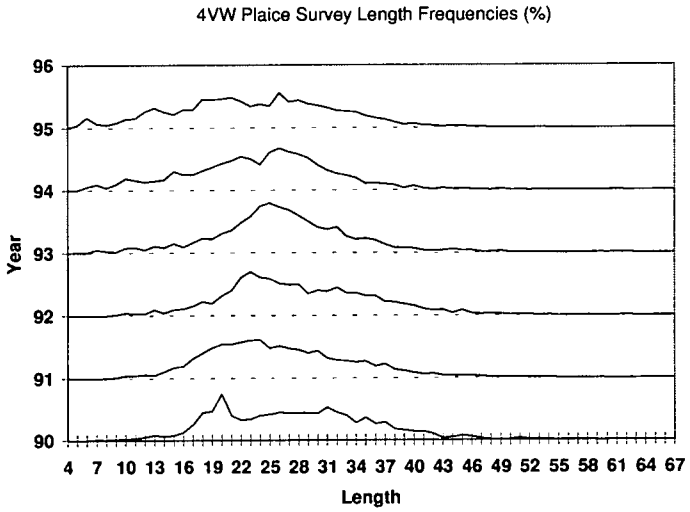


Fig. 17d.


4VW Plaice Summer Survey Mean Nos Per Tow
35 cm +
20-34 cm
0-19 cm
Numbers
Year


4VW Plaice Survey Length Frequencies (%)
Year
Length

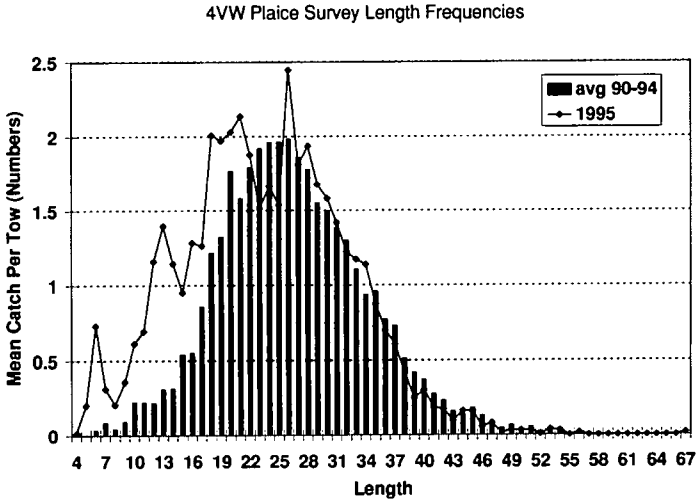

4VW Plaice Survey Length Frequencies
avg 90-94
1995
Mean Catch Per Tow (Numbers)
Length

Fig. 18.

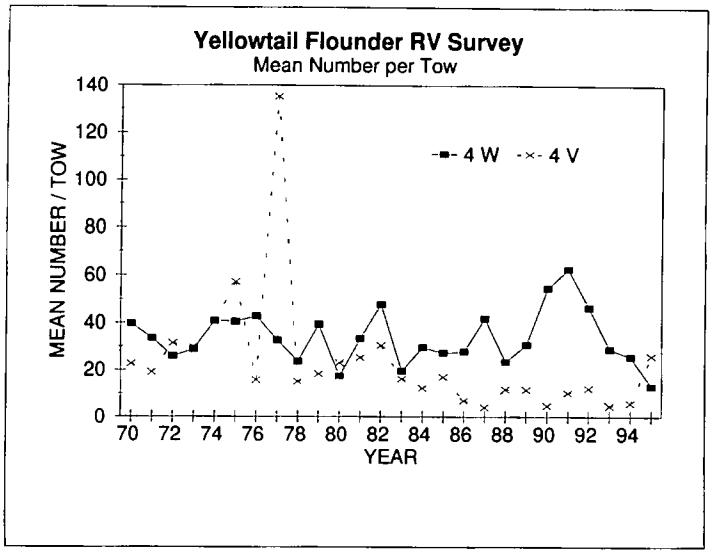


Fig. 19.

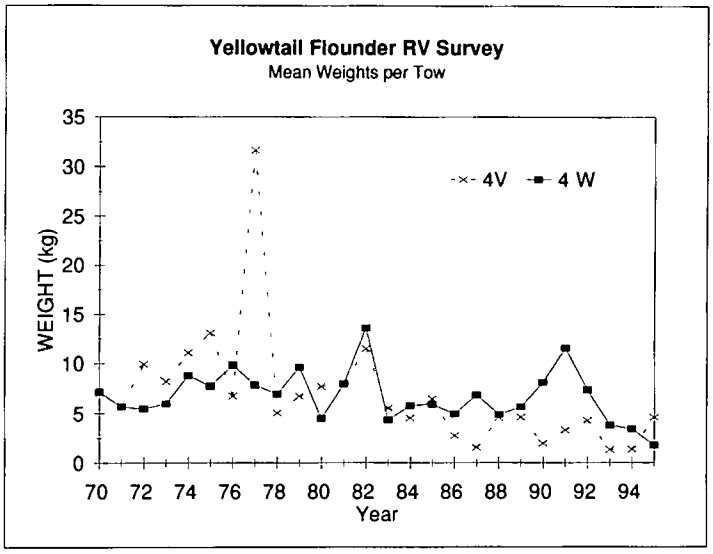


Fig. 20.

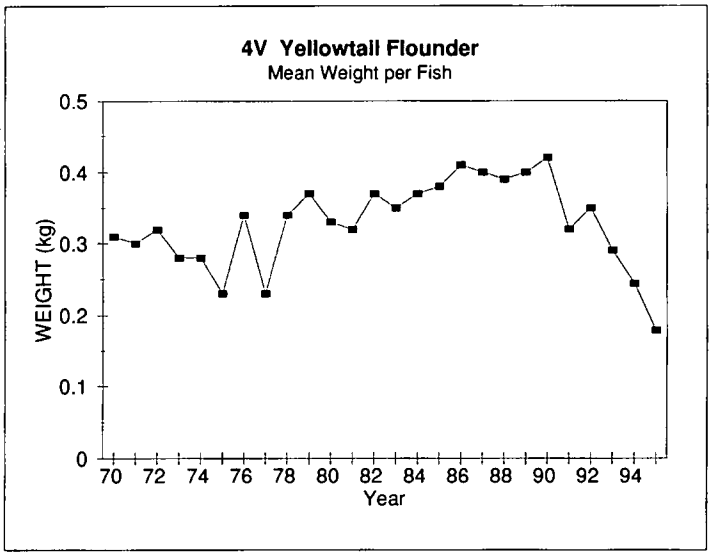


Fig. 21.

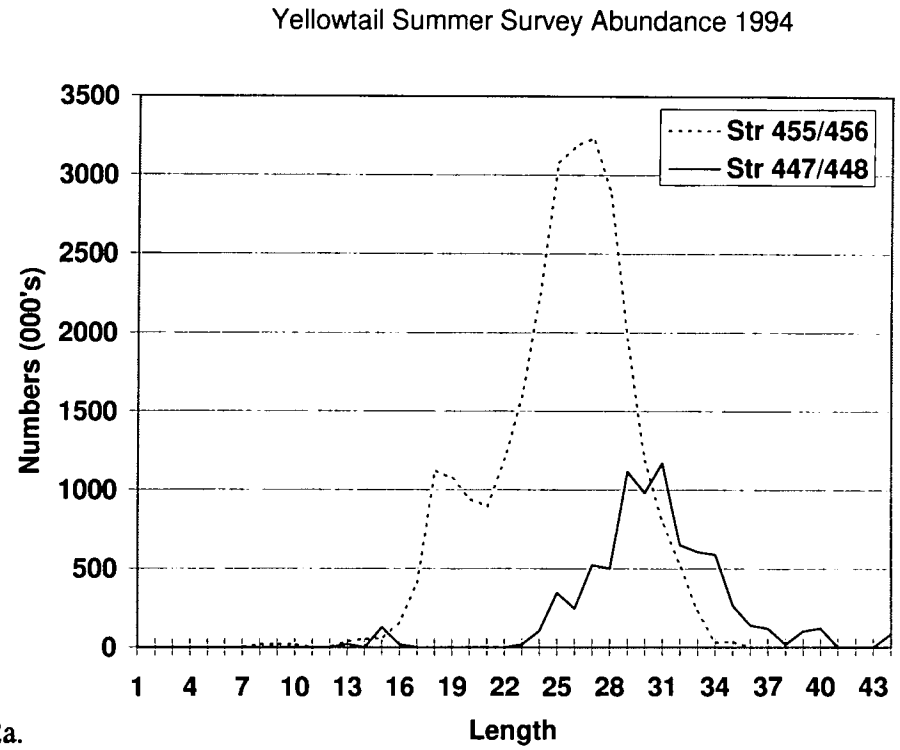


Fig. 22a.

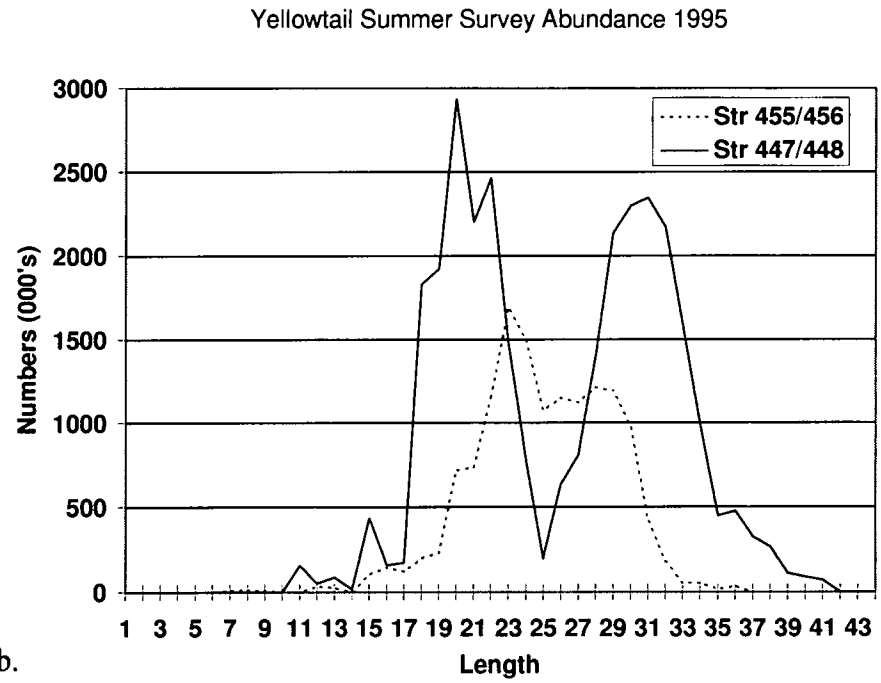
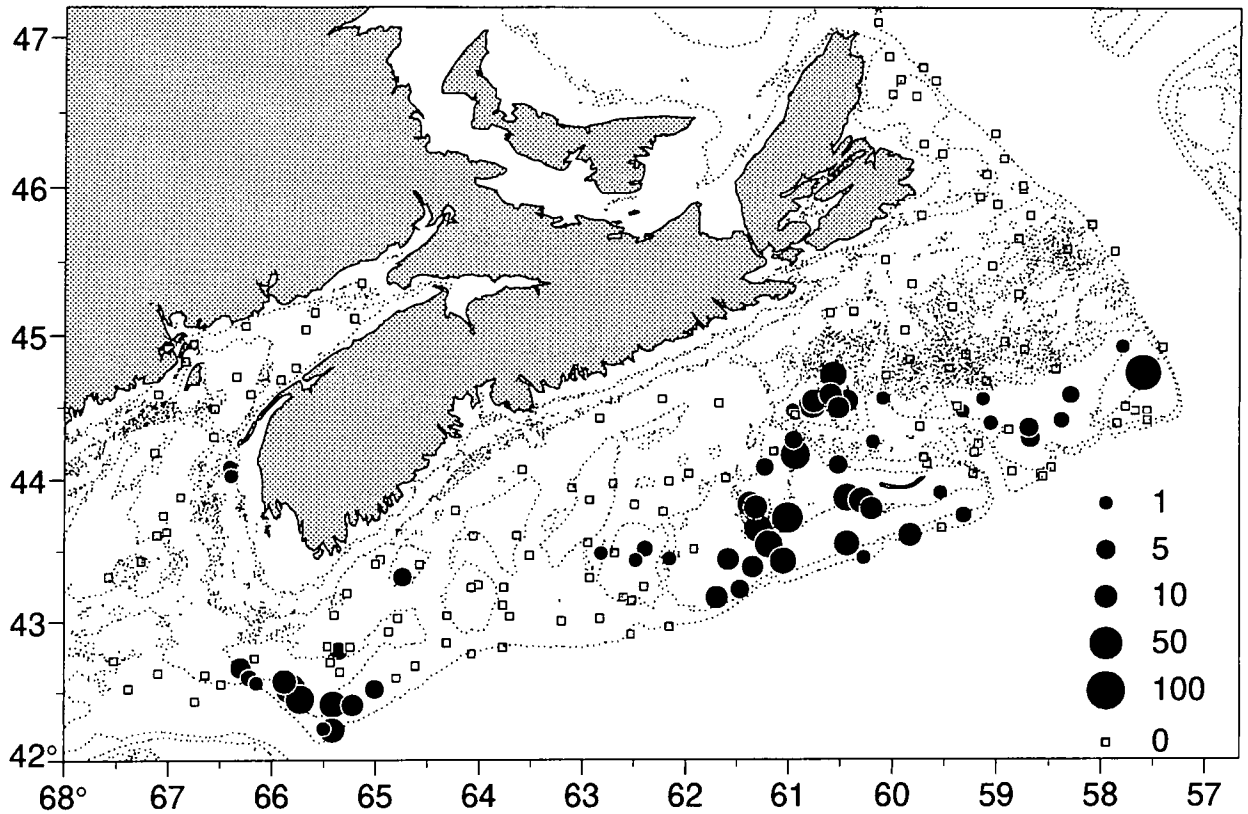
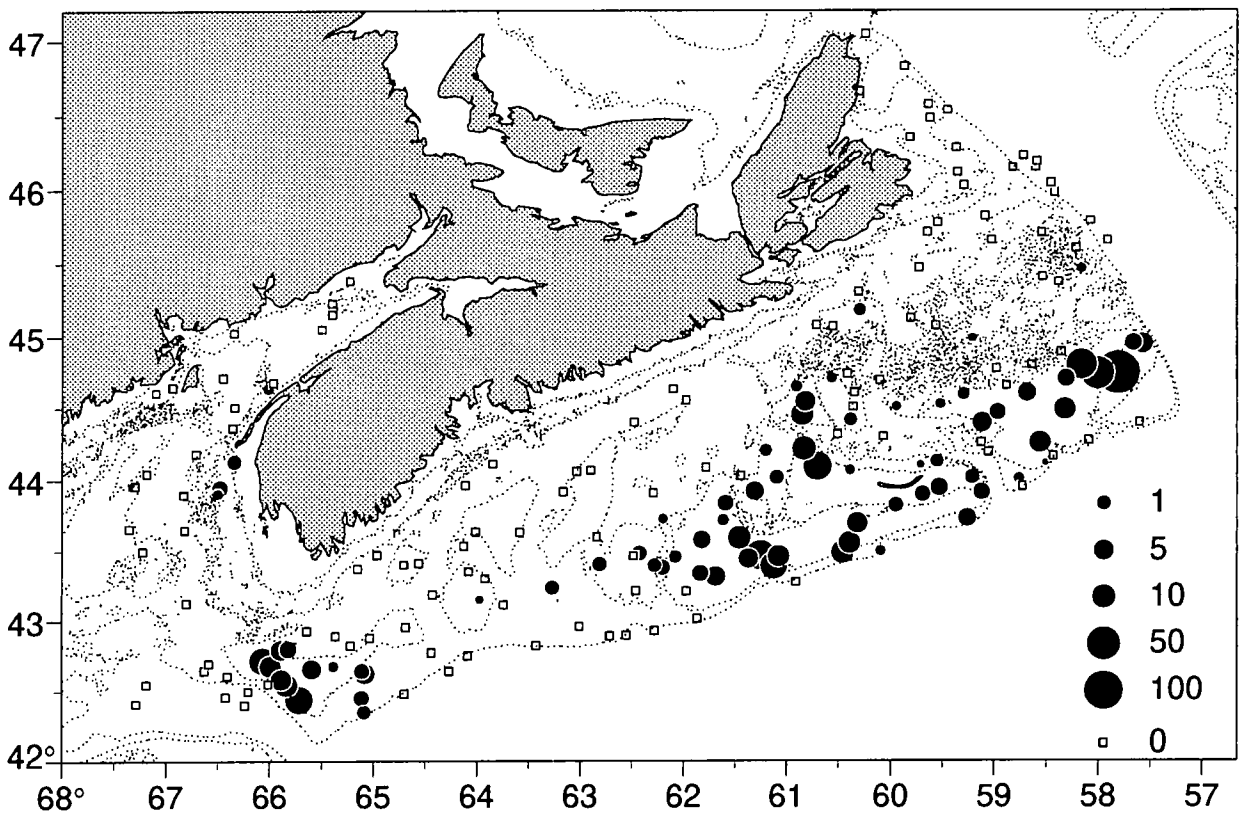


Fig. 22b.

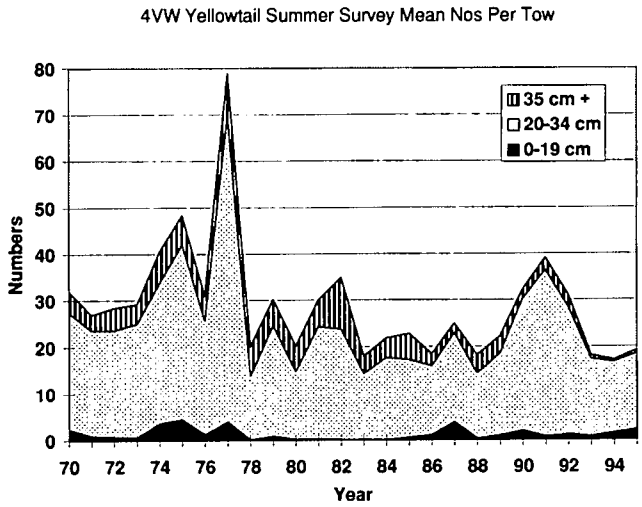


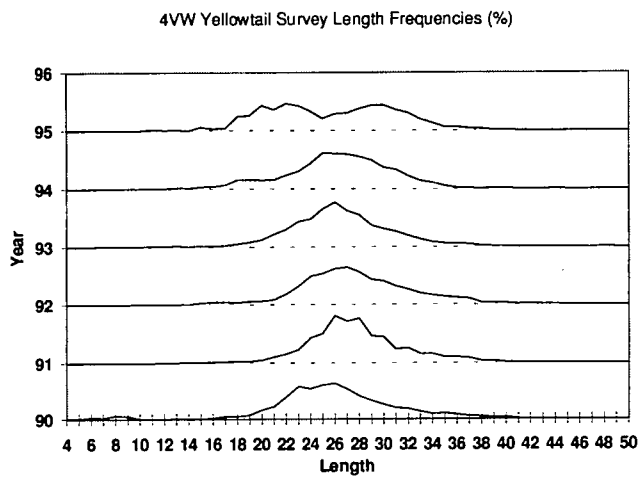
Summer Groundfish Survey 4VWX Yellowtail Biomass (kg/tow) July 1994



Summer Groundfish Survey 4VWX Yellowtail Biomass (kg/tow) July 1995

Fig. 23.


4VW Yellowtail Summer Survey Mean Nos Per Tow
35 cm +
20-34 cm
0-19 cm
Numbers
Year
0
10
20
30
40
50
60
70
80
70 72 74 76 78 80 82 84 86 88 90 92 94


4VW Yellowtail Survey Length Frequencies (%)
Year
Length
90
91
92
93
94
95
96
4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50

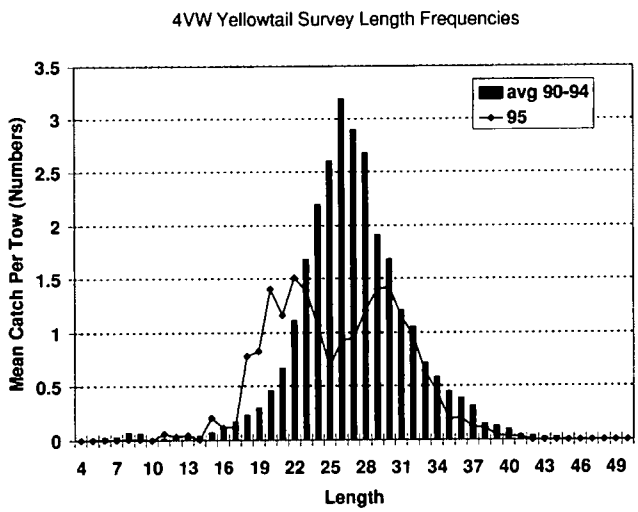

4VW Yellowtail Survey Length Frequencies
avg 90-94
95
Mean Catch Per Tow (Numbers)
Length
0
0.5
1
1.5
2
2.5
3
3.5
4 7 10 13 16 19 22 25 28 31 34 37 40 43 46 49

Fig. 24.

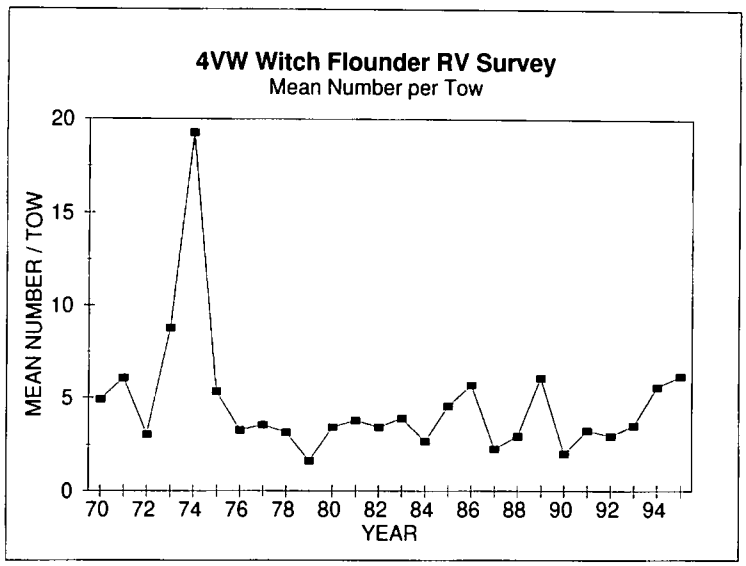


Fig. 25.

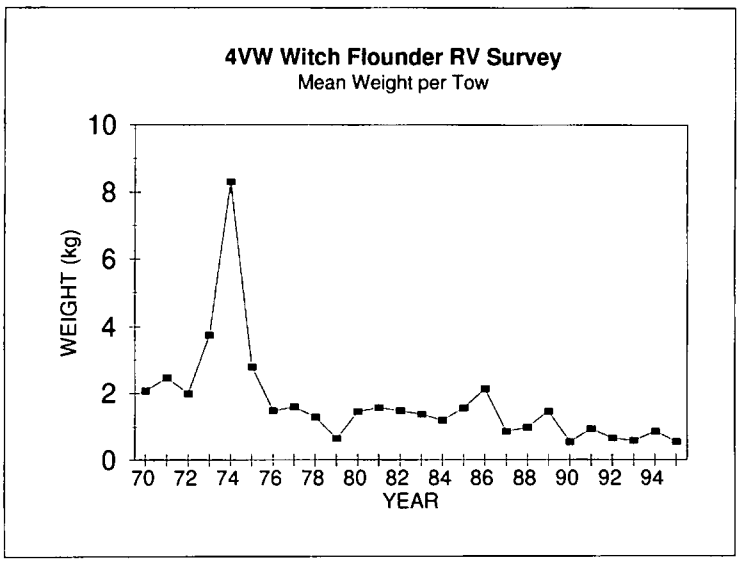


Fig. 26.

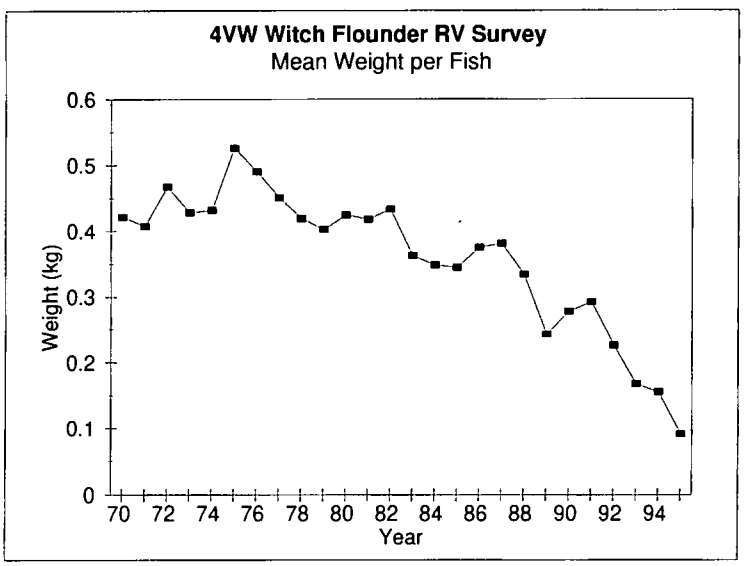
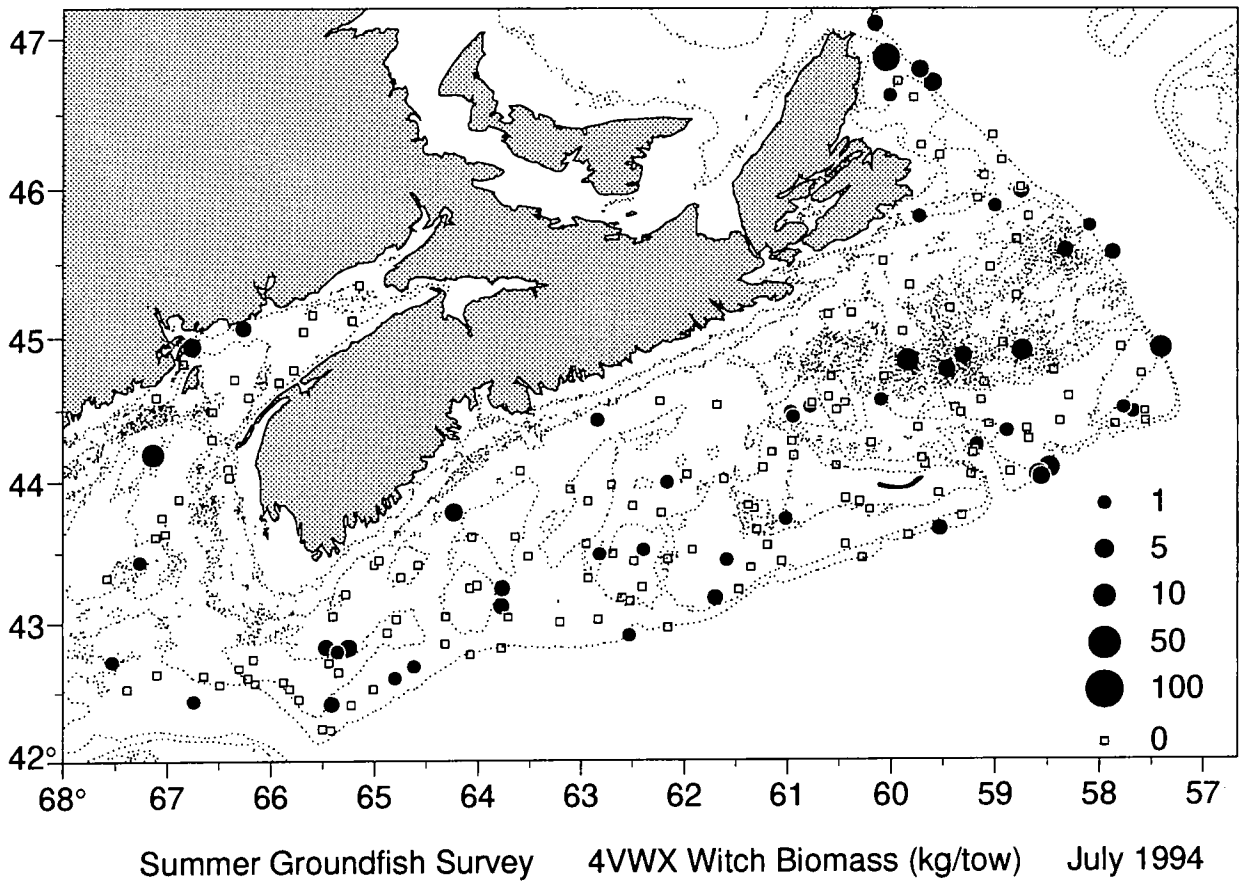


Fig. 27.


47
46
45
44
43
42°
68°
67
66
65
64
63
62
61
60
59
58
57
1
5
10
50
100
0
Summer Groundfish Survey
4VWX Witch Biomass (kg/tow)
July 1994

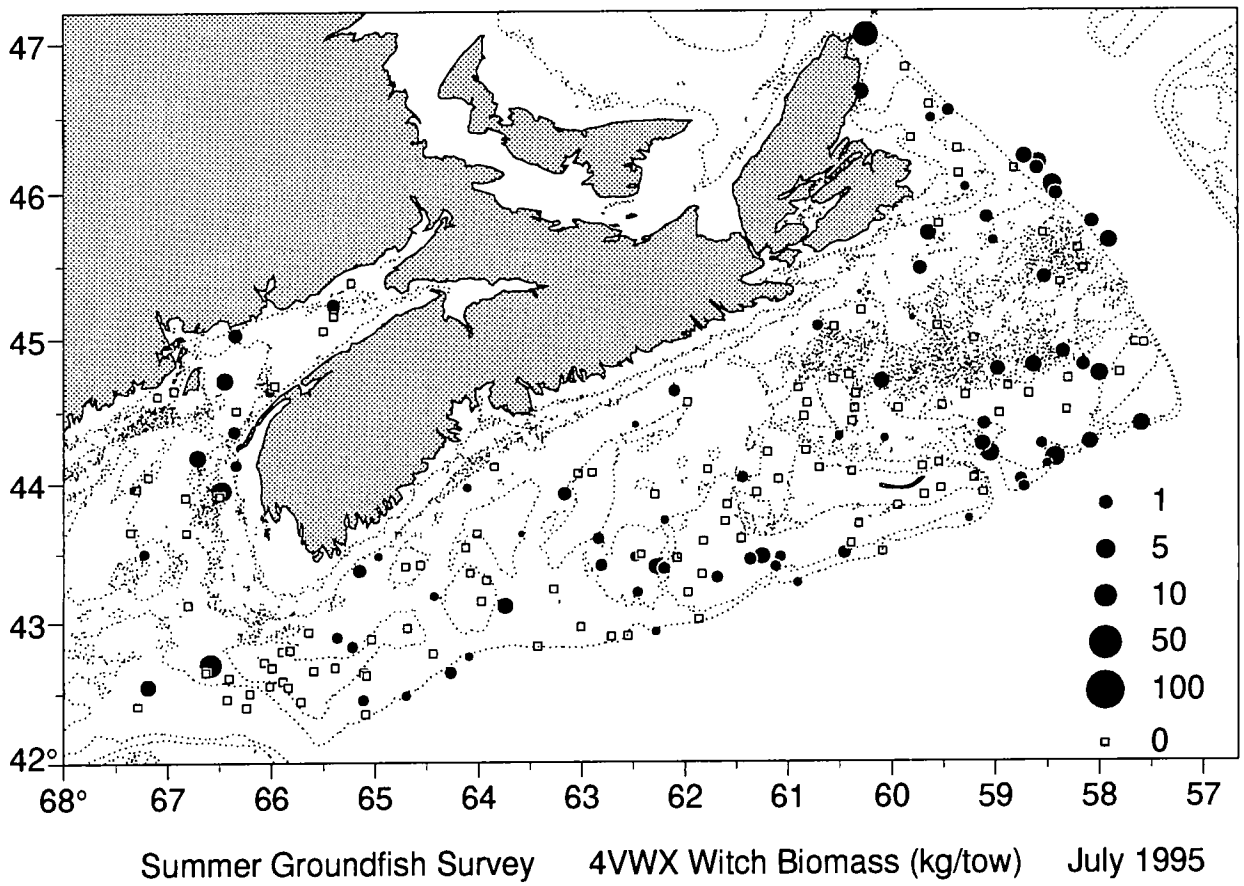
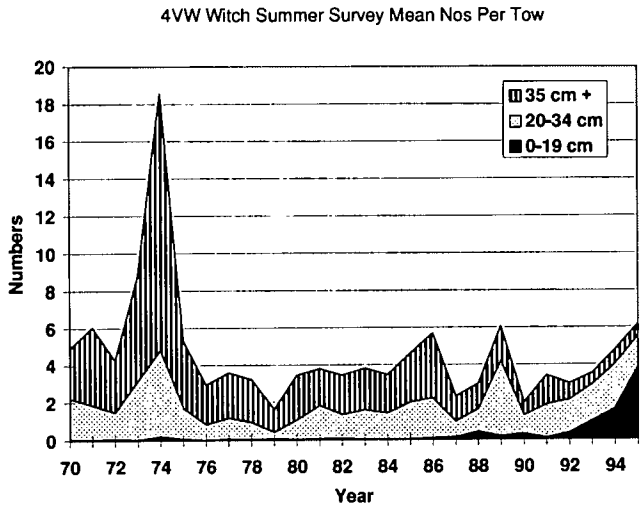
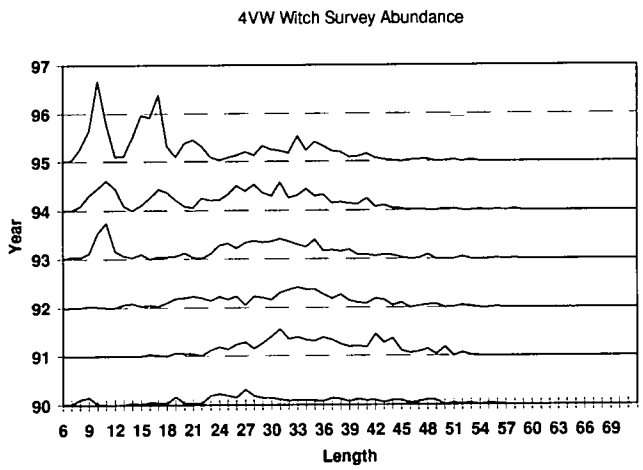

47
46
45
44
43
42°
68°
67
66
65
64
63
62
61
60
59
58
57
1
5
10
50
100
0
Summer Groundfish Survey
4VWX Witch Biomass (kg/tow)
July 1995

Fig. 28.


4VW Witch Summer Survey Mean Nos Per Tow
35 cm +
20-34 cm
0-19 cm
Numbers
Year


4VW Witch Survey Abundance
Year
Length

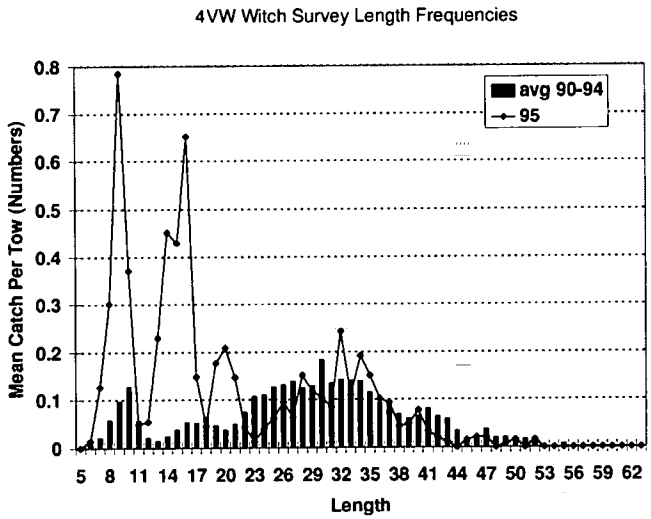

4VW Witch Survey Length Frequencies
avg 90-94
95
Mean Catch Per Tow (Numbers)
Length

Fig. 29.

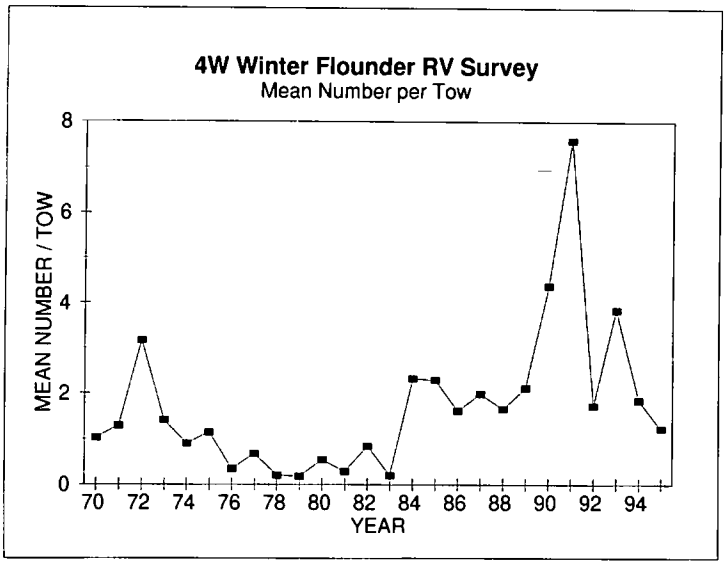


Fig. 30.

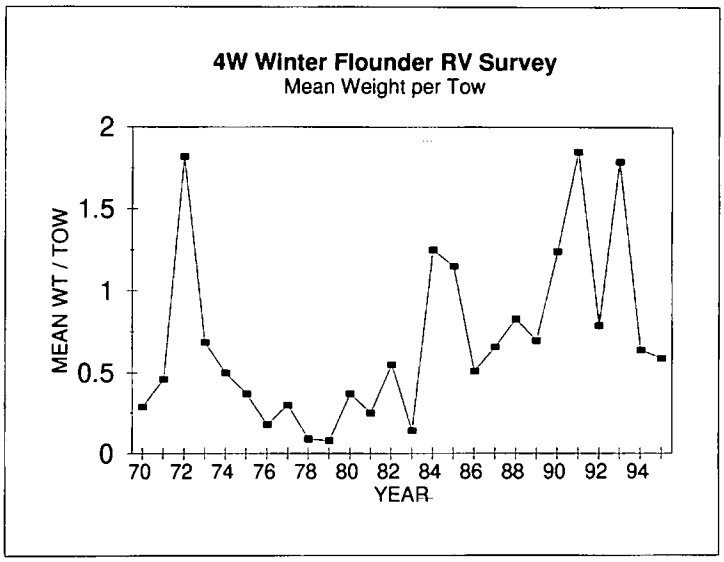


Fig. 31.

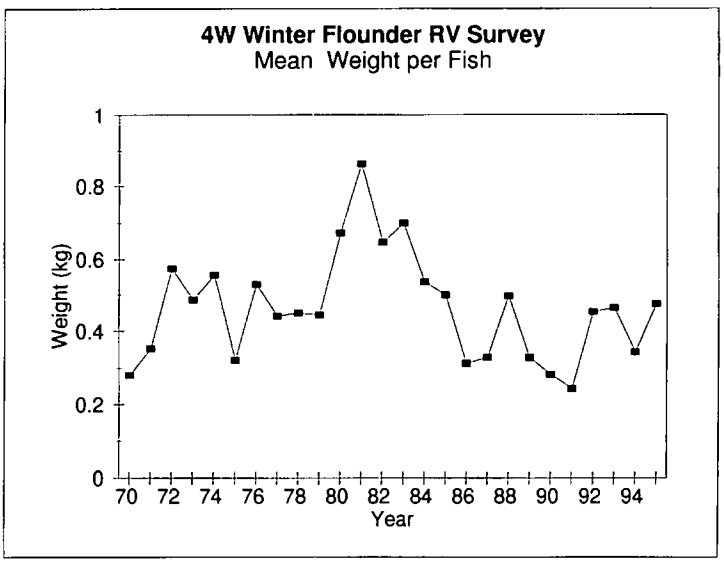
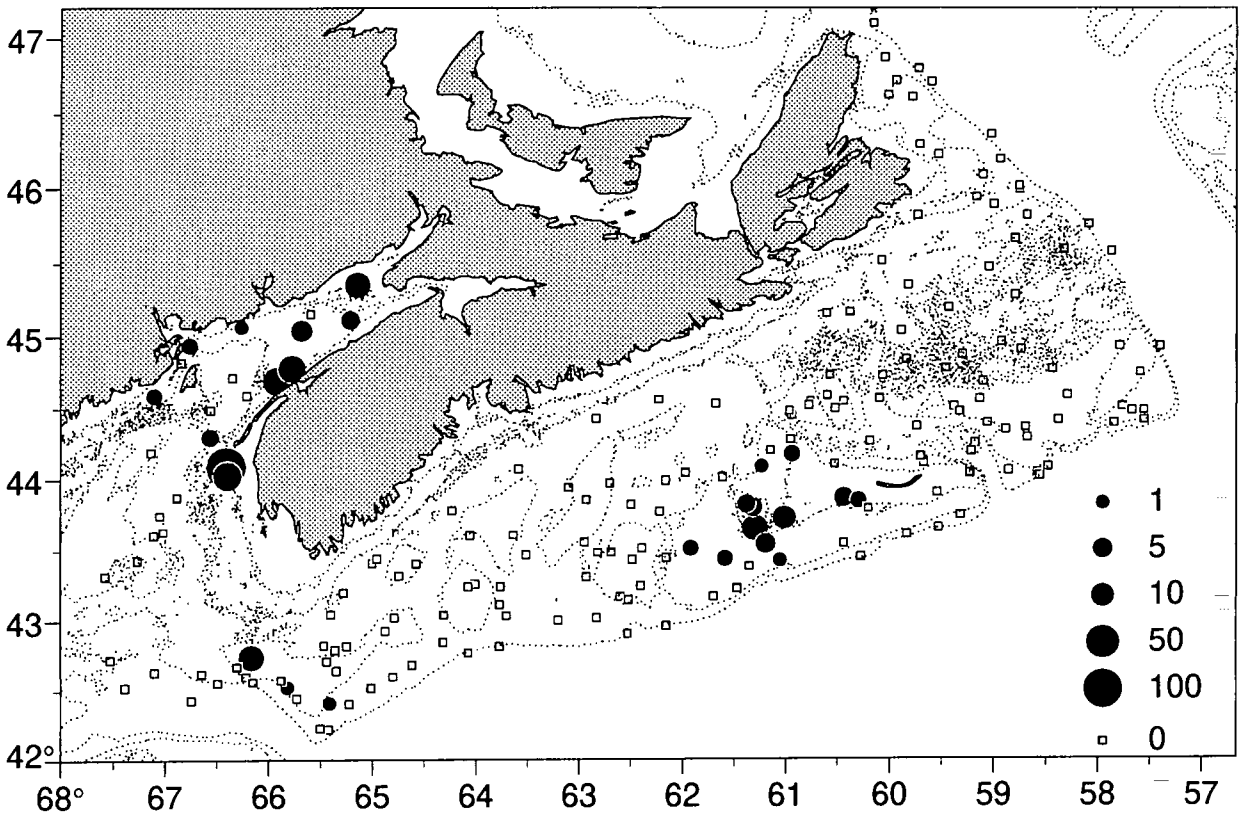
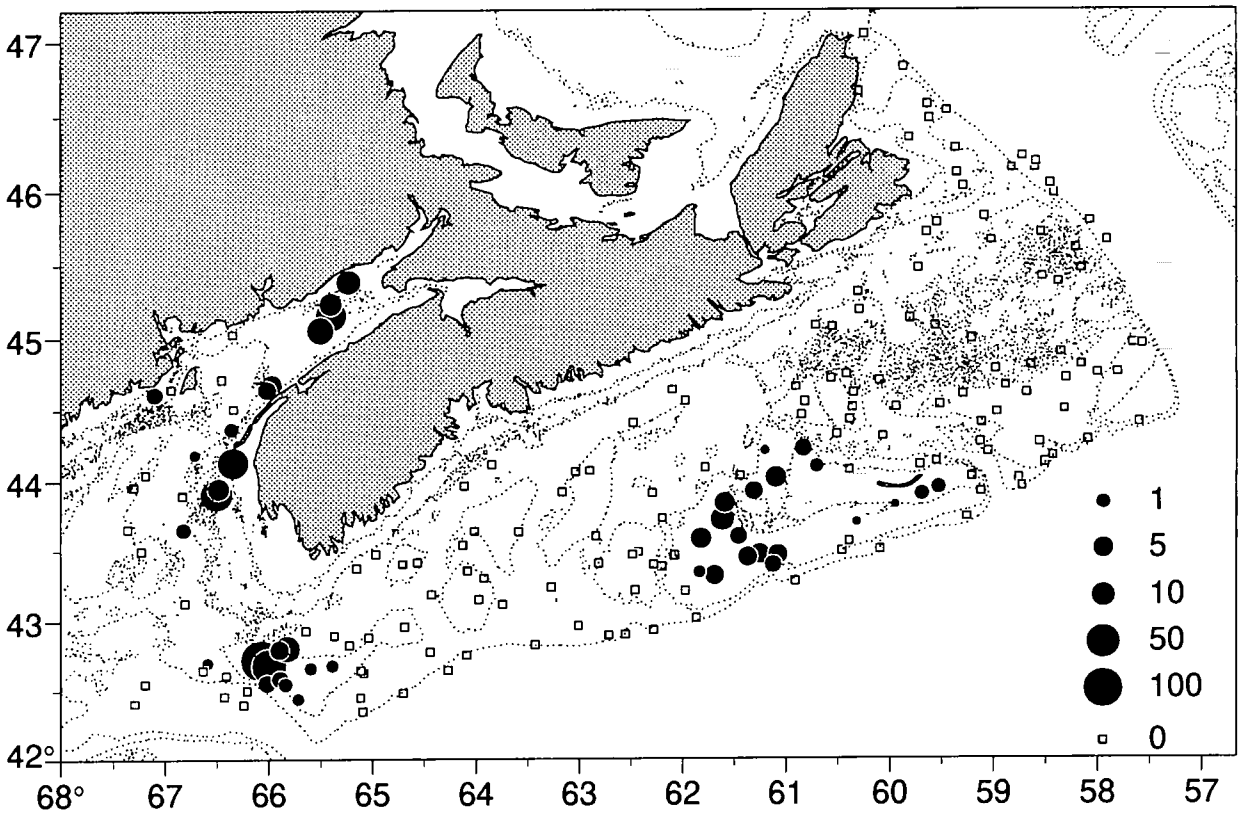


Fig. 32.

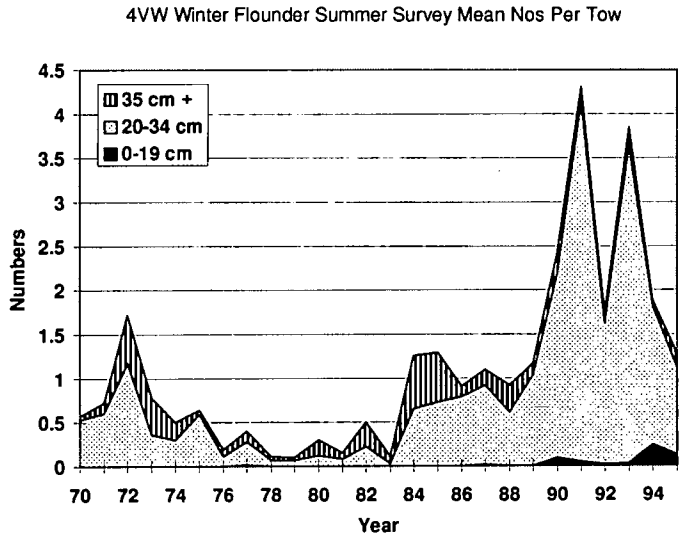


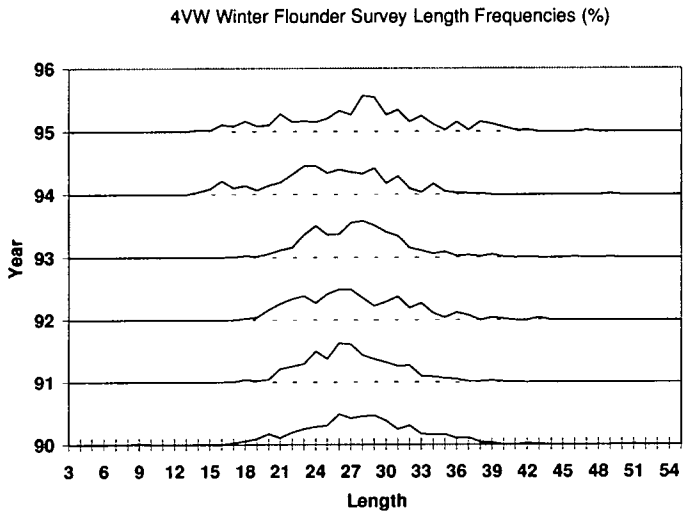
Summer Groundfish Survey 4VWX Winter Flounder Biomass (kg/tow) July 1994



Summer Groundfish Survey 4VWX Winter Flounder Biomass (kg/tow) July 1995

Fig. 33


4VW Winter Flounder Summer Survey Mean Nos Per Tow
35 cm +
20-34 cm
0-19 cm
Numbers
Year


4VW Winter Flounder Survey Length Frequencies (%)
Year
Length

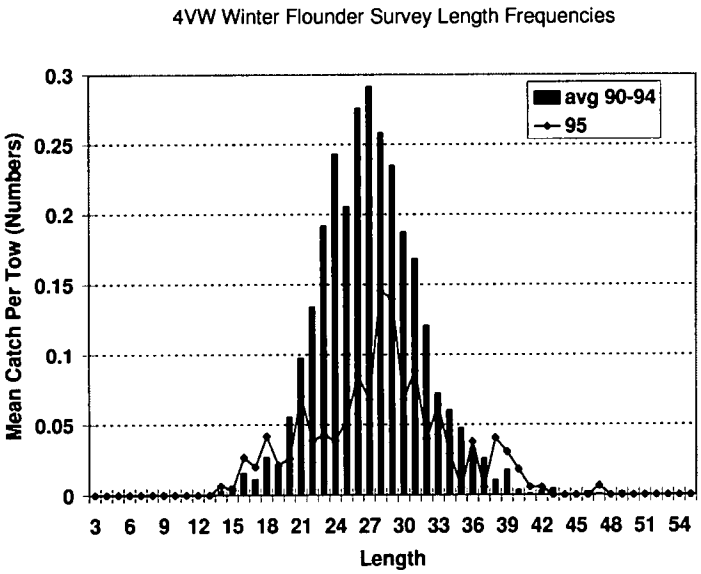

4VW Winter Flounder Survey Length Frequencies
avg 90-94
95
Mean Catch Per Tow (Numbers)
Length

Fig. 34.

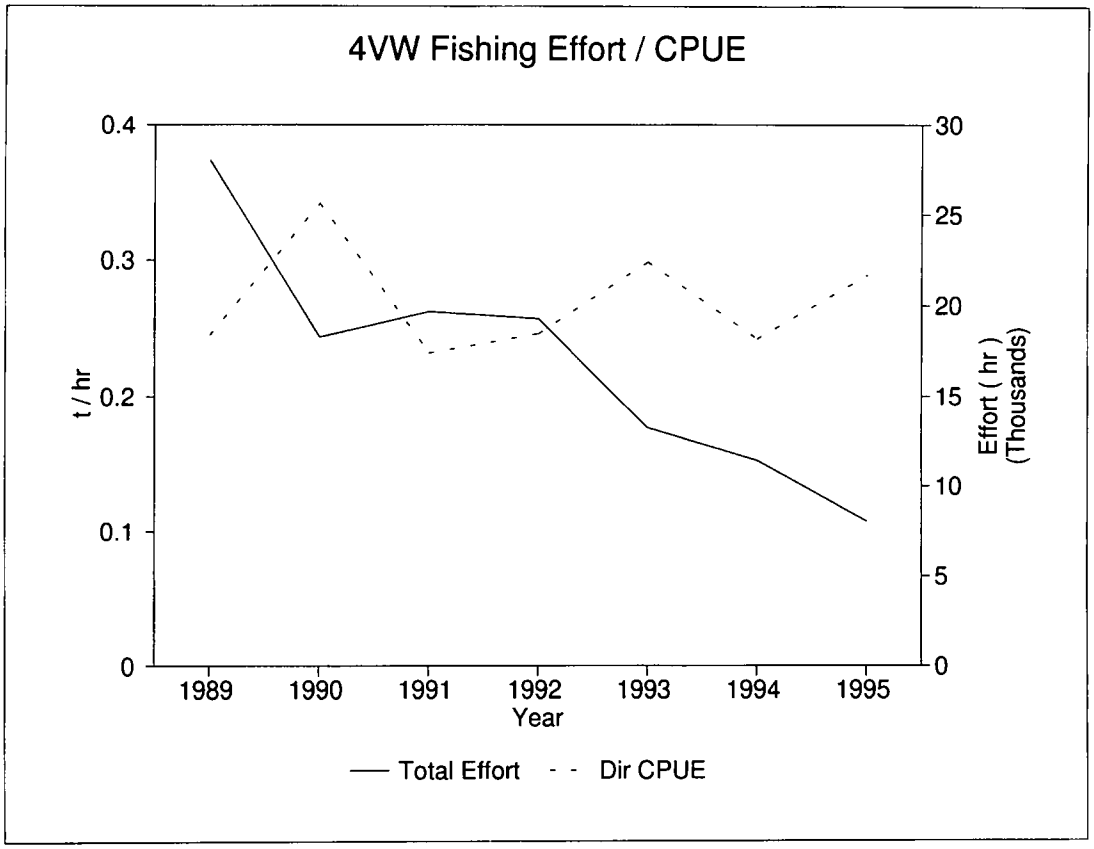

4VW Fishing Effort / CPUE
0.4
0.3
0.2
0.1
0
t / hr
30
25
20
15
10
5
0
Effort (hr)
(Thousands)
1989
1990
1991
1992
1993
1994
1995
Year
Total Effort
Dir CPUE

Fig. 35.

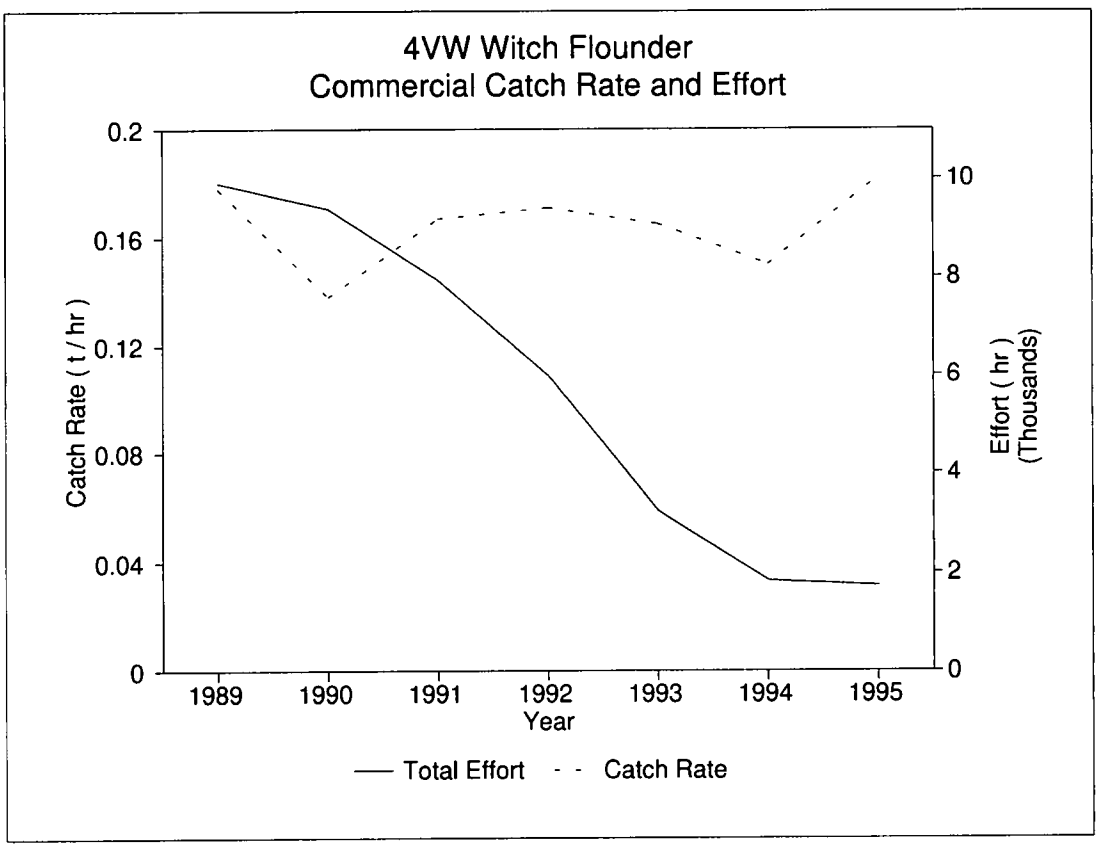

4VW Witch Flounder
Commercial Catch Rate and Effort
0.2
0.16
0.12
0.08
0.04
0
Catch Rate (t / hr)
10
8
6
4
2
0
Effort (hr)
(Thousands)
1989
1990
1991
1992
1993
1994
1995
Year
Total Effort
Catch Rate

Fig. 36.

1995 Commercial Catch for Plaice

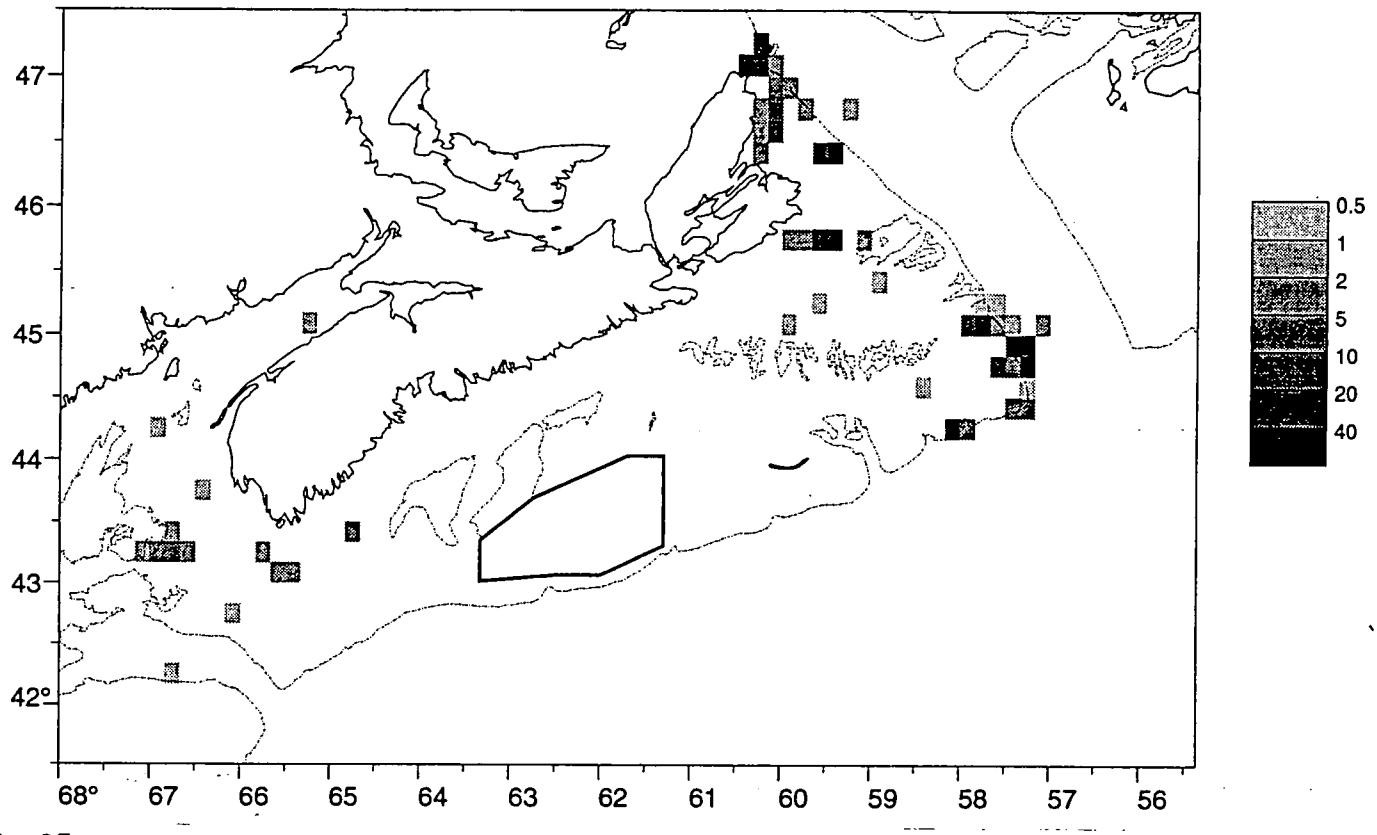


Fig. 37.

1995 Commercial Catch for Yellowtail

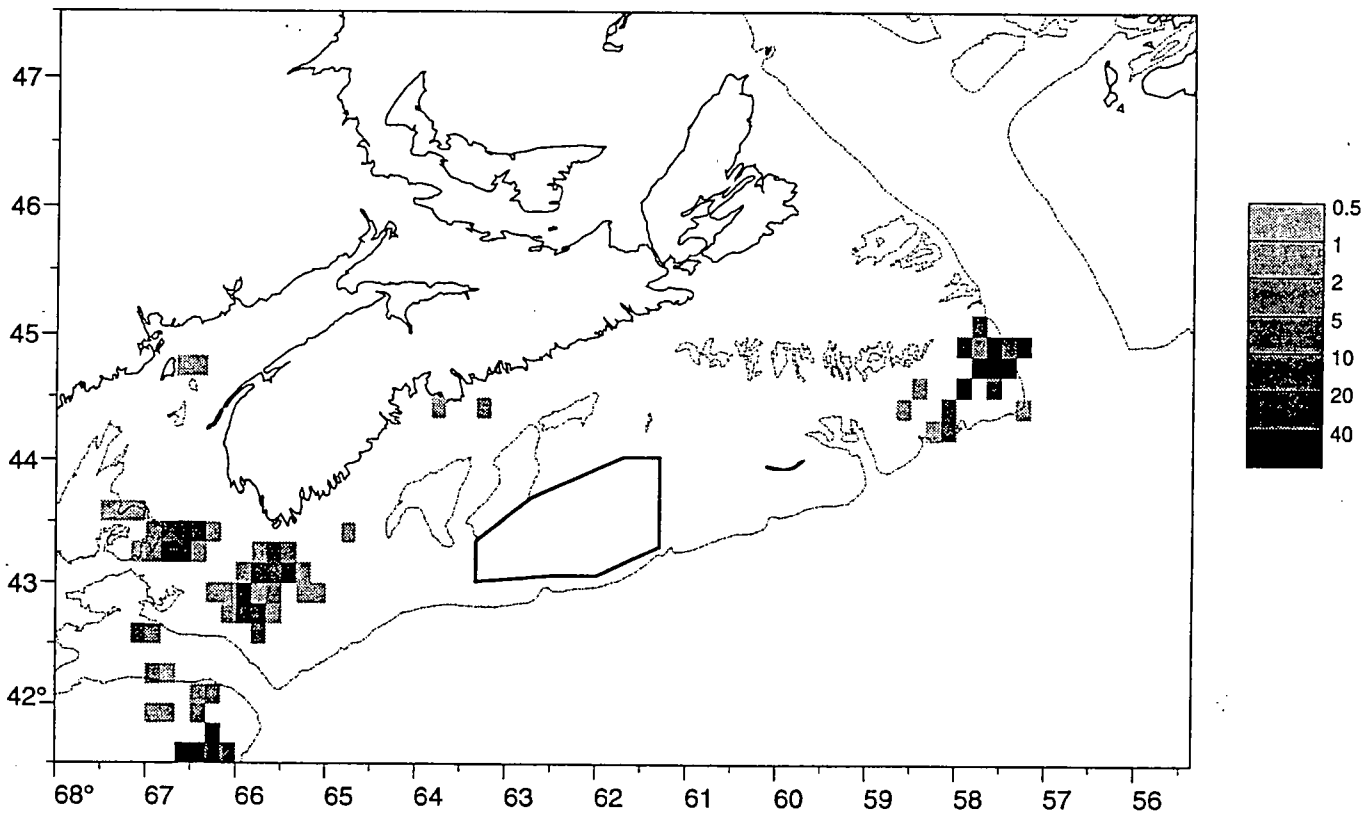


Fig. 38.

1995 Commercial Catch for Witch

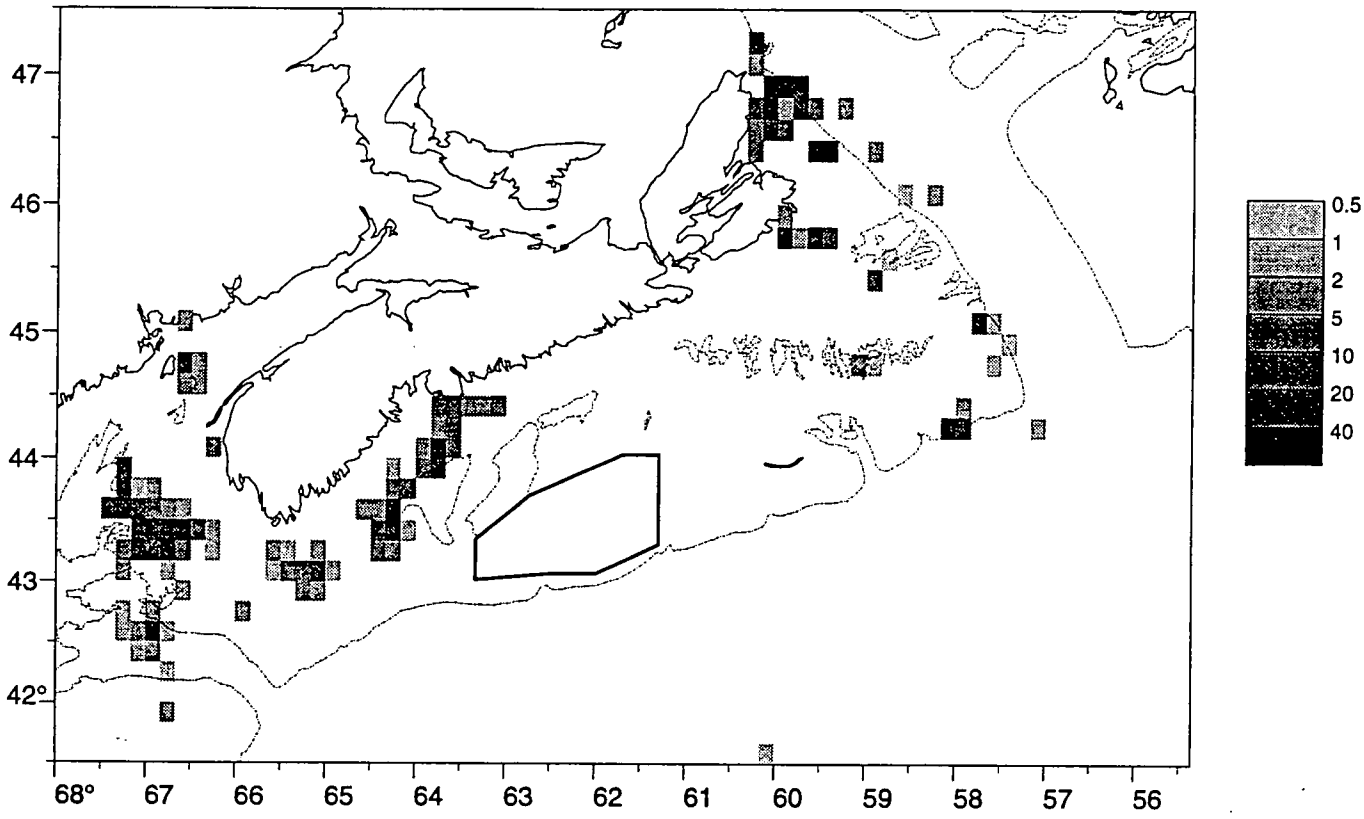


Fig. 39.

1995 Commercial Catch for Winter

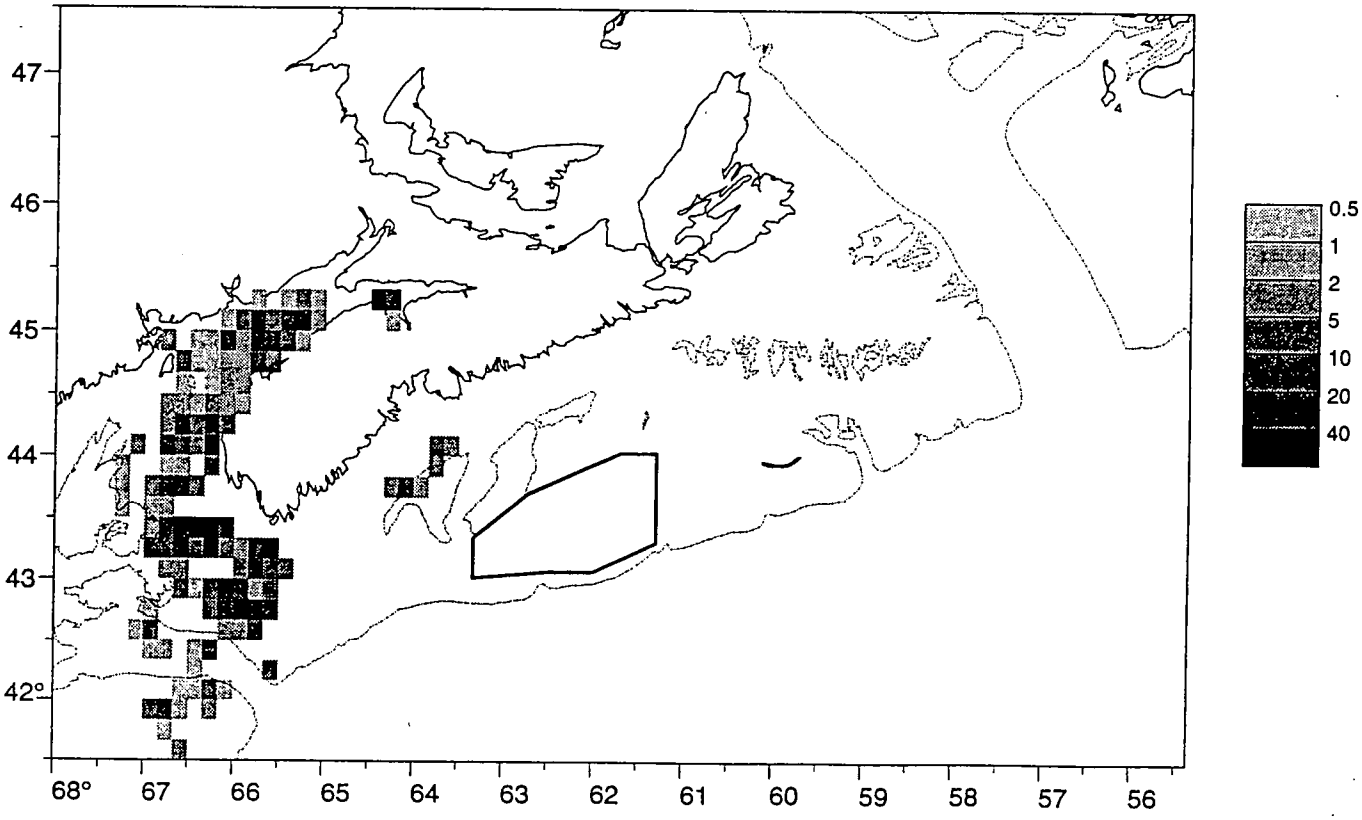


Fig. 40.

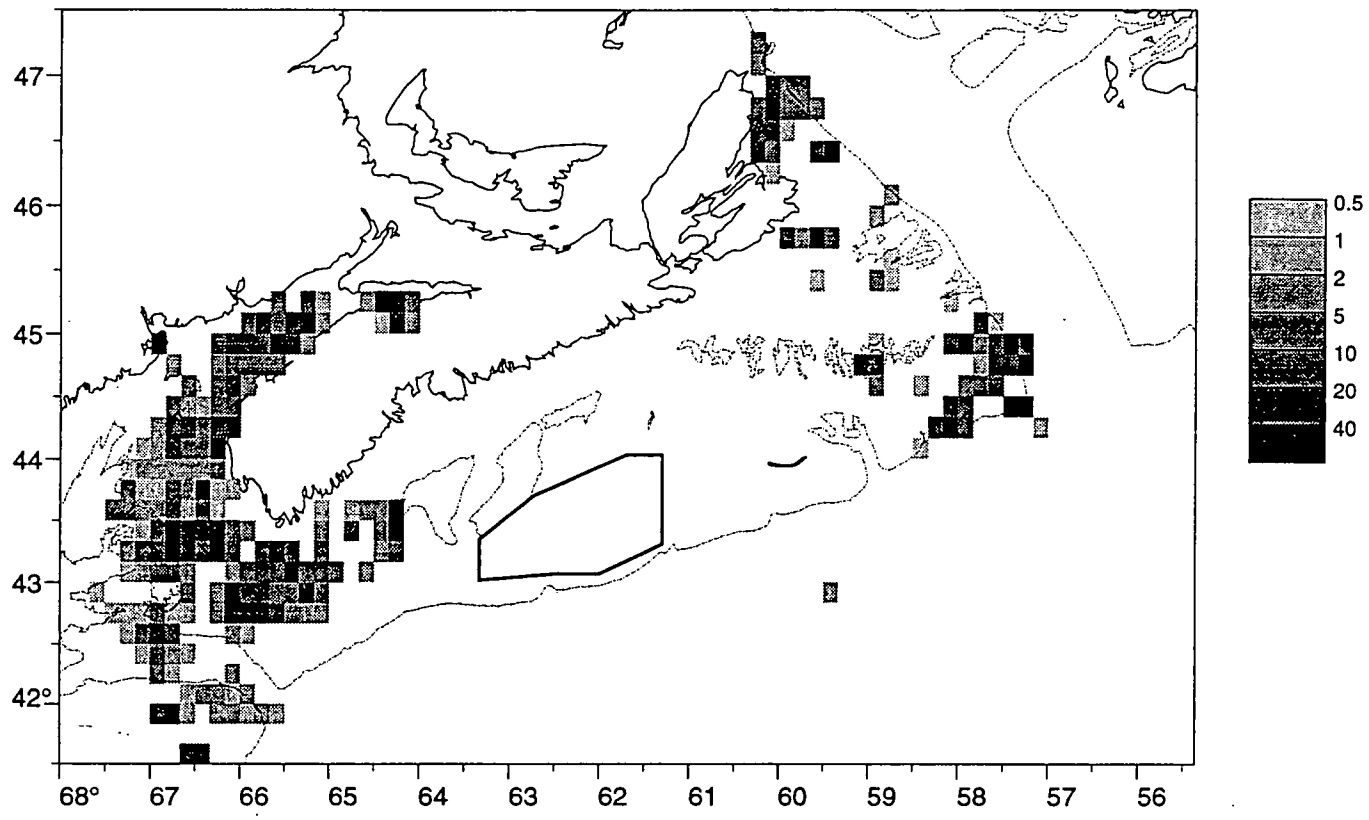
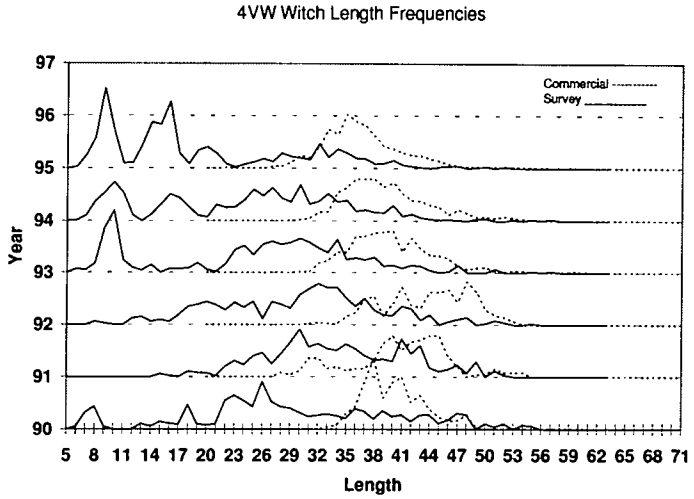
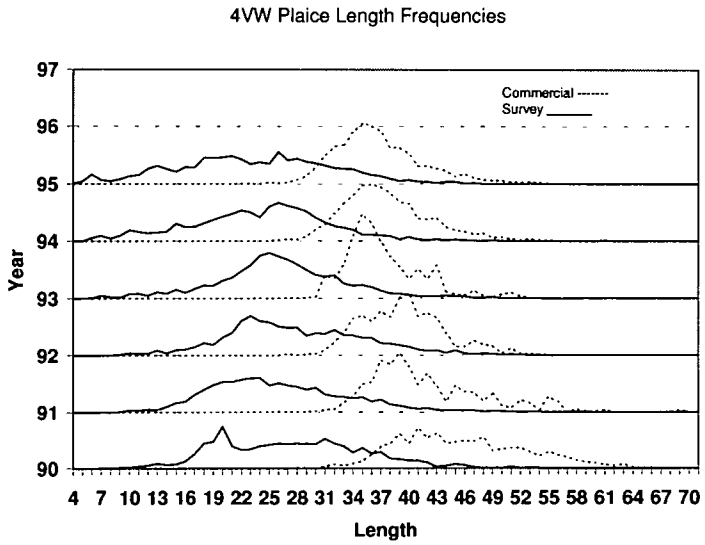

1995 Commercial Catch for Unspecified
47
46
45
44
43
42°
68°
67
66
65
64
63
62
61
60
59
58
57
56
0.5
1
2
5
10
20
40
Mon Mar 25 14:48:44 1996

Fig. 41.


4VW Witch Length Frequencies
Commercial
Survey
Year
97
96
95
94
93
92
91
90
5 8 11 14 17 20 23 26 29 32 35 38 41 44 47 50 53 56 59 62 65 68 71
Length


4VW Plaice Length Frequencies
Commercial
Survey
Year
97
96
95
94
93
92
91
90
4 7 10 13 16 19 22 25 28 31 34 37 40 43 46 49 52 55 58 61 64 67 70
Length

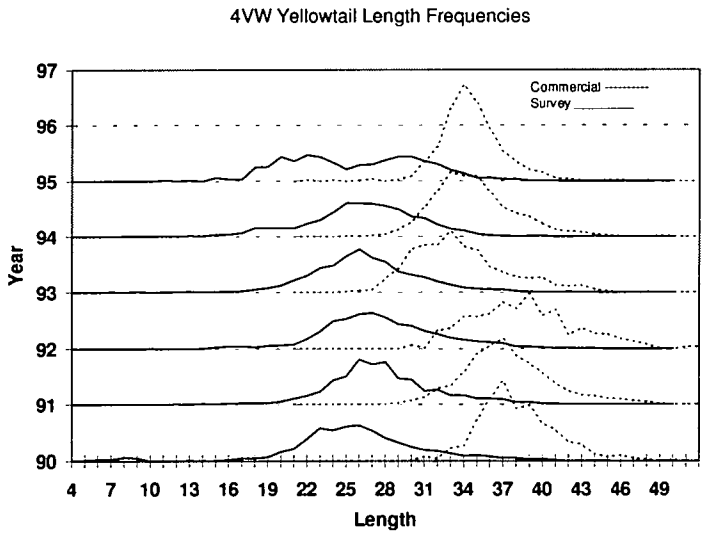
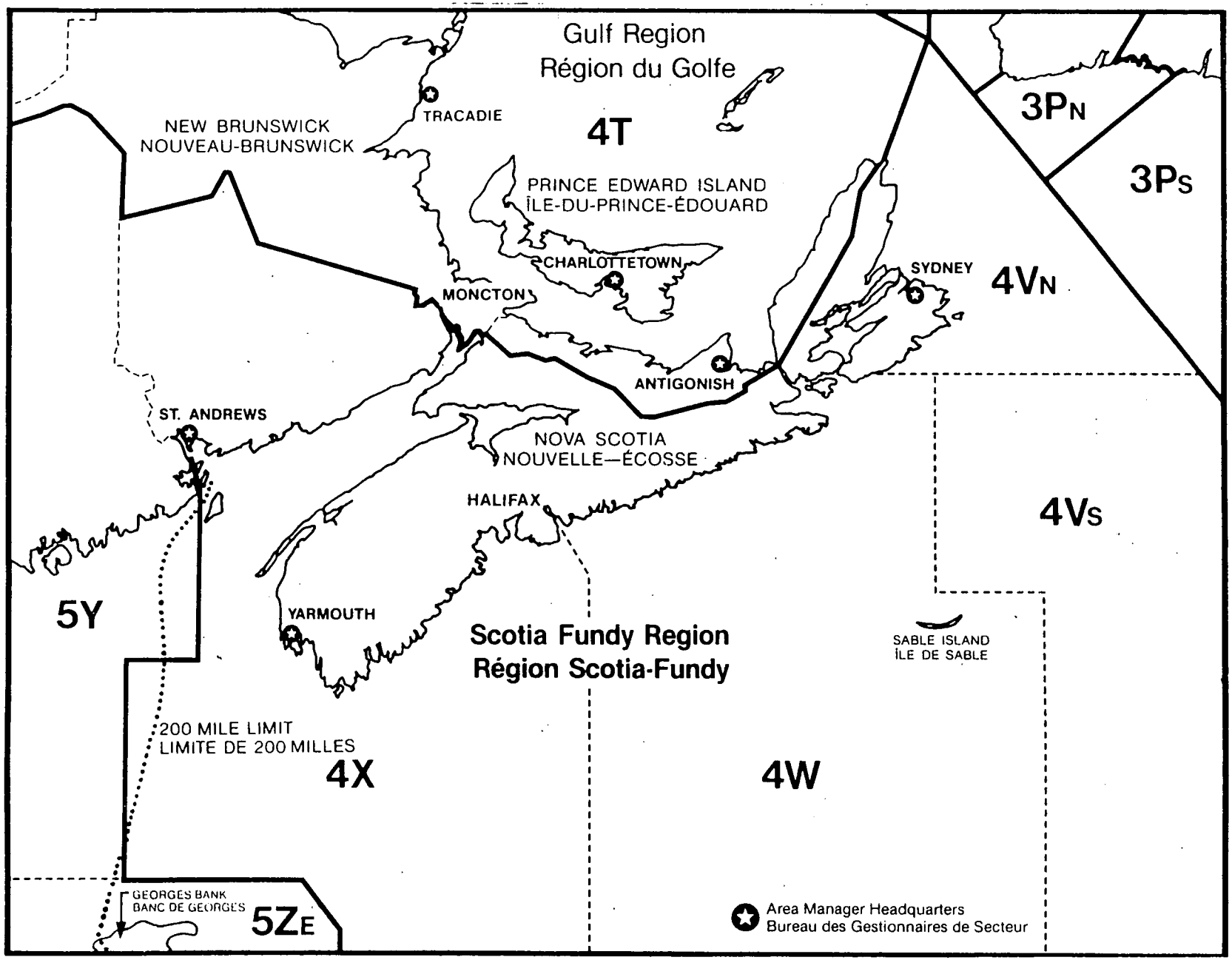
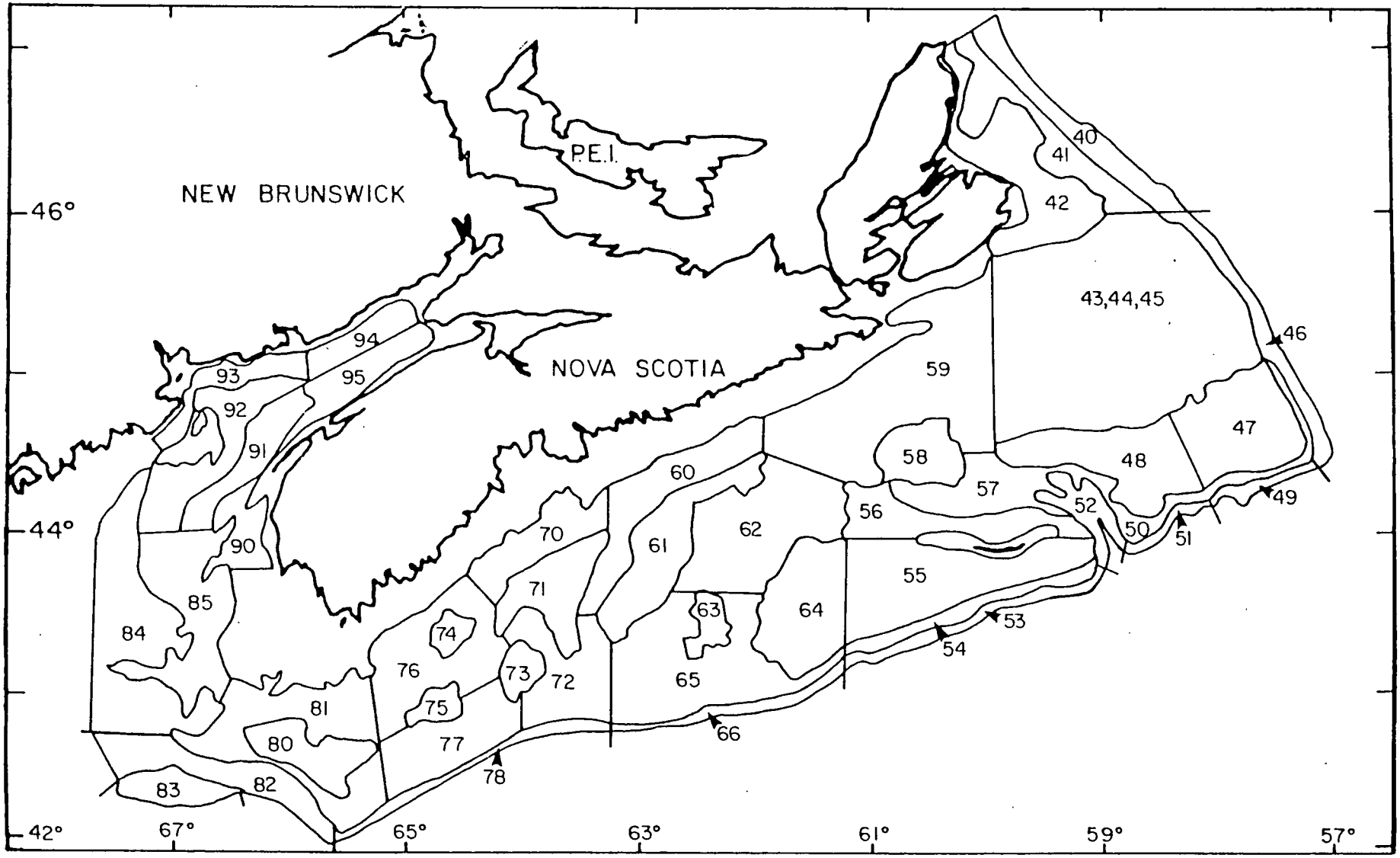

4VW Yellowtail Length Frequencies
Commercial
Survey
Year
97
96
95
94
93
92
91
90
4 7 10 13 16 19 22 25 28 31 34 37 40 43 46 49
Length

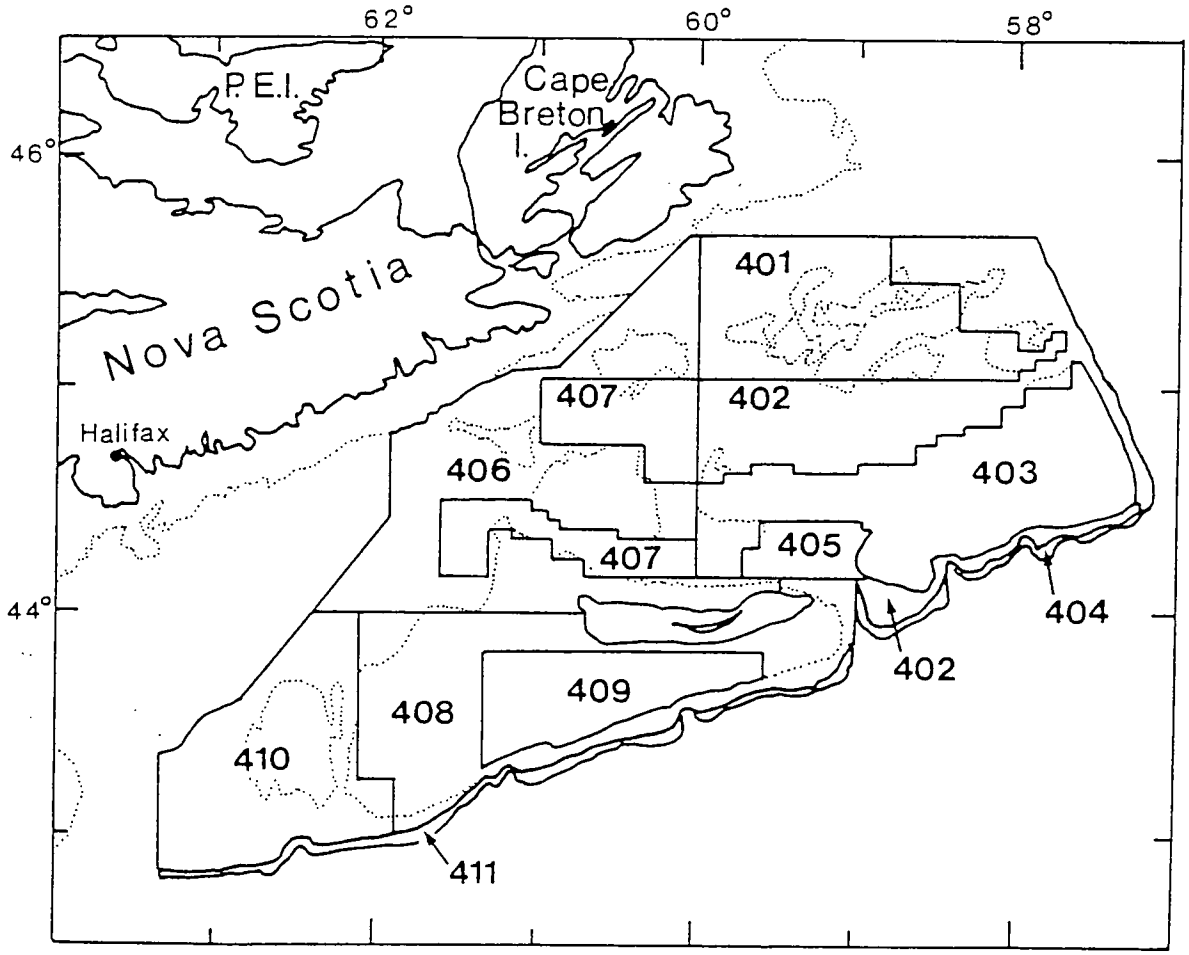
Fig. 42.


Gulf Region
Région du Golfe
TRACADIE
NEW BRUNSWICK
NOUVEAU-BRUNSWICK
4T
PRINCE EDWARD ISLAND
ÎLE-DU-PRINCE-ÉDOUARD
CHARLOTTETOWN
MONCTON
SYDNEY
4VN
3PN
3PS
ANTIGONISH
ST. ANDREWS
NOVA SCOTIA
NOUVELLE—ÉCOSSE
HALIFAX
4VS
5Y
YARMOUTH
Scotia Fundy Region
Région Scotia-Fundy
SABLE ISLAND
ÎLE DE SABLE
200 MILE LIMIT
LIMITE DE 200 MILLES
4X
4W
GEORGES BANK
BANC DE GEORGES
5ZE
Area Manager Headquarters
Bureau des Gestionnaires de Secteur

Appendix 1.


P.E.I.
NEW BRUNSWICK
NOVA SCOTIA
46°
44°
42°
67°
65°
63°
61°
59°
57°
40
41
42
43,44,45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
70
71
72
73
74
75
76
77
78
80
81
82
83
84
85
90
91
92
93
94
95

Appendix 2.


62°
60°
58°
46°
44°
P.E.I.
Cape Breton I.
Nova Scotia
Halifax
401
407
402
406
403
407
405
404
402
409
408
410
411

Appendix 3.