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An Update of the Status of
4VW and 4X Flatfish Stocks

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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 50% of the total flounder landings in 4VW and 66% in 4X. Stock status evaluations were based on sampling the commercial landings for 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 1994 amounted to 2,824 t, a decrease from the 3,959 t taken in 1993. Commercial catch rates for the ITQ fleet declined slightly in 1994; 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 a decline in weight per tow while numbers are stable and the average weight of a fish has declined. 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, it would be prudent to restrict catches in 1996 at no more than the 1994 level.

Total landings for flatfish in 4X for 1994 amounted to 3,277 t, a decrease from 4,011 t taken in the 1994 fishery. Commercial catch rates declined slightly while total effort declined since 1992. Survey abundance for 4X winter flounder is still relatively high, although it has declined in recent years, especially in the Browns Bank and Upper Bay of Fundy areas. Average weight has declined in recent years and the commercial fishery has shifted toward smaller fish. The situation for witch flounder includes a low weight per tow, fewer large fish in the population, and declining average weight. As well, landings declined even though witch commands a much higher price than other flounders. The American plaice and yellowtail resources appear to be stable or increasing. Although flounders, with the exception of witch, appear to be maintaining their abundance, the extent of the decline in witch suggests that special protective measures are warranted. As well, the declines in local populations of winter flounder suggests that care should be given to developing a management plan that recognizes the existence of several population units.

Résumé

Jusqu'en 1993, les plies de 4VWX ont été gérées comme un seul stock, pour lequel le TAC était fixé à 14 000 t. En 1994, l'unité de gestion a été divisée en deux composantes, une à l'est (4VW) et l'autre à l'ouest (4X), et le TAC a été réduit à 10 000 t, 4 500 t étant allouées à 4X et 5 500 t à 4VW, en fonction des prises historiques. La gestion de la plie rouge a également été intégrée à la composante ouest. Le plan de gestion de 1995 fixait le TAC à 7 500 t, réparties entre 4VW et 4X à raison de 4 125 t pour la composante est et de 3 375 t pour la composante ouest. Des QIT de plie ont été adoptés en août 1994 dans 4X et les titulaires de permis selon des QIT de l'est de la Nouvelle-Écosse ont pu choisir entre un régime de QIT ou la pêche concurrentielle pour 1995. Les données sur les débarquements restent peu fiables, les plies non spécifiées représentant jusqu'à 50 % des débarquements totaux de plie dans 4VW et 66 % dans 4X. Les évaluations de l'état du stock ont été fondées sur un échantillonnage des prises commerciales pour établir leur composition selon la taille, sur l'effort et les taux de prises des pêcheurs commerciaux pour toutes les plies confondues ainsi que sur les indices d'abondance des relevés de recherche et la composition des prises selon la taille, par espèce.

Les débarquements totaux de poissons plats dans 4VW en 1994 se chiffraient à 2 824 t, ce qui représente une baisse par rapport aux 3 959 t capturées en 1993. Les taux de prises de la pêche commerciale selon des QIT ont baissé légèrement en 1994. L'effort a diminué pour l'ensemble de la pêche des plies depuis 1992. L'abondance de la plie canadienne et de la limande à queue jaune sont en recul net dans 4VW, en particulier dans la division 4V. Les résultats, tant du relevé de recherche que de la pêche commerciale, révèlent aussi que les gros poissons sont plus rares que par le passé et dénotent une baisse du poids moyen, indiquant désormais une prédominance des petits poissons dans la population. Pour ce qui est de la plie grise, les résultats du relevé indiquent une baisse du poids par trait tandis que le nombre de ces plies est resté stable et que leur poids moyen a diminué. Le relevé dénote une possibilité d'amélioration du recrutement quoique, là encore, les gros poissons sont plus rares parmi la population. L'abondance de la plie rouge est restée relativement élevée dans 4W. Compte tenu de la baisse de la biomasse de toutes les plies exploitées par les pêcheurs commerciaux dans 4VW et de l'absence de gros poissons révélée tant par le relevé de recherche que par la pêche commerciale, il serait prudent de plafonner les prises en 1996 à leur niveau de 1994.

Dans 4X, les débarquements de poissons plats s'élevaient au total à 3 277 t en 1994, et étaient en recul sur ceux de 1994 (4 011 t). Les taux de prises commerciaux ont légèrement reculé et l'effort total est en baisse depuis 1992. D'après le relevé de recherche, l'abondance de la plie rouge dans 4X demeure relativement élevée, quoiqu'elle ait diminué ces dernières années dans les régions du banc de Brown et du fond de la baie de Fundy. Le poids moyen a fléchi ces dernières années et les pêcheurs commerciaux se sont tournés vers les plus petites plies. La situation dans la pêche de la plie grise se traduit par un poids faible par trait, un plus petit nombre de gros poissons dans la population et un poids moyen en baisse. De plus, les débarquements ont diminué, malgré que la plie grise commande un prix beaucoup plus élevé que les autres plies. Les populations de plie canadienne et de limande à queue jaune semblent stables ou à la hausse. Quoique l'abondance des plies, sauf en ce qui concerne la plie grise, semble se maintenir, l'importance du recul de cette dernière donne à penser que des mesures de protection spéciales s'imposent. De plus, étant donné la baisse des populations locales de plie rouge, il conviendrait d'envisager l'élaboration d'un plan de gestion qui tienne compte de l'existence de plusieurs unités de populations.

INTRODUCTION

Four species of flatfish, excluding halibut, are exploited commercially on the Scotian Shelf (4VW and 4X). 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 1978 (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 biological parameters examined by Neilson *et al.* (unpublished) it was recommended that the flatfish stock be divided into a western (4X) and an eastern (4VW) stock component. 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.

Due to sector overlap privileges 162 t of quota was set aside for <65', Gulf, Quebec and Newfoundland vessels.

ITQ licence holders were advised that any catch after April 1 would be counted against ITQs when implemented. The total 4VW flounder quota for mobile gear <65' was caught before August 1, and no ITQs were established in 1994. 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.

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 by each species separately. 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 (i.e. American plaice 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 landing statistics makes it impossible to determine the level of exploitation for the individual 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.

An examination of actual log and purchase slip records for 1993 and 1994 was initiated in order to assess the problem (Appendix 1). It should be noted that each field is exclusive and entries found only in the log portion are not captured on the catch effort data base. For 4VW results in both 1993 and 1994 were very similar. The majority of witch flounder and yellowtail were identified on both the log and the purchase slip or the purchase slip alone. However, American Plaice was generally only identified on the log Unspecified flounder on the other hand was recorded on the purchase slip, never on the log and rarely on both the log and purchase slip.

For 4X things were not as clearcut. Between 1993 and 1994 there was a small improvement in the identification of flounder (i.e. more landings were reflected on the purchase slip by species). As was the case in 4VW unspecified flounder occur for the most part on the purchase slip only.

However, unlike 4VW all other flounders were reported only on the log (plaice, yellowtail) or only reported on the purchase slip about 50% of the time (winter and witch). It may be that very small amounts of various flounders including witch, although identified on the log are landed in small enough quantities not to warrant separate pricing on the purchase slip. The amount of catch associated with the log, as well as the purchase slip, need to be investigated. It is hoped that at some point the log information could be used to prorate the total catch; however, it would still necessary to groundtruth the log information by comparing it with plant weighouts and field sampling, etc. The situation in 4VW appears to relate, for the most part, to confusion between plaice and unspecified flounder, while in 4X the winter flounder verses unspecified flounder is confounded with a large amount of unidentified plaice, yellowtail and witch flounder.

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, or we will have to devise a way of apportioning flounder landings, based on a combination of log estimates, field observations, plant weighouts, audits, etc.

4X Flatfish

Description of the Fishery

Total landings of 4X flatfish increased to 6,015 t in 1990 and then declined to 3,277 t in 1994 (Table 1, and Figs.1, 2). Table 2 gives a breakdown of landings for each species by country. Canada is the major exploiter of the resource while the USA accounted for a small portion of the landings prior to 1984. Unspecified flounder made up between 60% and 80% of the 4X landings in recent years. Although total flatfish landings are down, all identified species landings increased in 1994, while landings of unspecified flounder declined. This small shift is due to better identification through more separation of flounder by some plants.

Figures 3 to 12, give the recorded landings by area, species and, gear and Tables, 3, 4 and 5 the recorded landings by area, season, gear, and tonnage class. However, because the species breakdown is not considered reliable this information can be discussed only in terms of total flounder landings by area.

Total landings of flatfish in 4X for 1994 amounted to 3,277 t, a decrease from 4,011 t taken in the 1993 fishery. Unspecified flounder made up 66% of the total flatfish landings in 4X down from 80% in 1993. Flatfish landings by the mobile gear <65' fleet declined by about 20% from 3,831 t in 1993 to 3,052 t in 1994. The <65' mobile gear fleet are responsible for over 90% of the total flatfish landings in 4X.

Offshore landings have been insignificant in 4X since the early 1980s (i.e. less than 100 t annually). Fixed gear landings in 4X increased from 163 t in 1993 to 214 t in 1994. Landings by longline vessels increased while gillnet vessels remained constant.

Discussions with industry participants indicated that the reason for not catching the entire 1994

quota could be due to redirection of effort by the <65' mobile gear fleet to developing fisheries for yellowtail on Georges Bank and monkfish in 4X. Industry also indicated that there was not enough cod and haddock quota to pursue a flounder fishery and that for 1994, individual quotas were not established until late in the year. Witch flounder was of some concern to the ITQ fleet with larger concentrations harder to find. Concern was also expressed by industry of declines in localized populations of winter flounder.

Landings to March 1, 1995, from quota reports for 4X, show a preliminary catch of 282 t most of which was taken by the <65' mobile fleet. In the same time period in 1994 the ITQ fleet landed about 500 t. This slow start to the 1995 fishery may be related to the new 10% bycatch restrictions on non traditional species and to the lower cod quotas.

Management

The 4X flatfish fishery is currently regulated by quotas on the following gear sectors: 1) fixed gear <65'; 2) mobile gear <45' Generalist; 3) mobile gear < 65' ITQ fleet; 4) mobile gear 65-100', and 5) vessels >100'. Because the flatfish fishery has been a bycatch fishery in the past, trip limits and specific licence conditions were not required to manage the fishery. Flatfish in 4X were put under the ITQ program in August of 1994. Allocations for the gear sectors are given in Table 6.

Research Survey Data 4X

Winter Flounder

Survey Catch Rates and Distribution

The summer RV survey (1970-1994) stratified mean numbers per tow for 4X winter flounder exhibited an overall increasing trend from the late 1970s to the early 1990s. A stable period was observed through the early 1980s with a subsequent increasing trend to 1992, the 1993 and 1994 points are approximately half the 1992 value (Table 7a, and Fig. 13) but above the long term mean. Mean weights per tow and minimum biomass estimates exhibit a similar trend (Tables 7b, 8, and Fig. 14). The 1993 and 1994 points were also approximately half the 1992 value although still above the long term mean. It should be noted that the summer survey does not cover the inshore portion of 4X, which is thought to contain a large portion of the winter flounder abundance.

Examining the survey mean weight per tow divided by the mean number per tow, suggests that the mean weight of a winter flounder in 4X declined gradually since the late 1970s (Fig. 15).

The mean number/tow within the strata at the head of the Bay of Fundy and the mouth of St. Marys Bay (strata 90-93) peaked during the late 1980s and has remained relatively high while

in the upper Bay of Fundy (strata 94, 95) abundance dropped significantly in 1994. In the offshore area (Browns Bank, stratum 80) survey numbers declined since 1991(Fig. 16) to more historical levels. Winter flounder did not appear consistently on Browns Bank in the RV survey until the mid to late 1980s, although industry reported a significant fishery prior to that time.

The summer survey distribution of winter flounder appears to be restricted to the Browns Bank area and the Bay of Fundy (Fig. 17). It is uncertain whether there is mixing between these two areas. Cooperative tagging studies with industry have been initiated to determine the extent of the movement of winter flounder. To date this involved only the ITQ fleet, but more tagging is planned for 1995, hopefully with participation also by the generalist fleet.

Length Frequencies

Survey length frequencies indicated that small winter flounder have not been caught in the Browns Bank area. Length frequency distributions (1970-1994) indicated that winter flounder above 40 cm were less abundant in recent years (Fig. 18a). To examine this apparent reduction in size composition, survey length frequency distributions for 1994 were compared to the historic average (1970-1990) as well as comparing the commercial and survey distributions. Fewer large fish (Fig 18b) were noted in 1994 and the commercial length frequency shifted toward smaller fish as well.

Witch Flounder

Survey Catch Rates and Distribution

The summer RV survey (1970-1994) stratified mean numbers per tow for 4X witch flounder were highly variable through the 1970s. Since the early 1980s, the survey has shown a declining trend (Table 7a, Fig. 19). The stratified mean weights per tow and minimum biomass estimates in 4X also show a declining trend since 1980 and both the numbers and weights in recent years are below the longterm mean (Tables 7b, 8, Fig. 20). To provide a view of the abundance of larger and smaller fish in the 4X area, an estimate of the mean weight of witch flounder was examined by dividing the mean weight per tow by the mean numbers per tow. Results indicated that the mean weight has been generally between 600 and 800 gm. For 1992 and 1993 mean weight dropped below 500 gm, and in 1994 to below 400 gm the lowest value in the series (Fig. 21).

Summer survey distribution maps for witch flounder catches indicated that witch are widely distributed in 4X, but in low concentrations. The 1994 distribution is similar to 1993; however, more witch flounder were caught east of Browns Bank in 1994 (Fig. 22).

Length Frequency

Survey length frequency distributions (1970-1994) indicated fewer large witch flounder have been caught in recent years (Fig. 23a). To examine this apparent reduction in size composition, 1994 survey length frequency distributions were compared to the historic mean (1970-1990) as well

as to the commercial size. In both cases a decrease in the number of large fish was noted (Fig. 23b); however, larger numbers of small witch flounder were present in the survey in recent years. The commercial size distribution also indicated a shift toward smaller fish.

Yellowtail

Survey Catch Rates and Distribution

The summer RV survey abundance estimates for 4X yellowtail flounder have increased since the early 1980s. Mean numbers and weights are currently at an historic high (Table 7a, 7b, 8 and Figs. 24, 25). The survey catch rates in 1994 were dependent on a few very large sets on the edge of Browns Bank; however, most of the yellowtail caught during the survey are found in the Brown's Bank area. The mean weight per fish for yellowtail has remained relatively stable over the time series (Fig. 26)

Yellowtail survey distribution in 4X is generally limited to the Browns Bank area and the mouth of the Bay of Fundy. Although abundance was much higher in 1994 compared to 1993, no significant changes in distribution were noted (Fig. 27).

Length Frequencies

Survey length frequency distributions (1970-1994) look highly variable and may be reflective of low catch rates (Fig. 28). To examine recent length frequency distributions more closely, 1994 survey length frequencies were compared to the historic average (1970-1990). No real changes in size composition were noted (Fig. 29).

American Plaice

Survey Catch Rates and Distribution

American plaice survey abundance estimates in 4X were relatively stable over the entire time series; mean numbers indicate a variable but increasing trend since the early 1970s with the 1994 value the highest in the series (Tables 7a, 7b, 8, and Figs. 30, 31). As a result of the increase in numbers and relative stability in weight per tow, the mean weight per fish for plaice has gradually declined since the early 1980s (Fig. 32).

The summer survey distributions show a similar pattern to earlier years with small concentrations between Browns Bank and Roseway, as well as the Bay of Fundy (Fig. 33).

Length Frequencies

Survey length frequency distributions (1970-1994) show little change in recent years; however, there are currently fewer large plaice in the population when compared to the 1970s and 1980s. (Fig. 34). To examine recent length frequency distributions more closely, 1994 distributions were

compared to the historic mean (1970-1990). Little change was seen in size composition except for a decline in plaice above 50 cm (Fig. 35).

Catch at Age 4VW and 4X

Catch at age information for flatfish was not available. Ageing for yellowtail, witch and winter flounder was discontinued in 1985 due to lack of use of the information in past assessments (Neilson 1985). The intention at that time was to concentrate ageing efforts on American plaice in order to conduct a more detailed analytical assessment of 4V plaice. Since 1988 no ageing has been done for American plaice and commercial sampling for length frequencies has been limited for all flatfish species. For 1994 a new commercial sampling schedule was put in place, based on recent fishery information. Individual survey length/weight information for yellowtail, witch and winter flounder was only available for 1994, but will be collected in the future. Length weight information was collected for American plaice over the time series.

Commercial data

Commercial Catch Rates

Directed catches for all stocks comprising the 4X flatfish complex are variable and often at very low levels. The landings with effort, for each species were examined for the 1989 to 1994 time period. Identified landings in some years were less than 5 t. With the bycatch nature of the fishery (though less so as other stocks decline), the increasing problem with unspecified flounder and the change in the way the statistics are reported, the use of commercial catch rates for individual species in evaluating the status of the flatfish stocks are likely of limited value. Catch rates were derived for the individual flounder species and combined flounder, 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 all 4X flounders combined declined slightly while total effort declined significantly since 1992 (Table 9 and Figs. 36a,). Total effort increased during 1991 and 1992 possibly due to the introduction of ITQs, and interest by the ITQ fleet in developing a catch history in flatfish. For witch flounder, catch rates were stable in 1993 and 1994 although they have declined since 1989. Except for a high point in 1992, effort has been relatively stable (Fig. 36b).

Fishery Distribution

Distribution was examined using available log information, i.e. lat, long and catch (Figs. 37 to 41). Unfortunately, most of this information pertains to unspecified flounder and only a small subset to individual species. If these subsets can be considered representative of the commercial distribution in 4X it would suggest that winter flounder are fished around the Browns Bank area up into the Bay of Fundy. However, unspecified flounder distributions, corroborated by industry indicate that winter flounder is fished in many small bays and inlets around the coast, especially in the inshore portion of the Bay of Fundy. The fishery distribution of witch flounder is more

wide spread and industry indicated that the fishery occurred predominantly in depths greater than 100 fathoms. There is very little directed fishery for plaice or yellowtail in 4X.

Fishery Length Frequencies

Commercial length frequencies for winter and witch flounder were examined for 1990 to 1994. Sampling for winter flounder was inadequate in 1994 and generally sampling for 4X flounders should be improved (Table 10). The size distributions show the modal length to be shifting to a smaller size for both, with fewer large fish caught in the commercial fishery (Figs. 42a, 42b). Yellowtail and plaice represent a small portion of the landings and a time series of commercial length frequencies was not available.

Conclusions

The 1994 catch allocation to the major participants in the 4X flounder fishery (i.e. the <65' mobile gear fleet) did not restrict their fishing activities, but nonetheless landings declined by about 20% from the 1993 level. However, catch rate declined only slightly from 1993 to 1994, the reduced landings being accounted for primarily by a reduction in effort. Redirection of effort by the <65' mobile gear fleet to developing fisheries for yellowtail on Georges Bank and monkfish in 4X may have accounted for the reduced effort on flounders. As well, the bycatch of CHP was considered by industry as limiting the flatfish fishery.

The primary species fished in the area, winter flounder, and also the two species of minor importance, plaice and yellowtail, appear to be maintaining their abundance, although witch flounder continues to decline. Some reduction in size distribution in both the survey and commercial fishery was noted for both winter and witch flounder. Some industry groups have expressed concern about particular localized winter flounder stocks, and commented that good concentrations of witch flounder are harder to find.

Prognosis

The FRCC recommended a reduction in both catch and effort for the entire flatfish resource for 1995.

That reduction in TAC for 1995, to about the level of the 1994, catch should stabilize effort at, or about the 1994 level; it could even result in some further reduction. Overall, resource prospects for 1996 are expected to be similar to those for 1995 for most of the 4X flounder resource.

Witch flounder provides an exception however, and the extent of the declines in survey abundance and commercial landings suggests that special protective measures are warranted for the 1996 fishery.

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. 43, 44) 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 45 to 54 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 1994 amounted to 2,824 t, a decrease from 3,959 t taken in 1993. Unspecified flounder made up 50% of the total landings in 1994 compared to 42% in 1993. Landings have decreased for the <65' mobile gear fleet from 3,477 t in 1993 to 2,593 t in 1994. 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 newly defined stock areas, the reduced TAC, and the new fleet sharing arrangements for 1994. Discussions with industry, indicated concern for the plaice and yellowtail resources in particular and flatfish in general.

For vessels >65', flatfish landings declined dramatically, dropping from 1,893 t in 1992 to 323 t in 1993 to 204 t in 1994. 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 426 t rather than 204 t. 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 the latter part of 1994 when the <65' mobile gear fleet quota was exhausted, some of these vessels fished under TVRPs for the offshore.

Fixed gear landings which have generally been in the 200-300 t range in recent years dropped to 159 t in 1993 and to 14 t in 1994. 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; 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. Throughout 1994 the 4VW flatfish quota remained a competitive fishery for all inshore gear sectors. 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.

Research Survey Data 4VW

Survey Catch Rates and Distribution

American Plaice

American plaice survey mean numbers and weight per tow in 1994 were 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. (Table 7a, 7b, 11 and Figs. 55, 56). To provide a view of the 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 to below 200 gm in 1994. Mean weight was generally between 300 and 400 gm prior to 1990 (Fig. 57).

Summer survey distribution maps for American plaice catches in 1994 show a similar distribution to earlier years (Annand *et al.* 1993), although the major concentrations previously found in the 4Vc area have declined dramatically (Fig. 33).

The spring 4VW survey (1986-1994) mean numbers per tow have declined since 1990 (Table 12, and Fig. 58a). 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 (1970-1994) 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 although the numbers of small fish remain relatively high (Fig. 59). To examine this apparent reduction in size composition, survey length frequencies 1994 were compared to the historic average (1970-1990) (Fig. 60a) and to the commercial length distributions (Fig. 60b). Fewer larger plaice were noted in 1994. It was also observed that the commercial fishery takes most of its catch at lengths not observed in large numbers in the survey.

Yellowtail

Survey Catch Rates and Distribution

The summer RV survey (1970-1994) abundance estimates in 4V have declined since the late

1970s and the population is composed of older fish (Tables 7a, 7b, 11 and Figs. 61, 62) almost all in the size range exploited by the commercial fishery (Fig 67b). Yellowtail are smaller and more abundant in 4W, and generally not of commercial size (Fig. 64). Weight per tow has also been decreasing in 4W but at a lesser rate than in 4V; however, numbers per tow are still at previous levels. Interrelationships may occur between the two areas and tagging results do indicate some movement between the two areas, mainly from 4W to 4V (Fig. 65).

Because the majority of the commercial fishery is prosecuted in 4V, has 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 250 gms in 1994 (Fig. 63).

The yellowtail summer 1994 survey distribution continues to indicate a change in distribution between 4V and 4W compared to earlier years (Annand *et al* 1993). Major concentrations were noted in 4W, even though most fishing activity occurs in 4V (Fig. 27).

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 12, Fig. 58b), 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 (1970-1994) indicated some shift to a smaller size range in recent years (Fig. 66). Modal length for the survey has decreased in 4V and is now very close to the minimum market size of 30 cm. Relative to past surveys in which fish less than 25 cm were generally well represented, signs of good recruitment in 4V are not apparent in the last ten years. To examine this apparent reduction in size composition, survey length frequencies for 1994 were compared to the historic average (1970-1990) (Fig. 67a) as well as to the commercial size distribution (Fig. 67b). In 4V an absence of both large and small fish was noted when compared to the historic average. With the inclusion of the 4W survey distribution the absence of small yellowtail was not observed. 4V length frequencies, indicated that the survey and commercial fishery caught virtually the same size fish, although in 1994 the commercial fishery caught more fish in a size range not observed in large numbers in the survey distributions.

Witch Flounder

Survey Catch Rates and Distribution

Witch flounder survey mean numbers per tow have been relatively stable, but have shown an

increase since 1990. Mean weight per tow has declined gradually since the early 1970s (Tables 7a, 7b, 11 and Figs. 68, 69). Survey indices are quite variable likely due to the distribution of witch in deep holes and the segregation by size (Powles, 1970). The mean weight per fish has declined since the mid 1970s. This long decline is no doubt influenced by incoming recruitment, but the lack of an increasing trend in the numbers per tow indicate limited effect by young fish, thus the extent of the decline is likely primarily related to the disappearance of larger fish (Fig. 70).

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 the 4Vn area (Fig 22). 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 12, Fig. 58c). 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 survey length frequencies indicate a trend toward smaller fish in the latter half of the survey series (Fig. 71). In recent years the survey appears to be picking up more <30 cm than in the past. To examine this apparent reduction in size composition, survey length frequencies for 1994 were compared to the historic average (1970-1990) (Fig. 73a) as well as to the commercial distribution (Fig. 74). A reduction in larger fish was observed with higher numbers of smaller witch flounder, while the commercial fishery caught fish generally in a size range not observed in large numbers in the survey length distributions.

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 7a ,7b, 11 and Figs. 75, 76). The summer survey distributions continue to show increased concentrations to the west of Sable Island in 4W, Sable Island and Middle and Western banks. (Fig. 17). The mean weight for winter flounder has shown some decline over time, possibly related to increased abundance of smaller fish (Fig. 77).

In the spring survey, numbers and weights per tow are very low and variable (Table 12, Fig. 58d). 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 (1970-1994) indicated some shift to a smaller size range in recent years (Fig. 72). This shift may be related to the increased abundance of smaller winter flounder in the 4W area. Survey length frequencies for 1994 were compared to the historic mean (1970-1990) (Fig. 73b). Some decline in larger fish was observed as well as a higher abundance of small winter flounder compared to the historic average.

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 1994 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' declined in 1994, but catch rates have been relatively stable over the past six years (Table 9, Fig. 78). Fishing effort for this fleet remained at about the 1993 level and indeed has been stable after the large increase in 1991; however total effort has declined since 1992, likely due to the virtual absence of the >65' fleets in the flounder fishery. Catch rates for witch flounder have remained relatively stable since 1989, even though landings have declined significantly. Total witch effort has also declined dramatically between 1989 and 1994 (Fig. 79).

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 only fished in 4Vn. However, unspecified flounder distributions, corroborated by industry sources, indicated that American plaice is 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 centered 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 and the 4W gully area.

Winter flounder is not directed for in 4VW and is considered a small bycatch fishery.

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 in 1993 and 1994 for yellowtail flounder. Witch flounder also exhibit a trend toward smaller fish, although not as pronounced as for plaice and yellowtail. The number of samples associated with the commercial length frequencies are given in Table 10.

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 and aside from some modest recruitment, fishing conditions appear to have deteriorated over the last few years and are not likely to improve substantially in the near future. It is noteworthy, however, that the 4W populations also showed some decline in abundance even in the absence of any significant level of fishing. Without any information on the exploitation rates, relative contributions by the fishery, or other related factors, to the significant population declines cannot be determined. Until such time as accurate catch information by species can be provided little guidance can be provided on appropriate levels of fishing. Consultations with industry were somewhat mixed, but generally indicated a scarcer flatfish resource. The shift to smaller fish in both the survey and commercial fishery may result in a discarding problem.

Prognosis

In 1994 a substantial reduction in effort was advised, if the objective was to reduce fishing mortality below recent levels. The present evaluation gives nor reason for changing that advice.

Catches between 1991 and 1993 were in the order of 4,000 t, with catches in 1994, 30% lower than the 1993 catch. The reduction in TAC for 1995 should result in catches in the 2,000 t range assuming similar utilization of fleet allocations. Catch and effort could increase in 1995 if all fleet allocations are taken. The catches of 4,000 t taken between 1991 and 1993 did not result in any improvement in stock status, therefore it would be prudent to continue to restrict catches in 1996 at no more than the 1994 level.

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Table 1. Total Landings for 4VW and 4X Flatfish.

	4VW						4X					
	Plaice	Witch Flounder	Yellowtail Flounder	Winter Flounder	Unspecified	Total	Plaice	Witch Flounder	Yellowtail Flounder	Winter Flounder	Unspecified	Total
1961	1384	5018	2908	138	237	9685	198	59	9	699	25	990
1962	1485	5777	3479	127	761	11629	242	61	24	449	120	896
1963	2059	7411	3888	82	-	13440	250	75	84	614	-	1023
1964	2570	8372	5249	31	194	16416	512	257	150	1280	-	2199
1965	7504	12522	5880	211	90	26207	694	421	224	1128	-	2467
1966	13480	14288	4685	89	30	32572	726	224	166	1257	-	2373
1967	9664	7433	4971	42	-	22110	1106	383	225	902	-	2616
1968	18319	20947	12923	38	29	52256	946	735	205	1143	1	3030
1969	12865	13301	3625	16	2	29809	870	792	201	1400	-	3263
1970	7723	5241	3356	52	9	16381	635	807	326	1478	2	3248
1971	13756	16723	1557	1601	0	33637	545	1141	218	1483	1	3388
1972	10087	10653	1321	629	43	22733	566	698	164	825	681	2934
1973	12093	13434	1374	1135	176	28212	339	535	139	774	806	2593
1974	16314	6917	703	1782	101	25817	458	498	236	974	716	2882
1975	11451	8591	1357	704	288	22391	296	331	213	670	834	2344
1976	10838	7201	674	580	547	19840	309	341	230	717	496	2093
1977	7308	2010	1141	235	46	10740	449	421	302	1022	898	3092
1978	6244	2103	1241	323	33	9944	512	188	387	884	1027	2998
1979	5526	1781	1799	241	91	9438	828	290	291	847	1212	3468
1980	6891	1990	2236	40	29	11186	682	331	255	1134	1858	4259
1981	6258	1279	2662	37	21	10257	514	462	227	1411	1556	4170
1982	5320	890	2411	92	11	8724	377	583	212	1144	1763	4079
1983	5523	1004	2102	80	50	8759	584	659	321	915	2023	4502
1984	5793	1340	2290	7	8	9438	335	593	172	877	1995	3972
1985	4120	1746	947	29	10	6852	317	525	73	795	2200	3910
1986	3090	2383	694	6	68	6241	592	631	111	1034	3234	5602
1987	4623	2725	1041	12	42	8443	262	492	109	1044	2380	4287
1988	3087	2406	989	112	89	6683	366	541	79	1460	2205	4651
1989	3365	1765	1459	187	93	6869	481	527	50	1289	976	3323
1990	1914	1296	2931	79	27	6247	469	643	79	1881	2943	6015
1991	378	1326	1331	44	1481	4560	988	605	144	602	3445	5784
1992	463	1023	1373	5	1876	4740	413	824	118	564	3940	5859
1993	123	523	1647	2	1655	3959	9	373	54	343	3232	4011
1994	105	275	1035	2	1408	2824	82	391	95	520	2189	3277

Table 2. Total Landings for 4VW and 4X⁽¹⁾ American Plaice.

	4VW					4X				
	Canada	USA	Russia	Other	Total	Canada	USA	Russia	Other	Total
1961	1358	26	-	-	1384	151	47	-	-	198
1962	1455	30	-	-	1485	187	55	-	-	242
1963	1958	17	84	-	2059	150	100	-	-	250
1964	2503	18	4	45	2570	335	176	-	1	512
1965	5253	9	2148	94	7504	289	170	235	-	694
1966	8666	3	4791	20	13480	447	107	172	-	726
1967	9579	1	82	2	9664	945	161	-	-	1106
1968	8961	-	9246	112	18319	867	67	10	2	946
1969	8485	-	4304	76	12865	815	51	4	-	870
1970	5725	5	1889	104	7723	578	50	7	-	635
1971	7088	3	6647	18	13756	425	67	53	-	545
1972	6379	23	3553	132	10087	476	33	57	-	566
1973	4873	2	7140	78	12093	273	6	60	-	339
1974	6664	4	9581	65	16314	303	9	146	-	458
1975	6361	10	5026	54	11451	262	30	4	-	296
1976	6694	1	4057	86	10838	238	26	45	-	309
1977	7245	-	48	15	7308	414	35	-	-	449
1978	6190	-	29	25	6244	489	20	3	-	512
1979	5511	-	13	2	5526	818	10	-	-	828
1980	6824	-	26	41	6891	666	15	-	-	681
1981	6149	-	68	41	6258	437	77	-	-	514
1982	5310	-	6	4	5320	311	66	-	-	377
1983	5483	-	32	8	5523	480	104	-	-	584
1984	5719	-	65	9	5793	220	115	-	-	335
1985	4083	-	-	37	4120	282	35	-	-	317
1986	3061	-	6	23	3090	560	32	-	-	592
1987	4601	-	14	8	4623	251	11	-	-	262
1988	3061	-	17	9	3087	362	4	-	-	366
1989	3354	-	4	7	3365	480	1	-	-	481
1990	1854	-	45	20	1919	464	6	-	-	470
1991 ⁽¹⁾	237	-	113	28	378	980	4	-	4	988
1992 ⁽¹⁾	493	-	14	71	578	414	3	1	5	423
1993 ⁽¹⁾	123	-	-	-	123	9	-	-	-	9
1994 ⁽¹⁾	105	-	-	-	105	82	-	-	-	82

⁽¹⁾ Data from DFO Statistics Branch; provisional data for countries other than Canada.

Table 2 (Continued). Total Landings for 4VW and 4X⁽¹⁾ (includes 5Y) Yellowtail Flounder.

	4VW					4X				
	Canada	USA	Russia	Other	Total	Canada	USA	Russia	Other	Total
1961	2908	-	-	-	2908	-	9	-	-	9
1962	3479	-	-	-	3479	4	20	-	-	24
1963	3759	-	129	-	3888	25	30	29	-	84
1964	5231	-	18	-	5249	57	36	57	-	150
1965	5295	1	584	-	5880	83	20	121	-	224
1966	3712	-	973	-	4685	58	14	94	-	166
1967	4956	-	15	-	4971	196	29	-	-	225
1968	5204	-	7708	11	12923	173	23	9	-	205
1969	2383	-	1242	-	3625	180	19	2	-	201
1970	735	1	2614	6	2256	212	20	94	-	326
1971	825	2	728	2	1557	208	10	-	-	218
1972	853	-	439	29	1321	154	4	6	-	164
1973	303	-	1013	58	1374	121	1	17	-	139
1974	378	-	119	206	703	215	3	18	-	236
1975	909	29	400	19	1357	174	35	-	4	213
1976	392	-	281	1	674	218	12	-	-	230
1977	1135	-	-	6	1141	289	13	-	-	302
1978	1226	-	-	15	1241	384	3	-	-	387
1979	1799	-	-	-	1799	289	2	-	-	291
1980	2235	-	-	1	2236	251	4	-	-	255
1981	2656	-	-	6	2662	225	2	-	-	227
1982	2409	-	-	2	2411	211	1	-	-	212
1983	2102	-	-	-	2102	320	1	-	-	321
1984	2284	-	-	6	2290	165	7	-	-	172
1985	941	-	-	6	947	73	-	-	-	73
1986	694	-	-	-	694	111	-	-	-	111
1987	1041	-	-	-	1041	109	-	-	-	109
1988	988	-	-	1	989	79	-	-	-	79
1989	1459	-	-	-	1459	50	-	-	-	50
1990	2930	-	-	1	1931	78	1	-	-	79
1991 ⁽¹⁾	1328	-	3	-	1331	144	-	-	-	144
1992 ⁽¹⁾	1373	-	-	-	1373	118	-	-	-	118
1993 ⁽¹⁾	1648	-	-	-	1648	54	-	-	-	53
1994 ⁽¹⁾	1035	-	-	-	1035	95	-	-	-	95

⁽¹⁾ Data from DFO Statistics Branch; provisional data for countries other than Canada.

Table 2 (Continued). Total Landings for 4VW and 4X⁽¹⁾ (includes 5Y) Witch Flounder.

	4VW					4X				
	Canada	USA	Russia	Other	Total	Canada	USA	Russia	Other	Total
1961	4915	103	-	-	5018	36	23	-	-	59
1962	5614	163	-	-	5777	24	37	-	-	61
1963	6943	124	344	-	7411	29	46	-	-	75
1964	8219	119	34	-	8372	187	70	316	-	257
1965	7654	45	4823	-	12522	56	49	124	-	421
1966	6966	-	7322	-	14288	80	20	-	-	224
1967	7205	-	227	1	7433	291	92	12	-	383
1968	8078	-	12817	52	20947	694	29	7	1	735
1969	5915	-	7338	48	13301	756	28	-	-	792
1970	4160	8	1059	14	5241	760	47	317	-	807
1971	6041	15	10661	6	16723	775	49	95	-	1141
1972	5346	80	5112	115	10653	563	40	120	-	698
1973	5471	13	7900	50	13434	383	32	97	-	535
1974	5457	27	1344	89	6917	373	28	13	4	498
1975	3125	-	5419	47	8591	281	33	27	-	331
1976	2181	1	3210	9	5401	285	29	6	-	341
1977	1905	-	98	7	2010	402	13	-	-	421
1978	1967	-	134	2	2103	172	16	-	-	188
1979	1774	-	3	4	1781	283	7	-	-	290
1980	1978	-	3	9	1990	320	11	-	-	331
1981	1266	-	-	13	1279	421	41	-	-	462
1982	884	-	2	4	890	527	56	-	-	583
1983	991	-	12	1	1004	482	177	-	-	659
1984	1306	-	28	6	1340	431	162	-	-	593
1985	1681	-	57	8	1746	452	73	-	-	525
1986	2329	-	54	-	2383	553	78	-	-	631
1987	2678	-	41	6	2725	472	20	-	-	492
1988	2294	-	111	1	2406	529	12	-	-	541
1989	1765	-	-	-	1795	524	3	-	-	527
1990	1304	-	-	-	1304	638	7	-	-	645
1991 ⁽¹⁾	1323	-	1	2	1326	602	3	-	-	605
1992 ⁽¹⁾	1025	-	4	2	1031	828	1	-	-	829
1993 ⁽¹⁾	532	-	-	-	532	373	-	-	-	373
1994 ⁽¹⁾	275	-	-	-	275	391	-	-	-	391

⁽¹⁾ Data from DFO Statistics Branch; provisional data for countries other than Canada.

Table 2 (Continued). Total Landings for 4VW and 4X⁽¹⁾ (includes 5Y) Winter Flounder.

	4VW					4X				
	Canada	USA	Russia	Other	Total	Canada	USA	Russia	Other	Total
1961	138	-	-	-	138	696	3	-	-	699
1962	127	-	-	-	127	443	6	-	-	449
1963	82	-	-	-	82	586	28	-	-	614
1964	31	-	-	-	31	1251	29	-	-	1280
1965	134	1	76	-	211	1103	4	21	-	1128
1966	60	-	29	-	89	937	8	312	-	1257
1967	42	-	-	-	42	884	18	-	-	902
1968	13	-	25	-	38	1115	13	15	-	1143
1969	4	-	12	-	16	1388	7	5	-	1400
1970	10	-	42	-	52	1470	8	-	-	1478
1971	12	1	1588	-	1601	1418	6	59	-	1483
1972	32	-	597	-	629	792	13	20	-	825
1973	271	-	864	-	1135	633	2	139	-	774
1974	570	-	1212	-	1782	751	7	216	-	974
1975	187	-	517	-	704	615	45	10	-	670
1976	212	-	368	-	580	696	13	8	-	717
1977	235	-	-	-	235	1009	13	-	-	1022
1978	323	-	-	-	323	879	5	-	-	884
1979	241	-	-	-	241	844	3	-	-	847
1980	40	-	-	-	40	1133	1	-	-	1134
1981	37	-	-	-	37	1411	-	-	-	1411
1982	92	-	-	-	92	1139	5	-	-	1144
1983	80	-	-	-	80	912	3	-	-	915
1984	7	-	-	-	7	870	7	-	-	877
1985	29	-	-	-	29	794	1	-	-	795
1986	6	-	-	-	6	1031	3	-	-	1034
1987	12	-	-	-	12	1024	20	-	-	1044
1988	112	-	-	-	112	1459	1	-	-	1460
1989	187	-	-	-	187	1289	-	-	-	1289
1990	78	-	-	-	78	1885	1	-	-	1886
1991 ⁽¹⁾	43	-	-	-	43	602	1	-	-	603
1992 ⁽¹⁾	5	-	-	-	5	564	-	-	-	564
1993 ⁽¹⁾	2	-	-	-	2	343	-	-	-	343
1994 ⁽¹⁾	2	-	-	-	2	520	-	-	-	520

⁽¹⁾ Data from DFO Statistics Branch; provisional data for countries other than Canada.

Table 3a. American Plaice 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 ⁽¹⁾	186	192	988	1366
1992 ⁽¹⁾	447	131	423	1001
1993 ⁽¹⁾	39	84	9	132
1994 ⁽¹⁾	96	9	82	187

Table 3b. Witch Flounder 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 ⁽¹⁾	1288	38	605	1931
1992 ⁽¹⁾	941	90	829	1860
1993 ⁽¹⁾	513	19	373	905
1994 ⁽¹⁾	271	4	391	666

⁽¹⁾ Data from DFO Statistics Branch; provisional data for countries other than Canada.

Table 3c. Yellowtail Flounder 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 ⁽¹⁾	1313	18	144	1475
1992 ⁽¹⁾	1357	16	118	1491
1993 ⁽¹⁾	1641	6	54	1701
1994 ⁽¹⁾	1031	4	95	1130

Table 3d. Winter Flounder 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 ⁽¹⁾	28	16	602	646
1992 ⁽¹⁾	2	3	564	569
1993 ⁽¹⁾	0	2	343	345
1994 ⁽¹⁾	0	2	520	522

⁽¹⁾ Data from DFO Statistics Branch; provisional data for countries other than Canada.

Table 3e. Unspecified Flounder landings for divisions 4VWX⁽¹⁾.

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 ⁽¹⁾	1275	206	3445	4926
1992 ⁽¹⁾	1798	85	3958	5841
1993 ⁽¹⁾	1618	37	3232	4887
1994 ⁽¹⁾	1400	8	2189	3597

⁽¹⁾ Data from DFO Statistics Branch; provisional data for countries other than Canada, includes 5Y.

Table 4a. American Plaice landings by quarter of year and division for Canada.

Canada (Maritimes and Quebec)

Year	4V					4W					4X					Canadian 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	220	186	142	148	696	101	192	111	174	578	6303
1971	2688	1892	711	1036	6327	238	138	229	156	761	61	175	81	108	425	7513
1972	2649	2032	440	502	5623	219	192	277	68	756	84	170	131	91	476	6855
1973	1765	1176	479	813	4233	205	153	208	74	640	67	71	64	71	273	5146
1974	3197	1992	452	571	6212	65	121	218	48	452	10	76	76	141	303	6967
1975	2764	1685	796	508	5753	133	197	239	39	608	5	55	115	87	262	6623
1976	2041	1809	1295	1124	6269	89	119	162	55	425	48	62	44	84	238	6932
1977	1407	2541	1942	811	6701	88	185	199	72	544	85	137	120	72	414	7659
1978	830	2655	1382	607	5474	54	260	304	98	716	48	84	260	97	489	6679
1979	979	1573	1123	1349	5024	32	293	144	18	487	46	354	308	110	818	6329
1980	1195	2379	1567	1113	6254	51	279	191	49	570	52	213	315	86	666	7490
1981	1265	1705	1402	1261	5633	37	264	162	53	516	72	173	164	28	437	6586
1982	641	1573	1643	1059	4916	13	154	195	32	394	34	96	123	58	311	5621
1983	936	1799	1874	485	5094	8	210	148	23	389	89	204	141	46	480	5963
1984	575	2050	1722	1162	5509	7	105	74	24	210	42	66	86	26	220	5939
1985	681	980	1668	580	3909	2	63	96	13	174	64	96	78	44	282	4365
1986	349	1139	864	440	2792	8	96	115	50	269	49	183	248	80	560	3621
1987	1361	1369	964	530	4224	20	137	162	58	377	65	110	58	18	251	4852
1988	395	1123	968	272	2758	30	95	149	29	303	60	117	142	43	362	3423
1989	375	1109	1286	193	2963	11	103	203	74	391	181	237	54	8	480	3834
1990	457	574	470	178	1679	13	64	85	13	175	134	158	143	29	464	2318
1991 ⁽¹⁾	73	97	11	5	186	2	5	28	16	51	3	166	411	400	980	1217
1992 ⁽¹⁾	100	120	131	96	447	-	16	30	0	46	58	185	87	84	414	907
1993 ⁽¹⁾	10	26	2	1	39	-	8	76	-	84	-	-	9	16	9	132
1994 ⁽¹⁾	19	48	18	11	96	-	-	9	-	9	4	16	46	-	82	187

⁽¹⁾ Data from DFO Statistics Branch; provisional data for countries other than Canada.

Table 4b. Witch Flounder landings by quarter of year and division for Canada.

Canada (Maritimes and Quebec)

Year	4V					4W					4X					Canadian 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	1257	872	409	728	3266	295	296	148	155	894	119	371	122	148	760	4920
1971	1676	1526	422	601	4225	672	554	291	299	1816	148	283	251	93	775	6816
1972	2093	1221	305	360	3979	648	256	241	222	1367	52	263	209	39	563	5909
1973	1592	1408	279	412	3691	700	591	177	312	1780	113	150	98	22	383	5854
1974	2896	1120	413	276	4705	205	185	128	234	752	27	171	140	35	373	5830
1975	907	837	292	206	2242	257	458	53	115	883	33	130	55	63	281	3406
1976	749	649	241	185	1824	64	122	76	95	357	60	84	104	37	285	2466
1977	614	459	265	145	1483	152	131	79	60	422	140	108	69	85	402	2307
1978	595	508	272	156	1531	83	240	95	18	436	57	61	21	33	172	2139
1979	573	405	319	271	1568	72	130	2	2	206	61	94	47	81	283	2057
1980	608	660	316	208	1792	50	78	25	33	186	88	71	83	78	320	2298
1981	368	380	256	106	1110	30	92	9	25	156	71	83	140	127	421	1687
1982	158	301	195	133	787	11	16	40	30	97	57	154	147	169	527	1411
1983	133	286	314	144	877	19	55	25	15	114	86	164	166	66	482	1473
1984	119	354	455	259	1187	20	50	37	12	119	64	141	180	46	431	1737
1985	171	516	661	281	1629	6	12	19	15	52	95	131	150	76	452	2133
1986	358	1036	624	203	2221	15	27	23	43	108	106	105	214	128	553	2882
1987	428	1018	682	425	2553	0	39	39	47	125	134	129	116	93	472	3150
1988	281	1104	548	252	2185	25	43	25	16	109	142	126	132	129	529	2823
1989	214	861	363	172	1610	10	79	38	28	155	246	209	40	29	524	2289
1990	106	596	390	666	1158	15	75	43	13	146	181	128	241	88	638	1942
1991 ⁽¹⁾	217	674	245	150	1286	6	14	14	3	37	292	126	66	118	602	1925
1992 ⁽¹⁾	73	517	222	129	941	5	58	18	3	84	360	206	115	147	828	1853
1993 ⁽¹⁾	3	248	188	73	512	-	4	13	3	20	189	110	42	32	373	905
1994 ⁽¹⁾	1	179	89	2	271	1	2	1	1	5	144	110	48	88	390	666

⁽¹⁾ Data from DFO Statistics Branch; provisional data for countries other than Canada.

Table 4c. Yellowtail Flounder landings by quarter of year and division for Canada.

Canada (Maritimes and Quebec)

Year	4V					4W					4X					Canadian 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	217	87	146	88	538	95	69	11	22	197	28	89	44	51	212	947
1971	77	519	74	57	727	24	25	29	20	98	20	77	74	37	208	1033
1972	29	382	66	8	485	296	17	23	32	368	12	58	71	13	154	1007
1973	3	206	11	1	221	52	12	8	10	82	30	29	53	9	121	424
1974	23	303	29	2	357	3	4	9	5	21	12	58	107	38	215	593
1975	1	690	194	8	893	-	15	1	-	16	14	41	93	26	174	1083
1976	1	50	188	137	376	0	2	8	6	16	15	76	107	20	218	610
1977	11	503	478	103	1095	8	18	3	11	40	37	114	111	27	289	1424
1978	3	555	303	210	1071	9	33	34	79	155	30	170	135	49	384	1610
1979	0	540	695	425	1655	2	89	28	25	144	22	118	102	47	289	2088
1980	0	1085	661	411	2157	1	31	38	8	78	37	112	78	24	251	2486
1981	3	827	1410	293	2533	8	80	26	9	123	18	73	108	26	225	2881
1982	2	1033	920	405	2360	11	17	5	16	49	36	54	77	44	211	2620
1983	2	1047	977	17	2043	11	34	7	7	59	50	106	118	46	320	2422
1984	133	1192	765	149	2239	12	25	8	0	45	38	61	52	14	165	2449
1985	8	154	624	146	932	3	3	1	2	9	27	24	20	2	73	1014
1986	4	352	227	89	672	0	7	14	1	22	23	31	24	33	111	805
1987	4	404	441	98	947	0	32	60	2	94	22	42	33	12	109	1150
1988	5	287	518	132	942	3	4	31	8	46	21	21	28	9	79	1067
1989	6	403	790	186	1385	0	24	29	21	74	5	34	6	5	50	1509
1990	11	452	2033	319	2815	5	17	82	11	115	12	11	34	21	78	3008
1991 ⁽¹⁾	1	198	882	232	1313	1	1	9	4	15	4	33	51	56	144	1472
1992 ⁽¹⁾	2	153	1116	86	1357	1	8	6	1	16	7	45	39	27	118	1491
1993 ⁽¹⁾	5	193	1288	156	1642	-	-	3	3	6	6	18	19	10	53	1701
1994 ⁽¹⁾	-	285	664	83	1032	-	-	3	1	4	3	26	27	40	96	1132

⁽¹⁾ Data from DFO Statistics Branch; provisional data for countries other than Canada.

Table 4d. Winter Flounder landings by quarter of year and division for Canada.

Canada (Maritimes and Quebec)

Year	4V					4W					4X					Canadian 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	1	1	5	1	8	-	-	1	1	2	51	660	513	246	1470	1480
1971	-	-	5	3	8	-	1	-	3	4	13	712	511	182	1418	1430
1972	2	0	2	12	16	8	0	0	8	16	0	272	421	99	792	824
1973	0	21	174	75	270	0	0	0	1	1	1	304	266	62	633	904
1974	0	122	339	10	471	0	0	31	68	99	1	273	337	140	751	1321
1975	-	7	118	3	128	-	6	44	9	59	6	243	274	92	615	802
1976	0	14	156	23	193	0	1	9	9	19	11	255	340	90	696	908
1977	0	6	220	0	226	4	2	2	1	9	16	392	436	165	1009	1244
1978	1	3	147	35	186	3	3	124	7	137	9	272	411	187	879	1202
1979	1	3	145	79	228	0	5	8	0	13	18	163	516	147	844	1085
1980	0	5	23	2	30	1	3	0	6	10	25	449	489	170	1133	1173
1981	0	9	2	15	26	4	4	1	2	11	8	426	754	223	1411	1448
1982	1	37	40	4	82	3	4	3	0	10	78	367	575	119	1139	1231
1983	46	13	3	10	72	1	4	3	0	8	37	282	482	111	912	992
1984	1	1	0	-	2	1	1	0	3	5	72	322	401	75	870	877
1985	0	1	26	0	27	0	1	1	0	2	25	290	421	58	794	823
1986	0	0	2	0	2	1	0	1	2	4	52	252	623	104	1031	1037
1987	0	1	1	7	9	0	1	2	0	3	15	404	521	84	1024	1036
1988	0	84	13	0	97	2	3	2	8	15	67	401	770	221	1459	1571
1989	0	9	133	5	147	1	12	14	13	40	191	497	456	145	1289	1476
1990	-	4	49	17	70	3	3	0	2	8	406	496	572	411	1885	1963
1991 ⁽¹⁾	-	2	18	8	28	0	0	9	6	15	76	85	158	283	602	645
1992 ⁽¹⁾	1	0	1	0	2	-	1	0	2	3	114	157	159	134	564	569
1993 ⁽¹⁾	-	-	-	-	-	-	-	-	2	2	26	117	145	55	343	345
1994 ⁽¹⁾	-	-	-	-	-	-	-	1	1	2	19	115	118	269	521	523

⁽¹⁾ Data from DFO Statistics Branch; provisional data for countries other than Canada.

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

Year	OTB TC 0 - 3						OTB TC 4+						Scottish & Danish Seine ⁽²⁾					
	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

⁽¹⁾ Data from DFO Statistics Branch.

⁽²⁾ All tonnage classes combined.

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

Year	OTB TC 0 - 3						OTB TC 4+						Scottish & Danish Seine ⁽²⁾					
	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	356	314	122	1406	-	2198	187	103	60	27	-	377	4	320	19	-	-	343
1971	203	274	94	1309	-	1880	173	185	87	15	-	460	8	304	19	1	-	332
1972	195	46	48	722	677	1688	225	99	47	4	4	379	1	405	51	-	-	457
1973	129	40	36	562	795	1562	94	80	18	-	9	201	-	263	50	1	-	314
1974	158	42	115	699	699	1713	73	43	28	7	5	156	1	278	39	1	-	319
1975	130	52	86	550	812	1630	86	55	15	9	15	180	-	152	25	4	3	184
1976	83	61	145	641	463	1393	112	55	11	2	5	185	3	168	38	13	5	227
1977	214	94	127	850	878	2163	135	101	49	18	-	303	14	198	25	2	17	256
1978	247	47	187	762	1014	2257	82	48	73	27	-	230	42	73	8	-	7	130
1979	559	52	208	718	1181	2718	106	110	4	4	16	240	18	117	34	9	2	180
1980	458	183	184	924	1804	3553	96	94	11	26	3	230	2	37	18	1	-	58
1981	317	277	155	1287	1547	3583	28	28	-	5	-	61	2	70	21	-	-	93
1982	225	301	180	1035	1697	3438	18	49	11	11	1	90	6	88	11	2	2	109
1983	304	248	207	802	1979	3540	28	52	2	6	19	107	9	122	22	-	3	156
1984	181	307	126	724	1939	3277	4	3	-	-	8	15	-	102	14	-	-	116
1985	244	247	36	696	2190	3413	9	10	2	2	8	31	2	168	26	7	-	203
1986	482	349	66	935	3223	5055	1	6	-	-	-	7	5	173	21	-	-	199
1987	207	310	47	879	2374	3817	5	5	3	-	-	13	6	135	36	-	-	177
1988	321	381	63	1341	2188	4294	1	7	1	-	-	9	1	122	13	4	-	140
1989	443	397	29	1185	953	3007	2	8	0	4	-	14	5	104	13	9	-	131
1990	410	545	70	1710	3006	5741	15	0	0	2	-	17	1	51	2	2	-	56
1991 ⁽¹⁾	967	398	130	593	3278	5366	4	14	1	3	23	45	1	182	5	1	14	203
1992 ⁽¹⁾	411	676	107	556	3645	5395	2	9	1	5	11	28	0	141	1	0	12	154
1993 ⁽¹⁾	-	248	38	283	3130	3699	9	2	-	2	4	17	-	122	4	1	5	132
1994 ⁽¹⁾	71	287	74	497	2018	2947	1	4	-	1	6	12	-	90	-	-	15	105

⁽¹⁾ Data from DFO Statistics Branch.

⁽²⁾ All tonnage classes combined.

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

Year	4VW												4X											
	LL, LIIP ⁽¹⁾						GN AND OTHER ⁽¹⁾						LL, LIIP ⁽²⁾						GN AND OTHER ⁽¹⁾					
	Plaice	Whch Flounder	Yellow Tail	Winter Flounder	Unspec. Flounder	Total	Plaice	Whch Flounder	Yellow Tail	Winter Flounder	Unspec. Flounder	Total	Plaice	Whch Flounder	Yellow Tail	Winter Flounder	Unspec. Flounder	Total	Plaice	Whch Flounder	Yellow Tail	Winter Flounder	Unspec. Flounder	Total
1970	245	3	2	-	-	250	39	9	-	-	-	48	27	-	9	23	-	59	4	23	2	14	-	43
1971	443	-	3	4	-	450	52	2	-	2	-	56	32	10	8	33	-	83	9	2	-	60	-	71
1972	484	1	5	-	-	490	81	4	-	3	-	88	26	-	6	39	-	71	29	13	2	27	-	71
1973	402	-	4	2	-	408	76	28	-	32	-	136	33	-	16	37	-	86	17	-	1	33	-	51
1974	335	2	2	1	-	340	185	51	-	11	3	250	63	1	30	1	-	95	8	9	3	43	-	63
1975	342	19	1	2	-	364	338	74	37	20	-	469	41	22	48	12	1	124	5	-	-	40	3	48
1976	204	31	-	18	-	253	103	38	-	17	-	158	32	-	24	23	21	100	8	1	-	17	2	28
1977	333	93	1	-	-	427	90	18	-	71	2	181	22	8	13	40	2	85	29	1	75	99	1	205
1978	318	21	7	13	-	389	312	30	79	11	-	432	51	3	11	37	4	106	67	1	105	53	-	226
1979	392	46	6	30	49	523	75	12	1	2	2	92	74	2	37	40	13	166	61	2	6	73	-	142
1980	454	33	5	6	-	498	31	10	6	1	-	48	38	4	11	46	44	143	72	2	27	136	7	244
1981	734	19	9	-	17	779	17	-	1	-	-	18	75	16	4	57	8	160	15	30	45	62	1	153
1982	1022	6	5	2	-	1035	11	-	-	-	-	11	41	51	9	33	2	136	21	38	-	58	61	178
1983	955	10	10	-	2	977	18	3	-	-	-	21	69	15	22	16	-	122	70	45	67	88	20	290
1984	720	7	27	-	1	755	15	13	-	1	-	29	24	2	11	40	1	78	11	17	14	106	45	193
1985	739	31	79	1	-	850	18	3	-	1	3	25	20	9	3	13	1	46	7	18	6	76	1	108
1986	800	27	133	-	1	961	88	18	12	1	1	120	44	10	11	4	2	71	28	15	13	92	-	148
1987	1025	39	230	-	8	1302	111	33	209	3	1	357	13	22	23	68	-	126	20	-	-	77	1	98
1988	754	44	270	6	5	1079	125	38	200	2	4	369	24	5	2	16	-	47	15	14	-	98	17	144
1989	696	6	49	14	4	769	35	40	24	1	-	100	9	0	2	31	6	48	19	12	5	57	17	110
1990	295	2	37	2	1	337	18	11	13	3	3	48	11	0	1	40	-	52	27	42	5	131	6	211
1991 ⁽¹⁾	1	3	41	0	126	171	1	10	8	1	42	62	7	0	2	0	4	13	0	8	5	4	123	140
1992 ⁽¹⁾	0	4	29	0	133	166	3	6	1	1	29	40	0	0	9	-	144	153	2	2	1	3	147	155
1993 ⁽¹⁾	-	4	12	1	56	73	-	4	13	-	69	86	-	-	10	49	16	75	-	1	1	8	78	88
1994 ⁽¹⁾	-	1	4	2	1	8	-	2	1	1	2	6	-	2	16	1	114	133	9	8	6	22	36	81

⁽¹⁾ Data from DFO Statistics Branch.

⁽²⁾ All tonnage classes combined.

Table 6. Management table for flatfish 1994.

a) Management January - March 31, 1994 4VWX (ITQ)

Year	Fleet	Allocation	Reported catch	% Taken
1994	ITQ <65'	0 - capped (at 90-93 average catch)	699 683(4X) 16 (4VW)	-
	Generalist <45' 4X	0	2	-

b) Management 4VW Flatfish

Year	Fleet	Allocation	Reported catch	% Taken
1994	Fixed < 65'	363	8	2
	Mobile < 65' sector overlap	162	77 (Gulf, S-F)	49
	Mobile < 65' ITQ Fleet (competitive fishery)	2088	2253 (+ 16 - Jan.- March 31)	108 (109)
	Mobile 65-100'	79	18	23
	Vessels > 100'	2809	426	15

c) Management 4X flatfish

Year	Fleet	Allocation	Reported catch	% Taken
1994	Fixed < 65'	100	152	152
	Generalist < 45' (April 1 - Dec. 31)	510	460 (+ 2 - Jan. - March 31)	90 (91)
	Mobile <65' ITQ (April 1 - Dec. 31)	3105	1883 (+683 - Jan - March 3)	61 (82)
	Mobile 65-100'	20	5	25
	Vessels > 100'	766	42	5

Table 7a. Mean numbers/tow and standard errors for 4VW and 4X flatfish for 1970 - 1994 (Summer Survey).

Year	Mean #/Tow								Standard Error							
	4VW				4X				4VW				4X			
	Plaice	Yellow-tail Flounder	Witch Flounder	Winter* Flounder	Plaice	Yellow-tail Flounder	Witch Flounder	Winter Flounder	Plaice	Yellow-tail Flounder	Witch Flounder	Winter* Flounder	Plaice	Yellow-tail Flounder	Witch Flounder	Winter Flounder
1970	50.18	32.10	4.91	1.03	13.07	.40	2.10	.31	6.69	9.69	0.82	0.54	10.68	.20	.75	.09
1971	47.55	27.01	6.06	1.3	6.44	.56	.92	.29	16.68	7.36	1.99	0.6	2.72	.29	.41	.16
1972	42.33	28.43	4.26	3.18	5.66	1.64	3.20	.24	8.18	5.37	0.87	2.54	1.94	.95	.86	.04
1973	36.43	29.29	8.79	1.42	5.02	.26	4.88	.54	6.69	7.80	4.08	1.13	1.28	.07	1.52	.24
1974	71.42	42.51	19.26	0.98	13.47	.35	3.42	1.04	11.44	10.35	12.60	0.67	3.19	.18	1.13	.67
1975	53.07	48.17	5.32	1.15	4.51	.43	1.97	.60	10.61	18.55	1.47	0.6	1.00	.11	.33	.14
1976	59.05	34.24	3.04	0.34	1.80	1.54	1.14	.68	21.51	7.43	0.80	0.18	.39	1.32	.28	.19
1977	34.72	79.06	3.55	0.68	1.94	.45	4.47	1.34	6.83	32.66	0.68	0.22	.49	.09	2.45	.54
1978	38.22	19.88	3.10	0.2	5.21	.44	2.37	.32	9.04	5.81	0.84	0.12	.85	.19	.56	.15
1979	57.65	29.94	1.64	0.18	3.72	2.05	.94	3.91	6.80	6.07	0.48	0.14	.90	.69	.31	2.15
1980	57.49	20.09	3.44	0.55	6.13	1.74	1.40	2.06	21.40	3.91	1.25	0.28	1.70	1.10	.25	.79
1981	50.69	29.86	3.78	0.29	4.46	1.48	3.60	3.35	10.93	4.45	0.81	0.09	1.13	.73	1.32	1.12
1982	49.29	40.24	3.44	0.85	8.15	1.61	3.63	4.32	7.57	13.64	0.56	0.42	2.31	.56	1.48	2.07
1983	49.03	18.05	3.80	0.2	6.01	.15	2.28	2.69	11.39	2.64	1.26	0.09	.81	.07	.70	1.93
1984	52.25	21.85	3.44	2.33	8.57	.93	4.87	4.01	11.98	4.50	0.84	1.03	2.27	.28	1.20	1.34
1985	41.36	22.79	4.55	2.31	4.62	.27	1.40	1.88	9.44	3.24	1.30	0.94	1.55	.17	.35	.49
1986	36.28	18.47	5.67	1.63	7.63	1.32	2.55	3.42	6.46	3.52	1.39	0.67	2.72	.54	.83	1.03
1987	32.83	24.88	2.28	2	7.67	.67	1.10	5.60	5.81	8.80	0.40	0.86	1.55	.35	.23	1.48
1988	28.32	18.21	2.96	1.67	11.31	2.77	1.60	7.08	4.69	1.92	0.44	0.58	4.07	1.61	.56	2.05
1989	37.73	22.22	6.07	2.13	8.37	1.28	1.70	6.57	10.96	3.07	2.16	0.73	1.81	.75	.57	1.47
1990	43.61	33.42	2.02	4.69	2.87	.66	.77	8.98	8.20	7.09	0.41	1.38	.73	.21	.30	4.76
1991	51.21	39.28	3.25	7.59	8.08	2.16	1.94	6.07	7.65	11.71	0.65	2.39	3.59	1.08	1.01	1.63
1992	29.97	31.31	2.97	1.74	9.33	1.77	.61	10.29	3.23	6.67	.77	.48	3.29	.72	.20	2.15
1993	27.78	18.07	3.52	3.85	5.26	1.85	1.47	5.44	3.86	3.39	.65	1.74	1.45	.63	.39	1.67
1994	28.21	16.76	5.59	1.86	14.35	4.66	2.13	5.44	5.02	2.98	1.77	0.52	3.62	1.44	.73	1.99

* No 4V data

Table 7a (Con't.) Mean number per tow and standard errors for 4V and 4W flatfish.

	4V								4W							
	Number/Tow				Standard Error				Number/Tow				Standard Error			
	Plaice	Y-tail	Witch	Winter	Plaice	Y-tail	Witch	Winter	Plaice	Y-tail	Witch	Winter	Plaice	Y-tail	Witch	Winter
1970	74.26	22.73	7.99	0	12.85	6.51	1.75	0	30.51	39.69	2.40	1.03	6.14	16.75	0.42	0.54
1971	79.11	19.05	11.23	0	36.76	4.79	4.34	0	21.55	33.52	1.81	1.30	3.16	12.81	0.56	0.60
1972	70.30	31.45	6.46	0	17.10	9.57	1.92	0	19.29	25.92	2.45	3.18	4.90	5.86	0.72	2.54
1973	33.80	29.76	6.51	0	7.81	13.07	1.09	0	34.44	28.87	10.66	1.42	14.46	9.30	7.37	1.13
1974	98.04	40.22	34.64	0	20.12	14.64	26.69	0	47.59	44.50	5.54	0.98	12.08	14.56	1.06	0.67
1975	66.50	57.31	7.09	0	12.87	23.96	2.62	0	41.96	40.59	3.87	1.15	16.16	27.43	1.58	0.60
1976	111.62	20.26	3.34	0	51.55	4.68	1.00	0	25.92	42.80	2.85	0.34	13.24	11.73	1.13	0.18
1977	54.10	135.27	4.73	0	12.47	72.05	1.22	0	18.74	32.75	2.58	0.68	7.04	5.35	0.72	0.22
1978	26.68	15.06	1.44	0	6.22	6.98	0.40	0	47.57	23.77	4.46	0.20	15.59	8.88	1.48	0.12
1979	88.93	18.38	1.44	0	9.15	5.22	0.41	0	31.86	39.41	1.80	0.18	9.83	10.19	0.81	0.14
1980	115.83	23.20	3.21	0	47.27	6.99	0.83	0	9.46	17.50	3.63	0.55	2.80	4.22	2.16	0.28
1981	86.87	25.38	4.58	0	21.52	6.17	1.17	0	20.89	33.51	3.13	0.29	9.13	6.31	1.12	0.09
1982	87.99	30.88	5.45	0	16.16	9.16	0.96	0	17.73	47.83	1.80	0.85	3.92	23.57	0.64	0.42
1983	83.75	16.12	4.39	0	22.96	3.68	1.17	0	20.73	19.61	3.32	0.20	8.77	3.74	2.09	0.09
1984	93.58	12.33	6.03	0	25.05	3.98	1.81	0	18.19	29.64	1.31	2.33	7.18	7.52	0.35	1.03
1985	69.95	17.09	5.26	0	20.47	4.65	1.97	0	17.80	27.44	3.97	2.31	3.50	4.50	1.72	0.94
1986	48.07	6.84	7.81	0.01	10.32	3.02	2.77	0.01	26.55	28.00	3.91	1.63	8.16	5.92	1.10	0.67
1987	47.78	4.06	3.12	0	10.10	1.32	0.66	0	20.50	41.96	1.59	2.00	6.56	15.98	0.47	0.86
1988	32.08	11.70	2.86	0	5.70	2.53	0.81	0	25.20	23.54	3.04	1.67	7.15	2.81	0.44	0.58
1989	66.27	11.63	6.57	0	23.50	4.28	1.52	0	14.22	30.91	5.66	2.13	3.77	4.34	3.72	0.73
1990	62.37	4.79	3.71	0	16.24	1.41	0.84	0	27.02	58.59	0.54	4.69	5.72	13.26	0.20	1.38
1991	69.81	10.29	5.12	0.34	11.28	4.23	1.42	0.34	36.01	62.82	1.72	7.59	10.40	20.94	0.26	2.39
1992	45.44	12.23	5.08	0	6.42	5.93	1.66	0	17.08	47.21	1.21	3.20	2.53	11.18	0.28	0.88
1993	39.45	4.70	5.15	0	6.95	2.18	0.98	0	18.19	29.07	2.17	7.02	4.11	5.92	0.86	3.17
1994	44.66	5.77	10.45	0	10.74	4.67	3.88	0	14.69	25.79	1.58	3.39	2.37	3.84	0.44	0.95

Table 7b. Mean weights/tow and standard errors for 4V, 4W and 4X flatfish for 1970 - 1994 (Summer Survey).

Mean Weight/Tow												
Year	4V				4W				4X			
	Plaice	Yellow-tail Flounder	Witch Flounder	Winter Flounder	Plaice	Yellow-tail Flounder	Witch Flounder	Winter Flounder	Plaice	Yellow-tail Flounder	Witch Flounder	Winter Flounder
1970	20.97	7.06	3.43	0	5.86	7.17	0.96	0.29	3.74	0.15	1.42	0.21
1971	26.96	5.79	4.45	0	5.72	5.70	0.84	0.46	1.85	0.15	0.59	0.13
1972	21.27	9.97	2.88	0	3.86	5.50	1.26	1.82	1.66	0.31	2.25	0.11
1973	12.27	8.20	3.09	0	8.54	5.99	4.32	0.69	2.07	0.07	3.29	0.26
1974	30.72	11.10	14.40	0	9.49	8.82	2.73	0.50	3.76	0.14	2.36	0.47
1975	21.86	13.13	2.92	0	13.60	7.77	2.69	0.37	1.45	0.19	1.83	0.39
1976	39.75	6.81	1.28	0	9.04	9.88	1.62	0.18	0.54	0.44	0.71	0.42
1977	14.83	31.65	2.03	0	5.92	7.87	1.25	0.30	0.75	0.45	3.37	1.34
1978	10.78	5.06	0.67	0	11.56	6.99	1.81	0.09	1.27	0.18	1.96	0.30
1979	31.21	6.77	0.50	0	9.58	9.68	0.80	0.08	1.37	0.50	0.70	2.34
1980	44.93	7.72	1.55	0	2.01	4.54	1.39	0.37	2.79	0.99	1.23	1.28
1981	33.66	8.10	2.08	0	7.05	7.99	1.17	0.25	1.42	0.85	2.25	2.16
1982	29.34	11.55	2.53	0	3.22	13.67	0.64	0.55	2.37	0.42	1.88	2.61
1983	24.13	5.58	1.75	0	3.99	4.38	1.09	0.14	1.87	0.07	1.77	0.95
1984	24.63	4.56	2.10	0	4.68	5.81	0.46	1.25	2.62	0.19	2.77	2.22
1985	27.47	6.50	1.96	0	3.76	5.96	1.24	1.15	1.08	0.16	0.93	0.76
1986	14.08	2.78	3.14	0.06	3.68	5.00	1.30	0.51	1.35	0.38	1.44	1.79
1987	15.41	1.62	1.21	0	4.28	6.91	0.59	0.66	1.69	0.17	0.74	1.75
1988	11.23	4.61	1.11	0	3.84	4.93	0.89	0.83	1.89	0.89	0.93	3.54
1989	23.10	4.66	1.47	0	1.93	5.71	1.47	0.70	1.39	0.29	1.06	2.90
1990	17.13	2.01	1.11	0	3.56	8.12	0.07	1.24	0.76	0.20	0.39	4.41
1991	16.09	3.37	1.39	0.04	5.37	11.58	0.59	1.85	1.22	0.53	0.79	3.09
1992	12.88	4.34	1.11	0	2.29	7.42	0.30	0.79	2.17	0.48	0.30	4.14
1993	8.87	1.37	1.09	0	2.33	3.84	0.17	1.79	0.86	0.46	0.70	2.04
1994	6.90	1.41	1.70	0	1.80	3.50	0.19	0.64	1.94	0.94	0.61	1.97

Standard Error												
Year	4V				4W				4X			
	Plaice	Yellow-tail Flounder	Witch Flounder	Winter Flounder	Plaice	Yellow-tail Flounder	Witch Flounder	Winter Flounder	Plaice	Yellow-tail Flounder	Witch Flounder	Winter Flounder
1970	3.42	2.51	0.63	0	1.15	2.29	0.16	0.14	2.80	0.11	0.63	0.16
1971	8.27	2.00	1.22	0	1.04	1.95	0.23	0.23	0.88	0.11	0.28	0.12
1972	3.87	2.65	0.66	0	0.78	1.15	0.42	1.55	0.64	0.15	0.66	0.02
1973	2.46	3.03	0.70	0	3.49	1.66	2.72	0.59	0.67	0.03	0.83	0.12
1974	8.24	3.11	10.24	0	4.06	2.33	0.76	0.37	0.89	0.07	0.67	0.31
1975	3.62	2.87	0.73	0	5.10	4.78	1.21	0.18	0.28	0.06	0.31	0.10
1976	15.67	1.25	0.46	0	4.68	2.50	0.65	0.08	0.13	0.38	0.21	0.16
1977	3.12	9.97	0.56	0	2.70	1.25	0.32	0.09	0.21	0.09	1.57	0.54
1978	2.47	2.33	0.21	0	4.29	2.93	0.55	0.06	0.33	0.09	0.51	0.11
1979	5.02	1.92	0.16	0	4.04	2.22	0.33	0.06	0.46	0.13	0.19	1.46
1980	17.97	1.69	0.38	0	0.49	0.91	0.77	0.17	0.85	0.64	0.24	0.51
1981	7.72	1.80	0.57	0	4.41	1.24	0.42	0.14	0.47	0.50	0.61	0.70
1982	4.91	3.69	0.49	0	0.99	7.40	0.22	0.25	0.69	0.15	0.50	1.19
1983	6.02	1.32	0.52	0	2.10	0.88	0.66	0.07	0.38	0.03	0.76	0.60
1984	6.59	1.50	0.50	0	1.98	1.24	0.13	0.61	0.77	0.08	0.84	0.70
1985	10.01	1.77	0.62	0	0.94	0.91	0.47	0.57	0.40	0.09	0.27	0.27
1986	2.65	1.19	0.88	0.06	1.14	0.99	0.34	0.23	0.53	0.17	0.37	0.49
1987	2.92	0.47	0.21	0	1.40	1.93	0.19	0.27	0.37	0.08	0.15	0.37
1988	2.02	0.92	0.26	0	0.90	0.65	0.30	0.39	0.62	0.52	0.35	0.82
1989	9.28	1.64	0.32	0	0.44	0.79	0.85	0.20	0.33	0.15	0.33	0.72
1990	4.75	0.58	0.30	0	0.91	1.52	0.03	0.40	0.19	0.09	0.15	2.32
1991	2.42	1.48	0.48	0.04	1.15	3.67	0.13	0.60	0.47	0.24	0.25	0.78
1992	1.96	2.07	0.28	0	0.42	1.59	0.09	0.24	0.76	0.18	0.14	0.87
1993	1.56	0.68	0.22	0	4.11	0.77	0.10	0.87	0.31	0.15	0.31	1.67
1994	1.20	1.15	0.87	0	0.40	0.47	0.06	0.22	0.45	0.29	0.23	0.73

Table 7b (Con't.) Mean weight per tow and standard error for 4VW flatfish.

	Plaice		Yellowtail		Witch		Winter	
	Weight	Standard Error	Weight	Standard Error	Weight	Standard Error	Weight	Standard Error
1970	12.64	1.66	7.12	1.69	2.07	0.30	0.16	0.08
1971	15.30	3.77	5.74	1.40	2.47	0.56	0.25	0.13
1972	11.72	1.80	7.52	1.35	1.99	0.38	1.00	0.85
1973	10.22	2.21	6.99	1.64	3.76	1.53	0.38	0.32
1974	19.84	4.44	10.29	1.92	8.31	4.85	0.29	0.19
1975	17.33	3.24	10.19	2.92	2.80	0.74	0.20	0.10
1976	20.90	6.70	8.70	1.61	1.49	0.43	0.11	0.05
1977	9.94	2.05	18.60	4.55	1.60	0.31	0.17	0.05
1978	11.21	2.61	6.11	1.95	1.30	0.32	0.05	0.03
1979	19.34	3.17	8.37	1.49	0.66	0.19	0.04	0.03
1980	21.38	8.11	5.97	0.91	1.46	0.45	0.20	0.09
1981	19.06	4.24	8.04	1.06	1.58	0.35	0.14	0.08
1982	14.94	2.27	12.72	4.41	1.49	0.25	0.30	0.14
1983	13.03	2.94	4.92	0.76	1.38	0.43	0.08	0.04
1984	13.68	3.17	5.25	0.96	1.20	0.24	0.69	0.33
1985	14.46	4.55	6.20	0.94	1.57	0.38	0.63	0.32
1986	8.37	1.35	4.00	0.76	2.13	0.44	0.31	0.13
1987	9.30	1.53	4.52	1.08	0.87	0.14	0.36	0.15
1988	7.18	1.04	4.79	0.55	0.99	0.20	0.45	0.21
1989	11.48	4.19	5.24	0.85	1.47	0.49	0.39	0.11
1990	10.05	2.28	5.57	0.85	0.56	0.14	0.71	0.21
1991	10.18	1.26	7.90	2.13	0.95	0.23	1.04	0.33
1992	7.12	0.92	6.08	1.28	0.67	0.14	0.44	0.13
1993	5.28	0.76	2.72	0.52	0.59	0.11	0.98	0.48
1994	4.11	0.58	2.55	0.58	0.87	0.40	0.35	0.12

Table 8. Minimum Biomass (t) estimates for Southwest Nova Scotia (4X).

	Plaice	Yellowtail	Witch	Winter
1970	5889	228	2354	328
1971	2916	240	877	202
1972	2615	493	3545	170
1973	3249	103	5176	415
1974	5918	219	3720	747
1975	2273	298	2876	620
1976	857	686	1090	666
1977	1177	700	5306	2106
1978	1996	278	2991	355
1979	1856	786	1452	3677
1980	4394	1556	1927	2020
1981	2231	1330	3532	3404
1982	3735	668	2959	4103
1983	2935	108	2779	1491
1984	4082	296	4316	3453
1985	1695	251	1459	1195
1986	2118	602	2262	2813
1987	2659	262	1161	2750
1988	2973	1400	1460	5560
1989	2191	460	1660	4560
1990	1192	307	606	6935
1991	1924	836	1236	4857
1992	3417	752	467	6512
1993	1359	726	1093	3211
1994	3043	1477	967	3093

Table 9. Flatfish individual and combined CPUE for OTB TC 1-3 where one or any flatfish species was main species.

	Plaice	Yellowtail	Witch Flounder	Winter Flounder	Unspecified	Any Flatfish (MS)
<u>4VW</u>						
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	.102	.312	.153	-	.204	.247
<u>4X</u>						
1989	.156		.086	.008	.137	.131
1990	.087	.055	.093	.120	.112	.113
1991	.092	.065	.102	.101	.083	.088
1992	.067	.059	.085	.077	.071	.073
1993	-	.041	.064	.066	.060	.061
1994	.056	.041	.063	.065	.055	.059

Table 10. Mobile gear commercial samples for 4VW and 4X.

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

4X				
	Winter	Witch	Yellowtail	Plaice
1990	2	-	-	-
1991	3	5	-	-
1992	4	3	-	-
1993	9	2	-	1
1994	1	8	-	2

Table 11. 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

Table 12a. Mean numbers/tow and standard errors for flatfish for 1986 - 1995 (Spring Survey).

Year	Mean #'s/tow				Standard Error			
	Plaice	Yellow-tail Flounder	Witch Flounder	Winter Flounder	Plaice	Yellow-tail Flounder	Witch Flounder	Winter Flounder
1986	20.04	15.95	4.19	0.04	3.77	3.62	1.40	0.02
1987	23.12	25.70	9.13	0.13	3.08	7.55	3.16	0.05
1988	21.22	34.87	5.43	0.08	5.67	9.85	2.05	0.04
1989	12.16	12.58	3.71	0.16	1.89	2.67	1.10	0.06
1990	22.78	10.76	1.76	0.07	2.76	2.38	0.40	0.02
1991	16.53	10.31	2.25	0.00	4.78	6.30	0.66	0.00
1992	13.42	2.72	1.93	0.01	2.00	0.78	0.54	0.01
1993	10.76	18.49	1.57	0.17	2.13	8.99	0.50	0.07
1994	12.47	10.16	2.65	0.29	2.61	2.43	0.78	0.09
1995	9.91	2.02	6.83	0.02	1.84	0.51	1.85	0.02

Table 12b. Mean weight/tow and standard errors for flatfish for 1986 - 1995 (Spring Survey).

Year	Mean weight/tow				Standard Error			
	Plaice	Yellow-tail Flounder	Witch Flounder	Winter Flounder	Plaice	Yellow-tail Flounder	Witch Flounder	Winter Flounder
1986	5.24	3.77	1.51	0.01	1.09	0.81	0.60	0.01
1987	7.17	5.86	3.93	0.04	0.97	1.72	1.60	0.02
1988	6.40	6.76	2.67	0.02	2.03	1.64	1.36	0.02
1989	2.59	2.40	0.87	0.04	0.44	0.42	0.25	0.02
1990	4.07	1.86	0.26	0.03	0.55	0.42	0.09	0.01
1991	3.12	1.63	0.38	0.00	1.14	0.86	0.12	0.00
1992	2.68	0.46	0.40	0.00	0.46	0.18	0.17	0.00
1993	2.41	3.01	0.07	0.03	0.64	1.39	0.03	0.02
1994	2.30	1.46	0.37	0.06	1.04	0.37	0.19	0.02
1995	2.03	0.16	0.22	0.01	0.53	0.05	0.09	0.01

Appendix 1. The number of vessel trips fishing with the species identified on the Log Record only; identified on the corresponding Purchase Slip only; identified on the Log Record and the corresponding Purchase Slip; ZIF landings (tonnes). The value below each trip count represents the number of trips found in the ZIF data.

Species Code	Species Name	Log Record Only	Purchase Slip Only	Log Record and Purchase Slip	ZIF Landings (tonnes)
<u>4VW in 1993</u>					
100	Cod	13 0	100 100	359 347	527.992
110	Haddock	6 0	19 19	106 106	120.286
120	Redfish	10 0	71 69	159 153	2,278.827
130	Halibut	1 0	19 19	6 6	1.565
140	Plaice	527 0	0 0	0 0	0
141	Yellowtail	40 0	22 22	163 163	1,494.298
142	Greysole	14 0	120 120	485 454	469.071
143	Winter Flounder	1 0	0 0	1 1	1.490
144	Turbot	1 0	98 90	13 7	1.535
149	Unspecified Flounder	0 0	571 546	37 35	1,383.930
170	Pollock	4 0	46 46	87 87	161.302
171	White Hake	6 0	212 209	106 85	41.715
174	Catfish	4 0	169 162	20 14	3.796
177	Monkfish	2 0	116 114	30 27	10.061
<u>4X in 1993</u>					
100	Cod	25 0	112 112	3,901 3,841	5,686.185
110	Haddock	33 0	125 125	2,692 2,671	2,155.645
120	Redfish	43 0	214 214	423 423	782.870
130	Halibut	21 0	1,096 1,095	279 279	107.353
140	Plaice	1,674 0	0 0	0 0	0
141	Yellowtail	397 0	40 37	89 85	35.843

142	Greysole	681 0	138 130	323 323	362.293
143	Winter Flounder	413 0	106 96	151 150	243.479
144	Turbot	0 0	0 0	0 0	0
149	Unspecified Flounder	26 0	3,233 3,151	587 548	3,099.189
170	Pollock	57 0	249 249	2,392 2,390	3,621.403
171	White Hake	40 0	882 882	579 579	515.446
174	Catfish	44 0	1,194 1,193	793 771	365.843
177	Monkfish	18 0	1,682 1,680	267 256	293.807
<u>4VW in 1994</u>					
100	Cod	8 0	61 60	173 168	33.397
110	Haddock	6 0	22 22	58 58	10.258
120	Redfish	1 0	28 28	49 49	370.902
130	Halibut	2 0	22 22	3 3	0.676
140	Plaice	288 0	0 0	1 1	0.310
141	Yellowtail	49 0	6 6	132 132	900.983
142	Greysole	19 0	53 53	216 206	232.407
143	Winter Flounder	1 0	2 2	0 0	0.035
144	Turbot	2 0	87 80	4 1	1.312
149	Unspecified Flounder	0 0	313 303	12 12	1,106.761
170	Pollock	1 0	23 23	37 37	41.584
171	White Hake	0 0	99 91	27 27	7.833
174	Catfish	1 0	87 86	3 3	0.920
177	Monkfish	3 0	61 53	8 8	3.840
<u>4X in 1994</u>					

100	Cod	9 1	62 61	3,026 2,986	4,178.221
110	Haddock	36 1	82 82	2,248 2,227	1,927.199
120	Redfish	41 0	174 174	515 515	1,459.595
130	Halibut	20 0	721 721	258 257	35.704
140	Plaice	1,177 0	33 33	109 90	61.783
141	Yellowtail	348 0	119 119	70 70	90.219
142	Greysole	674 0	138 138	468 468	373.889
143	Winter Flounder	428 0	383 371	214 214	487.114
144	Turbot	0 0	0 0	0 0	0
149	Unspecified Flounder	55 1	2,190 2,163	266 254	2,004.684
170	Pollock	45 0	161 160	2,199 2,188	2,700.720
171	White Hake	31 0	743 742	844 844	612.224
174	Catfish	40 0	730 730	680 658	264.098
177	Monkfish	20 0	1,194 1,194	653 639	789.126

4X FLATFISH LANDINGS



Fig. 1

4X FLATFISH LANDINGS BY SPECIES

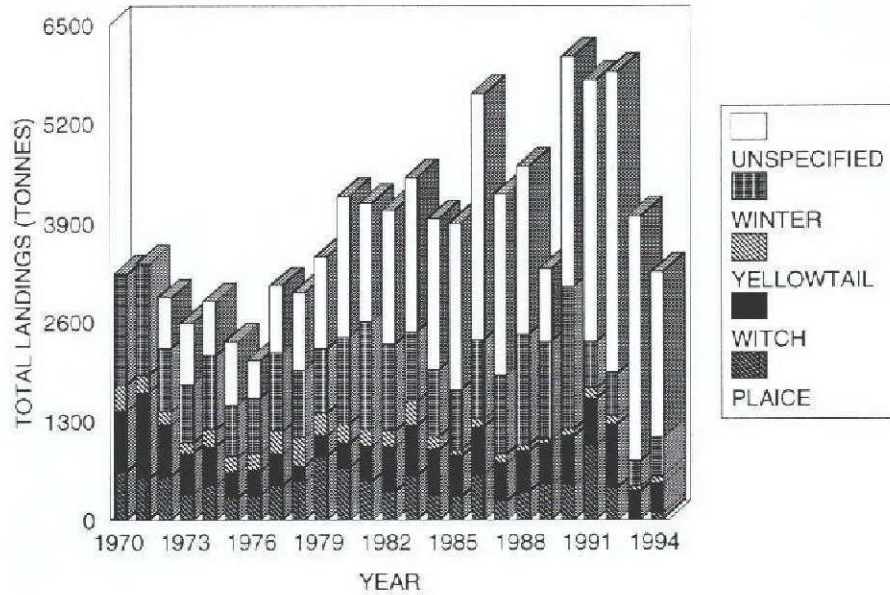


Fig. 2

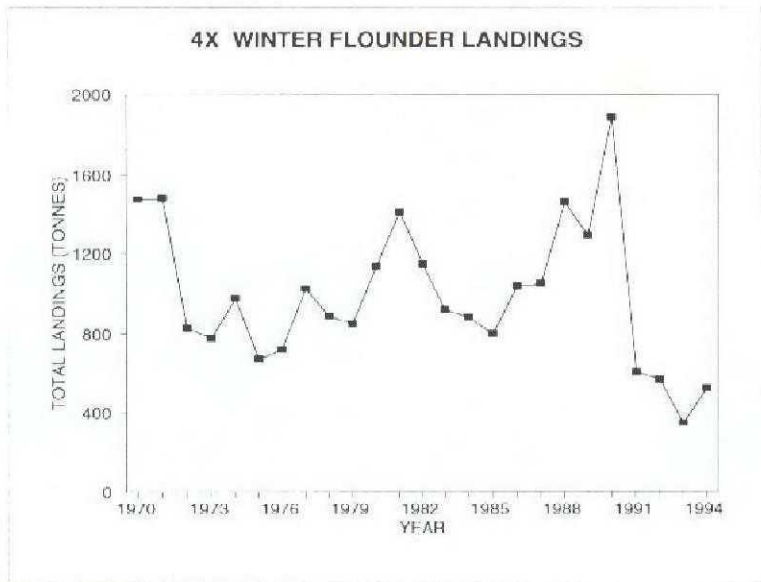


Fig. 3

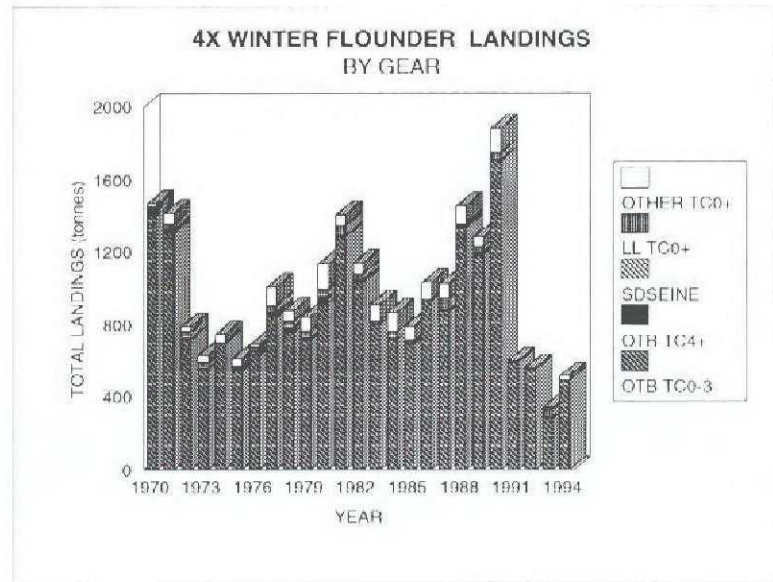


Fig. 4

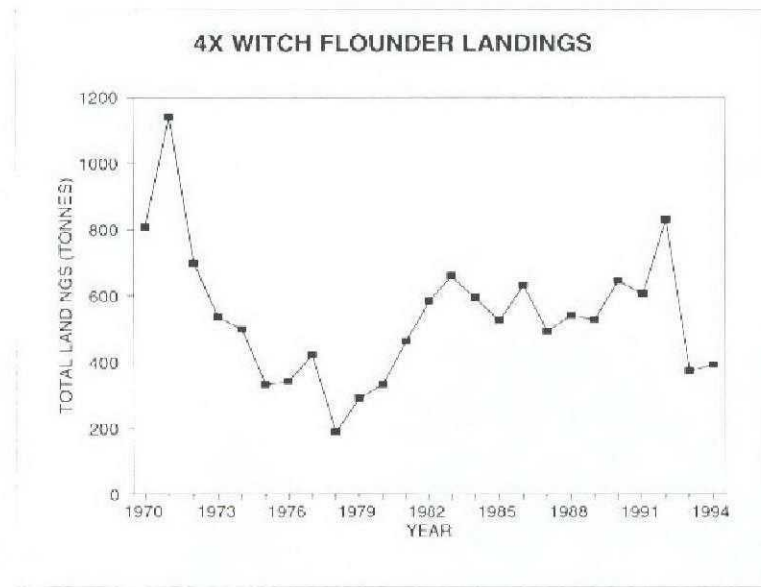


Fig. 5

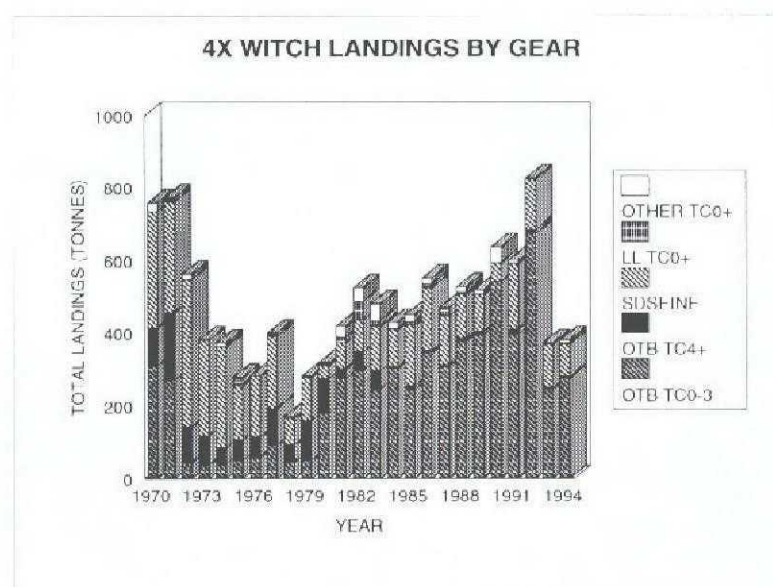


Fig. 6

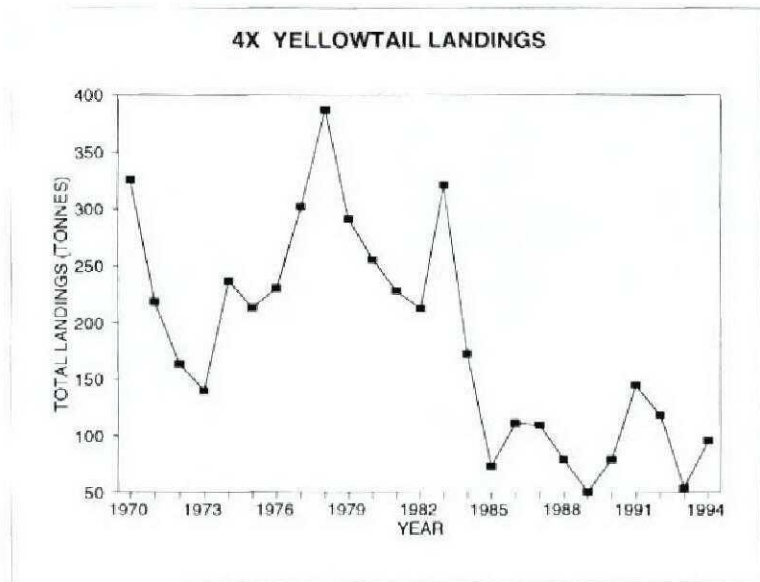


Fig. 7

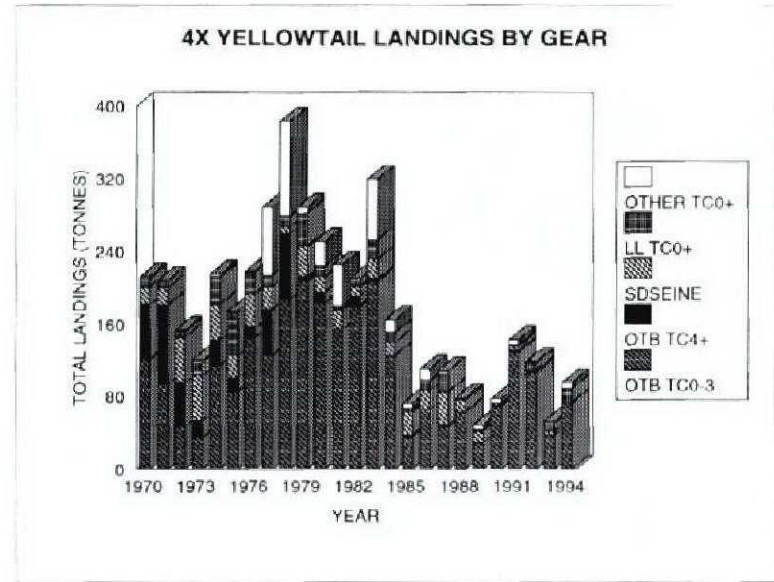


Fig. 8

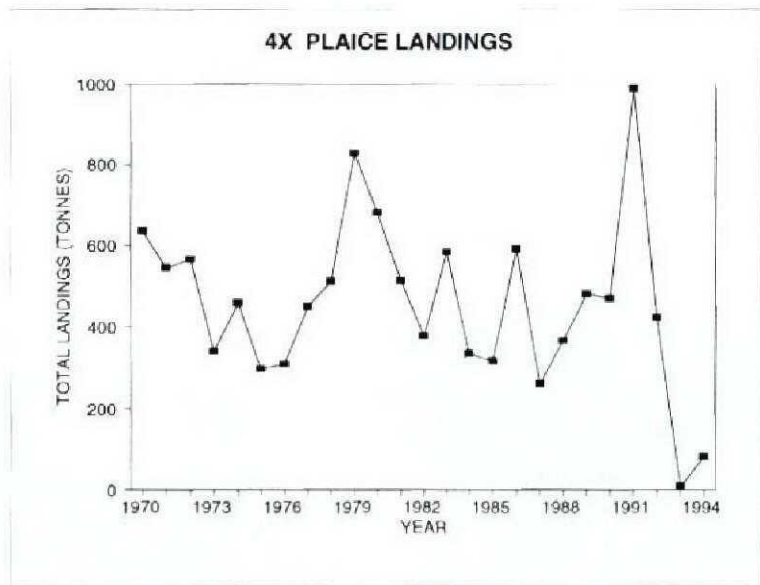


Fig. 9

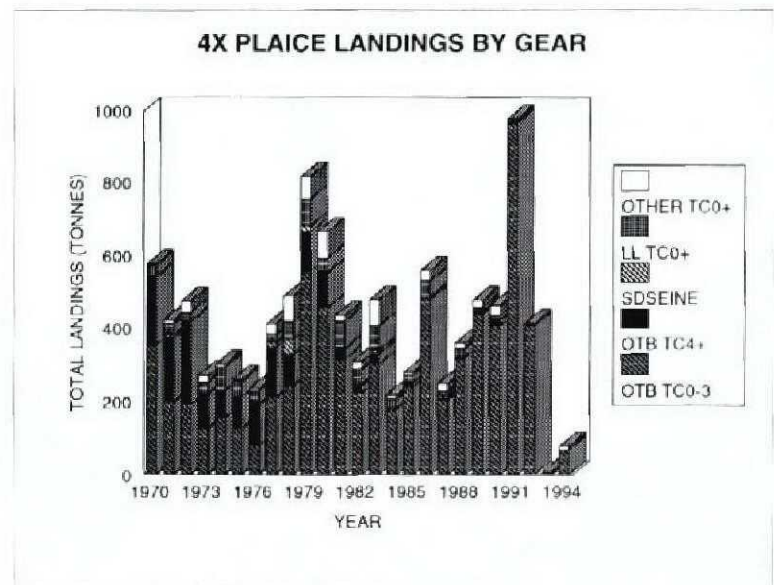


Fig. 10

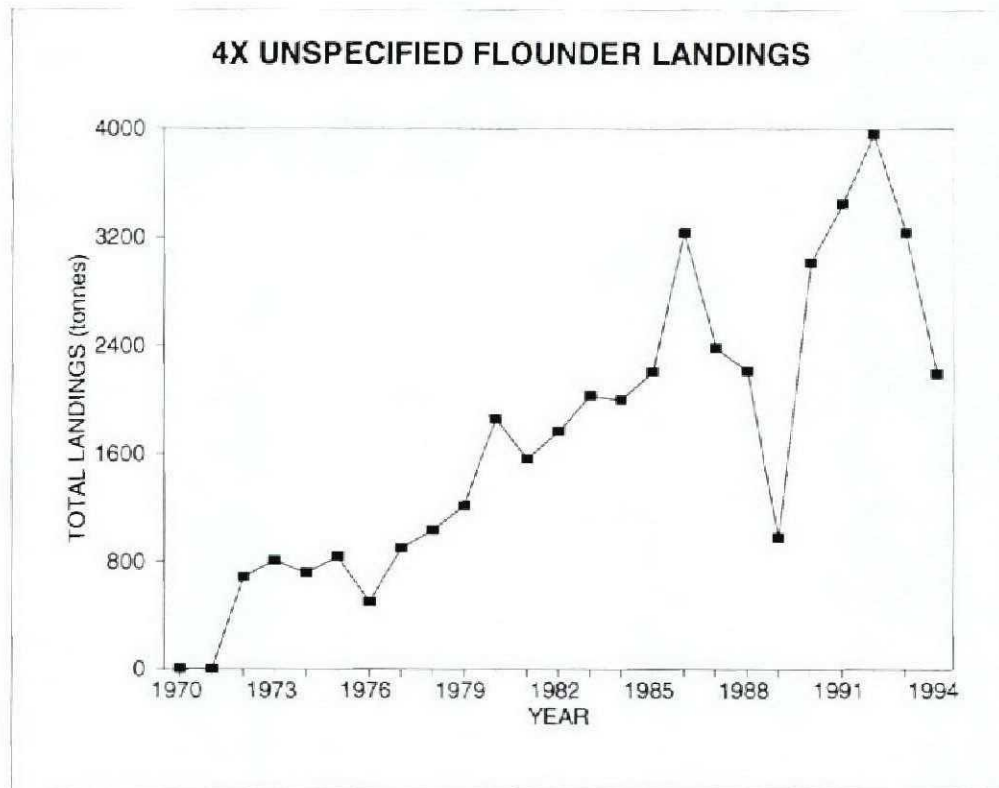


Fig. 11

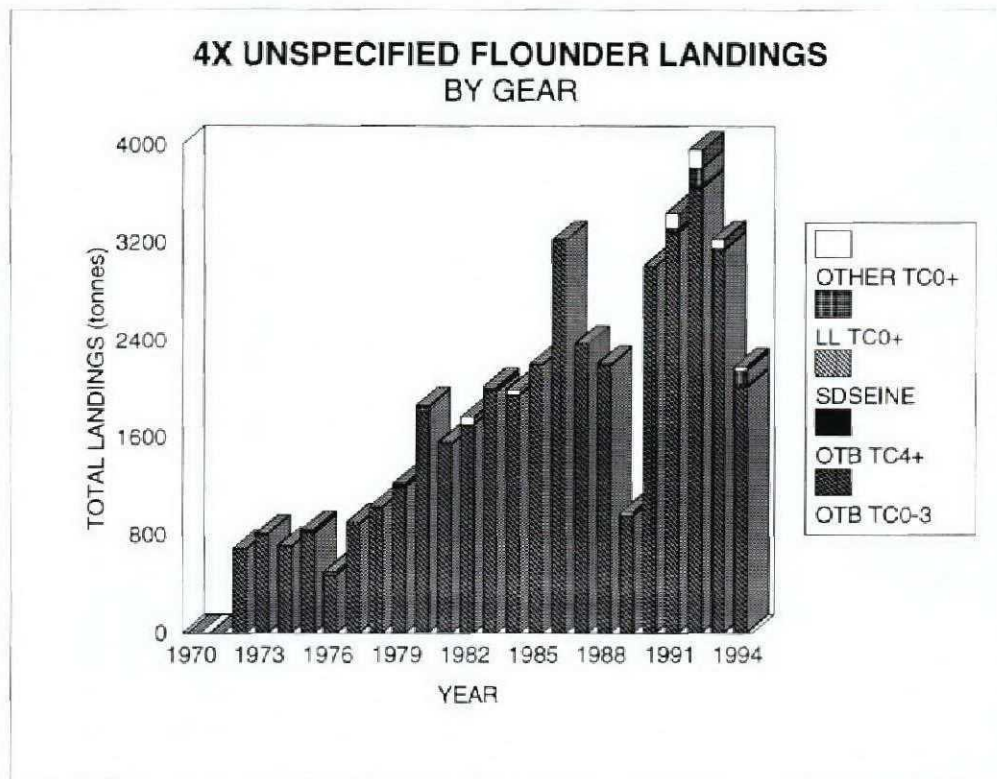


Fig. 12

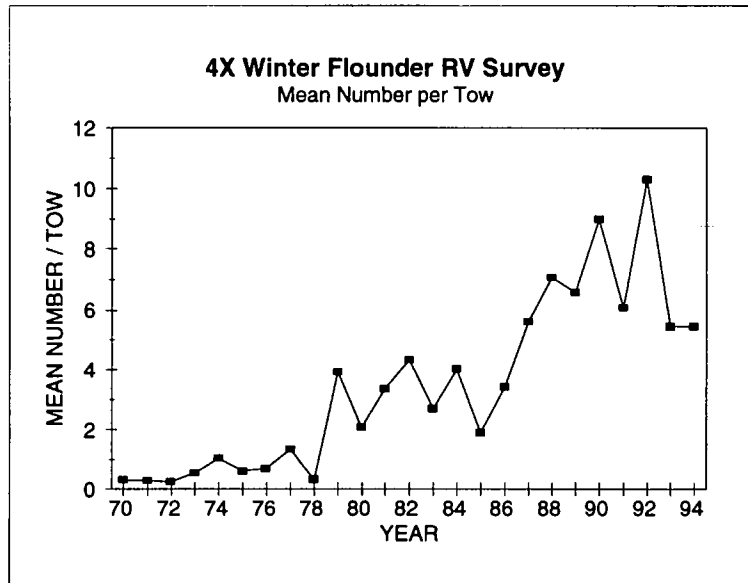


Fig. 13

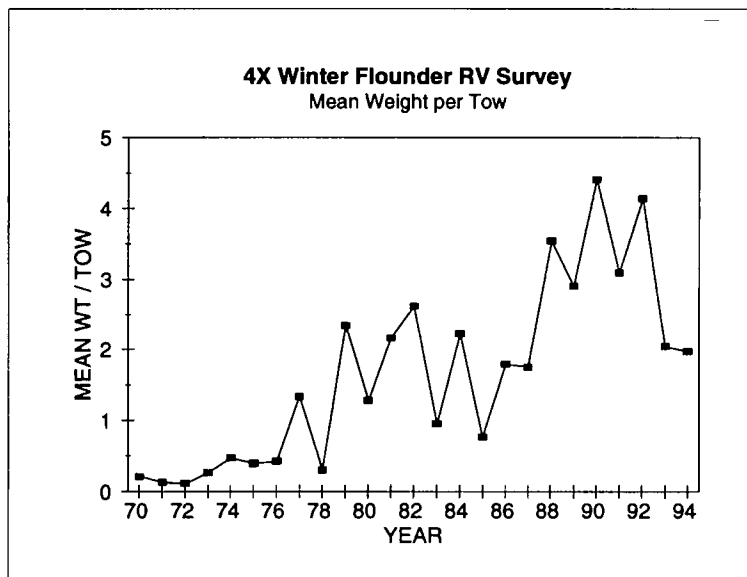


Fig. 14

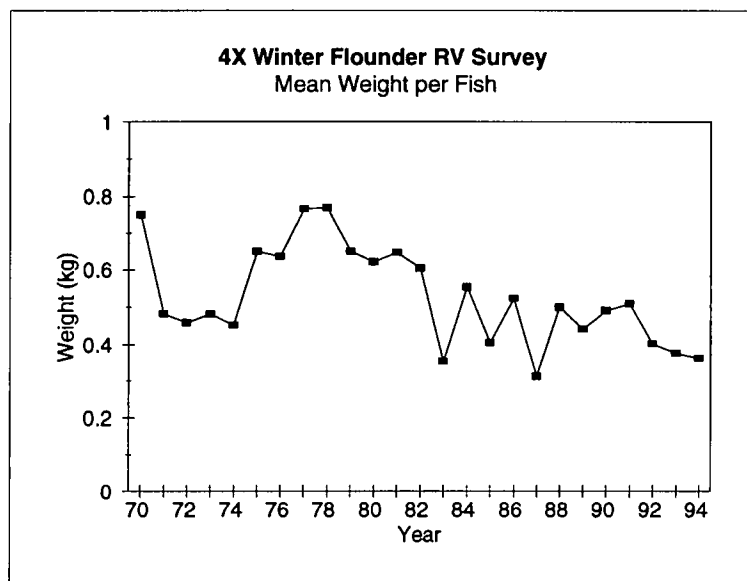


Fig. 15

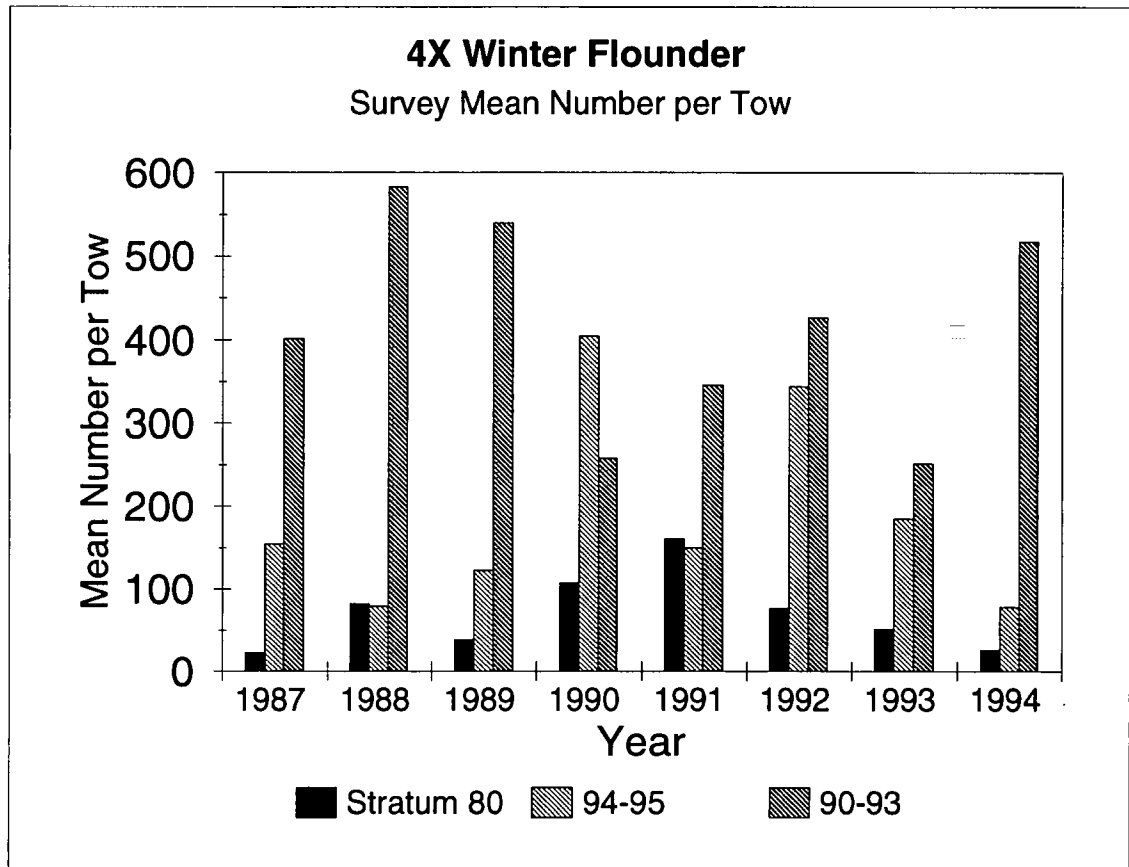
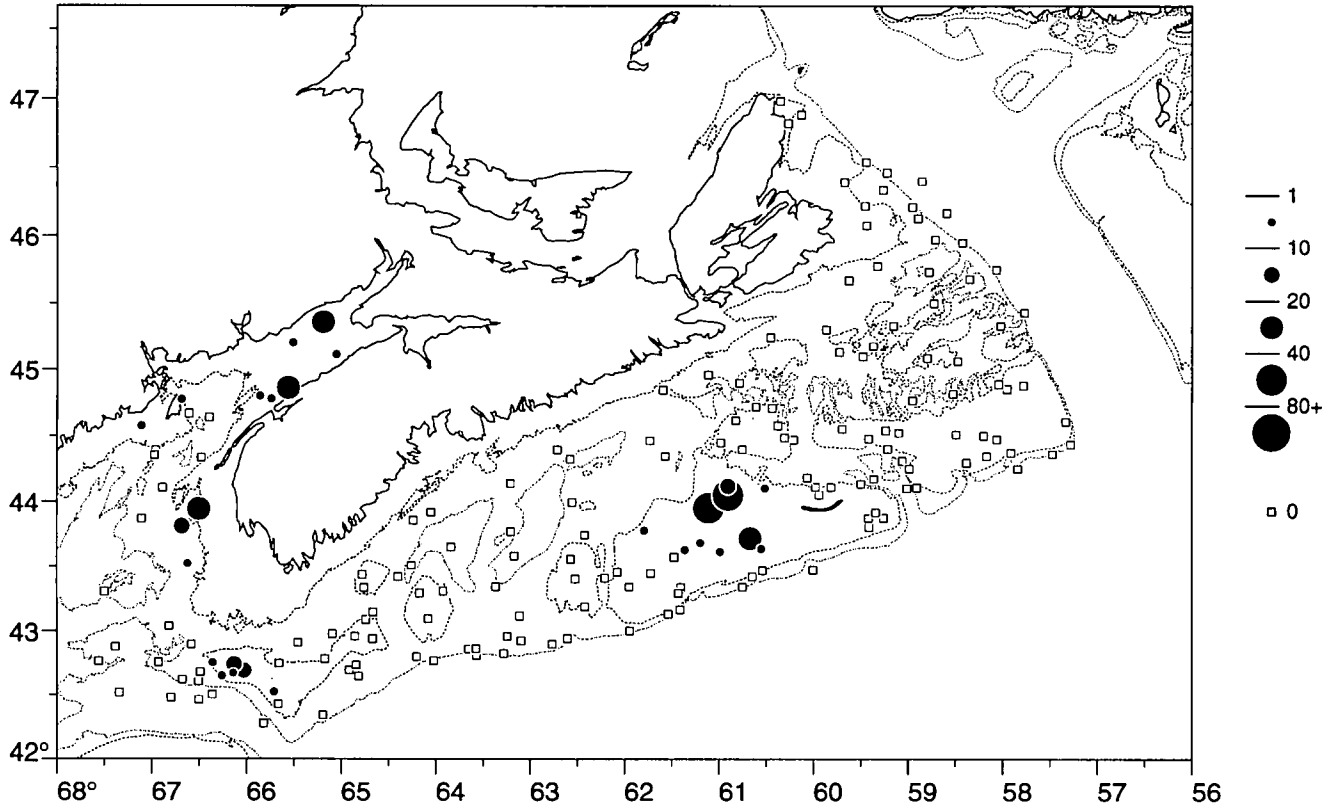


Fig. 16

WINTER FLOUNDER (ALL STRATA) CATCHES (KG) FROM SCOTIA FUNDY SUMMER 93 GROUND FISH SURVEY



WINTER FLOUNDER (ALL STRATA) CATCHES (KG) FROM SCOTIA FUNDY SUMMER 94 GROUND FISH SURVEY

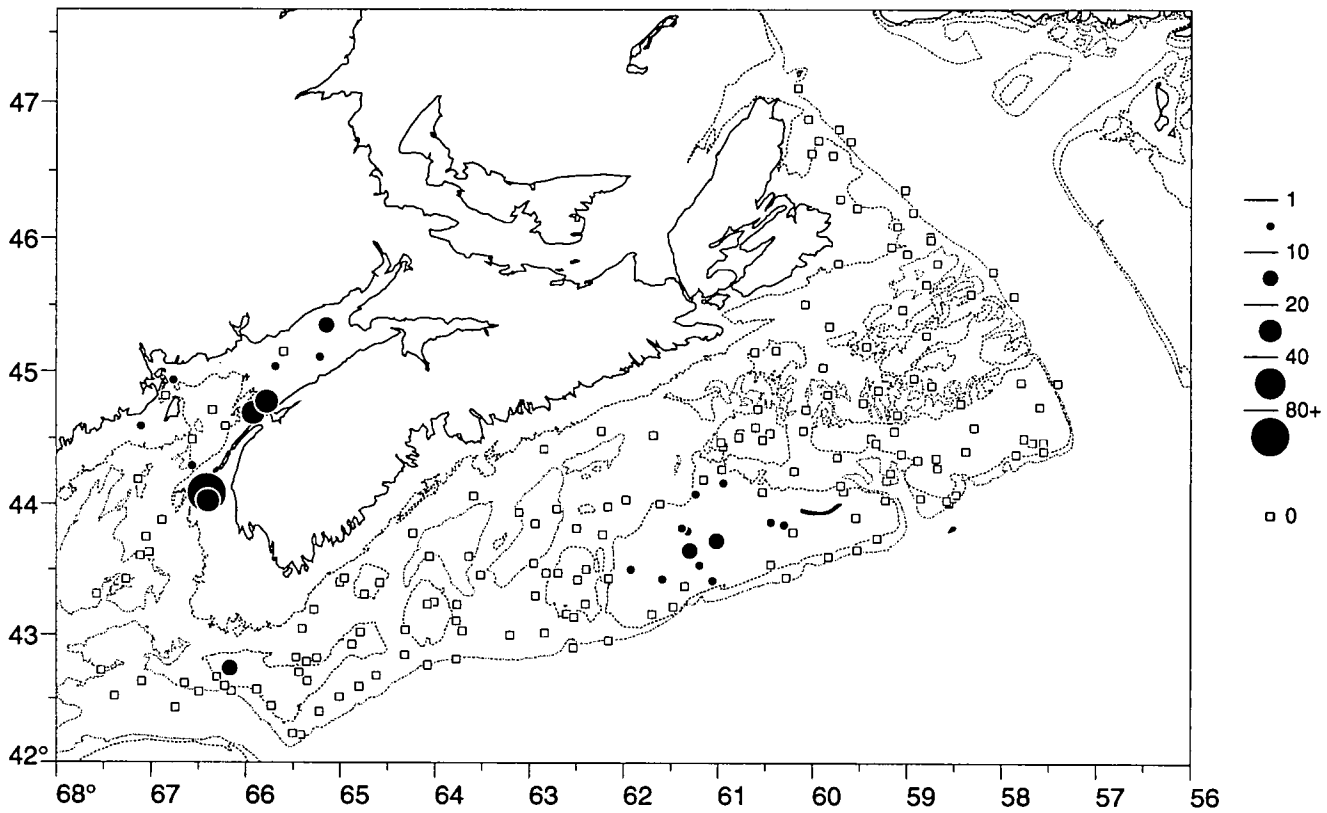


Fig. 17

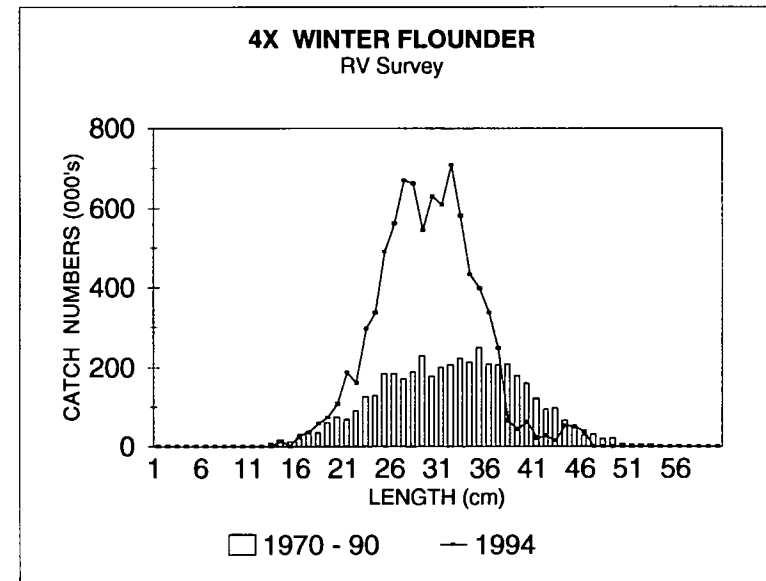
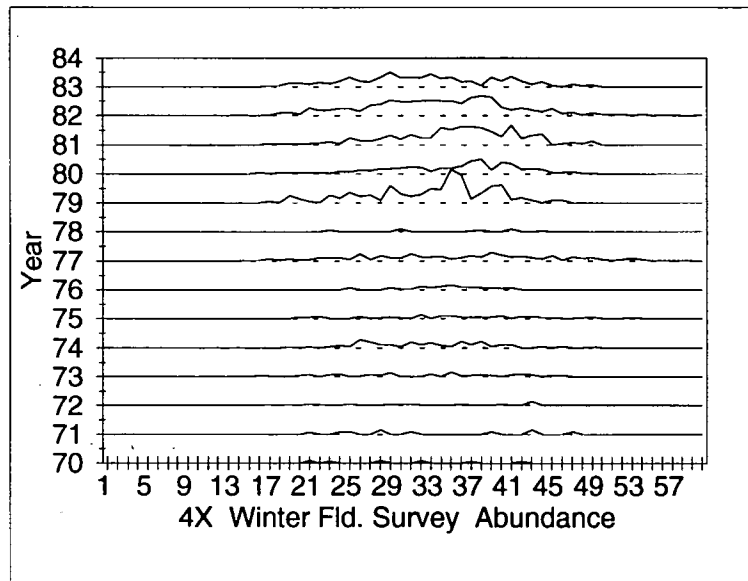
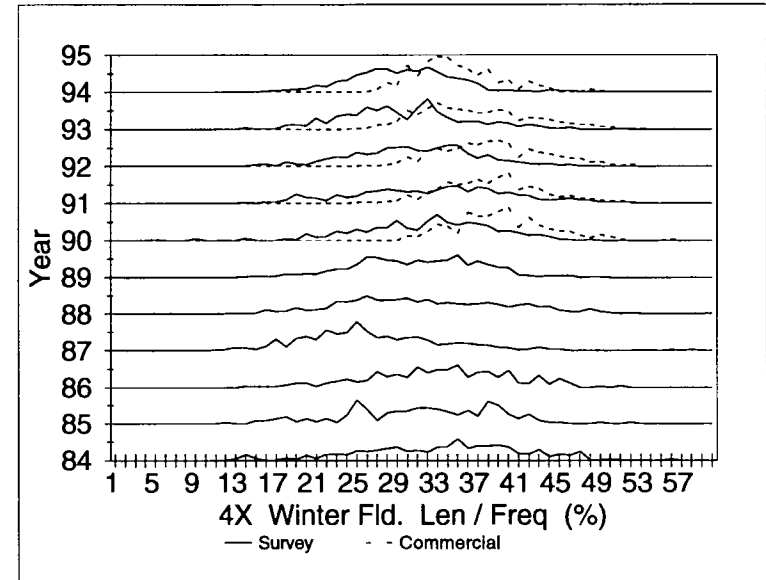
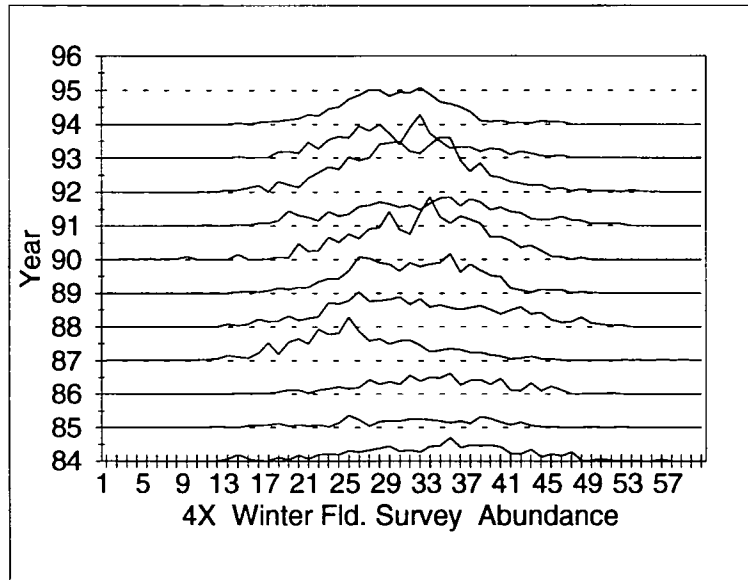


Fig. 18a

Fig. 18b

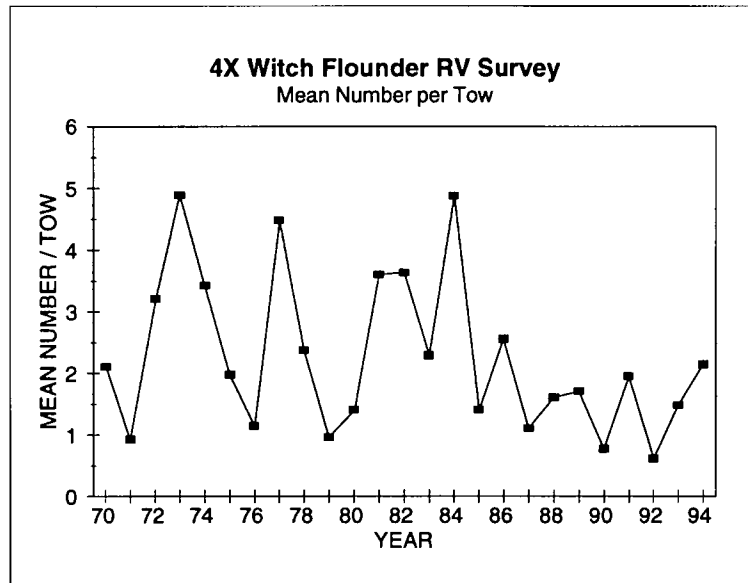


Fig. 19

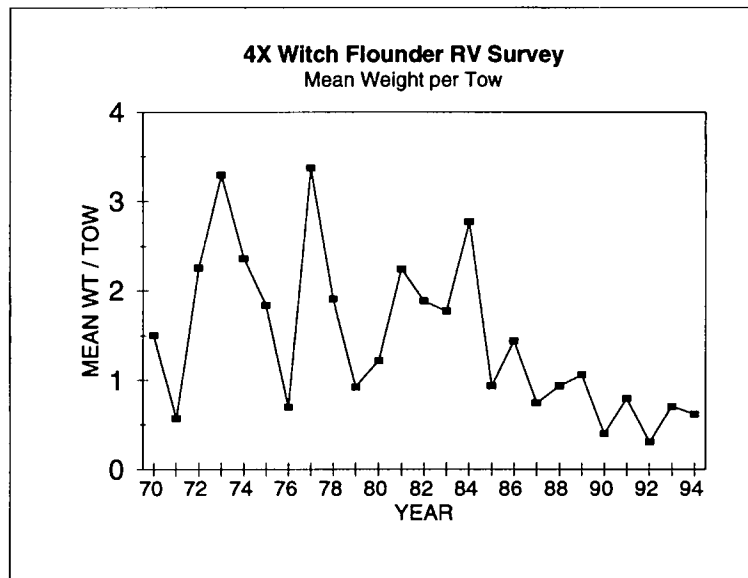


Fig. 20

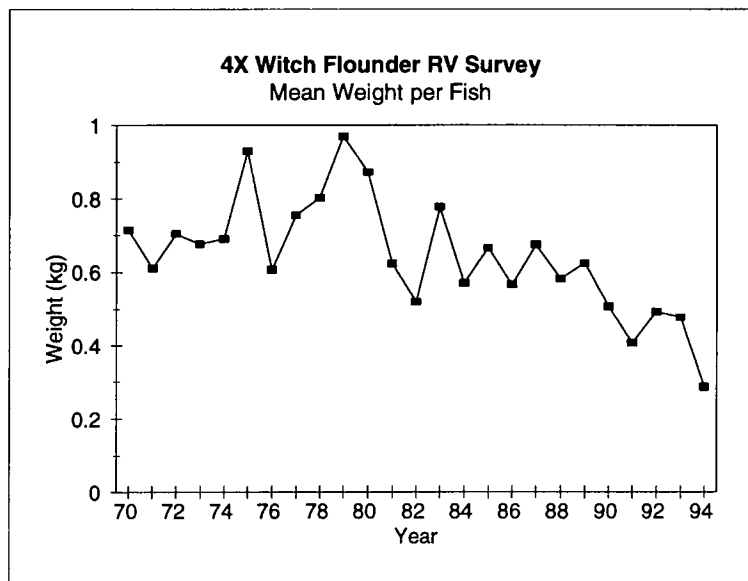
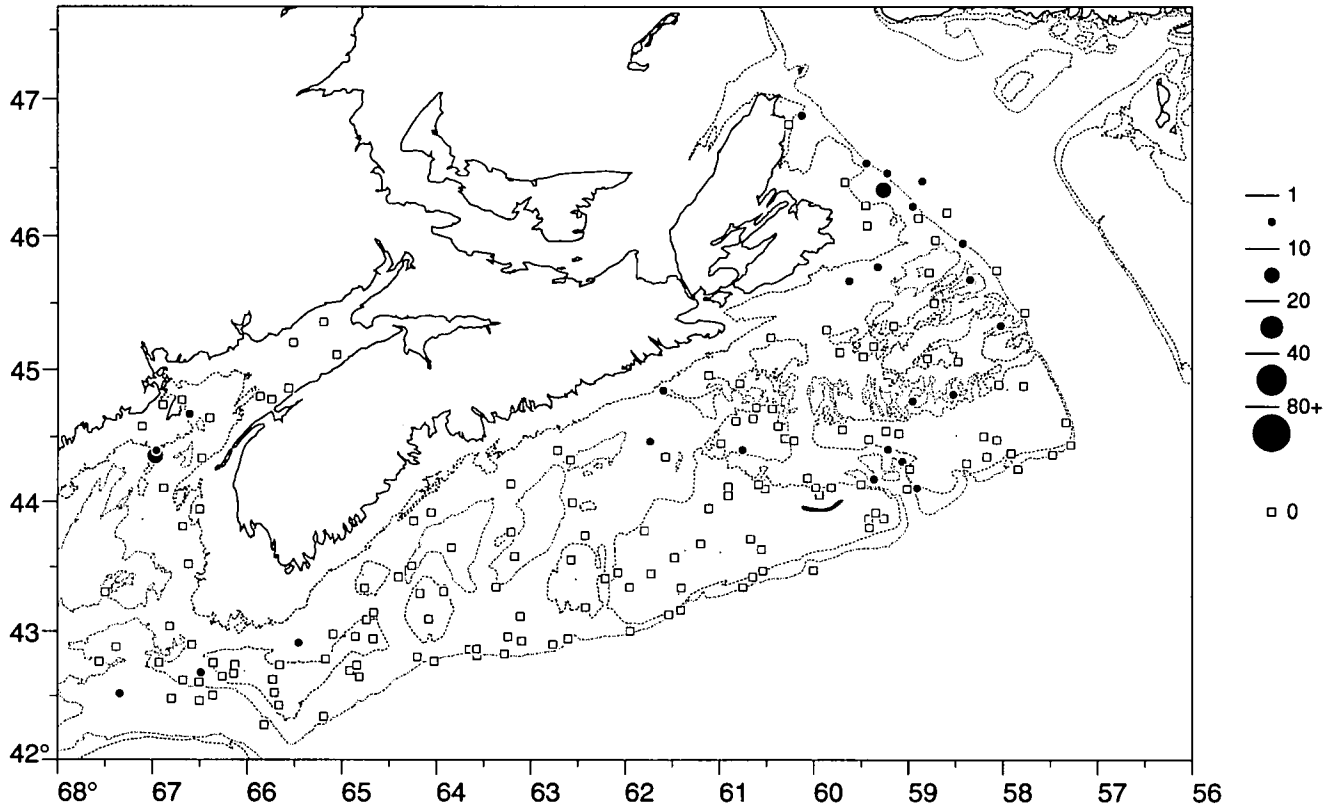


Fig. 21

WITCH FLOUNDER (ALL STRATA) CATCHES (KG) FROM SCOTIA FUNDY SUMMER 93 GROUND FISH SURVEY



WITCH FLOUNDER (ALL STRATA) CATCHES (KG) FROM SCOTIA FUNDY SUMMER 94 GROUND FISH SURVEY

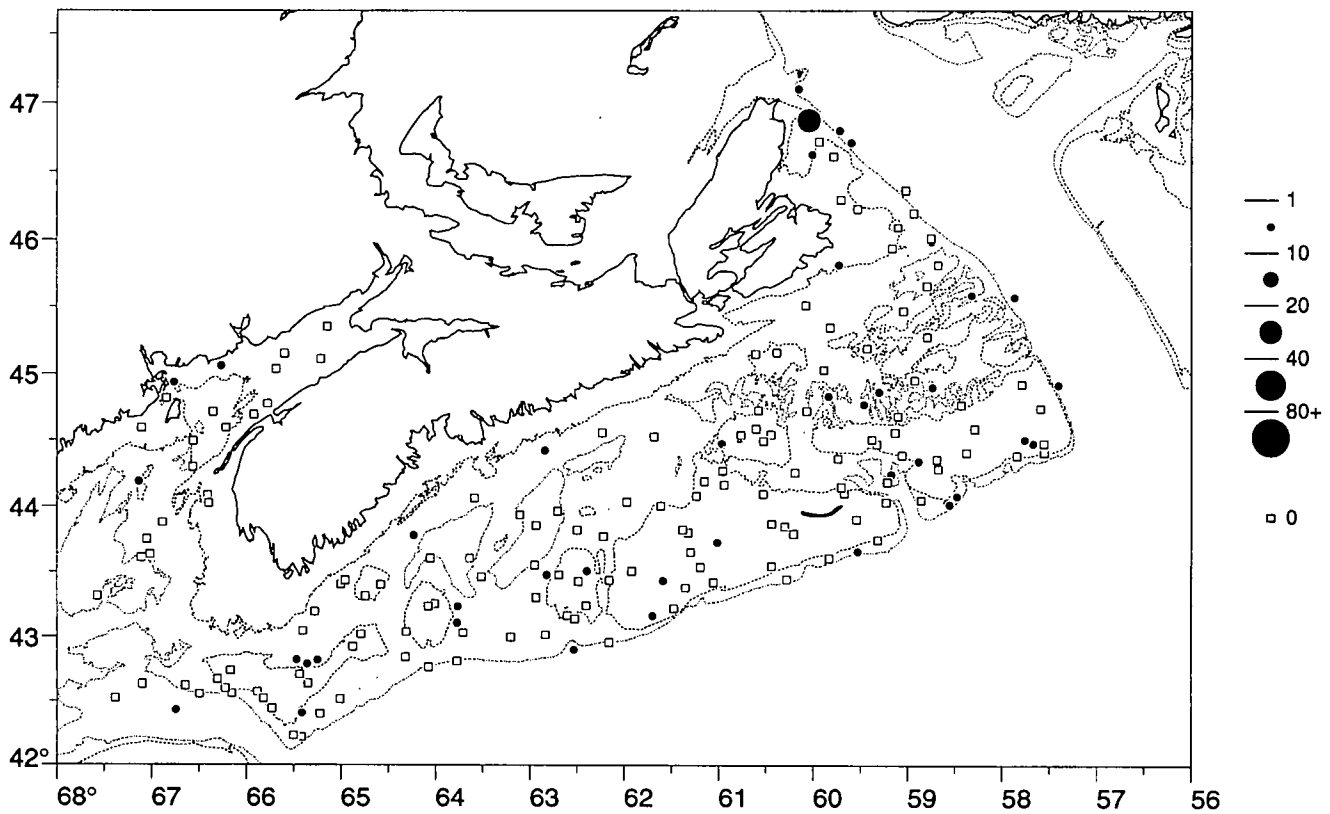


Fig. 22

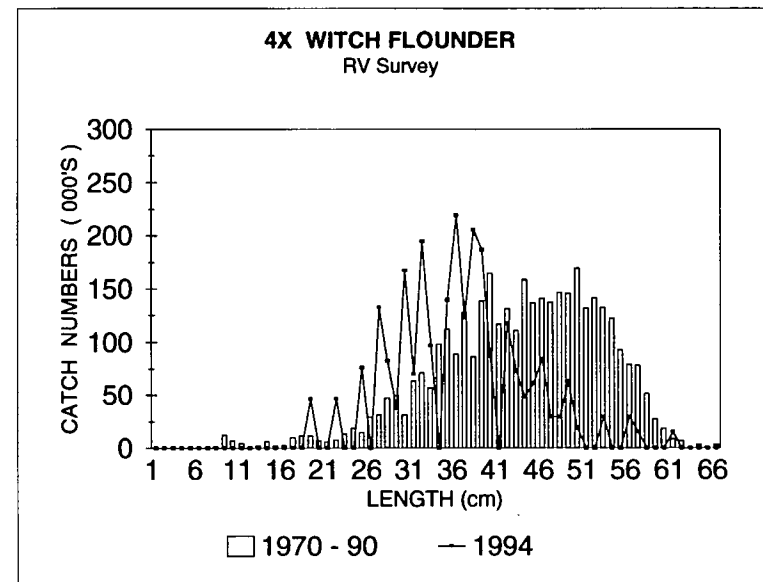
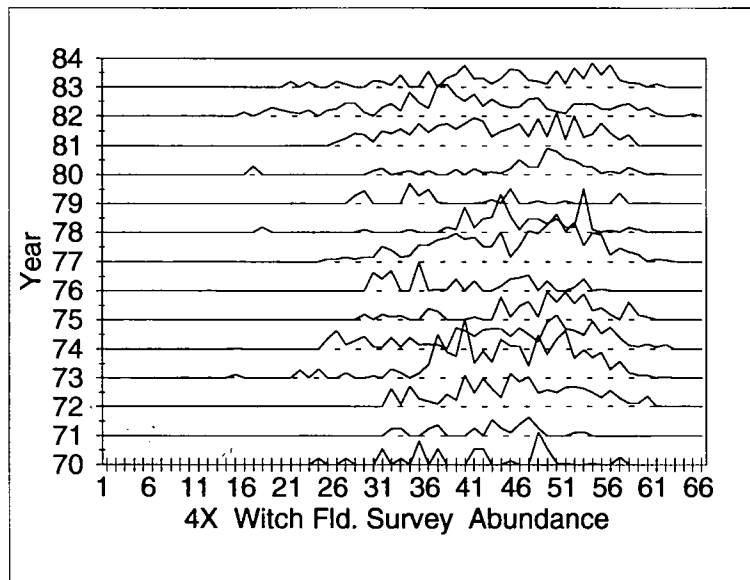
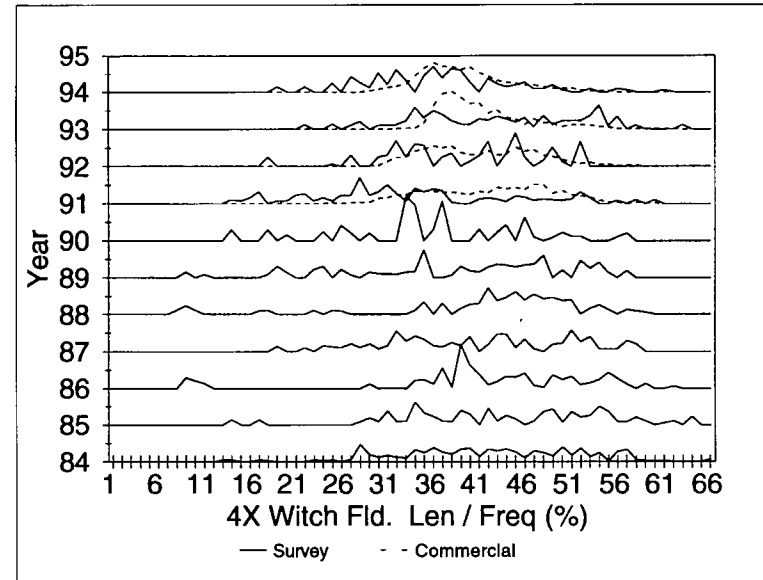
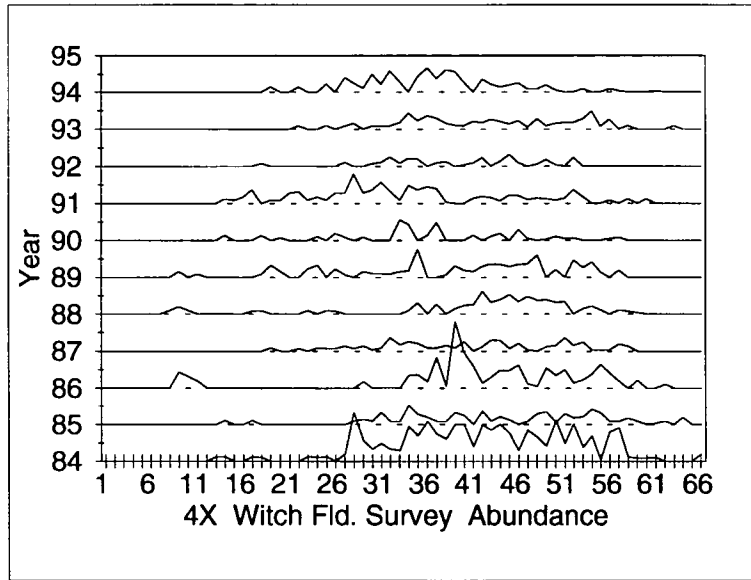


Fig. 23a

Fig. 23b

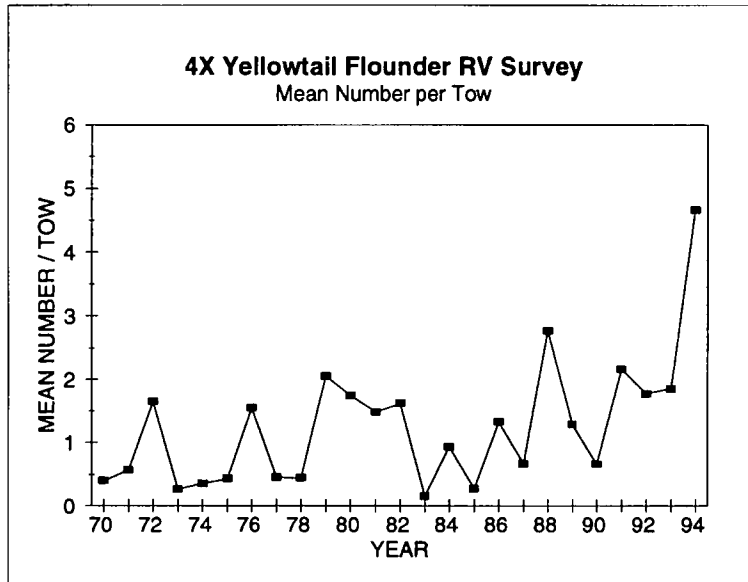


Fig. 24

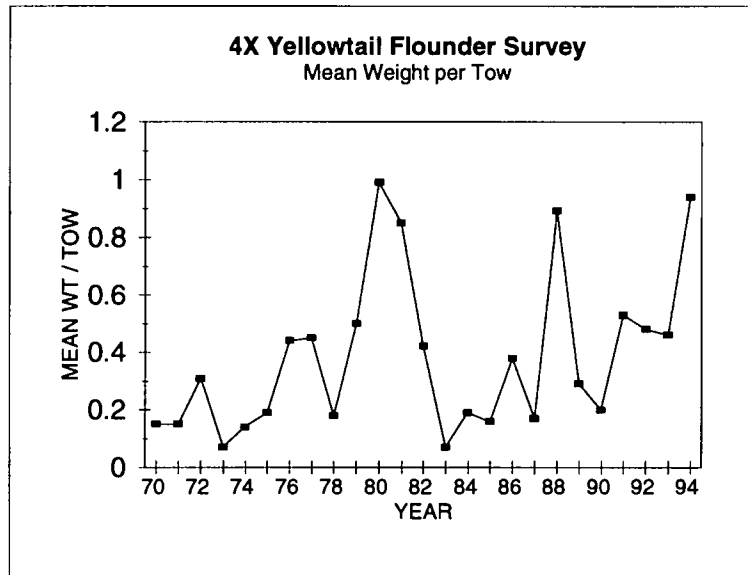


Fig. 25

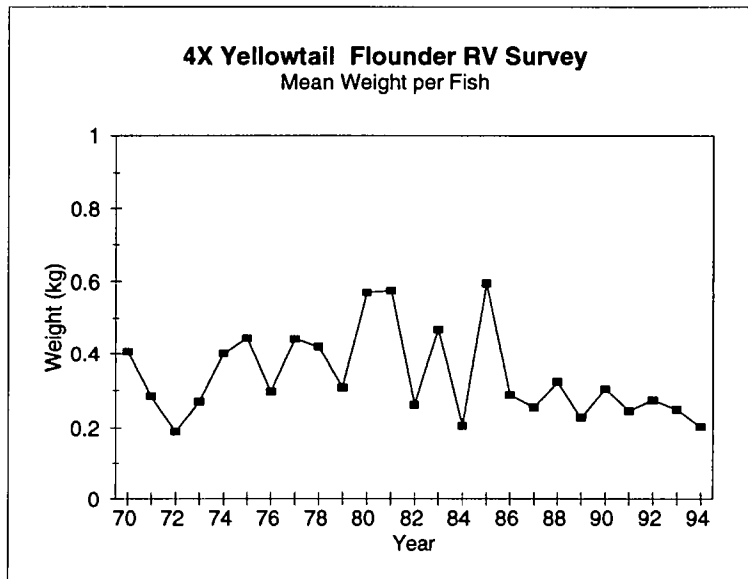
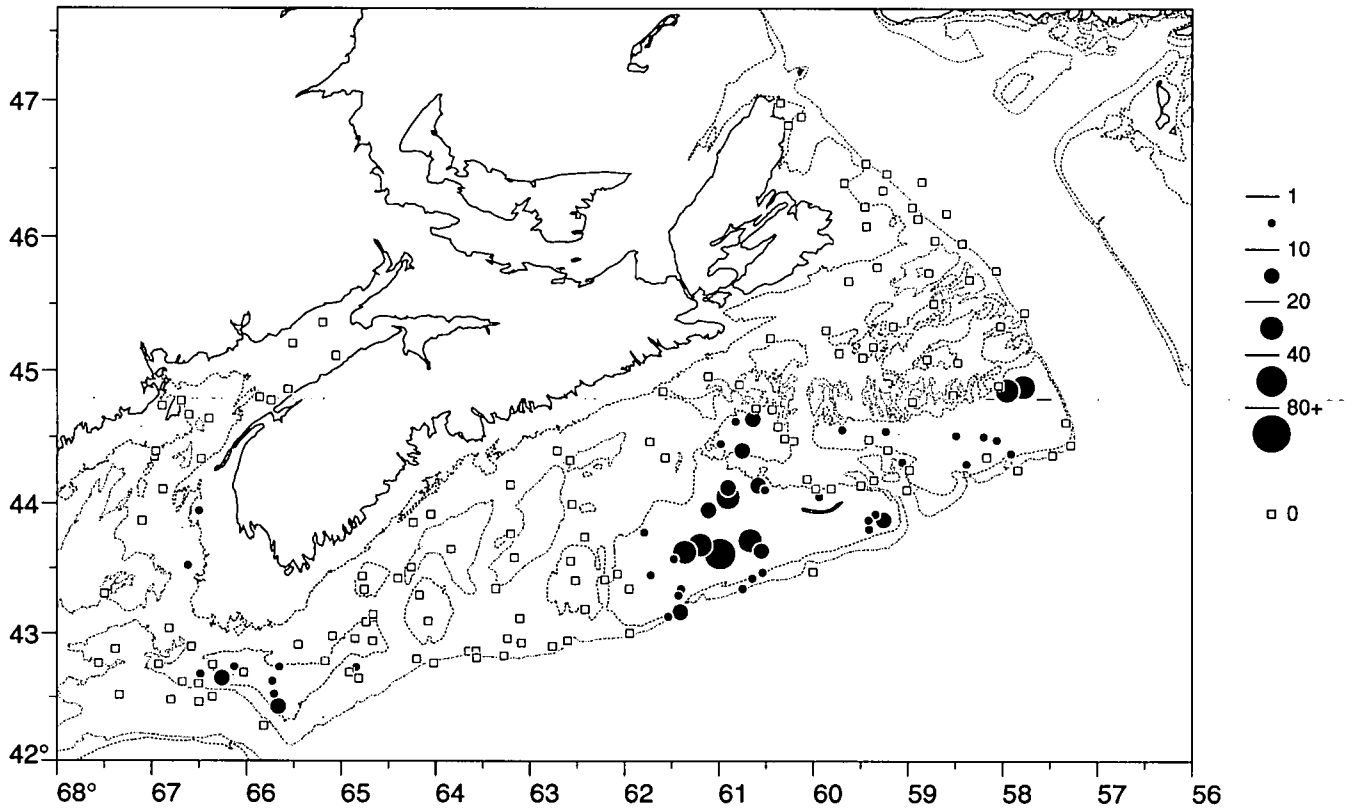


Fig. 26

YELLOWTAIL FLOUNDER (ALL STRATA) CATCHES (KG) FROM SCOTIA FUNDY SUMMER 93 GROUND FISH SUR



YELLOWTAIL FLOUNDER (ALL STRATA) CATCHES (KG) FROM SCOTIA FUNDY SUMMER 94 GROUND FISH SUR

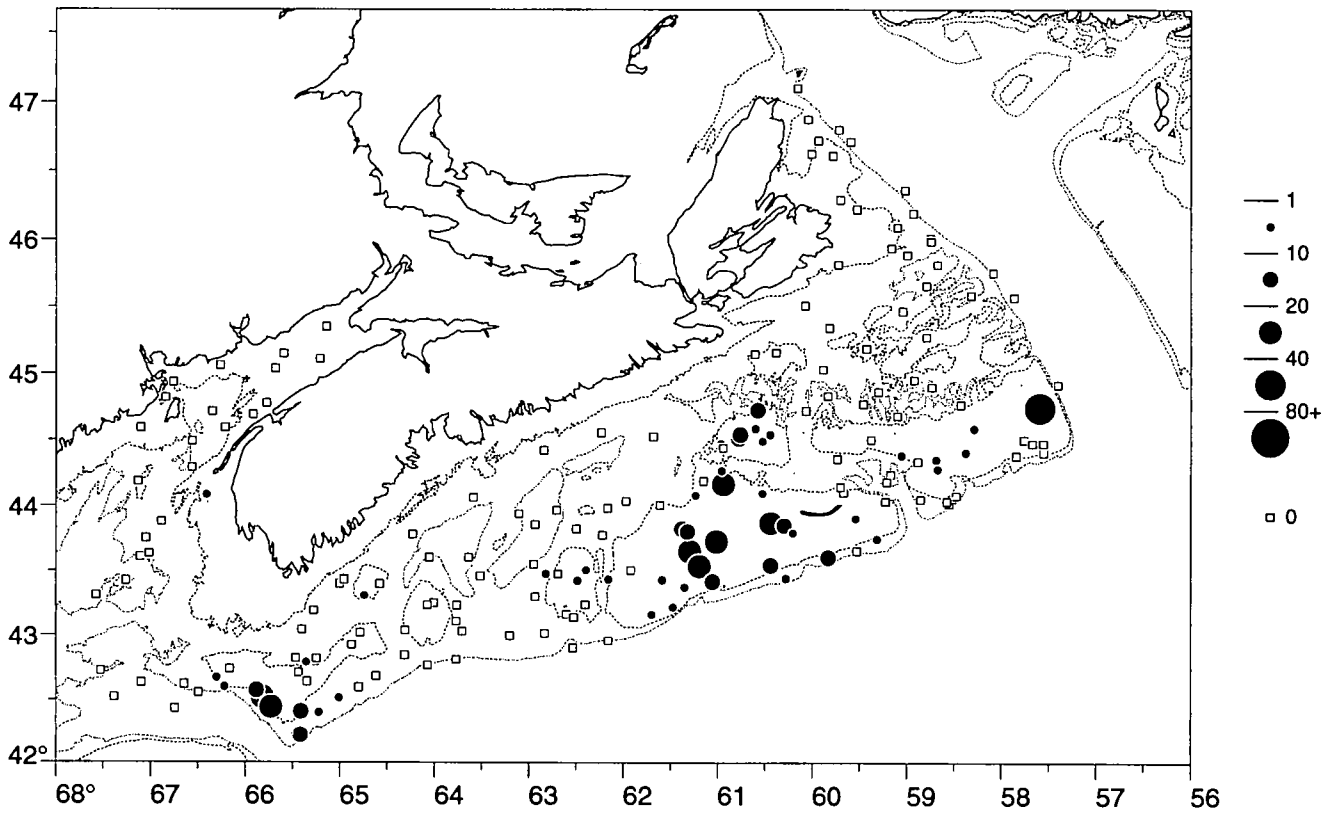


Fig. 27

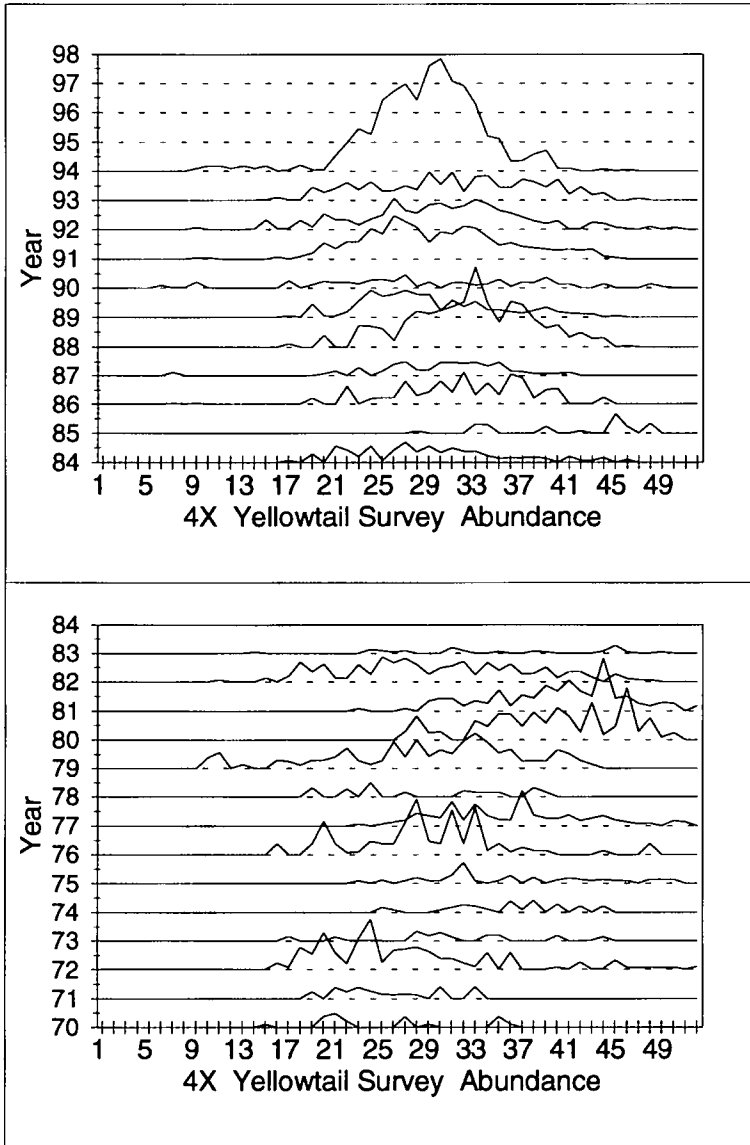


Fig. 28

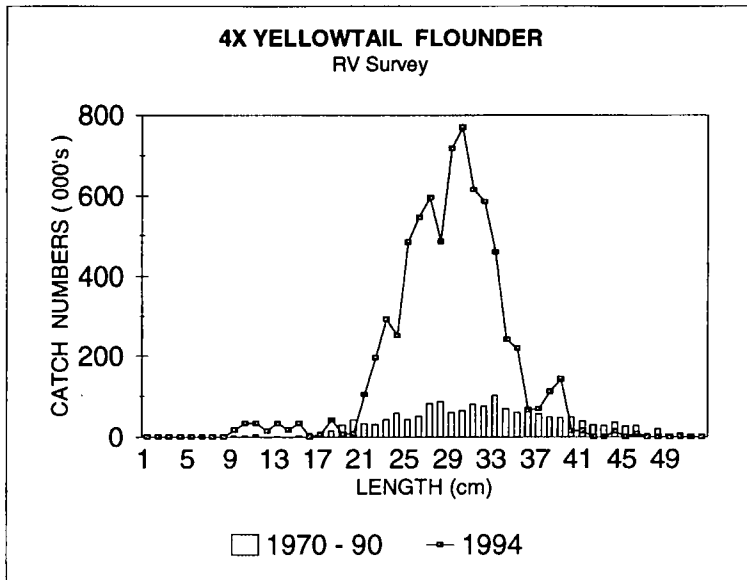


Fig. 29

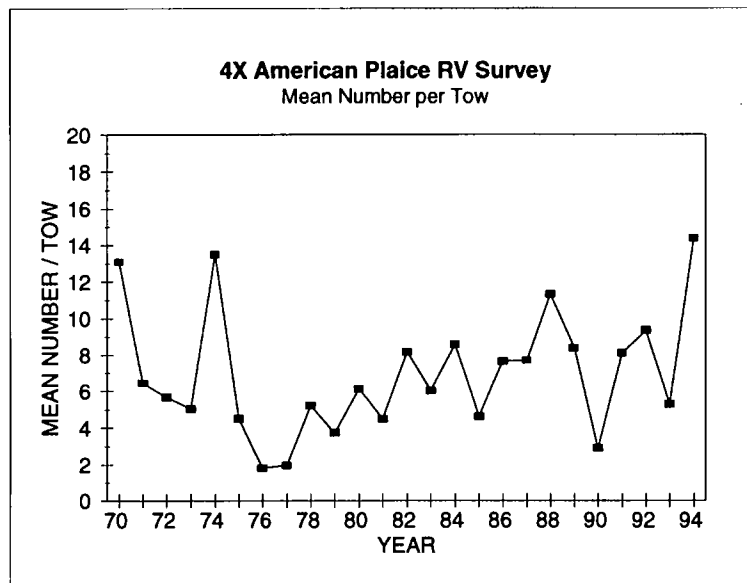


Fig. 30

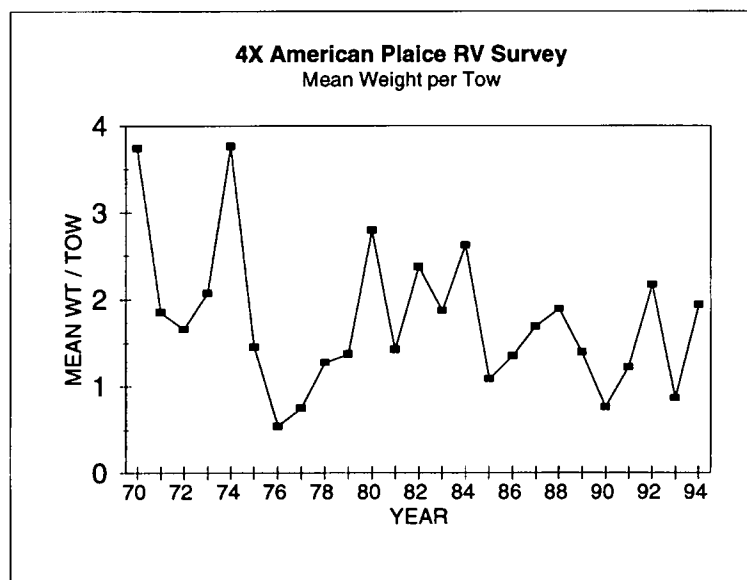


Fig. 31

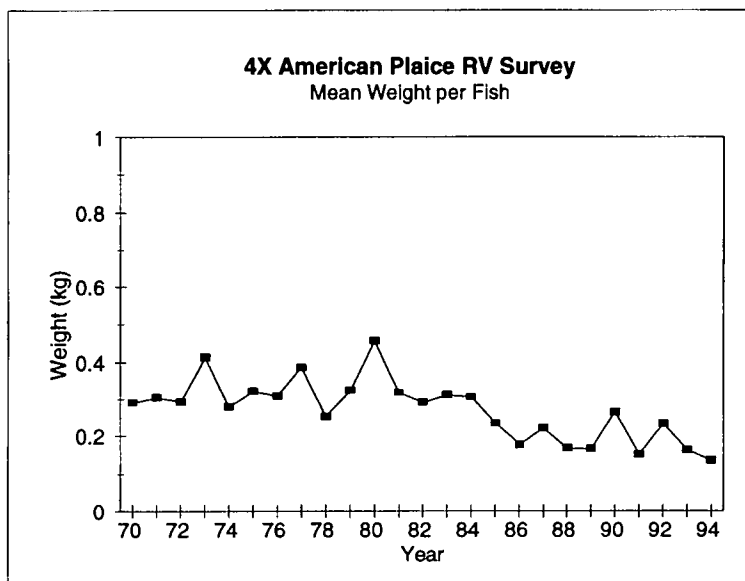
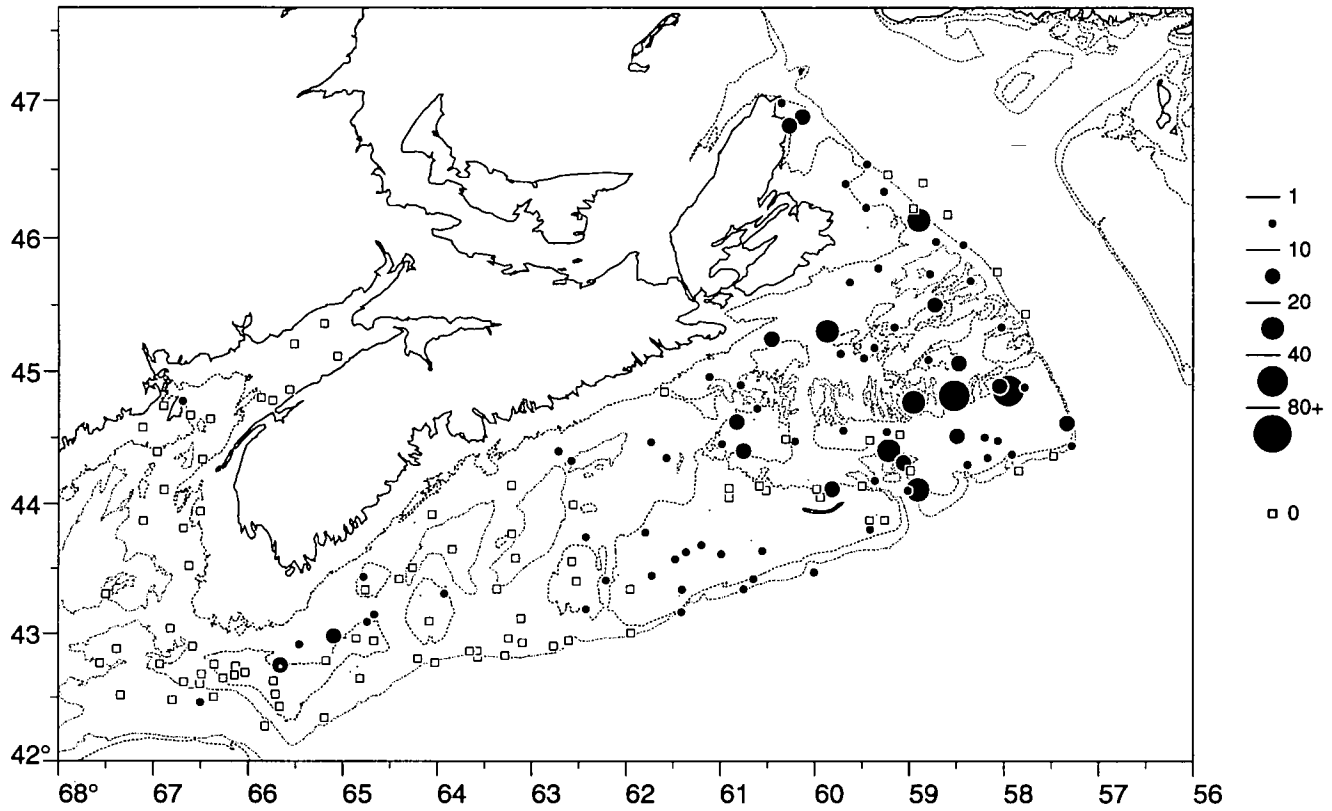


Fig. 32

AMERICAN PLAICE (ALL STRATA) CATCHES (KG) FROM SCOTIA FUNDY SUMMER 93 GROUND FISH SURVEY



AMERICAN PLAICE (ALL STRATA) CATCHES (KG) FROM SCOTIA FUNDY SUMMER 94 GROUND FISH SURVEY

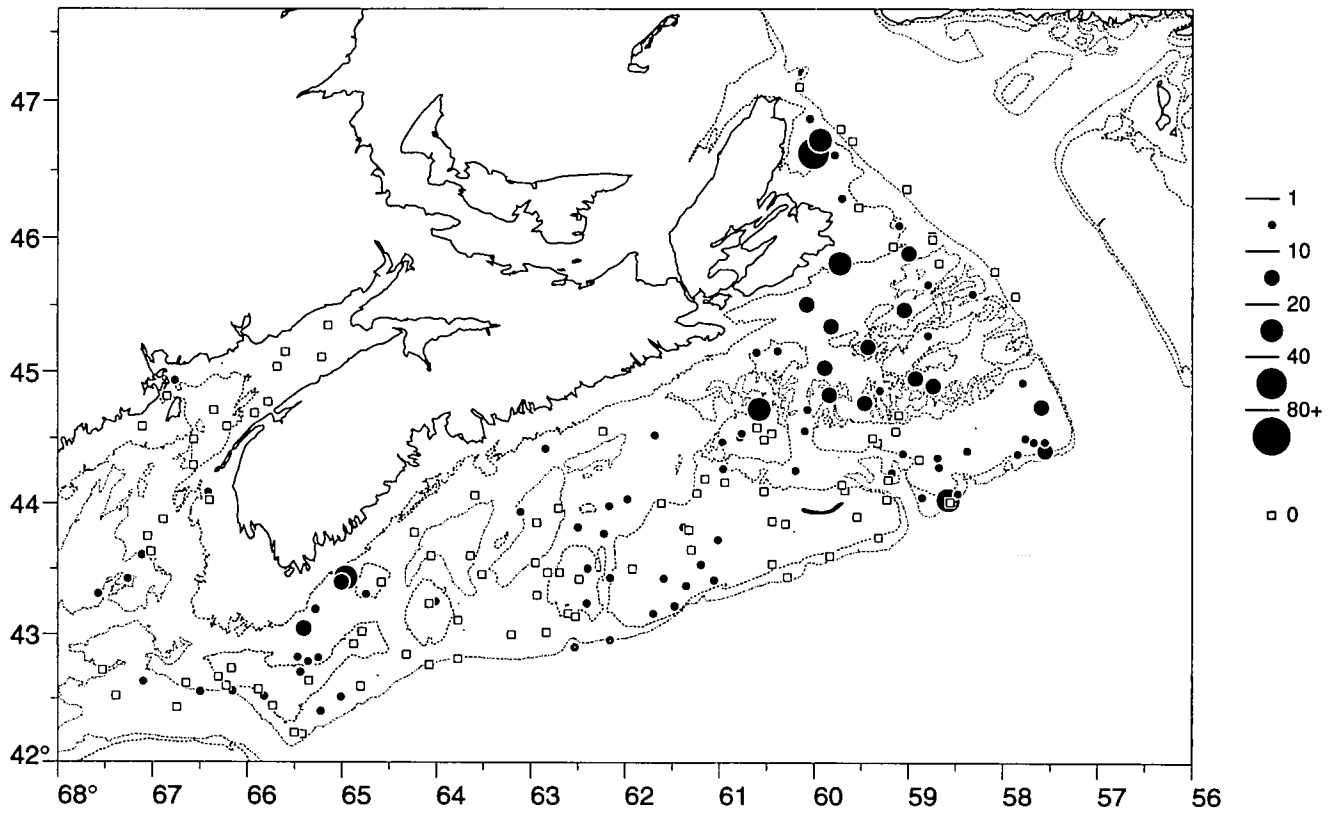


Fig. 33

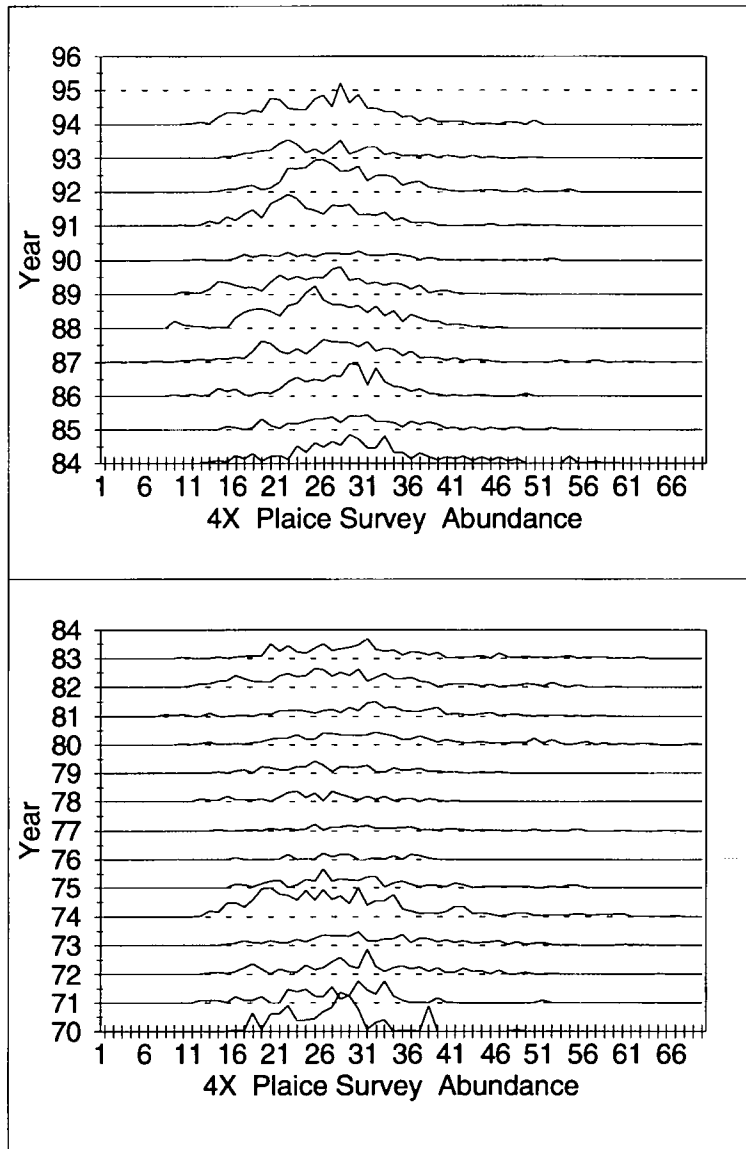


Fig. 34

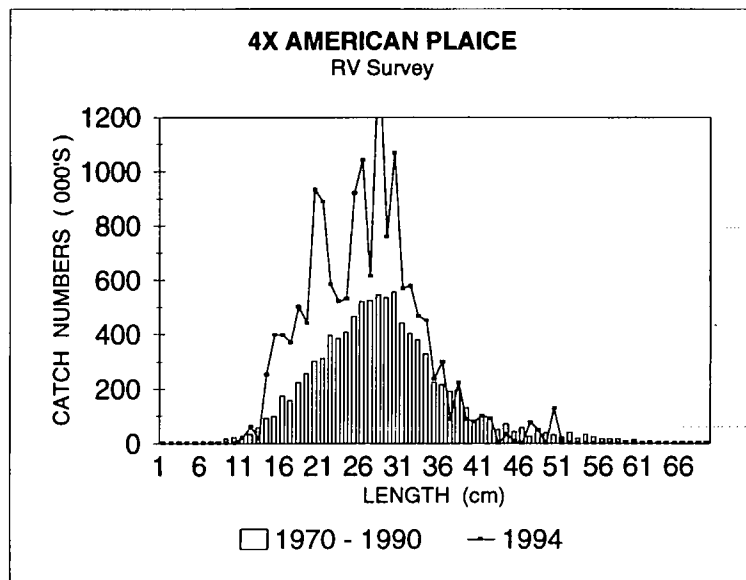


Fig. 35

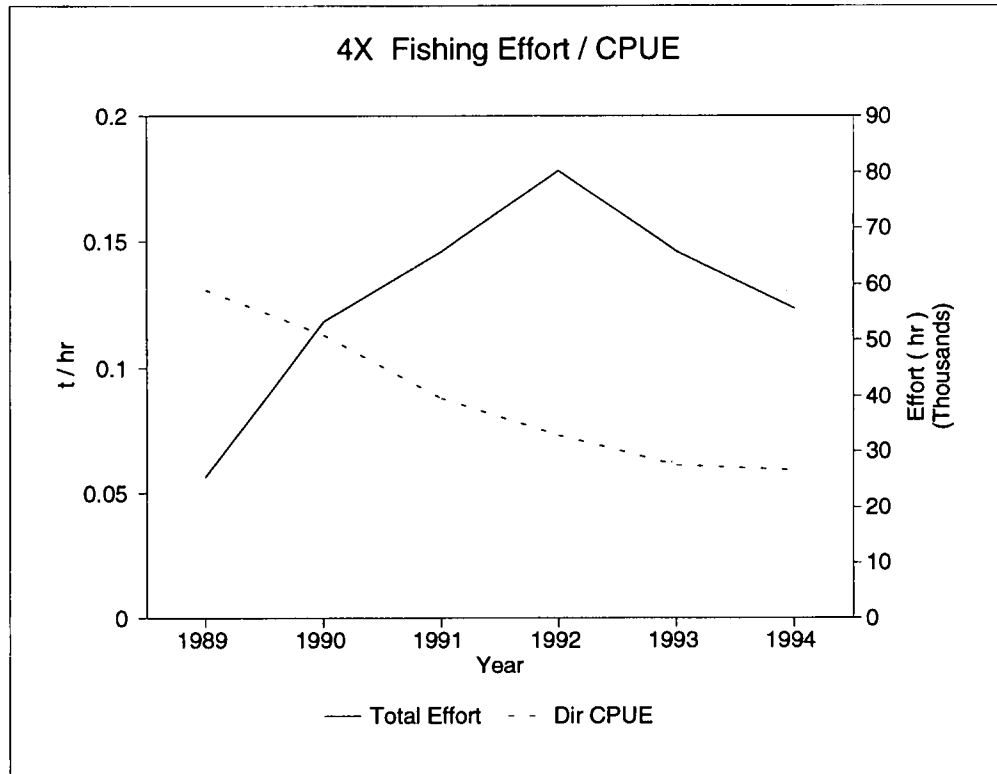


Fig. 36a

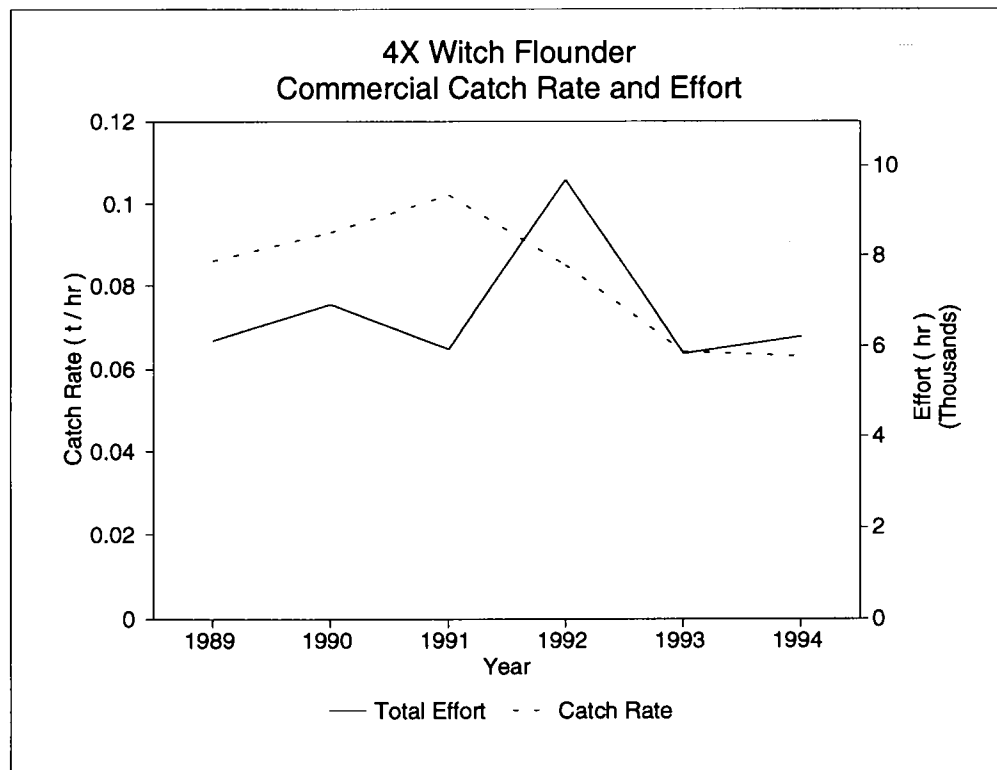
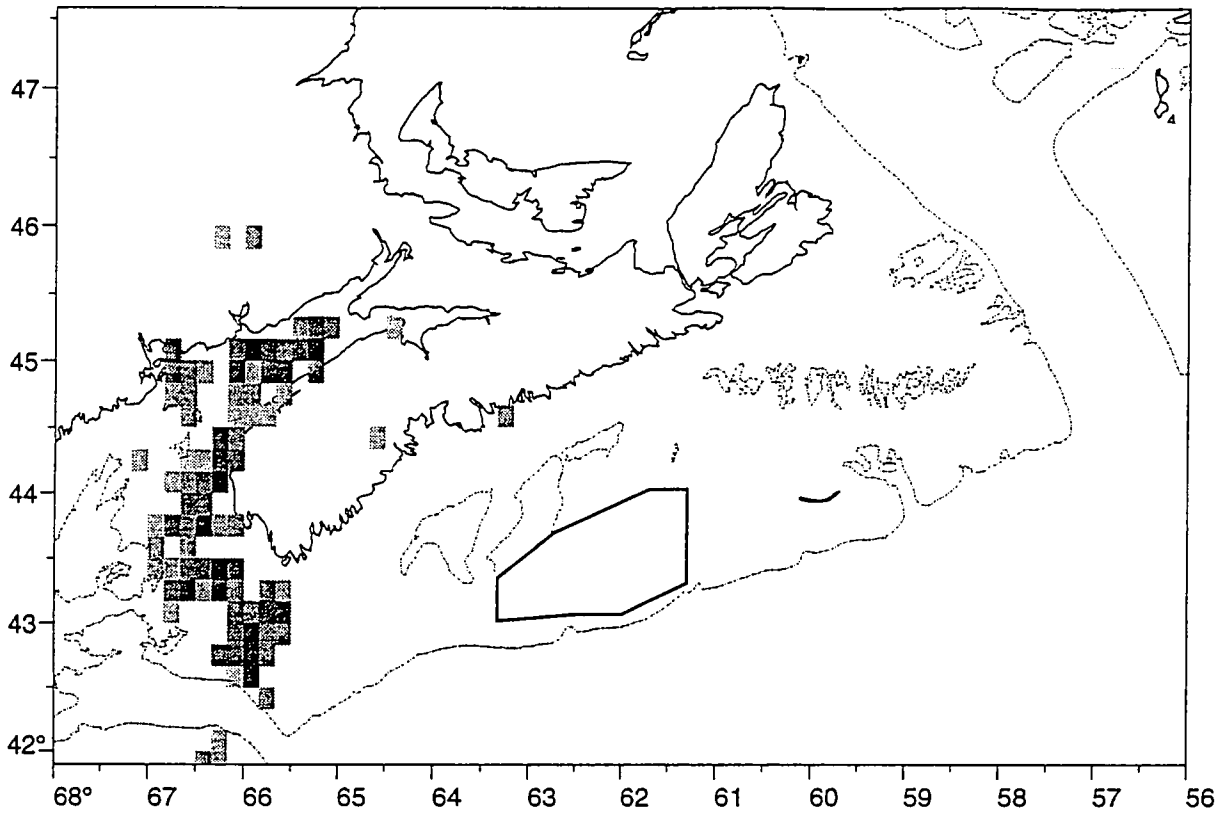


Fig. 36b

1993 Commercial Catch for Winter



1994 Commercial Catch for Winter

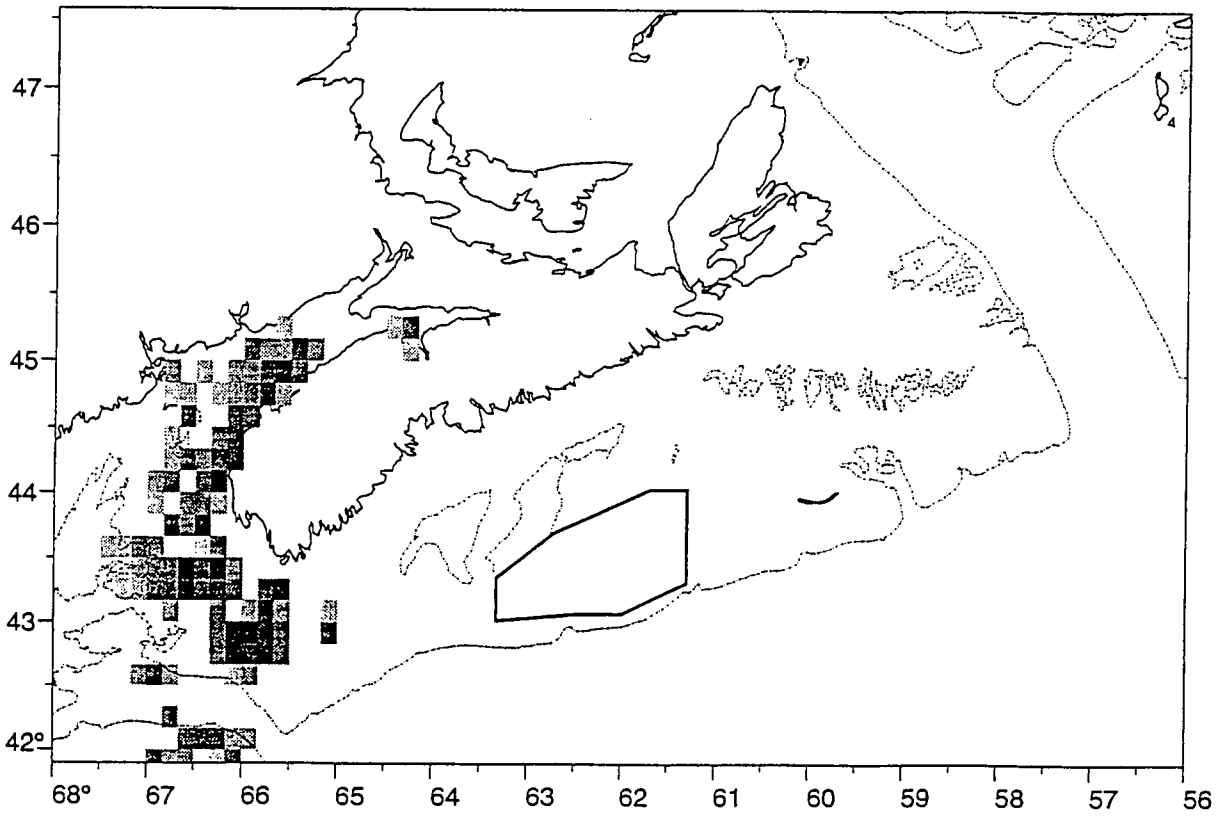
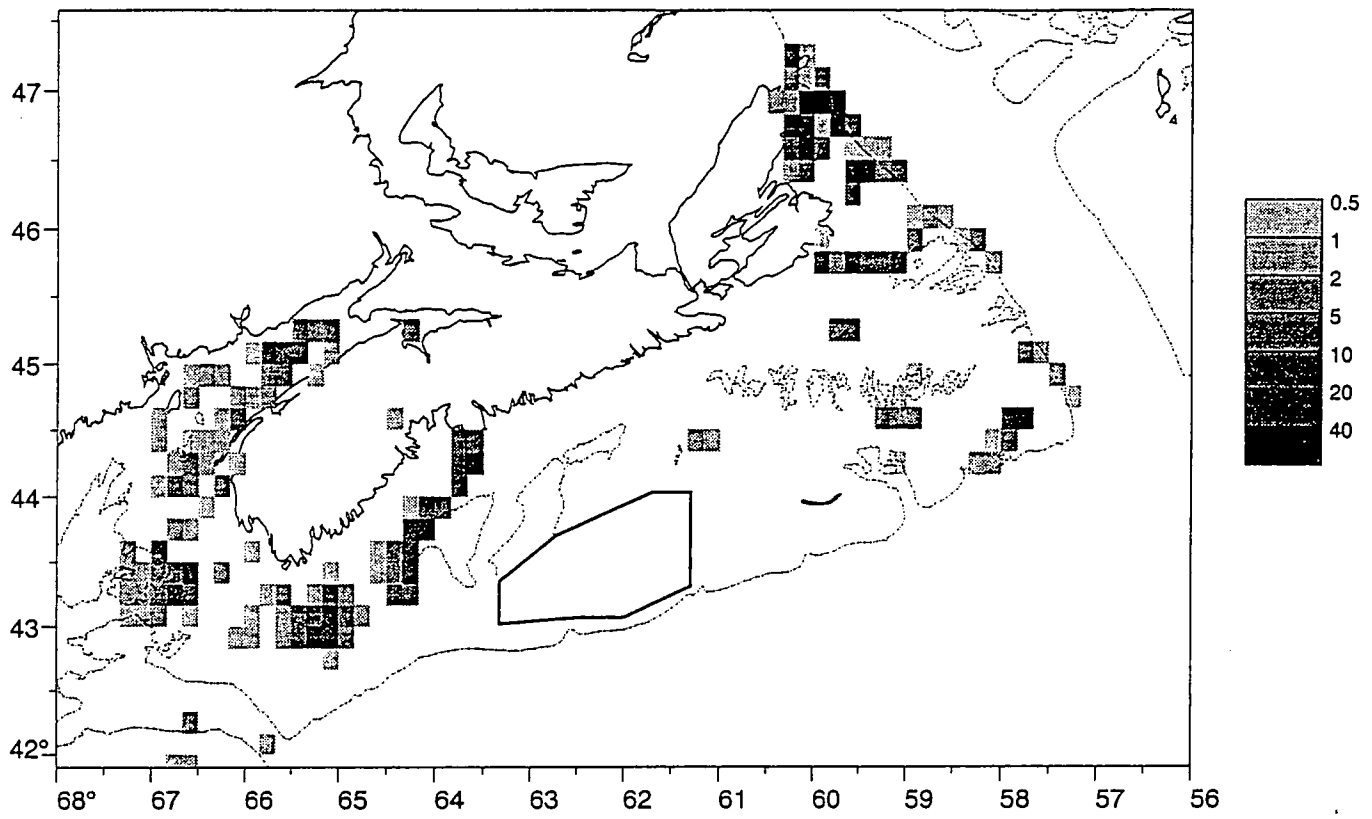


Fig. 37

1993 Commercial Catch for Witch



1994 Commercial Catch for Witch

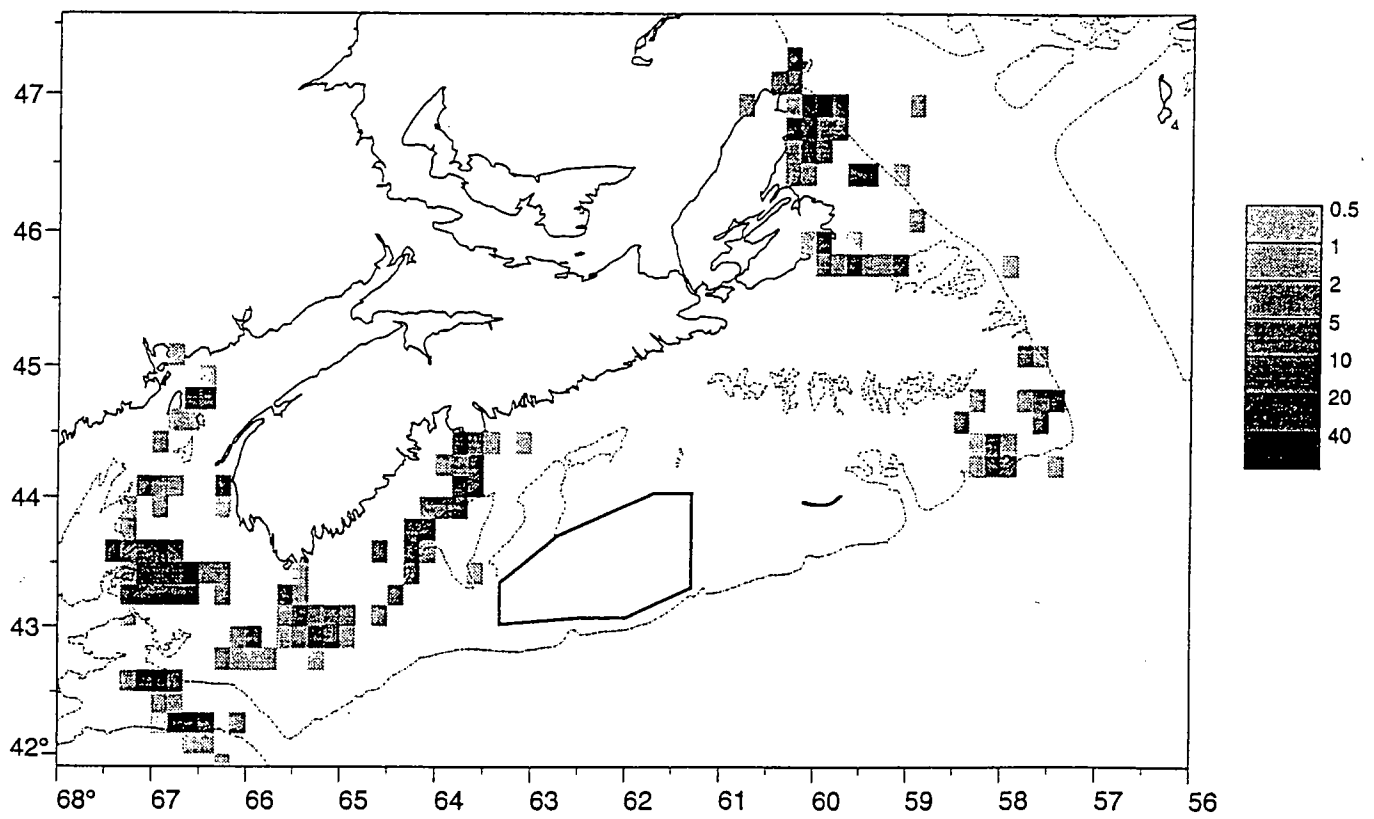
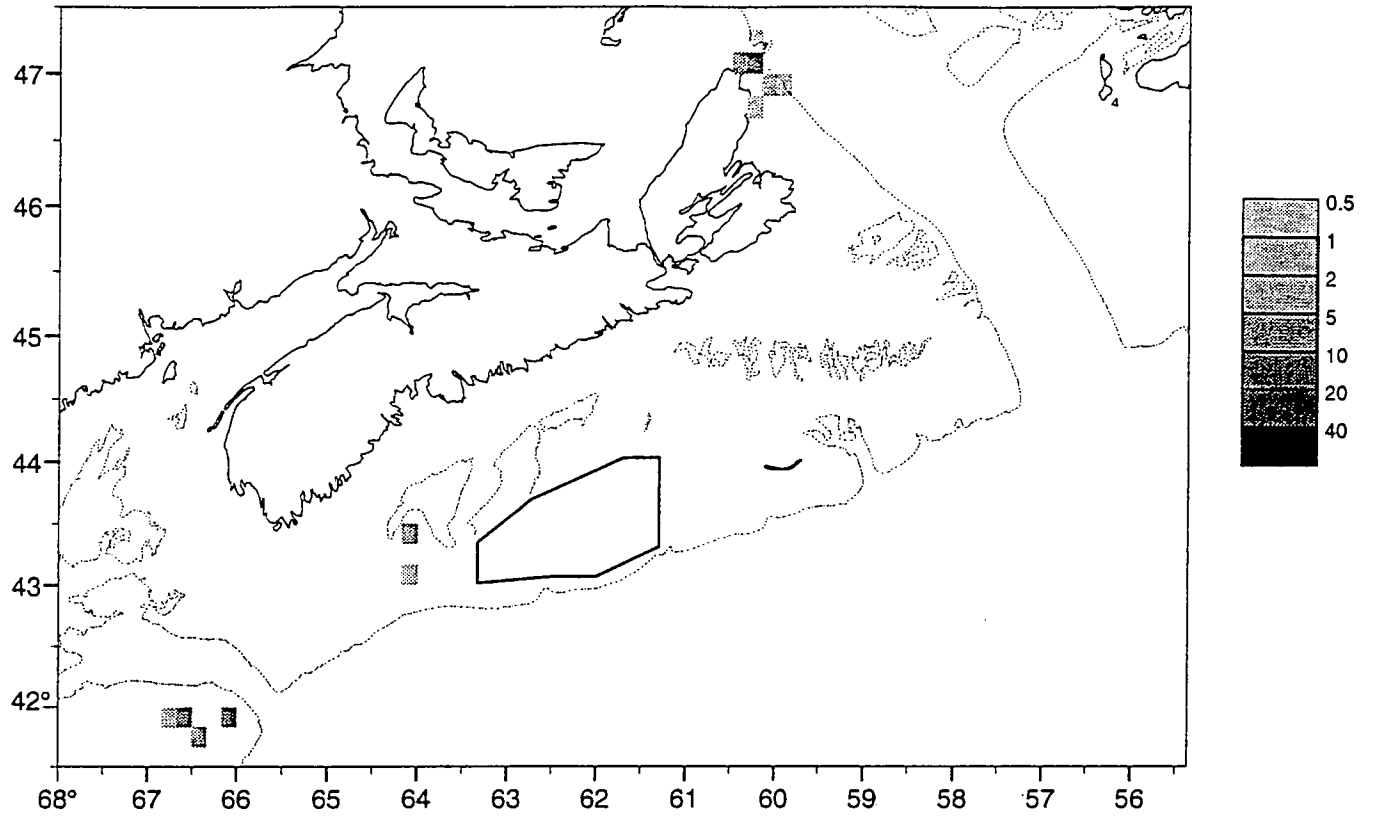


Fig. 38

1993 Commercial Catch for Plaice



1994 Commercial Catch for Plaice

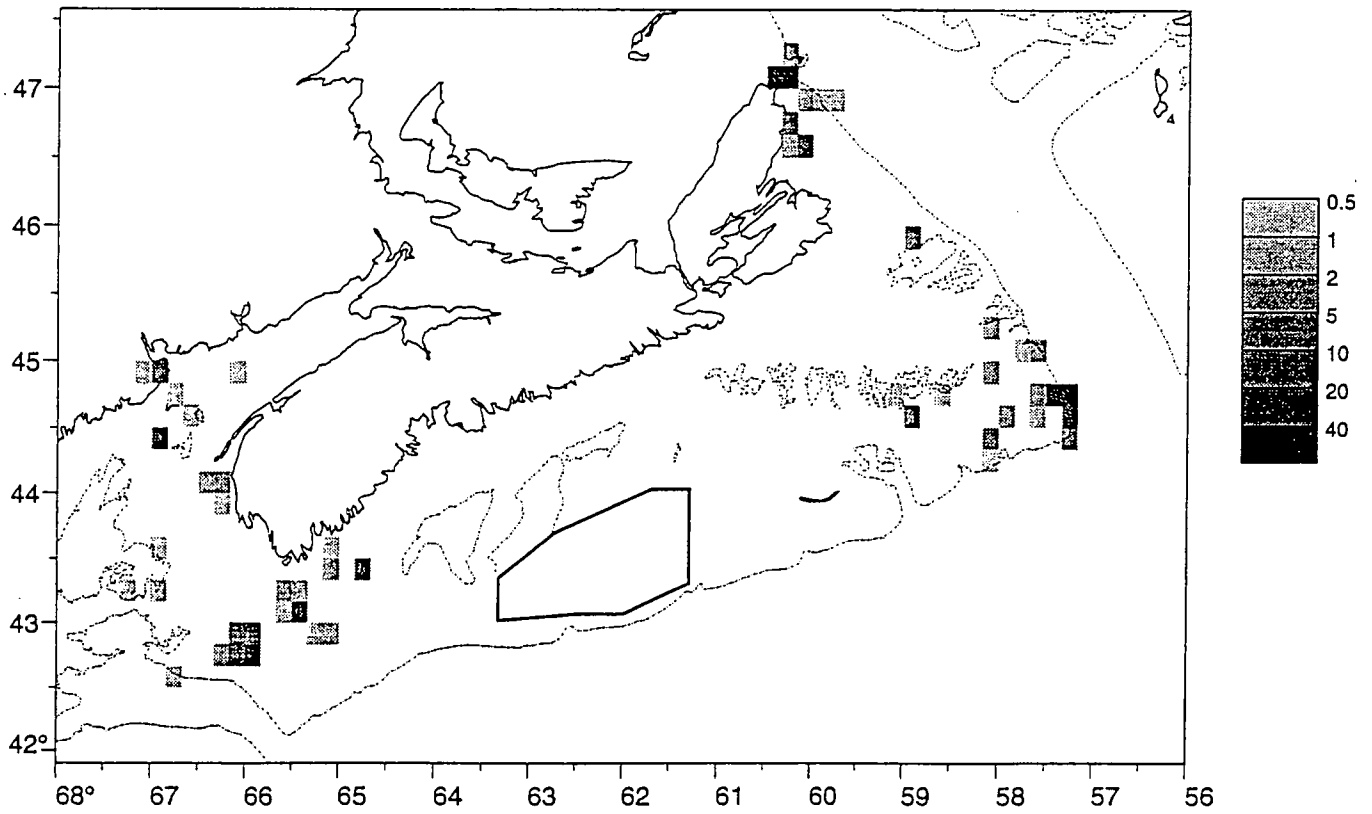
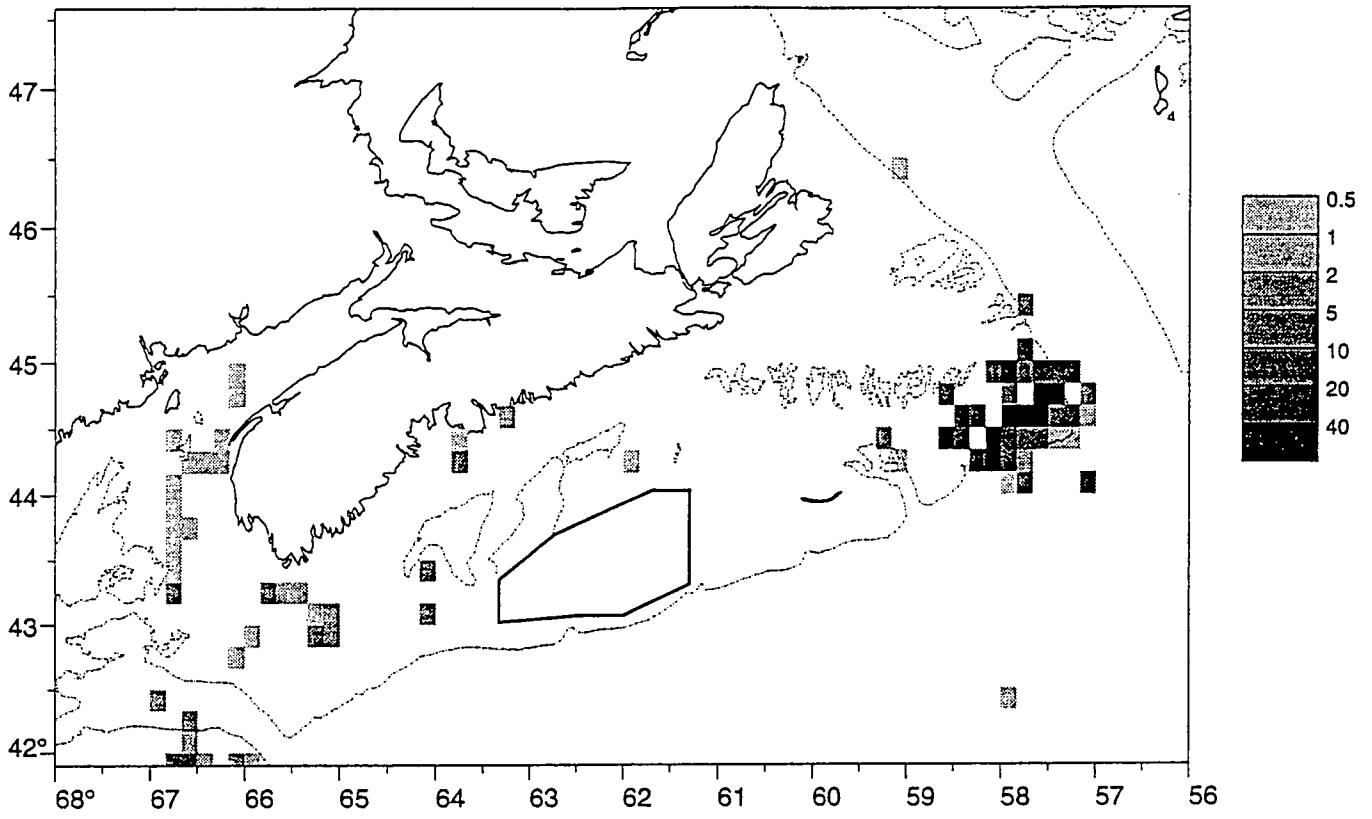


Fig. 39

1993 Commercial Catch for Yellowtail



1994 Commercial Catch for Yellowtail

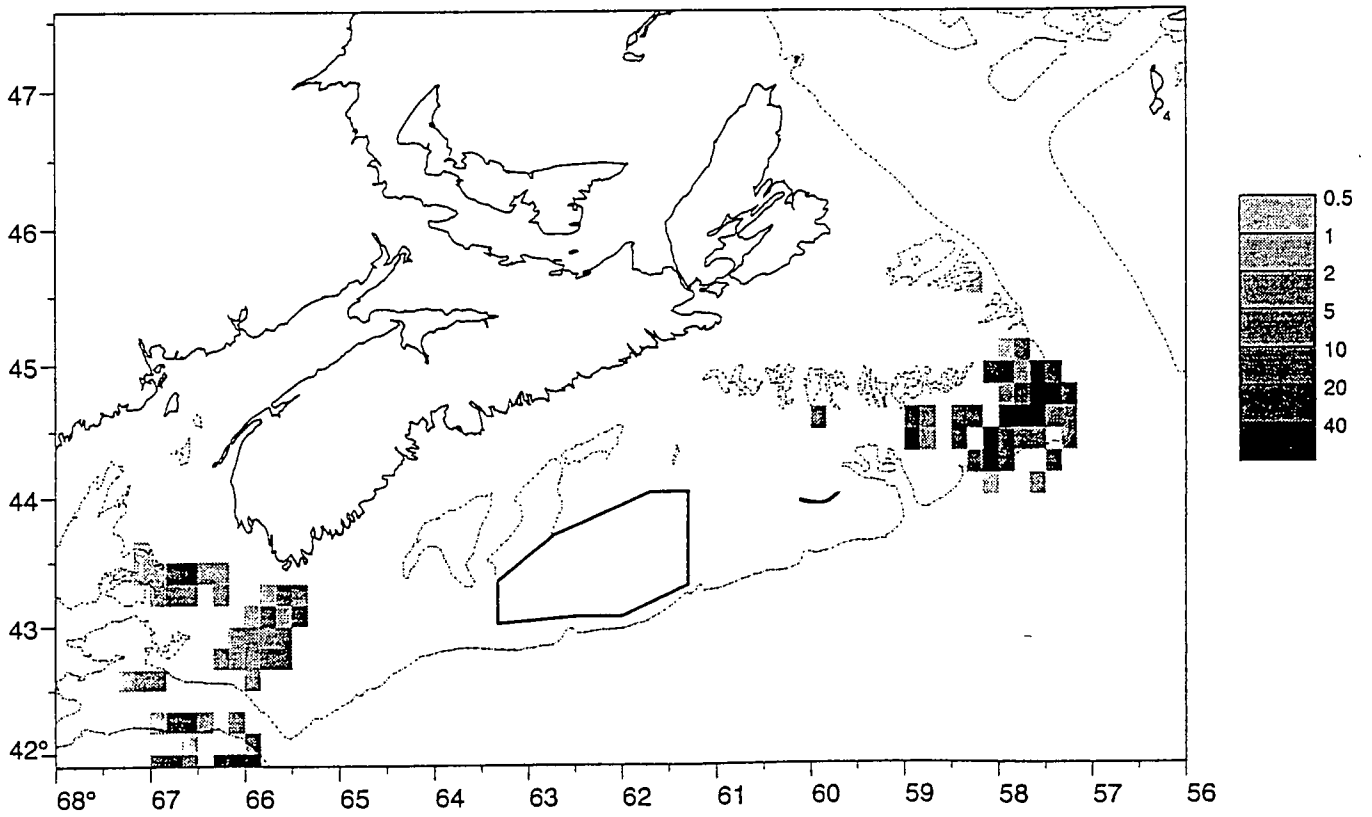
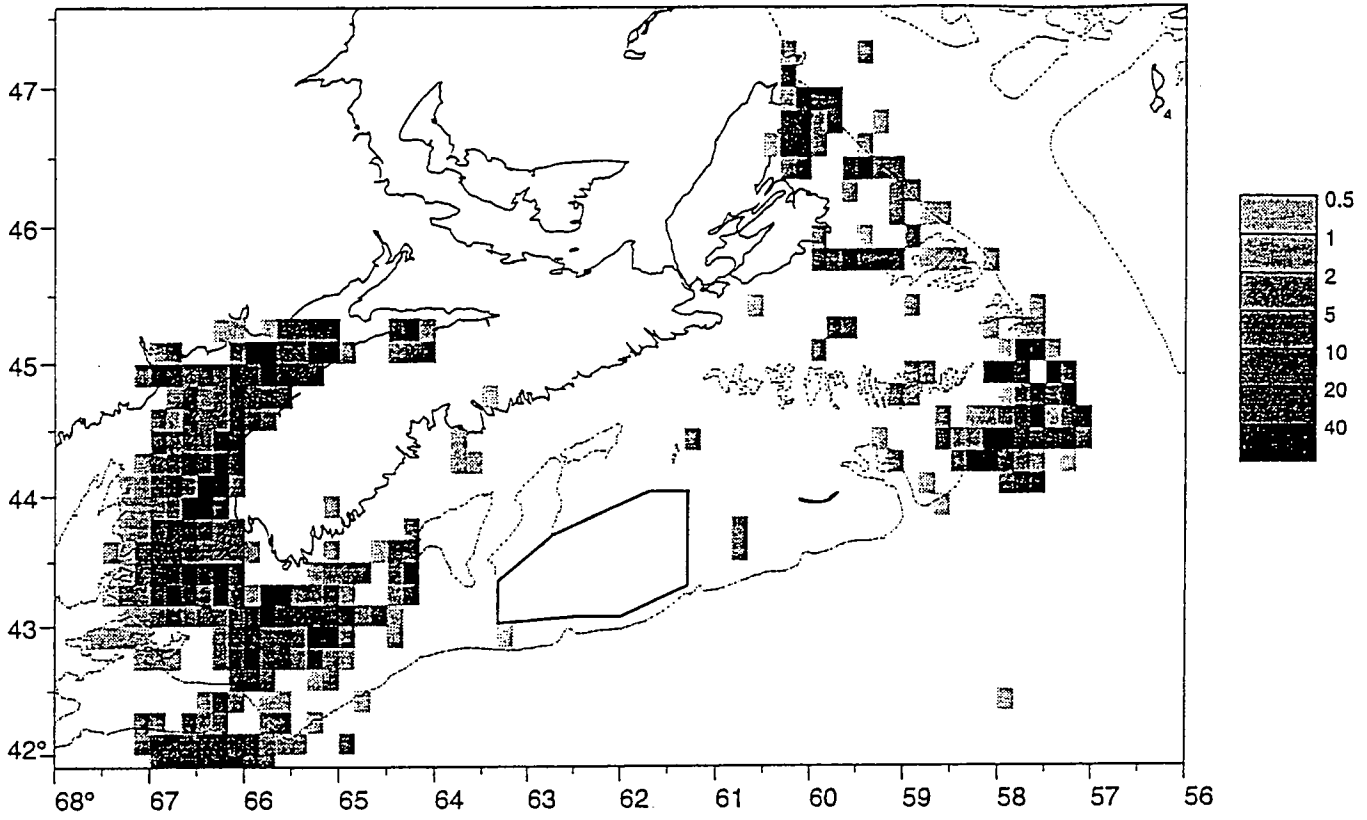


Fig. 40

1993 Commercial Catch for UnSpecified



1994 Commercial Catch for UnSpecified

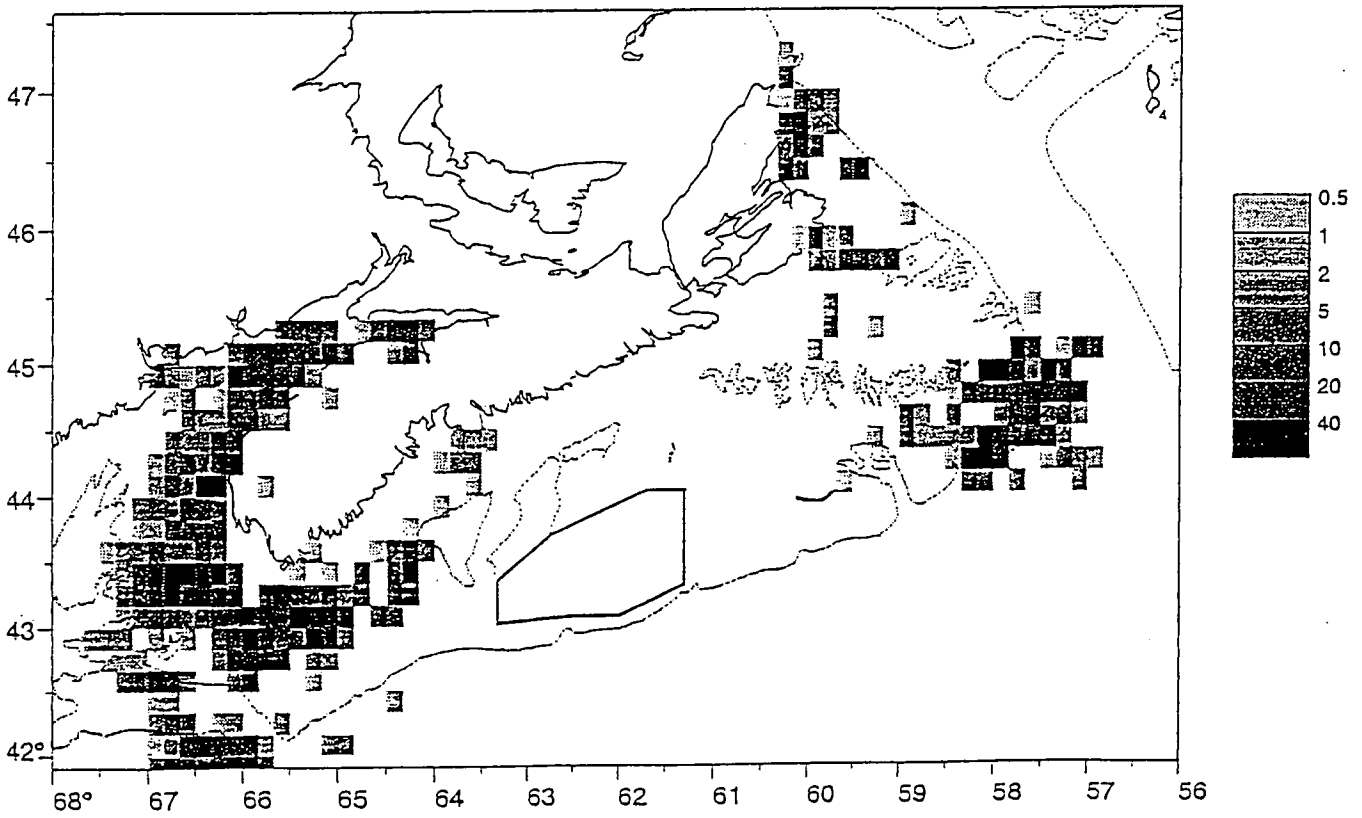


Fig. 41

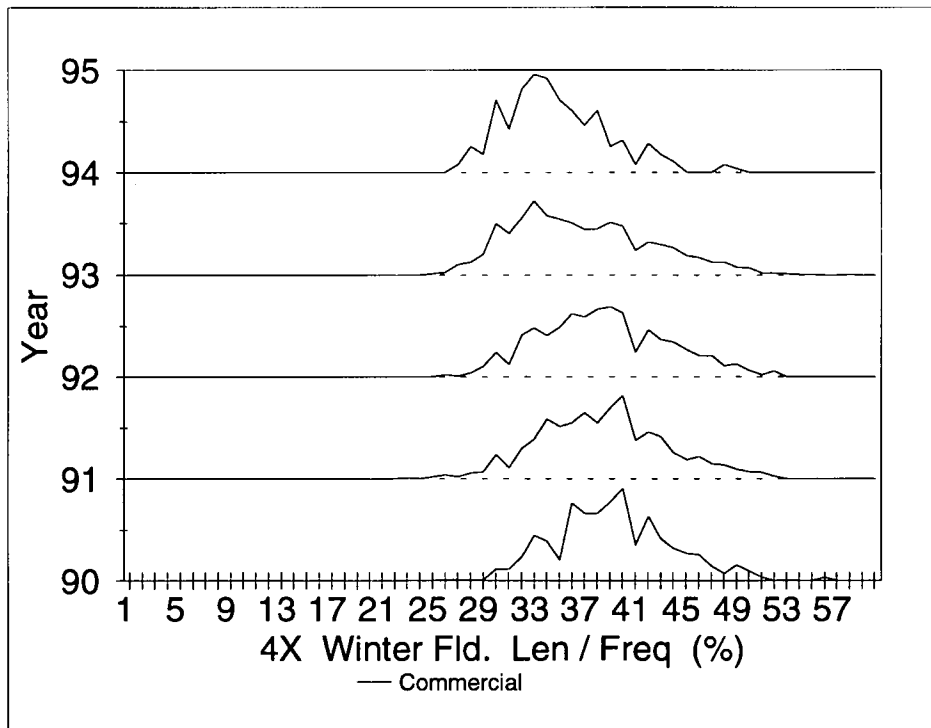


Fig. 42a

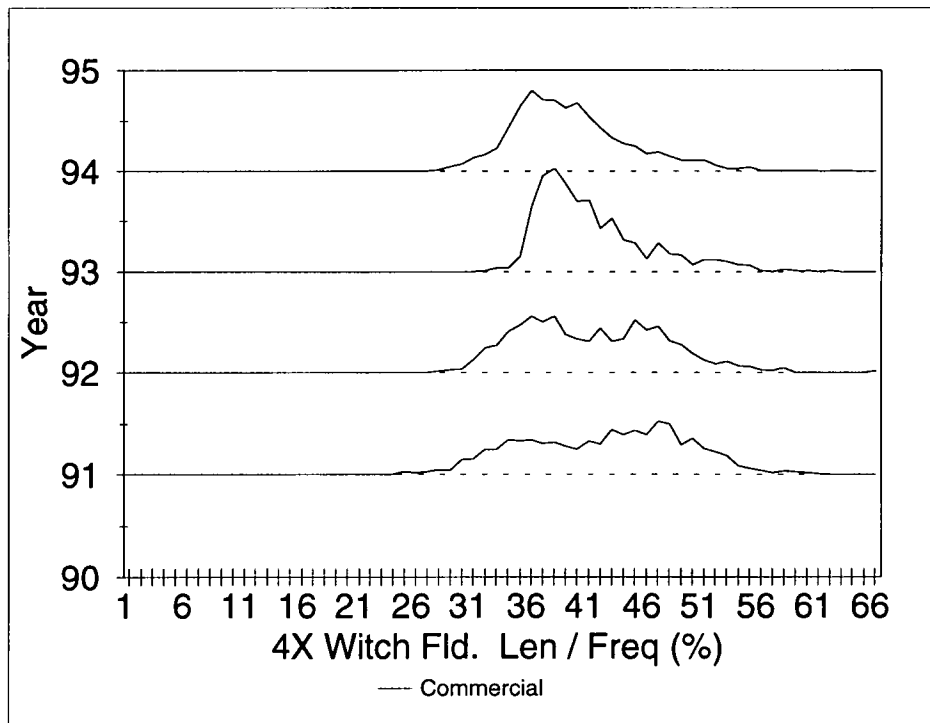


Fig. 42b

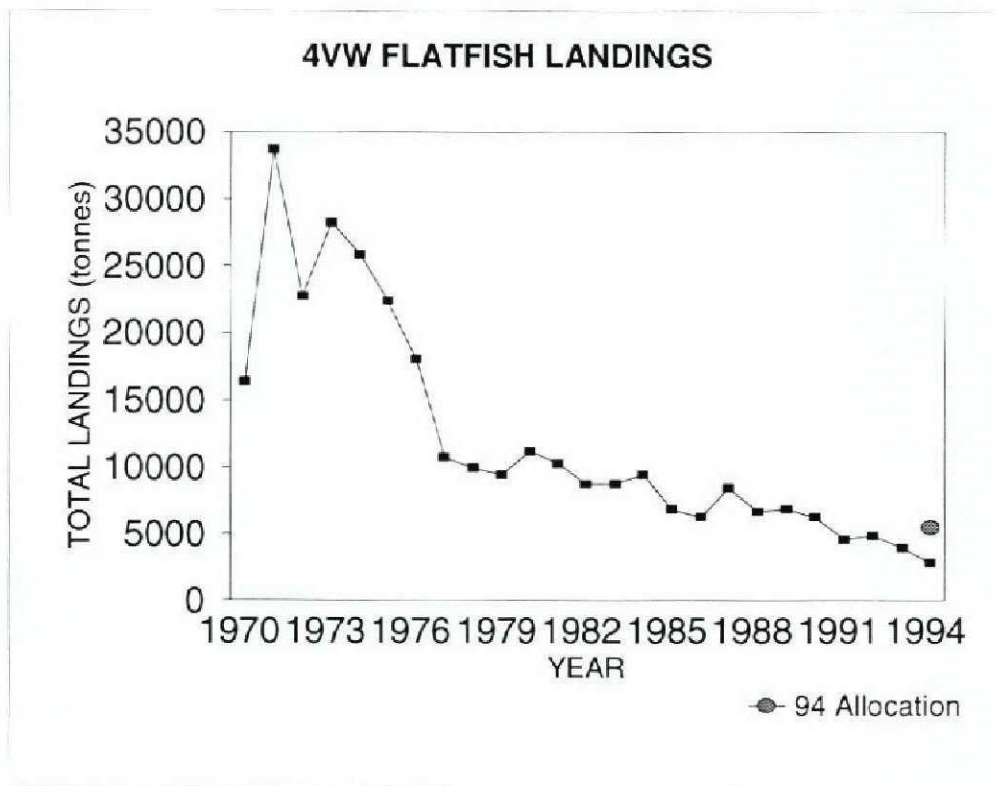


Fig. 43

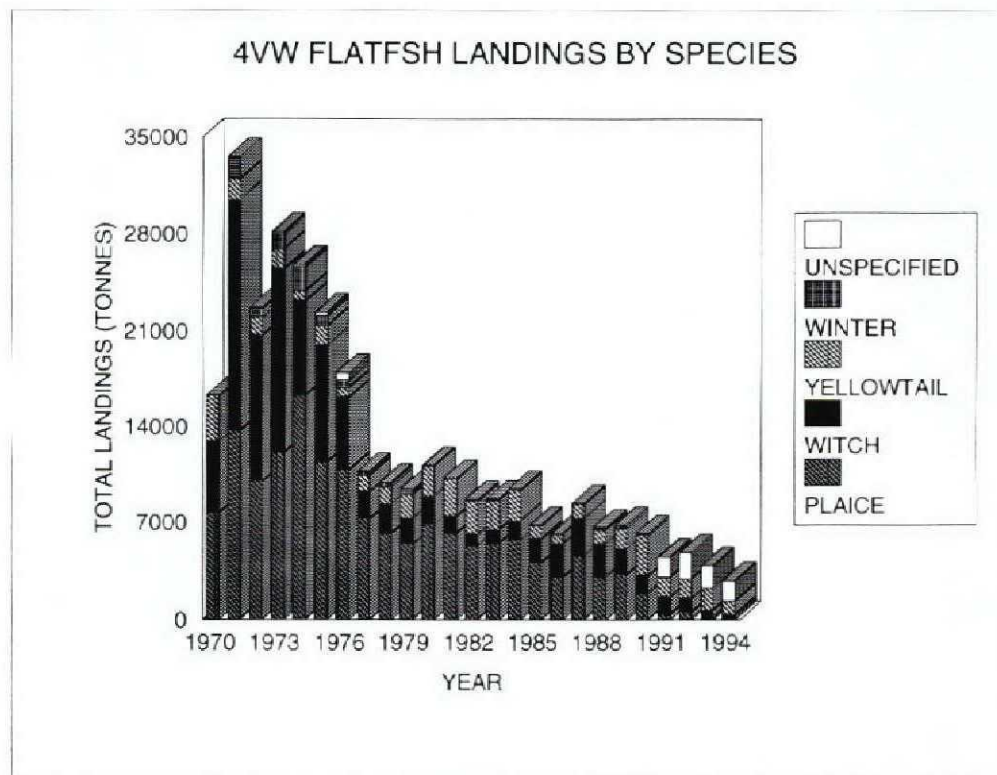


Fig. 44

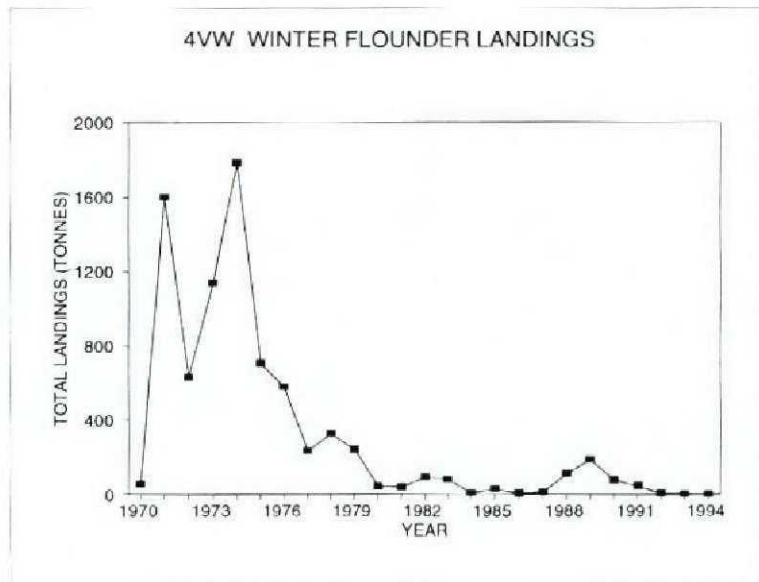


Fig. 45

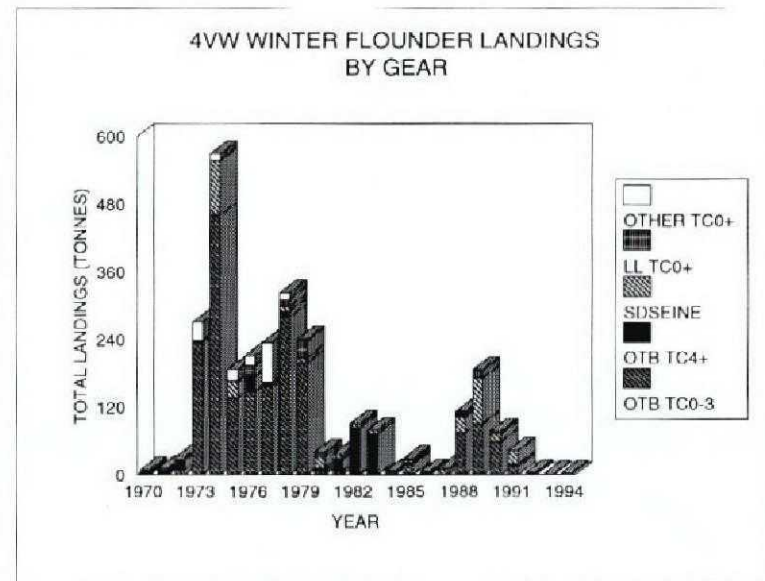


Fig. 46

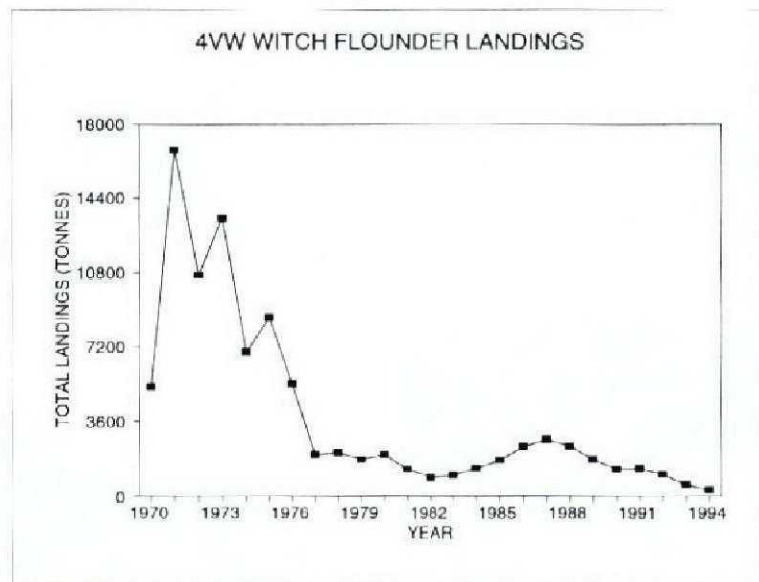


Fig. 47

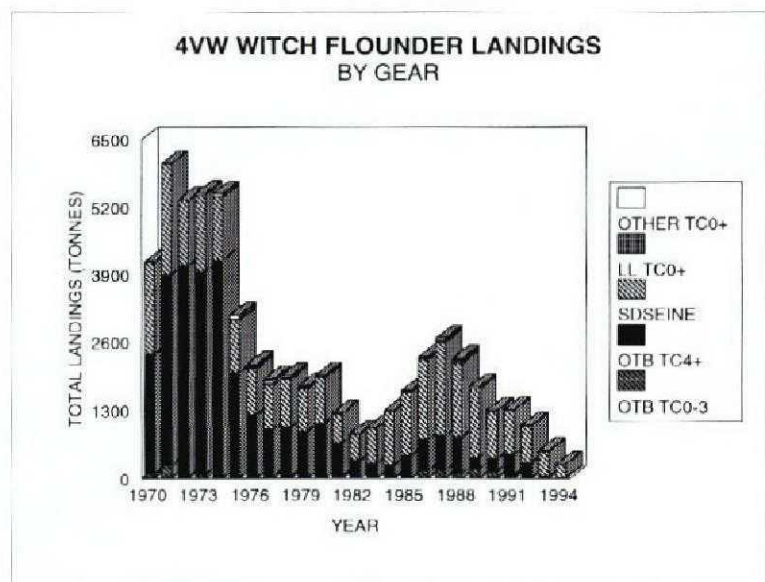


Fig. 48

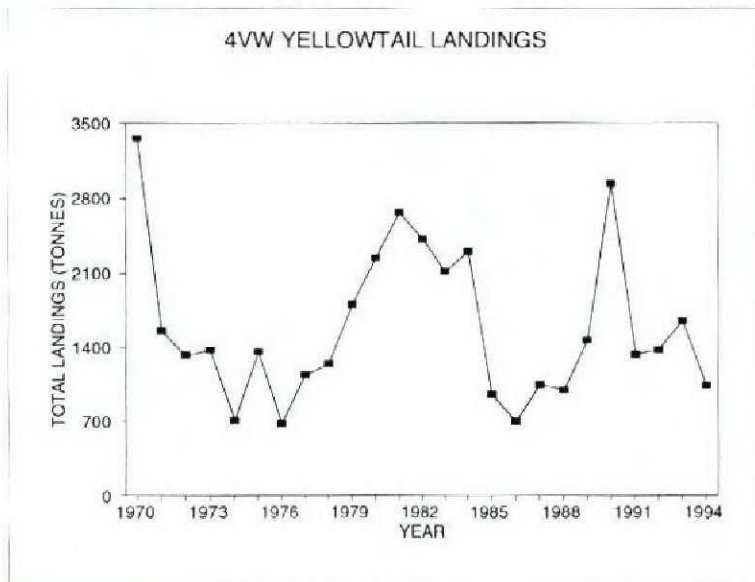


Fig. 49

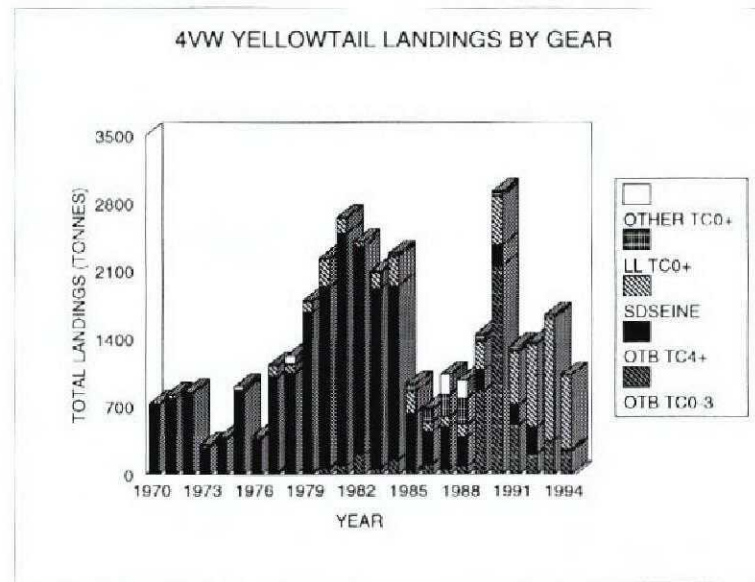


Fig. 50

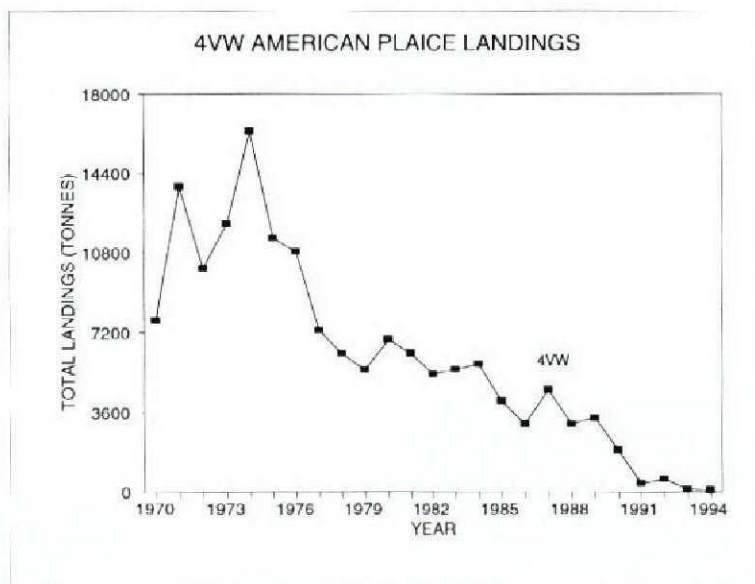


Fig. 51

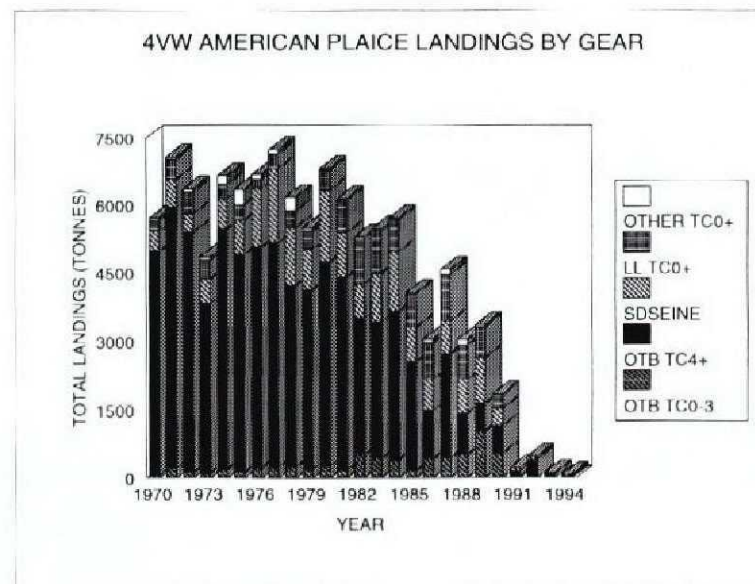


Fig. 52

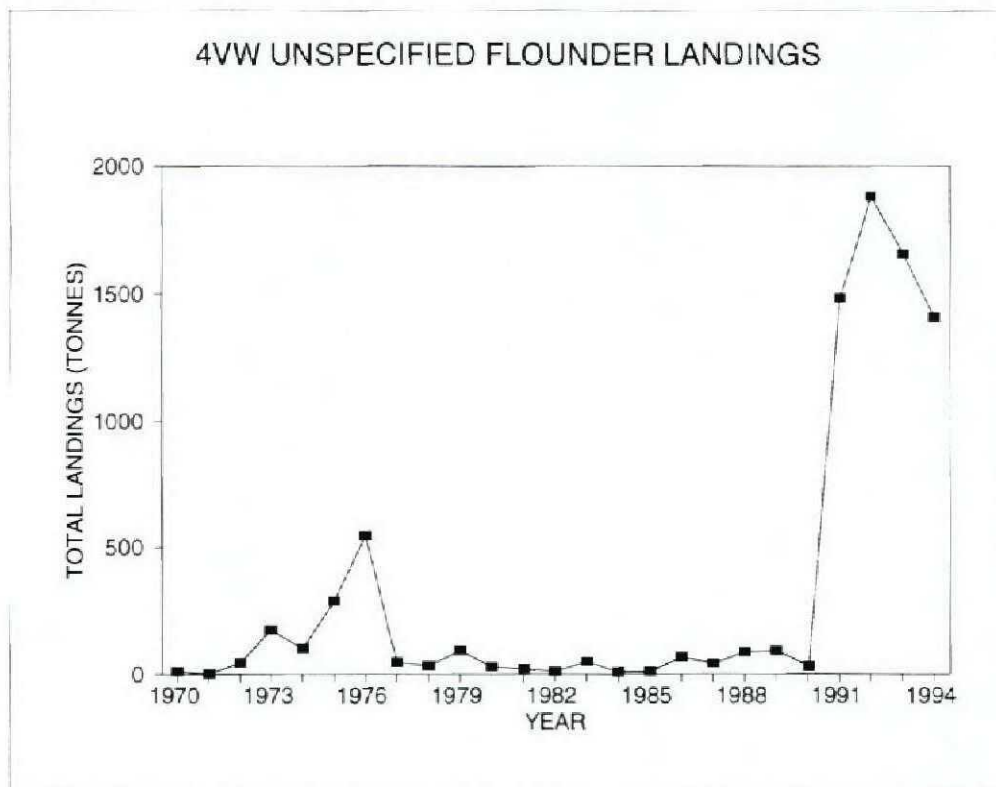


Fig. 53

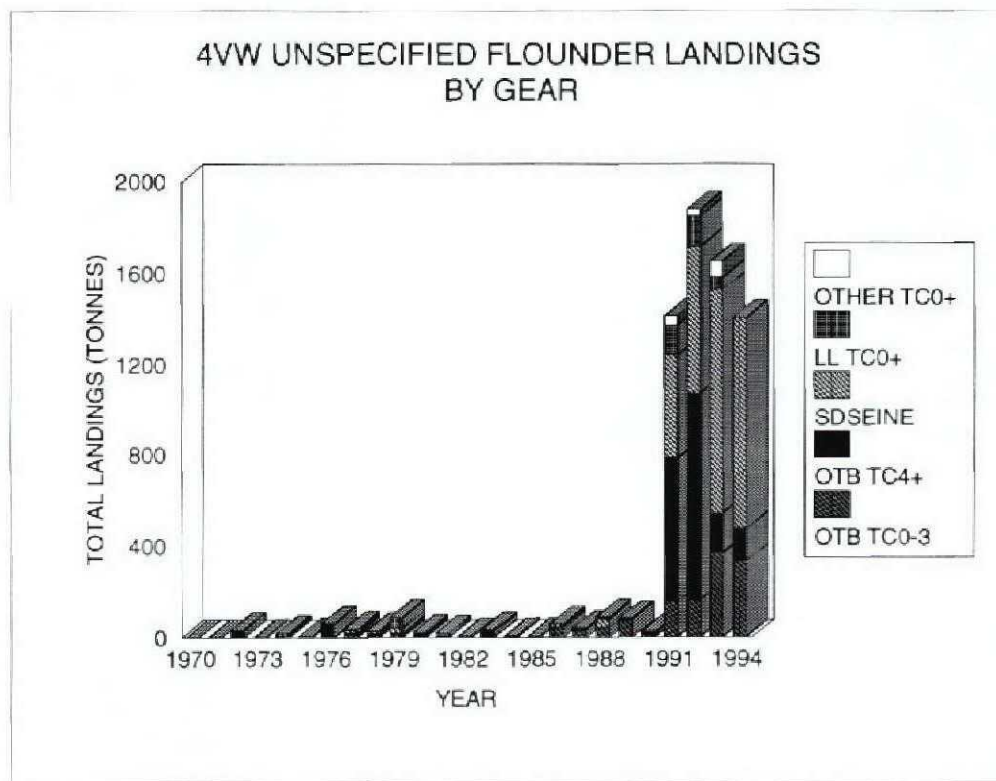


Fig. 54

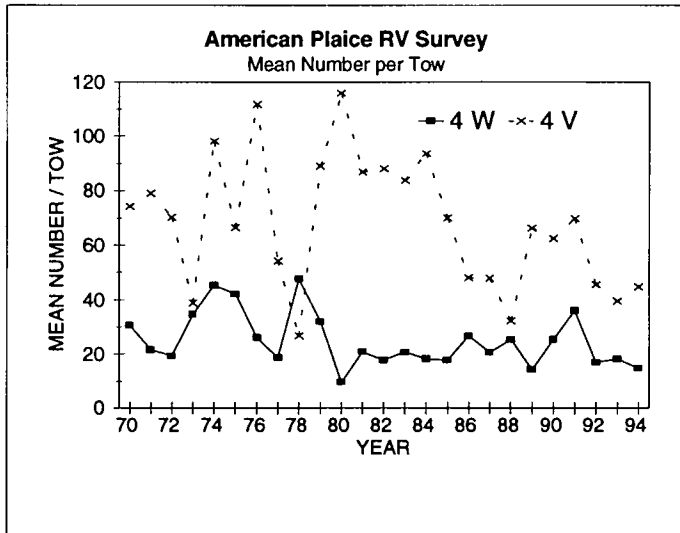


Fig. 55

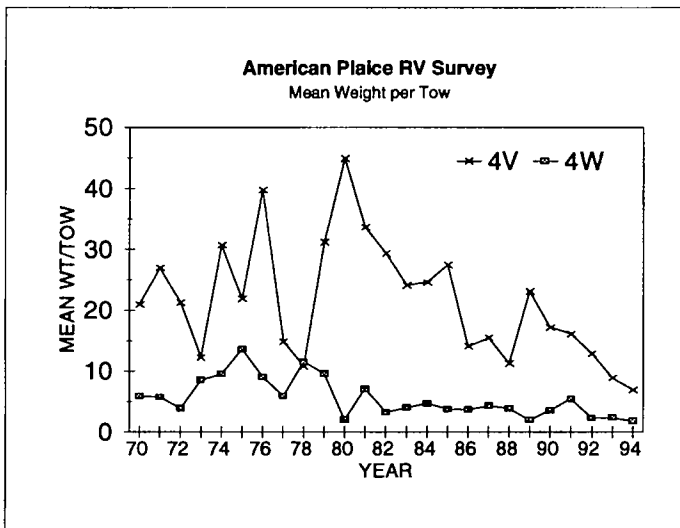


Fig. 56

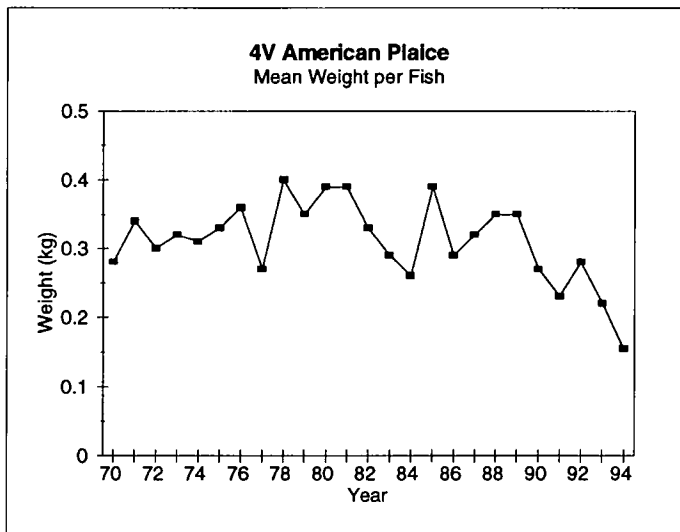


Fig. 57

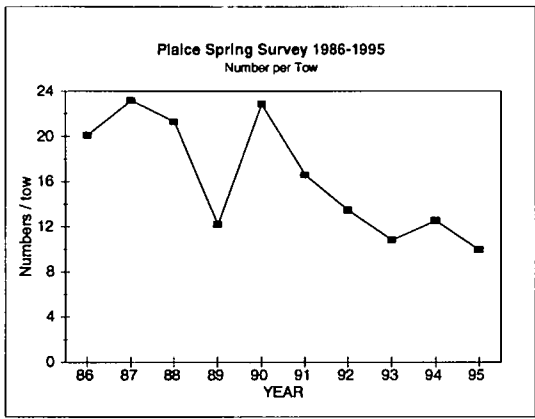


Fig. 58a

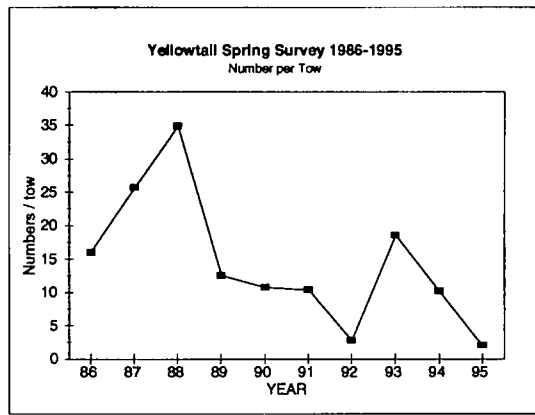
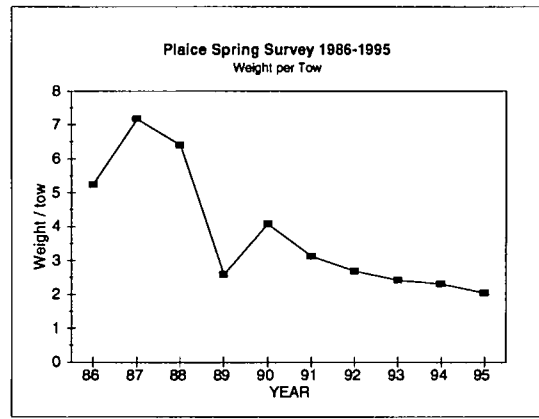


Fig. 58b

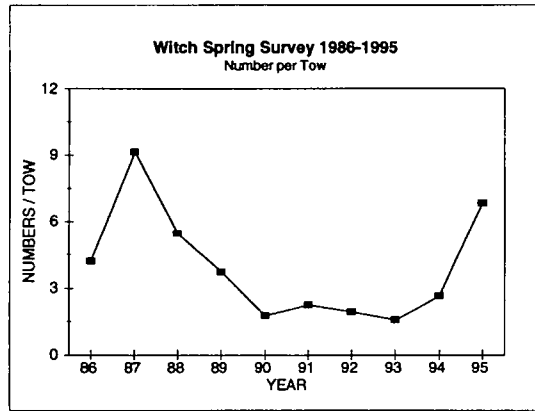
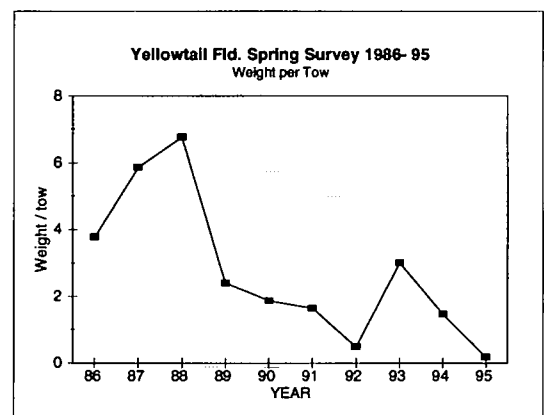


Fig. 58c

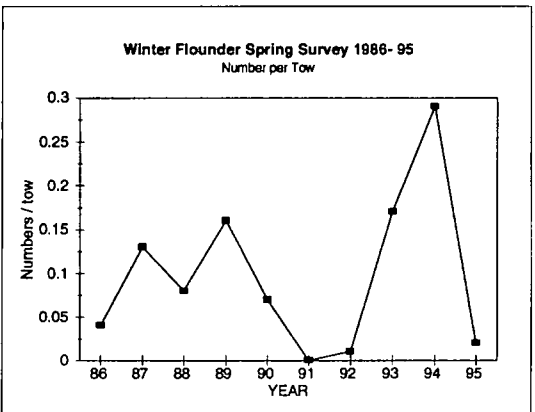
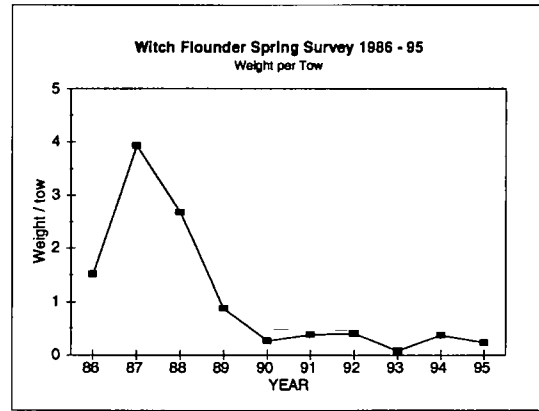
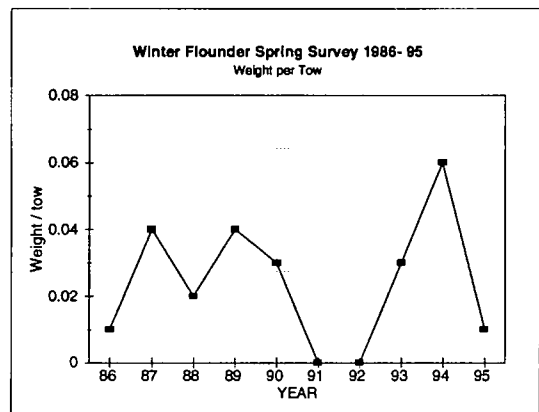


Fig. 58d



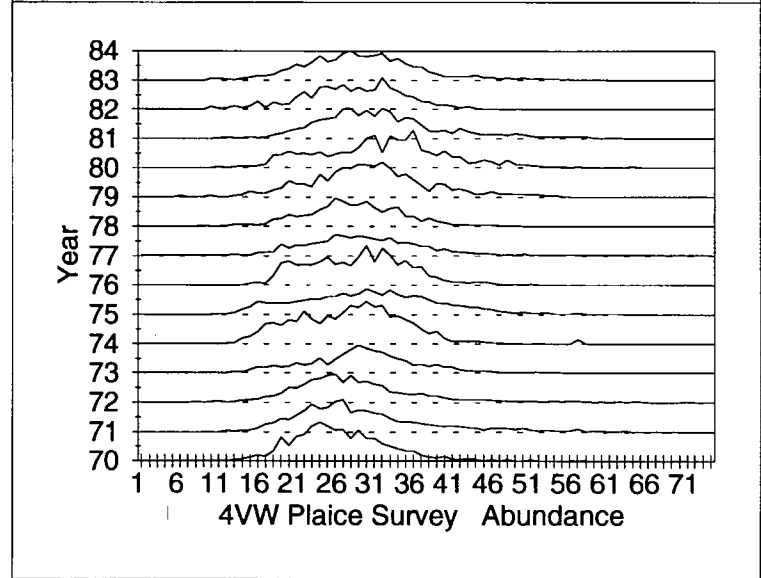
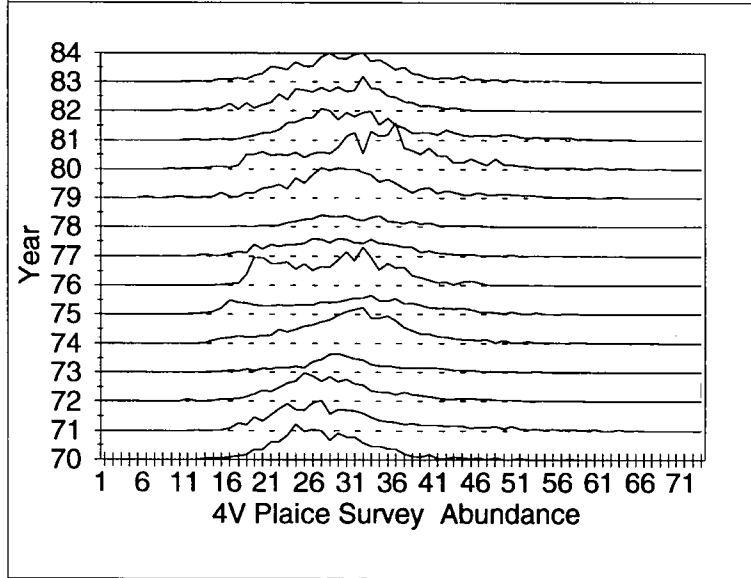
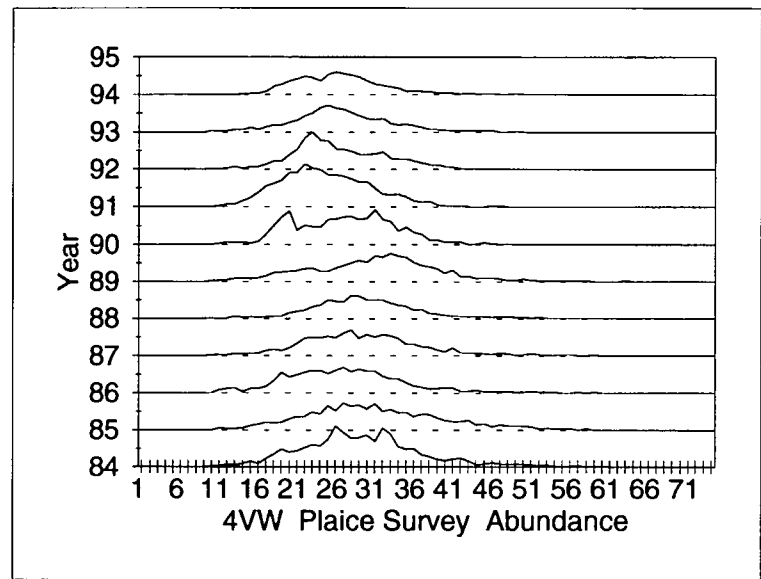
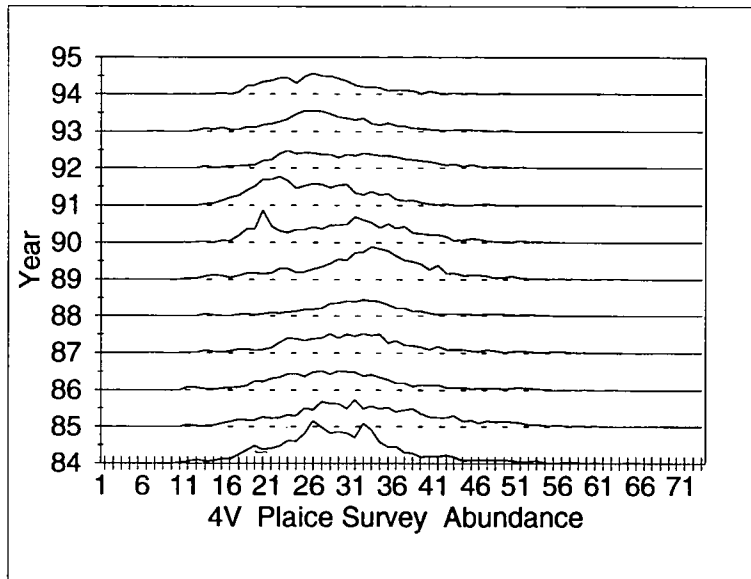


Fig. 59

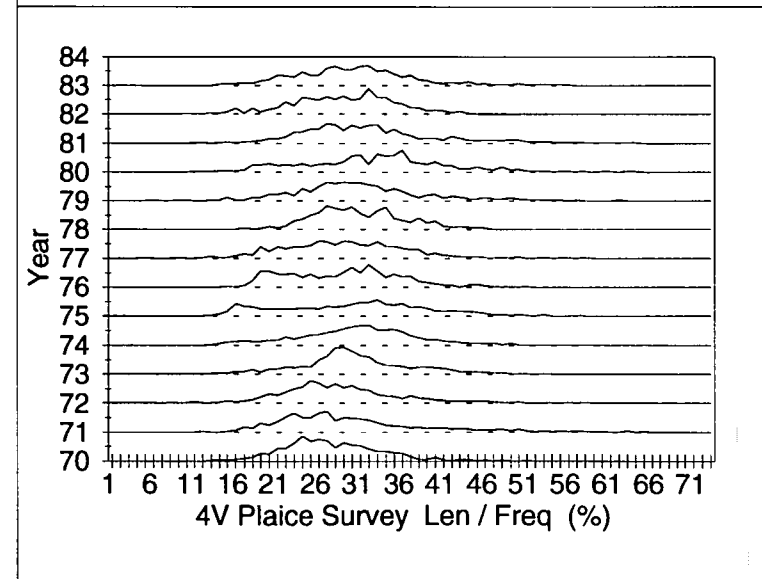
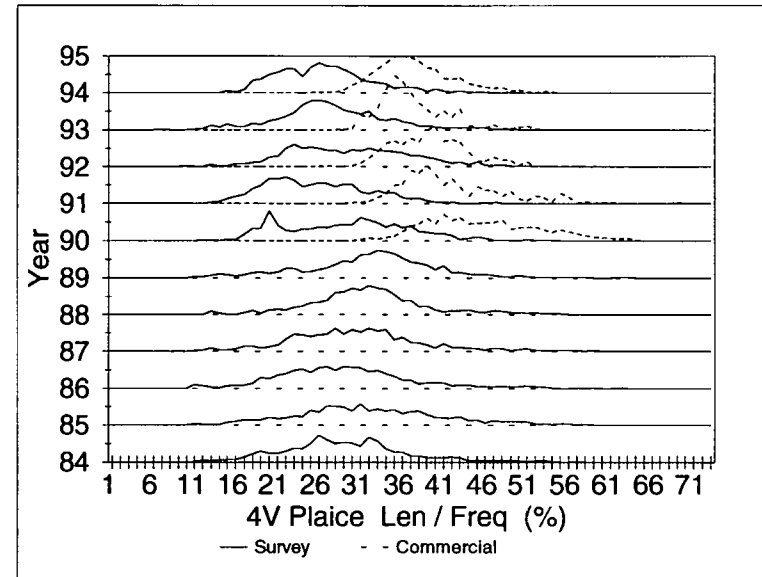
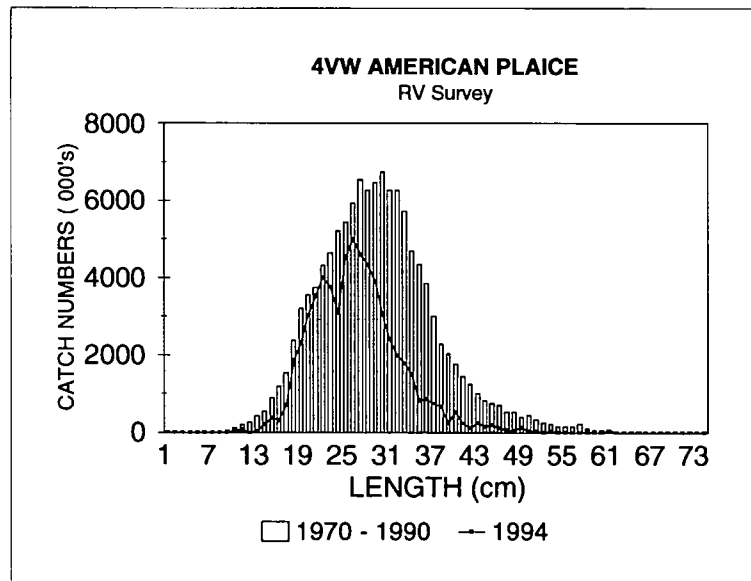
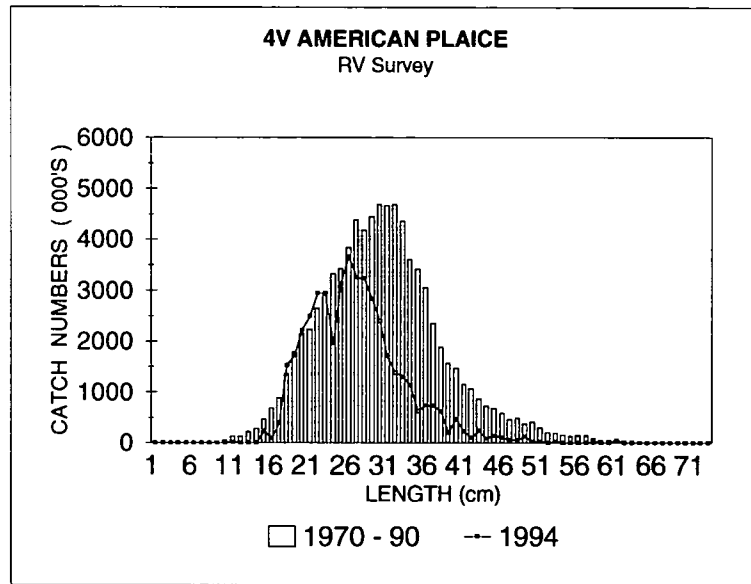


Fig. 60a

Fig. 60b

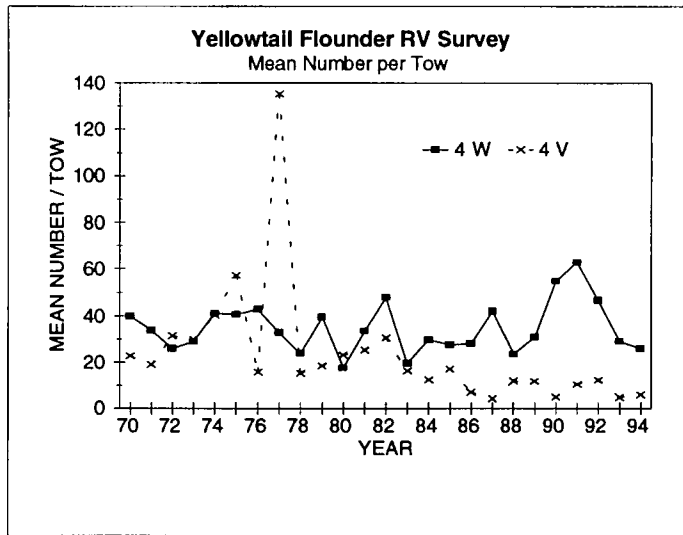


Fig. 61

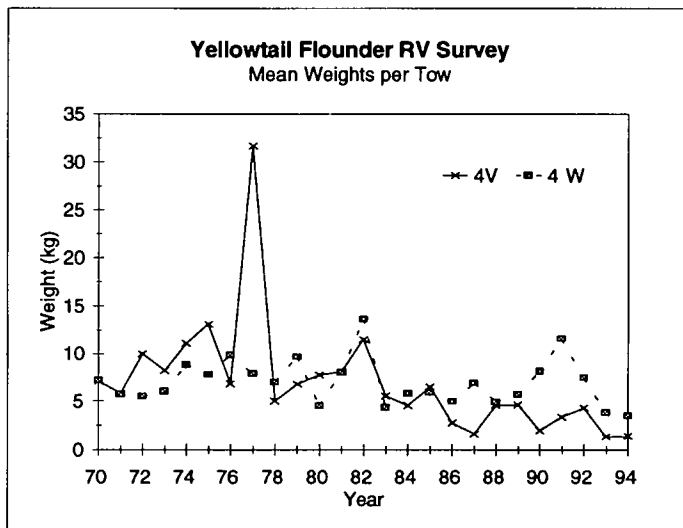


Fig. 62

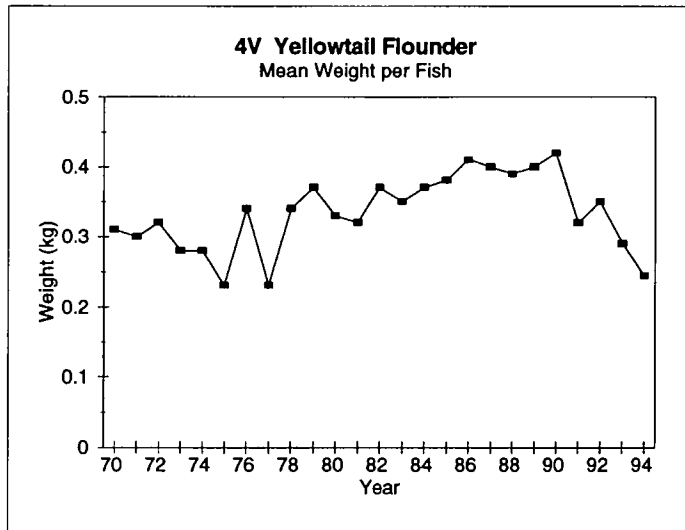


Fig. 63

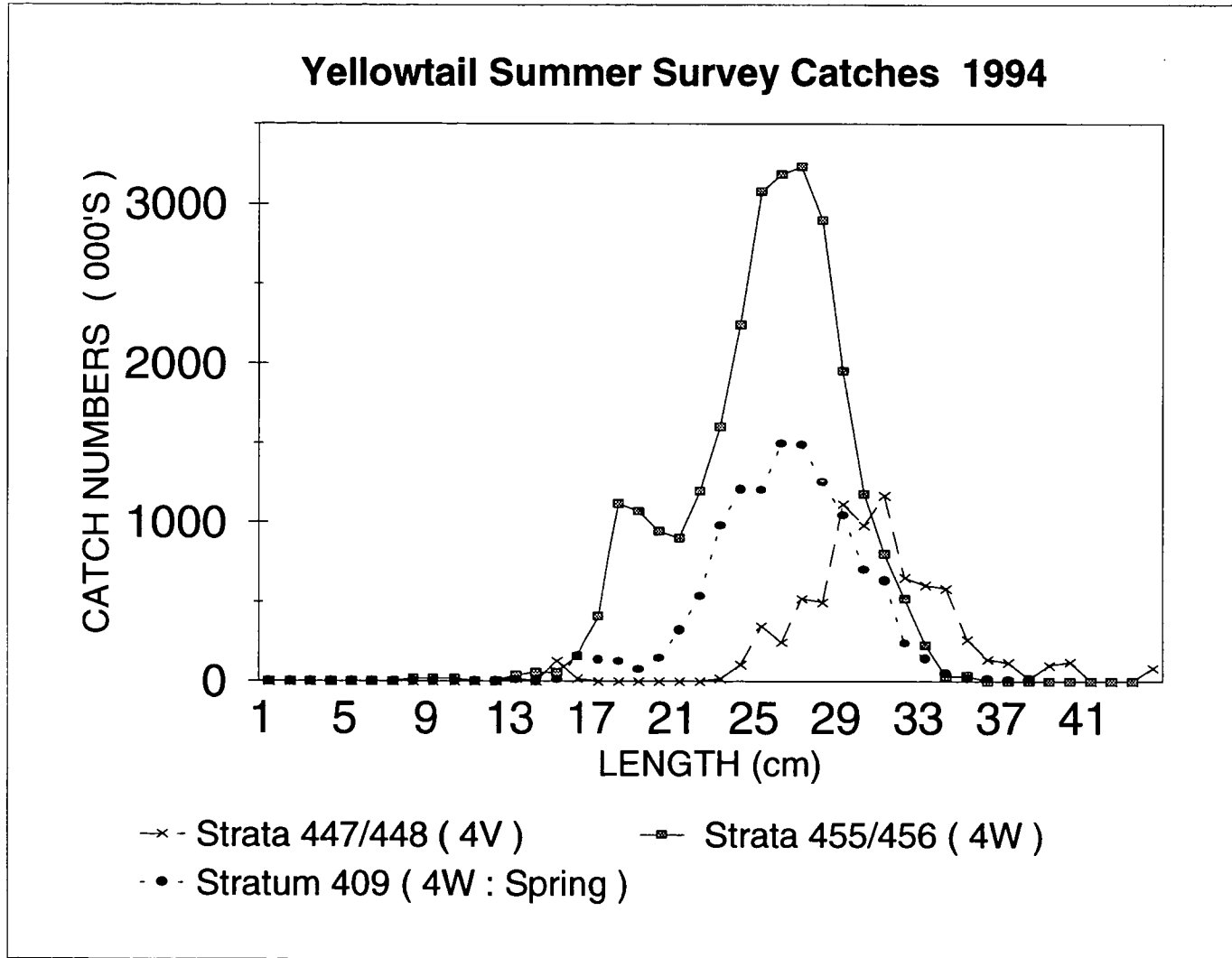
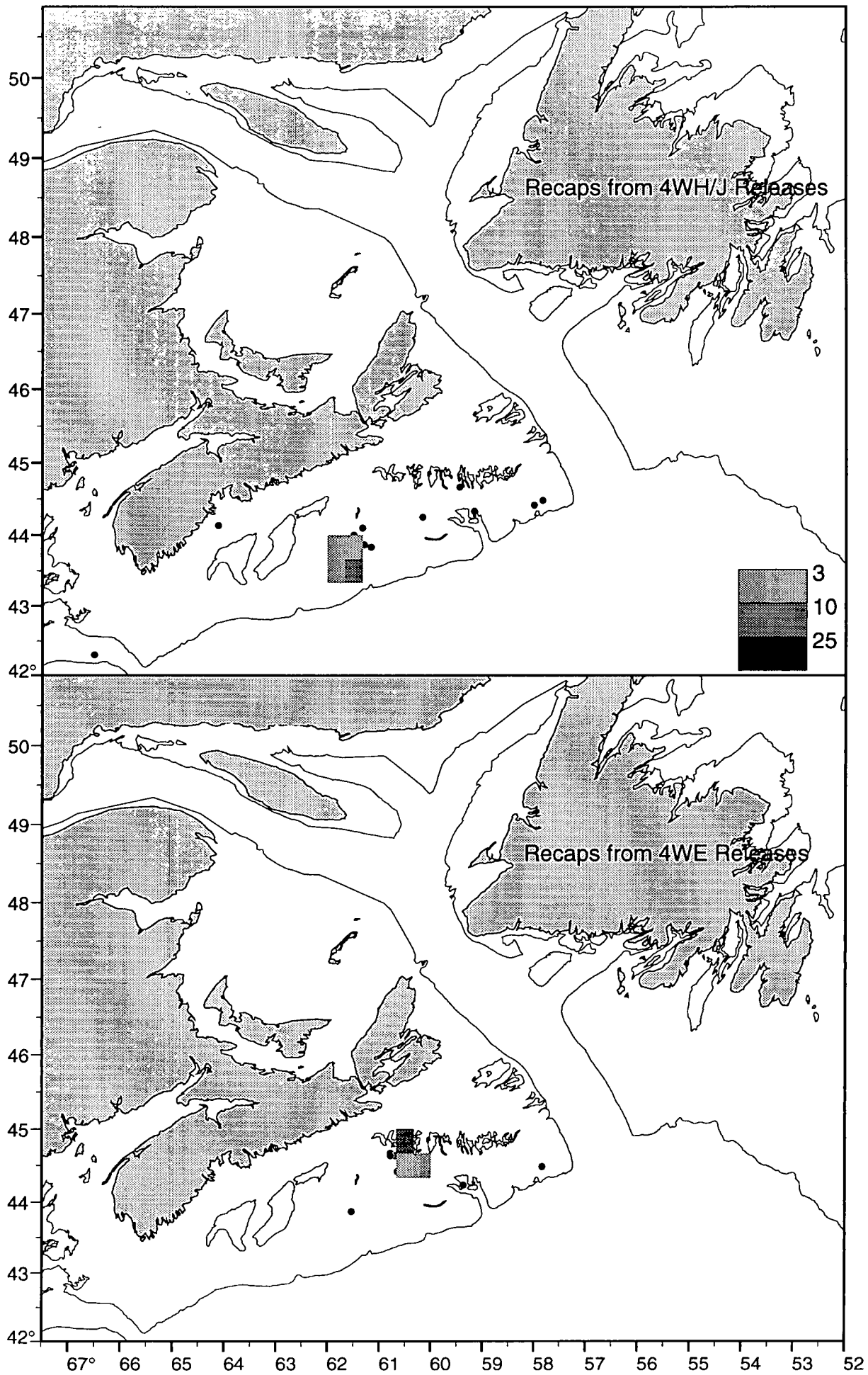


Fig. 64



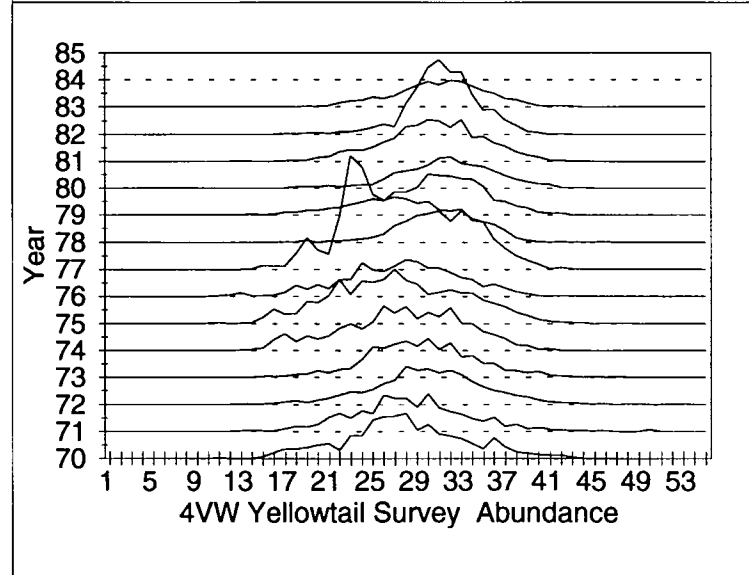
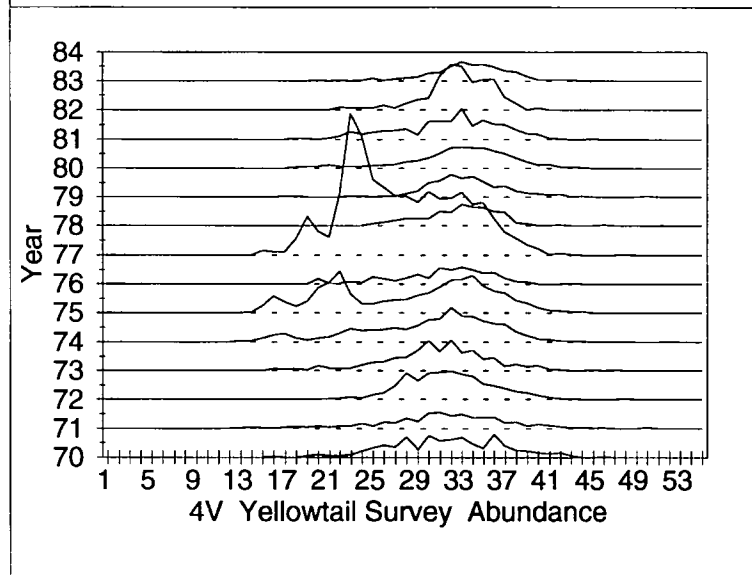
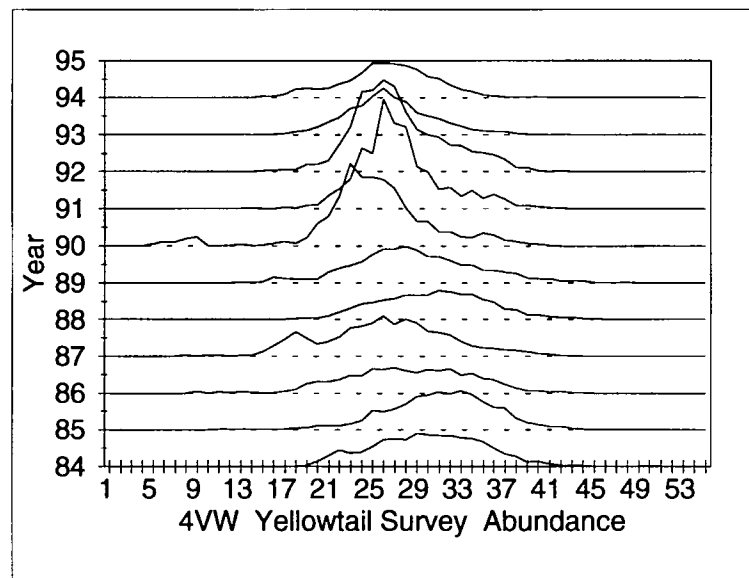
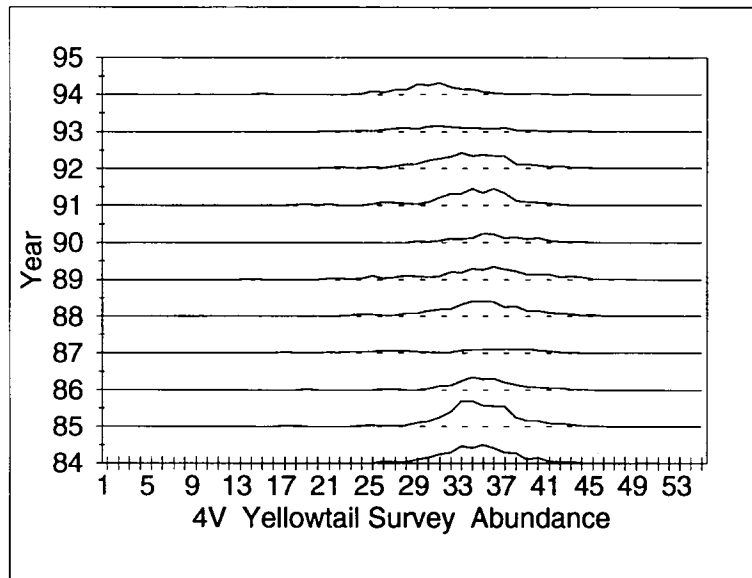


Fig. 66

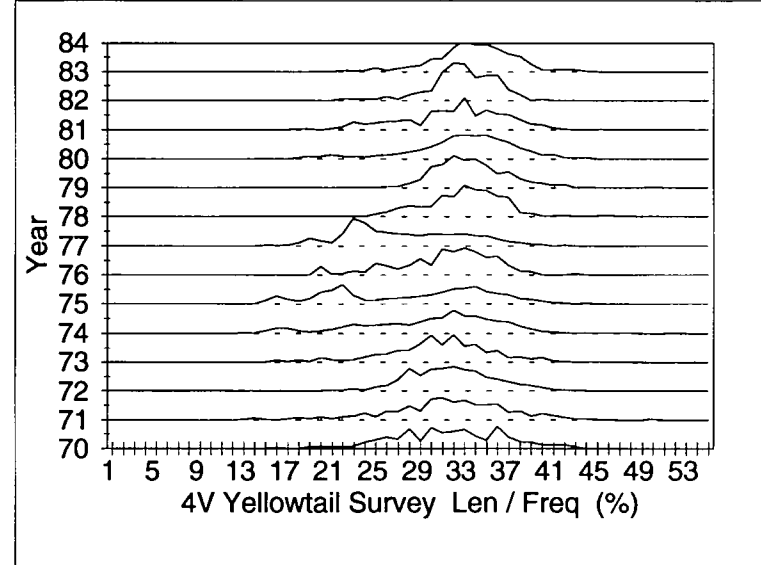
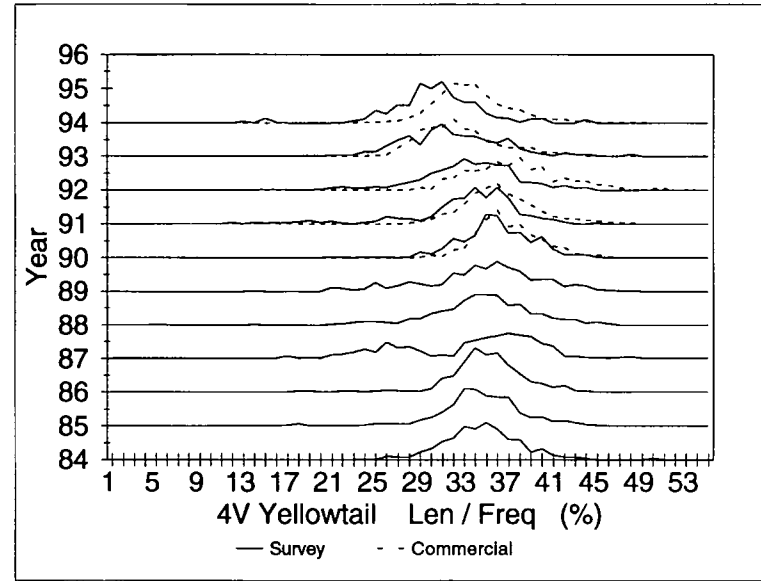
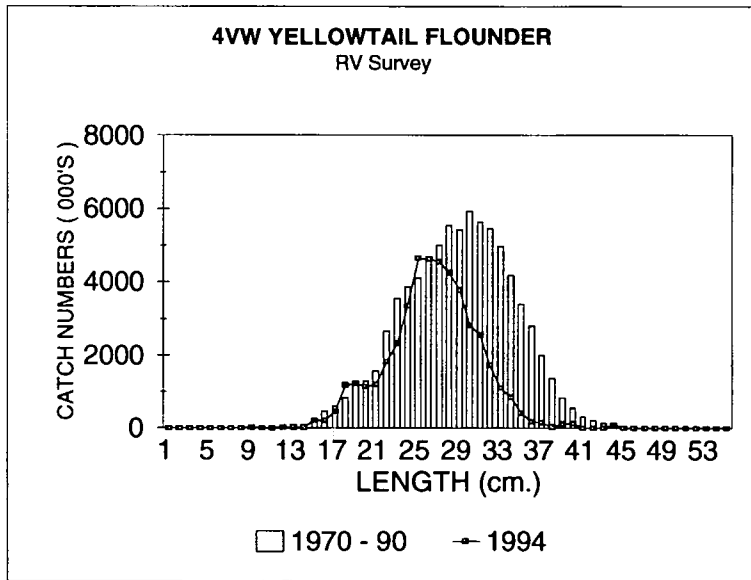
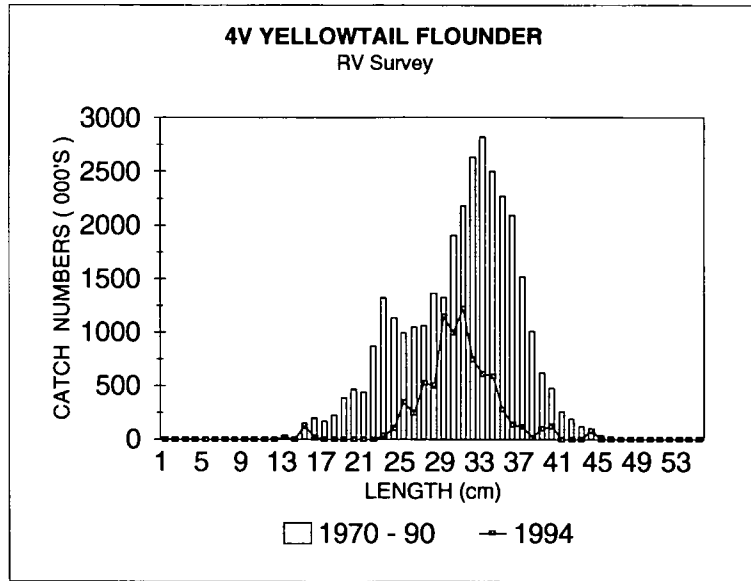


Fig. 67a

Fig. 67b

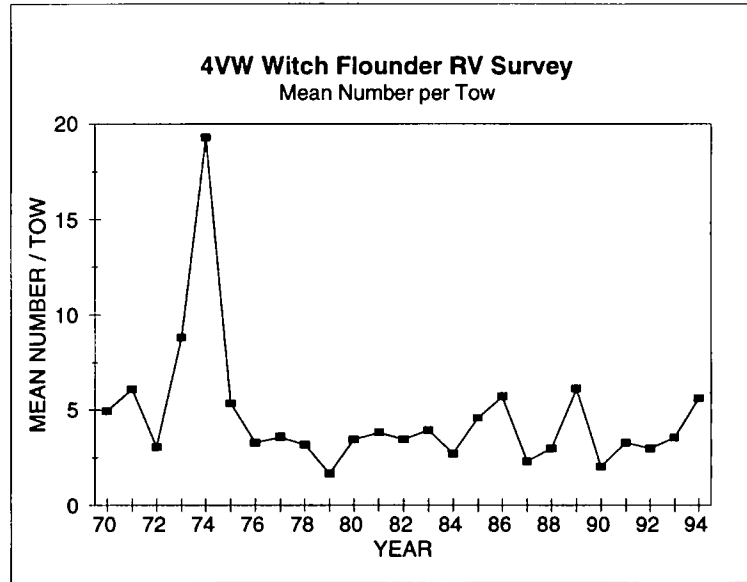


Fig. 68

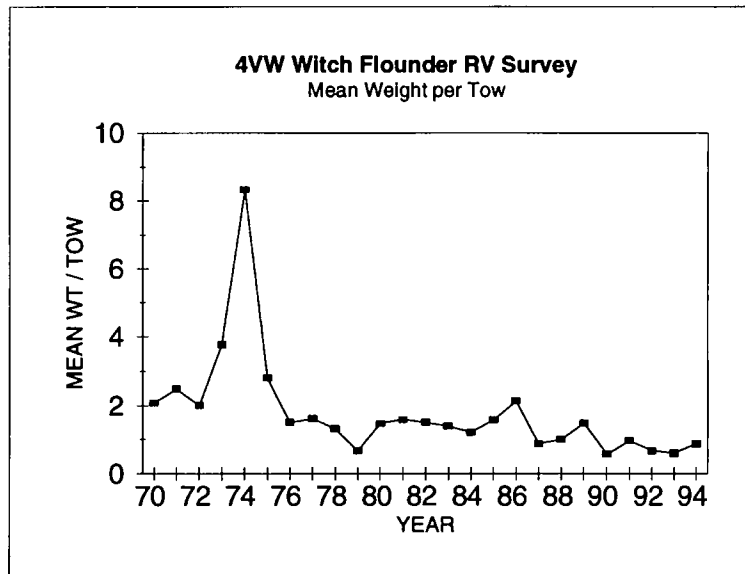


Fig. 69

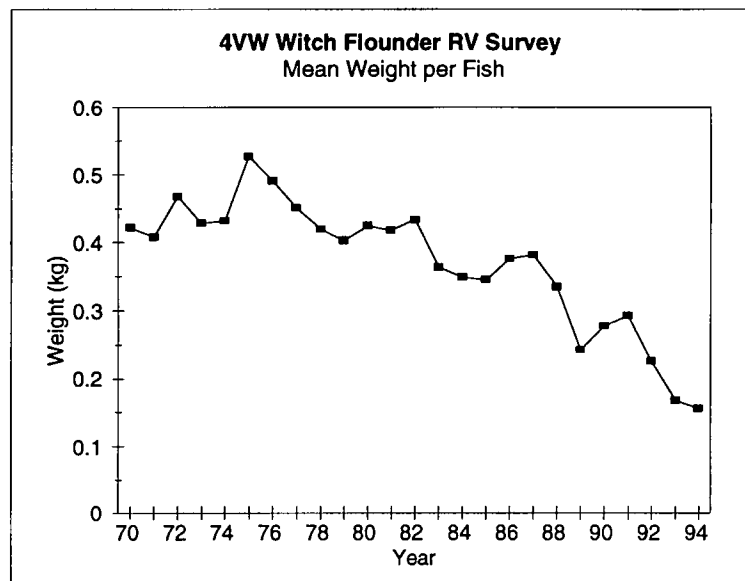


Fig. 70

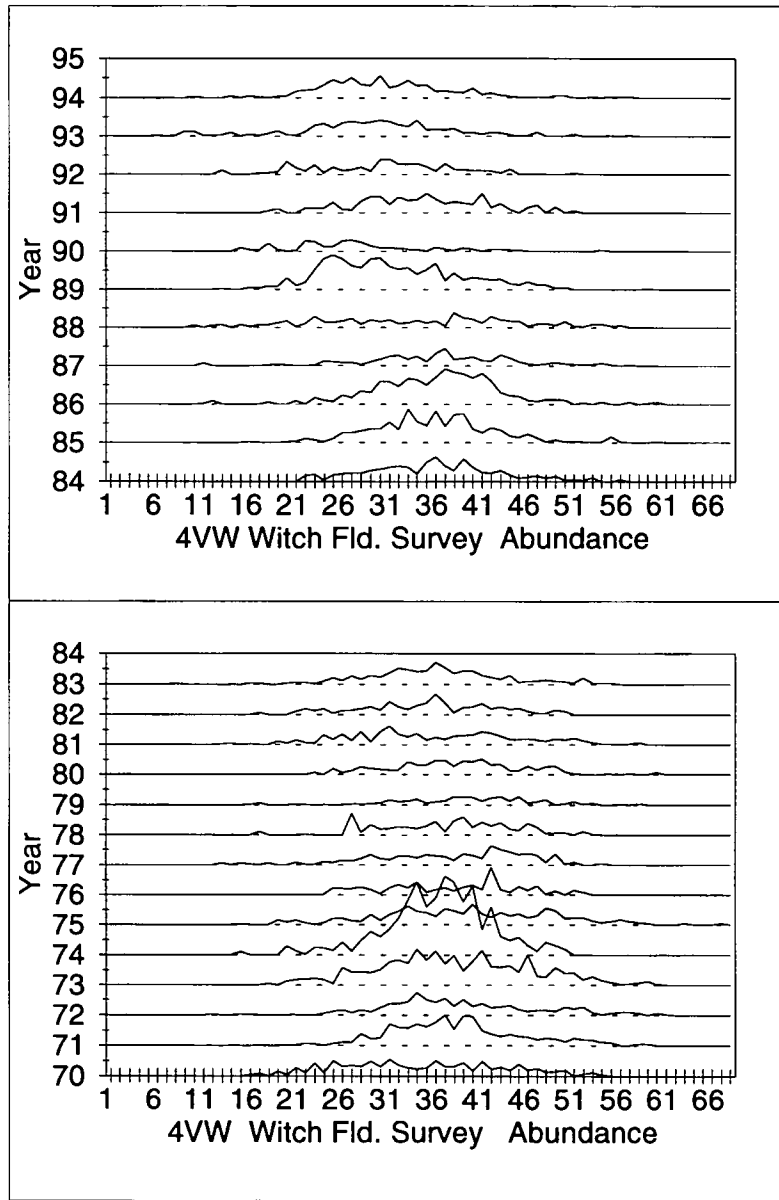


Fig. 71

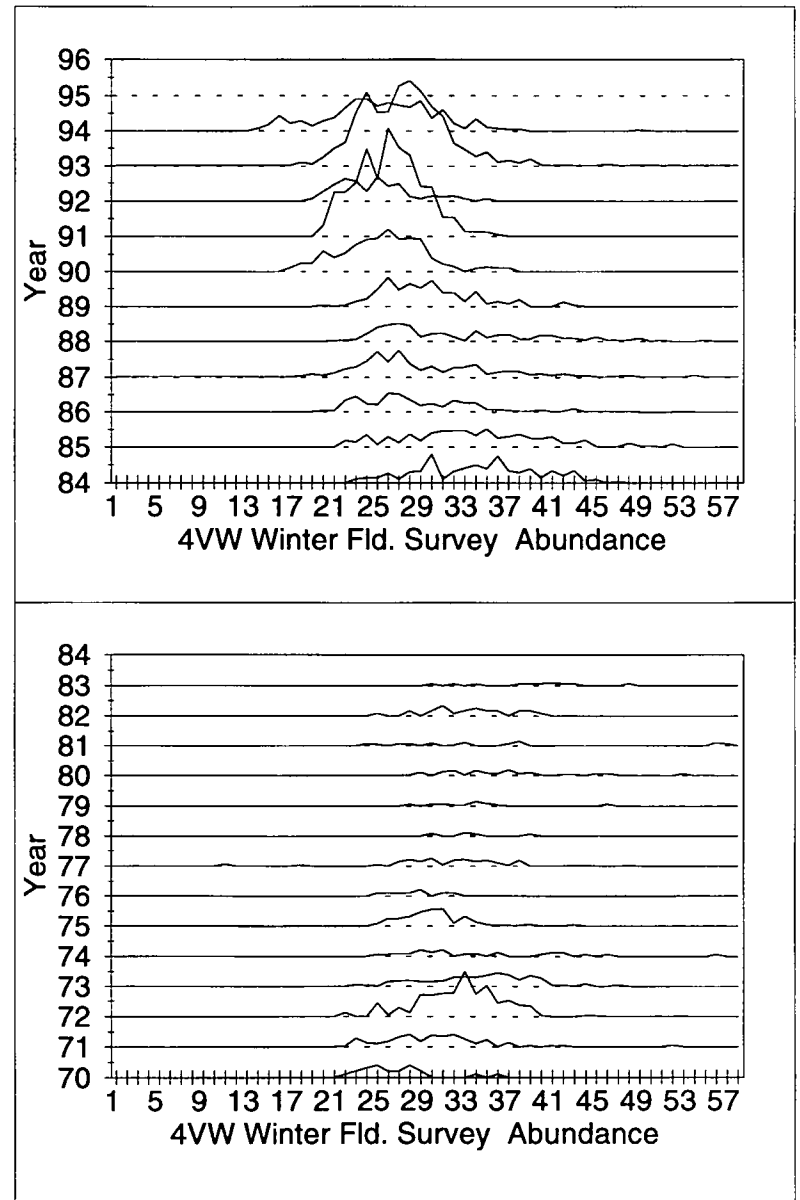


Fig. 72

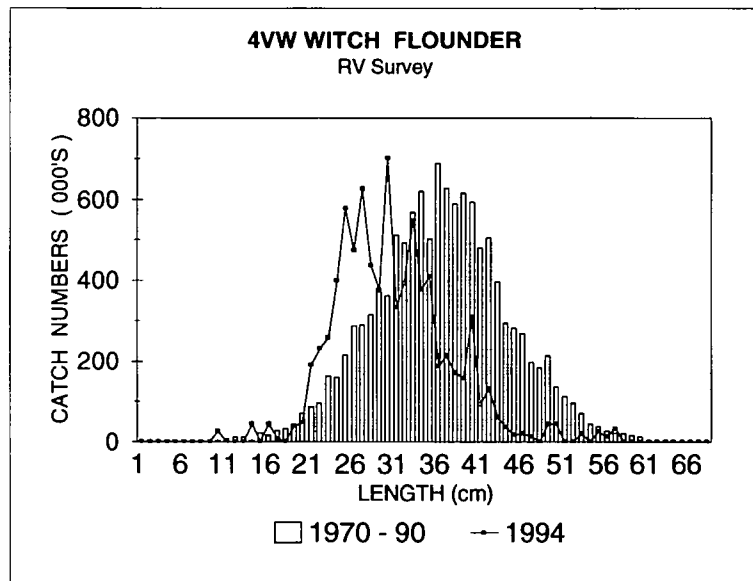


Fig. 73a

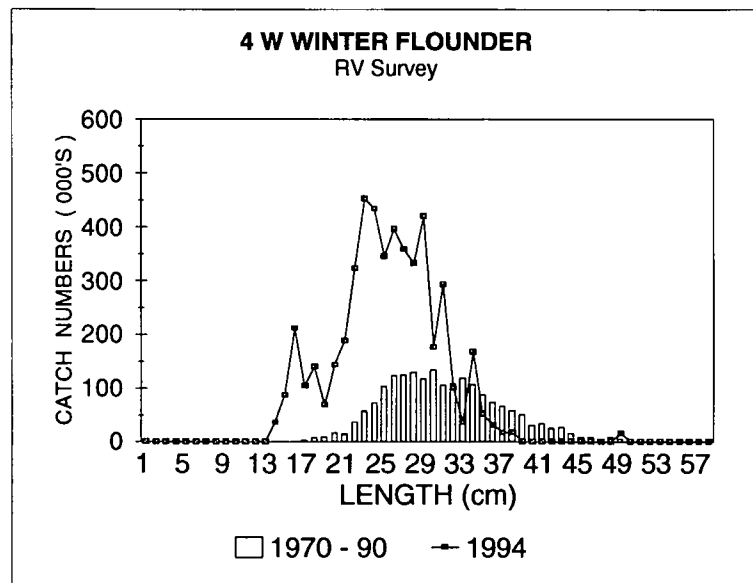


Fig. 73b

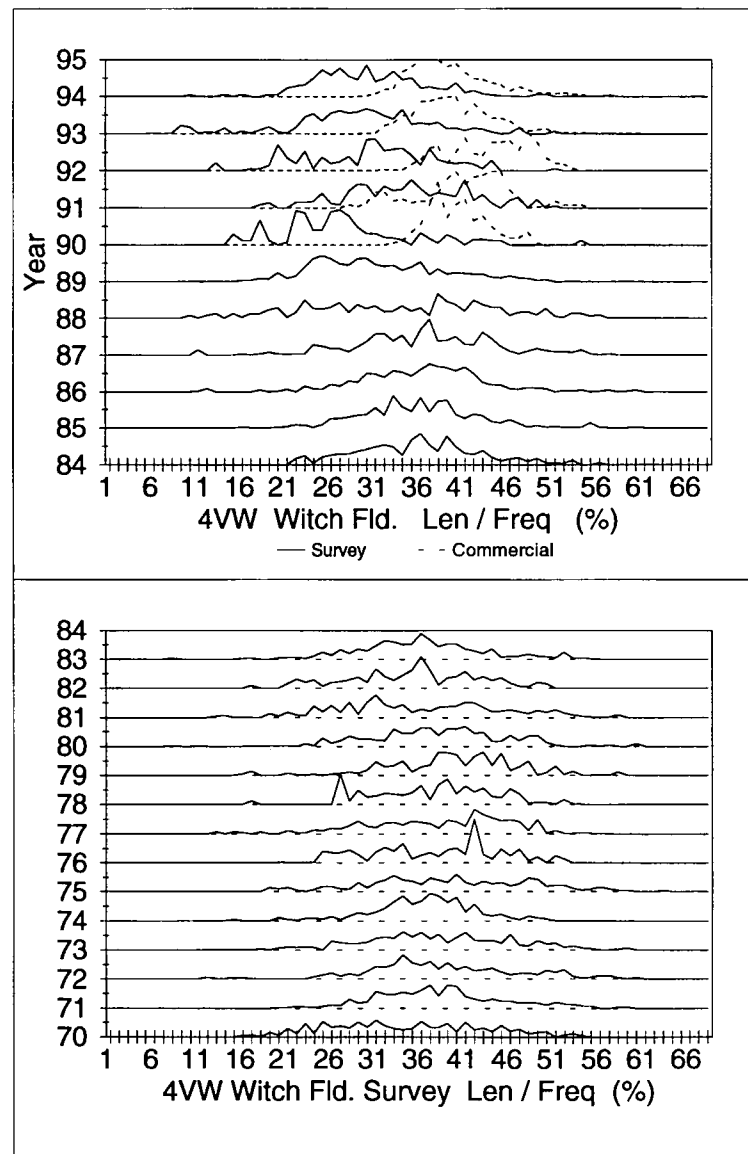


Fig. 74

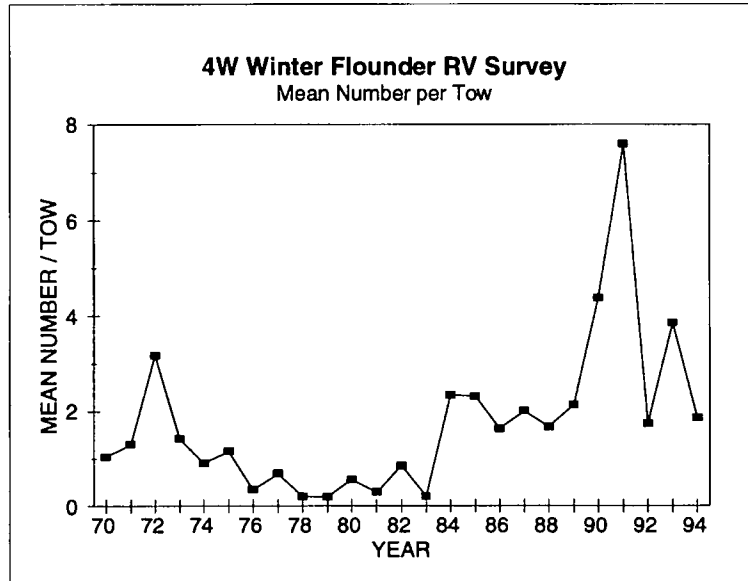


Fig. 75

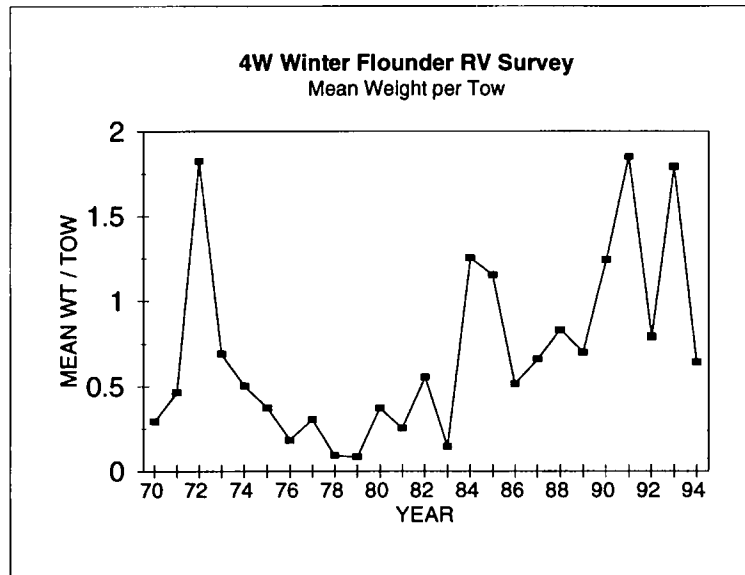


Fig. 76

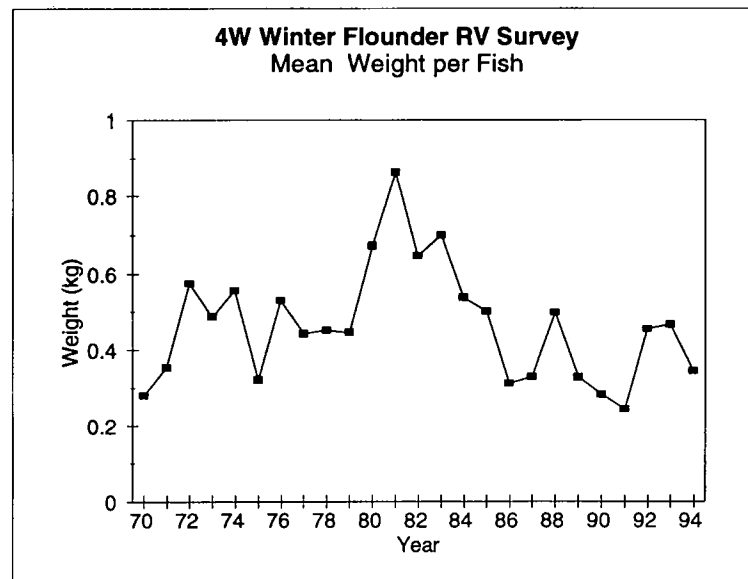


Fig. 77

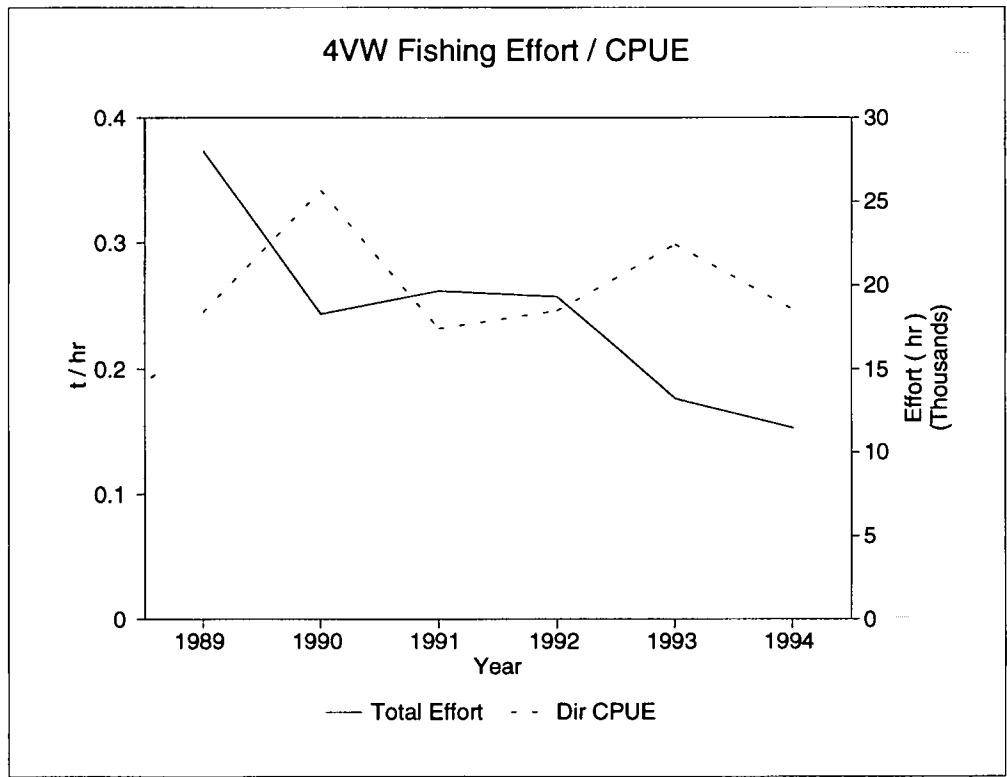


Fig. 78

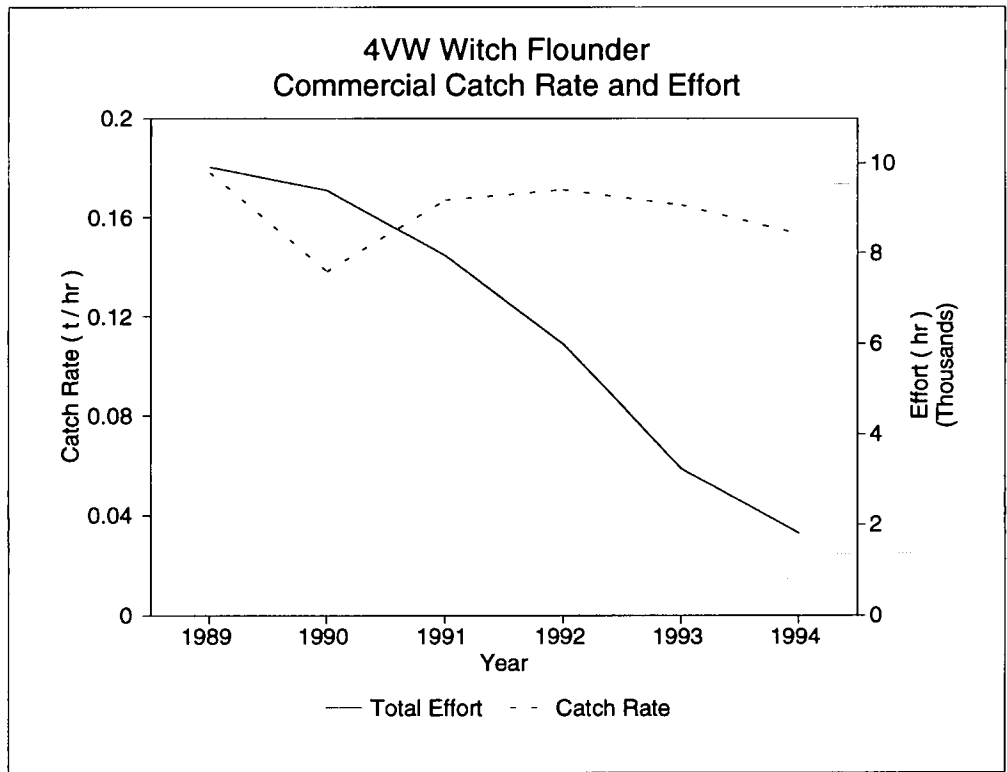


Fig. 79

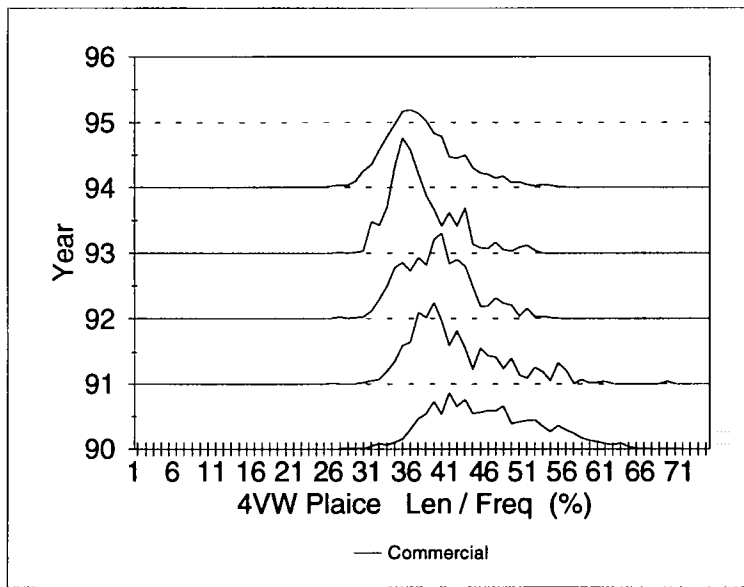


Fig. 80

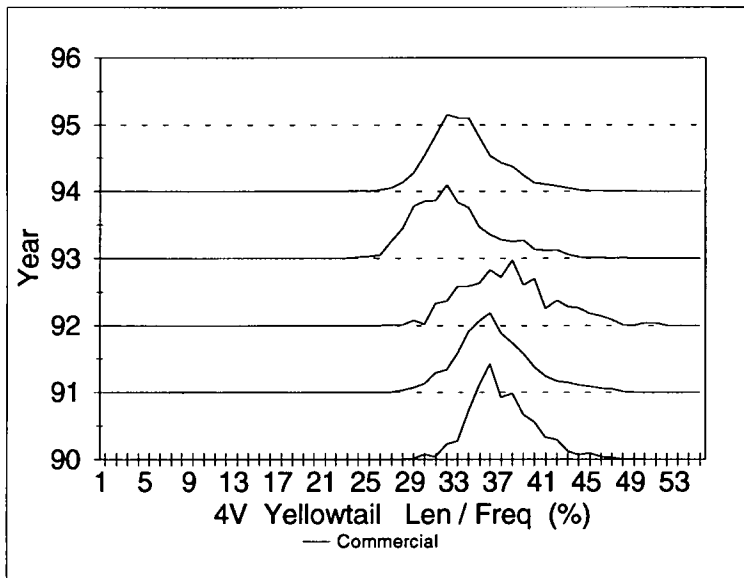


Fig. 81

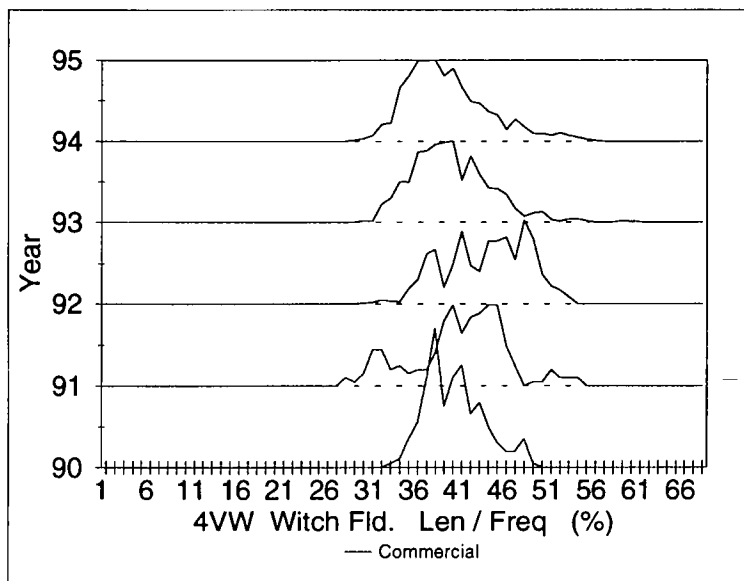


Fig. 82